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CARNEGIE MUSEUM

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W. J. HOLLAND, *Editor*

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ERRATA AND CORRIGENDA.

Throughout for "Corumba" read Corumbá.

Page 37, for "stalli" read *stalii*.

Page 107, No. 149, for "furculata" read **furcillata**.

Page 110, for "Abracis" read **Abracris**.

Page 132, for "*Pezottix arrogens*" read *Pezolettix arrogans*.

Page 187, reverse scale of reduction for figures in plates X and XI.

Page 206, for the last two lines on page read: "Apparently confined to higher elevations; the three examples above listed all coming from the Paramo de Rosas in the Venezuelan Andes."

Pages 222-356, in Dr. Arnold E. Ortmann's Paper upon the Families and Genera of the Najades, make the following changes throughout:

For "Fusconaja" read *Fusconaia*.

For "Nephronajas" read *Nephronaias*.

For "Amygdalonajas" read *Amygdalonaias*.

Page 265, in legend of figures 9 and 9a for "*Pleurobena*" read Pleurobema.

Pages 427, 435, 441, for "borelli" read **borellii**.

Page 451, for "*Leurocererus*" read *Leurocerus*.

Page 479, for "*Arnica cylindroides*" read *Arnica cylindroides*.

Page 479, for "*Opshomala*" read *Opsomala*.

ANNALS

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VOLUME VIII. NO. I.

EDITORIAL NOTES.

THE Editor was temporarily absent during the month of October, during which he made a flying visit to the city of Tangier in Morocco. During his absence the general oversight of the Museum was committed to Mr. Douglas Stewart, his Assistant, and the Director was delighted upon his return to find that during his absence Mr. Stewart, assisted by Mr. Coggeshall, had succeeded in obtaining through the kindness of the National Limestone Company a valuable series of stalactites and stalagmites, which had been brought to light in the workings of the Company at Naginey, Mifflin County, Pennsylvania. In advancing their quarry the Company opened a cavern resplendent with a multitude of stalagmitic formations surpassing in beauty any which have recently been found. A large collection thoroughly representative of the contents of the cavern was fortunately secured before the process of dynamiting was resumed, and the cave disappeared. It is the plan to attempt to re-create in the Hall of Mineralogy a miniature representation of the cave with the stalactites and stalagmites in position.

SEVERAL fine collections of birds from the higher mountain ranges of the Province of Santa Marta have been recently received from Mr. M. A. Carriker, Jr., and also some insects—principally lepidoptera—from great elevations. These prove to be exceedingly interesting. A large collection representing the fauna of Bolivia, which has been

delayed in transit over a year because of disputes between the Bolivian and Argentine authorities, has at last reached Hamburg and is expected shortly to arrive at the Museum.

THE giraffes collected by Mr. Childs Frick have been mounted and installed. The case containing them is probably the largest, certainly the tallest, existing in any museum in the new world. The group is most effective, and has provoked much admiring comment on the part of those who have seen it. It will shortly be followed by the installation of a group of African buffaloes, a group of zebras representing two species, and a group of wildebeests.

MR. O. A. PETERSON returned in October from the fossil quarry in Uinta County, Utah. Mr. Earl Douglass is remaining at the quarry during the fall and winter. The work during the past summer progressed rapidly, and there are now two carloads of fossil remains which have been taken up and boxed ready to be transferred to the Museum. The bones obtained during the past season are reported to be in remarkably fine condition. As the work has proceeded it has been discovered that the deposit of dinosaurian remains is much richer than was anticipated, and we probably will succeed in removing from the quarry the remains of five or six dinosaurs, large and small. The specimen which has been designated in our operations as "No. 1" represents undoubtedly the largest dinosaur which has as yet been discovered nearly complete in the new world. While not as long as the *Diplodocus*, it is evidently an animal of greater stature and greater bulk. Almost all of the caudal vertebræ have been freed from the matrix, and it has been definitely ascertained that this colossal reptile possessed the same remarkable prolongation of the caudal vertebræ which is such a striking feature in the case of *Diplodocus*. It is highly probable that all the sauropod dinosauria were provided with what has been called the "whip tail."

Specimen "No. 40," which lay alongside of "Specimen No. 1" and just below it in the opening, turns out to be a remarkably perfect skeleton. The ribs were found articulated and in position, and all of the vertebræ have been recovered in a continuous series from the head to nearly the extremity of the tail. While somewhat smaller than specimen "No. 1," it is a singularly fine skeleton, surpassing in com-

pleteness any skeleton which has heretofore been unearthed in America. Both the hind limbs and forelimbs, and the feet, were found practically in position.

VOLUME V of the Memoirs, being Dr. C. H. Eigenmann's *magnum opus*, upon the Fishes of British Guiana, is rapidly going through the press, and, in spite of some inevitable delays, will shortly appear.

PRESIDENT D. STARR JORDAN has returned from his visit to Japan, Korea, and China. The Editor is in receipt of several delightful letters from him, in which he informs us that he succeeded in securing, largely through the courtesy of the Japanese authorities in Japan and Korea, one of the largest, if not altogether the largest, collection of the fishes of those countries, which has up to the present time been brought to America. The collections will remain in his possession temporarily to enable him to study them, and he promises shortly to furnish us a paper on the fishes of Korea.

PREPARATIONS are being made for the reception and entertainment of the Archæological Institute of America and the American Philological Association, which will be jointly provided for by the University of Pittsburgh and the authorities of the Institute during the week intervening between Christmas and the first day of the New Year.

THE installation of the new furniture in the laboratory of Dr. Ortmann is nearing completion. When finished there will be room for the arrangement and classification of the great collections under the care of the curator of recent invertebrates, and they will thus become accessible to students.

During the summer months Dr. Ortmann made a number of excursions, reaching the sources of a number of the rivers of West Virginia and Kentucky. He has made a number of interesting discoveries.

AN unknown donor has recently sent to the Museum a beautiful specimen of an albino robin, which has been prepared and placed in the collection. It is to be wished that we could know the name of

the kind person who sent this interesting and remarkable specimen to the Museum.

THE work of completing the sets of scientific periodicals required in the work of the naturalists connected with our staff is going forward continuously. A number of important additions were made during the summer and fall, and some others are contemplated. The work of building up a reference library, such as is indispensable in a large museum, calls for patience and a considerable expenditure of money.

AT the request of the President of the Argentine Republic, Dr. Roque Saenz Peña, Mr. Andrew Carnegie has decided to present to the Museum at La Plata a replica of *Diplodocus carnegiei* similar to the one which he has given to the Kings of England and Italy, the President of France, and the Emperors of Germany, Austria, and Russia. The work of assembling the replica and mounting it preparatory to shipment will necessarily consume much time. The task is long and tedious, but experience has enabled us to solve many of the greater difficulties, so that this specimen may possibly be prepared with greater rapidity than those which were originally made. It is impossible at this moment to tell when the arrangements can be made for shipping and installing the specimen in the museum for which it is destined.

IN October, during the absence of the Director, Mr. Childs Frick visited the Museum, and was assisted by Mr. Stewart in making preliminary arrangements for outfitting his expedition to Abyssinia. He sailed from New York a couple of days before the Director of the Museum landed at that port, and, when last heard from, had safely arrived in Abyssinia, and was about to proceed into the interior. His friends at the Carnegie Museum follow him with their best wishes for success, good health, and prosperity in all his undertakings.

I. SOUTH AMERICAN ACRIDOIDEA.

BY LAWRENCE BRUNER.

The present paper follows that published in November, 1910, in the Seventh Volume of these ANNALS entitled "South American Tetrigidæ." Both that and this are reports on portions of the extensive collection made by H. H. Smith and owned by the Carnegie Museum.

While the account of the grouse-locusts here referred to was made rather complete for the whole continent, it is impracticable to continue the same style of treatment for the remaining families of South American Acridoidea. Accordingly with few exceptions only the actual material at hand will be noted. Nevertheless several synoptical tables of the species of important genera are included, where it is thought such additions will prove helpful to orthopterological students, while studying the insects belonging to the fauna of South America.

The types of the various species now described are, with few exceptions, the property of the Carnegie Museum. The others are in the collection of the writer.

Additional reports on this same collection of Orthoptera are in course of preparation and will appear later. These include representatives of the Grylloidea and Locustoidea (Phasgoneuroidea).

The arrangement or sequence of the various families and genera as found in the following pages, while not exactly in accord with my conception of the classification of these insects, follows rather closely that of W. F. Kirby as contained in his *Synonymic Catalogue of Orthoptera*, Vol. III.¹

Family EUMASTACIDÆ.

But few representatives of the *Eumastacidæ* are at hand, although the group is practically tropical in its distribution. Only two genera are found in the material before me.

¹ *A Synonymic Catalogue of Orthoptera*, Vol. III, Orthoptera Saltatoria, Part II (Locustidæ vel Acridiidæ). Printed by order of the trustees of the British Museum, 1910.

Genus *EUMASTAX* Burr.1. *Eumastax tenuis* Perty?

Mastax tenuis PERTY, Delect. Anim. Brasil., 123, tab. XXIV, fig. 3 (1830).

Eumastax tenuis BURR, Essai sur les Eumastacides, pp. 44, 45 (1899).

Mastax virescens WESTWOOD, Arc. Ent., I, p. 100 (1841).

Mastax minuta BOLIVAR, An. Soc. Esp., X, p. 481 (1881).

The collection now being reported upon contains a single female specimen, which is doubtfully referred here. It was taken in June by H. H. Smith.

Habitat.—Para, Brazil.

Genus *MASYNTES* Karsch.

Masyntes KARSCH, Ent. Nachr., XV, pp. 26, 31 (1889).

The insects which comprise the genus *Masyntes* are confined to tropical America. They appear to have their center of distribution in Paraguay and southern Brazil. A single species, however, occurs in Cuba. The several forms may be separated by the annexed synoptic table:

SYNOPSIS OF THE SPECIES OF *MASYNTES*.

- A. Tegmina fully developed, abbreviated or rudimentary, and in some cases even aborted.
 - b. Fastigium of the vertex emarginate, bifid. Pronotum furnished with oblique lateral carinae. [Cuba.].....*gundlachi* Scudder.
 - bb. Fastigium of the vertex rounded, entire. Pronotum without lateral carinae.
 - c. Smaller (σ^7 , 14–15 mm., ϕ , 20 mm.). Pronotum truncate behind.
 - d. Middle of pronotum of ϕ minutely excised. Hind femora of ϕ 15 mm. long. [Paraguay.].....*borellii* Giglio-Tos.
 - dd. Middle of pronotum of ϕ entire. Hind femora of ϕ 12.25 mm. long. [Chapada, Brazil.].....*chapadensis* sp. nov.
 - cc. Larger (σ^7 , 18–20 mm., ϕ , 25–26 mm.). Pronotum rounded or subangulate behind.
 - d. Tegmina and wings fully developed. Posterior margin of pronotum rounded. [Paraguay.].....*tigris* Burr.
 - dd. Tegmina and wings somewhat abbreviated. Posterior margin of pronotum subangulate. [Chapada, Brazil.]
brasiliensis sp. nov.
- AA. Tegmina and wings missing. Fastigium of the vertex rounded. [Bahia, Brazil.].....*saurus* Burr.

2. *Masyntes brasiliensis* sp. nov.

About the same in size and with the general appearance of *M. tigris* Burr, but differing from that species in the shorter hind femora

and tegmina and in the posterior margin of the pronotum, which is distinctly but broadly angulated, instead of rounded, as in Burr's species.

General color above obscure fuscous, modified by having the disk of the pronotum dull testaceous, and the sixth (♀) and sixth and seventh (♂) abdominal segments above lemon-yellow. Under side of body, front including clypeus and labrum, base of mandibles, lower third of sides of pronotum, and the lower part of the mesopleura, flavous. Anterior legs ochraceous, the hind femora flavous with an olivaceous tinge on basal three-fifths, the carinæ black or blackish, on the apical two-fifths orange-yellow and twice fusco-fasciate; the knees also black. Hind tibiæ somewhat obscure or infuscated and provided with a sub-basal pallid annulus, the tarsi more or less flavous.

Vertex rounded, entire, slightly produced in advance of the elongate prominent eyes, and, viewed laterally, meeting the front in a somewhat acute angle. Frontal costa sulcate throughout, reaching the clypeus. Antennæ as described for *M. tigris*, the first and second and greater part of third joints flavous, remainder dark fuscous or black. Pronotum somewhat longer than wide, the posterior lobe a little expanding, the median carina linear and fairly prominent throughout; hind margin widely, and somewhat roundly, angulate, the anterior margin straight; sides longer than high, the lower margin oblique, in the male nearly straight, in the female somewhat sinuate, the posterior angle decidedly acute (♂) or but slightly so (♀). Tegmina and wings strongly infuscated, abbreviated in both sexes, about three-fifths (♂) or one-fourth (♀) the length of the abdomen. Hind femora moderately robust, all the carinæ finely serrated, as long as the abdomen in the female, and nearly one-half longer in the male. Tip of male abdomen about as described for *tigris*; the supra-anal plate and cerci also much the same as in that species. Subanal plate, or last ventral segment, scarcely pubescent, its apex not sinuate; valves of the ovipositor rather straight, long, and slender, the lateral margins quite strongly toothed.

Length of body, ♂, 17.5 mm., ♀, 26 mm.; of pronotum, ♂, 2.2 mm., ♀, 2.9 mm.; of tegmina, ♂, 7 mm., ♀, 4.75 mm.; of hind femora, ♂, 13 mm., ♀, 16 mm.

Habitat.—The types were collected by H. H. Smith. The male comes from Corumba, Brazil, where it was taken during the month of March; the female bears the label "Chapada, Campo, Oct." Other specimens are at hand from the same localities and bear the same dates.

3. *Masyntes chapadensis* sp. nov.

This insect is most closely related to *M. borellii* Giglio-Tos, from which it differs chiefly in the shorter hind femora and the entire, instead of excised, middle of the hind margin of the pronotum. In color *chapadensis* differs from *borellii* by having the front, labrum, and clypeus dull brown, instead of yellowish; the median carina of the pronotum is concolorous, instead of yellow. The tegmina and wings are also decidedly shorter in the present species than in the one with which it has been compared.

Length of body, ♂, 14 mm., ♀, 20 mm.; of pronotum, ♂, 2 mm., ♀, 2.3 mm.; of tegmina, ♂, 2.7 mm., ♀, 2.15 mm.; of hind femora, ♂, 10.5 mm., ♀, 12.5 mm.

Habitat.—There are specimens at hand from both Chapada and Corumba, Brazil. They were taken during February and April. The types are in the Carnegie Museum.

Family TRUXALIDÆ.

Representatives of the family Truxalidæ are widely distributed over the surface of the earth, although no single continent seems to be greatly favored in this dissemination. Under these conditions it is needless to state that there are numerous genera and species now known and new ones continually being discovered. The present collection contains several of these latter, as may be seen by referring to succeeding pages.

Genus HYALOPTERYX Charpentier.

Hyalopteryx CHARPENTIER, Orthopt. Descr. et Depict., pl. XLVI (1845).

The present genus is confined to South America, where its representatives abound in Brazil, eastern Bolivia, and Paraguay.

4. *Hyalopteryx rufipennis* Charpentier.

Hyalopteryx rufipennis CHARP., Orthopt. Descr. et Depict., pl. XLVI (1845).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, a single female (H. H. Smith), January.

The synoptic table given by me in my List of Paraguayan Locusts (Proc. U. S. Nat. Mus., XXX, p. 623) runs this insect as above, which is evidently correct.

Genus TRUXALIS Fabricius.

Truxalis FABRICIUS, Syst. Ent., p. 279 (1775).

Truxalis, as at present restricted, belongs to the American hemisphere, where it is represented on both continents by the following named species.

5. *Truxalis brevicornis* (Linnæus).

Gryllus brevicornis LINNÆUS, Cent. Ins. Par., p. 15 (1763).

Truxalis brevicornis FABRICIUS, Syst. Ent., p. 279 (1775).

Acridium ensicornum DE GEER, Mem. Ins., p. 449, pl. XLII, figs. 1, 2 (1773).

Opsomala punctipennis SERVILLE, Hist. Nat. Ins. Orthopt., p. 590 (1838).

Truxalis viridula PALISOT DE BEAUVOIS, Ins. Afr. et Amer., p. 80, pl. III, fig. 1 (1807).

Oxycoryphus burkhartianus SAUSSURE, Rev. et Mag. Zool., p. 315 (1861).

Truxalis adspersa BLANCHARD, Voy. Amer. Merid., VI, pt. 2, p. 216, pl. XXVII, fig. 2 (1837-1843).

Habitat.—Specimens of this insect are at hand from Corumba and Chapada, Brazil, where they were taken during the months of March and July respectively (H. H. Smith). It also occurs throughout Brazil, Paraguay, much of Argentina, and northward through Central America, Mexico, and the United States east of the Mississippi river, even to the Canadian border.

Genus ORPHULA Stål.

Orphula STÅL, Recens. Orthopt., I, p. 105 (1873).

A genus of medium-sized locusts belonging to tropical America. Species are found in both North and South American countries. At least seven of them have been recognized.

6. *Orphula pagana* Stål.

Gomphocerus (Hyalopteryx) pagana STÅL, Freg. Eug. Resa., Ins., Orthopt., p. 339 (1860).

Truxalis (Orphula) pagana STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphula pagana GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, No. 184, p. 9 (1894).

Habitat.—Corumba and Chapada near Cuyaba, Matto Grosso, Brazil, March to August (H. H. Smith). Also other Brazilian, Paraguayan, Bolivian, and Argentinian localities.

Genus ORPHULELLA Giglio-Tos.

The locustid genus *Orphulella* is typical of the New World and is well represented in both North and South America. Its members are

numerous in all grassy openings, in meadows, on savannas, prairies, and even the pampas and llanos, where they are the common grasshoppers of the respective regions in which each species is found. At least fifty apparently distinct forms have been described. More than half of these occur in North America, where representatives abound from well in Canadian territory to the Isthmus of Panamá. In South America at least one species has been described from as far south as the Rio Negro of Argentina, while all of the West Indies are within the range of several other forms. These locusts are slightly below the medium in size and inconspicuous in appearance. The colors of most of them are quite variable, while the characters which separate the species are not strongly apparent, even to the trained entomologist. Undoubtedly several additional forms will be found, when the various regions within the range of their distribution have been more carefully explored. A later and more critical study of the genus may also result in the better separation of the species.

SYNOPSIS OF THE SOUTH AMERICAN SPECIES OF ORPHULELLA.²

- A. Lateral carinæ of the pronotum interrupted between the anterior and posterior sulci.
- b. Size larger (♀, 21-23 mm.).
- c. Separate sections of the carinæ lunate; the tibial claws normal. Antennæ filiform. *obscura* Bruner.
- cc. Separate sections of the carinæ straight; tibial claws long and strong, the second of inner ones nearly twice the length of the first, recalling *Stirapleura*. Antennæ subsensiform. *interrupta* sp. nov.

² In presenting this synoptical table the writer wishes to state that he does so with a knowledge that it is only temporary, and very incomplete even for the described forms. Walker's *Stenobothrus graciosus* (Cat. Derm., Brit. Mus., IV, p. 758) belongs to the genus *Orphulella* and seems to fall near *O. punctata*, from which it may be distinct. Male specimens of green color are very rare in *punctata*. The insect described by Bolivar as *Orphula patruelis* may also belong to the genus *Orphulella*. If so, its "distinctly ensiform" antennæ would place it near either *crassa* or *interrupta*. Possibly Walker's *Stenobothrus concinnulus* (l. c., p. 759) also belongs here, although Kirby places it with *Orphulina* (Cat., p. 119). It would come somewhere in the vicinity of *intricata*. The *Chrysochraon* ? *abbreviatum* Scudder (Proc. Bost. Soc. Nat. Hist., XII, p. 339) is also, according to a later statement of that author, a member of the genus *Orphulella* (see l. c., XXVII, p. 206). It very likely belongs near *peruna* Bruner and *chipmani* Bruner in the section with straight lateral carinæ in advance of the principal sulcus. *O. intricata* appears twice in the table. It is very similar to *insularis* both in size and general appearance, although much of the territory between the habitat of the two lacks closely related representatives.

bb. Size smaller (♀, 15 mm.). *gracilis* Gig.-Tos.

AA. Lateral carinæ of the pronotum complete or subinterrupted between the anterior and posterior sulci.

b. Body normal, neither greatly compressed nor unusually robust.

c. Lateral carinæ in advance of the last transverse sulcus, decidedly arcuate, angulate, or more or less strongly divergent. Antennæ variable.

d. Size larger (♀, 19-22 mm. in length).

e. Body unusually slender; tegmina and wings in both sexes greatly surpassing the tips of hind femora and apex of abdomen. Dusky maculations confined to discal field of the tegmina.

elongata sp. nov.

ee. Body normal in form, not especially slender. Tegmina and wings but little longer than ♀ abdomen.

f. Pronotal carinæ quite strongly arcuate. The dusky maculations of the tegmina generally distributed, occupying most of the wing. [Tropical America.]

punctata De Geer.

ff. Pronotal carinæ gently arcuate. The dusky maculations of the tegmina confined to the discal field.

g. Hind margin of the disk of pronotum distinctly angulate. Body moderately robust; the fastigium of the vertex, even of ♀, right-angled. [Costa Rica.]

meridionalis Bruner.

gg. Hind margin of the disk of pronotum rounded; the fastigium of the vertex, even of the ♂, gently obtusangulate. [Brazil]. *costalis* Walker.

dd. Size smaller (♀, 12.5 mm. to 18 mm. in length).

e. Lateral carinæ of the pronotum always complete.

f. Antennæ filiform, but little, if at all, flattened.

g. Lateral foveolæ of the vertex well-defined, elongate triangular. [Brazil and Paraguay.] . . . *expandens* Walker.

gg. Lateral foveolæ almost obliterated. [St. Domingo.]

decisa Walker.

ff. Antennæ robust, short, the joints depressed or flattened. [Para, Brazil.]

g. Lateral foveolæ of the vertex faint, almost linear, the bounding walls scarcely apparent. [Isle of Trinidad.]

insularis Bruner.

gg. Lateral foveolæ of the vertex well defined, about twice as long as basal width, the bounding walls prominent. [Argentina.] *intricata* Stål.

ee. Lateral carinæ of the pronotum sometimes faint or subinterrupted between the transverse sulci. [Argentina.] . . . *intricata* Stål.

cc. Lateral carinæ in advance of the last transverse sulcus straight, or very gently arcuate, little, or not at all, divergent. Antennæ slender, filiform.

- d. Size smaller (♂, 12-13 mm., ♀, 15-18 mm.).
 e. Form graceful, size smaller (♂, 12 mm., ♀, 16.5-17 mm.) [Isle of Trinidad to northern Brazil].....*chipmani* Bruner.
 ee. Form more robust, size larger (♂, 13 mm., ♀, 17-18 mm.). [Central Peru.]*peruna* Bruner.
 dd. Size larger (♂, 15 mm., ♀, 23-25 mm.). [Cuba and Isle of Pines.]
scudderi Bolivar.
- bb. Body robust, strongly compressed, making the insect appear unusually deep.
 c. Lateral carinae of pronotum in advance of last transverse sulcus straight-parallel. Antennae heavy, the basal joints strongly depressed.
crassa sp. nov.
- cc. Lateral carinae of pronotum in advance of the last transverse sulcus more or less strongly arcuate. Antennae comparatively slender, the basal joints but little flattened.
 d. Lateral foveolae of vertex shallow, elongate-triangular; hind femora with the apex normal, moderately robust.....*grossa* sp. nov.
 dd. Lateral foveolae of vertex rather deep, basal width one-half the length; hind femora with the apex small, unusually slender.
compacta sp. nov.

7. *Orphulella obscura* Bruner.

Orphulella obscura BRUNER, Proc. U. S. Nat. Mus., XXX, p. 627 (1906).

Habitat.—Chapada, Corumba, and Para, Brazil, from April to September. Several specimens of both sexes (H. H. Smith).

This insect is very variable in color, but in every case is quite readily recognizable on account of the rather heavy fuscous markings of the pronotum, tegmina, and legs. It does not appear to be as common as some of the other species of the genus, or else its habits are of such a nature as to render it less liable to detection and capture.

8. *Orphulella interrupta* sp. nov.

This locust, as shown by the above synoptic table of the South American species of the genus, is most closely related to *O. obscura* and *O. gracilis*, both of which it approaches in having the lateral carinae of the pronotum interrupted between the sulci. From the former it may readily be separated by the slightly larger size and the form of the separate sections of the carinae; from the latter by its much larger size and the more robust hind femora. Antennae short, the proximal joints a little flattened.

General form somewhat robust; the head large, a little wider than the front edge of the pronotum, the occiput very gently arcuate when viewed laterally, the vertex somewhat ascending, rather deeply sulcate, nearly twice as broad as long, the antero-lateral carinae meeting in an

obtuse angle, lateral foveolæ scarcely differentiated, but rather included in the antennal scrobes. Eyes fairly prominent, a trifle longer than the anterior edge of the cheeks below them; the ocelli large, the lateral pair located at the end of a short downwardly directed carina which would ordinarily mark the posterior extremity of the foveola, and very close to the upper one-fourth of the eye. Frontal costa prominent, broad, gently sulcate, strongly punctate, expanding but little below, reaching the clypeus. Lateral carinæ also prominent, evenly divergent, and reaching the base of the mandibles. Pronotum of moderate length, quite strongly constricted laterally at middle, the two lobes about equal in length; lateral carinæ widely interrupted at middle, on anterior lobe most prominent at front margin, convergent posteriorly, and terminating just in advance of the first transverse sulcus; on hind lobe heaviest at the transverse sulcus, divergent, and fading before reaching the posterior edge at shoulders; hind margin broadly angulate. Tegmina of moderate width, sparsely veined, extending a little beyond the apex of hind femora; intercalary vein well developed, the apex rounded. Hind femora robust, passing the abdomen by the length of the genicular area; hind tibiæ rather strongly hirsute, the inner claws or spurs heavy, elongate, the second nearly twice the length of the first, reminding one of this feature in the species of *Sterapleura*, eight- or nine-spined externally, ten- or eleven-spined internally. Interspace between the mesosternal lobes quadrate, a little narrower than the lobes themselves.

General color ochraceo-testaceous, the head, pronotum and pleura, as well as anterior legs, streaked and strongly conspersed with ferruginous; the pronotal carinæ pallid, very faintly bordered with piceous; tegmina smoky hyaline, marked along the disk and anterior field with quadrate brown patches and spots, these separated by areas of pallid cross-veins. Hind femora marked with faint fuscous patches on upper edge and black dots along the external carinæ, the lower outer edge infuscated; hind tibiæ cinereo-testaceous conspersed with brown, the spines black-tipped. Antennæ ferruginous.

Length of body, ♀, 22 mm., of pronotum, 4 mm., of tegmina, 19.5 mm., of hind femora, 13.6 mm.

Habitat.—Chapada, Brazil, in July (H. H. Smith, collector).

The type, which is unique, is in the collection of the Carnegie Museum.

9. *Orphulella gracilis* Giglio-Tos.

Orphulella gracilis GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 11 (1894).

Habitat.—Several specimens from among the collections studied have been determined as this species. They come from Chapada, Brazil (H. H. Smith).

10. *Orphulella elongata* sp. nov.

Related to *O. punctata* De Geer, but much slenderer and more graceful in form.

Female.—But little heavier than the males of *O. punctata*. The head very gently wider than the anterior edge of the slightly compressed pronotum, the occiput somewhat ascending above the plane of the pronotum, of moderate length; fastigium of the vertex very gently acuminate, the antero-lateral walls but little elevated above the disk; lateral foveolæ profound, somewhat elongate-triangular, the upper side gently arcuate. Eyes of moderate size, acuminate above, their anterior edge straight. Antennæ slender, filiform. Pronotum with the anterior and posterior lobes about equal in length, quite strongly compressed, especially on the anterior half; the lateral carinæ strongly and evenly arcuate in front of the last transverse sulcus, approaching closest at middle, where they are but half as far apart as on the hind margin of the posterior lobe. Tegmina long and slender, reaching about one-fifth of their length beyond the tip of the abdomen, their veins very inconspicuous. Hind femora slender, their apex scarcely reaching the tip of the abdomen; hind tibiæ slender, externally ten-spined.

General color dull brown, varied with testaceous on face, lower half of sides of pronotum, abdomen, and legs. Occiput, disk of pronotum, and dorsal edges of tegmina pale testaceous, the latter marked rather evenly along the dorsal angle and on the disk with fuscous dots, those on the disk much more pronounced. Wings rather strongly infuscated apically and along the anterior margin. Hind femora with the usual fuscous markings on the upper edge and along the lower outer carina; hind tibiæ fusco-cinereous, with a paler basal annulus. Antennæ pallid (at least on basal half, the only portion remaining on the type specimen).

Length of body, ♀, 20 mm., of pronotum, 2.4 mm., of tegmina, 19 mm., of hind femora, 10.5 mm.

Habitat.—A single ♀, the type, Corumba, Brazil, where it was taken during April by H. H. Smith.

There are two males of this genus before me which possibly belong to this species. They approach quite closely to those which are unhesitatingly referred to *O. punctata* De Geer, but seem to be separable from that species in their more elongate form and slightly longer wings, in one of them surpassing the apex of the abdomen by fully one-third of their length. One of the specimens has the dorsal portion of the tegmina pale grass-green, while the other follows closely the coloration as described for the female. The carinæ of the pronotum here, as well as in the female, are pallid, and are bordered within on the hind lobe by a widening streak of black as is frequently the case in members of the genus.

The measurements of these males are as follows: Length of body, 14.5 mm., of pronotum, 3 mm., of tegmina, 15–15.5 mm., of hind femora, 8.5–9 mm.

Habitat.—Corumba, Brazil, March. One of them bears the additional label "highlands."

11. *Orphulella punctata* De Geer.

Acrydium punctatum DE GEER, Mém. Ins., III, p. 593, pl. 42, fig. 12 (1773).

Truxalis punctata STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphulella punctata GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 12 (1894).

Stenobothrus mexicanus WALKER (*nec* Saussure), Cat. Dernapt. Salt. Brit. Mus., IV, p. 756 (1870).

This is the most abundantly represented species of the genus, and specimens are at hand from all the Brazilian localities at which Smith collected. Much variation in color and also considerable in size is observable among the material at hand. The species was taken practically throughout the year.

12. *Orphulella meridionalis* Bruner.

Orphulella meridionalis BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 77, 81 (1904)

Habitat.—Costa Rica and southward. Not contained among the material now reported upon.

13. *Orphulella costalis* Walker.

Stenobothrus costalis WALKER, Cat. Dermap. Salt., Brit. Mus., IV, p. 759 (1870).

Habitat.—It is barely possible that individuals of the insect described as *Stenobothrus costalis* by Walker are at hand among the two

hundred or more specimens before me from Brazil, the locality cited by that author.

14. *Orphulella intricata* Stål.

Orphula intricata STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphulella intricata GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, No. 184, p. 12 (1894).

Habitat.—Argentina, and perhaps also southern Brazil. Not noticed among the large series of specimens of the genus *Orphulella* at hand.

15. *Orphulella expandens* Walker.

Stenobothrus expandens WALKER, Cat. Dermap. Salt., Brit. Mus., IV, p. 758 (1870).

Orphulella expandens KIRBY, Syn. Cat. Orthopt., III, p. 122 (1910).

Orphulella elegans GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 12 (1894).

Habitat.—Chapada, Brazil, September to April (H. H. Smith). Numerous specimens.

16. *Orphulella insularis* Bruner.

Orphulella insularis BRUNER, Journ. N. Y. Ent. Soc., XIV, p. 150 (1906).

Habitat.—Like the next species this locust is confined to the Windward islands of the West Indies and northern South America.

It too is absent from the material being reported upon, and is included for purposes of comparison.

17. *Orphulella chipmani* Bruner.

Orphulella chipmani BRUNER, Journ. N. Y. Ent. Soc., XIV, p. 149 (1906).

Habitat.—Trinidad, British Guiana, and Para, Brazil, and perhaps also other portions of northern South America.

The present collection does not contain representatives of this species, but from its known range it must have been overlooked by H. H. Smith.

18. *Orphulella peruna* Bruner *nom. nov.*

Zonocerus bilineatus SCUDD., Proc. Bost. Soc. Nat. Hist., XVII, p. 268 (1874).

Orphulella? *bilineatus* SCUDD., l. c., XXVII, p. 210 (1896).

Habitat.—Along the upper Amazons in Brazil, Ecuador, and Peru. Not represented in the present collection. While Scudder did not definitely place this insect in *Orphulella* there seems to be but little doubt that it belongs here. The name *bilineata* was preoccupied in the genus *Orphulella* by *Stenobothrus bilineatus* Scudder from North America, the latter being an *Orphulella*, hence the change of name

19. *Orphulella scudleri* Bolivar.

Orphula scudleri BOLIVAR, Mem. Soc. Zool. France, I, p. 142 (1888).

Orphulella scudleri BRUNER, Biol. Cent. Amer., II, pp. 77, 82 (1904).

Habitat.—Cuba and Isle of Pines.

Included here merely to show relationship to some of the preceding forms.

20. *Orphulella crassa* sp. nov.

Body unusually robust, compressed, and deep for the genus, reminding one strongly of an *Orphula* and also of *Orphulella mexicana* Saussure. Tegmina of female somewhat abbreviated, their apex sub-oblique. Wings with the disk tinged with yellow or vinaceous, their apical half somewhat infuscated. Lateral foveolæ of vertex shallow and inconspicuous.

Head about as wide as the front edge of the pronotum, rather higher than usual, viewed laterally slightly elevated above the pronotum, the front strongly oblique, nearly straight, meeting with the vertex at an acute angle; the latter a little longer than wide and somewhat acuminate even in the female, the antero-lateral walls profound and provided within by an unusually deep sulcation. Eyes large, prominent, their length about equaling (σ^7) or a little shorter (♀) than the anterior margin of the cheeks below them. Antennæ in the female with the joints on basal half strongly depressed, about as long as the head and pronotum taken together, in the males rather heavy, the basal joints but little depressed, somewhat exceeding the combined length of head and pronotum. Pronotum a little narrower in front than behind, compressed, the lateral lobes a little higher than long, the lower margin sinuate; anterior lobe plainly longer than the posterior one, lateral carinæ entire and parallel in advance of the last transverse sulcus, rather strongly divergent back of it, posterior margin obtusangulate. Meso- and metathorax unusually deep, these with the deep basal abdominal segments giving the insect an abnormal perpendicular diameter. Tegmina irregularly and moderately strongly veined, in the females somewhat abbreviated, little if any surpassing the apex of the abdomen; in the males fairly broad, of normal length. Hind femora robust, their apex passing the tip of the abdomen in both sexes; hind tibiæ ten- to eleven-spined externally. Mesosternal lobes separated by a space equal in width to the lobes themselves, their inner edge broadly rounded.

General color variable, ranging from green, pale testaceous, fer-

ruginous, to dull fuscous. Upper edges of sides of pronotum just below the carinæ, passing to outer margins of disk on hind lobe black in most instances, absent in some. Tegmina in females faintly maculate along disk and occasionally also on dorsal field; in the males only along disk and apically. Sometimes the dorsum from fastigium to hind edge of pronotum provided with a narrower or broader pallid band, in some individuals continuing as a pallid coloring of the dorsal area of the tegmina.

Length of body, ♂, 15 mm., ♀, 22-24 mm.; of pronotum, ♂, 3.35 mm., ♀, 4 mm.; of tegmina, ♂, 13.5 mm., ♀, 14-15 mm.; of hind femora, ♂, 10.5 mm., ♀, 15 mm.

Habitat.—Rio de Janeiro, September to November, H. H. Smith.

21. *Orphulella grossa* sp. nov.

Reminding one at first glance of *O. crassa*, to which it bears a general resemblance in form and size. It may, however, be readily separated from that insect by its having the lateral carinæ of the pronotum in advance of the principal transverse sulcus arcuate, instead of parallel; in having the two lobes of the pronotum equal in length; the antennæ slender and filiform, instead of heavy and flattened basally; and by the normally rounded apices of the tegmina, which project beyond the tip of the abdomen.

Head moderately robust, a little wider than the anterior edge of the slightly compressed and constricted pronotum; fastigium about as long as broad, its antero-lateral margins meeting at a right angle, and bordered behind by a shallow lunate depression; lateral fovæolæ elongate, acutely triangular. Face less strongly oblique than in the same sex of *O. crassa*, the frontal costa evenly divergent below, continuous to the base of the clypeus, scarcely sulcate, but more or less punctulate above and below. Pronotum with the two lobes of about equal length, the lateral carinæ arcuate and twice interrupted by the transverse grooves in advance of the principal sulcus; the lateral lobes about as long as high, their lower edge rather strongly sinuose; hind margin widely angulated, the apex somewhat rounded. Tegmina normal, their apex rounded and extending beyond the tip of abdomen and knees. Hind femora of normal length. Interspace between the mesosternal lobes about as long as broad, the inner edge of the lobes themselves evenly rounded.

Length of body, ♀, 22 mm., of pronotum, 4.5 mm., of tegmina, 19 mm., of hind femora, 12 mm.

Habitat.—The single female at hand, the type, comes from Para, Brazil, where it was collected during the month of April.

In general the color of this insect is dirty testaceous varied with brown, very similar in pattern to dark-colored specimens of *O. punctata* De Geer, recalling that insect, save in the more robust and deeper body.

22. *Orphulella compacta* sp. nov.

Most nearly related to the *O. grossa* described above, but differing from that insect in the shorter tegmina and wings, the somewhat flattened antennal joints, the remarkably slender apical third of the hind femora, and the very strongly impressed triangular lateral foveolæ of the vertex, which are a little longer than the basal width. Size of insect medium. General color dull wood-brown varied with testaceous bands and flecks. Head not especially large, equal in width to the anterior edge of the pronotum and a little higher than it. The vertex gently depressed, not quite as long as the distance between the eyes, its antero-lateral walls moderately heavy, and meeting at the fastigium in a right angle, the disk quite deeply sulcate in advance of the upper extremity of the eyes; the latter fairly prominent, a little longer than the anterior edge of the cheeks below them. Frontal costa with the lateral margins evenly divergent below, sulcate, and sparsely punctulate throughout. Antennæ slender, the basal joints somewhat flattened, but not transversely enlarged, about as long as the combined length of head and pronotum. Latter with the two sections about equal in length, gently constricted on the sides at middle; lateral carinæ evenly arcuate in advance of the principal transverse sulcus and also severed by the middle sulcus about equally distant at the hind and front margins of this lobe; lateral lobes a little higher than long; hind margin of disk obtusangulate. Tegmina of moderate width, their apex rounded and only reaching the tip of the abdomen; hind femora robust at base, but very slender on apical third, reaching tip of wings and abdomen. Hind tibiæ nine-spined externally. Meso- and meta-sternal lobes and interspace as described for *O. crassa*.

Length of body, ♀, 19 mm., of pronotum, 3.6 mm., of tegmina, 14 mm., of hind femora, 11 mm.

Habitat.—The type, and only specimen at hand; bears the labels "Rio de Janeiro" and "Oct."; it was collected by H. H. Smith, and is contained in the Carnegie Museum.

The color of this insect as mentioned above is dull wood-brown

varied with flecks and bands of pale testaceous on face, occiput, sides of pronotum, and pleura in the usual patterns common to representatives of this and related genera. The tegmina also bear traces of pale and dark flecks along the disk. The lower outer carina of femora is also alternately pallid and infuscated; the tibiæ are pale cinereous and more or less flecked with brown. Very likely this species, like many of its congeners, will be found to vary greatly in color.

Genus LINOCERATIUM Bruner.

Linoceratium BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 31, 84 (1902, 1904).

A tropical American genus of Locusts related to *Orphulella*, only two species of which are known.

23. *Linoceratium australe* sp. nov.

Very similar in size and appearance to *L. boucardi* Bruner, but differing from that insect in the form of the lateral carinæ of the pronotum, the more equal size of the sexes, and in the present species lacking the infuscation on the genicular region of the hind femora and tibiæ, which is so marked in *boucardi*.

Length of body, ♂, 13.5 mm., ♀, 17 mm.; of pronotum, ♂, 2.5 mm., ♀, 3 mm.; of tegmina, ♂, 13 mm., ♀, 15 mm.; of hind femora, ♂, 8.77 mm., ♀, 10 mm.

Habitat.—Corumba, Brazil, March to May, several specimens of both sexes bearing the number 2120 (H. H. Smith). The types are in the collection of the Carnegie Museum.

The two species of the genus *Linoceratium* thus far known may be separated as follows: The first is the type of the genus.

- A. Lateral carinæ of the pronotum in advance of the principal sulcus, gently arcuate. Genicular area of the hind femora infuscated. [U. S. of Colombia and Central America.] *boucardi* Bruner.
 AA. Lateral carinæ of the pronotum in advance of the principal sulcus straight, gently convergent posteriorly. Genicular area of hind femora without infuscation. [Corumba, Brazil.] *australe* sp. nov.

Genus ORPHULINA Giglio-Tos.

Orphulina GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, No. 184, pp. 8, 9 (1894).

This is another of the tropical American truxaline genera of locusts, which occurs in the region covered by the present paper.

24. *Orphulina acuta* Rehn.

Orphulina acuta REHN, Proc. Acad. Nat. Sci. Phila., LVIII, pp. 23-25, figs. 7, 8 (1906).

Habitat.—São Paulo, Brazil. Several specimens contained in H. H. Smith's collection from Chapada are doubtfully referred to Rehn's *O. acuta*. They were collected during the months of May to August inclusive (H. H. Smith).

25. *Orphulina pulchella* Giglio-Tos.

Orphulina pulchella GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 10 (1894).

Habitat.—Same locality as the preceding. Also several specimens from Chapada, Brazil, which are referred to this species (H. H. Smith).

Genus PARORPHULA Bruner.

Parorphula BRUNER, 2d Rept. Locust. Com. Buenos Aires, pp. 22, 25 (1900).

The representatives of the present genus are denizens of grassy fields, and range from southern Brazil to the Rio Negro of Argentina. At least four species are known. They may be separated as follows:

SYNOPSIS OF THE SPECIES OF PARORPHULA.

- A. Tegmina in the male not especially broad.
 - b. General color of insect more or less green.....*graminea* Bruner.
 - bb. General color of insect testaceous varied with brown and fuscous.
 - c. Dorsum of pronotum and dorsal field of the tegmina pallid.
 - pallidinota* Bruner.
 - cc. Entire body together with the tegmina more or less varied with pale and dark streaks.....*strigata* Bruner.
 - AA. Tegmina of male unusually broad, reminding one of these organs in *Cocytotettix*. Color variable, but never green.....*latipennis* sp. nov.

The species *graminea* may be considered as the type of the genus.

26. *Parorphula latipennis* sp. nov.

Readily recognized by the unusually broad tegmina as well as fenestrate anterior area of the wings in the male, which characters at once suggest the genus *Cocytotettix* Rehn (*Fenestra* Brunner v. Wattenwyl). The strongly posteriorly divergent lateral carinae of the pronotum, the absence of the longitudinal carina of the vertex and occiput, and the rather general infuscation of the wings, along with other characters place it in *Parorphula*.

Head slightly ascending, about the same length as the pronotum;

the fastigium of the vertex slightly acuminate, about as long as the distance between the eyes, the lateral margins raised so as to form a well-defined wall in advance of a bordering groove, the disk well rounded, without a longitudinal median ridge. Beneath this bounding carina are located the elongate, slightly arcuate lateral foveolæ, which are acuminate anteriorly. Eyes rather prominent, pyriform, about as long (♂) or a little shorter than (♀) the anterior genicular groove below them. Antennæ decidedly ensiform, somewhat longer than the combined length of the head and pronotum. Frontal costa rather prominent, deeply sulcate; the head viewed laterally with the front quite strongly retreating, straight; lateral carinæ prominent, sharp, continuous to the base of clypeus. Pronotum compressed and with the sides parallel on anterior lobe, the hind lobe rather strongly divergent, the lateral carinæ as well as the median sharp, prominent, cut about the middle by the last transverse sulcus; anterior lobe sparsely and the posterior one closely punctulate, the hind margin widely and roundly angulate. Tegmina in both sexes extending beyond the tip of the abdomen, in the male very wide on the apical half, in the female normal, gently obliquely truncate at apex, with a well-defined intercalary vein in the female, but a very poor one in the male. Wings of male with the costal area very wide and provided with twelve or thirteen transverse parallel veins, giving to this portion a very conspicuous fenestrate appearance. Posterior femora only moderately robust, surpassing the tip of the abdomen in both sexes; hind tibiæ eleven-spined externally. Last ventral segment of male abdomen short, acuminate; cerci about as long as the supra-anal plate, slender, tapering but little, the apex blunt; interspace between the mesosternal lobes quadrate or subquadrate, somewhat narrower than the lobes themselves.

General color variable, but possibly never to any extent green, usually testaceous, brunneous, or fuscous, varied more or less prominently with darker and lighter lines, flecks, and mottlings. Eyes ferruginous or castaneous; upper edge of sides of pronotum longitudinally banded with piceous, partially crossing to the disk on the hind lobe, the lateral carinæ pallid. Occiput, disk of pronotum, and dorsal field of tegmina usually pallid; disk and costal area of tegmina generally brown or fuscous, mottled, or maculate with pallid, but sometimes only the longitudinal veins dark and the remainder pallid or testaceous. Legs testaceous, more or less varied with fuscous;

sometimes in very dark specimens almost black, varied with dashes of testaceous. Sides of abdomen and pleura pallid, the underside largely black. Wings clouded or smoky, save on the fenestrate area, where they are transparent and vitreous.

Length of body, ♂, 20 mm., ♀, 24 mm.; of pronotum, ♂, 3.5 mm., ♀, 4.1 mm.; of tegmina, ♂, 19 mm., ♀, 23.5 mm.; width of male tegmina, 4.6 mm.; length of hind femora, ♂, 12 mm., ♀, 15 mm.

Habitat.—Chapada, Brazil, June to August (H. H. Smith.).

Genus TOXOPTERUS Bolivar.

Toxopterus BOLIVAR (*nec* KOCH), An. Soc. Españ., XIX, p. 313 (1890).

27. *Toxopterus miniatus* Bolivar.

Toxopterus miniatus BOLIVAR, Anales Soc. Españ. Hist. Nat., XIX, p. 314 (1890).

Habitat.—Specimens of both sexes of this truxaline locust with beautifully deeply red-colored wings are at hand. They were collected throughout the season from January to December. The majority of the specimens bear the label "Chapada," although there is a single male labeled "Rio de Janeiro, November."

Other specimens, which were collected in Bolivia, Paraguay, and extreme northern Argentina, have been examined.

LEUROCERUS gen. nov.

The present genus is erected to receive the insect described by J. A. G. Rehn as *Cocytotettix linearis* (Proc. U. S. Nat. Mus., XXX, p. 374, 1906).

Elongate, slender, wings of male without the fenestrate area so characteristic of the various species of *Cocytotettix* Rehn (*Fenestra* Brunner v. Wattenwyl, but not of Giglio-Tos). Head about as long as the pronotum. Antennæ gently ensiform in both sexes, of medium length. Eyes pyriform, nearly twice the length of the anterior edge of the cheeks; vertex almost as wide as the broadest part of the fastigium, which is formed much as in *Amblytropidia* and provided with lateral walls and a well-developed median carina. Front rather strongly oblique; the frontal costa moderately prominent, sulcate, or with the disk merely depressed below the lateral walls, frequently provided with a well-defined median ridge or carina above the ocellus. Pronotum with the sides nearly parallel, the lateral carinæ nearly as prominent as the median; the lateral lobes almost as high as long, the

lower edge but little sinuate, the last transverse sulcus situated about the middle, it alone severing the median carina; posterior margin of disk obtusangulate. Tegmina of moderate width, the costal margin only gently lobate near the base, the apex rounded, the middle area without a well-defined intercalary vein. Wings, even of male, lacking the fenestrate area so prominent in *Truxalis*, *Orphula*, and their allies, in this respect resembling *Amblytropidia*, to which group it belongs.

28. **Leurocerus linearis** (Rehn).

Cocytotettix linearis REHN, Proc. U. S. Nat. Mus., XXX, p. 374 (1906).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, April to September, numerous specimens of both sexes (H. H. Smith).

This insect is more closely related to *Amblytropidia* than to *Cocytotettix*.

Genus AMBLYTROPIDIA Stål.

Amblytropidia STÅL, Recens. Orthopt., I, pp. 93, 107 (1873).

The genus *Amblytropidia* is confined to the New World, where its representatives are found from the southern United States to central Argentina. The majority of its species, however, occur in the tropical portions of both North and South America, where they are to be met with in savannas or grassy openings in the forests, and to some extent in the forests themselves. At least eighteen distinct species of the genus have already been discovered. As in several other truxaline genera, the species of this genus are rather closely related and somewhat difficult to separate. The annexed synoptic table will, it is hoped, assist the student in determining the described forms:

SYNOPSIS OF THE SPECIES OF AMBLYTROPIDIA.

- A. Median carina of the vertex quite prominent. Last transverse sulcus of the pronotum situated plainly behind the middle.
- b. General structure, especially of the females, quite robust; the majority of species rather pale-colored. Tegmina of females, as a rule, not, or but little, surpassing the tips of the hind femora, in some instances a little shorter than the abdomen. The latter concolorous above.
- c. Antennæ of female (those of the male always relatively longer) a trifle longer than the head and pronotum combined. Tegmina provided with fuscous spots.
- d. Smaller. [Brazil].....*ferruginosa* Stål
- dd. Larger. Hind tibiæ with thirteen spines in the outer row. [Central America, Guatemala.].....*magna* Bruner.
- cc. Antennæ of female no longer, often noticeably shorter, than the combined length of the head and pronotum. Tegmina variable.

- d.* General color brunneo-testaceous, immaculate, or with faint fuscous dots on tegmina.
- e.* Larger (σ^7 , 20-23 mm.).
- f.* Tegmina pale testaceous, unspotted. [Paraguay and Argentina.].....*australis* Bruner,
- ff.* Tegmina with faint fuscous dots along dorsal edge. [Corumba, Brazil.]*geniculata* sp. nov.
- ee.* Smaller (15.5-16 mm.). Tegmina faintly maculate with fuscous. [Chapada, Brazil.]*minor* sp. nov.
- dd.* Color variable, frequently both vittate and maculate.
- e.* Insect often more or less markedly longitudinally striped with green.
- f.* Smaller. General color pallid testaceous or greenish. Tegmina often provided with a subcostal pale line, or the dorsum with lateral green stripes reaching from the eyes to the middle of the tegmina. The latter as long as the abdomen. [Paraguay and Southern Brazil.]
- ff.* Larger. General color dark wood-brown or fuscous.
- g.* Tegmina provided (♀) with a dirty white subcostal line. Dorsum concolorous. [Corumba, Brazil.]
- corumbæ* Bruner.
- gg.* Tegmina without the subcostal line. Dorsum often entirely green. [Paraguay and Southern Brazil.]
- robusta* Bruner.
- bb.* General structure moderately graceful, even in the females. Chief color usually more obscure, being brown or even fuscous. Tegmina of females always extending beyond the tip of the abdomen. Abdomen of male usually tinged above with orange or ferruginous.
- c.* Hind tibiæ eleven- to thirteen-spined externally.
- d.* Prevailing colors brown.
- e.* Hind tibiæ twelve- to thirteen-spined externally. [British Guiana and Trinidad.].....*trinitatis* Bruner.
- ee.* Hind tibiæ eleven- to twelve-spined externally. [Chapada, Brazil.]
- chapadensis* Rehn.
- dd.* Prevailing color olive-brown in male. Female not known. [Mexico, eastward.]*auriventris* Bruner.
- cc.* Hind tibiæ fifteen- to sixteen-spined in outer row. [West coast of Central Mexico.].....*elongata* Bruner.
- AA.* Median carina of the vertex less prominent. Last transverse sulcus of the pronotum situated about the middle.
- b.* Hind tibiæ provided with fifteen to nineteen spines in the outer row.
- c.* Form of insect rather robust. Color variable. [Costa Rica, Central America.].....*costaricensis* Bruner.
- cc.* Form of insect slenderer. Color rather uniform. [Mexico, southward into South America.]

- d.* Anterior portion of the disk of pronotum narrower than the hind portion; lateral carinae of male pronotum concolorous, disk and sides not decidedly infuscated. [Mexico.]
mysteca Saussure.
- dd.* Anterior portion of the disk of pronotum about equal to the width of the hind portion, the disk and sides more or less strongly infuscated.
- e.* Sides of basal abdominal segments strongly marked with black. [Mexico.] *ingenita* Bruner.
- cc.* Sides of basal abdominal segments not infuscated or black. [Southern Brazil.] *interior* sp. nov.
- bb.* Hind tibiae provided with but fourteen spines on outer row. [Eastern U. S. southward.] } *occidentalis* Saussure.
 { *subconspersus* Walker.

29. *Amblytropidia ferruginosa* Stål.

Amblytropidia ferruginosa STÅL, Recens. Orthopt., I, p. 107 (1873).

Habitat.—Four males and one female taken at Chapada, Brazil, during the months of March, May, and November (H. H. Smith).

These specimens on account of their markedly ferruginous color and agreement in size with Stål's measurements warrant me in placing them under *ferruginosa*. They are quite distinct from all other forms, which have been examined by me.

30. *Amblytropidia australis* Bruner.

Amblytropidia ferruginosa GIGLIO-TOS (*nec* Stål), Boll. Mus. Zool. Anat. Torino, IX, No. 184, p. 13 (1894); BRUNER, Locusts of Argentina, p. 32 (1900).

Amblytropidia australis BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 62, 64 (1904).

Habitat.—Paraguay and Argentina. Not contained among the material collected by H. H. Smith and now being studied. Nevertheless there is little doubt as to its occurrence in southern Brazil.

31. *Amblytropidia geniculata* sp. nov.

Very similar to *A. australis* Bruner, but slightly larger, somewhat more graceful, and with longer tegmina and wings. As indicated in the synoptical table, there are faint fuscous dots present on the dorsal area of the folded tegmina. The apex of hind femora and base of tibiae are strongly infuscated.

Length of body, ♂, 21–23 mm., of pronotum, 3.45 mm., of tegmina, 17–18 mm., of hind femora, 13–13.5 mm.

Habitat.—Corumba, highlands, March to July (H. H. Smith).

Only males are at hand, but these all agree in having traces of fuscous dots on the tegmina, and in having these members decidedly more elongate than in the same sex of *A. australis*. There are from twelve to fourteen spines on the external margin of the hind tibiae.

32. *Amblytropidia minor* sp. nov.

A small, but moderately robust species, in which the apex of the hind femora and base of tibiae are strongly infuscated. Tegmina with the costal margin undulate, the apical one-fourth plainly narrower than remainder, reminding one a little of these members in some of the species of *Stenobothrus*, *Chloëaltis*, etc. Hind tibiae twelve-spined externally.

Male.—Head rather large, very little wider than the anterior portion of the pronotum. Eyes large and moderately prominent, quite plainly more than twice the length of the anterior margin of the cheeks; fastigium of the vertex well rounded, and provided with strong antero-lateral margins and a median longitudinal carina, the latter becoming almost obliterated on the occiput; frontal costa prominent, wide, and provided with strong lateral carinae, which gently approach at the ocellus, broadly and quite profoundly sulcate, continuous to the clypeus and provided near the upper end with a rather prominent median carina. Antennae linear, their length about one-fourth greater than the head and pronotum combined. Latter with the sides and carinae parallel, the hind lobe decidedly shorter than the front lobe, the surface of sides and disk of hind lobe closely, and rather finely, punctulate, remainder subglabrous; anterior margin a little rounded, the hind margin obtusangulate. Tegmina moderately broad and with the costal field more strongly developed than usual in the genus, reaching beyond the apex of the abdomen as far as the tips of the hind femora, the intercalary region without definite vein. Hind femora robust on basal, slender on apical half, extending about one-fourth their length beyond the tip of the abdomen. Interspace between the mesosternal lobes nearly quadrate, *i. e.*, about as wide as long, the inner edges of the lobes but little rounded.

General color pale brownish-testaceous, the face, sides of head, pronotum and pleura in part dull brown. Basal portion of hind tibiae and genicular area of hind femora both internally and externally strongly infuscated. Tegmina somewhat infuscated apically and faintly conspersed with scattered fuscous dots.

Length of body, ♂, 13-14 mm., of pronotum, 3 mm., of tegmina, 12 mm., of hind femora, 10.5 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil. May and June (H. H. Smith, collector). The type bears the additional label "2109."

33. **Amblytropidia vittata** Giglio-Tos.

Amblytropidia vittata GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, No. 184, p. 13 (1894); BRUNER, Proc. U. S. Nat. Mus., XXX, p. 631 (1906).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, April to July and September (H. H. Smith). Described from Luque, Paraguay, and also reported from São Paulo, Brazil. A very distinct species.

34. **Amblytropidia corumbæ** sp. nov.

Very similar to *A. interior* in general appearance, but differing from it in the larger size, the shorter hind lobe of the pronotum, and in having fewer spines on the outer margin of the hind tibiae.

Head of medium size, in the male about as wide as in the female, a little narrower than the anterior margin of the pronotum. Vertex prominent, the fastigium decidedly wider than the narrowest part between the eyes, rounded, cribrately punctate, and provided with a strong median carina, which continues across the occiput; eyes prominent, elongate, fully twice (♀) or almost three times (♂) the length of the anterior edge of the cheeks below them. Frontal costa prominent, broad, of equal width throughout, the lateral walls heavy, in the male broadly sulcate throughout, in the female only below the ocellus, but with the surface punctate above, the upper portion between the fastigium and ocellus in both sexes exhibiting a coarse median ridge. Antennæ slender, filiform, in the female about as long as the head and pronotum combined, in the male decidedly longer. Pronotum quite strongly and cribrately punctate, its sides parallel (♂) or slightly expanding on the hind lobe (♀), the latter plainly shorter than the anterior one; anterior margin of the disk gently rounded, the posterior edge obtusangulate, with a very slight emargination on either side. Tegmina and wings fully developed, a very little surpassing the apex of the hind femora; the former of moderate width, without a definite intercalary vein, except towards the outer portion of the area, where a trace of one is present in the female specimen before me. Hind femora somewhat slender and elongate, the apical third noticeably more graceful than usual in

the section of the genus to which the present species belongs. Outer row of spines on hind tibiae thirteen in number. Mesosternal lobes separated by a slightly elongate space, which is deeply cleft at middle by a very profound longitudinal groove or sulcus, as in one or two other species of the genus.

General color pale chocolate-brown, varied on the femora and abdomen by testaceo-ferruginous. In the female there is a very marked subcostal dirty white line bordered above by one of dark brown; remainder of tegmina wood-brown and dimly and irregularly conspersed with fuscous flecks. Genuicular area of hind femora and immediate base of hind tibiae strongly infuscated as in this sex of *robusta*, *australis*, and *minor*.

Length of body, ♂, 24.5 mm., ♀, 36 mm.; of pronotum, ♂, 4.35 mm., ♀, 7 mm.; of tegmina, ♂, 21 mm., ♀, 30 mm.; of hind femora, ♂, 15.5 mm., ♀, 23 mm.

Habitat.—Corumba, Brazil, the ♂ in March, the ♀ in April. Collected by H. H. Smith. Types (♂ and ♀) in Carnegie Museum.

35. *Amblytropidia robusta* Bruner.

Amblytropidia robusta BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 631, 632 (1906).

Habitat.—Sapucay, Paraguay. Also at hand from Puerto Bertoni, Paraguay, but not among the H. H. Smith material from Chapada and other localities in southern Brazil.

36. *Amblytropidia chapadensis* Rehn.

Amblytropidia chapadensis REHN, Proc. U. S. Nat. Mus., XXX, p. 371 (1906).

Habitat.—Corumba and Chapada, Brazil, September to November (H. H. Smith).

A similar, but somewhat slenderer species than the preceding.

37. *Amblytropidia interior* sp. nov.

About the same size and having the general appearance of the North American species, *A. occidentalis* Saussure, but differing from that insect in its somewhat more robust form and by having fifteen instead of fourteen spines on the outer edge of the hind tibiae. Anterior and posterior lobes of the pronotum about equal in length.

Vertex between the eyes at its narrowest point a little less than the width of the fastigium at its widest part just in advance of their upper anterior margin, the median carina rather broad and prominent

in front, becoming narrower and fainter posteriorly, but continuing across the occiput to the anterior margin of the pronotum; disk and top of head coarsely and shallowly punctulate. Eyes rather large, but not especially prominent, in the male fully twice, in the female one and two-thirds times the length of the anterior margin of the cheeks immediately below them. Antennæ filiform, not quite (♀) or a trifle longer (♂) than the combined length of the head and pronotum, the basal joints a little flattened, but not expanded; frontal costa prominent, its sides rather coarse, nearly parallel, and reaching the clypeus, the middle shallowly sulcate and coarsely punctulate, most apparent below the ocellus. Face quite strongly oblique when viewed in profile. Pronotum of moderate length, gently expanding caudad, the two sections about equal in length, median carina prominent, severed at middle by the last transverse sulcus; lateral carinæ weaker, most apparent in front, becoming less strong and diverging evenly to the rear; posterior margin obtusangulate, the disk feebly cribrately punctulate, most apparent on the hind lobe, lateral lobes and pleura also similarly marked. Tegmina and wings perfectly developed, passing the tip of the abdomen in both sexes, the former without a definite intercalary vein or definite sub-basal costal lobe. Hind femora fairly slender, surpassing the tip of the abdomen about one-fourth (♂) or one-fifth (♀) of their length; hind tibiæ fifteen-spined externally. Interspace between the mesosternal lobes fully twice as long as broad (♂) or a little less (♀).

General color dark wood-brown, more or less tinged with ferruginous and testaceous on the abdomen above and below. Tegmina more or less strongly maculate or conspersed along the disk with black or fuscous. In some specimens the tegmina possess a pallid subcostal line, and the disk of the pronotum and occiput are provided with longitudinal fuscous and pallid lines. Wings vitreous; becoming very faintly clouded apically. The principal longitudinal veins fuscous, most of the cross-veins and the longitudinal veins on anal field pallid.

Length of body, ♂, 20.5 mm., ♀, 29 mm.; of pronotum, ♂, 4 mm., ♀, 5 mm.; of tegmina, ♂, 12 mm., ♀, 23 mm.; of hind femora, ♂, 13.5 mm.

Habitat.—Chapada, Brazil, from June to October. They bear the number "2094" of H. H. Smith. Types in the Carnegie Museum.

Genus STAUORHECTUS Giglio-Tos.

Staurorhectus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, No. 302, p. 26 (1897).

The species of this genus are distributed over portions of Argentina, Bolivia, Paraguay, and southern Brazil. The described forms may be separated as follows:

SYNOPSIS OF THE SPECIES OF STAUORHECTUS.

- A. Caudal femora without, or with rather indistinct, pregenicular annuli of yellow.
- b. Size large; female ranging from 30 to 38 mm. in length of body.
 - longicornis* Giglio-Tos.
 - bb. Size medium; female ranging from 28 to 30 mm. in length of body.
 - longicornis variegatus* Rehn.
- A.A. Caudal femora with very pronounced pregenicular annuli of yellow. Size rather small.
- b. Tegmina of both sexes much shorter than the abdomen. Antennæ unicolorous, black..... *brevipennis* Rehn.
 - bb. Tegmina of both sexes equal to, or longer than, the abdomen. Antennæ with pallid tip..... *intermedius* sp. nov.

38. *Staurorhectus longicornis* Giglio-Tos.

Staurorhectus longicornis GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, No. 302 p. 26 (1897).

Habitat.—Corumba and Chapada near Cuyaba, Matto Grosso, Brazil, where it was taken in large numbers from March to August inclusive (H. H. Smith). The variation in color is great, and there is also quite a disparity of size among the specimens at hand. None of the individuals examined seem to belong to the form *longicornis variegatus* Rehn (see Proc. U. S. Nat. Mus., XXX, p. 377 (1906)).

39. *Staurorhectus brevipennis* Rehn.

Staurorhectus brevipennis REHN, Proc. U. S. Nat. Mus., XXX, p. 377 (1906).

Habitat.—Corumba, Matto Grosso, Brazil, during July (H. H. Smith). Several specimens.

40. *Staurorhectus intermedius* sp. nov.

About the size of, and somewhat similar to, *Staurorhectus brevipennis* Rehn, but differing from that insect in having the tegmina and wings fully developed, the lateral carinæ of the pronotum almost obliterated on the anterior lobe, and in having the long, slender, black antennæ pale-tipped. Valves of ovipositor similar to those of *Amblyscapheus glaucipes* Rehn (*lineatus* Bruner).

Head large, as long as, and a little wider than, the anterior edge of the pronotum, the occiput a very little ascending above the level of the former, the face viewed in profile rather strongly oblique; eyes large and fairly prominent, oval, plainly longer than the anterior edge of the cheeks immediately beneath them, separated on the vertex by a space a trifle greater (σ^7) or fully one and one-half times the diameter of the basal antennal joint (φ), the fastigium horizontal, about as long as wide in the male or plainly wider than long in the female, deeply sulcate in the former in the form of the bowl of a spoon, in the latter with a lunate sulcation immediately back of the front end, antero-lateral carinæ meeting at front in an acute angle (σ^7) or forming a very slightly obtuse angle (φ), lateral foveolæ scarcely apparent. Frontal costa narrowed above and roundly uniting with the fastigium, plane above the ocellus, gradually widening, and continuous to the clypeus, very gently sulcate at the ocellus; lateral or facial carinæ prominent, rather strongly divergent below. Antennæ graceful, filiform, about equal to (φ) or a third longer (σ^7) than the hind femora. Pronotum a little longer than high, its sides about parallel, the disk of the hind lobe flattened, rather profusely punctulate; the lateral carinæ sharp and prominent, convergent to the principal sulcus, interrupted till the immediate anterior edge of the front lobe, where they appear as oblique dashes; median carina slender, but plainly visible throughout; hind margin subangulate. Tegmina narrow, their apex rounded, fully as long (φ) or plainly surpassing the tip of the abdomen (σ^7), the dorsal field closely, but not prominently, veined, the discal area without an intercalary vein. Hind femora long, rather robust on basal half, but slender on apical half, extending beyond the apex of the abdomen by one-fourth (φ) or fully two-fifths of their length (σ^7). Hind tibiæ provided with eleven spines in the outer row. Valves of the ovipositor short and robust; last ventral segment of the male abdomen short and roundly acuminate, the cerci moderately robust, straight, evenly tapering, and, like the tibiæ and tarsi, lengthily hirsute. Interspace between the mesosternal lobes slightly transverse in both sexes.

Sides of head back of eyes, upper half of lateral lobes of pronotum, upper edges of pleura and costal and discal fields of tegmina, black, duller in the females; dorsal portion of tegmina grass-green, anterior and middle legs greenish-olive, duller in females; fastigium, vertex, and middle of occiput, together with the disk of pronotum, longi-

tudinally fasciate with flavous; front, lower portion of cheeks, lower half of pleura, and underside of body, flavous tinged with green (♂) or pale testaceous tinged with olive (♀). Hind femora chiefly orange-red with the apex black, preceded by a prominent pale annulus; upper edge of femora more or less conspersed with fuscous, and in the females tinged with cinereous along the upper half of the outer disk; hind tibiae strongly infuscated, except for a rather prominent sub-basal pale annulus. Antennae infuscated, or black, with the immediate apical joints pallid.

Length of body, ♂, 17.5 mm., ♀, 25 mm.; of pronotum, ♂, 3 mm., ♀, 4.30 mm.; of tegmina, ♂, 12.5 mm., ♀, 17.5 mm.; of hind femora, ♂, 13 mm., ♀, 17 mm.

Habitat.—Three males and four females, Para, Brazil; one male, Santarem, Brazil; and two females, Chapada, near Cuyaba, Matto Grosso, Brazil. April to June (H. H. Smith).

The types, ♂ and ♀, are deposited in the Carnegie Museum.

In some of its characters the present species approaches the genus *Amblyscaphus* Bruner, as indicated above; but the robust form and presence of lateral pronotal carinae, although much interrupted, place it in *Staurorhectus* Giglio-Tos, along with *longicornis* Giglio-Tos and *brevipennis* Rehn, both of which are before me, as I write. Three of the females coming from Para have the dorsal field of the tegmina testaceous, instead of green.

Genus *ISONYX* Rehn.

Isonyx REHN, Proc. Acad. Nat. Sci. Philad., 1906, p. 36.

There is but a single species in the present genus which according to its author is related to *Borellia* Rehn as well as to *Staurorhectus* Giglio-Tos. Possibly it is also allied to *Stereotettix* Rehn.

41. *Isonyx paraguayensis* Rehn.

Isonyx paraguayensis REHN, Proc. Acad. Nat. Sci. Philad., 1906, pp. 36-39, figs. 11-13.

Habitat.—Sapucay, Paraguay (Foster). This insect is not contained in the H. H. Smith material now under examination, but as the Chapada region has a fauna similar to that of Sapucay, Paraguay, it evidently occurs in southern Brazil as well. In size it is the same as *Borellia carinata* described by the same author.

Genus *BORELLIA* Rehn.

Borellia REHN, Proc. U. S. Nat. Mus., XXX, p. 379 (1906).

According to Rehn this genus is quite closely related to *Staurorhectus* Giglio-Tos. Its representatives are confined, so far as known, to southern Brazil.

42. *Borellia carinata* Rehn.

Borellia carinata REHN, Proc. U. S. Nat. Mus., XXX, pp. 379-381 (1906).

Habitat.—The large series of specimens at hand are labeled "Chapada," "Chapada near Cuyaba, Matto Grosso, Brazil," and "Rio de Janeiro." They were taken during the months of May, June, July, and October (H. H. Smith).

Genus *EUPLECTROTETTIX* Bruner.

Euplectrotettix BRUNER, Locusts of Argentina, pp. 38, 39 (1900).

A genus somewhat closely related to *Scyllina* Stål, but quite readily separable from the latter by the pronotal characters. The species are several in number and occur from southern Brazil southward.

43. *Euplectrotettix ferrugineus* Bruner.

Euplectrotettix ferrugineus BRUNER, Locusts of Argentina, pp. 39-40 (1900).

Habitat.—Several males are at hand from Chapada, Brazil, where they were taken in September by H. H. Smith.

44. *Euplectrotettix scyllinæformis* sp. nov.

Robust, grayish, mottled with brunneo-ferruginous and fuscous, vertex without the least trace of lateral foveolæ, the lateral carinæ of pronotum present only on the anterior edge of the front lobe. Hind tibiæ red, without pallid basal annulus, the external margin ten-spined.

Head large, a little wider than the anterior portion of the pronotum, the occiput evenly rounded and somewhat elevated above the general level of the disk of pronotum; eyes of moderate size, not prominent, rather widely separated above; the vertex short, blunt, nearly twice as wide as long and transversely deeply lunately sulcate, the area usually occupied by the lateral foveolæ coarsely punctulate; frontal costa roundly confluent with the vertex, of nearly equal width throughout, not prominent, in no manner sulcate, rather uniformly punctulate, even below the ocellus. Antennæ filiform, rather heavy, and about as long as the head and pronotum combined. Pronotum gently constricted at middle, the posterior margin but little wider than the

anterior, median carina moderately developed; hind margin subangulate. Tegmina of normal width, without intercalary vein, the costal margin not fenestrated as in *ferrugineus*, the most nearly allied species of the genus. Hind femora normal, surpassing the apex of the abdomen by the length of the genicular portion, the tibiae weakly spined, and with rather small, not very unequal, inner claws.

General color as described above; the tegmina irregularly con-spersed with brunneo-fuscous, beyond the middle showing a tendency towards maculation. Hind femora with traces of fuscous bands above, a preapical annulation below, and internally deep coral-red.

Length of body, ♂, 19 mm.; of pronotum, 3.6 mm.; of tegmina, 18 mm.; of hind femora, 12.5 mm.

Habitat.—Chapada, Brazil, September (H. H. Smith).

The type is the only specimen at hand. It is the property of the Carnegie Museum.

Genus SCYLLINA Stål.

Scyllina STÅL, Recens. Orthopt., I, pp. 94, 112 (1873).

Pseudostauronotus GIGLIO-TOS (*nec* Brunner), Zool. Jahrb. Abth. Syst., VIII, p. 801 (1894).

Plectrophorus MCNEILL (*nec* Férrussac), Proc. Davenport Acad. Sci., VI, pp. 198, 258 (1900).

Plectrotettix MCNEILL, Psyche, VIII, p. 71 (1897).

45. *Scyllina uniformis* Rehn.

Scyllina uniformis REHN, Proc. U. S. Nat. Mus., XXX, p. 384 (1906).

Habitat.—Chapada near Cuyaba, Matto Grosso, Brazil, during the months of April to July inclusive (H. H. Smith).

46. *Scyllina brunneri* (Giglio-Tos).

Pseudostauronotus brunneri GIGLIO-TOS, Zool. Jahrb., Abth. Syst., VIII, p. 810 (1894).

Scyllina brunneri REHN, Proc. U. S. Nat. Mus., XXX, p. 385 (1906).

Habitat.—Chapada, Brazil, March and April (H. H. Smith). It is also known from Caiza, Bolivia, and Paraguay.

47. *Scyllina suffusa* Rehn.

Scyllina suffusa REHN, Proc. U. S. Nat. Mus., XXX, pp. 385-387 (1906).

Habitat.—Chapada, Matto Grosso, Brazil, in September (H. H. Smith).

Not recognized among the material at hand, but there remains quite a lot of specimens of the genus which have not been carefully studied.

48. *Scyllina smithi* Rehn.

Scyllina smithi REHN, Proc. U. S. Nat. Mus., XXX, pp. 387-388 (1906).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil; also Rio de Janeiro (H. H. Smith). They were taken during the period embraced by the months of April to October inclusive.

49. *Scyllina schistocercoides* Rehn.

Scyllina schistocercoides REHN, Proc. U. S. Nat. Mus., XXX, pp. 388-390 (1906).

Habitat.—May to October at Corumba and Chapada, Brazil (H. H. Smith).

Several other species of the genus undoubtedly occur in the same general region. They are *S. brasiliensis*, *conspersa*, *varipes* Bruner, and *S. borellii* Giglio-Tos.

Genus STEREOETTIX Rehn.

Stereotettix REHN, Proc. U. S. Nat. Mus., XXX, p. 381 (1906).

50. *Stereotettix paralogistes* Rehn.

Stereotettix paralogistes REHN, Proc. U. S. Nat. Mus., XXX, p. 381 (1906).

The collection contains a large series of a small grasshopper, which I refer to this species. Both sexes are represented. Aside from considerable variation in color and some in size, there are two distinct types of pronotal structure as regards the lateral carinæ. In the typical form these are complete, straight, and nearly parallel. In the other form they are interrupted and rather strongly arcuate, as in *Stiropleura*. A few specimens are at hand, in which these carinæ are present only as short anterior and posterior extremities of what might have been decussate lines (∩). Since there are no apparent other differences in the two forms, and intermediate forms exist, not even varietal names need be suggested. Only in those individuals having these carinæ interrupted to a greater or lesser degree is there a noticeable tendency towards arcuation.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, March to October (H. H. Smith).

In some of the individuals there is also a tendency towards wing abbreviation, in which case the tips of these members do not reach the apex of the abdomen. This feature is usually, but not always, most apparent among the females.

Genus STIRAPLEURA Scudder.

Stirapleura SCUDDER, in Wheeler, Ann. Rept. U. S. Geol. and Geogr. Surv., W. 100th Merid., 1876, Append. JJ, p. 290 (1876).

51. *Stirapleura brunnea* Rehn?

Stirapleura brunnea REHN, Proc. U. S. Nat. Mus., XXX, p. 390 (1906).

Several specimens of a locust, which appears to be most closely related to the present species, are before me. While these insects are quite variable in their coloration, and to some extent also in the form and prominence of the lateral carinæ of the pronotum, they might all be included under a single species. Rehn's measurement of the pronotal length of his types, however, is too great by .5 mm. for the males and by .7 mm. for the females now at hand. Otherwise they agree almost exactly.

I had placed this insect aside under the manuscript name *Pelopedon obscurum*, and should a remeasurement of Rehn's types prove the figures as given by him to be correct, I would then consider the two forms distinct, and suggest the above name for these individuals. The present form and the insect described by Rehn as *Stereotettix paralogistes* are also rather closely related generically.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, May to September (H. H. Smith). Numerous specimens of both sexes. Collection of Carnegie Museum.

Family LOCUSTIDÆ [Ædipodidæ].

This family is very poorly represented in South America, and is especially so in the present collection.

Genus CÆLOPTERNA Stål.

Cæloptera STAL, Oefv. Vet.-Akad. Forh., XXX, no. 4, p. 53 (1873).

Only a single species of this subaquatic Ædipodine genus is known, notwithstanding its rather wide distribution.

52. *Cælopterna acuminata* (De Geer).

Acrydium acuminatum DE GEER, Mém. Ins., III, p. 501, pl. 42, fig. 10 (1773).

Cælopterna acuminata STÅL, Recens. Orthopt., I, p. 145 (1873).

? *Paulinia mucosa* BLANCHARD, in D'Orbigny, Voy. Amer. Merid., VI, no. 2, p. 216, pl. 27, fig. 6 (1843).

Cælopterna stalli SCUDDER, Proc. Bost. Soc. Nat. Hist., XVII, p. 277 (1875).

Epacromia selecta WALKER, Cat. Dermapt. Salt. Brit. Mus., V, Suppl., p. 84 (1871).

Cælopterna acuminata var. *brevipennis* GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 7 (1894).

Habitat.—Corumba, Brazil, and Asuncion, Paraguay (H. H. Smith).

As suggested by the present writer in a former publication (Proc. U. S. Nat. Mus., XXX, p. 637) this insect is more or less aquatic in its habits. It is also nocturnal and is best collected after night, when it is attracted to bright lights.

Family OMMEXYCHIDÆ.

The representatives of the present family are medium-sized to large locusts, with more or less strongly rugose, or even with spined, pronotum and hind femora. They all belong to the South American continent, where the majority of forms occur to the southward of the equator, even entering the pampean region of Argentina as far as the Rio Negro. The different species are frequently confined to special food-plants, upon which they congregate in large numbers.

The four genera belonging to the family are separated as follows:

TABLE FOR DETERMINING THE GENERA OF OMMEXYCHIDÆ.

- A. Body more or less graceful and cylindrical, somewhat rugose. The antennæ filiform. Pronotum feebly carinated.
- b.* Tegmina and wings fully developed, extending considerably beyond the tip of the abdomen in both sexes. Carinæ of hind femora smooth. Internal angles of the mesosternal lobes rounded at apex. *Parossa* nom. nov.³
- bb.* Tegmina and wings frequently abbreviated. Carinæ of the hind femora toothed or crenulated. Internal angles of the mesosternal lobes not rounded. *Ommexecha* Serville.
- AA. Body very obese and greatly depressed; coarsely tuberculate, carinated, and spined. Antennæ with the joints somewhat flattened, subsensiform. Pronotal carina always more or less cristate.
- b.* Tegmina and wings present. Pronotum without lateral toothed, leaf-like expansion; its hind border broadly angulated, and adorned with five flat, tooth-like projections, the middle one furcate. . . *Spathalium* Bolivar.
- bb.* Tegmina and wings missing. Pronotum furnished at lower lateral edges with a toothed, leaf-like expansion; its hind border broadly rounded, and adorned with a series of six distinct, heavy, blunt spines.

Græa Philippi.

Genus PAROSSA nom. nov.

Ossa GIGLIO-TOS (*nec* MOTSCH.), Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 15 (1894).

Paulinia KIRBY (*nec* BLANCHARD), Syn. Cat. Orthopt. Brit. Mus., III, p. 296, (1910).

³ The insect described and figured by Blanchard (D'Orbigny, *Voy. Amer. Merid.* VI, No. 2, p. 216, pl. 27, fig. 6 (1843), and which Kirby considers congeneric with *Ossa bimaculata* and *O. viridis* of Giglio-Tos, seems more likely to represent the *Acrydium acuminata* De Geer. Hence the suggestion of the name *Parossa* to replace the preoccupied name *Ossa* of Giglio-Tos.

53. **Parossa bimaculata** (Giglio-Tos).

Ossa bimaculata GIGLIO-TOS, Bol. Mus. Zool. Anat. Torino, IX, no. 184, p. 17 (1894).

Paulinia bimaculata KIRBY, Syn. Cat. Orthopt., III, p. 296 (1910).

Habitat.—Chapada, Brazil (H. H. Smith).

Genus *OMMEXECHA* Serville.

Ommexecha SERVILLE, Ann. Sci. Nat., XII, p. 285 (1831).

54. **Ommexecha servillei** Blanchard.

Ommexecha servillei BLANCHARD, Ann. Soc. Ent. France, V, p. 613, pl. 22, figs. 2, 3 (1836).

Habitat.—Corumba, Brazil, during March and April (H. H. Smith).

55. **Ommexecha brunneri** Bolívar?

Ommexecha brunneri BOLIVAR, An. Soc. Españ., XIII, pp. 28, 493 (1884).

Habitat.—Benevides and Para, Brazil, where specimens, which are referred here with doubt, were taken in the months of May and July by H. H. Smith.

56. **Ommexecha germari** Burmeister.

Ommexecha germari BURMEISTER, Handb. Ent., II, p. 655 (1838).

Habitat.—Specimens of both sexes are at hand. They come from Corumba, Brazil, where they were collected in March and April by H. H. Smith.

Genus *SPATHALIUM* Bolívar.

Spathalium BOLIVAR, An. Soc. Españ., XIII, pp. 21, 30, 493 (1884).

57. **Spathalium serrulatum** (Thunberg)?

Gryllus serrulatus THUNBERG, Mém. Acad. Petersb., IX, 396, 414 (1824).

Ommexecha serrulata STÅL, Recens. Orthopt., I, p. 136 (1873).

Habitat.—Specimens of an insect referred with some doubt to this species are at hand. They were collected at Chapada, Brazil, during March and November by H. H. Smith.

58. **Spathalium bolivari** sp. nov.

A comparatively large, rather robust locust, with beautiful blue wings, in which the basal part is black, more or less conspersed with hyaline points, veins, and cross-veins mostly deep cærulean. General color of insect brownish purple, or vinaceous.

Head, pronotum, pleura, and femora granulately tuberculate and

rugose. Head large, in both sexes a little narrower than the anterior edge of the pronotum; occiput ascending, transversely rugose or wrinkled, separated from the vertex by a rather definite, but somewhat interrupted, transverse carina, which extends from eye to eye near their upper posterior margin; vertex even with the top of the eyes, not at all (♀) or only gently (♂) depressed at middle, quite evenly sloping downward anteriorly, and suddenly narrowed just in advance of the eyes at the fastigium to the width of the frontal costa; latter quite prominent between the antennæ, deeply sulcate, viewed laterally, produced anteriorly, as far as the length of the rather large basal antennal joints; ocellus⁹ located high on the front, being on a line with the lower edge of the antennæ, the costa somewhat interrupted, but in a manner continuous to the clypeus. Antennæ rather slender for a representative of this group, the basal joints somewhat flattened, but nowise giving these appendages an ensiform appearance, about fifteen-jointed. Eyes small, globular, the diameter about one-half (♂) or slightly less (♀) than the length of the anterior margin of the cheeks immediately below them. Pronotum with the anterior, posterior, and lateral margins quite conspicuously tuberculately spined, greatly expanding behind, the median carina quite strongly developed on the anterior lobe and so profoundly severed by the transverse sulci as to form two rather prominent triangular posteriorly directed teeth, on the posterior lobe continuous, low and narrow, hind margin of disk obtusangulate, remarkably thickened and provided along its upper edge with about six tubercular spines on each side of the middle. Tegmina and wings complete, a little longer than the abdomen in both sexes; the former tapering, coriaceous, profusely, but not strongly, veined, in the disk some of the cross-veins heavier and forming a series of oblique carinæ; the tegmina are also conspicuously marked by two or three longitudinal series of hyaline spots, which are without the characteristic veining of the other portions of the member. Hind wings one-half longer than wide, pointed, rather sparsely veined. Abdomen robust at base, rapidly and evenly tapering caudad. Hind femora quite strongly compressed, the superior carina hirsute, scarcely serrate, and not at all undulate; outer disk not regularly pinnate, but instead, rather coarsely and irregularly squamose; genicular lobes acuminate. Hind tibiæ robust, about as long as the femora, nine- to ten-spined externally, eleven- to twelve-spined internally. Mesosternum very broad, the interspace between the lobes fully

twice as wide as the lobes themselves, the inner margin of the lobes very oblique and broadly rounded. Anterior margin of the prosternum strongly carinate, gradually rising from the sides towards the middle, where it culminates in a fairly long acuminate spine. Dorsum of mesothorax provided immediately beneath the hind lobe of the pronotum with a conspicuous red cere, which shows only during flight, when the wings are expanded, or when the front edge of the pronotum is depressed—a "catch color" common to both sexes, but most conspicuous in the female.

General color, as indicated above, dark vinaceous-brown or purplish; on the face, cheeks, sides of pronotum, pleura, and femora more or less cinereo-testaceous, often tinged with brown and ferruginous. Abdomen bluish-black above, on sides and below testaceous and tinged with roseate, orange, or ferruginous. Anterior and middle tibiæ fasciate with fuscous; hind femora below infuscated, internally fasciate with fuscous, the entire genicular area and basal fourth of tibiæ strongly piceous, the latter apically becoming vinaceous. Antennæ fuscous, fasciate with flavous.

Length of body, ♂, 18.5 mm., ♀, 32.5 mm.; of pronotum, ♂, 5.1 mm., ♀, 8 mm.; greatest width of pronotum, ♂, 6.5 mm., ♀, 10 mm.; length of tegmina, ♂, 14 mm., ♀, 25 mm.; of hind femora, ♂, 9.5 mm., ♀, 14 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, where it was taken from November to April by H. H. Smith, "No. 2083." Types in the collection of the Carnegie Museum.

This insect bears some resemblance at least in the color of the wings to *Ommexecha carulans* Bolivar, but is much larger.

Family PYRGOMORPHIDÆ.

Genus ALGETE Bolivar.

Algete BOLIVAR, Bol. Soc. Españ. Hist. Nat., V, p. 213 (1905).

59. *Algete brunneri* Bolivar.

Algete brunneri BOLIVAR, Bol. Soc. Españ. Hist. Nat., V, p. 214 (1905).

Habitat.—Pernambuco, Brazil, during the month of May (coll. L. Bruner). Not contained among the H. H. Smith material.

This insect was found feeding on a herbaceous plant very similar to the common "Catnip." This plant grew in profusion on the premises of an abandoned homestead in the outskirts of the city. Specimens were taken *in coitu*.

Genus OMURA Walker.

Omura WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 503 (1870).

60. *Omura congrua* Walker.

Omura congrua WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 503 (1870).

Protomachus depressus STÅL, Bihang Svensk. Akad. Handl., IV, no. 5, p. 53 (1876).

Habitat.—The collection contains specimens of this insect coming from both Para and Santarem, Brazil. They were collected during the months of April to July inclusive.

61. *Omura congrua* var. *brunneri* n. var.

Very similar to the typical form, but differing from it in being much smoother, in having shorter antennæ, and in its somewhat smaller size.

Length of body, ♂, 30 mm., ♀, 46 mm.; of pronotum, ♂, 4.6 mm., ♀, 7 mm.; of antennæ, ♂ and ♀, 8.5 mm.; of hind femora, ♂, 13 mm., ♀, 17 mm.

Habitat.—Demerara, British Guiana, March and April, 1901 (R. J. Crew, collector).

Specimens of this insect are in the collection of the present writer.

Family CYRTACANTHACRIDÆ (Acridiidae).

The spine-breasted locusts comprise by far the most extensive family of these insects for the world as a whole. Especially is this statement true as regards the American continent, where its representatives greatly outnumber those of all the other families of locusts combined. Not only do we find a preponderance of species in the group, but of genera as well; and in many instances the individuals of species are likewise excessive. It is among the representatives of this family that we find the greatest diversity in size, form, coloration, and even of habits. Our largest, and, aside from some of the grouse-locusts, smallest, representatives of the suborder belong here. Most of the species, which are at times present in different regions of America as pests, are likewise members of this family.

Living among the rankest vegetation in forest, jungle, swamp, savanna, or pampa, prairie, plain, and even in desert regions, as a majority of the representatives of the family do, an unusually large percentage of the forms still remain unknown. Notwithstanding this fact upwards of one hundred and forty distinct genera are already known from the South American continent alone. Every small col-

lection coming from any part of that country contains both new genera and species. The present collection, as will be observed by an examination of succeeding pages, furnishes a very fair quota of such forms.

When we consider the comparatively small tracts and few sections of that vast country, which have been visited and explored by collectors, as compared with the portions, which still remain unexplored, we cannot avoid wondering what the great forests and swampy districts of the tropics will yield to the votaries of science in the way of future discoveries in the family.

It had been the intention of the writer at this time to present a carefully prepared synopsis of the South American genera of this family. A dearth of the proper material and lack of sufficient time has, however, necessitated its postponement to some future date.

Genus PRIONOLOPHA Stål.

Prionolopha STÅL, Recens. Orthopt., I, p. 27 (1873).

The present genus was erected for the reception of the *Gryllus* (*Bulla*) *serratus* of Linnæus, which occurs throughout most of tropical America. According to orthopterologists there is but a single species recognized, although many synonyms have been created by the description of supposedly distinct forms.

62. *Prionolopha serrata* (Linnæus).

Gryllus (*Bulla*) *serratus* LINNÆUS, Syst. Nat., 10th ed., p. 427 (1758).

Acridium serratum DE GEER, Mem. Ins., III, no. 10, p. 493, pl. 41, fig. 6 (1773).

Gryllus serratus FABRICIUS, Syst. Ent., II, 6, p. 288 (1775).

Pamphagus serratus THUNBERG, Mém. Acad. Petersb., V, p. 260 (1815).

Xiphocera serrata BURMEISTER, Handb. Ent., II, p. 614 (1838).

Tropinotus serratus SERVILLE, Ann. Sci. Nat., XXII, p. 273 (1839).

Prionolopha serrata STÅL, Recens. Orthopt., I, p. 44 (1873).

♂ *Acridium serratofasciatum* DE GEER, Mem. Ins., III, no. 11, p. 495, pl. 42, fig. 2 (1773).

♂ *Pamphagus lateralis* THUNBERG, Mém. Acad. Petérsb., V, p. 260 (1815).

Gryllus Locusta cymbiformis STOLL, Spectres, Saut., p. 12, pl. 4b, figs. 14, 15 (1813).

Pamphagus cymbiformis BLANCHARD, Hist. Ins., III, p. 38 (1840).

Gryllus Locusta scutatus STOLL, Spect., Saut., p. 39, pl. 21b, fig. 81 (1813).

Acridium dentatum OLIVIER, Encycl. Meth., VI, p. 216 (1791).

Xiphocera elegans WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 528 (1870).

Habitat.—Specimens of this insect in the present collection are at hand from Para, Chapada, and Corumba, Brazil (H. H. Smith).

The specimens from Corumba are decidedly larger and more robust than the others. They also differ in having longer and heavier hind legs with much longer spines on the inner side of the hind tibiæ, while the crest of the pronotum is higher and more evenly arcuate than in individuals examined from elsewhere. Specimens of the present species have been examined by me from Central America, U. S. of Colombia, Venezuela, British Guiana, Trinidad, Paraguay, Peru, and Ecuador.

Genus *ALCAMENES* Stål.

Alcameses STÅL, Bihang Svensk. Akad. Handl., V, no. 4, pp. 14, 54 (1878).

The genus *Alcameses* Stål is strictly South American, and its representatives are confined to southern Brazil, Paraguay, and northern Argentina. Several distinct species are known. These insects are rather closely related to the genus *Prionolopha* of the same author. The annexed table will aid in the separation of the species so far as known:

SYNOPSIS OF THE SPECIES OF *ALCAMENES*.

- A. Pronotum with the median carina tectiformly elevated. The posterior lobe much longer than the anterior.
- b. Anterior and middle sulci of the pronotum obsolete above. Tegmina twice maculate. Hind tibiæ twelve- to thirteen-spined in outer row.
granulatus Stål.
 - bb. Anterior and middle sulci of the pronotum strongly impressed, cutting the crest. Hind tibiæ ten- to eleven-spined externally.
 - c. Tegmina not maculate.
 - d. Tegmina lanceolate, one-half to three-fourths the length of the abdomen, the costal border only gently lobate...*cristatus* Bruner.
 - dd. Tegmina acuminate, very short, not extending beyond the apex of second abdominal segment, the costal border very strongly lobate.
lobipennis sp. nov.
 - cc. Tegmina at least faintly maculate, their hind border strongly arcuate and pale bordered.....*brevipennis* Giglio-Tos?
- AA. Pronotum with the crest only moderately elevated. The posterior lobe shorter than the anterior one.
- b. Body slender. The posterior sulcus of the pronotum a little more prominent than the others. Hind margin obtuse. Hind femora slender.
brevicollis Stål.
 - bb. Body robust. The posterior sulcus of the pronotum strongly impressed. Hind margin a right angle. Hind femora tumid at base.
clarazianus Pictet et Saussure.

63. *Alcamenes lobipennis* sp. nov.

Having about the same size and general build as *A. cristatus* Bruner, but readily separated from that species by the very strongly lobate anterior border of the much shorter tegmina, and the smaller and less prolonged last ventral segment of the male abdomen.

Head large, fully as wide as the front edge of the pronotum; the occiput and cheeks rounded, the former finely transversely rugose, the latter smooth; eyes prominent, elliptical, a very little narrower above, in the male as long as, and in the female one and one-fourth times the length of the anterior edge of the cheeks below them; fastigium horizontal, in the male very gently acuminate, in the female a little obtuse, the disk flat, somewhat rugoso-granulate and provided with a well-defined median carina which continues over the occiput to the anterior angle of the pronotum; frontal costa most prominent above between the base of the antennæ and the union with the fastigium, where it is as narrow as the diameter of the second antennal joint, from this joint evenly divergent below and fading so as to be nearly obliterated before reaching the clypeus, scarcely sulcate. Face shallowly and coarsely punctulate. Pronotum rugoso-granulose, on disk of hind lobe with vien-like raised lines, strongly tectate; the anterior lobe shorter than the posterior one, all three transverse sulci profound, and deeply severing the crest which is smooth; anterior edge slightly acute, the posterior edge very much so; the posterior border of the lateral lobes and the lateral edges of the hind prolongation of disk forming together a continuous arc. Tegmina short, not extending beyond the middle of the third (σ^7) or the second (φ) abdominal segment, the basal half of the costal field very strongly lobed, the lower extremity of lobe almost touching the hind coxal scrobe. Abdomen compressed, carinate, tapering, the last ventral segment of the male small, compressed, acuminate; supra-anal plate triangularly acuminate, tectate, its middle on basal two-thirds deeply sulcate; cerci small, conical, hirsute. Posterior femora comparatively slender, very slightly exceeding the abdomen in length, their carinæ faintly serrate. Antennæ robust, the basal joints slightly depressed; in the male as long as, in the female about three-fourths the length of the hind femora. Posterior tibiæ eleven-spined on outer margin. Prosternal spine robust, long, the apical half strongly bent to the rear, its apex gently overlapping the front edge of mesosternum.

General color of typical specimens apple-green, slightly varied by

piceous, dull brown, and testaceous. Lateral margins of fastigium together with upper antennal foveæ piceous to glossy black immediately in advance of the eyes. Ocelli amber-yellow; the eyes ochraceous. Lateral carinæ of male faintly embrowned, as are the upper edges of the hind femora and the tibiæ. Tibial spines pallid at base, the apical portion black. Antennæ greenish basally, becoming somewhat infuscated apically, most pronouncedly so in the male.

Length of body, ♂, 32 mm., ♀, 45 mm.; of pronotum, ♂, 16.5 mm., ♀, 22.5 mm.; of tegmina, ♂, 8 mm., ♀, 10 mm.; of hind femora, ♂, 18 mm., ♀, 22.5 mm.

Habitat.—Chapada, near Matto Grosso, Brazil, May (H. H. Smith). The types are contained in the collection of the Carnegie Museum.

Two additional specimens (♂ and ♀) are at hand. They come from the same locality. These are uniformly dark wood-brown instead of green. The male was taken during March, the female in August.

64. *Alcamenes brevipennis* (Giglio-Tos)?

Prionolopha brevipennis GIGLIO-TOS; Boll. Mus. Zool. Anat. Torino, XV, no. 377, p. 4 (1900).

Among the material at hand is a single female specimen of another species of *Alcamenes* which is very doubtfully referred to *Prionolopha brevipennis* Giglio-Tos. The description published by the author of that species is so brief as not to be at all characteristic and could be applied to one of several species of *Alcamenes*. His insects were undoubtedly green or greenish, varied with fuscous and black on the head and pronotum. The specimen at hand is dark brunneo-ferruginous with a black bordered pronotal crest and a pallid dorsal edge on the closed tegmina, which latter also exhibit traces on the disk of dull fuscous mottlings. The hind femora are rather robust, the carinæ quite strongly spined and the upper lateral apices prominently toothed. In size this specimen agrees fairly well with the measurements of Giglio-Tos so far as the pronotum, length of the tegmina and of the hind femora are concerned, but, instead of measuring 55 mm. in length, as mentioned by him, this one is fully 70 mm. long.

Habitat.—This insect comes from Corumba, Brazil, where it was taken during the month of March (H. H. Smith). It is the property of the Carnegie Museum.

Should this insect prove to be distinct from *brevipennis* Giglio-Tos it may be known as *Alcamenes marginipennis*.

Genus MUNATIA Stål.

Munatia STÅL, Bihang, Svensk. Akad. Handl., III, no. 14, p. 28 (1875).

65. *Munatia minor* (Giglio-Tos).

Procolpia minor GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 17 (1894).

? *Munatia australis* BRUNER, Proc. U. S. Nat. Mus., XXX, p. 644 (1906).

Habitat.—There are specimens at hand from Chapada, Para, Rio de Janeiro, etc., as well as from Montevideo. They were collected from March to November (H. H. Smith).

There are great variations in robustness, length of wing, coloration, etc., in the measurements of specimens before me as I write, possibly sufficient to warrant the making of at least two, if not three species. The generic affinities of these insects are certainly closer to *Munatia* than to *Procolpia* as suggested by both Rehn and Giglio-Tos.

Genus COLPOLOPHA Stål.

Colpolopha STÅL, Öfv. Vet.-Akad. Forh., XXX, no. 4, p. 53 (1873).

66. *Colpolopha obsoleta* (Serville).

Tropinotus obsoletus SERVILLE, Ann. Sci. Nat., XXII, p. 274 (1831).

Xiphocera obsoleta BURMEISTER, Handb. Ent., II, p. 613 (1838).

Colpolopha obsoleta PICTET ET SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 338 (1887).

Xiphocera basalis WALKER, Cat. Dermapt. Salt., Brit. Mus., III, p. 522 (1870).

Habitat.—The present collection contains specimens, which were collected during June and July at Para, Brazil (H. H. Smith).

Genus DIEDRONOTUS Bolivar.

Diedronotus BOLIVAR, Bol. Soc. Españ., VI, p. 396 (1906).

Tropinotus SERVILLE (*nec* Kuhl), Ann. Sci. Nat., XXII, p. 272 (1831); STÅL, Recens. Orthopt., I, pp. 27, 44 (1873); BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 640, 645 (1906).

Tropidonotus STÅL (*nec* Schleg.), Bihang. Svensk. Akad. Handl., V, no. 4, p. 14 (1874); PICTET ET SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 335 (1887); GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XIII, no. 311, p. 41 (1898).

The genus *Diedronotus* Bolivar (*Tropinotus* Serville) is confined to tropical America, where it is represented by a rather large number of attractive species. While enjoying a range extending from Yucatan in the north to the Rio Negro in the Argentine Republic, its center of distribution seems to be in southern Brazil and Paraguay. At least fifteen species have been heretofore described. To these

two others are now added. All of these may be separated by the subjoined synoptic table.

SYNOPSIS OF THE SPECIES OF *DIEDRONOTUS*.

- A. Crest of the pronotum more or less crenulate, or even serrulate, posteriorly.
Genicular angles of the hind femora acute, a little lengthened.
- b. Tegmina and body cinereous, testaceous, or ferruginous, usually, but not always, more or less mottled or streaked with brown or fuscous.
- c. Markings of the tegmina either large and forming more or less well-defined bands, or else showing as longitudinal lines along the principal veins.
- d. Hind tibiæ twelve-spined. The anterior field as well as the disk of the wing chiefly rose-color. [U. S. of Colombia.]
rosulentus Stål.
- dd. Hind tibiæ nine- to eleven-spined. The anterior field of the wing more or less completely infuscated.
- e. Hind femora very long, reaching considerably beyond the tip of the abdomen in both sexes. Crest of the pronotum deeply cleft by all three sulci, the lobes distinctly separated.
discoideus Serville.
- ee. Hind femora shorter, only reaching the tip of the abdomen (♀) or but little surpassing it (♂). Crest of the pronotum less deeply cleft, the lobes at least closely approximate.
- f. Tegmina moderately slender, the apex quite obliquely truncate, in some instances decidedly acuminate.
- g. Maculation of tegmina typical, consisting of several transverse bars and large blotches and distributed over most of the wing.....*angulatus* Stål.
- gg. Maculation of tegmina almost or quite wanting.
- h. Size small. Tegmina and wings but little surpassing the apex of the abdomen. General color of the tegmina testaceo-ferruginous, marked on basal half with a large triangular spot. [Cordoba, Argentina.]
schulzi Bruner.
- hh. Size large. Tegmina long, slender, acuminate, pale cinereous, the infuscation of tegmina confined chiefly to the longitudinal veins. [Western Brazil and East Peru.].....*strigatus* sp. nov.
- ff. Tegmina unusually wide.
- g. Pronotal carina high and strongly arched, wings not especially infuscated. [Yucatan and Honduras.]
mexicanus Bruner.
- gg. Pronotal carina of moderate elevation, not strongly arched; wings strongly bordered with deep fuscous. [Montevideo.].....*fuscipennis* sp. nov.
- cc. Markings of tegmina small, irregularly scattered over the wing, save for a row in basal half of the discal area.

- d.* Pronotum short, the crest low, and but little produced posteriorly.
Hind tibiae with nine spines in the outer row.

modestus Giglio-Tos.

- dd.* Pronotum longer, considerably produced posteriorly. Hind tibiae with ten spines in the outer row. *conspersus* Bruner.

- bb.* Tegmina and body uniformly colored, without maculations or conspersing.

- c.* Tegmina, as well as entire body and legs, green. *insignis* Giglio-Tos.

- cc.* Tegmina, body, and legs uniformly dull brown, save a paler dorsal stripe on the former. *affinis* Bruner.

- AA.* Crest of the pronotum smooth posteriorly. Genicular angles of the hind femora shorter and more rounded.

- b.* Hind tibiae provided with fewer (ten) spines in outer row.

- c.* General form somewhat graceful; markings of tegmina very regular.

Crest of the pronotum evenly arched. *regularis* Bruner.

- cc.* General form rather robust; markings of tegmina somewhat irregular.

Crest of pronotum less evenly arched. *guarani* Rehn.

- bb.* Hind tibiae provided with more (eleven to nineteen) spines in outer row. Color variable.

- c.* Color in part, or largely, green; the discal area of tegmina with, or without, dark spots.

- d.* Posterior femora punctate, and with all the carinae nigro-serrate.

Hind tibiae armed with eleven or twelve spines on the outer margin. [San Leopold, Central Brazil]. *scabripes* Stål.

- dd.* Posterior femora nearly smooth, only partially nigro-punctate on the carinae. Hind tibiae armed with thirteen to sixteen spines on outer row.

- e.* Larger and more robust (male 36, female 51 mm.); the disk of the tegmina provided with a row of prominent dark subquadrate spots. Hind femora rather robust basally. Hind tibiae thirteen or fourteen-spined. *lavipes* Stål.

- ee.* Smaller and slenderer (male 33, female 40 mm.); disk of tegmina immaculate, or only showing traces of the discal spots.

- f.* General color ochraceous, varied with chestnut and cinnamon-brown. Outer row of spines on hind tibiae numbering thirteen to fifteen. [Chapada, Brazil.]

attenuatus Rehn.

- ff.* General color at least of pronotum and tegmina largely green.

Outer row of spines on hind tibiae numbering fifteen to sixteen. [São Paulo, Brazil]. *gracilis* Bruner.

Color ochreous or ferrugineo-testaceous.

- d.* Hind tibiae with ten to twelve spines in outer row, crest of pronotum arcuate. Tegmina with a pale costal line. *lineatus* Bruner.

- dd.* Hind tibiae with eighteen to nineteen spines in outer row, crest of pronotum straight. Tegmina without a costal line.

laufferi Bolivar.

67. *Diedronotus angulatus* (Stål).

Tropinotus angulatus STÅL, Recens. Orthopt., I, p. 44 (1873).

Tropidonotus angulatus STÅL, Obs. Orthopt., III, p. 19 (1878).

Habitat.—Corumba and Chapada, Brazil (H. H. Smith).

The specimens at hand are somewhat variable in color, but are quite typical of the species as found elsewhere.

68. *Diedronotus strigatus* sp. nov.

Tropinotus strigatus BRUNER, Horæ Soc. Ent. Rossicæ, XXXIX, p. 469 (1910) (MS.).

A moderately large, somewhat slender species, in which the tegmina are narrow and quite long, with the apex acuminate. Lateral angles of the disk on the pronotum strongly toothed. General color testaceo-cinereous, more or less strongly strigate with grayish fuscous, and without the usual large transverse maculations.

Head fully as wide as the anterior edge of the pronotum, the occiput short, gently arcuate, and quite prominently transversely ridged, especially in the female; vertex between the eyes about equal in width to the shorter diameter of one of them, the fastigium flat, triangular, the apex slightly acute, even in the female, its lateral edges straight, slightly raised above the disk, disk provided with a longitudinal carina which continues posteriorly across the occiput. Frontal costa fairly prominent, sulcate, finely punctate, its sides evenly divergent, continuous to the clypeus. Antennæ slender, the basal joints depressed or flattened. Eyes fairly prominent, as long as the anterior edge of the cheeks below them. Pronotum as well as head and body studded with sharp granulations and with the lateral carinæ prominent, straight, evenly divergent behind and strongly toothed, their hind end forming a distinct angle with the hind margin of disk; crest or median carina moderately high, profoundly severed by the transverse sulci and strongly crenulato-serrulate towards the hind margin. Posterior and anterior margins of disk acuminate, the former very much so. Tegmina and wings long and narrow, the former decidedly acuminate at their apex. Posterior femora strongly serrate, about normal in length, rather slender on apical half, the genicular lobes acute. Hind tibiæ long and slender, ten-spined on the outer margin. Prosternal spine compressed, the apex directed to the rear at almost a right angle.

General color testaceo-griseous, minutely and sparsely flecked

throughout with black granules. The tegmina conspicuously strigate with fuscous along the border and longitudinal veins. Wings with the disk and border colored much as in *T. angulatus* Stål. Sides of pronotum and pleura also more or less strigate with fuscous. Hind tibiae of the general color, the spines black-tipped.

Length of body, ♂, 31 mm., ♀, 45 mm.; of pronotum, ♂, 11 mm., ♀, 15.5 mm.; of tegmina, ♂, 29 mm., ♀, 41 mm.; of hind femora, ♂, 20 mm., ♀, 26 mm.

Habitat.—This insect comes from Chapada, Brazil, where it was collected by H. H. Smith. The type is contained in the collection of the Carnegie Museum.

Aside from the color variations this insect differs from typical *angulatus* in the longer, narrower tegmina and wings, and in having eleven instead of nine or ten spines on the outer margin of the hind tibiae. In addition to the present form there are two or three others which occur in the same general region. It is quite probable that these variations represent several species now in the course of formation.

69. *Diedronotus fuscipennis* sp. nov.

A rather large, robust, moderately granular species, with wide tegmina and wings, in which the median carina of the pronotum is profoundly severed by the transverse sulci as in *mexicanus*, *angulatus*, and *discoideus*. In general appearance it approaches the former more closely.

Head of moderate size, set into the front edge of the robust pronotum nearly to the hind margin of the small eyes; vertex somewhat wider than the short diameter of one of the eyes, the fastigium horizontal, flat, with a longitudinal median carina, which continues over the occiput, its lateral edges straight and meeting in front at about a right angle. Frontal costa prominent, gently sulcate, from between the antennae nearly to the clypeus, the sides gently approaching just below the ocellus. Antennae very gently ensiform; the eyes about three-fifths the length of the anterior edge of the cheeks below them. Pronotum robust, the median carina cristate, of moderate altitude, straight on the anterior, arcuate on the posterior lobe, where it is gently crenulate; lateral carinae crenulate or nodulose, broadly arcuate, rounded, joining with the posterior lateral edges of the disk instead of at an angle as in *angulatus* and *strigatus*; the anterior edge of disk a right-angle instead of acute, the hind margin somewhat

acute; disk of hind lobe provided on each side with two rather prominent converging raised lines. Tegmina wide for this genus, quite closely veined and coriaceous on basal half, less dense on apical portion, the apex subobliquely docked. Wings a little less than twice as long as broad, all of the costal field, the anterior portion of radial field, and a broad border on the latter, strongly infuscated, the fenestrate area alone transparent. Abdomen robust, strongly carinated above. Hind femora robust, as long as the abdomen, granular, and somewhat serrate; hind tibiæ moderately heavy, the outer edge provided with eleven spines. Prosternal spine large, robust, and the apical half strongly bent to the rear.

General color cinereo-testaceous, more or less varied on sides of head, pronotum, pleura, and tegmina with ferruginous and dull brown. The tegmina with faint traces of the characteristic dark basal maculæ and subapical transverse fasciæ so characteristic of *discoideus*.

Length of body, ♀, 50 mm., of pronotum, 17.5 mm., of tegmina, 45 mm., of hind femora, 30 mm.

Habitat.—The only specimen at hand, the type, bears the label "Montevideo." It is in the Carnegie Museum.

As indicated by the name, the present species has the wings very strongly infuscated, save in the basal portion of the radial field, where the color is bright orange.

70. *Diedronotus regularis* (Bruner).

Tropinotus regularis BRUNER, Ent. News, XVI, pp. 215, 216 (1905).

Diedronotus regularis KIRBY, Syn. Cat. Orthopt., III, p. 361 (1910).

Habitat.—Chapada, Brazil, in July, a single female (H. H. Smith).

Mr. Rehn's *Tropinotus guarani* is quite closely related to this insect.

71. *Diedronotus scabripes* (Stål)?

Tropidonotus scabripes STÅL, Obs. Orthopt., III, p. 19 (1878).

Tropinotus scabripes BRUNER, Ent. News, XVI, p. 215 (1905).

Diedronotus scabripes KIRBY, Syn. Cat. Orthopt., III, p. 361 (1910).

Habitat.—The single female specimen in the present collection was taken in June at Chapada, near Cuyaba, Matto Grosso, Brazil (H. H. Smith).

72. *Diedronotus attenuatus* (Rehn).

Tropinotus attenuatus REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 118-120, figs. 6, 7 (1909).

Habitat.—A large series including both sexes, is at hand from Chapada near Cuyaba, Matto Grosso, Brazil. They were taken during the months of May, June, and July (H. H. Smith).

This species comes closest to *D. gracilis* (Bruner) from São Paulo.

73. **Diedronotus lineatus** (Bruner).

Tropinotus lineatus BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 646, 648 (1906).

Diedronotus lineatus KIRBY, Syn. Cat. Orthopt., III, p. 361 (1910).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, a single male specimen collected in June (H. H. Smith).

This insect also occurs at Sapucay, Paraguay, where it was collected by W. T. Foster. (Collections U. S. Nat. Museum, L. Bruner, and Philadelphia Acad. Sciences.)

Genus **CORYACRIS** Rehn.

Coryacris REHN, Proc. U. S. Nat. Mus., XXXVI, p. 111 (1909).

Very closely related to *Elæochlora* Stål, and composed of insects with fully developed tegmina and wings in both sexes. The species, so far as known, are confined to southern Brazil, Paraguay, and Argentina along the Rio Parana. The type of the genus is the following species.

74. **Coryacris angustipennis** (Bruner).

Elæochlora angustipennis BRUNER, 2d Rept. Locust Comm. B. Aires, p. 58 (1900).

Coryacris diversipes REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 111-114, figs. 1, 2 (1909).

Habitat.—Specimens of both sexes were collected during March at Corumba, Brazil, by H. H. Smith.

75. **Coryacris** sp.

There is before me, as I write, a single female specimen of this genus which bears the label "Pedras de Amolar, near mouth of São Lorenzo Rio, P." While colored similarly to *C. angustipennis*, referred to above, this individual is nearly or quite twice as large. The measurements follow:

Length of body, ♀, 64 mm., of pronotum, 14 mm., of tegmina, 57 mm., of hind femora, 36.5 mm., of antennæ, 26 mm.

Female specimens of *C. angustipennis* before me vary from 48 to 55 mm. in length.

This large individual has the apical two-fifths of the tegmina rather regularly and plainly conspersed with fuscous dots. It bears the

collector's number "2118" (H. H. Smith). I would suggest the name *Coryacris conspersipennis* as suitable for it.

Genus ELÆOCHLORA Stål.

Elæochlora STÅL, Æfv. Vet. Akad. Forh., XXX, no. 4, p. 52 (1873).

The genus *Elæochlora* Stål is composed of a dozen or more species of rather large and showy locusts. All of the known forms are South American, and most of them tropical in their distribution. Possibly a few of the described species will eventually be placed in other genera. In fact, quite recently Mr. James A. G. Rehn has redescribed the *E. angustipennis* Bruner under the name *Coryacris diversipes*, as will be seen by reference to the next to the last of preceding forms mentioned in the present paper.

There are two or three distinct types of structure observable among the species of this genus, and it was the intention of the writer to construct a synoptical key for their separation. The lack of several of them for comparisons, together with the press of other duties, has, however, made it necessary to defer this action for the present.

76. *Elæochlora trilineata* (Serville).

Xiphicera trilineata SERVILLE, Ann. Sci. Nat., XXII, p. 272 (1831).

Xiphocera trilineata, BURMEISTER, Handb. Ent., II, p. 614 (1838).

Elæochlora trilineata STÅL, Recens. Orthopt., I, p. 46 (1873).

Habitat.—If I have rightly determined this insect, there is a specimen at hand from Rio de Janeiro, Brazil, where it was taken during the month of December by H. H. Smith.

77. *Elæochlora viridicata* (Serville).

Xiphicera viridicata SERVILLE, Ins. Orthopt., p. 614, pl. 14, fig. 3 (1839).

Elæochlora viridicata STÅL, Recens. Orthopt., I, p. 46 (1873).

Habitat.—Chapada, Brazil, during the months of December, January, and April (H. H. Smith).

78. *Elæochlora pulchella* Rehn.

Elæochlora pulchella REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 126-128, figs. 13, 14 (1909).

Habitat.—Corumba, Brazil, during March and April (H. H. Smith).

79. *Elæochlora humilis* Rehn.

Elæochlora humilis REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 124-126, figs. 11, 12 (1909).

Habitat.—Rehn's type came from Chapada, near Cuyaba, Matto Grosso, Brazil (H. H. Smith).

80. ***Elæochlora hymenæa*** (Gerstæcker).

Xiphocera hymenæa GERSTÆCKER, Stettin. Ent. Zeit., XXIV, p. 186 (1873).

Elæochlora longispina PICTET ET SAUSSURE, Mitth. Schweiz. Ent., V, pp. 344, 345 (1887).

Habitat.—A male specimen from Rio de Janeiro, taken in September, is placed here (H. H. Smith).

81. ***Elæochlora brevipennis*** sp. nov.

This species, like Rehn's *E. arcuata*, belongs to the section of the genus which contains *trilineata*, *viridicata*, *humilis*, and *pulchella*. It is most closely related to *arcuata* in the form of its tectate pronotal carina. But it differs from that species in the more rugose pronotum, the more robust hind femora, and the smaller eyes, as well as in the shorter and less acuminate tegmina. Its color is wood-brown, fuscous, and testaceous, the only tinge of green about it being on the outer face of the hind femora.

General form robust, the size medium; head fairly large, nearly as wide as the front edge of the pronotum, the occiput viewed in profile gently rounded, a little lower than the anterior middle of the pronotum; vertex wide, its width equal to the longest diameter of one of the eyes, the fastigium with its front slightly ascendant, very gently sulcate, about as long as its basal width, the lateral margins very gently rounded. Frontal costa prominent above, sulcate throughout, its walls evenly divergent below and reaching the base of the clypeus. Antennæ rather slender, as long as the head and pronotum combined, composed of twenty-two or twenty-three segments. Eyes not very large, but fairly prominent, about one-fourth shorter than the anterior edge of the cheeks below them, nearly elliptical. Lateral ocelli small, situated just in advance of the lower portion of the upper fourth of the eyes on a lateral continuation of the fastigium of the vertex and just back of its anterior carina. Pronotum very strongly rugose and studded both on the disk and lateral lobes with large rounded tubercles, slightly recalling the genus *Helionotus*, the median carina heavy, strongly arched, and thrice severed by the three transverse sulci, the posterior one most profound and situated plainly back of the middle; hind margin slightly obtuse-angled, the margin studded with several rounded tubercles; lateral carinæ also strongly and numerously

toothed, on each side just in advance of both the second and third sulci prominently so by a single tooth much longer and heavier than the others; the front margin also somewhat angulate and less prominently studded with tubercles than the hind margin. Tegmina short, broad, their apex rounded, reaching just beyond the hind margin of the third abdominal segment, the costal edge lobate. Abdomen compressed, strongly carinate above, rapidly tapering, the last ventral segment pyramidal, acuminate; the supra-anal plate tectate, elongate-triangular, rather deeply sulcate at middle on basal half. Anal cerci short, slender, pointed. Prosternal spine pyramidal, rather slender; meso- and meta-sternal lobes widely separated, the space about equal to the width of the lobes themselves. Hind femora robust, slightly surpassing the apex of the abdomen; hind tibiæ nine-spined on outer margin, the inner spines also nine in number, slightly curved, and a very little larger than the external ones.

General color above brunneo-fuscous, varied on the disk and sides of pronotum and dorsal portion of head and abdomen with streaks and patches of testaceous and piceous. Front between the anterior edges of the eyes and cheeks dark ochraceous, the posterior lower cheeks also of a similar shade, but fading into the darker anterior edges and occiput. Legs and lower portion of body testaceous mottled and flecked with cinereo-fuscous. Tegmina dark brown, conspicuously and moderately widely bordered with dirty yellow or testaceous. Inner spines of hind tibiæ black, the outer ones, together with the tibiæ, themselves pallid. Antennæ brownish testaceous basally, infuscated apically. Eyes mahogany-brown.

Length of body, ♂, 30 mm., of pronotum, 11.5 mm., of tegmina, 8.75 mm., of hind femora, 15 mm., greatest width of pronotum, 8 mm.

Habitat.—A single ♂, the type, comes from Chapada, Brazil (Campo), where it was collected by H. H. Smith during the month of October. It is deposited in the Carnegie Museum.

Genus *CALLONOTACRIS* Rehn.

Callonotacris REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 128-129 (1909).

This unique locustid genus is confined to southern Brazil, where it is represented by a single species.

82. *Callonotacris lophophora* Rehn.

Callonotacris lophophora REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 129-132, figs. 15-18 (1909).

Habitat.—Three males and one female, Chapada, near Cuyaba, Matto Grosso, Brazil, in January and April (H. H. Smith, No. 2082).

So far as known the types, ♂ and ♀, are the only other specimens in collections.

Genus CHROMACRIS Walker.

Chromacris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 643 (1870).

83. *Chromacris miles* (Drury).

Gryllus Locusta miles DRURY, Ill. Exot. Ent., II, p. 79, pl. 42, fig. 2 (1773).

Locusta (Rutodideres) miles WESTWOOD, Drury, Ill. Exot. Ent., II, p. 89, pl. 42, fig. 2 (1837).

Rhomalea miles PICTET ET SAUSSURE (in part), Mitth. Schweiz. Ent. Ges., VII, p. 349 (1887).

Chromacris miles BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 238, 239 (1907).

Habitat.—The present collection contains specimens taken at Para, Corumba, and Chapada, near Cuyaba, Matto Grosso, Brazil. They were collected during the months of April to November (H. H. Smith).

The species occurs in Central America and much of tropical South America.

84. *Chromacris latipennis* (Pictet et Saussure).

Rhomalea latipennis PICTET ET SAUSSURE, Bull. Soc. Ent. Suisse, VII, p. 351 (1887).

Chromacris latipennis KIRBY, Syn. Cat. Orthopt., III, p. 373 (1910).

Habitat.—The collection before me as I write contains a single male, which is referred to this species. It was taken at Chapada during the month of April (H. H. Smith).

Genus ZONIOPODA Stål.

Zoniopoda STÅL, Recens. Orthopt., I, pp. 32, 51 (1873); BRUNER, Proc. U. S. Nat. Mus., XXX, p. 652 (1906).

The present collection contains several specimens of the genus *Zoniopoda* Stål, two of which appear to be new. This fact, together with the known center of distribution of the genus, has made it appear worth the while to include here a revised synoptic table of the species.

SYNOPSIS OF THE SPECIES OF ZONIOPODA.

- A. Posterior femora always, and tibiae in most instances, banded with either black, yellow, or red, or with all three colors.
 - b. Body and tegmina mostly green or greenish.
 - c. Head and legs more or less prominently marked with red and black.
 - Hind tibiae banded.....*tarsata* Serville.¹

¹ Rehn in his paper on Non-Saltatorial and Acridoid Orthoptera from Sapucay, Paraguay, claims that *Zoniopoda tarsata* and *Z. cruentata* Blanchard are distinct. (See *Proc. Acad. Nat. Sci. Phila.*, 1907, p. 175.)

- cc. Head entirely green. Hind femora with a narrow black band on each side at base of condyle; hind tibiæ green or coralline.
juncorum Berg.
- bb. Body as well as head and legs largely, or at least strongly, varied with black.
- c. Tegmina dark olive to black.
- d. The veins of the tegmina yellow or testaceous.
- e. Pronotum longitudinally striped with black and yellow.
- f. Head largely blood-red.....*omnicolor* Blanchard.
- ff. Head not varied with red.....*emarginata* Stål.
- cc. Pronotum not longitudinally striped with black and yellow.
- f. Pronotum chiefly yellow and testaceous and provided with a median and a subfrontal black band. Body and legs largely pale. Knees, coxæ, and head, red.
fissicauda Bruner.
- ff. Pronotum glossy black, bordered broadly behind and narrowly in front with pale testaceous or dirty white. Body and limbs largely black, pale marks on head tinged with red.
exilipes Bruner.
- dd. Veins of tegmina infuscated, same color as the remainder of wing. Pronotum, body and legs as in preceding species (*exilipes*).
collaris sp. nov.
- cc. Tegmina blackish-fuscous, tessellate with yellow, wings red.
picta Bolivar.
- AA. Posterior femora not at all banded, unicolorous, or at most with the carinæ pallid as compared with the ground-color.
- b. Body very robust, the tegmina and wings abbreviated; the hind femora comparatively short. General color black, the head banded with pallid and red. Pronotum broadly pale-margined behind. Coxæ and abdomen red-maculate. Tegmina with reddish veins; wings in part bright carmine; hind tibiæ coral-red....*robusta* sp. nov.
- bb. Body slenderer; tegmina and wings normal, the hind femora also normal. General color green or greenish. Pronotum not margined with pallid.
- c. Pronotum unicolorous, in nowise striped or banded.
- d. Body of insect rather robust; the vertex quite wide and strongly depressed, median carina of the pronotum prominent; hind tibiæ green, or at most tinged with pink; subanal plate coarse and long.
- e. Hind wings cærulean.....*iheringi* Pictet et Saussure.
- ce. Hind wings rose-tinted.....*hempeli* sp. nov.⁵
- ⁵ *Zoniopoda hempeli* sp. nov.
- A single male specimen is at hand in which the posterior or radial field of the wings is bright rose-color instead of cærulean. The antennæ are colored much as those of *mimicula* Rehn, but are even more decidedly fasciate than in that species, while the vertex is fully as broad as the shortest diameter of one of the prominent eyes and has the fastigium rather strongly depressed as in *iheringi* Pictet et Saussure. The last ventral segment is quite prominent, elongate, compressed, acuminate and

dd. Body of insect slenderer, the vertex narrower, but little depressed; median carina of the pronotum low; hind tibiae and tarsi scarlet; last ventral segment strongly produced, acuminate, the apex with a strong V-shaped emargination.

mimicula Rehn.

cc. Pronotum with more or less decided longitudinal flavous lines. Hind tibiae greenish-yellow, the tarsi scarlet.....*similis* Bruner.

85. *Zoniopoda tarsata* (Serville).

Acridium tarsatum SERVILLE, Ann. Sci. Nat., XXXI, p. 283 (1831).

Acrydium tarsatum GRAY, Griffith, Anim. Kingd., XV, p. 781 (1832).

Zoniopoda tarsata STÅL, Recens. Orthopt., I, p. 51 (1873).

Gryllus servillei GUERIN, Icon. R. Anim., Ins., pl. 54, fig. 9 (1829).

Habitat.—Rio de Janeiro, in November (H. H. Smith).

According to Rehn a number of the references to the present species should be referred to the next.

86. *Zoniopoda cruentata* (Blanchard).

Acridium cruentatum BLANCHARD, D'Orbigny, Voy. Amer. Mer., VI, no. 2, p. 216, pl. 27, fig. 5 (1837-1843).

Zoniopoda cruentata REHN, Proc. Acad. Nat. Sci. Philad., LIX, p. 175 (1907).

Zoniopoda tarsata BRUNER (*nec* SERV.), Locusts of Argentina, pp. 53, 61 (1900); *ib.*, Proc. U. S. Nat. Mus., XXX, p. 652 (1906).

Habitat.—Said to be Argentina, Uruguay, Paraguay, etc. Not contained in the present collection. (See Rehn, *Proc. Acad. Nat. Sci. Philad.*, 1907, p. 175.)

87. *Zoniopoda similis* Bruner.

Zoniopoda similis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 652 (1906).

Habitat.—Chapada, Brazil, during November, two males (H. H. Smith).

88. *Zoniopoda iheringi* Pictet et Saussure.

Zoniopoda iheringi PICTET ET SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 356 (1887).

Habitat.—Chapada, Brazil, in April (H. H. Smith).

narrowly but fairly deeply emarginate at apex, about one-half longer than wide. The pronotum is quite strongly rugoso-punctulate, has the transverse sulci deeply impressed and the hind edge of the disk very faintly more than a right-angle. Hind tibiae robust, eleven-spined externally, pale greenish-yellow, not at all tinged with pink or red. Entire insect quite strongly hirsute.

Length of body, ♂, 27.5 mm., of pronotum, 6.1 mm., of tegmina, 23 mm., of hind femora, 14 mm.

Habitat.—São Paulo, Brazil (A. Hempel). The type is in the writer's collection.

89. *Zoniopoda mimicula* Rehn.

Zoniopoda mimicula Rehn, Proc. U. S. Nat. Mus., XXXVI, pp. 132-134, figs. 19, 20 (1909).

Habitat.—Two males, Chapada, Brazil, where they were collected in March and November by H. H. Smith. One of these specimens bears the collector's number, 2108.

90. *Zoniopoda collaris* sp. nov.

As indicated in the foregoing synoptic table of the species of *Zoniopoda*, *collaris* is quite closely related to *exilipes* Bruner, from which it differs chiefly in the color of the tegmina, the slightly more robust form, and in having the head tinged with red or orange, instead of with pale yellow or dirty white.

Length of body, ♂, 30 mm., of pronotum, 6.25 mm., of tegmina, 28.5 mm., of hind femora, 16 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, where it was taken by H. H. Smith in January. The type is unique. It is deposited in the collection of the Carnegie Museum.

I am inclined to believe that this is only a color-variety of *Z. exilipes*, but keep it separate until we have more material from which to draw conclusions.

91. *Zoniopoda robusta* sp. nov.

A very robust, short-winged insect, in which the color is black, varied with flavous and red. Hind wings with a color-pattern somewhat similar to that found in several of the species belonging to the genus *Chromacris*.

Head large, smooth; the front perpendicular, viewed in profile a little arcuate, from in front about as broad above as below, moderately high; occiput short, arcuate; vertex very wide, fully three times the width of the frontal costa at the ocellus; the fastigium short and very strongly depressed, its anterior portion sulcate and continuous with that of the frontal costa. Frontal costa only moderately prominent above, its sides nearly parallel save at its lower extremity, where it gradually fades before reaching the base of the clypeus. Eyes small, elliptical, the anterior edge less convex than the posterior, in the male a very little shorter, in the female one-half shorter than that portion of the cheek immediately below them; lateral ocelli large, conspicuous, located in the upper portion of the antennal scrobe just below the lateral carinae of the vertex and in advance of the upper third of the

eyes. Antennæ long and filiform, unicolorous, in the female at least one and one-half times the combined length of head and pronotum (missing in male specimen). Pronotum short, without lateral carinæ, rather wide, but a trifle longer than its greatest width; the anterior lobe glabrous, but sparsely and minutely punctulate, its sides parallel; hind lobe closely and rather deeply punctulate, expanding posteriorly, the disk flattened; median carina fairly prominent, thrice severed by the profound transverse sulci and thereby giving to it a lobate appearance; anterior margin straight, strongly reflexed; posterior margin widely angulate, the apex rounded; lateral lobes higher than long, the lower posterior angle broadly rounded. Tegmina somewhat abbreviated, in the male just reaching the tip of the abdomen, in the female about two-thirds as long as the abdomen, tapering towards the apex, the latter rounded, sparsely, but rather heavily, veined. Wings somewhat shorter than the tegmina, nearly as broad, as long, the anterior field with a rather strong fenestrate area, colored much as in the species of *Chromacris*. Hind femora moderately robust, evenly narrowing apically, the pennæ regular and few, carinæ smooth; genicular lobes short, rounded; hind tibiæ robust, eight-spined on outer row. Prosternal spine of moderate size, acuminate, directed gently to the rear. Meso- and meta-sternal lobes widely separated, the interspace of both broader than long; tip of male abdomen blunt, the last ventral segment short, the supra-anal plate triangular, tectate.

General color glossy black. Head perpendicularly vittate with prominent flavous bands, which are more or less strongly tinged with orange-red, these bands are arranged one at the posterior border of each cheek, and one on each side of the face following and including the lateral carinæ and continuing below across the clypeus and labrum, and above across the vertex and occiput, where they join with the upper extremities of the genal lines. Pronotum with most of the posterior lobe and a small portion of the lower lateral edges of the anterior lobe flavous as in *collaris* and *exilipes*. Tegmina with the principal and cross-veins testaceo-vinaceous. Pleura with oblique narrow lines in advance of the coxæ. Hind femora with the carinæ and edges of pennæ of outer face flavous; hind tibiæ except base and immediate apex blood-red. Coxæ, sides of meso- and meta-sternum, each of the ventral segments of abdomen and of the dorsum on each side above and below conspicuously maculate with sealing-wax red.

Length of body, ♂, 26.5 mm., ♀, 40 mm.; of pronotum, ♂, 6.5

mm., ♀, 9 mm.; of tegmina, ♂, 17 mm., ♀, 19 mm.; of hind femora, ♂, 17.5 mm., ♀, 18.5 mm.; of hind tibiæ, ♂, 17 mm., ♀, 18 mm.

Habitat.—Chapada, Brazil, April (H. H. Smith). The types belong to the Carnegie Museum.

In some respects this insect approaches *Chromacris* and in others it agrees best with *Zoniopoda*. It is especially to *Z. omnicolor*, *collaris*, and *exilipes* of the last genus that it shows relationship.

Genus PRIONACRIS Stål.

Prionacris STÅL, Bihang. till K. Svensk. Vet.-Akad. Handling., V, no. 4, pp. 19, 55 (1878).

Representatives of this genus are confined to tropical South America, where they are among the larger and more showy species. Thus far three have been described. They may be separated as follows:

SYNOPSIS OF THE SPECIES OF PRIONACRIS.

- A. Disk of wings tinged with rosaceous, general color of insect yellowish-olive. [New Granada].....*compressa* Stål.
 AA. Disk of wings tinged with green or blue. General color of insect dark olive or brown.
 b. Wings tinged with cærulean. [Upper Amazons].....*cærulescens* Bolivar.
 bb. Wings tinged with green. [Paraguay and southern Brazil]...*erosa* Rehn.

92. *Prionacris erosa* Rehn.

Prionacris erosa REHN, Proc. Acad. Sci. Philad., LX, pp. 176-179, figs. 10, 11 (1908).

Habitat.—Chapada, Brazil, a single female specimen, which was taken during the month of April by H. H. Smith.

Since Rehn's description included only the male, the following measurements of the female may be of value: Length of body 46 mm., of pronotum, 10.5 mm., of tegmina, 45 mm., of hind femora, 21.5 mm. Otherwise this sex is practically the same as the male.

Genus TITANACRIS Scudder.

Titanacris SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 352 (1869).

The large lobe-crested locusts, which comprise the present genus, are confined to tropical America, where they are fairly well distributed from southern Mexico to southern Brazil. They were rather carefully studied by Scudder (*l. c.*) and later by Pictet and Saussure (Mitth. Schweiz. Ent. Ges., VII, pp. 362, 363, 1887).

93. *Titanacris velasquezi* (Nieto).

Acridium velasquezii NIETO, Rev. et Mag. de Zool., 1857, p. 360, pl. 12.

Lophacris velasquezii SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 354 (1869).

Acridium olfersii SAUSSURE, Rev. et Mag. de Zool., 1861, p. 162.

Titanacris velasquezii PICTET ET SAUSSURE, Bull. Soc. Ent. Suisse, VII, p. 365 (1887).

Habitat.—A single specimen is at hand from Para, Brazil, where it was taken in August by H. H. Smith.

94. *Titanacris albipes* (De Geer).

Acridium albipes DE GEER, Mém. Ins., III, p. 487, pl. XL (1773).

Titanacris albipes SCUDDER, Proc. Bost. Soc. Nat. Hist., XXI, p. 353 (1869).

Gryllus (Locusta) cristatus, var. *d.* LINNÆUS, Mus. Ulr. Reg., p. 137 (1764).

Habitat.—Two male specimens of the present species were taken at Chapada, Brazil, during September by H. H. Smith.

Genus *TROPIDACRIS* Scudder.

Tropidacris SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 346 (1869).

The present genus contains the largest of our American locusts, with perhaps a single exception. They occur from southern Texas to middle Argentina and Paraguay. At least six distinct species have been recognized, but many more described. The synonymy of the different species is quite complicated, and possibly never will be entirely deciphered. The different forms are separated by Pictet and Saussure in their Catalogue d'Acridiens, pp. 28-29. Practically all of the recognized forms, save possibly one, are to be found in Brazilian territory.

95. *Tropidacris collaris* (Stoll).

Gryllus (Locusta) collaris STOLL, Spect. Saut., p. 39, pl. 21b, fig. 80 (1813).

For additional synonymy see Kirby's catalogue Orthoptera, III, p. 379.

Habitat.—Specimens are before me from Para, Chapada, and Corumba, Brazil. They were captured during the months of June to August inclusive (H. H. Smith).

96. *Tropidacris latreillei* (Perty)?

Acrydium latreillei PERTY, Del. Anim. Art., p. 123, pl. 24, fig. 4 (1832).

See Kirby for additional synonymy, *l. c.*

Habitat.—A single female from Chapada, near Cuyaba, Matto Grosso, Brazil, is referred here with some doubt. (Collected by H. H. Smith in January.)

97. *Tropidacris cardinalis* Pictet et Saussure.

Tropidacris cardinalis PICTET ET SAUSSURE, Bull. Soc. Ent. Suisse, VII, pp. 359, 360 (1887).

Gryllus dux FABRICIUS (*nec* DRURY), Spec. Ins., I, p. 362 (1781).

Habitat.—The present collection contains three males, labeled as coming from Honduras.

98. *Tropidacris grandis* (Thunberg).

Gryllus grandis THUNBERG, Mém. Acad. Petersb., IX, pp. 393, 403 (1824).

Tropidacris grandis STÅL, Reccens. Orthopt., I, p. 49 (1873).

Tropidacris fabricii SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 349 (1869).

Acridum dux BRULLE (*nec* DRURY), Hist. Ins. IX, p. 225, pl. 20 (1835).

Habitat.—Rio de Janeiro, Brazil, during December, two males bearing H. H. Smith's number 2076.

Genus NAUTIA Stål.

Nautia STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, pp. 42, 87 (1878).

Edalometopon REHN, Proc. Acad. Nat. Sci. Philad., LVII, p. 418 (1905).

These insects belong to tropical America. Species are found in both North and South America.

99. *Nautia ornatipes* Bruner.

Nautia ornatipes BRUNER, Biol. Cent. Amer. Orthopt., II, p. 243 (1907).

Robust, the pronotum but little expanding posteriorly, broadly rounded behind, and produced over the base of the tegmina, anterior margin sinuose. Antennæ subensiform, moderately heavy, and about as long as the hind femora. The latter with comparatively few and smooth paginæ on outer face, the genæ large, black, marked with white on the genicular lobes.

Vertex rather narrow, about as wide as the diameter of the second antennal joint, the fastigium triangular, about as long as broad, but little depressed, longitudinally sulcate; frontal costa prominent between the base of antennæ effaced below the transverse facial groove. Front not greatly oblique, strongly and coarsely punctulate. Eyes large, but not very prominent, æneous, and the facets showing more plainly than usual. Occiput short, and, together with the cheeks, prominently punctate. Pronotum rugoso-punctate, much more closely so on the hind than on the front lobe, the transverse sulci continuous, but not profound; the median carina showing plainly on the hind, but absent from the front lobe; lateral lobes a trifle higher

than long. Pleura strongly punctate. Tegmina coriaceous, having rather more the appearance of being punctate than close-veined, the apex broadly rounded, not reaching the apex of the abdomen. Abdomen short, tapering, the valves of ovipositor straight, slender, more or less hirsute, and somewhat similar to the cerci, the upper pair somewhat the stronger and longer. Hind tibiæ and tarsi rather densely hirsute, the former provided with seven spines on both sides, the latter with the second joint a little longer than the first. Prosternal spine robust, short.

General color brownish olive, the sides of pronotum above and the tegmina along the discal field provided with a pale testaceous or dirty white band. Antennæ blackish above, reddish beneath, with the black encroaching inwardly below. The hind femora are of a paler olive-green and beautifully marked externally near the base by bright blood-red blister-like patches, which give to the whole insect a very notable appearance.

Length of body, ♀, 29 mm., of antennæ, 14 mm., of pronotum, 9 mm., of tegmina, 15 mm., of hind femora, 18 mm., of hind tarsi, 10 mm.

Habitat.—A single female specimen is at hand from Bartica, Demerara, British Guiana, where it was taken by R. J. Crew. (Coll. L. Bruner.)

100. *Nautia vitta-genæ* Bruner.

Nautia vitta-genæ BRUNER, Biol. Cent. Amer. Orthopt., II, p. 243 (1907).

As shown by the synoptic table of the species of this genus, as published in the *Biologia Centrali-Americana*, the present species is most closely related to the one just described. Besides the differences mentioned there it varies from *N. ornaticipes* in having the antennæ, which are black, linear, instead of subensiform; in the much shorter and more closely punctate pronotum, the sides of which are plainly longer than high; in having the tegmina fully as long as the abdomen; in the uniform coloration of the hind femora; in the reddish, instead of olivaceous and fuscous, hind tibiæ and tarsi; in having the pale longitudinal line on the tegmina dark pink, bordered narrowly above and below, instead of pale testaceous or dirty white; and in having the eyes much more prominent. The present species has the fastigium of its vertex decidedly depressed and much slenderer than in the species with which it has been compared.

Cerci of male very robust basally, directed posteriorly, so that the upper edge of the basal two-fifths lies parallel with the body, the lower

edge roundly narrowing, so that at the end of the parallel portion they are graceful and nearly equal, and from this point are directed upwards, a little inwards, and again bowed outwards. Prosternal spine robust, subquadrate, short, the apex somewhat acuminate.

Length of body, ♂, 26 mm., of antennæ 18 mm., of pronotum, 7 mm., of tegmina, 16 mm., of hind femora, 15 mm., of hind tarsi, 9 mm.

Habitat.—A single male taken by R. J. Crew at the same locality as the preceding species. (Coll. L. Bruner.)

101. **Caloscirtus rubripennis** gen. nov. et sp. nov.

A rather small, fairly robust, olive-green locust, with bright blood-red hind-wings, red dorsum of abdomen, and elongate, slender, red antennæ; and in which the hind femora are decidedly robust and provided with tuberculate or semiserrate upper carinæ.

Head slightly wider than the front edge of the pronotum, the occiput short, eyes large and moderately prominent, nearly one-third longer than that portion of the cheeks below them, vertex narrow, less than half as broad as the frontal costa, between the base of antennæ; fastigium somewhat depressed. sulcate, and separated from the frontal costa by a rather prominent transverse carina; frontal costa a little prominent between the antennæ, shallowly sulcate, and provided in the middle with a broad longitudinal carina, broadest above, but narrowing towards the ocellus, below which point it is obsolete. Face rugose and coarsely punctate, the lateral carinæ inconspicuous and slightly bowed outward at their middle, but little further apart at their lower than upper end; cheeks also coarsely punctate, likewise the occiput in part. Antennæ twenty-two-jointed, slender, nearly as long as the hind femora (♂) the basal joint large, about as broad as the greatest width of the frontal costa. Pronotum coarsely rugoso-punctate, a trifle expanded on the hind lobe; median carina distinct, interrupted by the well-marked transverse sulci; anterior margin roundly advanced upon the occiput in middle, obtusangulate behind. Pleura coarsely punctate. Tegmina rather narrow, sparsely, but strongly, veined, as long as the abdomen; wings a little shorter than the tegmina, obtuse, and with the outer margin strongly undulate. Hind femora robust and provided with coarse, large knees, their upper edges sub-serrate on carinæ and coarsely punctate, the paginæ together with the lower carinæ and face smooth, genicular lobes sub-

acuminate; hind tibiæ heavy, short, six-spined on outside and rather strongly hirsute; hind tarsi with the second joint about one-half as long as the first. Last ventral segment of male abdomen short, pinched from sides so as to form a short longitudinal ridge; supra-anal plate with the sides nearly parallel on basal half, then suddenly contracted to about one-half the width and completed as a triangular projection the center of which is provided with a median carina, which separates and forms a loop towards the base of the plate, each side of disk provided with three or four dark tubercles; anal cerci heavy, two and one-half times as long as wide and twisted on outer half. Prosternal spine very short and broad at base, but with the apex terminating in a small short tubercle. Entire insect sparsely hirsute, save on lower side of abdomen apically, where the hairs form two decided tufts.

General color pale olive-green, paler below. Hind femora and tibiæ much darker green, the sides of genæ and base of tibiæ blood-red, on the latter followed by a dusky patch and then by a narrow pale annulus; tarsi testaceous. Tegmina brownish-olive with a narrow, but well defined, median longitudinal testaceous vitta on each, running from the base to the apex. Basal joints of antennæ pale, beyond bright red.

Length of body, ♂, 15.5 mm., of antennæ, 9.5 mm., of pronotum, 4 mm., of tegmina, 11.5 mm., of hind femora, 10.5 mm.

Habitat.—A single male collected during early April at Demerara, British Guiana, by R. J. Crew. (Coll. L. Bruner.)

Genus HISYCHIUS Stål.

Hisychius STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, pp. 44, 89 (1878).

The representatives of the present genus of apterous locusts are confined to tropical America and mostly to the northern half of South America. Three species have thus far been characterized, and now a fourth is added. These may be separated by the annexed synoptical key.

SYNOPSIS OF THE SPECIES OF HISYCHIUS.

- A. Antennæ linear. Fastigium of the vertex declivant.
 - b. Knees of hind femora concolorous. Spines of hind tibiæ entirely black.
 - c. Larger (♀, 45 mm. long). Lower outer carina of discoidal area of hind femora adorned with alternating conspicuous black teeth, or spines. [Peru.] *nigrispinus* Stål.
 - cc. Smaller (♀, 33 mm. long). Lower outer carina of discoidal area adorned with small inconspicuous teeth. [Para, Brazil.] . . . *brasiliensis* sp. nov.

- bb.* Knees of hind femora black. Spines of hind tibiæ testaceous, or yellow at base. [Ecuador.].....*minor* Giglio-Tos.
AA. Antennæ ensiform. Fastigium of the vertex subhorizontal. [Panama.]
festæ Giglio-Tos.

102. ***Hisychius brasiliensis*** sp. nov.

Most closely related to *H. nigrispinus* Stål, from which it may readily be recognized by its much smaller size and the absence of the black patch at the tympanum, and by the less conspicuous alternating teeth on the lower carina bordering the external pagina of the hind femora. General color olivaceous brown. Antennæ infuscated, with orange-yellow tips.

Rather robust, fusiform, strongly, coarsely, and rugosely punctured on head and thorax; on the abdomen less strongly so. Entire insect sparsely hirsute, more abundantly so on the hind tibiæ and tarsi. Head fairly large, about as wide as the front edge of the pronotum, the occiput somewhat punctulate; eyes a little prominent, elliptical, in the female a trifle longer than the anterior edge of the cheeks immediately beneath. Vertex somewhat wider than the diameter of the first antennal joint, widely and profoundly sulcate, the sides being bounded by rather coarse and prominent longitudinal carinæ, which project backwards upon the anterior portion of the occiput as far as does the deflexed fastigium anteriorly, the latter a little wider than long and profoundly sulcate, the sulcation being continuous with that of the upper portion of the frontal costa, the lateral walls very gross and somewhat sinuose; frontal costa fairly prominent above the ocellus and between the antennæ, almost obliterated below; lateral or facial carinæ prominent, quite strongly divergent, and reaching the base of the mandibles upon which they continue as coarse angles. Antennæ filiform, very slender, nearly as long as the hind femora, their immediate two or three apical segments orange-yellow. Pronotum evenly rounded above and free from carinæ, rather strongly divergent posteriorly; hind margin truncate, the front margin gently sinuose; all three transverse sulci prominent, and a fourth near front margin; hind lobe very short, not over one-fourth the length of the pronotum; hind and front margins as well as hind margin of mesothorax studded with fair-sized polished tubercles. Auditory apparatus low down and inconspicuous, almost covered by the base of hind femora. Hind femora robust, a very little surpassing the apex of the abdomen, having all the carinæ

plainly dentate. Outer margin of the hind tibiæ with six spines in addition to the apical spine. Prosternal spine small, slender, conical on a broad heavy base.

Length of body, ♀, 33 mm., of pronotum, 6 mm., of hind femora, 19 mm.

Habitat.—Para, Brazil, a single ♀, where it was taken during the month of April by H. H. Smith. The type is deposited in the Carnegie Museum.

Group LEPTYSMÆ and Allies.

There are in America a number of genera of long-winged, slender, cylindrical locusts, of nearly uniform greenish color, which have the margins of their hind tibiæ developed into more or less acute lamellæ, which aid these semi-aquatic locusts in swimming, when, accidentally or otherwise, they find themselves in water. The following table is an attempt at a preliminary arrangement of the genera.

TABLE FOR SEPARATING THE GENERA OF LEPTYSMÆ AND ALLIES.

- A. Posterior tibiæ slightly expanding apically, the margins acute.
- b. Mesosternal lobes with their inner margins nearly straight and touching for most of their length. Tegmina acuminate.
- c. Fastigium of the vertex as long as, or longer than, the longest diameter of the eyes.
- d. Fastigium of the vertex provided with decided longitudinal grooves or sulci.
- e. The vertex furnished with but a single longitudinal groove.
- f. Form of insect cylindrical, the fastigium with its sides rounded, and the median sulcus of nearly equal width throughout.
Leptysmæ Stål.
- ff. Form of insect more robust, the fastigium with its sides straight, and the median sulcus narrowing rapidly behind.
Columbacris gen. nov.
- ee. The vertex furnished with more than one longitudinal groove.
- f. Vertex with four such grooves.....*Leptysmæ* Giglio-Tos.
- ff. Vertex with many grooves.....*Oxyphyma* Saussure.⁶
- dd. Fastigium of the vertex without definite longitudinal grooves or sulci.....*Cylindroleptix* Bruner.
- cc. Fastigium of the vertex shorter than the longest diameter of the eyes.
Stenacris Walker.

⁶ The genus *Oxyphyma* Saussure (*Rev. Zool.*, XIII, p. 156, 1861) is placed in this group on the authority of W. F. Kirby (*Syn. Cat. Orthopt.*, III, p. 412, 1910). Saussure's description is so meager, however, that its exact location is somewhat problematical. The habitat of Saussure's insect is also doubtful.

- bb.* Mesosternal lobes with their inner margins more or less distant.
- c.* Posterior margin of the pronotum rounded.
- d.* Tubercle of the prosternum transverse, broad, the apex truncate to emarginate. *Oxybleptella* Giglio-Tos.
- dd.* Tubercle of the prosternum conical, more or less acute.
- e.* Body very graceful, or slender. The front strongly oblique. Head much exerted, conical. Antennæ distinctly ensiform. Eyes rather elongate, viewed from above strongly convergent, meeting at an acute angle. Pronotum distinctly dilated posteriorly, the lower edge of sides straight, oblique. Tegmina plainly dilated towards the apex.
Inusia Giglio-Tos.
- ee.* Body more robust. Front less oblique. Head only gently exerted, not conical. Antennæ filiform, or with immediate basal segments alone flattened. Eyes not at all, or but little, elongated, when viewed from above slightly convergent, forming an obtuse angle. Pronotum not, or but little, dilated posteriorly; the lower edge of sides straight on posterior half, emarginate on anterior half. Tegmina narrowed toward the apex.
- f.* Pronotum cylindrical, the dorsum straight viewed laterally, the metazona not elevated. Frontal costa below the ocellus and the lateral carinæ of the face subobsolete. Eyes rather oblique, less prominent.
- g.* Head back of the eyes not narrowing posteriorly; eyes less prominent; antennæ somewhat incrassate, the immediate basal joints flattened; anal field of tegmina pallid. Mesosternal lobes distant. *Stenopola* Stål.
- gg.* Head back of eyes narrowing posteriorly; eyes strongly prominent. Antennæ linear; tegmina ferruginous, the anal field concolorous. Mesosternal lobes less distant.
Oxyblepta Stål.
- ff.* Pronotum gently dilated posteriorly, the dorsum when viewed laterally sinuate, subselliform, the metazona gently elevated, the humeral angles rather distinct. Frontal costa and lateral carinæ of the face distinct. Eyes less oblique and strongly prominent. *Henia* Giglio-Tos.
- cc.* Posterior margin of the pronotum obtusangulate, sometimes truncate, entire, or emarginate at middle.
- d.* Angle of the posterior margin of the pronotum entire, not incised. Tegmina greatly surpassing the hind femora.
- e.* Tegmina with their apices subacuminate. Frontal costa not prominent between the antennæ. Eyes less strongly convergent and not distant from anterior edge of pronotum.
Paracornops Giglio-Tos.
- ee.* Tegmina with their apices distinctly rounded. Frontal costa

prominent between the antennæ. Eyes quite strongly convergent, and sometimes distant from the anterior edge of the pronotum.

f. Frontal costa obliterated on lower half of face. Antennæ more than twice the length of the pronotum. The latter smooth.

Euparnops Scudder.

ff. Frontal costa continued below the middle of the face. Antennæ one-half longer than the head and pronotum combined. The latter gently punctulate. *Cornops* Scudder.

dd. Angle of the posterior margin of pronotum incised or emarginate. Tegmina not surpassing the hind femora.

e. Frontal costa percurrent, sulcate throughout. Fastigium of the vertex subhorizontal.

f. Prosternal tubercle large and broadly transverse, its apex broadly emarginate. Hind margin of pronotum truncate. Tegmina and wings much abbreviated, lateral.

Eumastusia Bruner.

ff. Prosternal tubercle small, pyramidal, acute. Hind margin of pronotum obtusangulate. Tegmina and wings three-fifths the length of abdomen. *Mastusia* Stål.

ee. Frontal costa subobsolete below the ocellus, not sulcate. Fastigium declivant. *Tetratenia* Stål.

AA. Posterior tibiæ not at all, or but little, expanded apically, the margins rounded.

Copiocera Burmeister.

Genus LEPTY SMA Stål.

Leptysma STÅL, Recens. Orthopt., I, pp. 42, 85 (1873).

At least a dozen distinct species of tropical American locusts are referable to the genus *Leptysma* Stål. These insects are subaquatic by nature, hence their haunts along the margins of streams, in swamps, and on low, wet grounds, where rank grass-like vegetation abounds.

Although the present collection contains at least a half dozen distinct forms, half of which are new, the lack of material precludes the attempt to monograph the genus. The species *marginicollis* Serville and *mexicana* Saussure plainly belong to a distinct genus from the remainder of the forms referred here.

103. *Leptysma gracilis* Bruner.

Leptysma gracilis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 658 (1906).

Habitat.—Specimens of this insect are at hand from Chapada, Brazil (H. H. Smith). The type locality is São Paulo, Brazil (Hempel).

This is the next to the smallest of the known species, and, although not fully characterized in the paper cited, is so characteristic that it cannot be mistaken.

104. *Leptyσμα dorsalis* (Burmeister).

Mesops dorsalis BURMEISTER, Handb. Ent., II, p. 610 (1838).

Habitat.—Chapada, Brazil, during the month of May (H. H. Smith).

The present writer considers *dorsalis* distinct from the next species.

105. *Leptyσμα filiformis* (Serville).

Opsomala filiformis SERVILLE, Ins. Orthopt., p. 593 (1839).

Leptyσμα filiformis STÅL, Recens. Orthopt., I, p. 85 (1873).

Habitat.—Specimens, which have been referred here, come from both Benevides and Chapada, Brazil. They were taken during July and August by H. H. Smith.

106. *Leptyσμα obscura* (Thunberg).

Truxalis obscura THUNBERG, Nova Acta Upsal, IX, pp. 77, 79 (1827).

Leptyσμα obscura STÅL, Recens. Orthopt., I, p. 86 (1873).

Habitat.—Chapada, Brazil, during the months of May to October inclusive, an extensive series of both sexes (H. H. Smith).

107. *Leptyσμα intermedia* sp. nov.

Belonging in the first division of the genus, and related to *L. argentina* and *L. gracilis*, but differing from both of them in its larger size and somewhat more robust form. A species with well-marked longitudinal lateral pallid stripes bordered above by piceous. Tegmina and wings comparatively shorter than in the related species.

Head horizontal, the occiput slightly shorter and somewhat narrower than the pronotum; eyes elongate lentiform, plainly longer than the anterior edge of the cheeks below them, separated above by a linear space; fastigium about equal to one of the eyes in length, slightly depressed anteriorly, gently acuminate, the lateral margins gently arcuate and faintly raised, median longitudinal sulcus not profound, becoming more pronounced anteriorly. Front viewed in profile nearly straight and horizontal, the frontal costa of moderate width and sulcate throughout, the lateral walls somewhat approaching and becoming less pronounced just below the ocellus. Antennæ robust, ensiform, about reaching the base of hind femora. Pronotum cylindrical, punctulate throughout, sparsely and faintly on the anterior, and quite closely and more strongly, on the posterior lobe; median carina inconspicuous, but plainly visible throughout, the

transverse sulci plain, the last about one-third of the distance from the hind to the front margins. these latter broadly rounded. Tegmina and wings narrow, their apex acuminate and extending about one-sixth of their length beyond the tip of the abdomen. Hind femora rather slender, about two-thirds the length of the abdomen; hind tibiae quite strongly expanded apically, the external edge provided with nine to eleven spines, somewhat irregularly arranged. Prosteral spine inflated apically, strongly punctulate and hirsute, directed caudad. Last ventral segment elongate, wedge-shaped, its apex entire or without the lateral backwardly directed spines or teeth; supra-anal plate provided with two short parallel black carinae at middle of base and one wart-like projection of the same color, while the hind margin of the preceding segment is also marked with four of these spots.

General color pale grass-green above, the underside more pallid; sides of head, lower edges of sides of pronotum, and middle of pleura conspicuously marked by a rather wide stripe of white, which is bordered above by piceous; eyes testaceo-ferruginous, front and antennae brown with a vinaceous tinge. Dorsum of abdomen tinged with orange-testaceous or ochraceous.

Length of body, ♂, 35 mm., of pronotum, 4.85 mm., of tegmina, 29.5 mm., of hind femora, 13.5 mm., of antennae, 13 mm.

Habitat.—The type bears the label "Uacarizal, Feb." It was taken by H. H. Smith, and is deposited in the Carnegie Museum. Eight other specimens, 7 ♂♂ and 1 ♀ are referred to this species. They were taken at Corumba during the month of March.

108. **Leptysmma uniformis** sp. nov.

Very similar in size and structure to *L. filiformis*, but differing from that insect both in color and some structural features. Quite uniformly grass-green and without the lateral longitudinal pale stripes found in the majority of the species of the genus.

Form slender, cylindrical, the head horizontal, including the fastigium about one and one-half times the length of the pronotum; fastigium moderately large, its sides gently convergent anteriorly, the immediate apex more or less acuminate, its center strongly longitudinally canaliculate; eyes large, but not prominent, in the males a very little exceeding the anterior margin of the cheek in length, in the female about equaling it, separated above by a space

one-half the diameter of the first antennal joint. Antennæ moderately large and heavy, regularly ensiform, the basal half triquetrous, somewhat exceeding the head and pronotum taken together. Frontal costa quite prominent, its sides parallel, sulcate throughout, the ocellus large and situated below the middle. Pronotum cylindrical, closely, regularly, and quite deeply, punctulate, both the anterior and posterior margins broadly rounded, the median carina plainly visible throughout (♀) or interrupted on anterior lobe (♂). Tegmina and wings long, narrow, acuminate, greatly surpassing the apex of both the hind femora and the abdomen. Hind femora slender, their apex extending a trifle beyond the outer margin of the fifth abdominal segment; hind tibiæ slender, but little expanded apically, the outer margin bearing eight to nine spines, which are somewhat irregularly arranged. Subgenital plate, or last ventral segment of male abdomen, somewhat elongate and tapering, the apex emarginate and terminating with short, blunt, lateral teeth; the contorted process above of moderate size, laterally compressed, and provided at apex with a slightly curved finger. Supra-anal plate quadrate on basal half, reduced to one-half the width and spatulate on apical half, slightly sulcate at middle throughout, on the basal half provided with two black longitudinal carinæ and two tubercles of the same color. Prosternal spine strongly hirsute, subcylindrical, quite long, and strongly directed to the rear.

Length of body, ♂, 31 mm., ♀, 42 mm.; of pronotum, ♂, 4 mm., ♀, 5.35 mm.; of tegmina, ♂, 29 mm., ♀, 39 mm.; of hind femora, ♂, 11 mm., ♀, 15 mm.; of antennæ, ♂, 11.5 mm., ♀, 15 mm.

Habitat.—The material comprising this species comes from Chapada, near Cuyaba, Matto Grosso, Brazil. The various specimens were collected by H. H. Smith, during the months of July, August, and September. The types are deposited in the Carnegie Museum.

109. *Leptyσμα grossa* sp. nov.

Quite large (50 mm. in length) and with an unusually large head and wide ensiform antennæ. Tegmina long, narrow, and very acuminate; the hind wings apparently wanting (at least this is true of the single ♀ specimen at hand). Sides of head, lower edges of pronotum and pleura, provided with a rather conspicuous pale band, which extends from the lower anterior edge of each eye to the insertion of the hind femora. Face and pectus somewhat hirsute.

Head large and coarse, nearly twice as long as the pronotum, the front edge of which it slightly exceeds in width; eyes of moderate size, not prominent, separated by a space equal to about one-half the diameter of the basal antennal joint; the fastigium very large and three-fourths the length of the occiput, deeply and broadly sulcate longitudinally at middle, separated from the vertex by a transverse sulcus, and bordered at sides and behind by a prominent rounded carina; lateral ocelli small, wholly within the deflexed area of the fastigium bounded by the lateral carina referred to above. Antennæ large, coarse, somewhat longer than the combined length of the head and pronotum, only the apical joints filiform; inserted considerably in advance of the lateral ocelli. Face nearly straight viewed in profile, the frontal costa quite prominent, of nearly equal width throughout and fairly deeply sulcate in advance of a line drawn between the lower anterior edge of the eyes, below or back of this shallow and fading. Pronotum somewhat widest in front, closely and minutely punctulate, the median carina distinctly visible throughout; anterior and posterior margins of disk rounded, the latter very gently emarginate at middle. Tegmina narrow, a fourth longer than the abdomen, the longitudinal veins fairly prominent, cross-veins faint, wings either very minute or entirely aborted. Anterior and middle legs minute; hind femora slender, reaching to middle of the fifth abdominal segment; hind tibiæ expanding but gently apically, their lateral edges scarcely laminate, nine to eleven spines externally. Valves of the ovipositor short, robust, supplied with strong apical and lateral teeth as well as with a discal row on base of upper pair. Prosternal spine slender, the apical half strongly bent to the rear, its apex rounded; anterior edge of mesosternum quite strongly advanced as a coarse blunt projection towards the middle of the prosternum.

General color pale testaceous. Sides of head, lower edges of pronotum and middle of pleura longitudinally striped with dirty white bordered by dull olivaceous. Antennæ, fastigium, and tegmina above, more or less tinged with rufous. Hind tibiæ tinged with pale glaucous or greenish gray. Pulvilli, tarsi beneath, and tibial spines, more or less piceous.

Length of body, ♀, 50 mm., of antennæ about 20 mm., of head to tip of fastigium, 12.5 mm., of occiput 6 mm., of pronotum, 6.5 mm., of tegmina, 49 mm., of hind femora, 23.5 mm.

Habitat.—The single female at hand, the type, comes from Chapada,

Brazil, and is contained in the Carnegie Museum. It was in all probability taken by H. H. Smith.

Genus COLUMBACRIS gen. nov.

Related to *Leptysmia*, *Stenacris*, *Cylindrotettix*, and *Leptysmia*, but differing from all of these in the form and comparative size of the fastigium of the vertex and the last ventral segment of the male abdomen.

Head large, moderately robust, horizontal, the face very oblique, slightly wider than the anterior edge of the cylindrical pronotum, which it equals in length. Vertex between the eyes about as wide as the greatest width of the antennæ, the fastigium large, a trifle exceeding the eyes in length, mitriform, the disk but gently sulcate on basal half, the front acuminate, the sides gently bowed and carinate. Frontal costa very prominent above, and broadest between the antennæ, profoundly sulcate throughout, continued to the base of the clypeus. Lateral or facial carinæ inconspicuous. Eyes prominent, very strongly oblique, and likewise divergent posteriorly, elongate-elliptical, as long as the anterior edge of the cheeks below them. Lateral ocelli large, situated on the lateral carinæ of the fastigium just opposite the insertion of the basal joint of the antennæ. The latter arising from a rather deep scrobe plainly in advance of the upper anterior extremity of the eyes. Pronotum cylindrical, rather closely and minutely punctate, most closely so on the posterior lobe and near the anterior border; second and third transverse sulci continuous, plain, the first rather faint and present only on the disk; front and hind margins rounded, the posterior about one-half as long as the anterior lobe. Lower lateral edges of pronotum straight on posterior half, oblique on anterior half. Tegmina of medium width, elongate-lanceolate, a little surpassing the apex of the abdomen. Wings long, narrow, apex of anterior field acuminate, the veins heavier and greenish, the radial field vitreous, delicate, and with more or less dusky veins. Hind femora rather robust and elongate for the group, the apex not quite reaching the base of the supra-anal plate; hind tibiæ strongly dilated apically, the margins sharply laminate, seven to eight-spined externally and twelve to thirteen-spined internally. Mesosternal lobes contiguous for about one-half their length. Prosternal spine heavy, enlarged, and bent to the rear on apical half, strongly hirsute. Supra-anal plate rather broad on basal half, with

a wide raised margin, then contracted to a little less than one-half its basal width, and projected between the cerci as a widely hollowed finger as far as the length of the wide basal half. Cerci very broad at base, suddenly contracted from above to about one-fourth the width, directed backward, then suddenly upward and tapering, the apex transverse, acuminate, piceous; the base of supra-anal plate provided with four to six piceous tubercles.

At first glance the representatives of this genus remind one of *Inusia*, but the contiguous mesosternal lobes place it along with the genera referred to above in connection with the comparisons drawn between genera. It does not come very close to *Leptysmia* as will be seen by a comparison of the size and form of the fastigium of the vertex. The same may also be said on comparing it with *Stenacris*. Its ensiform antennæ will readily separate it from the latter genus.

110. *Columbacris caudata* sp. nov.

Uniformly pale grass-green, without traces of paler and darker lateral, longitudinal bands. Its general appearance is that of a slender *Arnilia* (*Stenacris*), but it is quite distinct from the various representatives of that genus, as indicated by the elongate triangular vertex, the very strongly oblique front, the decidedly ensiform antennæ, and the very pointed and slightly downwardly curved last ventral segment of the male abdomen.

Length of body, ♂, 31 mm., of pronotum, 4.6 mm., of tegmina, 25 mm., of hind femora, 13.5 mm., of antennæ, 9.5 mm., or about as long as the combined length of the head and pronotum.

Habitat.—The type, a male, comes from Corumba, Brazil, where it was taken during March by H. H. Smith. It is the property of the Carnegie Museum.

An additional specimen, also a male, without antennæ and hind legs is at hand. It comes from the same locality and bears a like date. This second specimen has a slightly slenderer fastigium of the vertex than the type, but otherwise is practically the same.

Genus LEPTYSMINA Giglio-Tos.

Leptysmia GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 34 (1894).

The present genus is composed of several medium-sized sub-cylindrical locusts, which bear a rather striking resemblance to the species of *Leptysmia*, but which are readily separated from the representatives of that genus by the four-grooved fastigium of the vertex.

111. *Leptysmina rosea* Giglio-Tos?

Leptysmina rosea GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 35 (1894).

Habitat.—Specimens from the Rio Paraguay below Asuncion are referred to this species (H. H. Smith). They differ somewhat from the description given by Giglio-Tos, but not sufficiently to warrant describing them as new. See also note after *L. gracilis*.

112. *Leptysmina gracilis* sp. nov.

Similar to, but decidedly smaller and slenderer than *L. rosea* Giglio-Tos. Sides of head from lower edge of eyes, the lower edges of pronotum and pleura pale-striped, bordered above by piceous, which latter color gradually fades into the testaceo-olivaceous, or testaceo-brunneous, of the upper side.

Head horizontal, a trifle narrower than the front edge of the pronotum, its sides parallel to the eyes; latter fairly prominent, and a trifle longer than the anterior edge of the cheeks, with a metallic lustre, and narrowly banded lengthwise alternately with piceous and testaceous, separated above by a space about one-half (♂) or two-thirds (♀) the diameter of the basal antennal joint; fastigium of the vertex as in *rosea*, but with the longitudinal carinae and sulcations less profound than in that species. Frontal costa of equal width and moderately sulcate throughout, viewed laterally nearly straight. Antennae with the basal segments flattened, subtriquetrous, a little longer than the head and pronotum combined in both sexes. Pronotum closely and rather finely punctulate throughout, the median carina visible, and of equal prominence throughout, the transverse sulci faint, the last one cutting it at about one-third of the length from the hind margin; posterior margin broadly rounded, the anterior edge truncate at middle. Tegmina lanceolate, their apex acuminate, and extending beyond the tip of the abdomen in both sexes. Femora a little robust, the anterior and middle pair short, the posterior ones evenly tapering, reaching to, or just beyond, the apex of the sixth abdominal segment in both sexes. Last ventral segment of male abdomen elongate-acuminate, the sides developed into lobe-like projections, as described in connection with the diagnosis of *L. rosea*. Supra-anal plate very similar to that of the other described species. Prosternal spine variable, but not laterally compressed.

General color above pale testaceo-olivaceous. Sides as described

above. Legs and under side greenish flavous; hind tibiæ amber-yellow, twelve- to fourteen-spined on outer edge.

Length of body, ♂, 28-30 mm., ♀, 37 mm.; of pronotum, ♂, 4.6 mm., ♀, 5.9 mm.; of tegmina, ♂, 23-27 mm., ♀, 32 mm.; of hind femora, ♂, 12-12.5 mm., ♀, 15 mm.

Habitat.—The collection contains three males and one female specimen of this insect, which were collected at Corumba, Brazil, three of them were taken during March and the other during July (H. H. Smith). Type in the Carnegie Museum.

There are two male specimens of another species of the genus at hand which were taken below Asuncion on the Rio Paraguay. I have referred them to *L. rosea* Giglio-Tos with some doubt, as they are perceptibly larger than the measurements given for that species. In structure these latter specimens (♂) are about as robust and nearly as large as the females of *gracilis* just described. They have been temporarily labeled as *Leptysmia tenuipennis* sp. nov.

Genus STENACRIS Walker.

Stenacris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 651 (1870).

Arnilia STÅL, Recens. Orthopt., I, pp. 42, 85 (1873).

This is still another of the genera of the subaquatic locusts belonging to America. The various forms are all tropical, or subtropical, in their distribution. Seven distinct species are credited to South America by Kirby. Only one of these has been recognized among the material at hand.

113. *Stenacris gracilis* (Giglio-Tos).

Arnilia gracilis GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302, p. 30 (1897).

Habitat.—Corumba, Brazil, lowlands, during March and December (H. H. Smith).

Genus OPSOMALA (Serville).

Opshomala SERVILLE, Ann. Sci. Nat., XXII, p. 267 (1831).

Opomala BURMEISTER, Handb. Ent., II, p. 610 (1838).

Opomala AGASSIZ, Nomencl. Zool. Ind. Univ., p. 262 (1846).

Chrostheipus BOLIVAR, Ann. Mus. Genova, XXXIII, p. 137 (1893).

The insects which Kirby separates under the present generic name resemble those belonging to *Stenacris* Walker, but have a less complicated structure of the last ventral segment, or subanal plate, of the male abdomen. They too belong to tropical America, and all but one are confined to the South American continent.

114. *Opsomala viridis* Serville.

Opshomala viridis SERVILLE, Ann. Sci. Nat., XXII, p. 268 (1831).

Opsomala viridis BURMEISTER, Handb. Ent., II, p. 611 (1838).

Arnilia viridis BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 254, 255 (1908).

Habitat.—Specimens, which are referable to this species, come from Rio de Janeiro and Corumba, Brazil, where they were collected during November and March by H. H. Smith.

115. *Opsomala coccineipes* (Bruner).

Arnilia coccineipes BRUNER, Proc. U. S. Nat. Mus., XXX, p. 659 (1906).

Opsomala coccineipes KIRBY, Syn. Cat. Orthopt. Brit. Mus., III, p. 419 (1910).

Habitat.—Corumbá, Brazil, during the months of March to July inclusive (H. H. Smith).

116. *Opsomala stali* sp. nov.

A large and robust insect, most nearly related to *O. coccineipes* Bruner and *O. viridis* Serville, as shown by the synoptic table of the species of this genus, published in the second volume of the Orthoptera of the *Biologia Centrali-Americana*, pp. 254-255, May, 1908.

Size large, the head robust, ascending; occiput about as long as the anterior lobe of the pronotum, gently arcuate; vertex about as wide as the frontal costa at the ocellus, depressed anteriorly and separated from the fastigium by a profound transverse sulcus; the fastigium ascending, triangular, rather large, a trifle broader than long, the lateral margins gently arcuate, the apex very gently acuminate, the disk rugose; lateral ocelli large, situated on the lateral carinæ very near the upper anterior extremity of the eyes. Frontal costa prominent, sulcate throughout, the lateral walls heavy, smooth, meeting above in an acuminate angle, the apex of which just touches the depressed point of the fastigium. Lateral facial carinæ rather strongly divergent in their lower half, where they gradually diminish in prominence. Front shallowly, but coarsely, punctulate. Antennæ coarse, subensiform, the basal joints somewhat depressed or flattened, their inner lower surface quite strongly infuscated. Pronotum cylindrical, rather closely and strongly punctulate, the anterior and posterior margins above rounded; median carina inconspicuous, but visible throughout, cut by all three transverse sulci, by the hind one most profoundly. Tegmina and wings comparatively wide, surpassing the tip of the abdomen fully one-third of an inch (♀), the apex of the former

acuminate. Hind femora rather long, robust; hind tibiae heavy, evenly expanding apically, the edges sharp, ten-spined externally, fourteen-spined internally. Prosternal spine moderately robust, a little compressed laterally, broadly rounded apically and gently directed to the rear.

General color flavo-testaceous tinged with green on head, pronotum, pleura, and tegmina (possibly pale grass-green in life). Sides of head below the eyes, lower edges of pronotum, and lower portion of pleura, marked by a rather wide pallid band bordered above by a faint trace of piceous. Under side and legs bright flavous; the posterior tarsi rufous. Antennal joints on basal two-thirds strongly marked with black internally and below. Wings strongly infuscated.

Length of body, ♀, 44 mm., of pronotum, 6.75 mm., of tegmina, 40 mm., of hind femora, 20.5 mm.

Habitat.—A single female, the type, was taken at Chapada, near Cuyaba, Matto Grosso, Brazil, in June by H. H. Smith. It is deposited in the Carnegie Museum.

On account of the robust structure of the head and thorax of this insect it has a strongly wedge-shaped form when viewed laterally, the abdomen being evenly slenderer from the base to its apex.

117. *Opsomala interior* (Bruner).

Arnilia interior BRUNER, Biol. Cent. Amer. Orthopt., II, p. 254 (1908).

Opsomala interior KIRBY, Syn. Cat. Orthopt., III, p. 419 (1910).

Habitat.—Corumba and Cuyaba, Brazil, on lowlands during March (H. H. Smith).

Genus OXYBLEPTELLA Giglio-Tos.

Oxybleptella GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 33 (1894).

Two representatives of this genus are known. They both belong to the region now under consideration.

118. *Oxybleptella sagitta* Giglio-Tos.

Oxybleptella sagitta GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 33, pl. 1, fig. 7 (1894).

Habitat.—Specimens, taken at Chapada, Brazil, during the months of May, June, and July by H. H. Smith, are referred to this species.

James A. G. Rehn described a second species of the genus from this same locality (*Proc. U. S. Nat. Mus.*, XXXVI, pp. 136-139, figs. 21, 22, 23, 1909). It has not been definitely recognized among the material before me now.

Genus OXYBLEPTA Stål.

Oxyblepta STÅL, Recens. Orthopt., I, p. 84 (1873).

Stenopola STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, p. 39 (1878).

This is still another genus of the subaquatic locusts which is confined to tropical South America. At least five species are known. Two of them are among the material now being studied.

119. *Oxyblepta puncticeps* (Stål).

Opsomala puncticeps STÅL, Eugen. Resa, Orthopt., p. 325 (1860).

Stenopola (Oxyblepta) puncticeps ST L, Recens. Orthopt., I, p. 84 (1873).

(?) *Stenopola puncticeps* GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 31 (1894).

Oxyblepta puncticeps KIRBY, Syn. Cat. Orthopt. Brit. Mus., III, p. 415 (1910).

Habitat.—Corumba, Brazil, during March to July inclusive (H. H. Smith).

120. *Oxyblepta bohlsi* (Giglio-Tos).

Stenopola bohlsii GIGLIO-TOS, Zool. Jahrb. Syst., VIII, p. 813 (1895).

Oxyblepta bohlsii KIRBY, Syn. Cat. Orthopt. Brit. Mus., III, p. 416 (1910).

Habitat.—Corumba and Chapada, Brazil, where they were collected during the months of March to July inclusive by H. H. Smith.

Genus PARACORNOPS Giglio-Tos.

Paracornops GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 31 (1894).

Cornops STÅL (*nec* SCUDDER), Bihang. Svensk. Akad. Handl., V, no. 4, p. 40 (1878).

The representatives of this genus are fairly abundant at suitable locations throughout the tropical parts of Central and South America. Four species have been recognized heretofore and two others are now added.

121. *Paracornops longicorne* sp. nov.

About the size of *P. longipenne* De Geer, but differing from that insect by having a larger head with more prominent eyes and a very slender and short acuminate, instead of a long blunt cylindrical, prosternal spine.

Head moderately large, plainly broader than the anterior margin of the pronotum; the eyes prominent, viewed from above their hind margins forming a little less than a right angle, but greater than in the insect that has been determined and which is referred to in the synoptic key as *longipenne* (*Proc. U. S. Nat. Mus.*, XXX, p. 662, 1906); width of vertex about equal to the diameter of the first antennal joint (σ^7) or fully one and one-half times as great (♀), the fastigium

very gently depressed, about as long as (σ^7) or a little less (φ) than its greatest width, the antero-lateral margins raised, the disk slightly and irregularly rugose, not longitudinally sulcate, but with its anterior portion a little lower than the bounding wall. Frontal costa viewed laterally fairly prominent above, straight, continuous to the clypeus; plain above the antennæ, coarsely punctate and sulcate below. Antennæ filiform, in the female a very little longer than the combined length of the head and pronotum, in the male slightly longer than the hind femora. Front quite profusely and strongly punctulate, the lateral carinæ prominent, divergent, and somewhat bowed below the middle. Pronotum rather strongly punctulate, of about equal width in front and behind, a little contracted laterally at middle, the transverse sulci visible throughout, but not at all prominent, the last one located decidedly back of the middle; median carina slight, but visible throughout; anterior margin broadly and evenly rounded, the hind margin obtusangulate, lower lateral margins strongly sinuate, the posterior angle rounded. Pleura punctulate. Tegmina and wings narrow, the former with about one-fourth (σ^7) or one-sixth (φ) of their length extending beyond the tip of the abdomen, their apex plainly rounded. Hind femora moderately robust, evenly tapering, as long as (φ), or somewhat longer than (σ^7), the abdomen, the genicular lobes acuminate; hind tibiæ gently expanded apically, the lateral edges plainly, but not greatly, lamellate; external row of spines, six, the internal row, nine in number. Interspace between the mesosternal lobes a little wider than long. Prosternal spine small, acuminate, emanating from the rear of a low rapidly narrowing pyramidal base. Male abdomen evenly and rapidly tapering, the last ventral segment abruptly upturned and contracted at sides so as to form a small pyramidal apex; supra-anal plate of peculiar form, the basal half being a very heavily rimmed depressed semi-circle with two short sub-parallel median carinæ and a lateral basal tubercle of black; the apical half a much narrower \supset -shaped projection which is also very strongly rimmed. Cerci of the curved type typical of this group of insects, the apical half slightly transverse and gently spatulate; valves of the ovipositor short and rather strongly margined with teeth, the outer margin of the upper pair provided with four prominent teeth.

Occiput, disk of pronotum, and dorsal edges of the folded tegmina in the male dark olivaceous green, in the female tinged with brown; sides of head back of eyes, upper half of sides of pronotum and upper

portion of meso- and meta-pleura together with the disk and anterior margin of the elytra in the male shining black, becoming paler towards the apex of the latter, in the female piceous, gradually fading into the brownish olive of the dorsum; below this line and in the face bright greenish yellow. Hind tibiæ greenish glaucous, infuscated apically. Hind femora with the knees of male infuscated externally, internally black, in the female ferruginous; base of hind tibiæ marked above with a longitudinal black patch. Antennæ basally testaceous to ferruginous, becoming infuscated on apical half.

Length of body, ♂, 19.75 mm., ♀, 26 mm.; of pronotum, ♂, 3.9 mm., ♀, 4.75 mm.; of tegmina, ♂, 20 mm., ♀, 22 mm.; of hind femora, ♂, 11.75 mm., ♀, 13.5 mm.; of antennæ, ♂, 13 mm., ♀, 8.5 mm.

Habitat.—The types, ♂ and ♀, come from Para, Brazil, where they were collected during the month of June. They are the property of the Carnegie Museum.

122. *Paracornops dorsatum* sp. nov.

Quite similar in color and general appearance to *P. longipenne*, or the insect that has been determined as that species, but smaller and decidedly slenderer. Prosternal spine transverse at base, evenly and quite abruptly tapering to the acuminate apex, which is directed gently towards the front.

Head of moderate size, no wider than the front edge of the pronotum; face and cheeks below the eyes profusely, but not very coarsely, punctulate. Eyes subglobose, not prominent, slightly longer than the anterior edge of the cheeks immediately below them, their hind margins forming nearly a right angle, separated at the vertex by a space slightly greater than the widest portion of the frontal costa; fastigium of the vertex about as long as wide, shallowly sulcate at middle anteriorly, the raised margins meeting in a right angle. Frontal costa not prominent, of nearly equal width throughout, punctulate and shallowly sulcate from between the antennæ almost to the clypeus, where the lateral carinæ become obsolete. Facial carinæ divergent, straight, fairly prominent. Antennæ filiform, a little longer than the head and pronotum combined. Pronotum subcylindrical, rather closely and granularly punctulate, the hind lobe a little expanding, its posterior extremity obtusangulate; median carina visible throughout, severed only by the last transverse sulcus, which is inconspicuous

like the others. Tegmina of moderate width, a little surpassing the tip of the abdomen, their apex rounded. Hind femora normal, their external genicular lobes scarcely acuminate; hind tibiae gently expanded apically, the outer margin six-spined, inner margin nine-spined. Mesosternal lobes separated by a quadrate space decidedly wider than long, about equal to one and one-half times the width of one of the lobes. Valves of the ovipositor strong and longer than usual, the apical hook long and strong; the lateral edges of the basal portion four- or five-toothed, the outer one much the largest.

General color brunneous above, very pale flavous below the dusky lateral lines and on the legs, possibly greenish yellow in life. Genicular region of hind femora and apical portion of hind tibiae infuscated. The dusky bands are dark piceous, almost jet-black next to the pallid lower parts, and gradually fading into the brownish upper parts.

Length of body, ♀, 22 mm., of pronotum, 4 mm., of tegmina, 19.5 mm., of hind femora, 11.75 mm.

Habitat.—The only specimen at hand, the type, was collected by H. H. Smith during November. It comes from Chapada, near Cuyaba, Matto Grosso, Brazil, and is in the collection of the Carnegie Museum.

123. *Paracornops aquaticum* Bruner.

Paracornops aquaticum BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 662, 663 (1906).

Habitat.—Specimens of this insect are at hand which bear the labels, "Corumba, Brazil, lowlands." They were taken during the months of February and March by H. H. Smith.

The type specimen was taken by the writer at San Bernardino, Paraguay, during the month of September.

Genus EUMASTUSIA gen. nov.

Related to *Oxybleptella* GIGLIO-TOS, but differing from that genus chiefly in the emarginate pronotum and the greatly abbreviated tegmina and wings.

124. *Eumastusia koebelei* (Rehn).

Mastusia koebelei REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 142-144, figs., 26, 27 (1909).

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, 1 ♂ and 1 ♀, August and September respectively (H. H. Smith).

Genus MASTUSIA Stål.

Mastusia STÅL, Bihang. Svensk. Vet.-Akad. Handl., V, no. 4, pp. 39, 84 (1878).

The genus *Mastusia* is entirely confined to South America, at least so far as known at present. Two species have been described previously, and now a third is added. The relationship of the present species to the other described forms is shown by the annexed synoptical table.

SYNOPSIS OF THE SPECIES OF MASTUSIA.⁷

A. Size larger (30 mm. or more in length).

b. General color olivaceous. Tegmina abbreviated, not greatly, if any, longer than the pronotum (♀ 32 mm. in length). Peru...*quadrifarinata* Stål.

bb. General color grass-green. Tegmina more elongate, nearly the length of the abdomen (♂ 30 mm. in length). Upper Amazon.

spectabilis Bolivar.

AA. Size smaller (♀ 26 mm.). Tegmina and wings two-thirds the length of the abdomen. Wings blue.....*cæruleipennis* sp. nov.

125. *Mastusia cæruleipennis* sp. nov.

A medium-sized moderately robust species, in which the head is quite noticeably wider than the anterior edge of the pronotum. The tegmina and wings two-thirds the length of the abdomen, the former brown with a narrow pallid longitudinal line along the angle, the latter cærulean. Antennæ with the apical joint pallid.

Head rather large, somewhat obese, rounded on sides and occiput, considerably higher than long; the eyes fairly prominent, elongate oval, somewhat pointed above, a little longer than the anterior edge of the cheeks below them; vertex fairly wide, of the same width as the frontal costa between the antennæ, and provided with a deep coarse pit, which separates it from the fastigium; the latter short, fully twice as wide as long, its surface back of the lateral and anterior margin gently depressed; lateral ocelli large, ferruginous, located on a small deflexed triangular area just in advance of the upper portion of the eyes. Face somewhat oblique, viewed in profile straight; the frontal costa prominent, widely sulcate throughout, continued to the clypeus; lateral or facial carinæ prominent, divergent below, and reaching from the posterior extremity of the fastigium to the base of the mandible. Antennæ filiform, about as long as the head and

⁷ The *Mastusia koebelei* Rehn belongs to a new genus (*Eumastusia*) more closely related to *Oxybleptella* Giglio-Tos than to *Mastusia*, as will be recognized by the widely transverse prosternal spine and other characters. It may be considered as the type of that genus.

pronotum combined, the basal joint quite large, nearly as great in diameter as the width of the vertex between the top extremity of the eyes, twenty-one-jointed. Pronotum cylindrical, quite strongly punctulate, most closely so on the hind lobe, on the upper field of the lateral lobes provided with two rather large quadrate glabrous patches; anterior and posterior margins of disk broadly rounded, the middle of hind edge a little emarginate; the three transverse sulci continuous, the posterior one most profound, the hind lobe slightly less than one-half the length of the front lobe. Tegmina and wings somewhat shorter than the abdomen, reaching to the posterior extremity of the sixth abdominal segment, the apex of the former rounded. Hind femora quite large and robust, somewhat passing the tip of the abdomen; the hind tibiae quite conspicuously expanded apically, their lateral edges strongly acute, seven-spined externally, ten-spined internally. Prosternal spine slender, erect, the apex acuminate and directed very gently to the front. Mesosternal lobes not touching on their inner edges, the space about half as wide as long. Valves of the ovipositor moderately long, the upper pair straight, robust, but little tapering, the apex obliquely docked, the outer margin finely serrate; lower pair slenderer, the outer third tapering and gently hooked, the outer margin also more or less closely serrate. Under-side of apical segments and valves of ovipositor strongly hirsute.

General color above brunneo-testaceous, the sides back of eyes piceous; below testaceous or flavous; hind femora olivaceous, above and externally, inside and below pale flavous; hind tibiae pale glaucous, the apical half of spines black; the tarsi infuscated. Antennae greenish at base, becoming strongly infuscated on apical half, the extreme apex dirty white.

Length of body, ♀, 26 mm., of pronotum, 5 mm., of tegmina, 13 mm., of hind femora, 15.5 mm.

Habitat.—Benevides, Brazil, H. H. Smith collector. The type is in the collection of the Carnegie Museum.

CHLOROHIPPUS gen. nov.

Related to both *Chrostheipus* Brunner v. Wattenwyl and *Copiocera* Burmeister, but differing from both of these genera as well as from *Epiprora* Gerstaecker in a number of respects. General form moderately robust, subcylindrical, the head, pronotum, and pleura densely and strongly punctulate, the former less densely so on occiput; anterior

and middle legs slender, short; hind legs robust and also rather short. Tegmina and wings considerably surpassing the apex of the abdomen, the former of nearly equal width on basal two-thirds or three-fourths, their apex acuminate.

Head large, robust, horizontal, somewhat broader than the front edge of the pronotum, the occiput nearly or quite as long as the pronotum, viewed laterally very gently arched; vertex horizontal, acuminate, a little longer than wide, the sides straight, somewhat laminate. Eyes small, not prominent, elongate pyriform, rather widely separated above. Frontal costa prominent between the antennæ, which are located opposite the upper third of the eyes, deeply sulcate, suddenly constricted and lowered and again widening in advance of the large ocellus, below this evanescent. Lateral or facial carinæ prominent, smooth, extending from near the outer edge of the antennal pits to the base of the mandibles where they unite with a transverse ridge which borders the lower face and forms a walled area of the front. Antennæ moderately robust, the basal joints depressed, giving to these members a subsensiform appearance. Pronotum of moderate length, gently divergent behind, all three transverse sulci continuous, more or less sinuose and severing the inconspicuous median carina, the posterior lobe a trifle shorter than the anterior lobe; anterior margin very broadly rounded, the hind margin subangulate; lower lateral edges gently sinuose, the posterior angle a right-angle, the immediate apex rounded. Tegmina slightly coriaceous, moderately long, the apical third or fourth tapering, the apex bluntly acuminate; wings transparent, delicate, a trifle more than twice as long as broad. Hind femora moderately robust, evenly tapering, two-thirds the length of the abdomen; tibiæ also robust, considerably shorter than the femora, seven- or eight-spined externally, nine-spined internally. Abdomen moderately large, tapering but little before the extreme apex; the valves of the ovipositor and cerci all finger-like, hairy, the latter unarmed with teeth or hardened apex for digging. Prosternal spine transverse, the apex entire; mesosternal lobes subangulate within, the interspace at middle about one-third of the width of one of the lobes.

126. *Chlorohippus roseipennis* sp. nov.

General color pale grass-green above. Anterior and lower edges of cheeks, lateral carinæ of face, lower margins of sides of pronotum

and lower portion of pleura, anterior and middle legs, lower half of hind femora, and venter flavous. Antennæ pallid on basal half above, black beneath and infuscated on apical half above. Lunules of hind femora ferruginous. Hind tibiæ oil-green, the spines black. Wings clear transparent rose-color on base, becoming very delicate carulean on apical third, the veins concolorous. In one specimen the wing is tinged with very delicate gray-blue and has a rather large faint patch of smoky brown on the radial field towards the posterior border, and the basal nervures are delicate lavender. Eyes castaneous.

Length of body, ♀, 44 mm., of head 7.75 mm., of pronotum 6.75 mm., of tegmina, 37 mm., of hind femora, 16.5 mm., of hind tibiæ, 13 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, July and August (H. H. Smith). The type is deposited in the Carnegie Museum.

Genus COPIOCERA Burmeister.

Copiocera BURMEISTER, Handb. Ent., II, pp. 602, 611 (1838).

Glaphyracris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 653 (1870).

The representatives of the genus *Copiocera* are all confined to tropical America, where they occur in damp localities in and about forests from Nicaragua to southern Brazil. Most of the species are dark-colored, varied on the abdomen with red or orange markings.

127. *Copiocera austera* Gerstæcker.

Copiocera austera GERSTÆCKER, Mitth. Ver. Neu-Vorpomm., XX, p. 36 (1889).

Habitat.—The specimens at hand are labeled "Rio de Janeiro," where they were taken in November by H. H. Smith.

Genus CHROSTHEIPUS Brunner v. Wattenwyl.

Chrostheipus BRUNNER v. WATTENWYL, Ann. Mus. Civ. Genov., Ser. 2, XIII, p. 137 (1893) footnote.

This genus was undoubtedly established especially for the reception of Serville's *Opsomala varipes* which certainly does not belong in the same genus along with *O. viridis*, *coccineipes*, *interior*, etc. It should not be included as a synonym of *Opsomala*.

128. *Chrostheipus varipes* (Serville).

Opsomala varipes SERVILLE, Ins. Orthopt., p. 584 (1839).

Habitat.—A single female specimen of this insect is at hand from Rio de Janeiro, where it was taken in December by H. H. Smith.

The relationship of this insect is much closer to *Copiocera* than to any of the insects which possess hind tibiae with lamellate margins. Its build is very robust and the prosternal tubercle is large, heavy, and transverse, and has its apex emarginate; the antennae are pale-tipped, while the hind tibiae have the series of spines on the external margin interrupted as in *Copiocera*. The description as given by Serville (*l. c.*) agrees with this insect in every respect except size, which is a little greater than that given, as will be seen by the following measurements:

Length of body, ♀, 69 mm., of head 11 mm., of pronotum, 9.25 mm., of tegmina, 35 mm., of hind femora, 24 mm., of hind tibiae, 18 mm.

Serville's citation of "Amerique septentrionale" as the habitat is certainly an error, since no record has since been made of a capture of a specimen of the species in that country, or for that matter, in any other country.

Genus EPISCOPOTETTIX Rehn.

Episcopotettix REHN, Trans. Amer. Ent. Soc., XXIX, p. 13 (1902).

129. *Episcopotettix sulcirostris* Rehn.

Episcopotettix sulcirostris REHN, Trans. Amer. Ent. Soc., XXIX, p. 13 (1902).

Habitat.—The type of this species, a male, according to its author, bore the label, "Forest of San Juan, Mexico." Unfortunately the female specimen now at hand is without a label of any kind.

Genus HOMALOSAPARUS Rehn.

Homalosaparus REHN, Proc. Acad. Nat. Sci. Philad., LX, p. 17 (1908).

The present genus was erected for the reception of a locust allied to *Abila* and *Phaeorparia*. Since that date a second species of the genus has been added. These insects are ferruginous in color with roseate hind wings. They are confined to southern Brazil and Paraguayan territory, so far as known at present.

130. *Homalosaparus canonicus* Rehn.

Homalosaparus canonicus REHN, Proc. Acad. Nat. Sci. Philad., LX, pp. 17-20, figs. 2, 3 (1908).

Habitat.—São Paulo, Brazil (A. Hempel). Not represented in the Carnegie material at hand.

131. *Homalosaparus sordidatus* Rehn.

Homalosaparus sordidatus REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 155-157, figs. 36, 37 (1909).

Habitat.—Corumba and Chapada, near Cuyaba, Matto Grosso, Brazil, May to August, many specimens of both sexes (H. H. Smith).

Genus BUCEPHALACRIS Giglio-Tos.

Bucephalacris GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 30 (1894).

The insects, which comprise the present genus, thus far have been found over only a comparatively limited area in Bolivia, northern Argentina, Paraguay, and Brazil. Two species have been described heretofore, and now two others are added, although one of these latter is far from being typical of the genus. All of the species, except the type, are based on single individuals. Judging from the structure of the hind tarsi and what is known of the habits of related forms, it is surmised that these locusts are arboreal in habit and possibly also rather rare. It would be interesting to know something more concerning the structure of the male genitalia, as well as the comparative size of the sexes, in the different species. They may be separated as follows:

SYNOPSIS OF THE SPECIES OF BUCEPHALACRIS.

- A. Form rather graceful, cylindrical, or subcylindrical. Tegmina and wings a little shorter than the abdomen; the former with comparatively few veins. Hind tibiæ glaucous.
 - b. General color olivaceous, the tegmina tinged with rose or vinaceous. Size smaller (♀, 23-25 mm.).
 - c. Head large and decidedly wider than the front edge of the pronotum.
 - borellii* Giglio-Tos.
 - cc. Head smaller, but little wider than the front edge of the pronotum.
 - fuscipennis* sp. nov.
 - bb. General color dull grayish brown, the tegmina not tinted with rose or vinaceous. Size larger (♀, 30 mm.). Hind femora provided with three fuscous bands, inner face and lower sulcus blood-red.
 - paraguayensis* Bruner.
- AA. Form rather robust. Tegmina and wings considerably shorter than the abdomen; the former rather closely veined. Hind tibiæ coral-red. Upper lateral edges of pronotum dusky-banded. . . . *corallipes* sp. nov.

132. *Bucephalacris fuscipennis* sp. nov.

General form slender, subcylindrical, reminding a little of the representatives of the genus *Coscineuta*, but certainly nearer to *Bucepha-*

lacris in many of its characters. General color olive-green, the tegmina with a strong tinge of vinaceous. Wings heavily infuscated.

Head of moderate size, scarcely wider than the front edge of the pronotum, rather evenly and finely punctulate; eyes large, prominent, fully a third longer than the anterior edge of the cheeks below them, the vertex not quite as wide as the diameter of the first antennal joint; fastigium about as long as broad, very gently depressed, its disk rather strongly rugose-punctulate, and with the anterior border truncate and strongly transversely carinate. Frontal costa prominent, plane, and with parallel sides above the ocellus, weak, much narrower and sulcate below. Antennæ filiform, slender, about one-fourth longer than the head and pronotum combined, the basal joint unusually long. Lateral or facial carinæ moderately prominent, divergent, reaching the clypeus. Pronotum subcylindrical, the hind lobe somewhat expanding, rather finely and closely punctulate, the anterior edge heavily bordered, a little advanced upon the occiput, with the middle gently and widely emarginate; posterior margin of disk evenly rounded, the transverse sulci continuous, the median carina faintly present on hind lobe only. Pleura finely punctulate. Tegmina rather narrow, a little tapering, their apex rounded, not quite reaching the tip of the abdomen. Hind femora rather robust, evenly tapering, the pinnæ of outer disk regular, as long as the abdomen. Hind tibiæ hirsute, robust, seven-spined externally and eight-spined internally; first and second tarsal joints about equal in length, the third joint almost as long as the first and second combined. Prosternal spine broadly pyramidal, its apex blunt, slightly hirsute; mesosternal lobes separated by a space considerably wider than long, the inner edge of the lobes widely and obliquely rounded caudad. Valves of the ovipositor normal.

General color dark brunnec-olivaceous, the pleura marked with blotches of dirty yellow. Eyes dark brown. Tegmina tinted with vinaceous on basal half of costal field and towards the apex discally. Genicular portion of hind femora infuscated, the lunules ferruginous; hind tibiæ glaucous. Antennæ with the basal joint olivaceous, remainder black. Wings strongly infuscated.

Length of body, ♀, 23 mm., of pronotum, 4.3 mm., of tegmina, 14.5 mm., of hind femora, 12.5 mm.

Habitat.—The type, the only specimen examined, was collected at

Benevides, Brazil, where it was taken by H. H. Smith during the month of July. It is in the Carnegie Museum.

133. *Bucephalacris corallipes* sp. nov.

The present species is characterized by the red hind tibiae, the banded pronotum, and the comparatively short tegmina and wings. In size it approaches *B. paraguayensis* most closely.

Head large, about as wide as high, slightly exceeding the anterior edge of the pronotum in width. Eyes large and prominent, strongly divergent, in length nearly double the anterior edge of the cheeks immediately below them. Vertex rather narrow, about the same width as that of the diameter of the first antennal joint; fastigium provided anteriorly with a longitudinal median carina, depressed, a little shorter than wide, the anterior edge truncate, and furnished with a rather prominent transverse carina which separates the disk from the frontal costa. Latter moderately prominent and with parallel sides between the antennae, in nowise sulcate, but furnished with a few punctures, at the ocellus suddenly both narrower and much lower, slightly sulcate, and becoming nearly obsolete. Facial carinae divergent, not prominent, but continuous to the outer base of the clypeus. Front alone strongly punctured, the cheeks and occiput comparatively smooth. Pronotum closely, and fairly coarsely, punctulate, a little longer than wide, the hind lobe with its sides divergent caudad; anterior margin a little advanced upon the occiput, its center very gently emarginate; the posterior margin very broadly subangulate; the median carina slight, most apparent on the hind lobe; the transverse sulci slight, continuous, the posterior one most profound. Pleura quite profusely, and the meso- and meta-sternum sparsely, punctulate. Tegmina and wings abbreviated, a little more than one-half the length of the abdomen, the former rather profusely veined on basal two-thirds, comparatively narrow, somewhat tapering. Wings with the apex nearly squarely docked, scarcely longer than broad, smoky hyaline, the veins infuscated. Hind femora rather slender, not reaching the tip of the abdomen; the tibiae and tarsi hirsute, the former six-spined externally and eight-spined internally, the latter with the first and second joints about equal in length. Prosternal spine short, robust, pyramidal, the apex blunt; mesosternal interval subquadrate, a little wider than long. Valves of ovipositor normal.

General color dark olive-green, the disk of pronotum bordered on either side by a moderately prominent, but not wide, piceous band, which reaches from the anterior to posterior margins. Legs greenish olive, the inner side and lower sulcus of hind femora flavous, the genicular region somewhat tinged with ferruginous; hind tibiæ and tarsi coral-red.

Length of body, ♀, 28.5 mm., of pronotum, 4.5 mm., of tegmina, approximately 12 mm., of hind femora, 13 mm.

Habitat.—Corumba, Brazil, April. The type is in the Carnegie Museum.

Genus *ZOSPERAMERUS* Bruner.

Zosperamerus BRUNER, Biol. Cent. Amer. Orthopt., II, pp. 214, 274 (1907-8).

This is a genus composed of medium-sized tropical locusts, which, so far as at present known, are confined to Central America and the northern parts of South America. These insects are characterized by their excessively long and slender hind tarsi, the colored base and infuscated apical half of the wings and by the very slender filiform antennæ. Three species have been described in the past and a fourth is now added. These four species may be separated by the following key:

SYNOPSIS OF THE SPECIES OF *ZOSPERAMERUS*.

- A. Size smaller (♀, 22 mm., ♂, 17 mm.). General color greenish olive to dark brunneo-cinereous, varied with bands and mottlings of dirty white or testaceous.
 - b. The femora of all the legs conspicuously banded with pallid and fuscous. [Nicaragua, Central America.].....*zonatipes* Bruner.
 - bb. Femora less conspicuously banded.
 - c. Face, cheeks, lateral lobes of pronotum, pleura, and hind femora conspicuously marked with dirty white patches. [Peru, S. America.]
albopictus Bruner.
 - cc. Face, cheeks, lateral lobes of pronotum, pleura, and hind femora very obscurely marked with testaceous. [Para, Brazil.]
brasiliensis sp. nov.
- AA. Size larger (♀, (?), ♂, 27 mm.). General color luteous, varied with red and black. [Para, Brazil.].....*marginalis* Walker.

134. *Zosperamerus brasiliensis* sp. nov.

As indicated by the above synoptic table the present species is rather closely related to both *zonatipes* and *albopictus*. From the former it differs by the less conspicuously banded femora and from the latter by its more obscure and even color.

General form slender, the tegmina and wings somewhat abbreviated, not quite reaching the middle of the genicular area of the hind femora, the former rather narrow and gently tapering apically, the apex rounded. Head rather large, broad, and not especially high, very perceptibly wider than the anterior margin of the pronotum; eyes very large and prominent, considerably longer than the anterior margin of the cheeks below them, separated above by the narrow vertex, which is no wider than the diameter of the basal antennal joint; fastigium of the vertex horizontal, slightly transverse, with its anterior margin provided with a raised border, which separates it from the upper extremity of the very wide frontal costa; this latter fully three times the width of the vertex between the eyes, plane, save for a few coarse punctures and a very gentle sulcation just above the ocellus, the sides parallel to the ocellus, where they suddenly approach and continue down the face, giving off laterally a short spur midway between the point of narrowing and the clypeus and producing a cross-like effect in the face. Lateral or facial carinae very gently bowed outward, their upper and lower extremities about equidistant. Front rather strongly and profusely punctulate, viewed in profile straight and only gently oblique. Antennae with the basal joint rather large, the remaining joints very slender, about one-third longer than the combined length of the head and pronotum. The latter rather strongly and closely punctured, selliform, the median carina weak, apparent only on the hind lobe, all three of the transverse sulci continuous, the last most profound, situated very slightly back of the middle; anterior margin very gently and roundly emarginate at middle, the hind edge evenly rounded. Hind femora somewhat robust, evenly tapering towards the apex, the pinnæ of outer face quite regular, the genicular lobes acuminate. Hind tibiae plainly shorter than the femora, a little expanded at apex, the external row of spines composed of seven in number; hind tarsi remarkably long and slender, the second joint cylindrical, slightly longer than either the first or third. Mesosternal lobes separated by a space about equal in width to the lobes themselves, the latter with their inner edge rounded. Prosternal spine robust, slightly transverse, the apex widely rounded.

General color dull brunneo-cinereous with an olivaceous tinge, varied on front, occiput, cheeks, pronotum, and legs by markings of dull testaceous. Legs dimly fasciate; hind tibiae cinereo-plumbeous, the hind tarsi carmine, striped longitudinally with black on the first

and second joints. Eyes castaneous, the antennæ pallid at base, infuscated beyond.

Length of body, ♀, 22 mm., of pronotum, 3.35 mm., of tegmina, 12.5 mm., of hind femora, 11.5 mm.

Habitat.—Para, Brazil (H. H. Smith). Type in Carnegie Museum.

Genus ABILA Stål.

Abila STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, pp. 21, 56 (1878).

135. *Abila smaragdipes* sp. nov.

Size medium, the form somewhat slender. General color above brunneo-ferruginous, face and lower half of sides of pronotum pallid, the underside testaceous; wings transparent smoky orange-red. Legs oil-green, the tarsi and genicular area of hind pair ferruginous. Antennæ linear, black.

Head large and prominent, plainly wider than, and considerably ascending above the dorsum of the pronotum, occiput transversely rugose; eyes prominent, nearly twice as long as the cheeks below them. Vertex about twice the width of the basal antennal joint, separated from the fastigium by a transverse depression and an inconspicuous elevation, the fastigium short, shallowly sulcate, and strongly depressed, the sulcation almost confluent with the shallowly sulcate frontal costa. Latter continued to the base of the clypeus and with its sides but slightly divergent anteriorly; lateral or facial carinæ fairly prominent, rather strongly divergent below. Antennæ linear, longer than the head and pronotum combined. Pronotum rather closely punctulate and irregularly rugulose anteriorly and posteriorly, subcylindrical, gently and roundly constricted at middle, without lateral carinæ, the median weak; the transverse sulci inconspicuous, but the last and middle ones continuous nearly to the lower margins of the lateral lobes; anterior margin a little sinuose, hind margin rounded. Tegmina of moderate width, extending beyond the abdomen and apex of femora in both sexes, their basal portion more or less coriaceous and very closely and irregularly veined, beyond submembranous and less closely veined, the apex obliquely truncated. Hind femora long and slender, considerably surpassing the tip of the abdomen in both sexes, the genicular lobes acuminate, superior carinæ somewhat serrated and terminating in a minute spine. Hind tibiæ a little enlarged apically, nine-spined externally, and ten-spined internally.

Externally the apical spine is present and almost as prominent as the others. The spines on the inner margin are heavier, longer, and somewhat curved, as compared with the outer ones. Last ventral segment of male abdomen gently upturned, long, slender, and acuminate. Cerci slender, acuminate, hirsute. Prosternal spine moderately slender, long, acuminate, the apex directed gently to the front. Interspace between the mesosternal lobes elongate, narrower than the lobes themselves, the inner margins of which are evenly rounded.

General color as described above. Tegmina brownish ferruginous, the dorsal margin a little paler, quite evenly, but faintly, conspersed with fuscous blotches. Occiput, and posterior portion of cheeks, together with the upper half of sides of pronotum and upper edges of pleura, brown. Eyes dark castaneous. Tibial spines and the spiracles black.

Length of body, ♂, 27 mm., ♀, 38 mm.; of pronotum, ♂, 4.1 mm., ♀, 6.5 mm.; of tegmina, ♂, 23 mm., ♀, 33.5 mm.; of hind femora, ♂, 16 mm., ♀, 23 mm.

Habitat.—The collection contains three males, which were taken at Para, Brazil, in July, and a single female labeled "Santarem" (H. H. Smith). The types are in the collection of the Carnegie Museum.

Genus ADELOTETTIX Bruner.

Adelotettix BRUNER, Tiré Horæ Soc. Ent. Russicæ, XXXIX, p. 476 (1910).

The present genus is composed of several rather dull-colored locusts of moderately large size. They seem to be confined to middle America, representatives occurring from Yucatan to Peru and Brazil. Judging from their general dull brownish color these insects live in the tropical forests among fallen leaves, or upon the shaded trunks of trees. Only females have thus far been examined by me. The species *collaris* may be taken as the type of the genus. The following table will assist in separating the known forms:

SYNOPSIS OF THE SPECIES OF ADELOTETTIX.

- A. Tegmina rather sparsely veined, especially apically.
 - b. Hind tibiæ brunneo-testaceous, nine-spined on both edges. Pronotum collared with black. [Yucatan.].....*collaris* Bruner.
 - bb. Hind tibiæ with apical half deeply red, seven- to eight-spined. Pronotum not collared with black. [Peru.].....*obscurus* Bruner.
- AA. Tegmina profusely veined even on apical half. Hind tibiæ vinaceous red, seven-spined externally. [Para, Brazil.].....*brunneus* sp. nov.

136. *Adelotettix brunneus* sp. nov.

Somewhat similar to both *A. collaris* and *A. obscurus*, but differing from both of them in its smaller size and more profusely veined tegmina.

Head very little, if any, wider than the front edge of the pronotum. The eyes large and prominent, about one-fourth longer than the anterior edge of the cheeks, separated above by a space equal to the diameter of the basal antennal joint; fastigium a very little depressed anteriorly, a trifle longer than wide; occiput and vertex smooth; frontal costa about as described for the other species; face, anterior and lower edges of cheeks, pronotum, and pleura profusely, and somewhat finely, punctulate. Tegmina quite profusely veined, of moderate width, and exceeding the length of the abdomen by about as much as their width, the apex broadly rounded. Hind femora robust, of moderate length, the genicular lobes angulate, the angle slightly less than a right angle. Hind tibiæ slenderer than in the other described species, eight-spined internally, seven-spined externally, the apical one wanting. Prosternal spine short, robust, slightly transverse, the apex broadly rounded; mesosternal lobes slightly wider than the interspace between them.

General color testaceo-brunneous, the hind femora a little paler. Tegmina brown with testaceous veins. Lunules of hind femora and base of tibiæ piceous; tibiæ and tarsi of hind legs vinous red. Antennæ black with two basal joints brunneo-testaceous and the apical three orange.

Length of body, ♀, 38.5 mm., of pronotum, 7 mm., of tegmina, 32 mm., of hind femora, 16 mm.

Habitat.—The single specimen at hand, the type, comes from Para, Brazil, where it was taken by H. H. Smith in May. It is in the Carnegie Museum.

Genus ADIMANTUS Stål.

Adimantus STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, p. 38 (1878).

A very characteristic tropical American locustid genus, to which at least three recognized forms belong.

137. *Adimantus vitticeps* (Blanchard).

Acridium vitticeps BLANCHARD, in D'Orbigny, Voy. Amer. Mérid. Ins., p. 216, pl. 27, fig. 4 (1846).

Adimantus vitticeps BRUNER, Proc. U. S. Nat. Mus., XXX, p. 666 (1906).

Habitat.—Corumba, Brazil (H. H. Smith).

Genus ZYGCLISTRON Rehn.

Zygoclistron REHN, Ent. News, XVI, p. 39 (1905).

The present genus is composed of medium- or slightly above medium-sized insects of modest coloration, which evidently live upon or near the ground in or at the edges of forests. Two species have been described in the past, and now a third is added. These insects are found in southern Brazil and Paraguay. They may be separated by the subjoined table.

SYNOPSIS OF THE SPECIES OF ZYGCLISTRON.

- A. Tegmina of females, at least, much shorter than the abdomen. Pronotum strongly rugose..... *trachystictum* Rehn.
 AA. Tegmina of females fully developed, as long as, or longer than, the abdomen. Pronotum less strongly rugose.
 b. Smaller (♀ 43 mm.). General color testaceo-ferruginous, not tinged with green or greenish, nor plainly banded with flavous... *modestum* sp. nov.
 bb. Larger (♀, 54 mm.). General color chrome-green, bay, and saffron; head, pronotum, and pleura conspicuously banded with flavous.
superbum Rehn.

138. *Zygoclistron modestum* sp. nov.

As indicated by the preceding synoptic table, the present species is readily separable from both of the other known species by its plain and nearly uniform color; from *trachystictum* by the fully developed tegmina and wings and the smoother pronotum; and from *superbum* by its smaller size and the absence of flavous bands. In general form and appearance similar to the figure of the latter (*Proc. Acad. Nat. Sci. Philad.*, 1907, p. 182, fig. 12).

Size medium; head of moderate size, the occiput short, gently bullate; vertex between the upper extremity of the eyes a little wider than the shortest diameter of one of them, the fastigium separated from the rest of the vertex by a plainly depressed transverse line, its posterior width nearly twice that of its length, the antero-lateral edges slightly elevated, meeting at an obtuse angle, the middle widely and shallowly sulcate. Frontal costa fairly prominent, its upper end very narrow, the sides strong and evenly divergent below, continuous to the clypeus, deeply and widely sulcate throughout; lateral or facial carinæ also prominent, rather strongly divergent below. Eyes elongate, subpyriform, a little longer than the anterior edge of the cheeks below them. Antennæ moderately robust, about as long as the head and pronotum combined. The latter subcristate, transversely rugoso-

punctulate, much more closely so on the posterior lobe, the sides parallel; median carina prominent, profoundly severed by all three of the transverse sulci, the intervening sections roundly lobate; both the anterior and posterior margins obtusangulate. Pleura also quite strongly and coarsely punctulate. Tegmina complete, fully as long as the abdomen, the venation quite prominent; anterior margin gently lobate on basal fourth. Hind femora slender, the superior carina gently serrate; the tibiæ normal, eight-spined externally. Valves of the ovipositor slender, moderately curved. Interspace between the mesosternal lobes narrow, more than twice as long as broad, the inner edges of the lobes themselves evenly rounded. Prosternal spine fairly prominent, the apical third compressed from the sides, its anterior margin directed cephalad into a dull finger-like lobe.

General color as described above. Wings orange-vermilion basally, becoming smoky apically, the extreme apex slightly paler. Spines on inner side of hind tibiæ somewhat longer than those on outside, their external edge infuscated to base, the inner basal portion pallid, with the apex black.

Length of body, ♀, 43 mm., of pronotum, 9 mm., of tegmina, 34 mm., of hind femora, 18.5 mm.

Habitat.—The collection contains three female specimens of the species, all of which were taken at Chapada, near Cuyaba, Matto Grosso, Brazil, one of them in the month of July and the others during August. The type is the property of the Carnegie Museum.

Genus ALEUAS Stål.

Aleuas STÅL, Bihang. Svensk. Akad. Handl., V, no. 4, pp. 25, 69 (1878).

The several species comprising the present genus belong to southern Brazil, Paraguay, Uruguay, and Argentina. At least five forms are known, four of them having been previously described, while the fifth is now added. They must be separated as follows:

SYNOPSIS OF THE SPECIES OF ALEUAS.

- A. Hind tibiæ armed externally with six or seven spines. Wings either fully developed or more or less abbreviated. Pronotum strongly rugosopunctate.
- b. Tibiæ normally with but six spines on the outer margin.
 - c. Tegmina slightly surpassing the apices of the hind femora. *vitticollis* Stål.
 - tc. Tegmina much abbreviated, less than half as long as the abdomen. *brachypterus* Bruner.

bb. Tibiæ with seven spines on the outer margin.

c. Tegmina and wings abbreviated, one-half the length of abdomen or less.
curtipennis sp. nov.

cc. Tegmina and wings surpassing the tip of the abdomen... *gracilis* Stål.

AA. Hind tibiæ armed externally with eight or nine spines. Wings always full developed. Pronotum not rugose-punctate..... *lineatus* Stål.

139. *Aleuas vitticollis* Stål.

Aleuas vitticollis STÅL, Syst. Acrid., p. 69 (1878).

Habitat.—Corumba, Brazil, in April (H. H. Smith). Also found in Paraguay and southward.

140. *Aleuas gracilis* Stål?

Aleuas gracilis STÅL, Syst. Acrid., p. 70 (1878).

Habitat.—A single specimen, also from Corumba, is referred to this species with doubt. It was collected during the month of March by H. H. Smith.

141. *Aleuas curtipennis* sp. nov.

A medium-sized brachypterous species, in which the hind femora are more or less strongly infuscated on the lower sulcus and internally, and the hind tibiæ are coralline.

Head large, about as wide (♂) or a little wider than the anterior edge of the pronotum (♀), the occiput gently arcuate, about one-half the length of the pronotum; eyes elongate, moderately prominent, their anterior edge nearly straight, a little longer than the anterior edge of the cheeks below them, separated above by a space equal to the shortest diameter of one of them in the female, and by two-thirds such diameter in the male. Fastigium gently depressed, somewhat sulcate in both sexes. Frontal costa prominent, acuminate above, the lateral walls sharp, in the female parallel from the antennæ to clypeus, in male slightly contracted just below the ocellus, in both sexes sulcate; facial carinæ also prominent, divergent. Face feebly and sparsely punctulate, viewed in profile gently arcuate, somewhat oblique. Antennæ filiform, slender, annulate, in the male as long as the head and pronotum combined, in the female somewhat less. Pronotum with the sides parallel, strongly rugoso-punctate, much more closely so on the posterior lobe; the dorsum viewed laterally gently arcuate, the median carina prominent, severed behind the middle by the last transverse sulcus, the posterior margin broadly angulate. Tegmina smooth, abbreviated, elongate elliptical, in the female

nearly reaching the tip of the third and in the male that of the fourth abdominal segment, their apex rounded, the veining peculiar and profuse, giving to these organs the appearance of being closely and regularly punctulate. All the legs short and heavy. Posterior femora not reaching the tip of the abdomen in either sex. Abdomen carinated, moderately slender in the male, more robust in the female. Last ventral segment of the male abdomen acuminate; supra-anal plate roundly triangular, the immediate apex slightly produced and acuminate, its disk bulging, rugose, the basal third nearly covered by two large flat attingent, triangular teeth, projecting from the hind margin of the preceding segment. Cerci moderately long and slender, evenly tapering from base to apex. Prosternal spine of medium size, pyramidal, directed gently to the rear, the apex a little blunt, especially in the male. Interspace between the mesoternal lobes much narrower than long, in the female one-half, in the male one-third, as wide as the lobes themselves.

General color flavo-testaceous, more or less streaked and mottled on head and pronotum with brunneous and olivaceous. Tegmina pale brunneo-flavous. Antennæ fuscous, the apex of each joint pallid, giving them a strongly annulated appearance. In the female the disk of the pronotum and middle of the occiput are marked with a wide longitudinal dull brown band which is bordered on each side by one of dirty testaceous; sides of head and lateral lobes of pronotum alternately and irregularly longitudinally streaked with dark olivaceous and testaceous. Face, pleura, and external face of hind femora also somewhat varied with dark olivaceous. Hind tibiæ and tarsi coralline, somewhat paler basally externally, lunules of hind femora black, the internal lower genicular lobes red.

Length of body, ♂, 26.5 mm., ♀, 38 mm.; of pronotum, ♂, 5.85 mm., ♀, 8.25 mm., of tegmina, ♂, 9 mm., ♀, 10 mm.; of hind femora, ♂, 12.5 mm., ♀, 16 mm.

Habitat.—Chapada, Brazil, ♂, April, ♀, May (H. H. Smith). The types are in the collection of the Carnegie Museum.

Genus *PARALEUAS* Giglio-Tos.

Paraleuas GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XIII, no. 311, pp. 47, 57 (1898).

The genus *Paraleuas* is made up of small or medium-sized locusts, which bear some resemblance to the larger species of *Bucephalacris*,

which occur in the same general region. Like the representatives of *Jodacris* and *Abracris* Walker (*Omalotettix* Bruner) they are to be met with among the dead leaves and herbage growing beneath the larger shrubs and trees composing the forests, which prevail over much of Brazil and Paraguay.

142. *Paraleuas fosteri* Bruner.

Paraleuas fosteri BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 669, 670 (1906).

Habitat.—Several specimens of this insect are at hand from Corumba, Brazil. They were taken during the months of March and July (H. H. Smith).

143. *Paraleuas frater* Rehn.

Paraleuas frater REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 144-146, figs. 28, 29 (1909).

Rehn describes a new *Paraleuas* (*l. c.*) which seems to be distinct from any of the previously described species, as well as from the one characterized here, although it approaches the latter most closely.

Habitat.—Rehn's specimens came from Chapada, Matto Grosso, Brazil, where they were taken by H. H. Smith.

The described species of this genus may be separated by a table given in the paper just cited. The present collection, however, contains numerous specimens of what appears to be a fifth species. It comes closest to the *P. minor* from which it differs in the somewhat longer tegmina and wings. Like that insect it is without banded hind femora. Its measurements are as follows: Length of body ♂, 15 mm., ♀, 18 mm.; of pronotum, ♂, 2.65 mm., ♀, 3.15 mm.; of tegmina, ♂, 14 mm., ♀, 16.5 mm.; of hind femora, ♂, 8.5 mm., ♀, 10.5 mm.

Habitat.—A large series of specimens is at hand from both Corumba and Chapada, Brazil, where they were taken during the months of April to October inclusive (H. H. Smith).

The color of this insect is rather uniform brunneo-ferruginous with inconspicuous lighter and darker markings on the head, thorax and tegmina. The hind femora are not banded with fuscous. I have called this insect *Paraleuas longipennis*. This may be the *P. frater* Rehn, listed above.

144. *Paraleuas punctipennis* Bruner?

Paraleuas punctipennis BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 670, 671 (1906).

Habitat.—There are specimens of a third *Paraleuas* at hand which are referred to this species, although they vary somewhat from the type which has been used for comparisons. They come from Corumba and Rio de Janeiro, where they were collected in May and October by H. H. Smith.

Genus *ORTHOSCAPHEUS* Bruner.

Orthoscapheus BRUNER, Proc. U. S. Nat. Mus., XXX, p. 671 (1906).

This genus is related to *Jodacris* Giglio-Tos, and occurs in the same general region. Only a single species is known.

145. *Orthoscapheus roseipennis* Bruner.

Orthoscapheus roseipennis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 672 (1906).

? *Osmilia coriacea* GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 18 (1894).

Habitat.—Corumba, Brazil, during the months of March to July inclusive (H. H. Smith).

As noted in the paper where described (*l. c.*, p. 672) this insect may prove to be Giglio-Tos's *Osmilia coriacea*. However, by the use of that author's synoptic table of genera of South American Acridiens it runs to *Jodacris* instead.

Genus *JODACRIS* Giglio-Tos.

Jodacris GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302, p. 32 note (1897).

Judging from the material before me, the present genus is composed of several somewhat closely allied species of locusts, which inhabit open woods, where they live among the fallen leaves and spend much of the time upon herbage, shrubs, and the trunks of trees. Accordingly they are inconspicuously colored. At least one of the species, *ferruginea*, is quite variable in its coloration. They probably deposit their eggs in decaying wood, or the bark of trees, since the present writer, while at San Bernardino, found the insects to be quite insistent in their desire to stick to fallen trees which had begun to decay.

SYNOPSIS OF THE SPECIES OF *JODACRIS*.

- A. Larger (♂, 19-20 mm., ♀, 22 mm.). Body rather robust. The sides of pronotum, tegmina, and femora quite prominently mottled, or marked with fuscous.

- b.* Cerci of male moderately robust, tapering but little on basal two-thirds, the outer third very slender and gently curved upwards and inwards, the heavy portion provided at apex with a short inwardly directed flattened lobe, or tooth.
- c.* Inwardly directed lobe or tooth of cerci of male normal; apical portion of upwardly directed apex of main prong long and slender. Insect rather strongly variegated with fuscous. *ferruginea* Giglio-Tos.
- cc.* Inwardly directed lobe or tooth of cerci of male large, hatchet-shaped; apical portion of upwardly directed apex of main prong shorter and more robust. Insect uniformly ferruginous. *chapadensis* sp. nov.
- bb.* Cerci of male less robust, evenly tapering to the small inwardly directed tooth, beyond this very slender and gently curved both downwards and inwards. *intermedia* sp. nov.
- AA. Smaller (♂, 16, ♀, 20 mm.). Body fairly slender. The sides of pronotum, tegmina, and femora inconspicuously, or not at all, marked with fuscous. Apical slender portion of cerci strongly and abruptly bowed inwards and crossing at tips. *furcillata* Rehn.

146. *Jodacris ferruginea* (Giglio-Tos).

Anniceris ferrugineus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 30 (1894) in part.

Jodacris ferruginea GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302, pp. 32-33, footnote (1897) in part.

Habitat.—Chapada, Brazil, during May to November inclusive. A large series of both sexes, H. H. Smith, one of the specimens bearing the collector's number, 2097.

147. *Jodacris chapadensis* sp. nov.

Uniformly brunneo-ferruginous throughout, and without marks or mottlings of fuscous or pallid, except for the dark fuscous outer lower sulcus of the hind femora and an internal preapical band of the same color, the lunules not infuscated. A little larger and slightly more robust about the thorax than *J. ferruginea* Giglio-Tos. Cerci of male of the same general pattern as in that species, but with the internal branch much larger and forming an obliquely arranged hatchet-shaped thickened blade, the main branch directed posteriorly and gently curved upwards, somewhat shorter and more robust than in the species to which it has just been compared. Supra-anal plate with a long finger-like apical projection, the lateral margin thickened basally and broadly upturned, the disk raised, and gently sulcate near the base, but irregular beyond.

Length of body, ♂, 20 mm., ♀, 22 mm.; of pronotum, ♂, 3.57

mm., ♀, 4 mm.; of tegmina, ♂, 10 mm., ♀, 10.5 mm.; of hind femora, ♂, 11 mm., ♀, 11.5 mm.

Habitat.—Corumba and Chapada near Cuyaba, Matto Grosso, Brazil, May to October. A number of specimens of both sexes (H. H. Smith). The types, ♂ and ♀, are in the Carnegie Museum.

In color this species reminds one strongly of the distinct and much smaller *J. fuscillata* of Rehn.

148. *Jodacris intermedia* sp. nov.

About the same size, but noticeably slenderer than *J. ferruginca* Giglio-Tos, to which it is most closely related. Especially characterized by the very narrow vertex of the male, in which this feature is almost linear.

Head small, the width no greater than the anterior edge of the pronotum; eyes large, very prominent, broadly elliptical, a little more than twice as long as the anterior edge of the cheeks below them, diverging so that their hind margins form a right angle; vertex exceedingly narrow, scarcely half as wide as the diameter of the second and subsequent antennal joints, the fastigium rather small, about as long as its basal width, horizontal; frontal costa very prominent above between the antennæ, plane, except for a few scattered punctures, and about as wide as the first antennal joint, almost obliterated below the ocellus, viewed laterally the front is moderately strongly oblique and sparsely, though somewhat strongly, punctulate. Antennæ robust, filiform, nearly one-third longer than the head and pronotum combined. Pronotum shaped much as in the same sex of *ferruginca*, but a trifle narrower in proportion to its length; median carina plainly visible throughout, save between the first and second transverse sulci, the hind lobe closely punctulate and a trifle more than one-half the length of the anterior lobe; anterior margin broadly rounded, with the faintest possible indication of being very widely emarginate, posterior margin of disk very obtusangulate. Pleura quite plainly and coarsely punctulate. Tegmina and wings only slightly surpassing the apex of abdomen and tips of hind femora. Latter robust, about as long as the abdomen. Hind tibiæ seven-spined externally, eight- or nine-spined internally. Abdomen moderately slender, the apex not upturned, ending in a short, roundedly acuminate last ventral segment; supra-anal plate elongate triangular, with a low median transverse carina, the lateral margins reflexed, or upturned.

and the base of disk gently longitudinally sulcate. Cerc: about a third longer than the supra-anal plate, as described in the synoptic table of the species, reaching the tip of the last ventral segment. Interspace between the mesosternal lobes quadrate, a little wider than the lobes themselves. Prosternal spine minute, acuminate, situated at the hind margin of a robust quadrate base.

General color (after preservation in spirits) dirty flavo-testaceous, varied on the pronotum, pleura, and front with dull brown. Tegmina showing traces of fuscous dots. Wings rather strongly infuscated, especially apically. Hind femora without traces of transverse bands or the usual dark lower sulcus, the lunules of apex of hind femora piceous, the lobes dirty white; hind tibiæ slightly infuscated at apex, very likely pale glaucous in life.

Length of body, ♂, 19 mm., of pronotum, 3.6 mm., of tegmina, 13.5 mm., of hind femora, 10 mm., of antennæ, 8.5 mm.

Habitat.—The type, a male, bears the label "Santarem." It is the property of the Carnegie Museum.

149. *Jodacris furculata* Rehn.

Jodacris furculata REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 147-149, figs. 30, 31 (1909).

Habitat.—Chapada near Cuyaba, Matto Grosso, Brazil, during August. A fair series (H. H. Smith).

Genus ABRACRIS Walker.

Abracris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 642 (1870).

Omalotettix BRUNER, Proc. U. S. Nat. Mus., XXX, p. 642 (1906).

The genus *Omalotettix* Bruner, according to W. F. Kirby of the British Museum, is the same as *Abracris* of Walker, which was based on *A. dilecta* from Santarem, Brazil. This genus was reviewed in the *Biologia Centrali-Americana* where the annexed synoptic table of the known species was published. It is modified herewith to include Walker's species *dilecta*.

SYNOPSIS OF THE SPECIES OF ABRACRIS.

- A. Hind femora with the lower edge and sulcus more or less infuscated, or blackened, and their upper edges and outer disk more or less fasciate.
 - b. Smaller (length, ♂ 13-15 mm., ♀, 19 mm.). Hind femora provided with a conspicuous fuscous patch on the outer face. *signatipes* Bruner.
 - bb. Larger (length, ♂ 16-20 mm., ♀ 19-24 mm.). Hind femora either without fuscous bands, or with bands.

- c. Hind femora with the basal fuscous oblique band well defined and continuous.
- d. General color dull luteous, the tegmina cinereous, their veins tawny [Santarem.] *dilecta* Walker.
- dd. General color wood-brown; the tegmina gray-brown, their veins obscure brown for the most part. [British Guiana; Victoria, Brazil.] *meridionalis* Bruner.
- cc. Hind femora with the basal band more or less obliterated on the outer face.
- d. Males and females nearly equal in size, the former 20 mm., the latter 24 mm. in length. [Brazil.] *chapadensis* Bruner.
- dd. The sexes unequal in size, ♂ 17 mm., ♀ 21 mm. in length. *nebulosa* Bruner.
- AA. Hind femora with the lower outer edge and sulcus pallid, the upper edge and outer face only faintly fasciate.
- b. Darker, varying from wood-brown to brunneo-ferruginous, not at all, or but faintly, conspersed with fuscous. [South America.] *caruleipennis* Bruner.
- bb. Lighter, varying from testaceous to brunneo-cinereous, profusely conspersed throughout with fuscous. [Brazil.] *conspersipennis* Bruner.

150. *Abracris nebulosa* (Bruner).

Jodacris (?) *nebulosa* BRUNER, Locusts of Argentina, p. 67 (1900).

Omalotettix nebulosa BRUNER, Proc. U. S. Nat. Mus., XXX, p. 63 (1906).

Jodacris ferruginea GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302 (1897) in part.

Habitat.—The specimens of this species contained in the present collection come from Corumba, Brazil. They were taken during April by H. H. Smith.

151. *Abracris signatipes* (Bruner).

Omalotettix signatipes BRUNER, Proc. U. S. Nat. Mus., XXX, p. 673 (1906).

Habitat.—There are several specimens at hand coming from Corumba, Brazil, also taken in April by H. H. Smith.

152. *Abracris dilecta* Walker.

Abracris dilecta WALKER, Cat. Dermapt. Salt. Brit. Mus. IV, p. 642 (1870).

This species is larger than *signatipes* Bruner, and comes nearer *meridionalis* Bruner, from which latter it appears also to be distinct.

Habitat.—The locality of Walker's insect is given as Santarem, Brazil. Not represented in the present collection, nor in any material examined by me.

153. *Abracris chapadensis* (Bruner).

Omalotettix chapadensis BRUNER, Biol. Cent. Amer. Orthopt., II, pp. 280, 282 (1908).

In size and general form similar to *A. meridionalis*, but readily separable from it by the complete absence of the oblique obscure bands on the outer face of the hind femora and by the uniformly cinereous hind tibiæ, which show a close relationship of *chapadensis* to *nebulosa*, *caruleipennis*, and *conspersipennis*. In the present species the cerci of the male are longer and slenderer than usual, and, instead of being forked, have the apex slightly expanded and flattened. The last ventral segment of the abdomen of the male is small, short, and comparatively blunt, being nearly equalled by the supra-anal plate and quite reached by the cerci.

Head of moderate size, as wide as the anterior edge of the pronotum; viewed laterally considerably elevated above the pronotum; eyes prominent, as wide above as below, separated by a very narrow sulcate vertex scarcely as wide as the diameter of the slender antennal joint; fastigium somewhat depressed, about as long as wide, very gently sulcate anteriorly, the margins provided with a well-defined carina; lateral ocelli large, occupying more than half the space between the eyes and the upper, lateral edges of frontal costa. Latter prominent and widest above between the antennæ, and, when viewed in profile, somewhat roundly produced anteriorly; above the ocellus coarsely punctulate, plane, below the ocellus narrowed and sulcate, continuous to the clypeus. Facial carinæ prominent, nearly straight, and but gently divergent below. Antennæ fairly robust, in the male about one-fourth longer than the head and pronotum combined. Pronotum subcylindrical in advance of the principal sulcus, expanding gently on the posterior lobe; the anterior edge emarginate, posterior edge widely and roundly angulate, the surface of disk and sides of hind lobe closely and confluent punctulate. Tegmina with the edges nearly parallel, extending beyond the tip of the abdomen about one-fourth their length, rather closely and strongly veined. Hind femora, normal, a little surpassing the apex of abdomen. The latter evenly tapering, the last ventral segment small, short, and comparatively blunt; supra-anal plate elongate-triangular, the sides gently arcuate, with the middle elevated and widely and deeply sulcate, the sulcation slightly constricted midway from the base towards the apex. Cerci as described above. Mesosternal lobes separated by a subquadrate

space about equal in width to the lobes themselves. Prosternal spine rather long, slender, straight and acuminate.

Length of body, ♂, 20.5 mm., of pronotum, 4 mm., of tegmina, 21 mm., of hind femora, 12 mm.

Habitat.—The type was collected during December at Chapada, Brazil, by H. H. Smith. It is deposited in the Carnegie Museum. Other material is at hand from the same locality.

154. *Abracris cæruleipennis* (Bruner).

Jodacris (?) *cæruleipennis* BRUNER, Locusts of Argentina, p. 68 (1900).

Omolotettix cæruleipennis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 674 (1906).

Habitat.—Chapada, Brazil (H. H. Smith).

155. *Abracris conspersipennis* sp. nov.

Omolotettix conspersipennis BRUNER, MS., Biol. Cent. Amer. Orthopt., II, p. 281 (1908).

About the size of, and most nearly related to, the *A. cæruleipennis* Bruner, which occurs most abundantly somewhat to the southward of the habitat of the present species. *Conspersipennis* is a pale testaceous insect, which is strongly and quite evenly conspersed throughout with dull brown.

Of medium size and robustness, noticeably a little more stoutly built than either *cæruleipennis* or *nebulosa*, the body and legs quite strongly hirsute, the tegmina less so. Head of moderate size, fully as wide as the anterior edge of the pronotum; eyes fairly prominent, but less so than in the species with which compared, the vertex between them about as wide as the frontal costa in both sexes, the fastigium quite strongly depressed, about twice as wide as long. Frontal costa plain and broadest above the ocellus, sulcate below, and continuous to the clypeus. Antennæ moderately robust, about as long (♀) or a little longer (♂) than the head and pronotum combined. Front, cheeks, pronotum, and pleura closely and strongly punctulate, and also more or less decidedly rugose, the raised portions pallid. Tegmina of moderate width and length. Hind femora robust. Hind tibiæ rather heavy, plainly expanded apically, the spines large and strong, largely pallid, but with black tips.

Length of body, ♂, 16 mm., ♀, 20 mm.; of pronotum, ♂, 3.15 mm., ♀, 4 mm.; of tegmina, ♂, 16 mm., ♀, 19 mm.; of hind femora, ♂, 8.5 mm., ♀, 10.6 mm.

Habitat.—Chapada, Brazil (H. H. Smith). The types, ♂ and ♀, are in the Carnegie Museum.

156. *Abracris meridionalis* (Bruner).

Omalotettix meridionalis BRUNER, Biol. Cent. Amer., Orthopt., II, pp. 280, 281 (1908).

In general appearance very similar to *A. signalipes* (*Omalotettix signalipes*) Bruner, but decidedly larger than that species, from which it differs also by having the oblique fuscous bands of the hind femora continuous with the transverse patch across the upper edge. The tegmina and wings of *meridionalis* are comparatively longer than in the species with which compared, while the former are darker in color and have their veins more uniformly obscure. In *meridionalis* the cerci of the male are nearly straight, rather evenly tapering, and have the inner fork minute and shorter than the outer, as compared with the somewhat curved form and strong inner toothed structure, as found in *signalipes*.

General color of head, sides of pronotum, pleura, legs, and abdomen, ferrugineo-testaceous, marked on head back of eyes, on the upper portion of the sides and disk of pronotum, and on the pleura, with dark brown, giving to these parts the appearance of being banded with the pallid coloring. Antennæ testaceo-ferruginous. Hind femora marked above by two strong broad transverse fuscous bands, the anterior or basal one of which continues uninterruptedly obliquely forward upon the outer disk two-thirds of the distance to its lower margin; the lower outer margin of the femur is strongly marked with black. Hind tibiæ dark plumbeous, with a sub-basal pallid annulus in an infuscated area, the apex also decidedly infuscated.

Length of body, ♂, 17.5 mm., ♀, 23 mm.; of pronotum, ♂, 3.6 mm., ♀, 4.35 mm.; of tegmina, ♂, 18 mm., ♀, 23 mm.; of hind femora, ♂, 10.25 mm., ♀, 12.4 mm.

Habitat.—The types which are in the author's collection were collected by R. J. Crew at Demerara, British Guiana. Other specimens are at hand from Victoria, Brazil (Coll. L. Bruner).

Genus CHRYSOPSACRIS Bruner.

Chrysopsacris BRUNER, Biol. Cent. Amer., Orthopt., II, p. 282 (1908).

This genus is composed of medium-sized locusts with comparatively large head, long filiform, twenty-jointed antennæ, prominent sub-

globular eyes, narrow vertex, short strongly punctate pronotum, more or less abbreviated tegmina and wings, long robust hind femora, and forked male cerci. The type of the genus is the *Gryllus bucephalus* Marschall⁸ as determined by the author.

Head medium or large, a little wider than the front edge of the pronotum; the occiput short, rounded; face rather oblique, even in the females; frontal costa prominent between the antennæ, less prominent and irregular below the ocellus, plane, or shallowly sulcate above, more deeply so below; lateral or facial carinæ somewhat divergent below; fastigium sulcate, a little depressed and angulately united with the frontal costa; vertex between the eyes very narrow (♂) or nearly as wide as the frontal costa at its widest part (♀). Antennæ filiform, about twenty-jointed, moderately long, in the males of some species longer than the hind femora. Pronotum coarsely and deeply punctate, rather short, sub-cylindrical, a little widening posteriorly, without lateral carinæ, the transverse sulci prominent, anterior edge truncate, or a little rounded, hind border obtusangulate, hind lobe much the shorter. Tegmina and wings abbreviated, so as to equal the length of abdomen, fusiform, rather prominently veined, plain, or mottled. Wings short and broad, blue, with black or fuscous tips. Abdomen short and tapering. Hind femora fairly robust, extending beyond the apex of abdomen in both sexes. Hind tarsi long and slender, the third joint as long as first and second, second one-half the length of first, or less; tibiæ and tarsi rather lengthily hirsute. Hind tibiæ seven-spined in outer row, the apical one wanting. Upper valves of the ovipositor strongly serrate or crenulate. Tip of the male abdomen short and prow-shaped; the cerci rather heavy, acuminate, and with an inner tooth near the middle. Prosternal spine pyramidal, straight, acuminate. Lobes of the mesosternum widely separated, the space as broad as, or broader than, the lobes themselves.

The insects comprising this genus bear a general resemblance to the various members of *Bucephalacris* Giglio-Tos, but differ in a number of respects. The most apparent difference, however, is in the comparative length of the hind tarsal joints. As described by Giglio-Tos the species of *Bucephalacris* have the first and second joints equal, while in *Chrysopsacris* the representatives have them very unequal, the length of the second being only one-half, or even less than that, of the first.

⁸ *Ann. Wiener Mus.*, 1835, p. 217, No. 10, pl. XVIII, fig. 9.

By referring to the locality cited, it will be seen that at least three species of the genus are known. These are separated by a synoptical table. None of the representatives are at hand among the material now being studied.

Genus *MACHÆROPELES* Rehn.

Machæropeles REHN, Proc. U. S. Nat. Mus., XXXVI, p. 152 (1909).

This genus of locusts belongs to the *Vilernæ* but seems to be quite a distance removed from any of the other genera of the group. Thus far only a single species is known.

157. *Machæropeles rostratus* Rehn.

Machæropeles rostratus REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 152-154, figs. 34, 35 (1909).

Habitat.—There are at hand a large series of both sexes. They come from Chapada and Corumba, Brazil, where they were taken during the period embraced in the months of April to August inclusive (H. H. Smith).

Genus *LEPTOMERINTHOPRORA* Rehn.

Leptomerinthoprora REHN, Proc. Acad. Nat. Sci. Philad., 1905, p. 436.

The various members of the present genus are distributed over Central America and the northern and central countries of South America. Four of the previously described forms come from Costa Rica and another from Para, Brazil. A sixth species is now added. It was taken at Chapada, Brazil. These species may be separated as follows:

SYNOPSIS OF THE SPECIES OF *LEPTOMERINTHOPRORA*.

- A. General form rather robust. The antennæ heavy, short, and annulated with flavous.
- b. Hind femora dull clay-color or brunneo-testaceous, either plain, or marked with oblique fuscous bands and mottlings.
- c. Femora plain, tinged with green. *brevipennis* Rehn.
- cc. Femora obscurely marked externally with oblique and internally with transverse bands; antennæ inconspicuously annulate.
- modesta* Bruner.
- bb. Hind femora green or greenish, unadorned, apex testaceous. Antennæ pale annulate.
- c. Most of face, cheeks below the eyes, and pale lines on pronotum, pleura, and tegmina bright wax-yellow. *flavovittata* Bruner.
- cc. Most of face, cheeks below the eyes and pale lines on pronotum, pleura, and tegmina brownish-testaceous. *smaragdipes* Bruner.

A.A. General form rather slender. The antennæ slender, long, and without annulations of flavous.

- b. Hind femora with a large testaceous patch externally near the base; antennæ much longer than head and pronotum combined, filiform. [Chapada, Brazil.] *gracilicornis* sp. nov.
- bb. Hind femora clouded externally with blackish; antennæ but little longer than head and pronotum combined, subensiform. [Para, Brazil.]
aqualis Rehn.

158. **Leptomerinthoprora gracilicornis** sp. nov.

Below the medium in size, slender, and with filiform antennæ, which equal the hind femora in length. The latter with a conspicuous large pale testaceous patch on upper half of outer face near base; lower sulcus and inner face near base carmine.

Head small, scarcely as wide as the anterior edge of the pronotum; front gently retreating; eyes prominent, oval, the vertex narrow, less than the diameter of the comparatively slender antennæ; fastigium of medium size, about as broad as long, the antero-lateral margins rounded, the disk rather widely and fairly deeply sulcate. Frontal costa quite prominent between the antennæ, where it is plane, with a few coarse punctures, suddenly lowered before the ocellus, where it is sulcate and narrowed to middle of front, when it again widens and continues to the clypeus; lateral or facial carinæ slender and continuous, but little divergent below, spaces between costa and lateral carinæ occupied by an interrupted supplemental carina. Pronotum without lateral carinæ, rather evenly divergent posteriorly, hind lobe closely and deeply punctulate, anterior lobe and face faintly so; median carina moderately well developed throughout, interrupted by all three of the transverse sulci; anterior margin roundly advanced at middle upon the occiput, hind margin widely angulate. Tegmina and wings abbreviated, about one-half the length of the abdomen, the former a little overlapping above, the costal margin gently arcuate, the veins moderately profuse, but not prominent, their apices rounded. Abdomen slender, tapering; valves of the ovipositor short, slender, of normal form. Anterior and middle femora slender, hind femora robust at base, slender apically, the upper carina minutely serrate basally, and terminating in a small triangular tooth on the apex; hind tibiæ slender, somewhat sinuose, lengthily hirsute, seven-spined externally, nine-spined internally. Interspace between the meso-sternal lobes plainly wider than long, fully equalling in width the

lobes themselves. Prosternal spine pyramidal, of medium size, acuminate.

General color above brown, the disk of pronotum and sides of occiput narrowly bordered on each side by a narrow longitudinal dirty yellow line; sides of face, back of lower edges of eyes, and lower edges of sides of pronotum together with a spot in advance of the insertion of middle legs, similarly marked. Tegmina uniformly brown. Hind femora externally and above embrowned, save for the large pallid sub-basal patch referred to above, and the genæ, which are also more or less pallid. Bounding carinæ of outer disk of femora alternately dark and pallid. Hind tibiæ testaceous basally, becoming dusky apically. Spines black; antennæ, anterior and middle legs, and hind tarsi, testaceous. Dorsum and sides of abdomen sparsely maculate with dull brown.

Length of body, ♀, 16 mm., of pronotum, 3.65 mm., of tegmina, 5.5 mm., of hind femora, 10.5 mm.

Habitat.—Chapada, Brazil, where it was taken by H. H. Smith in April. The type is in the collection of the Carnegie Museum.

Genus *VILERNA* Stål.

Vilerna STÅL, Recens. Orthopt., I, pp. 38, 71 (1873).

The genus *Vilerna* of Stål is confined to tropical America, where representatives occur from middle Mexico to northern Argentina. All of the species are of medium size and brunneo-ferruginous in color. They live among the low herbage in and about forests, where they have a tendency to gather upon plants like the pineapple and aloes about the bases of the thorny or serrate leaves where they are well protected from enemies.

159. *Vilerna æneo-oculata* (De Geer). †

Acrydium æneo-oculata DE GEER, Mém. Ins., III, p. 502, pl. 42, fig. 11 (1773).

Vilerna æneo-oculata STÅL, Recens. Orthopt., I, p. 71 (1873).

Acrydium sanguinipes OLIVIER, Encycl. Méth. Ins., VI, p. 231 (1791).

Acridium sanguinipes SERVILLE, Ins. Orthopt., p. 670 (1839).

Habitat.—Benevides, Para, Rio de Janeiro, and Chapada, Brazil, April to July and October (H. H. Smith). It also occurs in Central America and all of the northern countries of South America.

160. *Vilerna rugulosa* Stål.

Vilerna rugulosa STÅL, Bihang, Svensk. Akad. Handl., V, no. 4, p. 61 (1878).

Habitat.—Specimens determined as this species are at hand from

both Para and Rio de Janeiro, Brazil, where they were taken during October and November by H. H. Smith.

It is the common species in Paraguay about Asuncion, where it was collected by the present writer in October.

161. *Vilerna flavipennis* Gerstæcker.

Vilerna flavipennis GERSTÆCKER, Mitth. Ver. Neu-Vorpomm., XX, p. 13 (1889).

Habitat.—Specimens determined as this species are at hand from Para and Chapada, Brazil. They were taken during the months of May to July inclusive by H. H. Smith.

Genus XIPHIOLA Bolivar.

Xiphiola BOLIVAR, Act. Soc. Españ. Hist. Nat., 1896, p. 17.

162. *Xiphiola borellii* Giglio-Tos.

Xiphiola borellii GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XV, no. 377, pp. 5, 6 (1900).

Habitat.—Specimens of this species are at hand both from Rio de Janeiro and Chapada, Brazil, where they were collected during the months of May to August inclusive (H. H. Smith).

Genus OSMILIOLA Giglio-Tos.

Osmiliola GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302, p. 32 (1897).

163. *Osmiliola aurita* Giglio-Tos.

Osmiliola aurita GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302, p. 33 (1897).

Habitat.—A pair of specimens are at hand that have been determined as this species. They come from Chapada, Brazil (H. H. Smith).

Genus RHABDOSCIRTUS gen. nov.

Related to *Xiphiola* Bolivar and *Saparus* Giglio-Tos, but differing from both in a number of respects, as will be seen by an examination of the following description:

General shape of insect fusiform, being rather robust in the vicinity of the mesothorax, from which it tapers both anteriorly and posteriorly. Head of medium size, a trifle narrower than the front edge of the pronotum; eyes large, prominent, elliptical, a little longer than the cheeks below them; vertex narrow, almost linear, depressed; the fastigium a little elevated anteriorly, somewhat longer than broad; frontal costa

produced between the antennæ, about as broad as the basal joint, not sulcate, but coarsely punctate above the ocellus, somewhat narrowed and much weaker below and continued to the clypeus, sulcate; lateral or facial carinæ subparallel, the face rugose between them. Antennæ twenty-jointed, rather long, heavy, and ensiform, or subensiform. Pronotum coarsely rugoso-punctate, without lateral carinæ, evenly divergent posteriorly, the dorsum rounded, and with a well-defined median carina; hind lobe shorter than the front, separated by a strongly defined transverse sulcus; anterior margin straight, posterior margin broadly obtusangulate. Tegmina long and narrow, rather closely veined on basal, more distantly on distal, half. Wings blue, infuscated apically, long, and narrow. Abdomen rather short, tapering, strongly carinated above; valves of the ovipositor acuminate, the outer edge of the upper pair crenulate. Hind femora extending beyond the tip of the abdomen, more than ordinarily robust, and with the upper carina serrate; hind tarsi with the second joint much shorter than the first. Space between the mesosternal lobes subquadrate, wider than long. Prosternal spine slender, straight. Hind tibiæ with seven spines in outer row, the apical spine wanting.

164. *Rhabdoscirtus vittatus* sp. nov.

The type of this genus is *vittatus*. It is of medium size, has the general color black, varied with flavo-testaceous vittæ as follows: one extending from the base of the antennæ down each side of the face to the base of mandibles, one from the back of each eye diagonally across the cheeks and lower portion of sides of pronotum and pleura to base of middle legs, one on each side of occiput and disk of pronotum and along dorsal angle of folded tegmina for two-thirds their length. The tegmina are also provided with a second and shorter line of this color just back of their costal edge. There is another on each side, which runs from the base of the tegmina to the insertion of the hind femora. These latter have a conspicuous stripe along the lower edge of their outer face, and a second one extending from near the middle of the base diagonally upward and to the rear, where it crosses to the inner face about one-third the distance towards the apex. A second short diagonal band of this color crosses the upper edge just beyond the middle. The palpi are pale, their apical joints being terete. The anterior edges of the three segments of the thoracic sternites are also pale. The wings are rather dark transparent blue with dusky apices.

Length of body, ♀, 24 mm., of antennæ, 13.75 mm., of pronotum, 6 mm., of tegmina, 24 mm., of hind femora, 14.25 mm.

Habitat.—A single female, the type comes from Demerara, British Guiana, where it was collected by R. J. Crew. (Coll. L. Bruner.)

Genus ANABLYSIS Gerstæcker.

Anablysis GERSTÆCKER, Mitth. Ver. Neu-Vorpomm., XX, p. 14 (1889).

165. *Anablysis pantharina* Gerstæcker.

Anablysis pantharina GERSTÆCKER, Mitth. Ver. Neu-Vorpomm., XX, p. 15 (1889).

Habitat.—A couple of male specimens of medium-sized locusts are at hand from Para, Brazil, which answer the description of this species. They were taken during July by H. H. Smith.

166. *Anablysis* (?) *fusco-maculata* sp. nov.

Very similar in color and general appearance to *Anablysis pantharina* Gerstæcker, as determined by me, but with comparatively smaller eyes, and without the prominent tooth or spine at the apex of the superior carina of the hind femora. The two terminal joints of the maxillary palpi flattened and amplified, conspicuously ivory-white.

General form elongate, subcylindrical, moderately graceful and fairly hirsute throughout. Head as wide as the anterior margin of the pronotum; eyes large, prominent, subglobular, at least two-fifths longer than the anterior margin of the cheeks; the vertex depressed, a little narrower than the frontal costa, longitudinally sulcate throughout; the fastigium still more depressed, and surrounded by a carina forming an almost circular anteriorly depressed area. Frontal costa prominent between the antennæ, deeply and widely sulcate, below the ocellus much lower and with the feeble sides gently divergent, fading before reaching the clypeus; lateral or facial carinæ prominent, nearly parallel. Antennæ filiform, long and slender, about twice as long as the combined length of head and pronotum. Pronotum subcylindrical, feebly biconstricted laterally, the hind lobe gently expanding; anterior edge broadly collared and roundly advanced upon the occiput; first transverse sulcus faint, second and third profound, the last located about one-third the length of the pronotum from its hind margin which is widely angulate. Tegmina rather narrow, sparsely veined, the edges nearly parallel, somewhat abbreviated, a little shorter than the abdomen, their apex rounded. Hind femora moderately slender, surpassing the abdomen by the length of the genicular

area, the lateral lobes of the latter rounded, the superior carina nearly smooth, terminating at the apex in a minute blunt tooth. Hind tibiæ six-spined externally. Anterior and middle femora not at all inflated. Abdomen elongate, not tapering, the apical portion gently clavate; last ventral segment short, smooth, roundly triangular, the apex entire; supra-anal plate scutiform, the disk rather complicated by ridges and depressions, and the margin more or less sinuose, the apex a little produced and depressed; cerci moderately heavy, long and evenly tapering, directed backwards and a little upwards, plainly passing the supra-anal plate. Mesosternal interspace slightly transverse, broadening caudad, plainly wider than the lobes themselves, the inner margins of which are rounded. Prosternal spine small, located on the heavy anterior margin of the prosternum, which gradually widens and increases in height as it approaches the center.

Pale brunneo-testaceous with a faint olive tinge on occiput, pronotum and legs, strongly and rather profusely maculate with fuscous and dull black. Fastigium, front below the ocellus, sides of head below the eyes and lower half of lateral lobes of the pronotum dirty yellowish white; scrobes of antennæ, frontal costa above, eyes, head immediately back of them, upper half of sides of pronotum, and pleura together with tegmina, largely fuscous, becoming black and interrupted on the latter so as to form a series of three or four oval or quadrate maculations. Mouth-parts, except palpi, and underside piceous; anterior and middle legs conspicuously annulated with fuscous, hind femora flecked with fuscous, which tends to the formation of bands, the genicular lunules faintly embrowned, but not fuscous; hind tibiæ more or less infuscated, becoming darker as the apex is approached. Antennæ infuscated, with four or five pale annulations.

Length of body, ♂, 17-20 mm., of pronotum, 4-4.6 mm., of tegmina, 10 mm., of hind femora, 11 mm., of antennæ, 12-13 mm.

Habitat.—Two males collected during July at Para, Brazil, by H. H. Smith. Type in the collection of the Carnegie Museum.

This insect does not exactly fit either *Anablysis* Gerstæcker or *Demonax* Stål, both of which it approaches in some of its characters. It seems, however, to come closest to the former. So far as the amplicate terminal joints of the palpi are concerned it approaches *Ommatolampis* and its allies, of which there are undoubtedly several undescribed genera belonging to tropical America.

Genus OMMATOLAMPIS Burmeister.

Ommatolampis BURMEISTER, Handb. Ent., II, p. 636 (1838).

Specimens of the present genus are to be found throughout tropical South America as well as the adjoining portions of Central America. As at present restricted, the representatives of the genus are apterous, or brachypterous, insects of medium size, in which the vertex is quite narrow and the palpi have the apical joints flattened and ampliate. The present writer has recently published a synoptical table of the species (*Horæ Soc. Ent. Ross.*, XXXIX, pp. 483-485, Dec., 1910).

167. *Ommatolampis collaris* sp. nov.

Ommatolampis collaris BRUNER, MS., *Horæ Soc. Ent. Rossicæ*, XXXIX, p. 484 (1910).

A moderately robust and comparatively smooth species with narrow tessellated back and testaceous tegmina, in which the prevailing color of the male is testaceous varied with fuscous and of the female nearly uniformly brunneo-testaceous.

Head large, the face rather short; eyes prominent, longer than the length of the cheeks below them, separated at the vertex by a space about equal to (♀) or a little less than (♂) the width of the frontal costa; fastigium depressed, shallowly sulcate; frontal costa not very prominent between the antennæ, widely and shallowly sulcate, in the male continuous to the clypeus, but in the female partly obliterated below the ocellus. Pronotum evenly rounded and gently expanding posteriorly, the transverse sulci rather profound in the males, much less so in the females; anterior edge rounded, the middle emarginate, hind edge truncate. Tegmina long and narrow, gently spatulate, sparsely but coarsely reticulate, reaching nearly (♀) or quite (♂) to the hind edge of the first abdominal segment. Abdomen carinate, evenly tapering, the tip of the male abdomen not upturned. Hind femora robust, the upper carinæ serrate and gently tuberculate, slightly surpassing the apex of the female abdomen and extending about one-fourth their length beyond in the male. Supra-anal plate broadly triangular, the lateral edges gently bowed, the disk provided with about eight black tubercles, the larger four of which are arranged equidistant along the base, the other four on the disk apically. Cerci of male pyramidal with an inner basal fold. Prosternal spine slender, straight, acuminate on a heavy base. Hind tibiæ seven-spined externally.

General color pale in the male to brunneo-testaceous in the female. In the male the occiput to lower edge of eyes, the anterior border together with the hind lobe of the pronotum, an oblique patch on each side in advance of the middle coxæ, the basal half and apical segments of the abdomen, and the knees and base of hind tibiæ, infuscated. Veins of wings widely testaceous on a black background. Hind tibiæ cinereous, in the males with an olivaceous and in the females a vinous tinge, the spines flavous with black tips. Antennæ infuscated apically.

Length of body, ♂, 21.5 mm., ♀, 27 mm.; of pronotum, ♂, 4.1 mm., ♀, 5.1 mm.; of tegmina, ♂, 4.5 mm., ♀, 5 mm.; of hind femora, ♂, 13.5 mm., ♀, 16.25 mm.; of antennæ, ♂, 14 mm., ♀, 12 mm.

Habitat.—Para, Brazil, in April where they were taken by H. H. Smith. Types in the Carnegie Museum.

Genus SITALCES Stål.

Sitalces STÅL, Bihang. Svensk. Akad. Handl., V, no. 9, p. 16 (1878).

The present genus is composed of small to medium-sized apterous, or subapterous, locusts of modest appearance. The several known or recognized species belong to tropical America, where they may be found among the herbaceous plants in and about the margins of forests. Most of the described species have been separated in a synoptical key published by the present writer (Biol. Cent.-Amer., Orthopt., II, p. 291, April, 1908). An additional species was also described by me recently from Peru (Horæ Soc. Ent. Rossicæ, XXXIX, p. 485, 1910).

168. *Sitalces robustus* Bruner.

Sitalces robustus BRUNER, MS. Biol. Cent.-Amer., Orthopt., II, p. 291 (1908).

Apparently most closely related to *volxemi* Stål, from which it differs most notably in the somewhat larger size, the brownish-olive instead of olive-green color, and in having the median pronotal carina well developed, instead of having it subobsolete. Outer margin of hind tibiæ eight-spined.

Eyes large and prominent, about one and one-half times as long as the anterior edge of the cheeks; very narrowly separated at the vertex, the interspace being slightly less than (♂) or just about the same as (♀) the diameter of the antennæ. Vertex depressed, the fastigium of moderate size, a little broader than long, rounded in front and bordered by a slight raised carina, the disk somewhat rugose and punctulate

Antennæ moderately heavy, filiform, in the female about equal to, in the male a little longer than, the head and pronotum combined. Frontal costa most prominent above the ocellus, where it is plane, fully twice the width of the vertex between the eyes, and rather coarsely punctulate, at the ocellus sulcate, below less prominent, also punctulate. Facial carinæ moderately prominent, the interspace of front punctate. Pronotum rugoso-punctate, most closely on the hind lobe, divergent posteriorly; median carina well developed throughout, except that it is severed by all three of the transverse sulci, the last being most profound; hind margin angulately emarginate at middle, the front somewhat sinuate. Tegmina minute, lateral, about half as wide as long, in the female reaching half way across the metanotum, in the male extending to the anterior edge of the first abdominal segment. Auditory apparatus obsolete. Apex of male abdomen gently enlarged and upturned; supra-anal plate large, subquadrate, the sides raised, the middle tumid, deeply and narrowly sulcate, terminating in a finger-like projection beyond the apex. Hind margin of preceding segment provided at middle with two slender parallel finger-like projections, which lie in the basal part of the sulcation of the supra-anal plate. Cerci large, quite similar to those of *volxemi* Stål.

General color brownish olive, becoming piceous on occiput, cheeks, the upper portion of lateral lobes of pronotum, and pleura. Front, legs, and underside, pallid. A conspicuous patch on cheeks back of lower edge of eyes, lower edges of pronotum and blotches on pleura in advance of the insertion of middle and hind femora, sordid white or ivory. Hind femora olivaceous, with more or less of a yellowish tinge, the genicular portion pale ferruginous; hind tibiæ glaucous.

Length of body, ♂, 15 mm., ♀, 23 mm.; of pronotum, ♂, 3.15 mm., ♀, 4 mm.; of tegmina, ♂ and ♀, 1.25 mm.; of hind femora, ♂, 10 mm., ♀, 12 mm.

Habitat.—Para and Rio de Janeiro, Brazil, September to November, several specimens of both sexes (H. H. Smith). Collection of the Carnegie Museum.

169. *Sitalces nudus* Bruner.

Sitalces nudus BRUNER, MS. Biol. Cent.-Amer., Orthopt., II, p. 291; ib., Horæ Soc. Ent. Rossicæ, XXXIX, p. 486 (1910).

The present species, of which three specimens are at hand, is rather closely related to the *S. infuscatus*, a description of which immediately

follows. The *S. nudus* was partially characterized in the second paper referred to above. In size it is practically the same as *infuscatus*, from which it differs primarily in the entire absence of tegmina and also in the less infuscated coloration.

Habitat.—The three specimens at hand, one male and two females were taken at Santarem, Brazil, by H. H. Smith.

170. *Sitalces infuscatus* Bruner.

Sitalces infuscatus BRUNER, MS. Biol. Cent.-Amer., Orthopt., II, p. 291 (1908).

Resembling *S. ovatipennis* Bruner from British Guiana, but much darker colored, and having more disparity in size between the sexes.

Body moderately hirsute, the pronotum, and in the male the other thoracic and first abdominal segments, rather strongly punctulate, the remaining portions of the body smooth. Head a little wider than the anterior end of the pronotum; vertex narrow, fastigium depressed, and with the vertex longitudinally sulcate, bordered in front by a well marked carina. Frontal costa plane and prominent above the ocellus, becoming weaker and narrower below. Face viewed in profile rather oblique. Antennæ filiform, a little (♀) or decidedly (♂) longer than the combined length of the head and pronotum. Transverse sulci of latter coarse and deeply impressed, continuous across the disk. Tegmina minute, squamiform, scarcely reaching the middle of the metanotum. Auditory apparatus minute almost obsolete. Hind femora normal, plainly extending beyond the apex of the abdomen in both sexes. Apical portion of male abdomen not enlarged, the last ventral segment short and blunt; supra-anal plate triangular, its lateral edges thickened, crossed at middle by a transverse carina, beyond this the plate is gently bent downwards; cerci long and slender, the apical third curved gently inwards. Prosternal spine minute on a rather robust base.

General color above dark brown to black, and, in some specimens, exhibiting traces of two occipital, two lateral pronotal, and a medio-dorsal, pale, bands. Cheeks below eyes, lower margins of sides of pronotum, and middle of pleura, marked by bright yellow lines. Face, except antennal grooves and the dusky band across the upper extremity of the frontal costa between them, the pectus, and much of lower portion of abdomen, flavous; legs olivaceous, the hind tibiæ greenish glaucous. Genicular lunules and base of tibiæ ferruginous.

Length of body, ♂, 11 mm., ♀, 15.5 mm.; of pronotum, ♂, 2.1

mm., ♀, 2.9 mm.; of tegmina, ♂ and ♀, 1 mm.; of hind femora, ♂, 7 mm., ♀, 9 mm.

Habitat.—Chapada and Benevides, Brazil, in April (H. H. Smith). Types in collection of the Carnegie Museum.

Genus PARASITALCES gen. nov.

This genus is established for a medium-sized entirely apterous, smooth-bodied locust, which reminds at first glance of a *Sitalces*. A closer examination, however, soon discloses many important differences, sufficient to place it in a distinct genus, as will be seen from the subjoined diagnosis.

General form elongate fusiform, rather strongly hirsute throughout, very much so on tibiæ and tarsi. Head rather large, fully as wide as (♀), or slightly wider (♂) than the anterior edge of the pronotum; viewed in profile the front is moderately oblique in the female and quite strongly so in the male; the occiput smooth and fairly long. Eyes prominent, about as long as (♀) or a little longer than (♂) the anterior edge of the cheeks, separated above by a space equal to the diameter of the antennæ in the females, narrower, almost linear in the males; fastigium of moderate size, plainly wider than long, the antero-lateral margin carinated, its anterior middle gently sulcate and narrowly continuous with that of the frontal costa. Latter fairly prominent above between the antennæ, where it is broadest and nearly thrice (♂) or at least twice (♀) the width of the vertex between the eyes, sulcate throughout and continued to the clypeus. Facial carinæ prominent, but little divergent below. Antennæ filiform, twenty-two jointed, somewhat longer than the combined length of the head and thorax. Prothorax without lateral carinæ, expanding on posterior lobe, which is short and closely and minutely punctulate; anterior edge broadly rounded, posterior margin truncated, both slightly emarginate at middle. Pleura in advance of meso- and meta-coxæ closely punctulate. Auditory apparatus rather small, oval. Hind femora with carinæ smooth, about normal in form, the outer disk regularly paginate, about as long as the abdomen in the female, a very little exceeding it in the only male specimen at hand, which is somewhat distorted. Outer margin of hind tibiæ six- to eight-spined. Interspace between the mesosternal lobes slightly transverse, plainly wider than the lobes themselves. Prosternal spine short, minute, located on a robust quadrate base. Male abdomen gently clavate,

the last ventral segment triangular, with its apex entire; supra-anal plate subquadrate, a little broader than long, the lateral margins raised and gently convergent caudad, the middle widely costate and sulcate, abruptly lowered half way to the apical, which latter is truncate. Cerci large, heavy, with a large flat inwardly directed median tooth sufficiently long to touch the apex of that from the opposite cercus, the main prong also flat, somewhat twisted and gently bowed inwardly.

171. *Parasitalces sexnotata* sp. nov.

General color above brunneo-olivaceous becoming paler medio-dorsally and caudad; below flavous, sides of head, back of eyes, and upper portion of sides of pronotum, piceous; front, cheeks, and sides of pronotum below the piceous band, pale yellowish white, more or less tinged with green. Legs olive-green, the hind tibiæ greenish glaucous, the lunules and lower margin of hind femora tinged with ferruginous. Sides of occiput and lateral margins of disk of pronotum conspicuously marked with orange patches, three on a side, *i. e.*, one on each side of the occiput and two on each side of the disk of the pronotum. There is also quite a conspicuous blood-red patch on the pleura in advance of, and above, the insertion of the hind femora. Antennæ flavous, becoming somewhat infuscated apically.

Length of body, ♂, 14 mm., ♀, 20-22 mm.; of pronotum, ♂, 2.6 mm., ♀, 3.5 mm.; of hind femora, ♂, 8.35 mm., ♀, 11.75 mm.

Habitat.—Chapada, Brazil, in April, three females and one male (H. H. Smith). Types in the collection of the Carnegie Museum.

Genus SCHISTOCERCA Stål.

Schistocerca STÅL, Recens. Orthopt., I, p. 64 (1873); SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, p. 441 (1899).

The genus *Schistocerca* is one of the most characteristic of the American genera of locusts, or short-horned grasshoppers. Its representatives are for the most part quite large, and rather showy and striking in appearance. Quite a number of the species are counted among the destructive locusts of their respective regions. Especially is this last remark true with reference to the tropical and subtropical parts of the Americas, where such forms as *S. americana*, *cancellata*, and *paranensis* are at times responsible for much injury to the agricultural interests, and the destruction of the vegetation of the cattle-ranges and even of the forests as well. The genus has been worked

up by Scudder (*l. c.*, pp. 441-476). Since that time several additional species have been added by Rehn and myself, and still another is described in the present paper.

172. *Schistocerca desiliens* Scudder.

Schistocerca desiliens SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 443, 445 (1899).

Habitat.—This species is represented by thirteen specimens. They come from Rio de Janeiro, Para, and Chapada, Brazil, where they were taken during the months of May and November by H. H. Smith.

173. *Schistocerca flavofasciata* (De Geer).

Acrydium flavofasciatum DE GEER, Mém. Ins., III, p. 488, pl. XL, fig. 8 (1773).

For additional synonymy see Scudder or Kirby.

Habitat.—This species is quite widely distributed in the tropical portions of South America. Only four specimens happen to be contained in the present collection. They come from Chapada, near Cuyaba, Matto Grosso, and Para, Brazil. The former were taken in April and the latter during May (H. H. Smith).

174. *Schistocerca idonea* Scudder.

Schistocerca idonea SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 444, 461 (1899).

Habitat.—The collection before me contains a single male and two females. They were taken at Chapada, near Cuyaba, Matto Grosso, Brazil, during the months of May and August by H. H. Smith.

These specimens are quite typical and come from the same region as did Scudder's types ("Crapada" which must certainly be a misprint for "Chapada").

175. *Schistocerca* sp.?

There are at hand five specimens, two males and three females, of another species of the genus. They do not quite fit any of the descriptions available, but appear to be related to *S. americana* Drury. They are, however, a little smaller and lack the infuscations of the costal margin of the tegmina.

Habitat.—Para, Brazil, during May (H. H. Smith).

176. *Schistocerca pallens* (Thunberg).

Gryllus pallens THUNBERG, Mém. Acad. Petersb., V, p. 237 (1815).

Acridium (*Schistocerca*) *pallens* STÅL, Recens. Orthopt., I, p. 66 (1873).

Schistocerca pallens BRUNNER ET REDTENBACKER, Proc. Zool. Soc. Lond., 1892, p. 210.

Habitat.—A series of thirteen specimens of this fine locust are before me. They bear the label "Chapada, Brazil," and were collected during the months of May to July inclusive by H. H. Smith.

177. *Schistocerca formosa* sp. nov.

This insect, as the name would imply, is a remarkably beautiful one in comparison with the various other species of the genus. In color it is bright olive-green, testaceous, red, purplish brown and white. It is also one of the largest representatives of the genus.

Head large and high, a little wider than the front edge of the pronotum, mandibles, clypeus, and labrum unusually large; eyes large, but not especially prominent, in the male nearly elliptical, but in the female with the front edge sub-straight; vertex rather broad, quite as wide (♂) or nearly equal (♂) to the shortest diameter of the eyes, the fastigium broad and coarse, quadrate, and shallowly sulcate; frontal costa broad and prominent, of nearly equal width throughout, broadly sulcate in the vicinity of the ocellus, coarsely punctate above. Antennæ just reaching (♀) or a very little surpassing (♂) the hind border of the pronotum, the basal joint large. Pronotum long, roundly tectate on anterior lobe, but more flattened behind; median carina coarse and prominent throughout. The sides not especially "pinched" so as to give the insect the strangulated appearance common to *S. paranensis*, *pergrina*, and *exsul*, surface profusely and coarsely punctulate; transverse sulci coarse, but not deeply impressed, the last situated a little behind the middle; hind margin broadly and roundly angulate even in the male, front margin broadly rounded. Tegmina of medium width, extending beyond the tip of abdomen in both sexes. Hind femora rather long and fairly heavy, nearly reaching the apex of abdomen in both the male and female. Front and middle femora only moderately robust in male. Last ventral segment of male abdomen deeply and narrowly notched. Prosternal spine long, coarse, and directed to the rear, its apex pointed and resting on the front edge of the mesosternum.

Head, pronotum, and pleura of meso- and meta-thorax pinkish

testaceous or dull salmon-colored broadly streaked with olive-green. The former with the frontal costa, lateral facial carinæ, and front edge of mandibles, a dash from the lower edge of eyes to lower hind angle of cheeks, the vertex and occiput on the latter divided by a forward projecting wedge of the salmon-color, olive-green. Pronotum with a broad slightly widening median, longitudinal light band, bordered on each side of disk by one of olive-green, and below this another light band followed by an oblique one of the green, the lower edge obliquely and rather broadly pale, a little lighter than the remaining light portions. Pleura with two oblique green bands between others of the salmon-color. Upper half of hind femora greenish, the lower half pale; hind tibiæ red, with black-tipped pale spines; middle and front femora greenish, the tibiæ and tarsi reddish. Under side of body pale testaceous, abdomen above with more or less of a greenish olive tinge. Tegmina with a broad pale dorsal band and a whitish costal one on basal half; disk brown with a pale longitudinal median streak, the bounding longitudinal veins of the discal area red. Wings somewhat infumated. Antennæ in the male red basally, darker apically, in the female lighter, reddish testaceous.

Length of body, ♂, 52 mm., ♀, 69 mm.; of antennæ, ♂, 16 mm., ♀, 19 mm.; of pronotum, ♂, 10.5 mm., ♀, 13 mm.; of tegmina, ♂, 49 mm., ♀, 63 mm.; of hind femora, ♂, 26 mm., ♀, 36 mm.

Habitat.—One male and one female, Cacagualito (1,500 ft.), Dept. Magdalena, Colombia, S. A., during the month of November. Types in Carnegie Museum.

This is by all odds the most attractive species of the genus which has thus far come to light, and differs so greatly from all the described forms that a knowledge of its haunts would be interesting. A smaller and somewhat similarly colored species occurs in the vicinity of São Paulo, Brazil. The latter is the insect which Rehn described as *Schistocerca gratissima* (*Proc. Acad. Nat. Sci. Philad.*, Feb., 1908, pp. 20-22, figs. 4, 5).

Genus ATRACHELACRIS Giglio-Tos.

Atrachelacris GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, no. 184 pp. 19-20 (1894).

The genus *Atrachelacris* is confined to southern Brazil and southward. Its representatives are unicolorous, green, and somewhat hirsute. They differ from the representatives of *Dichroplus*, their nearest ally, in the comparatively smaller head.

178. *Atrachelacris unicolor* Giglio-Tos.

Atrachelacris unicolor GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, no. 184, p. 21 (1894).

Habitat.—Paraguay and northern Argentina. Not represented in the H. H. Smith collection made in southwestern Brazil.

179. *Atrachelacris gramineus* sp. nov.

Very similar to *A. unicolor* Giglio-Tos in general appearance, but larger, more robust, and of a yellowish instead of olive-green color. Strongly hirsute throughout.

Head rather small, plainly narrower than the front edge of the pronotum, into which it is set almost to the eyes. Latter very little (σ^7) or not any (φ) longer than the anterior margin of the cheeks, separated above by a space a very little greater than the widest portion of the frontal costa, the fastigium depressed and very broadly and shallowly sulcate, most apparently so in the male, where this area is plainly bounded by lateral carinae, which are continuous with the sides of the costa; the latter moderately prominent, broad, and continuous to the clypeus, widest just above the ocellus, sulcate throughout, but most profoundly so below the ocellus; antennae somewhat exceeding the combined length of the head and pronotum. Pronotum strongly divergent caudad, its surface irregularly longitudinally rugose, the rugae inconspicuous, except when viewed with a magnifier, the hind lobe slightly longest; hind margin obtusangulate, the immediate apex rounded. Tegmina sparsely veined, the basal third coriaceous, remainder more or less membranous. Hind femora robust and coarse, the carinae prominent, very prominently hirsute; anterior and middle femora of male not greatly enlarged; hind tibiae eight- to nine-spined externally, heavy. Tip of male abdomen as in *unicolor*, but the cerci less robust at base and quite strongly incurved apically; last ventral segment noticeably longer, and with its apex more acuminate than in the type species.

General color pale yellowish green on head, pronotum, tegmina, pleura, hind femora above and externally, and tibiae; sides of abdomen, venter, lower edges and inner face of hind femora, and pectus greenish pale flavous. Antennae flavous, sometimes with a rufous tinge apically. Lunules of hind femora tinged with rufous. Tibial and tarsal claws, spines of hind tibiae, and tips of valves of ovipositor, black; eyes wax-yellow.

Length of body, ♂, 24 mm., ♀, 29–30 mm.; of pronotum, ♂, 5.75 mm., ♀, 7.35 mm., of tegmina, ♂, 19 mm., ♀, 25 mm.; of hind femora, ♂, 13.5 mm., ♀, 18 mm.

Habitat.—Southern portion of the province of Santa Fe, northern Buenos Aires, Entre Rios, etc., in Argentina.

Whether or not this form is sufficiently distinct to warrant the making of a separate species, I cannot say. Some of the differences mentioned in the description are quite important, but others are not. The larger size and more robust build of the temperate region form is an extraordinary feature, as compared with the smaller and less robust stature of the tropical form.

Genus *DICHOPLUS* Stål.

Dichroplus STÅL, Recens. Orthopt., I, p. 78 (1873).

“Many of the insects which comprise this extensive genus are very closely related to one another in their general appearance, and the comparatively few forms, which have thus far been noted by entomologists, have been so briefly described, that it is a little doubtful as to the identity of all of them. This is especially true when the student is limited in the material that is accessible for study. With comparatively few exceptions, the members of the genus are confined to regions south of the equator in South America, with Paraguay and northern Argentina as the center of their distribution. This being true, most of the species may be expected to occur in the country now under consideration. Specimens of at least seven distinct species are at hand.

180. *Dichroplus fuscus* (Thunberg).

Gryllus fuscus THUNBERG, Mém. Acad. Pétersb., V, p. 235 (1815).

Pezotettix (Trigonophymus) fuscus STÅL, Recens. Orthopt., I, p. 78 (1873).

Dichroplus fuscus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 21 (1894).

Habitat.—There are several specimens at hand, including both sexes. They were collected at Chapada, Brazil, during the months of May and July by H. H. Smith.

181. *Dichroplus gracilis* sp. nov.

Of about the size and general appearance of *D. punctulatus* Thunberg, but very distinct from that species in a number of its structural features. Sides of pronotum without the usual dusky bar, hind femora beneath and internally bright blood-red, fuscous bands reduced

to faint traces on upper edge. Vertex much wider than normal in members of the genus. Head and anterior lobe of the pronotum smooth, scarcely at all punctulate.

Head of moderate size, slightly wider than the anterior edge of the pronotum, the occiput well rounded and gently elevated above the plane of the pronotum; eyes not at all prominent, scarcely if any longer than the anterior edge of the cheeks, separated at the vertex by a space fully one and one-half times the width of the frontal costa between the antennæ; fastigium depressed, scarcely sulcate even anteriorly, the antero-lateral margins reaching as carinæ a trifle more than half way to the eyes; frontal costa fairly prominent between the antennæ where it is plane, coarsely punctulate, and about twice the width of the second antennal joint, at the ocellus a little contracted, below gently expanded, and somewhat sulcate to the base of the clypeus. Facial or lateral carinæ fairly prominent and about parallel. Antennæ moderately robust, the joints a little depressed on upper side, rather profusely and strongly pitted, somewhat longer than the head and pronotum combined. Pronotum a little contracted at middle, expanding posteriorly, the anterior middle rounded, the hind margin broadly angulate; median carina obliterated in front, present, but faint on the hind lobe, the two lobes about equal in length. Tegmina and wings fully developed, plainly surpassing both the femora and the apex of the abdomen, the discal field provided with a prominent intercalary vein. Hind femora fairly robust, or about normal, extending a little beyond the tip of the abdomen, the tibiæ strongly hirsute, nine-spined on the outer edge. Middle and anterior femora but little inflated. Interspace between the mesosternal lobes a little longer than wide; prosternal spine robust, somewhat compressed from the sides, and directed to the rear. Abdomen gently clavate, the last ventral segment triangular, about as long as its basal width, the apex entire, bluntly rounded; supra-anal plate broadly and roundly triangular, the lateral margins a little thickened and gently upturned, the disk widely and profoundly sulcate at base, where the marginal apophyses from the preceding segment project as short blunt protuberances within the sulcation. Cerci heavy at base, but suddenly narrowed beyond the basal fifth, directed backwards and upwards and gently bowed inwards, the apical third somewhat flattened and sulcate externally, the apex obliquely docked from above, total length nearly a third greater than that of the supra-anal plate.

General color wood-brown, irregularly marmorate with brunneo-testaceous; hind femora pallid externally, the upper margin irregularly flecked with brown, which shows a tendency to form two traces of transverse bars, discal borders alternately flavous and brunneous, the genicular lunules in nowise darkened; lower sulcus and internal face bright blood-red; hind tibiæ brunneous with a faint vinaceous tinge; the anterior and middle legs somewhat conspersed with brown. Antennæ pale ferruginous.

Length of body, ♂, 16.5 mm., of pronotum, 3.5 mm., of tegmina, 14 mm., of hind femora, 10 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, represented by a single male, the type, which was taken in April by H. H. Smith. Collection of the Carnegie Museum.

The wide vertex and scarcely sulcate fastigium of this insect are similar to these characters as found in the different species of *Leiolettix*, but other characters, as the form of the pronotum, etc., tend to place it with the species of *Dichroplus* instead. The nine spines in the outer row of the hind tibiæ and a faint longitudinal dark line on the hind coxæ would associate the present species with *fuscus* Thunberg and *exilis* Giglio-Tos, with closer relationship to the latter.

182. *Dichroplus arrogans* (Stål).

Acridium (*Podisma*) *arrogans* STÅL, Eugénies Resa, Orthopt., p. 333 (1860).

Pezolettix (*Dichroplus*) *arrogans* STÅL, Recens. Orthopt., I, p. 78 (1873).

Pezottix arrogans STÅL, Bihang. Svensk. Akad. Handl., V, no. 9, p. 6 (1878).

Dichroplus arrogans BRUNER, 2d Rept. Locust Com. B. Aires, pp. 72, 75, 76, figs. 36, 42 (1900).

Habitat.—This species is confined to Uruguay and middle Argentina. A specimen is at hand from Montevideo, where it was taken during December by H. H. Smith.

Dichroplus arrogans has a very similar appearance to that of the North American *Melanoplus atlantis* Riley and some of its near allies.

183. *Dichroplus punctulatus* (Thunberg).

Gryllus punctulatus THUNBERG, Mém. Acad. Pétersb., IX, p. 408 (1824).

Pezolettix (*Trigonophymus*) *punctulatus* STÅL, Recens. Orthopt., I, p. 77 (1873).

Pezolettix (*Dichroplus*) *punctulatus* STÅL, Obs. Orthopt., III, p. 6 (1878).

Dichroplus punctulatus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 21 (1894).

Acridium (*Podisma*) *fraternum* STÅL, Eugénies Resa, Orthopt., p. 333 (1860).

Cyrtacanthacris munda WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 612 (1870).

Habitat.—Specimens are before me from both Chapada and Santarem, Brazil. They were taken in April and September by H. H. Smith.

184. **Dichroplus brasiliensis** Bruner.

Dichroplus brasiliensis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 682 (1906).

Habitat.—Rio de Janeiro, Brazil, during the months of June to November inclusive (H. H. Smith).

185. **Dichroplus robustulus** (Stål).

Pezotettix robustulus STÅL, Obs. Orthopt., III, p. 7 (1878).

Dichroplus robustulus BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 679, 683 (1906).

Habitat.—Chapada, Brazil, where it was taken in March and November by H. H. Smith.

186. **Dichroplus olivaceus** sp. nov.

A medium-sized, but rather slender insect, reminding at first glance of *Atrachelacris unicolor* Giglio-Tos in color and general appearance, but possessing the characters in main of a *Dichroplus*. Head and pronotal characters similar to those of *D. gracilis* described in the present paper. Moderately hirsute throughout.

Head about as wide as the anterior edge of the pronotum, rather smooth, impunctate; the eyes of medium size, not prominent, no longer than the anterior margin of the cheeks below them, separated on the vertex by a space fully one-half wider than the greatest width of the frontal costa between the base of the antennæ; fastigium roundly depressed, very broadly and shallowly sulcate, decidedly wider than long, the antero-lateral carinæ arcuate and almost reaching the eyes; frontal costa prominent, almost twice as broad between the antennæ as the diameter of the basal joint of the latter, a little narrower at and below the ocellus, broadly, but not deeply, sulcate throughout, continued to the clypeus; facial carinæ parallel. Antennæ filiform (incomplete). Pronotum impunctate, gently expanded on the hind lobe, the median carina faint, present only on the hind lobe, the two lobes nearly equal in length, the hind margin slightly obtusangulate, the immediate apex rounded. Tegmina and wings somewhat surpassing the tip of hind femora and apex of abdomen, sparsely veined and membranous beyond the basal one-fourth, the discal field provided with a well defined intercalary vein. Anterior and middle femora only gently inflated, the hind femora about normal.

their apex extending a little beyond the tip of the abdomen. Hind tibiae eight-spined externally. Interspace between the mesosternal lobes decidedly longer than wide, and scarcely over half the width of the lobes themselves. Prosternal spine rather coarse and of considerable length, acuminate, directed gently caudad. Tip of abdomen gently clavate, the last ventral segment a little broader than long, the apex very broadly and roundly emarginate at middle. Supra-anal plate about as long as broad at base, the sides somewhat sinuose and rounded, with the edge a little thickened and upturned, the apex a little, but widely, produced, the middle longitudinally sulcate, for the most part narrowly, at the base a little wider, and receiving the small marginal apophyses of the preceding segment. Cerci as described for *D. gracilis*, but a little heavier.

General color dull olive-green, irregularly marmorate with flavous. Sides of head back of eyes and sides of pronotum without traces of the usual fuscous bar. Lunules of hind femora and hind tarsi stained with ferruginous, lower sulcus and inner face of former flavous.

Length of body, ♂, 21 mm., of pronotum, 4.85 mm., of tegmina, 17 mm., of hind femora, 12 mm.

Habitat.—Chapada, Brazil, in April. A single male (H. H. Smith). Collection of the Carnegie Museum.

Genus LEIOTETTIX Bruner.

Leiotettix BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 643, 684 (1906).

The species of the genus *Leiotettix* are medium-sized locusts, which are related to both *Dichroplus* and *Scotussa*. They are found chiefly in Brazil and Paraguay, where they frequent grassy fields.

187. *Leiotettix viridis* Bruner.

Leiotettix viridis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 685 (1906).

Habitat.—Specimens of this insect are before me bearing locality labels of both Chapada and Rio de Janeiro, Brazil. They were taken during the months of May, July, August, and October.

188. *Leiotettix sanguineus* Bruner.

Leiotettix sanguineus BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 685, 687 (1906).

Habitat.—Chapada, Brazil (H. H. Smith).

Genus PARASCOPAS Bruner.

Parascopas BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 643, 689 (1906).

Scopas GIGLIO-TOS (*nec* Bonaparte), Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 29 (1894).

189. *Parascopas chapadensis* Rehn.

Parascopas chapadensis REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 159-162, figs. 38, 39 (1909).

Habitat.—Chapada, Brazil, in April (H. H. Smith).

190. *Parascopas obesus* (Giglio-Tos).

Scopas obesus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 29 (1894).

Parascopas obesus BRUNER, Proc. U. S. Nat. Mus., XXX, p. 689 (1906).

Habitat.—Corumba, Brazil, in March (H. H. Smith).

A third species, *P. sanguineus* Bruner, has been added to this genus (*Ent. News*, XXI, pp. 306-307, 1910). It comes from Puerto Bertoni, Paraguay, which is in the same general region.

Genus EUROTETIX Bruner.

Eurotettix BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 643, 691 (1906).

The representatives of the present genus seem to be confined in their distribution to a rather limited region embraced in Paraguay, northern Argentina, and southern Brazil. Like the majority of the other Melanopline locusts they are grasshoppers, *i. e.*, they are most frequently found in open grassy localities. The two previously known forms, together with a third now described, are readily separable by the annexed synoptic table:

SYNOPSIS OF THE SPECIES OF EUROTETIX.

- A. Larger (♂, 18.5-19 mm.). Hind tibiæ vinaceous, the lower sulcus of hind femora flavous with a pinkish tint internally near base. *robustus* sp. nov.
- AA. Smaller (♂, 11-15 mm.). Hind tibiæ purple or lavender, lower sulcus purple, or scarlet.
- b. Hind femora very robust, without indications of dusky bands across their upper edge. The lower sulcus deep purple. *femoratus* Bruner.
- bb. Hind femora less robust, their upper edge with two dusky bands. The lower sulcus scarlet. *minor* Bruner.

191. *Eurotettix robustus* sp. nov.

A much larger and more robust insect than either of the previously described species, in which the tegmina of the female overlap on the dorsum. Hind femora robust, the tibiæ vinaceous. While the general color of this insect is ferruginous, there is a faint tinge of olivaceous in the male above and on the anterior and middle femora.

Head inserted into pronotum almost to the eyes and about as wide, the occiput rounding and gently elevated above the plane of the pro-

notum; vertex as wide as the broadest portion of the frontal costa (♂) or about one-fourth wider (♀), the fastigium comparatively large and broadly, but shallowly, sulcate, roundly depressed, provided with a faint transverse carina where it meets the frontal costa. Latter flat and punctulate above, sulcate at the ocellus and below, about reaching the clypeus, of nearly equal width. Antennæ filiform, slender, almost as long as the hind femora. Pronotum expanding behind, the hind margin subangulate, the transverse sulci fairly prominent, especially the posterior, which is straight and situated plainly behind the middle; median carina visible only on the smooth hind lobe. Tegmina lobate, nearly as broad as long, in the female slightly overlapping on the dorsum, in the male not quite touching. Hind femora large and robust, in both sexes reaching beyond the tip of the abdomen by nearly the length of the knees. Hind tibiæ also rather robust and eight-spined externally. Tip of male abdomen not enlarged, the last ventral segment short, its upper or outer margin meeting in a slightly acute angle; supra-anal plate small, plain, triangular, its sides gently curved, the median base provided with a small sulcus; cerci rather long and slender, but little tapering apically, curved gently inward and to the rear. Mesosternal lobes separated by a space a little longer than wide. Prosternal spine of moderate size, acuminate. Valves of ovipositor comparatively small and slender—of normal form among the *Melanopli*.

General color above brunneo-ferruginous, profusely and irregularly mottled with fuscous; below flavous. Sides of head and upper half of sides of pronotum provided with well defined darker bands, most prominent in the male, face, cheeks below the eyes, and lower portion of lateral lobes of pronotum of latter sex pale flavous, as are also dashes on the pleura in advance of the base of the hind femora. Inner face of hind femora infuscated, the upper edge and genicular area also more or less strongly fuscous, in the male each femur is provided a little before its middle above with a well defined fuscous patch; lower edge flavous, in the female with a pinkish tinge basally and next to the inner edge.

Length of body, ♂, 18.5 mm., ♀, 24 mm.; of pronotum, ♂, 5 mm., ♀, 6.5 mm.; of tegmina, ♂, 3.25 mm., ♀, 5.5 mm.; of hind femora, ♂, 11 mm., ♀, 15 mm.

Habitat.—Several specimens comprising both sexes are before me coming from Chapada, near Cuyaba, Matto Grosso, Brazil, where

they were taken in April (H. H. Smith). Types in the Carnegie Museum.

Genus *CHLORUS* Giglio-Tos.

Chlorus GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XIII, no. 311, p. 50 (1898).

This is another brachypterous genus of locusts of the group *Melanopli*, the representatives of which are, for the most part, confined to southern Brazil, Paraguay, and northern Argentina. At least four species are known, including the one now described.

192. *Chlorus brunneus* sp. nov.

Quite closely related to both *C. borellii* Giglio-Tos and *C. vittatus* Bruner in size and form, but differing from both of them by almost entirely lacking any green tints in its coloration. About the size of and having the pattern of its markings similar to those of *vittatus*. At once recognized by the pale greenish-yellow hind tibiae and the heavy longitudinal dusky marking on the outer disk of the hind femora; inner disk on apical half also black or very strongly infuscated. Lower sulcus and basal half of inner face deep blood-red, remaining portions flavo-ferruginous, irregularly conspersed above with fuscous, the genicular portion also strongly infuscated. Occiput and dorsum of pronotum infuscated and bordered on each side by the usual ferrugineo-testaceous bands. Cheeks below the eyes, lower half of lateral lobes of pronotum and pleural bands in advance of the middle and hind coxae, testaceous. Abdomen brunneo-testaceous, above conspersed with brown flecks, and at sides marked near base with rather large patches of piceous. Antennae pallid.

Length of body, ♀, 27 mm., of pronotum, 6.5 mm., of tegmina, 5.5 mm., of hind femora, 16 mm.

Habitat.—Corumba, Brazil, March, two females (H. H. Smith). In the Carnegie Museum.

Genus *PARADICHROPLUS* Brunner v. Wattenwyl.

Paradichroplus BRUNNER v. WATTENWYL, Ann. Mus. Genova, XXXIII, p. 145 (1893).

The genus *Paradichroplus* of Brunner is represented in South America by several species. These insects are, for the most part, confined to Paraguay and southern Brazil. The following table will aid in their separation:

SYNOPSIS OF THE SOUTH AMERICAN SPECIES OF *PARADICHRPLUS*.

- A. Hind tibiæ provided with nine spines in the outer row.
- b. General color yellowish, the dorsum of the pronotum and abdomen dusky.
Head black..... *bilobus* Giglio-Tos.
- bb. General color greenish olivaceous, the dorsum of the pronotum and abdomen light. Head concolorous..... *brunneri* Giglio-Tos.
- AA. Hind tibiæ provided with eight spines in the outer row.
- b. Hind tibiæ of the normal form, their lateral edges not expanded and acute.
- c. Larger (♀, 22-25 mm.). Moderately robust, the head large. General color ferruginous, the abdomen with four or six basal segments twice spotted at middle with black.... *bipunctatus* Giglio-Tos.
- cc. Smaller (♀, 18-21 mm.). Rather slender, the head normal. Color variable.
- d. Color testaceo-ferruginous. Hind tibiæ orange-red; internal and external disk of hind femora infuscated or obscure.
rubripes sp. nov.
- dd. Color more or less olivaceous. Hind tibiæ greenish; internal and external disk of hind femora not especially infuscated.
- e. Genicular area of hind femora with black lunules.
fusiformis Giglio-Tos.
- ee. Genicular area of hind femora pale ferruginous, without the dark lunules..... *geniculatus* sp. nov.
- bb. Hind tibiæ expanded apically and with the lateral edges acute.
aberrans Giglio-Tos.

193. *Paradichroplus rubripes* sp. nov.

Very similar in general form to *P. geniculatus*, but noticeably larger. General color testaceo-ferruginous, the hind femora internally rather strongly infuscated, externally in the female strongly tinged with olivaceous; the tibiæ orange-red.

Head of moderate size, about the width of the anterior edge of the pronotum; eyes a little prominent, oval (♀), a little longer than the front edge of the cheeks below them, subglobular (♂), nearly twice the length of the anterior edge of the cheeks. Vertex as in *geniculatus*, the frontal costa rather wide and broadly sulcate, more or less punctured above the ocellus, in both sexes ending above the base of the clypeus. Antennæ slender, filiform, quite noticeably longer than head and pronotum together. Pronotum expanding posteriorly, viewed laterally tumid anteriorly; transverse sulci quite prominent, hind lobe closely and minutely punctulate, the median carina faint, most apparent on the posterior portion; hind margin gently and broadly emarginate. Tegmina minute, narrow, lateral, a very little surpassing the hind margin of the first abdominal segment. Hind

femora of moderate robustness, reaching a little beyond the apex of the abdomen in both sexes; tibiæ provided externally with eight spines. Supra-anal plate triangular, the middle sulcate at base; cerci of male long, slender, gently incurved apically; last ventral segment short, narrowing, entire at apex. Prosternal spine pyramidal, of moderate size.

General color testaceo-ferrugineous with some fuscous mottlings on head, pronotum, and legs, much darkest in the male. Hind femora infuscated internally, tinged with olivaceous on the outer disk; the genicular lunules black. Hind tibiæ pale orange-red; antennæ of males testaceous, of females reddish becoming infuscated apically.

Length of body, ♂, 16 mm., ♀, 21 mm.; of pronotum, ♂, 3.1 mm., ♀, 4.1 mm.; of tegmina, ♂, 2.3 mm., ♀, 3 mm.; of hind femora, ♂, 9.5 mm., ♀, 12 mm.

Habitat.—The types, ♂ and ♀, together with a paratypical ♀ come from Corumba, Brazil, where they were taken during March by H. H. Smith. These insects are deposited in the Carnegie Museum.

194. *Paradichroplus geniculatus* sp. nov.

Most closely related to *P. fusiformis* Giglio-Tos, but differing from that species by having the knees of hind femora uniformly pale ferruginous, while the legs themselves are pale greenish olive. Abdomen of male strongly tinged with orange.

Size small, form rather slender. Entire insect sparsely hirsute. Head of medium size, about as wide as the front edge of the pronotum, the front gently oblique; eyes fairly large, but not prominent, in the female very little, in the male about one-fourth, longer than the anterior margin of the cheeks immediately below them, vertex a little wider than (♀), or not quite as wide (♂) as the basal antennal joint; the fastigium strongly depressed, in the male deeply, in the female shallowly, sulcate. Frontal costa prominent and profoundly sulcate throughout, slightly widest above the ocellus, in the female not quite reaching the clypeus. Lateral or facial carinæ prominent, straight, but little divergent below. Antennæ filiform, slender, somewhat exceeding the combined length of head and pronotum. Pronotum smooth, moderately divergent, without traces of lateral carinæ and with the faint median carina showing only on the hind lobe; transverse sulci prominent; anterior margin broadly rounded upon the occiput, the posterior margin very widely shallowly and roundly emarginate.

Tegmina minute, lateral, narrow, in both sexes reaching slightly past the hind margin of the first abdominal segment. Hind femora robust, in the female reaching, and in the male extending beyond, the apex of the abdomen by the length of the genicular portion; the hind tibiæ with eight spines externally. Abdomen carinated above, gently tapering, in the male not enlarged apically, the last ventral segment short, the apex entire; supra-anal plate triangular, sulcate at middle basally, the lateral edges somewhat margined; marginal apophyses small, inflated; cerci long and slender, the apical half curved inwards so that their points meet at the apex of the supra-anal plate. Prosternal spine rather robust, quadrate, pyramidal.

General color of female above rusty olivaceous, in the male inclining to dark brown on occiput and meso- and meta-thorax, with the abdomen of latter strongly tinged with reddish orange; cheeks behind lower margin of eyes and lower half of sides of pronotum together with pleura, pallid, bordered above by a piceous band in the males, but obliterated in the females, sides of basal segments of latter black-maculate. Underside pale testaceous, femora and tibiæ of all the legs chiefly greenish olive, the knees of hind pair and all the tarsi strongly tinged with pale ferruginous. Antennæ bright ferruginous to rufous.

Length of body, ♂, 14 mm., ♀, 18 mm.; of pronotum, ♂, 3 mm., ♀, 3.5 mm.; of hind femora, ♂, 8.75 mm., ♀, 9.5 mm.; of tegmina, ♂ and ♀, 2.5 mm.

Habitat.—Chapada, Brazil. Several specimens of both sexes, including immature individuals, collected during April by H. H. Smith. The types are in the collection of the Carnegie Museum.

195. *Paradichroplus fusiformis* Giglio-Tos.

Paradichroplus fusiformis GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, XII, no. 302 p. 35 (1897).

Habitat.—Corumba and Chapada, Brazil, during March and April (H. H. Smith).

Genus OSMILIA Stål.

Osmilia STÅL, Recens. Orthopt., I, p. 68 (1873).

The genus *Osmilia* is made up of a number of closely related tropical American species, which are quite difficult to separate, especially in the case of the forms described by the earlier authors. At least four of the nine species listed by Kirby in his *Catalogue of Orthoptera* belong to Brazil.

196. *Osmilia violacea* (Thunberg).

Gryllus violaceus THUNBERG, Mém. Acad. Pétersb., IX, pp. 396, 413 (1824).

Acridium (Osmilia) violacea STÅL, Recens. Orthopt., I, p. 68 (1873).

Osmilia violacea GIGLIO-TOS, Boll. Mus. Zool. Anat. Torino, IX, no. 184, p. 18 (1894).

Habitat.—Numerous specimens of this species are before me as I write. They were taken at Para, Santarem, Corumba, Rio de Janeiro, Chapada, and other Brazilian localities. The dates of capture include the months of April to December inclusive (H. H. Smith).

Genus RHYTIDOCROTA Stål.

Rhytidochrota STÅL, Recens. Orthopt., I, pp. 35, 54 (1873).

197. *Rhytidochrota lævifrons* Stål.

Rhytidochrota lævifrons STÅL, Bihang, Svensk. Akad. Handl., V, no. 4, p. 78 (1878).

Habitat.—Two males and a single female, Para, Brazil, in April (H. H. Smith).

198. *Rhytidochrota turgida* Stål?

Rhytidochrota turgida STÅL, Recens. Orthopt., I, p. 54 (1873).

Habitat.—A single female specimen from Para, Brazil, is referred to this species with some hesitation. It, like the preceding, was collected during the month of April by H. H. Smith.

Genus PSILOSCIRTUS gen. nov.

There is still another of the numerous medium-sized apterous, or subapterous, South American locusts at hand, which cannot be made to fit any of the known genera. It is therefore my decision that hereafter it shall be designated as *Psiloscirtus olivaceus*. The present genus comes closest to *Rhachicreagra* Rehn, but differs from that insect in a number of respects. It also bears resemblance to *Rhytidochrota* Stål, as may be seen by a reference to the following diagnosis.

Body sparsely hirsute throughout, apterous, very coarsely punctulate and rugulose on head, thorax, and first abdominal segment. Head of moderate size, the vertex very narrow, linearly sulcate, the fastigium depressed, also longitudinally and narrowly sulcate, not quite merging with the sulcation of the frontal costa. Latter rather prominent between the antennæ, punctulate, fading below the ocellus. Eyes large, prominent, their longest diameter nearly twice the length of the front margin of the cheeks. Face somewhat oblique. An-

tennæ filiform, as long as the hind femora, composed of about twenty joints, which beyond the immediate basal ones are rather evenly, strongly, and profusely pitted. Pronotum subcylindrical, the posterior lobe being gently dilated, a little less than half as long as the anterior one, and straight behind; median carina wanting. Hind femora about two-fifths longer than the abdomen, moderately robust, the upper and lower carinæ serrate, the genicular lobes not acute. Hind tibiæ seven-spined externally and nine-spined internally. Tip of male abdomen upturned, the last ventral segment short, tapering, its outer margin entire. Supra-anal plate elongate-triangular, the lateral edges upturned and sinuate, the apex bluntly rounded, the middle roundly elevated and longitudinally faintly sulcate. Cerci rather broad at base, somewhat flattened, gently tapering to middle, where they give off a backwardly directed tooth, turn inward, and again fork, the inner branch being the larger and longer. Mesosternal lobes separated by a quadrate space a little narrower than the lobes themselves. Prosternal spine with a heavy base, but short and small.

199. *Psiloscirtus olivaceus* sp. nov.

General color olivaceous. On the head and thorax above tinged with ferruginous; on the femora and beneath with flavous. Genicular lunules of hind femora and surroundings strongly infuscated. Auditory apparatus large, nearly circular.

Eyes pale castaneous with a metallic lustre in certain lights. All three transverse sulci of pronotum continuous, fairly deep; the posterior one about one-fourth the length of the disk from the hind margin. Latter very gently, but widely, emarginate. Lower edges of pronotum, cheeks back of eyes, and pleura concolorous, without paler or darker markings. Anterior and middle femora only moderately inflated. Hind tibiæ and tarsi rather profusely hirsute.

Length of body, ♂, 14.5 mm., of pronotum, 3 mm., of hind femora 10.25 mm.

Habitat.—Benevides, Brazil, in July, a single male (H. H. Smith). This insect is in the Carnegie Museum.

Genus *EUSITALCES* gen. nov.

At first glance reminding one of a *Sitalces* Stål, but upon a closer examination showing a nearer relationship to *Rhachicreagra* Rehn. From the last named genus it differs in having but six spines on the outer

carina of the hind tibiæ, instead of eight, in the more prominent and less depressed fastigium of the vertex, the blunter and shorter prosternal spine, and in having much larger and broader tegmina.

The type of this genus is the following described species which is represented by a single male from Bartica, Demarara, British Guiana. It was taken during late March or early April by Mr. R. J. Crew, and sent to the author, in whose collection it now is.

200. *Eusitalces vittatus* sp. nov.

Size rather small; antennæ long and coarse; body very dark brown or black, striped with yellow; the femora stout and chiefly ferruginous, becoming olivaceous apically, the knees infuscated; the tibiæ and tarsi greenish gray; face and venter yellowish.

Head moderately large, a little wider than the front edge of the pronotum, the occiput somewhat ascending above the plane of the pronotum; eyes large and prominent, subglobular, with a brassy tinge, separated above by a space scarcely more than one-half as great as the width of the frontal costa between the base of antennæ; fastigium of the vertex triangular, about as broad as long, the center provided with a fairly broad longitudinal median sulcus, which narrows posteriorly and continues to the front edge of the occiput; frontal costa prominent above the ocellus, a little narrowed immediately below, then again expanding and continuous to the clypeus, broadly and deeply sulcate, with coarse walls; viewed laterally the face is nearly straight; facial carinæ prominent, nearly parallel. Antennæ coarse, about as long as the hind femora, twenty-jointed. Pronotum without lateral carinæ, somewhat constricted laterally at the middle transverse sulcus, all three sulci profound, the median carina plain in front of anterior sulcus and prominent on the hind lobe; the latter considerably expanding posteriorly, front lobe sparsely punctate and somewhat transversely rugose, hind lobe closely and finely punctate; anterior edge of disk roundly emarginate, hind border angulately so, and with the edge slightly elevated in the emargination. Tegmina lobate, lateral, broadly oval, reaching nearly to the hind edge of the metathorax. Tympanum or auditory apparatus inconspicuous. Hind femora large, robust, extending beyond the apex of the abdomen nearly one-half of their length, the upper carina with faint serrations or tubercles, at the apex ending in a minute spine; terminal joint of hind tarsi equal to, or a little more than, the

first and second joints combined, the arolium large, transverse. Apex of male abdomen bluntly acuminate, short; supra-anal plate triangular, a little longer than basal width, sides somewhat elevated, apex rounded; cerci a little longer than plate, moderately heavy, directed backward and bent roundly inwards on apical half, forked, the lower prong longest and the slenderer of the two. Hind tibiæ and tarsi strongly hirsute. Prosternal spine short and weak, directed slightly to the front.

Cheeks, thorax, and basal half of abdomen blackish, a line on hind edges of eyes above, across occiput and continued as a lateral border to the disk of the pronotum, the upper portion of tegmina, across first and showing as dots on the two succeeding abdominal segments, the dorsal carina of abdomen, also a band across the cheeks, the lower portion of sides of pronotum and mesothorax, yellow. There are also two similarly colored spots on the metathorax above the coxæ of the hind femora. Antennæ at base testaceous, changing to ferruginous towards the middle, and apically infuscated. Tibial spines pale, black-tipped.

Length of body, ♂, 12 mm., of pronotum, 2.85 mm., of tegmina, 1.15 mm., of hind femora, 8.9 mm.

Genus EUJIVARUS gen. nov.

Resembling the members of the genus *Jivarus* in their general characteristics, but at once separable from them by the absence of the terminal spine on the outer margin of the hind tibiæ. Related to *Microtylopteryx* Rehn.

Insects medium or small in stature, fusiform or subfusiform, very coarsely, deeply, and somewhat closely punctulate throughout, but more especially so upon the pronotum and dorsum of meso- and metanotum. Tegmina very much abbreviated, lateral, lobiform, or spatulate, rather strongly veined near base and on the costal field, remainder simply sparsely but coarsely punctulate. Auditory apparatus minute. Pronotum without lateral carinæ, evenly expanding posteriorly, the median carina fairly prominent throughout, severed by all three transverse sulci, the last at least two-thirds of the distance towards the hind margin; latter somewhat emarginately truncate at middle. Abdomen of both sexes strongly and evenly tapering apically as in *Rhytidichrota*; the supra-anal plate elongate, triangular, with the sides gently bowed and somewhat thickened, ending at about one-third the distance from the apex, the latter projecting as a flat-

tened median smaller triangular process. Cerci heavy at base, on outer half suddenly contracted to a rather slender finger three times as long as thick, the apex acuminate. Prosternal spine large, broadly transverse, the apex either simple or bilobed. Interspace between the mesosternal lobes nearly or quite as long as wide, the inner margin of the lobes themselves rounded, the interspace narrowest caudad. Hind tibiae six- to eight-spined externally. Two species are at hand. They may be separated as follows:

SYNOPSIS OF THE SPECIES OF EUJIVARUS.

- A. Larger (♀, 14-16 mm. in length). Sides of pronotum nearly as strongly and closely punctulate as the disk. Hind femora without fuscous transverse bands..... *fusiformis* sp. nov.
- AA. Smaller (♀, 13 mm. in length). Sides of pronotum, especially in the black band glabrous and almost entirely free from puncturation. Hind femora obliquely banded externally and transversely above with fuscous.
meridionalis sp. nov.

The species *fusiformis* may be considered the type of the genus.

201. *Eujivarus fusiformis* sp. nov.

Size small. General shape fusiform, evenly tapering both cephalad and caudad from the base of the hind femora. Head small, a little narrower than the front edge of the pronotum, into which it sets almost or quite to the hind margin of the eyes. Latter prominent, in the female about one-third longer than, in the male nearly double, the anterior edge of the cheeks in length; vertex rather narrow, scarcely as wide (♂) or as wide (♀) as the diameter of the rather robust filiform antennæ, its posterior portion and anterior part of occiput longitudinally carinate; fastigium a little depressed, triangular, a trifle wider than long, in the middle widely and shallowly sulcate, the surface rather coarsely punctulate, separated from the upper portion of the frontal costa by a well-defined angle; front gently oblique, rather strongly punctulate, frontal costa prominent above between the antennæ, at the ocellus and below very much less prominent, sulcate and continuous to the base of the clypeus, its sides rather coarse and somewhat sinuose. Antennæ heavy, about as long as the head and pronotum together, seventeen-jointed, all but the two basal joints strongly pitted and hirsute. Terminal joints of palpi a very little flattened and squarely truncate at apex. Pronotum expanding posteriorly and evenly rounded above, without traces of lateral carinæ, the deflected lobes almost as closely and deeply punctulate as the

disk, except on a narrow area anteriorly back of the eyes; median carina present and equally prominent, cut back of the anterior two-thirds by the last sulcus; posterior border sinuose, broadly emarginate, anterior border subtruncate; lower lateral edges also sinuose, the hind angle broadly rounded. Tegmina small, lateral, very narrow at base, the anal edge straight and longitudinally veined; costal edge rather strongly lobate, without veins, but deeply punctured, the apex rounded. Pleura strongly punctured. Auditory apparatus inconspicuous, entirely covered by the apical half of the tegmina. Abdomen strongly carinated above throughout, as is also the metathorax. Hind femora robust, the upper and lower edges punctured; the disk glabrous, carinae smooth, not at all serrate. Hind tibiae six- to seven-spined externally. The strongly transverse prosternal protuberance faintly, or not at all, notched at middle.

General color of occiput, sides of head back of eyes, the pronotum, except narrowly at lower edges, dorsum of meso- and meta-thorax, pleura for most part, and abdomen basally, dark brown to black. Most of front, cheeks below the eyes, lower edges of sides of the pronotum, two patches on pleura in advance of the insertion of the middle and hind legs, and lower side of insect, flavous. Sides and apical portion of abdomen, anterior and middle legs, upper and lower edges of hind femora, largely testaceous. Immediate base and several patches beyond internally of latter and the upper half of external disk varied with black or fuscous, the lower half of disk tinged with gray. Hind tibiae dull vinaceous red. Anterior and middle tibiae and tarsi, and sometimes the femora, fasciate and maculate with black. Antennae infuscated.

Length of body, ♀, 14 mm., of pronotum, 3.65 mm., of tegmina, 2.8 mm., of hind femora, 9 mm.

Habitat.—Chapada, near Cuyaba, Matto Grosso, Brazil, May to November (H. H. Smith). Type in the Carnegie Museum.

Several specimens are at hand in addition to the type. Two of these latter were collected during April and differ from the other in being of a much paler color dorsally and in having more fuscous on the hind femora. They do not, however, differ sufficiently to warrant describing them as distinct.

202. *Eujivarus meridionalis* sp. nov.

Smaller and more robust than *E. fusiformis*. The head fully as broad as the anterior edge of the pronotum; front less oblique than

in that species and the frontal costa but little produced between the antennæ. Eyes large and prominent, fully twice the length of the anterior edge of the cheeks below them, separated above by a space a little narrower than the diameter of the antennæ (♀) or by one almost linear (♂). Occiput heavily carinated longitudinally; the vertex as in *fusiformis*. Antennæ robust, about two-thirds (♀) or four-fifths (♂) as long as the head and pronotum combined. Pronotum with a glabrous area on upper portion of lateral lobes bordered above by a subcarina, which would take the place of lateral carinæ were these actually present. Tegmina more broadly expanded apically than in *fusiformis*, reaching hind margin of first abdominal segment, their dorsal edge pallid and irregularly rugose rather than veined, bowed both upwards and inwards apically; the disk shining black and strongly and irregularly punctulate. Basal abdominal segment plainly longitudinally ridged on dorsum between the tegmina and the medio-dorsal carina, the latter prominent and continuous with that of the occiput and thorax. Hind femora rather short and robust, a little surpassing the apex of the abdomen in the female, fully one-third of their length in the male. Outer margin of hind tibiæ eight-spined. Prosternal spine strongly transverse and bituberculate at apex.

General color-pattern as in the preceding species, but inclining to brown instead of testaceous. Hind femora plainly bifasciate transversely on upper edge, and obliquely on outer face, upper basal third with a conspicuous grayish brown patch. Anterior and middle legs pallid, more or less mottled and fasciate with fuscous; hind tibiæ as in *fusiformis*.

Length of body, ♂, 10 mm., ♀, 13 mm.; of pronotum, ♂, 2.5 mm., ♀, 3.25 mm.; of tegmina, ♂, 1.85 mm., ♀, 2 mm.; of hind femora, ♂, 6.5 mm., ♀, 7.65 mm.

Habitat.—Pernambuco, May (L. Bruner). Types in the author's collection.

Genus PYCNOSARCUS Bolivar.

Pycnosarcus BOLIVAR, Bol. Soc. Españ., VI, p. 392 (1906).

Polysarcus SAUSSURE (*nec* FIEBER), Rev. Zool., Ser. 2, XI, p. 392 (1859).

203. *Pycnosarcus atavus* (Saussure).

Polysarcus atavus SAUSSURE, Rev. Zool., Ser. 2, XI, p. 393 (1859).

Pycnosarcus atavus BOLIVAR, Bol. Soc. Españ., VI, p. 392 (1906).

Habitat.—Rio de Janeiro, Brazil. Three nymphs, one male, and five females, taken in October by H. H. Smith.

II. ON THE SPECIES OF HASEMANIA, HYPHESOBRYCON, AND HEMIGRAMMUS COLLECTED BY J. D. HASEMAN FOR THE CARNEGIE MUSEUM.¹

By MARION DURBIN ELLIS.

(Plates I-III.)

Genus HASEMANIA gen. nov.²

(Type, *Hasemania melanura* spec. nov.)

A Tetragonopterid, with two rows of premaxillary teeth, the maxillary without teeth, or with a few teeth in its upper angle, the lateral line incomplete, the caudal naked. No adipose fin. Like *Hyphessobrycon*, but without an adipose. Pectoral frequently archaic in small specimens.

a. Maxillary equal to the eye, with two small tricuspid teeth. Premaxillary teeth narrow, tricuspid, or conical. Snout sharp; interorbital narrow, less than the eye, 4 in the head. D. 11; A. 19; scales 7-32-5 or 6.

maxillaris sp. nov.

aa. Maxillary less than the eye, elliptical, without teeth. Teeth in the inner row of the premaxillary with more than three points. Interorbital 3, or less, in the head.

b. Snout short and blunt. Dentary with four or five five- or six-pointed teeth. A distinct blackish caudal spot extending to the tips of the middle caudal rays. D. 11; A. 16 to 18; scales 6-33 to 36-5. . . *melanura* sp. nov.

bb. Dentary with three broad, chisel-shaped, eight- or nine-pointed teeth. No distinct caudal spot; a heavy black lateral stripe; another black stripe along the under side of the caudal peduncle, extending to the base of the last anal ray, and continued in a straight line to just above the first anal ray. D. 11; A. 14 to 17; scales 5-33 or 34-4. . . . *bilineata* sp. nov.

1. *Hasemania maxillaris* sp. nov.

Plate I, fig. 1.

Type unique. 29 mm. C. M. No. 2937. Porto União, Rio Iguassú.

Head 3; depth 3; D. 11; A. 19; scales 7-32-5 or 6. Eye 3 in the head; interorbital less than the eye, about 4 in the head. Compressed,

¹ Contributions from the Zoölogical Laboratory of Indiana University, under the direction of C. H. Eigenmann. No. 115.

² For Mr. John D. Haseman, who collected all of the specimens of this genus thus far known.

depth of head at the base of the occipital process 1.2 in the greatest depth. Preventral region rounded. Predorsal region rounded, without a regular series of median scales. Occipital process a little more than 5 in the distance from its base to the dorsal. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal, and two-thirds as long as the parietal without the occipital groove. Second suborbital with a wide naked margin behind and below. Snout pointed, rather short, mouth large. Maxillary equal to the eye. Mandible longer than the eye, 2.4 in the head. Premaxillary with five tricuspid and conical teeth in the inner row, and three conical teeth in the outer row. Maxillary with two conical teeth. Dentary with five or six tricuspid teeth, followed by three to six very small conical teeth on the sides. Gill-rakers 6 + 9. Scales cycloid, striæ crooked, more numerous near the sides of the free margin of the scale, variable in number (18 +). Caudal naked. No anal sheath extending over the rays of the fin, but a series, or part of a series, of small scales along the base of the anal. Lateral line with pores developed on about six scales. Origin of the dorsal the length of the eye nearer to the caudal than to the snout, its longest ray about 4.5 in the length. Caudal probably about 1.33 in the head. Origin of the anal on the vertical from the ninth dorsal ray. Anal truncate. Ventrals on the vertical from the first dorsal ray, very short, just reaching the second scale in front of the anal. Pectorals archaic. Adipose lacking. No humeral spot, a faint caudal spot, not continued on the rays. Lateral stripe very faint. Dorsal, caudal, and ventrals uniformly dusky; distal half of anal dusky. All the scales, excepting those in the preventral region, outlined with dusky; much darker along the back. Silvery except along the back.

2. *Hasemanía melanura* sp. nov.

Plate I, fig. 2.

Type, one specimen, 35 mm. C. M. No. 3002. Porto União, Rio Iguassú.

Cotypes, forty-nine specimens, 25 to 44 mm. C. M. No. 3003. Porto União, Rio Iguassú.

Head 3.2 to 3.7; depth 2.6 to 2.8; D. 11; A. 16 to 18; scales 6-33 to 36-5; eye rather small, 3 in the head; interorbital equal to, or greater than, the eye, 2.8 to 3 in the head. Compressed, depth of head at the base of the occipital process 1.6 in the greatest depth.

Predorsal region rounded, with, or without, a complete series of eleven median scales. Occipital process short, about 6 in the distance from its base to the dorsal, bordered by two or three scales. Frontal fontanel an almost equilateral triangle, narrower than the parietal fontanel, and 1.6 in the parietal without the occipital groove. Second suborbital leaving a naked margin behind and below. Snout short and moderately blunt, less than the eye, 4 in the head. Maxillary shorter than the eye, equal to the length of the snout, elliptical in outline, the front and back not parallel. Mandible equal to the eye. Premaxillary with four or five five- to seven-pointed teeth in the inner row, and three three-pointed teeth in the outer row. Maxillary without teeth. Dentary with a graduated series of four or five five- or six-pointed teeth, followed by four or five minute teeth on the sides. Gill-rakers 6 + 8. Anal sheath very short. Lateral line with pores developed on seven or eight scales. Origin of the dorsal half the length of the eye nearer to the caudal than to the snout. Longest dorsal ray 4.7 in the length. Origin of the anal on the vertical from the third or fourth scale behind the dorsal; anal truncate, the longest ray equal to the length of the base. Caudal shorter than the head, 4 in the length. Ventrals on the vertical from the first dorsal ray, very small, reaching the third or fourth scale in front of the anal. Pectorals normal, but small, reaching the third to fifth scale in front of the ventrals. No humeral spot. Lateral stripe narrow, lead-gray, extending from the humeral region to the triangular caudal spot. Caudal spot narrowed abruptly behind and continued to the tips of the middle caudal rays. Dorsal, anal, ventrals, and pectorals unmarked, but somewhat dusky. Scales silvery below the lateral line.

3. *Hasemania bilineata* sp. nov.

Plate I, fig. 3.

Type, one specimen, 41 mm. C. M. No 3004. Alto da Serra, São Paulo, in a creek.

Cotypes, four specimens, 38 to 20 mm. C. M. No. 2938. Mogy das Cruzes.

Cotypes, four specimens, 16 to 14 mm. C. M. No. 2939. Mogy das Cruzes.

Head 3.5; depth 2.8 to 3; D. 11; A. 14 to 17; scales 5-33 or 34-4. Eye 2.5 to 3 in the head; interorbital equal to the eye. Compressed, depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without complete series of median

scales. Predorsal region rounded, with a regular series of about eleven scales. Occipital process short, 6 or more in the distance from its base to the dorsal. Interorbital almost flat. Frontal fontanel truncate, not so wide as the parietal, three-fourths as long as the parietal without the occipital groove. Second suborbital with narrow naked margin behind and below. Maxillary less than the eye, 3.6 in the head. Mandible equal to the eye. Premaxillary with four seven-pointed teeth in the inner row, and one conical or tricuspid tooth representing the outer series. Maxillary without teeth. Dentary with three broad, chisel-shaped teeth with eight or nine points. Gill-rakers 8 + 11. Scales cycloid. Probably no interpolated scales or rows of scales. Anal sheath very short or lacking. Lateral line with pores on the first three to six scales. Origin of the dorsal equidistant from the snout and caudal, the longest ray 3.8 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal rounded, the longest ray equal to the base. Ventrals on the vertical from the third or fourth scale in front of the dorsal. Ventrals reaching to the third or fourth scale in front of the anal. Pectorals (of fishes over 16 mm. in length) normal in form, and reaching the fourth or fifth scale in front of the ventrals. Pectorals of specimens of less than 16 mm. in length archaic. Adipose lacking. No true humeral or caudal spots. A heavy black lateral stripe from the caudal peduncle to the head, much fainter over the region of the body-cavity. An almost straight black line from the caudal along the under side of the caudal peduncle to a point just above the origin of the anal. Last four scales of the back black. Fins all unmarked. Scales above the lateral stripe heavily outlined with dusky.

Genus HYPHESSOBRYCON Durbin.

4. *HypheSSobrycon taurocephalus* sp. nov.

Plate I, fig. 4.*

Type, 55 mm. C. M. No. 3007. Serrinha Paraná, Rio Iguassú.

Cotypes, thirty-two specimens, 39 to 55 mm. C. M. No. 3008. Serrinha Paraná, Rio Iguassú.

Cotypes, twenty-two specimens, 30 to 45 mm. C. M. No. 3009. Porto União, Rio Iguassú.

* The figure is incorrect, in that it does not show the pygiform, which is located vertically above the posterior extremity of the insertion of the anal.—Editor.

Cotypes, thirteen specimens, 27 to 36 mm. C. M. No. 3010. Porto União, Rio Iguassú.

Head 3.8-4; depth 3; D. 11; A. 14 to 16; scales 5 or 6-32 to 36-4 to 5. Eye 3 to 3.25; interorbital much wider than the eye, 2.2 in the head. Little compressed, depth of the head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded. Occipital process a little more than 4 in the distance from its base to the dorsal, bordered by two or three scales. Frontal fontanel triangular, as wide as the parietal, two-thirds as long as the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. *Maxillary margin very convex, the proximal third much constricted, very short, 1.5 in the eye or nearly 5 in the head; mandible also short, equal to the eye, about 3 in the head.* Mouth moderately large; *snout very short*, equal to the maxillary. Premaxillary with three three- to five-pointed teeth in the outer row, and five broad five- to seven-pointed teeth in the inner row; the last of the inner series is often much reduced. *Maxillary without teeth.* Dentary with graduated series of four or five five- to seven-pointed teeth, followed by one or two small notched teeth on the sides. Gill-rakers 7 + 10. Anal sheath rudimentary. Lateral line with pores developed on five to nine scales. Origin of the dorsal the length of the eye nearer to the caudal than to the snout, the longest ray 4.6 in the length. Caudal equal to the head. Origin of the anal on the vertical from the second or third scale behind the dorsal. Anal emarginate; the longest rays almost equal to the *anal base, which about equals the head without the preopercle.* Anal armature developed on the first six or seven rays. Ventrals on the vertical from the first or second scale in front of the dorsal; reaching the first, second, or third scale, in front of the anal. Pectorals reaching the second, or third scales, in front of the ventrals. *Humeral spot lacking. Caudal spot sharply constricted behind, and continued to the end of the middle caudal rays, continued forward as a heavy lateral stripe, which often reaches the upper angle of the preopercle.* The lateral stripe overlaid with dull silvery. Dorsal, caudal, pectorals, and first five anal rays, dusky. Scales of the back outlined with dusky. Bluish irridescent on the sides over and below the lateral stripe.

5. *Hyphessobrycon parvellus* sp. nov.

Plate II, fig. 1.

Type, 30 mm. C. M. No. 3011. Alagoinhas, Rio Catú.

Cotypes, three specimens, 20 to 22 mm. C. M. No. 3012. Alagoinhas, Rio Catú.

Cotype, one specimen, 22 mm. C. M. No. 3013. No label.

Cotypes, seven specimens, 13 to 19 mm. C. M. No. 2932. Quicimadas, Rio Itapicuriú.

Cotype, 1 specimen, 17 mm. C. M. No. 3014. Aqua Quente.

Cotype, one specimen, 18 mm. C. M. No. 2930. Ribeirão, Azula Lagôa.

Cotype, one specimen, 12 mm. C. M. No. 2931. Rio Tieté.

Head 3.5; depth 2.75; D. 11; A. 20 or 21; scales 5-32 to 34-3 to 4. Eye 2.3 in the head; interorbital less than the eye, about 2.7 in the head. Compressed, depth of head at the base of the occipital process 1.25 in the greatest depth. Occipital process bordered by two and a half scales. Interorbital convex. Frontal fontanel triangular, very small. Second suborbital leaving a narrow naked margin behind and below. Mouth rather small; snout very short, about 1.66 in the eye. Maxillary less than the eye, 2.6 in the head. Mandible equal to the eye. Premaxillary with three or four narrow, conical teeth in the outer row, and five or six tricuspid teeth in the inner row. Maxillary with, or without, one small, conical tooth. Dentary with a graduated series of four tricuspid teeth followed by three conical teeth on the side. Gill-rakers 11 + 9, short and strong. Anal sheath composed of six scales covering the base of the first ten rays. Lateral line with pores developed on the first six to eight scales. Origin of the dorsal equidistant from the snout and the caudal. Longest dorsal ray 3.5 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the last dorsal ray. Anal usually emarginate. Ventrals on the vertical from the first scale in front of the dorsal; ventrals just reaching the anal. Pectorals just reaching the ventrals. No humeral spot. Caudal spot either diffused or condensed. Lateral stripe narrow, faint, overlaid with silvery. Anal often with a dark margin. *Longest anal and dorsal rays tipped with white.* Sides, exclusive of the region over body cavity, with numerous chromatophores.

6. *Hyphessobrycon reticulatus* sp. nov.

Plate II, fig. 2.

Type, 48 mm. C. M. No. 3018. Campos.

Cotype, one specimen, 49 mm. C. M. No. 3010. Morretes.

Cotypes, seven specimens, 40 to 43 mm. C. M. No. 3020. Muniz Freire.

Cotype, one specimen, 45 mm. C. M. No. 3021. Mogy das Cruzes, Rio Tieté.

Cotypes, eight specimens, 20 to 46 mm. C. M. No. 3022. Iguapé, in fresh water near the sea. Five specimens, 15 to 18 mm. (without caudal), have archaic pectorals.

Cotype, one specimen, 26 mm. C. M. No. 2946. Cacequy.

Cotype, one specimen, 30 mm. C. M. No. 3586. Rio Doce, May 26, 1908.

Head 3.5-3.7; depth 2.5 or 2.6; D. 11; A. 18 to 21; scales 6 to 7-31 to 34-4 to 5 eye 2.7 to 3 in the head. Interorbital a little more than the eye, 2.2 in the head. Compressed, depth of the head at base of the occipital process 1.5 in the greatest depth. Peventral region rounded, without complete median series of scales. Predorsal region usually with a regular series of eleven to fourteen median scales. Occipital process 6 in the distance from its base to the dorsal, bordered by two scales. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal, and three-fourths as long as the parietal without the occipital groove. *Second suborbital in contact with the preopercle below and behind.* Maxillary equal to the eye, mandible a little longer than the eye, 2.1 in the head. Mouth large, snout very short. Premaxillary with three to five tricuspid teeth in the outer row, and five three- to five-pointed teeth in the inner row. *Maxillary rarely without teeth, usually with one small three- to five-pointed tooth.* Dentary with a graduated series of four or five three- to five-pointed teeth, followed by one or two small tricuspid teeth and five or six very minute conical teeth on the side. Gill-rakers 7 + 9. Anal sheath of about nine scales covering the bases of the first ten rays. Lateral line with pores developed on the first five to seven rays. Origin of the dorsal the length of the eye nearer to the caudal than to the snout, penultimate ray 2.5 in the longest, which is 4.25 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the seventh or eighth dorsal rays. *Base of anal convex.* Anal subtruncate or only slightly emarginate, the longest ray 1.5 in the base. Ventrals on the vertical from the fourth scale in front of the dorsal. Ventrals just reaching the anal. Pectorals little more than just reaching the ventrals. *Humeral spot intense black, round, but with faint vertical elongations, sometimes surrounded, more often followed, by a light area.* *Caudal spot* irregular, more intense on the fin than on the caudal peduncle, *never extending as far as half-way to the end of the middle caudal rays.* A narrow but intense lateral stripe in the region above the anal, fading out just before it joins the caudal spot and just in front of the vertical from the dorsal.

A dark line along the base of the anal. Fins all dusky, especially the anal and lower lobe of the caudal. Scales all clearly outlined with brownish. Cheeks and back thickly peppered with brown chromatophores.

7. *Hyphessobrycon duragenys* sp. nov.

Plate II, fig. 3.

Type, 68 mm. C. M. No. 3023. Mogy das Cruzes, Rio Tieté.

Cotypes, five specimens, 45 to 53 mm. C. M. No. 3024. Mogy das Cruzes.

Cotypes, nine specimens, 28 to 43 mm. C. M. No. 3025. Jacarehy.

Head 3.25-3.7; depth 2.5; D. 10 to 12; A. 16 to 18; scales 5 or 6-32 to 36-4 to 5. *Eye small, 3.0 to 3.5 in the head; interorbital wider than the length of the eye, 2.8 to 3.2 in the head. Compressed, depth of the head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, usually without complete series of median scales. Occipital process about 5 in the distance from its base to the dorsal, bordered by three or four scales. Interorbital only slightly convex. Frontal fontanel triangular, as wide as the parietal, and one-half to three-fourths as long as the parietal without the occipital groove. Second suborbital usually in contact with the preopercle. Third suborbital about one-half as wide as the eye. Mouth moderately large; snout short; maxillary equal to the eye; mandible longer than the eye, 2.5 to 3 in the head. Pre-maxillary with three or four tricuspid teeth in the outer row and a graduated series of five three- to five-pointed teeth in the inner row. Maxillary with one tricuspid tooth. Dentary with a graduated series of four five-pointed teeth, followed by three or four narrow, conical teeth on the sides. Gill-rakers 8 + 10. Anal sheath short, of about five scales, covering the base of the first seven rays. Lateral line with pores developed on nine to twelve scales. Origin of the dorsal a little more than one-half the eye nearer to the caudal than to the snout; penultimate ray one-half the longest, which is 3.5 to 4 in the length. Caudal not as long as the head. Origin of the anal on the vertical from the first or second scale behind the dorsal. Anal obliquely truncate, the longest ray 1.33 in the base. Ventrals on the vertical from the third scale in front of the dorsal. Ventrals reaching the second or third scale in front of the anal. Pectorals reaching the first or second scale in front of the ventrals. Humeral spot narrow and vertically elongate. Caudal spot intensely black, tapering forward into the lateral stripe, more*

suddenly constricted behind and continued to the end of the middle caudal rays. Lateral stripe overlaid with silvery. Distal third of the anal more or less dusky. Scales of the back dusky. Scales of the sides, especially below the lateral stripe, with a silvery blue iridescence.

One specimen 73 mm., Rio das Velhas (C. M. Cat. No. 3076a) differed from typical specimens as follows: Depth 3.2. Maxillary with three small tricuspid teeth. Caudal spot and lateral stripe quite diffuse; humeral spot intense, and somewhat widened dorsally.

8. *Hyphessobrycon bifasciatus* sp. nov.

Plate II, fig. 4, ♂; Plate III, fig. 1, ♀.

Type, 44 mm. ♂, 37 mm. ♀. C. M. No. 3026. Campos.

Cotypes, thirty-five specimens, 29 to 44 mm. C. M. No. 3027. São João da Barra.

Cotypes, two specimens, 41 and 38 mm. C. M. No. 3028. Xiririca.

Cotype, one specimen, 40 mm. C. M. No. 3029. Porto Alegre.

Cotypes, two specimens, ♂, 35 mm.; and ♀, 47 mm. C. M. No. 3030. Morretes.

Cotypes, forty-two specimens, 26 to 46 mm. C. M. No. 2936. Muniz Freire.

Cotypes, thirteen specimens, 31 to 44 mm. C. M. No. 3032. Lagôa Feia, Tocas.

Cotypes, seventy-eight specimens, 29 to 47 mm. C. M. No. 3034. Campos.

Cotypes, twenty-seven specimens, 16 to 24 and 44 mm. C. M. No. 2935. Caquequy.

Head 3.8; depth 2.5; D. 11; A. 29-32; scales 6 or 7-33 to 36-5 or 6; eye 2.3 to 2.5 in the head. Interorbital almost equals the eye, 2.8 in the head. Compressed, depth of the head at the base of occipital process 1.67 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales. Occipital process about 5 in the distance from its base to the dorsal. Interorbital slightly convex; frontal fontanel triangular, as wide as the parietal and four-fifths as long as the parietal without the occipital groove. *Second suborbital leaving a naked margin, equal to half its own width, behind and below.* Maxillary not quite equal to the eye, a little more than 3 in the head. Mandible equal to the eye. Mouth moderate, snout .5 in the eye. Premaxillary with three or four narrow tricuspid or broadly conical teeth in the outer row, and four or five five- to seven-pointed teeth in the inner row. *Maxillary with one three- or five-pointed tooth of medium size.* Dentary with a weakly graduated series of four, sometimes five, five- to seven-pointed teeth, followed by two or three quite small teeth on the sides. Gill-rakers 6 + 10. Scales on the ventral half of the sides facing a little obliquely backwards

and downwards, especially in the region directly over the base of the anal, where they are often more or less crowded. *A small scale interpolated at the base of each anal ray.* The first eleven to thirteen of these interpolated scales larger, and extending upon the base of the rays so as to form a short anal sheath. Lateral line with pores on the first six to nine scales. Origin of the dorsal equidistant from the snout and caudal; penultimate ray about one-third of the longest—which is 3.33–3.67 in length. Caudal a little shorter than the head. Origin of the anal on the vertical from the eighth dorsal ray. *Anal of male somewhat rounded, the last ray one-half the longest which is almost twice the length of the eye.* Anal armature developed as a series of small recurved hooks on each of the first fifteen to twenty rays. Anal of the female emarginate, the longest ray 1.67 in the base; the last rays much shorter than in the males of equal size. *Ventrals* on the vertical from the first or second scale in front of the dorsal, *barely reaching the anal in females, but prolonged to the base of the seventh to tenth anal rays in males.* Pectorals just reaching the ventrals. *A vertically elongate humeral spot, followed by a bright bar, and a second dusky bar extending almost entirely across the sides.* *Seven to twelve black V-shaped lines, the angle toward the head, along the very faint silvery lateral stripe.* *No caudal spot.* Fins all somewhat dusky, except along the outside of the ventrals of the males and sometimes at the bases of the caudal and anal in females. Scales of the back and upper half of the sides outlined with dusky. The region over the anal with many large pale chromatophores. The very young specimens, sixteen to twenty-four millimeters long, from Cacequey, had all the markings very poorly developed, the chromatophores being more evenly distributed.

9. *HypheSSobrycon melanopleurus* sp. nov.

Plate III, fig. 2.

Type, 34 mm. C. M. No. 3035. Alto da Serra, São Paulo.

Cotypes, two specimens, 32 and 35 mm. C. M. No. 3036. Alto da Serra, São Paulo.

Head 3.8; depth 3.2 to 3.5; D. 10 or 11; A. 26 to 28; scales 6 or 7–30 to 36–5; eye 3 in the head; interorbital a little greater than the eye, 2.5 in the head. Compressed; depth of head at the base of the occipital process 1.3 in the greatest depth. Preventral and predorsal regions narrowly rounded, without complete series of median scales.

Occipital process short, about 8 in the distance from its base to the dorsal. Interorbital nearly flat; frontal fontanel narrowly triangular, as wide as the parietal and 1.5 in the parietal without the occipital groove. Maxillary a little less and mandible a little more than the eye. Snout very short, 1.8 in the head; mouth rather large. Pre-maxillary with four tricuspid teeth in the inner row and two or three slightly narrower teeth in the outer row; maxillary with four or five narrow tricuspid to conical teeth; dentary with a series of four strong tricuspid teeth, followed by about seven minute conical teeth on the side. Gill-rakers 6 + 9, each with a single row of very small retrorse spines. Lateral line with pores developed on seven to nine scales. Origin of the dorsal nearly the length of the eye nearer the caudal than to the snout; highest dorsal ray 1.3 in the head. Origin of the anal on the vertical from the third dorsal ray. Anal rather deeply emarginate; longest anal ray about 2 in the base of anal and about 1.7 in the head. Ventrals on the vertical from the fourth or fifth scale in front of the dorsal; short and weak, scarcely reaching the first long anal rays. Pectorals large, reaching beyond the middle of the ventrals. Ground-color light; a broad backish stripe from the eye to the end of the middle caudal rays, becoming fainter behind the adipose; a very faint vertical elongation of the lateral stripe in the region of the humeral spot. A faint, dusky, oblique stripe across the dorsal from the base of the first to the tips of the seventh and eighth rays. All of the fins a little dusky. Scales of the back heavily outlined with dusky, top of the head and lips quite dark. Sides and head silvery between the lateral stripes.

10. *Hyphessobrycon callistus* (Boulenger).

Four specimens, 31 to 39 mm. C. M. No. 3037. From vicinity of Corumbá.

Six specimens, 25 to 38 mm. C. M. No. 3038. Jaurú.

Eight specimens, 26 to 38 mm. C. M. No. 3039. Cáceres.

Fourteen specimens, 33 to 38 mm. C. M. No. 3040. Puerto Suarez.

11. *Hyphessobrycon santæ* (Eigenmann).

Six specimens, 33 to 42 mm. C. M. No. 3033. Sete Lagoas.

One specimen, 58 mm. C. M. No. 3034. Mogy das Cruzes.

12. *Hyphessobrycon anisitsi* (Eigenmann).

Thirty-six specimens, 30 to 45 mm. C. M. No. 3046. Miguel Calmoré, in a lake four miles from the town.

Twenty-one specimens, 21 to 44 mm. C. M. No. 3017. Jundaihy, São Paulo.

Seven specimens, 41 to 57 mm. C. M. No. 3015. Sapuçay.
 Two specimens, 53 to 55 mm. C. M. No. 3072. Aregua, Paraguay.
 Three specimens, 26 to 35 mm. C. M. No. 2947. Casequy.

13. *Hyphessobrycon lütkeni* (Boulenger).

Fifty-eight specimens, 25 to 69 mm. C. M. No. 3047. Campos.
 Sixty-six specimens, 31 to 69 mm. C. M. No. 3041. Porto Alegre.
 Eleven specimens, 40 to 54 mm. C. M. No. 3042. Lagôa Feia.
 Thirteen specimens, 38 to 48 mm. C. M. No. 3005. Muniz Freire.
 Six specimens, 40 to 48 mm. C. M. No. 2950. São João da Barra.
 Twelve hundred and fifty-one specimens, 19 to 60 mm. C. M. No. 2934. Jacarehy.
 Eleven specimens, 26 to 48 mm. C. M. No. 3006. Cacequy.
 Four specimens, 12 to 19 mm. C. M. No. 2933. Jacarehy.
 One specimen, 45 mm. C. M. No. 3073. Aregua, Paraguay.
 Two specimens, 41 to 51 mm. C. M. No. 3074. Sapuçay, Paraguay

14. *Hyphessobrycon heterorhabdus* (Ulrey).

Two specimens, 29 and 30 mm. C. M. No. 3004. Bragança.

15. *Hyphessobrycon rosaceus* Durbin.

Three specimens, 24 to 34 mm. C. M. No. 3078. Bastos.

16. *Hyphessobrycon stictus* Durbin.

Four specimens, 33 to 36 mm. C. M. No. 3079. Santarem.
 Two specimens, 36 to 40 mm. C. M. No. 3080. Manãos.

17. *Hyphessobrycon serpæ* Durbin.

Two specimens, 27 to 42 mm. C. M. No. 3086. Maciel, Rio Guaporé.
 One specimen, 23 mm. C. M. No. 3087. Caceres.

Genus HEMIGRAMMUS Gill.

18. *Hemigrammus marginatus* sp. nov.

Plate III, fig. 3.

Type, 38 mm. C. M. No. 3053. Queimadas, Rio Itapicurú.

Cotypes, twenty-two specimens, 13 to 39 mm. C. M. No. 3054. Queimadas, Rio Itapicurú.

Cotypes, three specimens, 23 to 29 mm. C. M. No. 3055. Boqueirão, near mouth of Rio Preto.

Cotypes, four specimens, 28 to 30 mm. C. M. No. 3056. Santa Rita.

Cotypes, three specimens, 29 to 33 mm. C. M. No. 3057. Lagôa da Porto.

Cotypes, six specimens, 26 to 38 mm. C. M. No. 3058. Jacobina, Rio Jacobina.

Cotypes, eighteen specimens, 33 to 38 mm. C. M. No. 3059. Pirapora.

Cotypes, forty-two specimens, 18 to 42 mm. C. M. No. 3060. Lagôa Pereira.

- Cotypes*, five specimens, 37 to 42 mm. C. M. No. 3061. Jaguará.
- Cotypes*, five specimens, 32 to 39 mm. C. M. No. 3062. Rio Paiaia.
- Cotypes*, eight specimens, 32 to 38 mm. C. M. No. 3063. Barreiras, Lagôas of Rio Grande.
- Cotypes*, six specimens, 22 to 38 mm. C. M. No. 3064. Sete Lagôas.
- Cotypes*, three specimens, 29 to 35 mm. C. M. No. 3065. Tinho, Rio Itapicurú.
- Cotype*, one specimen, 40 mm. C. M. No. 3082. Maciel, Rio Guaporé.
- Cotype*, one specimen, 28 mm. C. M. No. 3084. Mogy Mirim, a creek in São Paulo.
- Cotypes*, two specimens, 40 and 42 mm. C. M. No. 3584. Rio Zinga, Nov. 7, 1907.
- Cotypes*, nine specimens, 26 to 32 mm. C. M. No. 3066. Riberão, Azula Lagôa, 12 miles from Tieté.
- Cotype*, one specimen, 21 mm. C. M. No. 3067. Sapuçay.
- Cotype*, one specimen, 40 mm. C. M. No. 3077. Caceres.
- Cotype*, one specimen, 34 mm. C. M. No. 3083. Rio Itapicurú, six miles north of Bom Fim.

Head 3.6 to 3.8; depth 2.8 to 3.25; D. 11; A. 20 to 24; scales 5-29 to 34-3 to 4. Eye 2 in the head. Interorbital less than the eye, 2.75 in the head. Compressed; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales.

Occipital process 5 or 6 in the distance from its base to the dorsal; bordered by three scales. Interorbital slightly convex. Frontal fontanel triangular, almost as wide as the parietal, and as long as the parietal without the occipital groove. Second suborbital little more than half the eye in width, usually with narrow naked margins behind and below. Mouth large; snout little more than half the length of the eye. Maxillary slender, just, or not quite, equal to the eye, 2 to 2.3 in the head. Mandible equal to the eye. Premaxillary with three or four tricuspid teeth in the outer row, and four or five, rarely six, three- to five-pointed teeth in the inner row. Maxillary with two or three, less often four, three- to five-pointed teeth, the posterior one sometimes conical. Dentary with a graduated series of four or five three- to five- and seven-pointed teeth, followed by a series of seven to twelve minute, conical teeth on the sides. Gill-rakers 6 + 10. Caudal scaled over the basal one-half. Anal sheath short, consisting of about six scales over the bases of the first ten rays. Lateral line with pores developed on five to fourteen scales. Origin of the dorsal equidistant from the snout and caudal; penultimate ray short, one-fourth of the longest, which is 3.67 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal emarginate,

the longest ray 1.25 in the length of the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals just reaching the anal. Pectorals just, or not quite, reaching the ventrals. No humeral spot. Caudal spot faint or lacking. A heavy leaden, lateral stripe, often somewhat expanded near the end of the caudal peduncle, narrowed in the region just below the dorsal. Dorsal and anal somewhat dusky. A broad, black, marginal, or submarginal, band across the caudal lobes. When this band is submarginal, the middle caudal rays also are black. The base of the caudal lobes hyaline, probably orange or red in life. Scales of the back and sides above the lateral stripe outlined with dusky. Sides below the lateral stripe with pale bluish iridescence.

19. **Hemigrammus brevis** sp. nov.

Plate III, fig. 4.

Type, 35 mm. C. M. No. 3068. Barreiras. Lagôas of Rio Grande.

Cotypes, two specimens, 31 to 33 mm. C. M. No. 3069. Penedo, Rio São Francisco.

Cotypes, three specimens, 34 to 36 mm. C. M. No. 3070. Barreiras, Lagôas of Rio Grande.

Cotypes, thirty-three specimens, 20 to 27 mm. C. M. No. 3071. Boqueirão, near the mouth of Rio Preto.

Head 3.5; depth 2.6; D. 11; A. 20 to 22; scales 5-29 to 33-3 to 4. Eye 2 to 2.3 in the head; interorbital less than the eye, 2.7 in the head. Compressed; depth of head at the base of the occipital process about 1.6 in the greatest depth. Preventral and predorsal regions rounded. Occipital process about 5 in the distance from its base to the dorsal, bordered by two scales. Interorbital slightly convex. Frontal fontanel triangular, as wide as the parietal, and almost equal to the parietal without the occipital groove. *Second suborbital in contact with the preopercle*. Mouth large, snout short, little more than one-half the eye. Maxillary and mandible approximately equal to each other and to the eye. Premaxillary with three to five tricuspid teeth in the outer row; and five, rarely four, three- to five-pointed teeth in the inner row. Maxillary with one to three three- to five-pointed teeth. Dentary with a graduated series of five five-pointed teeth, followed by a series of seven to eleven minute tricuspid and conical teeth on the sides. Gill-rakers 10 + 9 with five minute spines behind the last two on the shorter limb. Caudal scaled over the basal one-half. Anal sheath short, composed of five scales covering

the bases of the first nine anal rays. Lateral line with pores developed on the first five to nine scales. Origin of the dorsal equidistant from the snout and the caudal; penultimate ray about one-fifth of the highest, which is 3.67 in the length. Caudal very little longer than the head. Origin of anal on the vertical from the last dorsal ray. Anal deeply emarginate, the longest ray 1.25 in the anal base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching the second to fourth anal ray. Pectorals reaching to the first scale in front of the ventrals or to the second scale behind the ventrals. No humeral spot. *Caudal spot not quite as wide as the caudal peduncle, but extending from the tips of the middle caudal rays to the vertical from one of the last five anal rays*, more diffuse at the anterior end. Lateral stripe very faint, heavily overlaid with silvery. Fins all a little dusky. Scales of the back outlined with dusky. Cheeks and sides below the lateral stripe with bluish iridescence.

20. **Hemigrammus levis** Durbin.

Two specimens, 31 to 38 mm. C. M. No. 3088. Santarem.

21. **Hemigrammus ulreyi** (Boulenger).

One specimen, 39 mm. C. M. No. 3048. From a slough near Petas, Bolivia.

Four specimens, 38 to 41 mm. C. M. No. 3049. Caceres.

Sixteen specimens, 35 to 44 mm. C. M. No. 3050. Jaurú.

Four specimens, 38 to 42 mm. C. M. No. 3051. Rio Santa Rita.

22. **Hemigrammus cœruleus** Durbin.

Three specimens, 49 to 58 mm. C. M. No. 3052. Manáos.

23. **Hemigrammus unilineatus** Gill.

Twenty-four specimens, 27 to 48 mm. C. M. No. 3043. Bragança.

Nine specimens, 31 to 38 mm. C. M. No. 3044. Maciel, Rio Guaporé.

24. **Hemigrammus rodwayi** Durbin.

Six specimens, 31 to 40 mm. C. M. No. 3045. Bragança.

One specimen?; 27 mm. C. M. No. 3049. Above Cachoeira, Rio Nova, Gagaz Piabana.

25. **Hemigrammus ocellifer** (Steindachner).

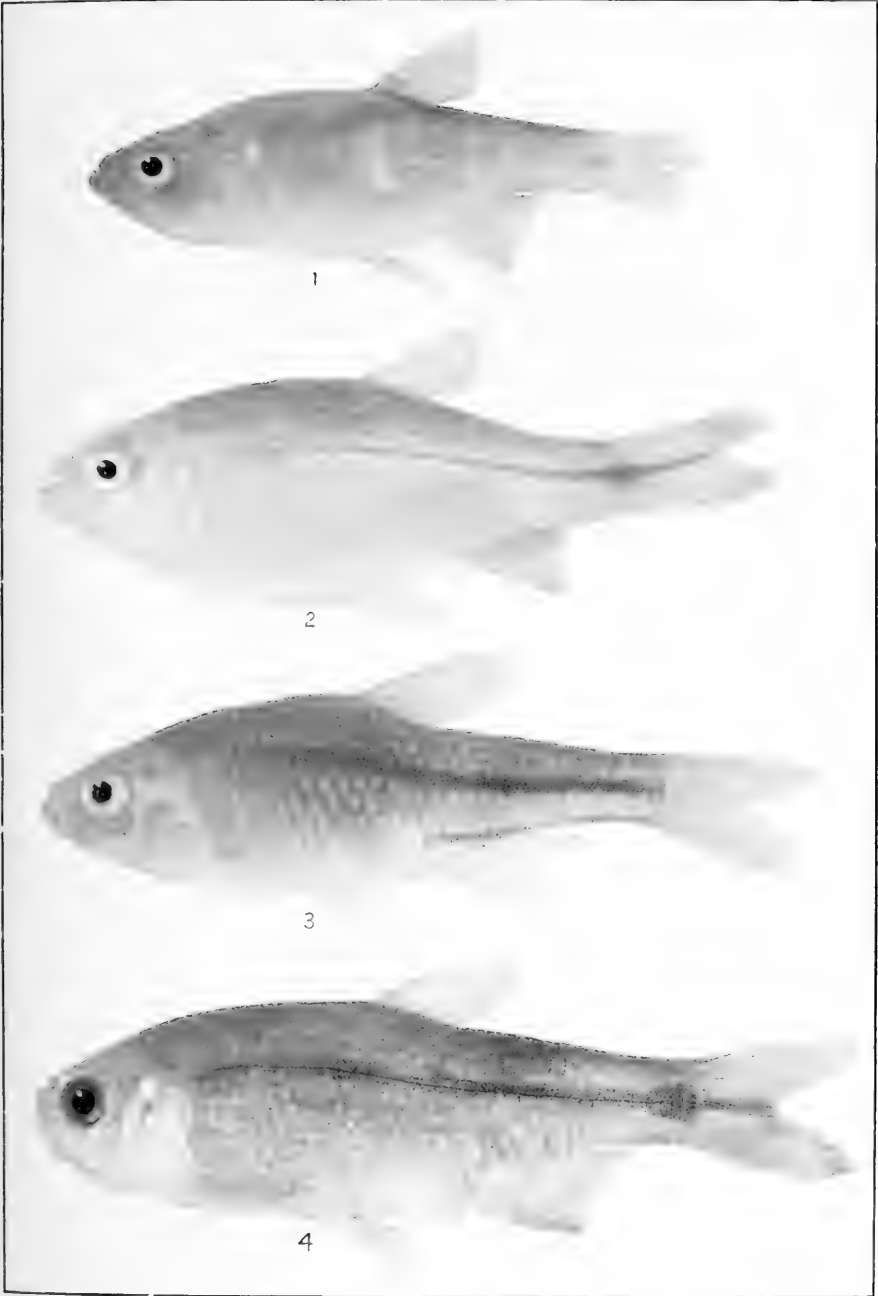
Eleven specimens, 31 to 40 mm. C. M. No. 3046. Bragança.

26. **Hemigrammus lunatus** Durbin.

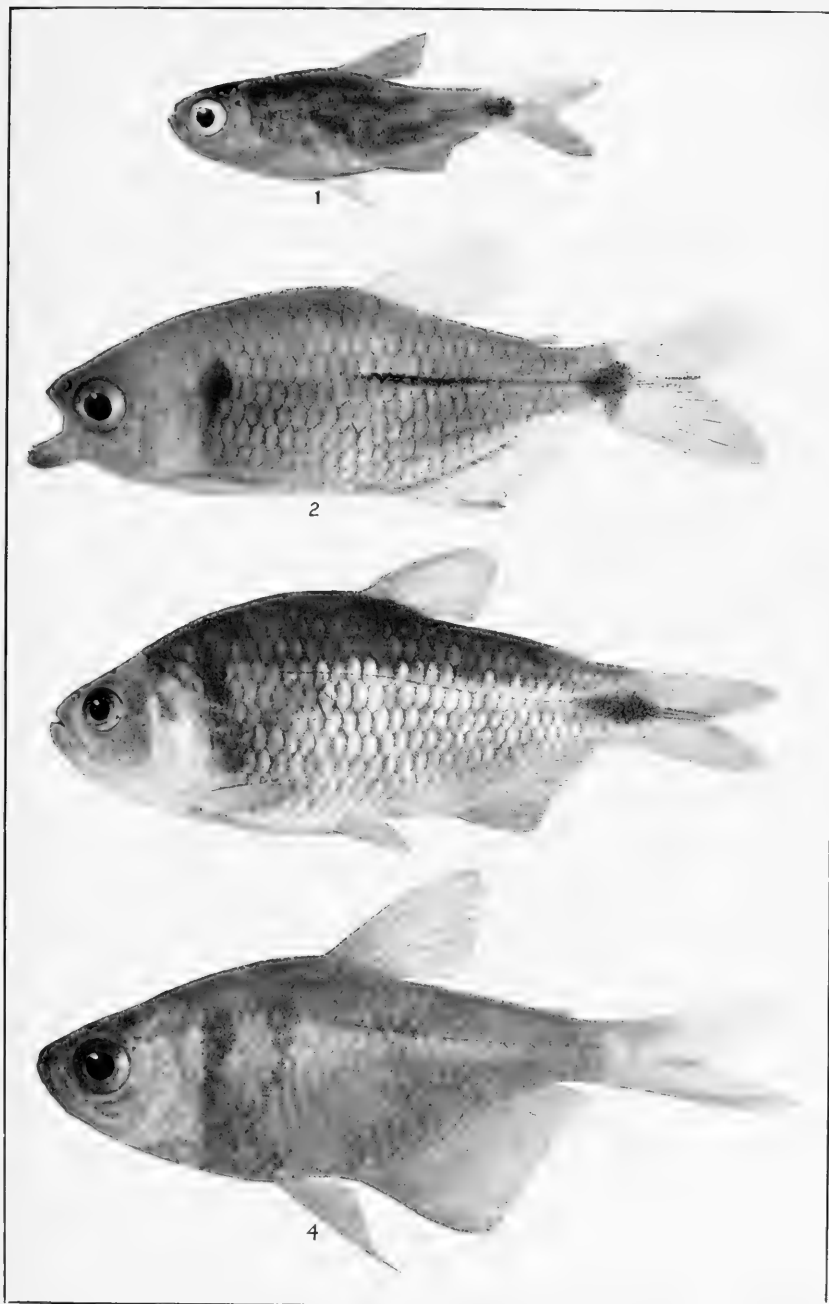
Five specimens, 24 to 45 mm. C. M. No. 3081. Caceres.

Two specimens, 46 and 48 mm. C. M. No. 2942. Jaurú.

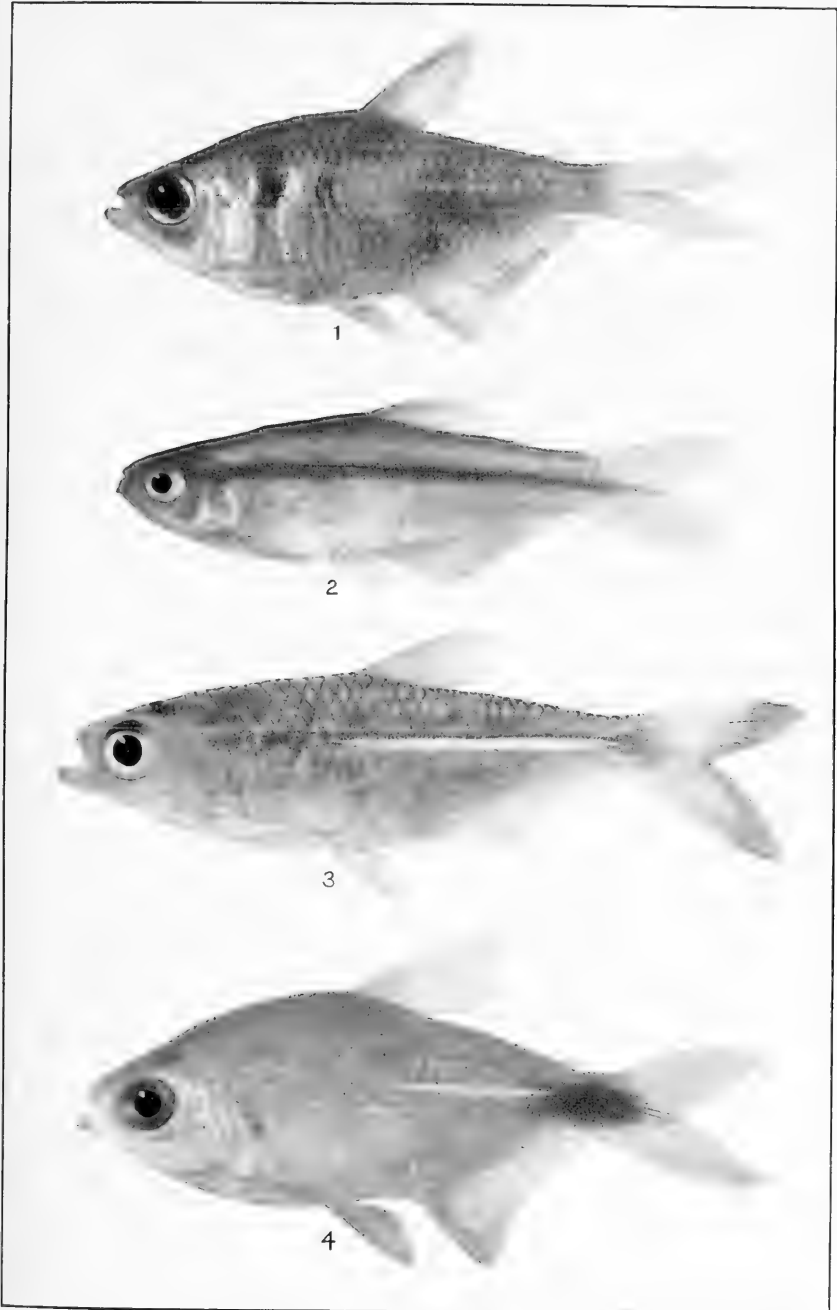
Two specimens, 45 and 48 mm. C. M. No. 2943. Rio Boa Ventura.



HASEMANIA AND HYPHESOBRYCON.



HYPHESOBRYCON.



HYPHESOBRYCON AND HEMIGRAMMUS.

27. **Hemigrammus schmardæ** Steindachner.

One specimen, 39 mm. C. M. No. 3085. Santarem.

28. **Hemigrammus microstomus** Durbin.

Seven specimens, 29 to 34 mm. C. M. No. 2944. Santarem.

29. **Hemigrammus orthus** Durbin.

Five specimens, 26 to 31 mm. C. M. No. 2945. Santarem.

30. (?) **Hemigrammus analis** Durbin.

One specimen, 30 mm. C. M. No. 3585. Santarem, Dec. 11, 1909, Haseman.

EXPLANATION OF PLATES.

PLATE I.

FIG. 1. *Hasemania maxillaris* Mrs. Ellis. (Type.) 29 mm. Carn. Mus. No. 2957.

FIG. 2. *Hasemania melanura* Mrs. Ellis. (Type.) 35 mm. Carn. Mus. No. 3002.

FIG. 3. *Hasemania bilineata* Mrs. Ellis. (Type.) 41 mm. Carn. Mus. No. 3004.

FIG. 4. *Hyphessobrycon taurocephalus* Mrs. Ellis. (Type.) 55 mm. Carn. Mus. No. 3007. (See footnote on p. 151.)

PLATE II.

FIG. 1. *Hyphessobrycon parvulus* Mrs. Ellis. (Cotype.) 29 mm. Carn. Mus. No. 2937.

FIG. 2. *Hyphessobrycon reticulatus* Mrs. Ellis. (Type.) 48 mm. Carn. Mus. No. 3018.

FIG. 3. *Hyphessobrycon duragenys* Mrs. Ellis. (Type.) 68 mm. Carn. Mus. No. 3023.

FIG. 4. *Hyphessobrycon bifasciatus* Mrs. Ellis. (Type.) ♂. 44 mm. Carn. Mus. No. 3026a.

PLATE III.

FIG. 1. *Hyphessobrycon bifasciatus* Mrs. Ellis. (Type.) ♀. 37 mm. Carn. Mus. No. 3026.

FIG. 2. *Hyphessobrycon melanopleurus* Mrs. Ellis. (Type.) ♀. 34 mm. Carn. Mus. No. 3035.

FIG. 3. *Hemigrammus marginatus* Mrs. Ellis. (Type.) 38 mm. Carn. Mus. No. 3053.

FIG. 4. *Hemigrammus brevis* Mrs. Ellis. (Type.) 35 mm. Carn. Mus. No. 3068.

III. NEW CHARACINS IN THE COLLECTION OF THE CARNEGIE MUSEUM.¹

By C. H. EIGENMANN.

(Plates IV-IX.)

The genera and species of characins described in the present paper were collected by Mr. John D. Haseman for the Carnegie Museum between November, 1907, and February, 1910, in various parts of eastern and southern Central South America. Descriptions of other new characins found by the same naturalist-explorer will be published in subsequent numbers of these ANNALS.

PROBOLODUS² gen. nov.

(Type *Probolodus heterostomus* sp. nov.)

A genus of Aphyocharacine fishes distinguished by its peculiar dentition.

Premaxillary with three teeth somewhat directed outward, each with three points in the angles of a nearly isosceles triangle, the middle point, which is also the anterior one, much heavier; maxillary with three to five teeth, the first two or three of which are directed outward; each ramus of the mandible with four large teeth, the first three directed outward, the fourth, and one or more smaller ones following it, directed upward; the larger teeth of the lower jaw heavy, conical, with a minute cusp on each side. Lateral line complete; caudal naked. Adipose well developed.

1. *Probolodus heterostomus* sp. nov.

Plate IV, fig. 1.

Type.—One specimen, 63 mm. C. M. No. 2973. Campos, June 13, 1908.

Cotypes.—Three specimens, 48 to 64 mm. C. M. No. 2974. Campos, June 13, 1908.

Cotypes.—Two specimens, 78 to 81 mm. C. M. No. 2975. Iporangu, Dec. 1, 1908.

Very similar in general appearance to *Astyanax fasciatus*.

¹ Contributions from the Zoölogical Laboratory of Indiana University, No. 122.

² Προβολή = a putting forward; ὀδός = a tooth.

Head 4-4.33; depth 2.66; D. 11; A. 26-28; scales 8 or 9-45 or 46-7 to ventrals; eye 3, interorbital 2.5, snout 3.5 in the head in the type, 2.5, 3.2, 3.5 respectively in the young. Dorsal and ventral outlines nearly equally curved, without distinct humps or depressions; ventral region rounded, the postventral area narrowly so. No regular series of median scales in front of the ventrals. Predorsal area narrowly rounded, with a regular median series of about twelve scales. Occipital process about five times in the distance from its base to



FIG. 1. Snout and lower jaw (mouth open) of *Probolodus heterostomus* Eigenmann, from above.

the dorsal, bordered by four or five scales on each side; interorbital rounded, the frontal fontanel little more than half as long as the parietal without the occipital groove. Snout sharp, the lower jaw entering the profile when the mouth is closed; a distinct angle between maxillary and premaxillary; maxillary not quite equal to length of eye; second suborbital leaving a naked border around its entire lower edge. Gill-rakers 6 + 12. Scales everywhere regularly imbricate except over the anal musculature; caudal naked, a weak anal sheath of one series of scales along the base of the anterior rays; each scale of the side, with several, maximum about eight, radial striæ; axillary scale of the ventrals well developed. Dorsal small, about 4 in the length; adipose well developed; caudal forked, the lobes 3.5-4 in the length; anal slightly emarginate, the highest ray reaching tip of thirteenth ray. Ventrals not quite reaching anal, pectorals to or a little beyond origin of ventrals. A large vertical humeral spot, chiefly above the 3d to the 5th scale of the lateral line; a silvery lateral band. A spot on caudal peduncle, in the younger ones definitely continued to the end of the middle rays.

*PSALIDODON*³ gen. nov.

(Type, *Psalidodon gymnodontus* sp. nov.)

No lips, the teeth exposed; dentary with six incisors, followed by four to six much smaller teeth in an incurving series. Premaxillary

³ Ψαλιδοδόν from ψαλίδιον, dim. of ψαλῖς = a pair of shears, and δδούς.

with a single series of five or six incisors, maxillary with three similar, but smaller, teeth. The incisors of both upper and lower jaws with a broad, sometimes nicked, central lobe, and a much smaller point on each side, the cutting edges forming a continuous curve. Caudal naked; lateral line complete; cheeks not entirely covered by the suborbitals.

This genus bears a close resemblance to *Henochilus*. I am not sure whether it is derived from *Henochilus* and has lost its inner premaxillary teeth, or whether *Henochilus* is in process of developing them.

2. *Psalidodon gymnodontus* sp. nov.

Plate IV, figs. 2-3.

Type.—One specimen, 189 mm. C. M. No. 3204. Porto União, Rio Iguassú. Dec. 27, 1908.

Cotypes.—Two specimens, 145 and 165 mm. C. M. No. 3205. Same place and date.

Head 4.25; depth 3.5 in the type, 2.8 in the specimen 145 mm. long; D. 11; A. 21; scales 6-36 to 39-4 or 5; eye equal to the snout, 3.5-3.75 in the length of the head; interorbital 3 or a little less; maxillary-premaxillary border 2.5 in the head. General shape varying greatly, elongate to deep, compressed. Ventral surface rounded, without median series of scales; predorsal area narrowly rounded, without regular median series of scales; about twelve series of scales in front of the dorsal. Occipital process a little less than 6 in the distance from the base to the dorsal, bordered by three scales on the side; head convex and smooth; fontanels narrow, the anterior about half as long as the posterior with the occipital groove; second sub-orbital leaving a naked area a little more than a fourth of its own width around its entire margin. Gill-rakers 5 + 13, slender and pointed, about two-fifths orbital diameter in length. Origin of dorsal about an orbital diameter nearer the snout than to the base of the middle caudal rays, its margin truncate, its first ray 5 or 6 in the length; caudal forked, its lobes 4-4.5 in the length; anal distinctly emarginate, its anterior rays 6-7.5 in the length; first anal ray nearly an orbital diameter behind the vertical from the last dorsal ray; ventrals reaching to anus, 7 in the length; pectorals not nearly reaching ventrals. Lateral line complete, somewhat decurved to above the end of the pectoral; scales regularly imbricate except over the anal, each with numerous divergent radial striæ; caudal naked; anal with

an inconspicuous sheath at the base of the anterior part. Silvery or plumbeous; an obscure, vertical humeral bar; a silvery lateral band; dorsal and margin of caudal and anal, in the two larger specimens, dusky.

The smallest of the three specimens differs notably. Its teeth have the central lobe longer, it is much deeper, which changes the ratios in general; it is plumbeous and more of the anal is dusky than in the other specimens.

SPINTHEROBOLUS⁴ gen. nov.

(Type, *Spintherobolus papilliferus* sp. nov.)

Teeth tricuspid, in a single series on dentary, premaxillary, and upper part of maxillary; no adipose fin; lateral line on one or two scales; caudal naked; anal very short, naked; tactile papillæ excessively developed.

3. *Spintherobolus papilliferus* sp. nov.

Plate V, figs. 1-4.

Type.—One specimen, 41 mm. C. M. No. 3582. Alto da Serra, São Paulo, Aug. 4, 1908.

Cotypes.—Four specimens, 25 to 39 mm. C. M. No. 2583. Same place and date.

Head 3.33; depth 3; D. 11; A. 12; scales 35, 13 between dorsal and ventral; eye 4.3, interorbital 3.5 in the head. Cyprinodontiform; profile sloping rapidly to above the ventrals; caudal peduncle a trifle less than half the greatest depth, length of the peduncle twice its height; predorsal area with thirteen scales; preventral area short, rounded, without a distinct median series of scales; occipital process about 6 in the distance from its base to the dorsal; frontal fontanel a very narrow slit; cheeks entirely naked; the suborbitals very narrow, concealed; mouth small, terminal; about six arrow-shaped teeth on the maxillary, seven similar, more distinctly three-lobed teeth on the premaxillary; eight similar teeth and two conical ones in each dentary; lateral line organs excessively developed about the head, each papilla orange. No gill-rakers. Origin of dorsal in middle of body, its highest ray 4.5 in the length; caudal lobes about 4 in the length; anal very short, its origin equidistant from preopercle and caudal; ventrals reaching to the anal, as long as the base of the latter; pectorals

⁴ Σπινθηρο-βόλος = emitting sparks.

reaching beyond the origin of the ventrals. Pores of lateral line on only two scales. Scales regularly imbricate, no interpolated rows; caudal and anal naked; axillary scale minute. Scales of sides outlined in dark, a dusky spot over the scales with developed pores.

GLANDULOCAUDA gen. nov.

(Type *Glandulocauda melanogenys* sp. nov.)

Allied to *Bryconamericus*, *Cælurichthys*, and *Hyphessobrycon*. Premaxillary with two distinct series of teeth. Four, rarely five, teeth in the inner series of the premaxillary; second preorbital covering the entire cheek; caudal naked, a few scales forming a flap on the base of the rays just above the middle of the fin; lateral line short; adipose fin present; origin of dorsal nearer middle caudal rays than to snout.

SPECIES OF GLANDULOCAUDA.

- c.* Much compressed, deep; depth of caudal peduncle greater than its length; origin of anal and dorsal about equidistant from snout.
- b.* A. 26; scales 8-40-7 or 8; teeth five-pointed; cheeks dark; lateral line with eleven to seventeen pores.....*melanogenys*.
- bb.* A. 27-33; scales 7-38-6; teeth three-pointed; cheeks silvery; lateral line with six or seven pores.....*inequalis*.
- aa.* Less compressed; depth of caudal peduncle less than its length; origin of dorsal in advance of that of the anal; A. about 20; depth 3.33; scales 5-33-5; lateral line with 5-7 pores.....*melanopleura*.

4. *Glandulocauda melanogenys* sp. nov.

Plate V, fig. 6.

Type.—One specimen, 49 mm. C. M. No. 3553. Alto da Serra, São Paulo, July 25, 1908.

Cotypes.—Twenty-one specimens, 29 to 51 mm. C. M. No. 3554. Same place and date.

Head 4; depth 2.75-3.33; D. 10; A. 26; scales 8-40-7 or 8; eye in adult 3 in head, equal to the interorbital. Compressed, deep in adult, more elongate in young; preventral area rounded, without a distinct median series of scales; predorsal area narrowly rounded, with about fifteen scales in a median series. Head smooth, rounded above; frontal fontanel considerably narrower and shorter than the parietal; second suborbital in contact with the preopercle along its entire lower margin, with a naked interspace behind; premaxillary-maxillary border, with a slight angle, 2.5 in the head; lower jaw

short, heavy, with a prominent chin, which is the most anterior part when the mouth is closed; premaxillary with an outer series of two or three teeth and an inner series of four; maxillary with three or four teeth; dentary with four large teeth and several minute, conical teeth on the side. Large teeth of the dentary, the maxillary teeth, and those of the inner series of the premaxillary *five*-pointed. Gill-rakers 6 + 9. Dorsal rounded, its origin variable, but always nearer the caudal than to the snout, its highest ray about 4.5 in the length; caudal short and broad, about 4 in the length; anal emarginate, its origin about midway between the base of the middle caudal rays and the middle of the eye; ventrals just reaching the anal, pectorals more or less beyond origin of the ventrals; caudal fulcra sometimes turgid. Scales regularly arranged; no anal sheath; a few scales forming a flap at the base of the rays just above the middle of the caudal. Lateral line developed in 11-17 pores. Cheeks and opercles profusely pigmented, except just behind the eye; a dark spot at origin of the lateral line, scapular process dark; a dark humeral band crossing the third to fifth scales of the lateral line; sides nearly evenly and profusely punctate; no caudal spot; anterior anal membranes sometimes black near the base; margin of caudal narrowly black.

5. *Glandulocauda inequalis* sp. nov.

Plate V, fig. 5.

Type.—One specimen, 40 mm. C. M. No. 3555. Porto Alegre, Jan. 19, 1909.

Cotypes.—Six specimens, 28 to 38 mm. C. M. No. 3556. Same place and date.

Head 4; depth 2.7-3; D. 10; A. 27-33; scales 7-38-6; eye 3 in the head, interorbital 2.5. Compressed, preventral and predorsal areas rounded; 15-18 scales in front of the dorsal; naked area of the cheek extending somewhat between the suborbital and the preopercle behind; premaxillary with an outer row of two or four teeth and an inner row of four to six, depending on the arrangement of the teeth toward the sides; four to six teeth in the maxillary; dentary with a large tooth at the symphysis, a smaller one next to it, this followed by the largest one, this by a recurved tooth, and this by several graduated teeth; all the teeth *three*-pointed. Lower caudal fulcra sometimes pungent spines. Pores developed on six or seven scales. Cheeks and opercle silvery, with few pigment cells; an obscure, dusky humeral band; outer halves of pectoral and ventrals dusky;

anal margin hyaline, followed by dusky, which fades toward the base of the fin; upper and lower margin of caudal dark. Otherwise this species is very similar to *melanogenys*.

6. *Gandulocauda melanopleura* sp. nov.

Plate V, fig. 7.

Type.—One specimen, 51 mm. C. M. No. 3557. Serinha Paran, Rio Iguass, Dec. 22, 1908.

Cotypes.—Five specimens, 35 to 44 mm. C. M. No. 3558. Same place and date.

Head 4; depth 3.33; D. 10; A. 19-20; scales 6-36-5; eye 3 in the head; interorbital 2.5. Little compressed, heavy forward. Preventral and predorsal areas rounded, the latter with about fifteen scales, of which the posterior half are in a median series, the anterior paired or irregularly in a median series; skull smooth; profile rounded; frontal fontanel nearly circular, the parietal about four times as long as the frontal; occipital process very short; second suborbital covering the entire cheek, except a narrow naked strip behind; snout blunt, maxillary-premaxillary border without an angle, 2.3 in the head. Premaxillary with a distinct outer series of three teeth and an inner series of four teeth; maxillary with three teeth; dentary with three strongly ridged large teeth, a smaller recurved one and several minute ones on the sides; teeth of inner series of premaxillary five-pointed, those of the outer series three-pointed. The dentary teeth are unusual, inasmuch as the three points are continued in ridges so distinct that the tooth has the appearance of being composed of a bundle of three teeth. Gill-rakers 7 + 9, the upper ones very short. Dorsal rounded, its origin about equidistant from the snout and the base of the middle caudal rays; adipose fin well developed; caudal short, the lobes a little over 4 in the length; anal short, scarcely emarginate; caudal peduncle longer than high; ventrals scarcely or not reaching anal; pectorals about to the ventrals. Scales in regular series, occasionally a very large scale. No anal sheath; a lobe of scales extending on the base of the rays just above the middle of the caudal, the scales apparently normal. Lateral line very short. Dusky, a darker lateral band; no humeral or caudal spots; base of anal dark.

HYSTERONOTUS⁵ gen. nov.(Type, *Hysteronotus megalostomus* sp. nov.)

Mouth large, premaxillary teeth in two distinct series; five or more teeth in the inner series of the premaxillary; second suborbital covering the entire cheek; caudal apparently without glandular scales; lateral line complete; adipose fin present; origin of dorsal nearer to caudal than to eye, considerably behind the vertical from the origin of the anal.

This genus stands unique in the *Tetragonopterinae* in the extreme backward position of its dorsal. In this character it approaches some of the *Aphyocharacinae*, from which its teeth sharply distinguish it.

7. *Hysteronotus megalostomus* sp. nov.

Plate VI, fig. 1.

Type.—One specimen, 45 mm. C. M. No. 3551. Rio das Velhas, May 10, 1908.

Cotypes.—Six specimens, 27 to 40 mm. C. M. No. 3552. Same place and date.

Head 4; depth 3.33; D. 10; A. 35-36; scales 7-42-5 to ventrals, about 8 to anal; eye 3, interorbital 2.6 in the head. Compressed, short-snouted; pectorals falcate; chest somewhat ridged, approaching on one side some of the *Characinae* and on the other some of the *Aphyocharacinae* in appearance.

Ventral area narrowly rounded; predorsal area rounded, with about twenty-five scales, not definitely arranged in a median series; occipital process forming a nearly equilateral triangle, its length about one-twelfth of the distance from its base to the dorsal, bordered on the side by two scales; fontanel reduced to a just perceptible slit, except at the base of the occipital process, where the parietal fontanel is an equilateral rhomboid, of which the two margins of the occipital process form two sides; interorbital with lateral grooves, scarcely convex in the middle; second suborbital in contact with the lower margin of the preopercle along its entire length, a narrow naked corner behind its upper posterior angle; mouth large, the premaxillary-maxillary border forming a continuous curve whose length is about half the length of the head. Snout pointed, premaxillary with an outer row of three teeth and an inner row of six or seven; maxillary quite slender, with three or four teeth; dentary with five or six larger teeth and a number of smaller ones on the sides; of the larger ones the first,

⁵ Ὑστερέω = to come late; νῶτος = the back.

and third or fourth, are largest; all the teeth, except the last ones on the dentary, *tricuspid*, the cusps all sharp, the middle one longest. Gill-rakers very slender, 4 + 12, those on the upper arch very much shorter than those near the angle of the lower arch, which are about one-fourth of the eye in length. Dorsal rounded, its origin about equidistant from eye and middle caudal rays, its highest ray about 4.5 in the length; adipose dorsal well developed; caudal deeply forked, the lobes 3.5 in the length; anal long, its origin a little nearer the snout than the base of the middle caudal rays; ventrals small, just reaching the anal; pectorals large, falcate, sometimes reaching to the anal. Scales regularly arranged on the caudal peduncle, less regularly arranged on the sides above the lateral line; below the lateral line with many interpolated rows, so that the series run obliquely downward; anal with a sheath of two series of scales along its base in front; caudal naked, sometimes a slight swelling on the bases of the rays just above and just below the middle; radial striæ short or none. Cheeks and opercles highly iridescent; a well-developed humeral bar; no caudal spot, the middle rays dusky.

8. *Creagrutus beni*⁶ sp. nov.

Plate VI, fig. 2.

Type.—One specimen, 53 mm. C. M. No. 3216. Villa Bella on Rio Beni, Oct. 5, 1909.

Head 4.33; depth 3.5; D. 10; A. 13; scales 4-40-3. Eye 3 in the head; interorbital equals the eye. Subcylindrical; predorsal area rounded, with a median series of eight scales; ventral area rounded, without a distinct median series of scales. Occipital process very short, bordered by one and one-half scales on each side; cheeks narrower than the eye, second suborbital in contact with the preopercle below, but not behind and in front; snout and maxillary about equal to the eye; lower jaw distinctly shorter. Maxillary with three graduated teeth, premaxillary with an outer row of five triangular or tricuspid teeth, the second, third, and fourth more and more withdrawn, so that the fourth is between the fifth of the outer series and the second of the inner series. Gill-rakers slender, 9 + 12. Anal sheath very small; base of each caudal lobe with a few scales. Origin of dorsal equidistant from tip of adipose and tip of snout;

⁶ A poorly preserved specimen from below the Cachoeira de Velha de Rio Nova, near Piabana, may belong here.

origin of anal behind the vertical from the last dorsal ray. Ventrals not reaching the anal; pectorals not to the ventrals. Straw-colored; a faint silvery band; sides with increasing number of chromatophores from the lateral line upward, very few below the lateral line; a conspicuous humeral bar crossing the third and fourth scales of the lateral line. No caudal spot.

9. *Phenacogaster franciscoëns* sp. nov.

Plate VI, fig. 3.

Type.—One specimen, 38 mm. C. M. No. 3231. Boqueiras, near mouth of Rio Porto, Jan. 6, 1908.

Cotypes.—Three specimens, 37 to 41 mm. C. M. No. 3232. Same place and date.

Cotypes.—Three specimens, 27 to 30 mm. (to base of caudal). C. M. No. 3233. Santa Rita, São Francisco basin, Jan. 24, 1908.

Cotypes.—Eight specimens, 30 to 33 mm. C. M. No. 3234. Barreiras, Lagôas of Rio Grande, tributary of Rio São Francisco, Jan. 14, 1908.

Cotypes.—Five specimens, 39 to 42 mm. C. M. No. 3235. Januaria, Dec. 12, 1907.

Head 3.75-4; depth 2.66-2.75; D. 11; A. 31-34;⁷ scales 6-35 or 36-4; eye 3 in the head, somewhat greater than the interorbital. Maxillary with 25-30 teeth ranged along nearly its entire free margin. Premaxillary with two complete, parallel series of teeth. Each series composed of tricuspid teeth toward the inner end and conical teeth toward the outer end. The following combinations of teeth have been observed, the first number in each case being tricuspid teeth:

Outer series 2 + 5, 3 + 4, 3 + 5, 2 + 5.

Inner series 6 + 2, 5 + 2, 6 + 3, 5 + 5.

Gill-rakers 6 + 8. Origin of dorsal and anal a little nearer to the caudal than to the tip of the snout. A large, conspicuous, black lateral spot, bordered with silvery behind, its center over the fifth or sixth scale of the lateral line. A conspicuous caudal spot, occupying the entire width of the end of the peduncle, continued on the middle rays but usually not to their tips (these markings faint in the specimens from Januaria), the fins dark. Base of caudal lobes milky-white (red in life?).

Very closely related to *P. megalostictus*, with which it seems to agree in nearly all characters. *P. megalostictus* attains a larger size and is a little slenderer.

⁷ Of those examined, five have 31, three have 32, four have 33, and one 34.

10. *Phenacogaster beni* sp. nov.

Plate VI, fig. 4.

Type.—One specimen, 48 mm. C. M. No. 3229. Villa Bella, Rio Beni, Oct. 5, 1909.

Cotypes.—Two specimens, 39 to 41 mm. to base of caudal. C. M. No. 3230. Same place and date.

Cotype.—One specimen, 46 mm. C. M. No. 3230c. Maciel, Rio Guaporé, Aug. 3, 1909.

Head 4.4; depth 2.66; D. 10; A. 36 or 37; scales 8-39-5; eye 2.75; interorbital 3. No. to three, scales in the angles of the overlapping scales of the ventral surface. Premaxillary with three tricuspid, and four or five conical, teeth in the outer series, seven tricuspid and three conical teeth in the inner series. Dentary with five tricuspid and eight conical teeth. A faint humeral spot over the seventh scale of the lateral line; a dark, deep lying line; a small caudal spot, and the middle caudal rays dotted.

Allied to *P. microstictus* Eigenmann, not as deep.

In one of the specimens the humeral spot is absent and the lateral line is developed on but twenty-six scales.

VESICATRUS gen. nov.

Phenacogaster with an incomplete lateral line. Type, *V. tegatus*, the only species.

11. *Vesicatrurus tegatus* sp. nov.

Plate VII, fig. 1.

Type.—One specimen, 33 mm. to base of caudal. C. M. No. 3201. Jaurú, Upper Paraguay basin. June 2, 1909.

Cotypes.—Seven specimens, 31 to 33 mm. to base of caudal. C. M. No. 3202. Same place and date.

Cotype.—One specimen, 30 mm. to base of caudal. C. M. No. 3202. Caceres, Upper Paraguay basin. May 24, 1909.

Head 3.75-4; depth 2.75; D. 10; A. 34-38, usually 36. Scales 6 or 7-37 (rarely 35)-4; eye 3 in the head, a little greater than the interorbital. Compressed, subrhomboidal. Ventral profile regularly arched; dorsal profile somewhat depressed over the eye, rising to the dorsal fin. Preventral area flat, with two series of larger scales overlapping along the middle, sometimes a scale in the angle between the two scales of a pair; predorsal area obscurely keeled, apparently with a complete median series of scales. Occipital process about 4.5 times

in the distance from its base to the dorsal, bordered by about three scales on each side. About nineteen teeth along three-fourths of the free margin of the maxillary; premaxillary with two complete and parallel series of teeth; two to four tricuspid and four conical teeth in the outer series, six or seven tricuspid and one or two conical teeth in the inner; about fifteen teeth in the dentary, the anterior tricuspid, the last conical, those between graduated. Origin of anal and dorsal about equidistant from tip of snout and base of caudal. Pectorals extending past origin of ventrals, ventrals past origin of anal; anal slightly emarginate. Lateral line developed on eight scales. Concentric ridges numerous, radial striæ few and obscure. A conspicuous black spot, somewhat smaller than the eye, just in front of, or partly on, the line joining origins of dorsal and anal, just above the urinary bladder; a conspicuous caudal spot occupying the entire end of the caudal peduncle and continued up on the middle caudal rays; sides, except just about the lateral spot and over abdominal cavity, peppered.

This species, resembling *Phenacogaster microstictus*, is readily distinguished by the incomplete lateral line and the posterior portion of the lateral spot.

12. *Astyanax bimaculatus novæ* var. nov.

Plate VII, fig. 2.

Thirteen specimens, 40–63 mm. C. M. No. 3278. Rio Sapon, Prazeres, Bahia, Feb. 11, 1908.

Thirteen specimens, 35–85 mm. C. M. Cat. No. 3279. Above Cachoeira da Velha, de Rio Nova, Goyaz, Piabana.

These specimens, agreeing with those from the Rio São Francisco in the anal rays, differ in having a black lateral stripe replacing the silvery band. The dark in the axils of the scales is also more conspicuous. A. 24 in three, 25 in four, 26 in three; lat. line 32 in one, 33 in two, 34 in three, 35 in four.

13. *Astyanax marionæ* sp. nov.

Plate VII, fig. 3.

Type.—One specimen, 54 mm. C. M. No. 3353. Six miles from San Louiz de Caceres, May 23, 1909.

Cotypes.—Four specimens, 16 to 51 mm. C. M. No. 3354. Same place and date.

Cotypes.—Five specimens, 43 to 50 mm. C. M. No. 3355. Corumba, April 27, 1909.

Head 3.5-3.75; depth 2.8-3.2; D. 11; A. 27 or 28; scales 7-35-5; eye 2.5; interorbital 3. Slender, dorsal and anal profiles gently and equally curved; ventral areas rounded, preventral area without a distinct median series of scales; predorsal area with about ten scales; occipital process about one-fifth of the space between its base and the dorsal; interorbital but slightly convex; frontal fontanel very little shorter, but much narrower than the parietal; second suborbital leaving a narrow naked margin; maxillary slender, one-half the length of the snout and eye; four teeth in the front row of the premaxillary, five in the second row; maxillary with one small tooth; mandible with four large teeth in front and several abruptly minute ones in each dentary. Gill-rakers 8 + 15. Scales regularly imbricate, no interpolated rows; lateral line somewhat decurved; anal with a sheath of a single row of scales along the base of the anterior rays; scales with a few faint radial striæ. Origin of dorsal about equidistant from snout and caudal, highest dorsal ray 4 in the length; caudal lobes about 3.5 in the length; origin of anal under last caudal ray; ventrals vary, reaching the anal; pectorals scarcely to the ventrals. Highly iridescent silvery; a bright silvery lateral band, a faint humeral band, no caudal spot.

Differing from *guianensis* in the partially naked cheek, etc.'

Named for Mrs. Marion Durbin Ellis, collaborator in monographing the minute *Tetragonopterina*.

14. *Astyanax guaporensis* sp. nov.

Plate VII, fig. 4.

Type.—One specimen, 49 mm. C. M. No. 3351. Maciel, Rio Guaporé, July 23-26, 1909.

Colypes.—Two specimens, 36 and about 40 mm. C. M. No. 3352. Same place and date.

Head 3.75; depth 2.75-2.9; D. 11; A. 27, 29, 31; scales 6-35-5; eye 2-2.25 in the head, interorbital 3. Compressed; ventral area rounded, predorsal area with about 8 scales; occipital process $\frac{1}{4}$ in the distance from its base to the dorsal; second suborbital leaving but a small triangle below its anterior corner naked, its surface pitted. Three or four teeth in the outer row of the premaxillary, five in the inner; about seven teeth on the maxillary; five large and several minute teeth on each dentary. Gill-rakers 7 + 12, those of the lower arch large and strong. Scales with an interpolated row over the anal,

otherwise regularly imbricate. Origin of dorsal equidistant from snout and tip of adipose or base of ventrals; ventrals reaching anal; pectorals beyond base of ventrals. A faint humeral band; no caudal markings; a series of black, inverted, comma-like dashes above a black line along the middle of the body. These markings all faint.

Closely allied to *guianensis*.

15. *Astyanax paranahybæ* sp. nov.

Plate VIII, fig. 1.

Type.—One specimen, 54 mm. C. M. No. 3356. Rio Paranahyba, Aug., 1908.

Head 4; depth 3.6; D. 10; A. 22; scales 6-38-4 (5 to anal); eye 3 in the head, .75 in the interorbital. Elongate, little compressed or elevated; greatest depth at origin of dorsal; preventral area flattened, with a median series of scales in front; isthmus heart-shaped, *abruptly constricted behind*, a groove at the constriction; post-ventral area rounded; predorsal area with about fourteen scales, in a median series; occipital process very short, about one-ninth of the space between its base and the dorsal, bordered by two scales on each side; interorbital flattish, second suborbital little more than half the width of the cheek; snout blunt; maxillary slender, 4 in the head, not reaching to below the eye; premaxillary without any antero-posterior extent. Three teeth in the outer row of the premaxillary, five in the inner row; maxillary with three or four teeth; mandibular teeth seven, *graduated*; all the teeth tricuspid. Gill-rakers minute. Scales regularly imbricate, no interpolated scales; caudal naked, anal sheath along the bases of the anterior rays of a single series of scales. Lateral line but slightly decurved. Origin of dorsal equidistant from tip of snout and caudal. Ventrals not reaching anal, pectorals joined to ventrals. Straw-color in alcohol; a faint silvery band; no caudal spot; a faint humeral spot crossing the fifth scale of the lateral line.

16. *Astyanax ribeiræ* sp. nov.

Plate VIII, fig. 2.

Type.—One specimen, 66 mm. C. M. No. 3368. Xiririca, Dec. 5, 1908.

Cotypes.—Fifty-six specimens, 26 to 82 mm. C. M. No. 3369. Morretes, Jan. 3, 1909.

Cotypes.—Twenty-seven specimens, 26 to 50 mm. C. M. No. 3370. Iporanga, Dec. 1, 1908.

Cotypes.—Eight specimens, 15 to 73 mm. C. M. No. 3371. Xiririca, Dec. 5, 1908.

Cotypes.—Four specimens, 61 to 75 mm. C. M. No. 3372. Xiririca, Dec. 8, 1908.

Cotypes.—Eleven specimens, largest 40 mm. C. M. No. 3373. Iguapé, Dec. 15, 1908.

Head 4.25-4.2; depth 2.5-3; D. 10-11; A. 23-27;⁸ scales 6 or, 7-34 to 38⁹-5 or 6; eye 2.75-3 in the head, a little less than, or equal to, the interorbital. Compressed, dorsal and ventral profiles equally arched; snout blunt, profile slightly depressed over the eye; pre-ventral area rounded, without a regular median series of scales; post-ventral area narrowly rounded; predorsal larea inconspicuously keeled, with a median series of about ten scales. Occipital process bordered with three scales on each side, its length one-sixth of the distance from its base to the dorsal; interorbital convex, frontal fontanel much shorter than the posterior without the groove; second suborbital leaving a naked area about one-third as wide as the bone; maxillary equal to the snout in length, its margin very convex; premaxillary with three teeth in the front series, five five-pointed teeth in the second; maxillary with two teeth; dentary with seven or eight graduated teeth. Gill-rakers 8 + 14. Scales regularly imbricate, no interpolated rows; anal sheath of a few scales along the base of the anterior rays; lateral line complete; each scale with several radial striæ. Origin of dorsal midway between tip of snout and base of upper caudal rays; origin of anal below, or behind, the base of the last dorsal ray. Dorsal pointed, the highest ray 3.5-4 in the length. Anal emarginate; caudal about 3.5 in the length; origin of ventrals in front of the vertical from the origin of the dorsal; ventrals not reaching anal, pectorals not to ventrals. Humeral spot large, on about six scales above the third to fifth scales of the lateral line, and with an extension toward the scapular process; caudal spot large and well defined, covering the entire width of the caudal peduncle; bases of middle caudal rays included in the spot, which does not extend to the ends of these rays. The specimens collected December 8, at Xiririca, are much lighter, the markings less well defined.

This species is closely allied to *mutator* and *intermedius*.

⁸ One with 23, two with 24, nine with 25, seven with 26, two with 37.

⁹ Three with 34, five with 35, three with 36, two with 38.

17. *Astyanax gymnogenys* sp. nov.

Plate IX.

Type and Cotype.—Two specimens, 87 mm. C. M. No. 3350. Porto União, Rio Iguassú, Dec. 28, 1908.

Head 3.8; depth 2.75; D. 11 or 12; A. 21–22; scales 6–41–6; eye 3.2; interorbital equal to the snout, 3.5–3.8 in the length of the head. Compressed, subrhomboidal; dorsal profile strongly arched, scarcely depressed at the nape; preventral arch rounded, with a median series of scales which may become regular in front; postventral area narrowly rounded; predorsal area keeled, with a median series of 13 scales; occipital process one-sixth the distance from its base to the dorsal, bordered by three scales on each side; interorbital but little convex; frontal fontanel long and narrow, but shorter than the parietal; snout small, the maxillary very broad and long, its length 3.5–4 in the head; second suborbital very narrow having a naked area but one-third narrower than the bone; premaxillary with three or four teeth in the front series and five in the second; a single, small concealed tooth on the maxillary. Mandible with three or four larger teeth and two not very abruptly smaller ones; teeth of upper jaw and larger ones of lower jaw tricuspid. Gill-rakers 8 + 10; scales regularly imbricate, no interpolated rows; lateral line little decurved; caudal naked, anal sheath of a single series of scales along the anterior rays, each scale with several radial striæ. Origin of dorsal nearer caudal than to tip of snout, its highest ray 4.25 in the length; caudal about 3.5 in the length; origin of anal about equidistant from caudal and base of pectoral; highest anal ray reaching to the base of the penultimate ray or the last but four rays. Silvery, with brassy luster; a very faint humeral bar; no caudal spot; caudal with its margin and middle membranes dusky; anal dusky, the first ray and tips of the next two milk-white.

This species is very closely related to *A. Eigenmanniorum*, which in the Rio Iguassu has either lost its caudal band or it has become very faint.

18. *Deuterodon acanthogaster* sp. nov.

Plate VIII, fig. 3.

Type.—One specimen, 54 mm. C. M. No. 3395a. Corumbá, April 27, 1909.

Cotypes.—Eleven specimens, 44 to 55 mm. C. M. No. 3395b–l. Same place and date.

Cotypes.—Six specimens, 35 to 52 mm. C. M. No. 3396. Rio Jaurú, June 3, 1909.

Head 4, depth about 2.3; D. 11; A. 23-26; scales 7-35-5; eye 2.5; interorbital about equal to the eye. Deep, compressed; innominate bones very strong, diverging forward, the ends protruding as spines (as in *Astyanax mucronatus*), the space between them concave; no regular median series of scales in front of the ventrals; predorsal line with about ten scales; occipital process about 5 in the distance from its base to the dorsal; interorbital convex, the frontal fontanel 1.5 in the parietal; snout short, blunt; second suborbital leaving but a narrow naked margin; maxillary shorter than the snout. Premaxillary with five broad, nine- (or more) pointed incisors in the second row; two

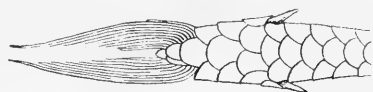


FIG. 2. Ventral fins and protruding spines of *Deuterodon acanthogaster* Eigenmann.

much smaller, five-pointed teeth in the front row; maxillary with two teeth similar to those of the second series; dentary with eight graduated teeth. Gill-rakers 6 + 9. Scales regularly imbricate except over the origin of the anal, where there is sometimes an interpolated scale. Caudal naked, anal sheath very imperfect, consisting of a few scales at the base of the anterior rays. Origin of the dorsal nearer to the snout than to the caudal, its highest ray 3 in the length; anal long, emarginate; ventrals reaching anus or anal; pectoral reaching ventrals. A faint humeral bar, a silvery lateral band, a well defined oval caudal spot continued on the base of the middle caudal rays.

Allied to *pinnatus* Eigenmann.

EXPLANATION OF PLATES.

PLATE IV.

FIG. 1. *Probolodus heterostomus* Eigenmann. (Type.) 63 mm. Carn. Mus. No. 2973.

FIG. 2. *Psalidodon gymnodontus* Eigenmann. (Type.) 189 mm. Carn. Mus. No. 3204.

FIG. 3. *Psalidodon gymnodontus* Eigenmann. (Type.) 189 mm. Carn. Mus. No. 3204. (Head magnified.)

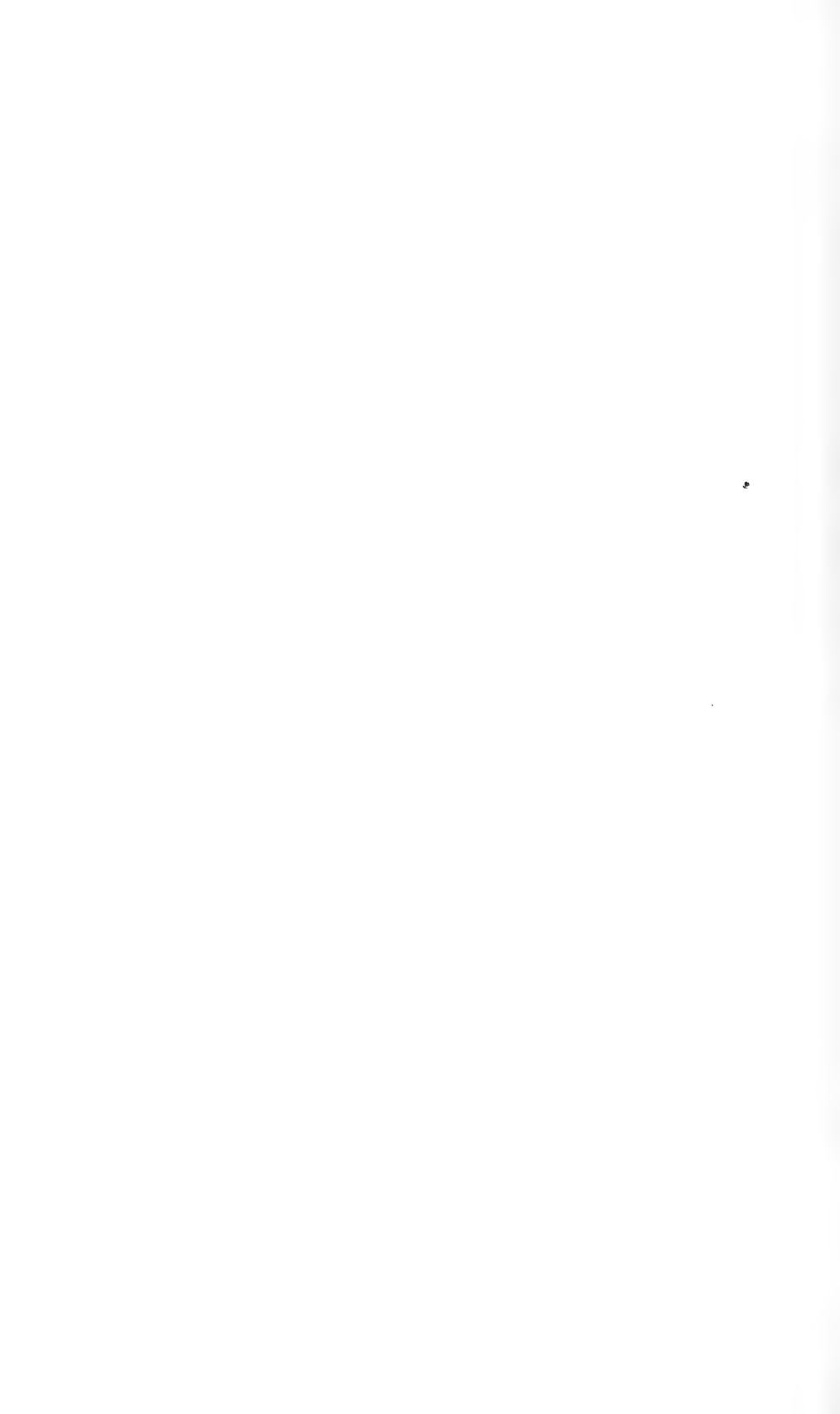
PLATE V.

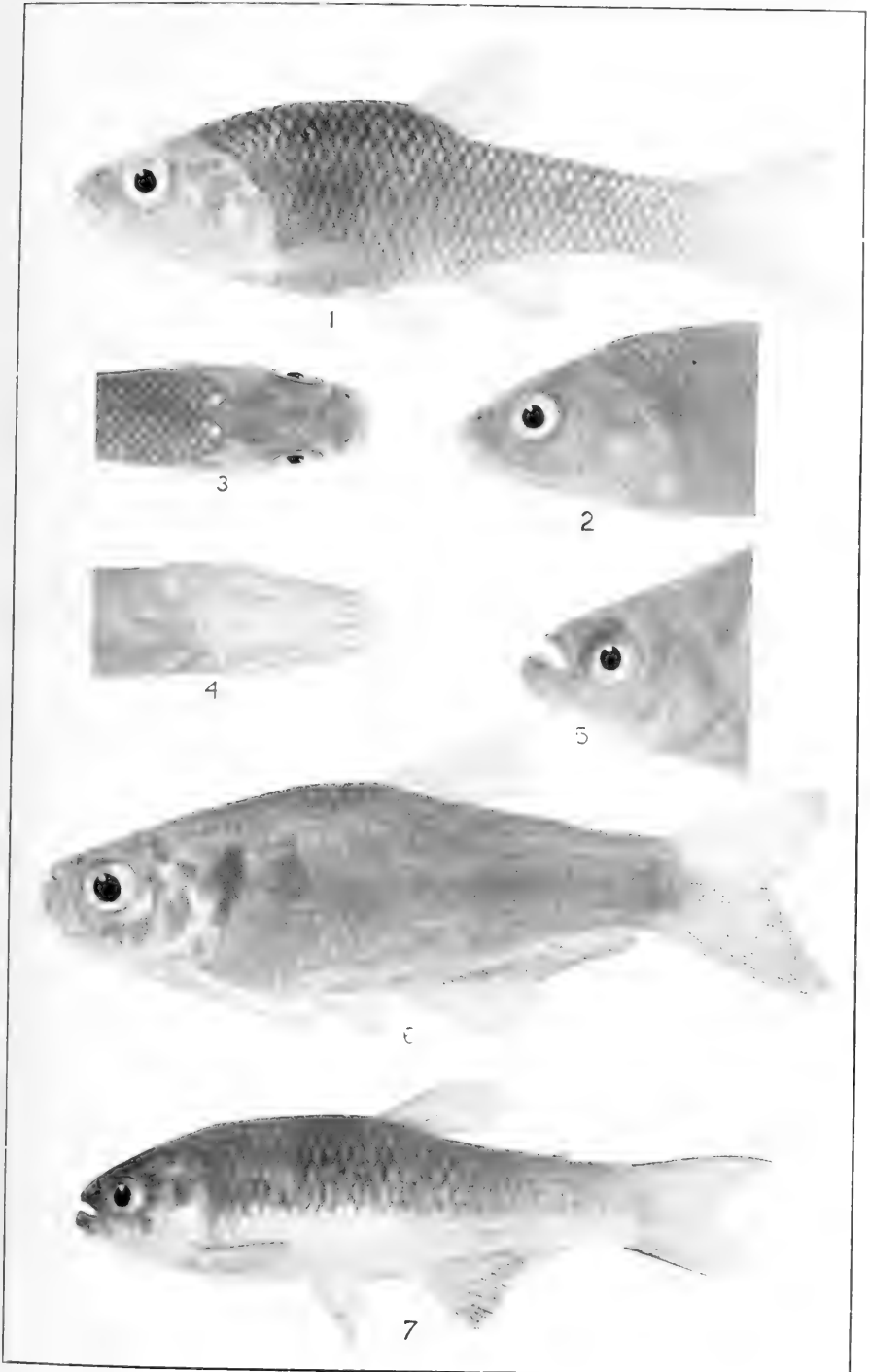
FIG. 1. *Spintherobolus papilliferus* Eigenmann. (Type.) 41 mm. Carn. Mus. No. 3582.

FIG. 2. *Spintherobolus papilliferus* Eigenmann. (Cotype.) Side of head, showing tactile papillæ. Carn. Mus. No. 3883a.

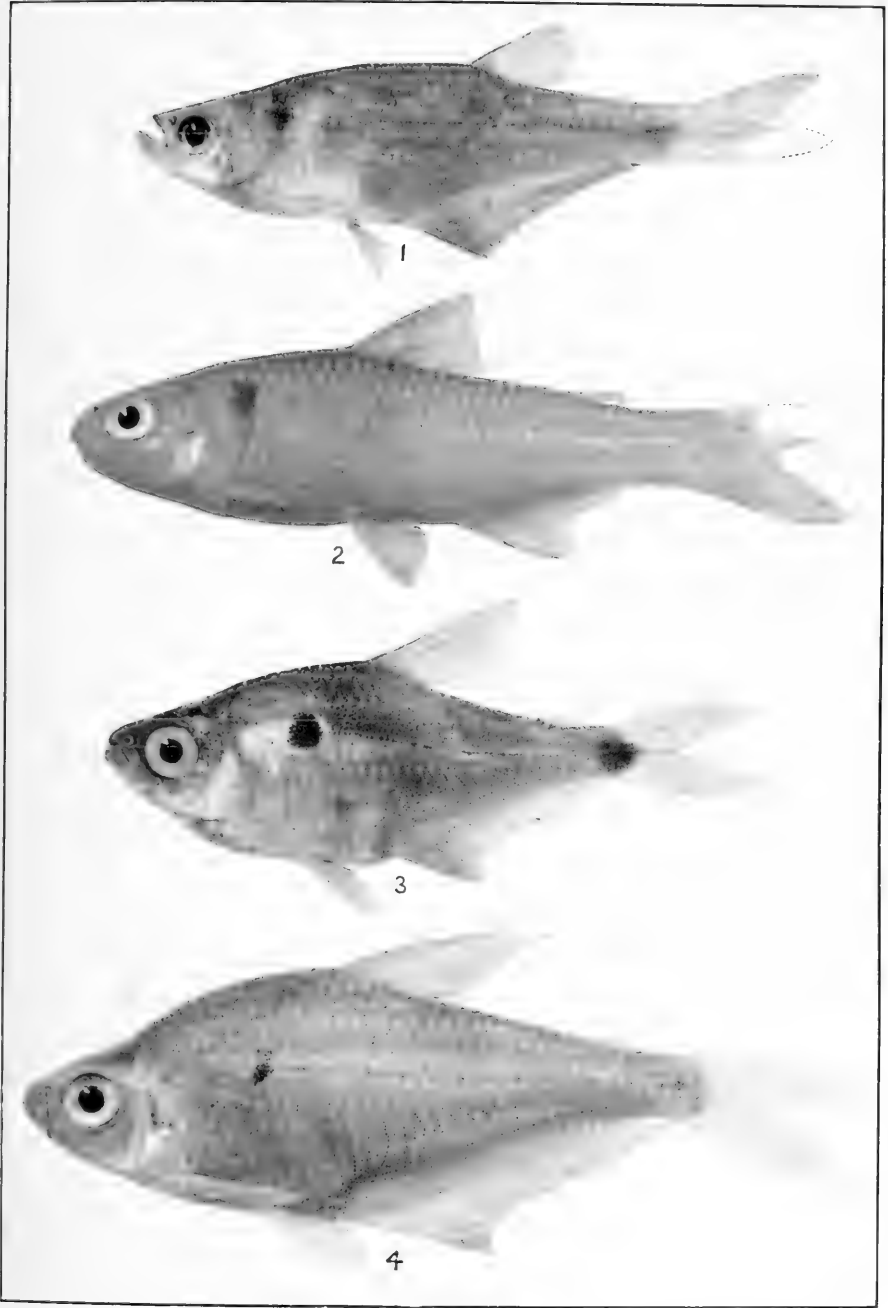


PROBOLODUS AND PSALIDODON.

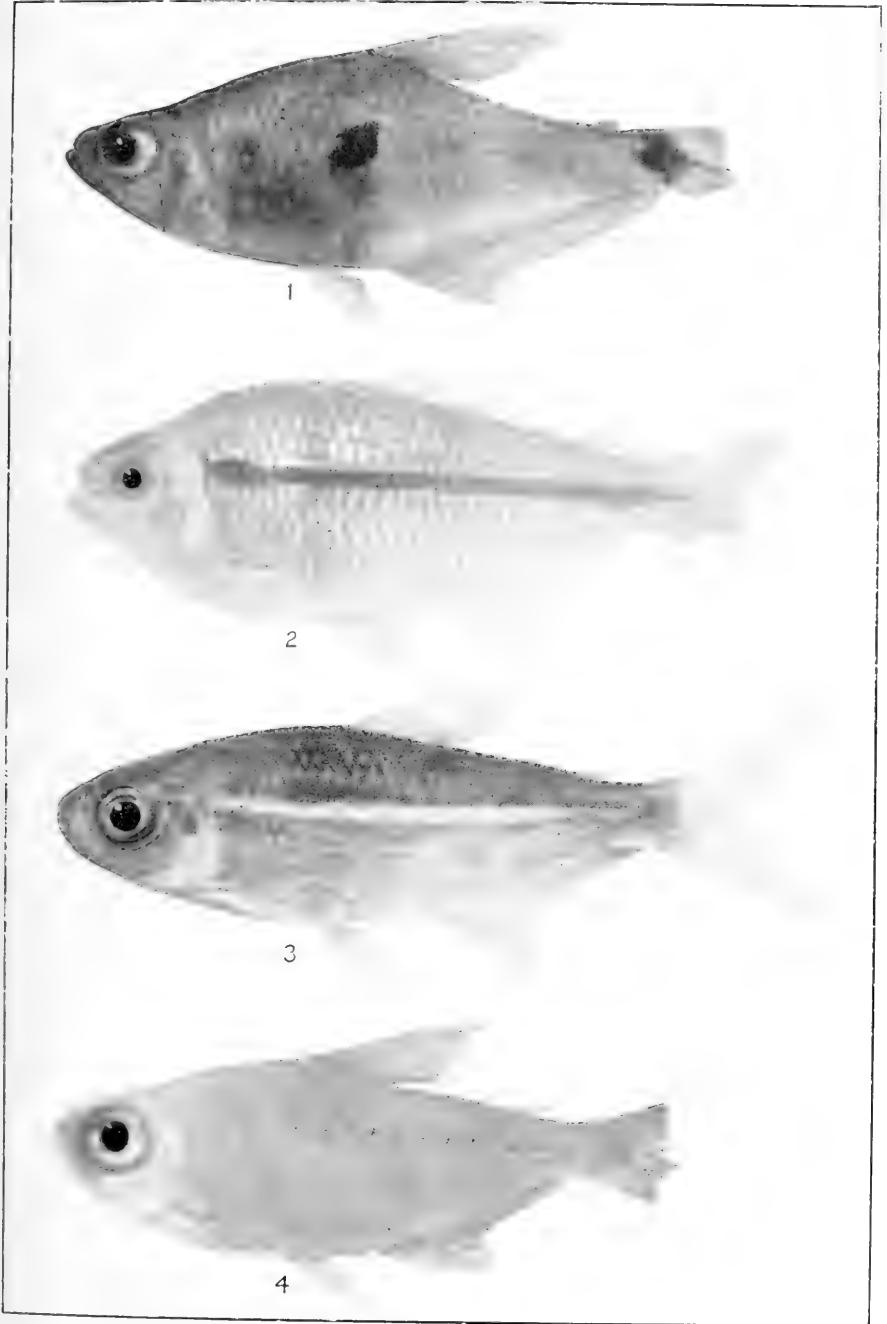




SPINTHEROBOLUS AND GLANDULOCAUDA.



HYSTERONOTUS, CREAGRUTUS, AND PHENACOGASTER.



VESICATRUS AND ASTYANAX.



A. TYANAX AND DEUTERODON.

FIG. 3. *Spintherobolus papilliferus* Eigenmann. (Cotype.) Top of head. Carn. Mus. No. 3883a.

FIG. 4. *Spintherobolus papilliferus* Eigenmann. (Cotype.) Lower surface of head, showing tactile papillæ. Carn. Mus. No. 3883a.

FIG. 5. *Glandulocauda inequalis* Eigenmann. (Type.) 40 mm. Carn. Mus. No. 3555.

FIG. 6. *Glandulocauda melanogenys* Eigenmann. (Type.) 49 mm. Carn. Mus. No. 3553.

FIG. 7. *Glandulocauda melanopleura* Eigenmann. (Type.) 51 mm. Carn. Mus. No. 3557.

PLATE VI.

FIG. 1. *Hysteronotus megalostomus* Eigenmann. (Type.) 45 mm. Carn. Mus. No. 3551.

FIG. 2. *Creagrutus beni* Eigenmann. (Type.) 53 mm. Carn. Mus. No. 3216.

FIG. 3. *Phenacogaster franciscoensis* Eigenmann. (Type.) 38 mm. Carn. Mus. No. 3231.

FIG. 4. *Phenacogaster beni* Eigenmann. (Type.) 48 mm. Carn. Mus. No. 3229.

PLATE VII.

FIG. 1. *Vesicatrus tegatus* Eigenmann. (Type.) 33 mm. Carn. Mus. No. 3201.

FIG. 2. *Astyanax bimaculatus novæ* Eigenmann. (Type.) Carn. Mus. No. 3278.

FIG. 3. *Astyanax marionæ* Eigenmann. (Type.) 52 mm. Carn. Mus. No. 3353.

FIG. 4. *Astyanax guaporensis* Eigenmann. (Cotype.) 33 mm. to base of caudal. Carn. Mus. No. 3352.

PLATE VIII.

FIG. 1. *Astyanax paranahybæ* Eigenmann. (Type.) 54 mm. Carn. Mus. No. 3356.

FIG. 2. *Astyanax ribeiræ* Eigenmann. (Type.) 65 mm. Carn. Mus. No. 3368.

FIG. 3. *Deuterodon acanthogaster* Eigenmann. (Type.) 54 mm. Carn. Mus. No. 3395a.

PLATE IX.

Astyanax gymnogenys Eigenmann. (Type.) 98 mm. over all. Carn. Mus. No. 3550.

IV. JURASSIC SAURIAN REMAINS INGESTED WITHIN FISH.

BY C. R. EASTMAN.¹

(Plates X-XI.)

Paleontology affords numberless instances where the nature of the food-supply of various lower and higher vertebrates can be positively determined by the actual stomach-contents which have been preserved within the abdominal cavity of the creatures concerned. These instances are sometimes of special value in confirming *a priori* conclusions respecting the diet of fossil vertebrates based upon the general character of their dentition. Other cases may attract interest on account of peculiar conditions or associations, which are either to be directly observed, or suggest themselves by inference. Mention should be made, too, of the considerable literature which has grown up within recent years concerning coprolitic matter and so-called "gastroliths," or stomach-stones.

A few of the above-mentioned occurrences are deserving of particular notice, on account of their possessing special points of interest, and because they afford a sort of standard for estimating the importance of a newly discovered case of fossilization about to be described in the present article.

Among mammals, the most familiar instances of the preservation of undigested food in the alimentary tract are furnished by the mammoth and mastodon. A dozen years or so ago much discussion was aroused concerning the possible survival into modern times and domestication by man of the so-called *Neomylodon listai* of Ameghino, or *Grypotherium domesticum* of Roth. Concerning the antiquity of the remains that have been described under these names, the last word would seem to have been spoken by Dr. A. S. Woodward in

¹An abstract of this article was presented at the annual meeting of the Paleontological Society, held at Washington, D. C., December 28, 1911.—Editor.

²On a portion of a mammalian skin, named *Neomylodon listai*. *Proc. Zool. Soc.*, London, 1899, p. 154. Exhibition of newly discovered remains of *Neomylodon* from Patagonia. Rept. 69th Meet. Brit. Assoc. Adv. Sci., Dover, p. 783.

articles published jointly with Dr. F. P. Moreno.² The idea that some of these creatures found in caverns of Patagonia were stall-fed, being kept in captivity by aboriginal inhabitants, received credence through the finding of vegetable fibers resembling chopped hay in association with their mummified remains.

Writing in 1900, Nordenskjöld,³ after an examination of the dung of one of these sloths, announced the following conclusion: "Le contenu des excréments montre que cet animal se nourrissait d'herbes et pas de feuilles et qu'il mâchait et digérait mal sa nourriture." That the author just quoted does not err on the side of rashness may be judged from the following non-committal remark: "Quant à la question de savoir si le *Glossotherium* a été contemporain de l'homme, je n'ose pas encore répondre définitivement."

Among reptiles, the most numerous and best authenticated cases where the nature of the food-supply is determinable, either from ingested prey, or from hard parts, such as scales, teeth, etc., preserved within coprolites,⁴ occur within the order Ichthyosauria. The question as to whether all so-called "embryoes" included within the abdominal cavity of *Ichthyosaurus* are really foetal, or are not in part at least young reptiles that have been swallowed, has been recently discussed by Branca.⁵ A similar question in regard to the supposed embryo contained within the body of the type specimen of *Compsognathus* was raised not long since by Dr. Franz Nopsca.⁶ If Marsh's original interpretation of this interesting specimen be set aside, no positive evidence remains that Dinosaurs were viviparous.

Turning our attention to the class of fishes, instances are known where distinctly recognizable skeletons of bony fishes are preserved within the intestinal tract of fossil sharks. A striking example is that of *Carcharias (Scoliodon)* in the Bologna Museum. The wonder-

² Nordenskjöld, E., La Grotte du *Glossotherium* (*Neomylodon*) en Patagonie. *Bull. Soc. Géol. France*, 1900 [3], vol. 28, pp. 29-32. See also Hatcher, J. B., The Mysterious Mammal of Patagonia. *Science*, N. S., 1899, vol. 10, pp. 814-815.

⁴ For an exhaustive investigation of reptilian coprolitic matter from the Wealden of Belgium one may refer to a contribution by M. Bertrand, entitled "*Les coprolithes de Bernissart*." *Mém. Musée Roy. Belg. d'Hist. Nat.*, Vol. I, 1903.

⁵ Branca, W. Two papers published 1907-8 in *Abh. Akad. Wiss. Berlin, Phys. Abh.* No. 3, and *Sitzber. Akad. Wiss. Berlin*, pp. 392-6. The latter is entitled "*Nachtrag zur Embryonenfrage bei Ichthyosaurus*."

⁶ *Neues Jahrb. f. Min.*, 1903, Supplement, vol. 16, pp. 476-494. See also the following: F. v. Huene, "*Der vermuthliche Hautpanzer des Compsognathus longipes Wagn.*" *Ibid.*, 1901, vol. 1, pp. 157-160.

ful preservation of muscle fibers and other soft parts in the Upper Devonian *Cladoselache* encourages the expectation that further light may be forthcoming respecting the food-habits of that primeval shark.

Very peculiar conditions have been observed by Campbell Brown in the case of a Liassic shark, *Hybodus*, which had apparently encountered a swarm of immature belemnites and proceeded to make a meal of them. In this connection the author states: "Das gefräßige Thier war augenscheinlich in einen dichten Schwarm kleinerer Belemniten gerathen und hatte sich mit denselben vollgestopft. Bei der Verdauung traten dann Beschwerden ein. Belemnitenrostra sind nicht gerade besonders geeignet, die Spiralklappe im Colon eines kleinen Haifisches zu passiren, besonders wenn mehrere Hundert zu gleicher Zeit im Magen liegen. Der Tod des Haies kann nicht überraschen!"⁷

Among teleostean fishes, it is not uncommon to find specimens showing the particular nature of their stomach contents. The predaceous ganoid *Caturus*, from the Upper Jura of Solenhofen, very often contains recognizable portions of *Leptolepis* within the abdominal cavity. In the Paris Museum of Natural History is preserved a slab containing two individuals of *Blochius*, from the Eocene of Monte Bolca, the larger one having apparently partially swallowed the other. Agassiz, however, states that the appearances are deceptive, and that the two individuals may have chanced to be comesuperimposed one upon the other in a rather striking attitude. Nevertheless he remarks:⁸ "Je ne prétend pas nier d'une manière absolue la possibilité d'une pareille coïncidence."

We have now to consider the very singular, if not indeed unique conditions presented by two specimens of Jurassic fishes belonging to the Bayet collection of the Carnegie Museum. The first of these which invites attention is a form, referable to the genus *Belonostomus* (Plate X), from the Lithographic Stone (Lower Kimmeridgian) of Cerin, in southeastern France. The species, judging from the slender proportions of the head, in which the snout is greatly elongated, is probably to be identified as *B. tenuirostris* Agassiz, but it is evidently an immature example, the total length of which probably did not exceed 16 cm. The caudal region is lacking, but the head and anterior part of the trunk are very clearly shown. The scales, cranial and

⁷ Brown, C. "Ueber das Genus *Hybodus* und seine systematische Stellung." *Palaeontogr.*, 1900, vol. 46, p. 163.

⁸ Agassiz, L. "Poissons Fossiles," 1844, vol. 2, pt. 2, p. 257.

facial bones, and vertebral centra would seem to be preserved partly in the form of an impression, partly as structures in which the external surface has been eroded away, or removed by chemical action.

The fish itself would not be remarkable, except for the circumstance that it happens to contain the skeletal remains of a small Rhyngocephalian reptile, probably *Homocosaurus*, within the abdominal cavity. The prey had been gulped down head first, and may have caused the death of the fish, as the digestive process had not advanced far enough to dismember the limbs nor to disturb the natural position of parts beyond a slight lateral compression of the trunk. The surface characters of the head are shown with tolerable distinctness, a depression is indicated which may be the pineal foramen, and a few slender teeth are exposed on one side anteriorly. The vertebral column of the reptile is preserved for some distance beyond the sacral region, and some of the anterior limb-bones are clearly visible. It is hoped that the accompanying plate (Pl. X) may aid in rendering the above-described conditions more intelligible to the reader.

The second specimen referred to, which is worthy of notice in this connection, likewise forms part of the Bayet collection, and was derived from the same horizon and locality as the first. It is a very complete teleostean skeleton, having a total length of 19 cm., and is preserved in the form of remarkably sharp counterpart impressions in a slab of lithographic limestone. The systematic position of the fish represented is very close to that of the type species of the so-called genus *Attakeopsis*, established by Victor Thiollière in 1858, but regarded by the late Karl von Zittel, Dr. A. Smith Woodward, and others as identical with the earlier described *Oeonoscopus* of O. G. Costa (Ittiol. Foss. Italia, 1853, p. 2). The example under discussion appears, however, to present more than individual differences from the solitary known species of *Oeonoscopus* occurring in the Cerin lithographic limestone, and is accordingly regarded as representing a distinct species.

The distinguishing characters of the new form, which may be designated as *O. elongatus*, are included in the following brief diagnosis:

***Oeonoscopus elongatus*, sp. nov.**

(Plate XI.)

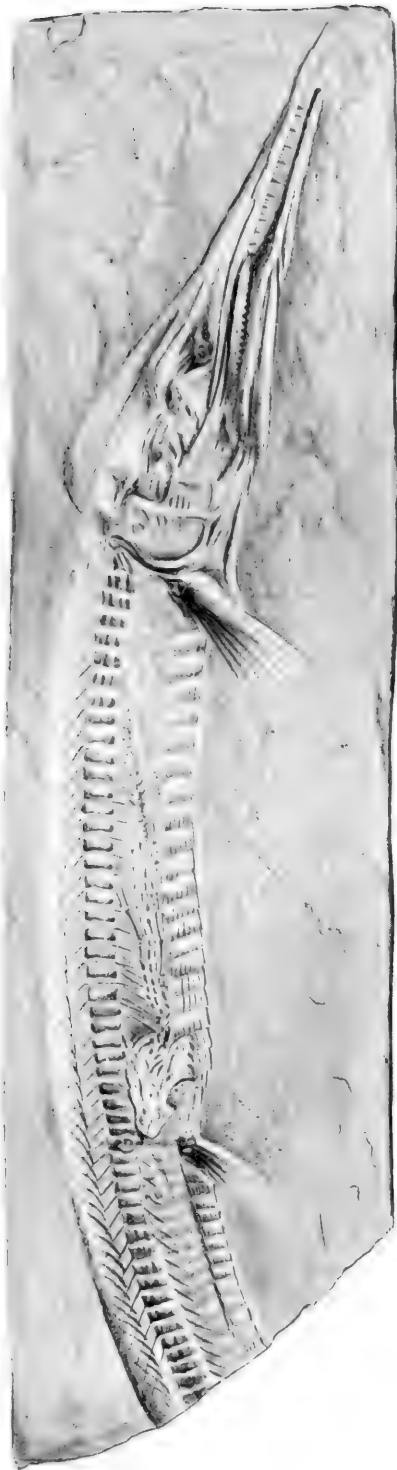
Type.—Nearly complete fish in counterpart: Carnegie Museum Cat. Nos. 4079 + 4079a.

A small species, attaining a total length of about 20 cm., and distinguished from all others belonging to the same genus by its slender and elongated form of body, and by the more anterior position of the dorsal fin, which arises opposite the pelvic pair, and does not extend back of a point midway between them and the insertion of the anal. Length of the head with opercular apparatus exceeding the maximum depth of the trunk, and contained about five times in the total length of the fish. Vertebrae about fifty in number, with strong neural and hæmal spines. A single large ridge-scale at the upper and lower borders of the caudal pedicle. Teeth small and conical. All fins relatively small, caudal lobes not much expanded. Scales indistinctly shown.

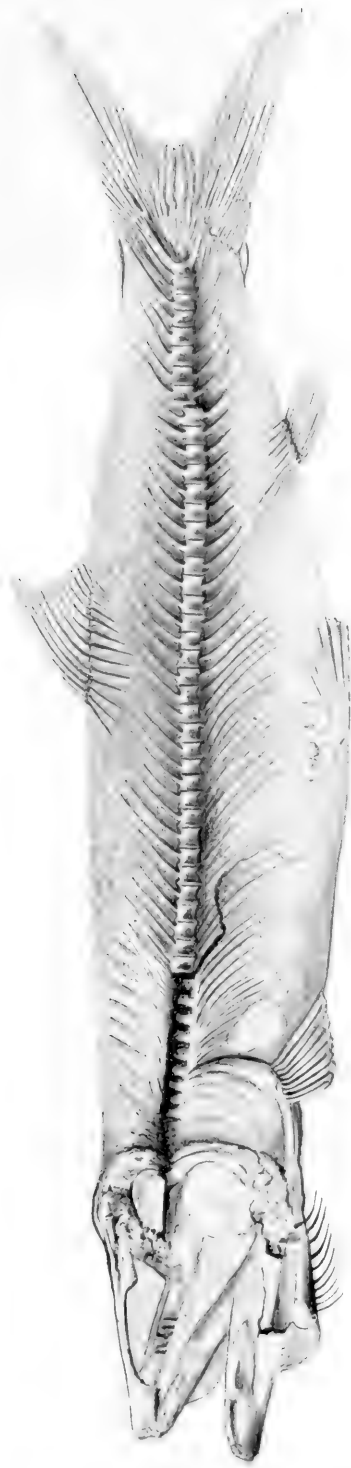
One of the halves of the counterpart in which this specimen is contained is illustrated in the accompanying plate, the original drawing having been made by Mr. Sidney Prentice. Within the abdominal cavity, or more particularly, within that part of it lying between the paired fins, is to be seen a tolerably distinct impression of a small reptile resembling a Lacertilian, the precise nature of which is indeterminate, but very probably is akin to *Homæosaurus*. Only the head and anterior position of the vertebral column are clearly recognizable, and it is noteworthy that the creature appears to have been swallowed tail foremost, whereas in the first described specimen the position of parts is reversed. The size of the ingested remains is practically the same in the case of both specimens.

So far as the present writer is aware, these two are the only instances afforded by paleontology where fossil reptiles happen to have become preserved within the abdominal cavities of fish. These occurrences are all the more remarkable, when it is remembered that the contained reptiles were terrestrial, and their ichthyic foes marine in habitat. This apparent anomaly may perhaps be accounted for by supposing the primitive lizards in question to have inhabited the shores of coral islands in the late Jurassic sea, which covered central Europe at the time. One may suppose the prey to have been captured in proximity to land, or possibly the terrestrial creatures were carried out to sea by floating vegetation to which they had clung, and were seized at a distance from land. The latter hypothesis finds perhaps a certain degree of plausibility from the abundance of plant remains which are known to occur at the Cerin locality.

The two specimens which are described and portrayed in the present



Belone tomus tenuirostris Agassiz, juv. X 3.



Oronoscopus elongatus, sp. nov. (Type). $\times 1$.

article form part of a representative and extremely important collection of fossil remains, both vertebrate and invertebrate, from the Lithographic Stone (Lower Kimmeridgian) of southeastern France and Bavaria. The whole of this superb collection was purchased some eight years ago from Baron Ernst de Bayet of Brussels by Mr. Andrew Carnegie, and generously presented by him to the institution founded by him in Pittsburgh.

EXPLANATION OF PLATES.

PLATE X.

Belonostomus tenuirostris Agassiz *juv.* Lithographic Stone; Cerin (Ain), France. Head and anterior portion of the trunk of an immature individual apparently belonging to this species, within the abdominal cavity of which is contained the skeleton of a small Rhynchocephalian reptile, probably *Homæosaurus*. The prey has been swallowed by the fish headforemost. The head, anterior limbs, and greater part of the vertebral column of the contained reptile are very clearly shown. Car. Mus. Cat. No. 4080. $\times \frac{1}{2}$.

PLATE XI.

Oeonoscopus elongatus, sp. nov. Lithographic Stone; Cerin (Ain), France. Holotype, preserved in counterpart, showing an imperfectly preserved Rhynchocephalian skeleton within the abdominal cavity. Car. Mus. Cat. No. 4079. $\times \frac{5}{7}$.

V. AN AUTOGRAPH LETTER OF LIEUTENANT-
GENERAL U. S. GRANT TO THE HON. EDWIN
M. STANTON, SECRETARY OF WAR.

BY W. J. HOLLAND.

(Plates XII and XIII.)

The Carnegie Museum, through the kindness of Mr. William Metcalf, Jr., has been enabled to add to its historical collections a letter, which is of more than usual interest. It is a lead-pencil note, evidently hastily written upon a scrap of paper, by General U. S. Grant, and addressed to the Hon. Edwin M. Stanton, Secretary of War. A facsimile of this note is given in Plate XII accompanying this paper. The note reads as follows:

FARMVILLE, Apl. 8th, 1865.

HON. E. M. STANTON, Sec. of War,
Washington.

The enemy so far have been pushed from the road toward Danville and are now pursued towards Lynchburg. I feel very confidant of receiving the surrender of Lee and what remains of his Army by to-morrow.

U. S. GRANT, *Lt. G—*

The confidence expressed by the great commander was justified by the events of the following day, for on April 9, 1865, General Lee surrendered at Appomattox Court House.

This note was originally presented by Hon. Edwin M. Stanton to Mr. Charles Knap, of Pittsburgh. Mr. Knap was the senior member of the firm of Knap and Wade, owners of the Fort Pitt Foundry, which during the Civil War cast all the large guns and mortars used by the Federal army. Between Mr. Knap and Hon. Edwin M. Stanton there existed a close friendship, which was strengthened by the constant intercourse brought about through the necessities of the Government during the four years of civil strife. After the war was over, Mr. Stanton, as a token of friendship, gave this note to Mr. Knap. The note passed from Mr. Knap into the possession of his favorite nephew, the late William Metcalf, Sr., who during the greater part of the civil war was the manager of the Fort Pitt Foundry.

Some time before Mr. William Metcalf's death he informed his son of his intention to present the letter to the Carnegie Museum, and it is in pursuance of this expressed purpose of his honored father that Mr. William Metcalf, Jr., has transferred to the Museum the custody of this most interesting document.

At the suggestion of Mr. Douglas Stewart the writer of these lines has had a plate prepared (Plate XIII) representing the life-mask of General Robert E. Lee, made by Clark Mills, the sculptor, subsequent to the civil war, and signed by him. This mask was some time ago very generously presented to the Museum by Mr. Theodore A. Mills, the only surviving son of Mr. Clark Mills. Mr. Theodore A. Mills has long been a member of the staff of this Museum. This is one of a number of life masks, inherited by Mr. Mills from his father, which he has kindly bestowed upon the Museum. There is a propriety in publishing a picture of this mask at the same time that a reproduction is given of the letter of General Grant.



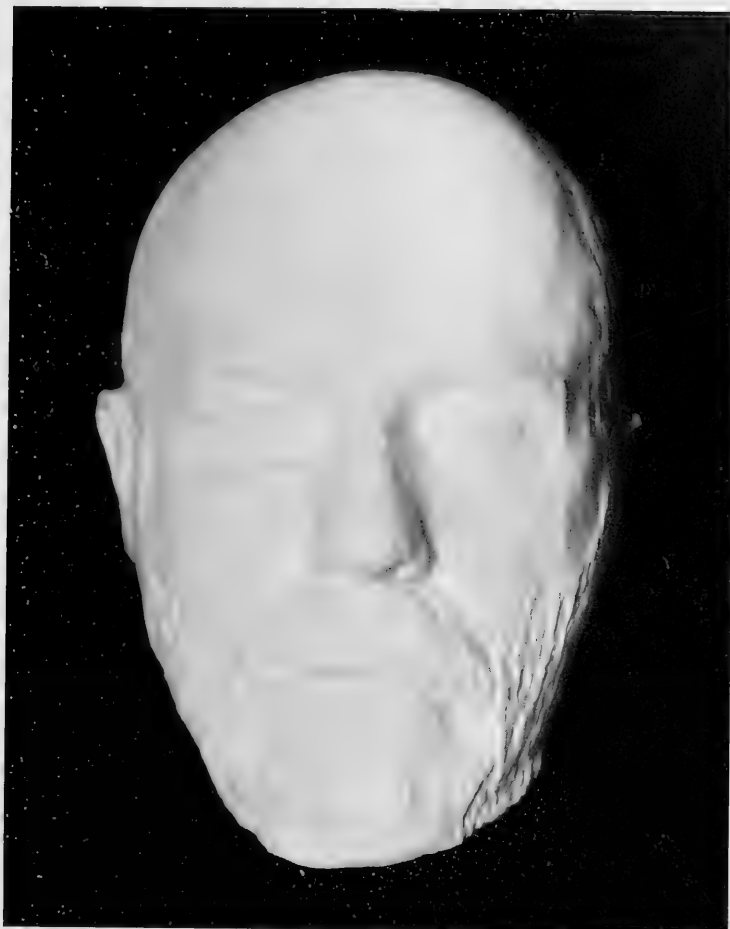
Farmville April 5th 1865

Hon. E. M. Stanton, Sec. of War
Washington.

The enemy so far
have been pushed from the
road towards Farmville and are
now pursued towards Lynchburg
I feel very confident of
securing the surrender of
Lee and what remains of
his Army by to-morrow

U. S. Grant

A. C.



Life-mask of General Robert E. Lee by Clark Mills. Presented to the Carnegie Museum by Theodore A. Mills.



ANNALS
OF THE
CARNEGIE MUSEUM

VOLUME VIII. NO. 2.

EDITORIAL NOTES.

THE annual meetings of the Archeological Institute of America and of the American Philological Association, which were held during the last week of December in Pittsburgh, were remarkably well attended. From both bodies we received expressions of gratitude for the courtesies extended to them and of appreciation of the work which is being done by the Museum on behalf of those branches of science which they represent.

THE One Hundred and Twenty-fifth Anniversary of the Founding of the University of Pittsburgh was celebrated during the last week of February in a manner thoroughly befitting the occasion. Representatives of more than two hundred American and foreign universities were present. Most of these visited the Carnegie Institute during their stay, and we had the great pleasure of greeting among them Señor Naón, the Minister Plenipotentiary of the Argentine Republic, who was especially interested in viewing the replica of the Diplodocus, which is being prepared for shipment to his country as a gift from Mr. Carnegie.

THE Chairman of the Committee on the affairs of the Museum, Mr. Geo. H. Clapp; and the Director, having been deputed both by the Museum and the Board of Trustees of the Institute to represent them on the occasion of the Centenary of the Academy of Natural

Sciences of Philadelphia, spent the three days from March 19 to March 21 in that city. The hospitality of Philadelphians is proverbial, and was greatly enjoyed. The gathering of scientific men was thoroughly representative, and it was with renewed inspiration that all those who attended upon this memorable occasion returned to their homes. The Academy of Natural Sciences has reason to be proud of the achievements of the past century, and enters upon its second century with a prestige and an equipment, which insure success in its future undertakings. *Vivat Academia!*

ON the afternoon of the ninth of April we had the pleasure of welcoming as a visitor to the Museum Colonel Theodore Roosevelt, who spent half an hour in a hurried examination of the Section of Paleontology and of the Section of Mammals, which he particularly wished to see. Both appeared to interest him greatly, and he found some things which apparently surprised him, among which was the mounted specimen of the Broad-lipped, or White Rhinoceros, taken at Lado, which has been standing in this Museum for the past ten years. "By George, Doctor, I thought that specimen was in England, and never dreamed it was here!" But it has been here for a decade. The giraffes shot by Mr. Childs Frick called forth expressions of great admiration, in view of their beauty and the superbly life-like manner in which they have been mounted. "Do you know, I had a strange experience with one of those beasts," said the late President. "It was standing out in the open, and I stalked it, and came up to within seventeen feet of it, before it noticed me. It was sound asleep!"

THE Commission recently sent to this country from the Museum von Meisterwerken der Naturwissenschaft und Technik of Munich spent the sixteenth and seventeenth of April in Pittsburgh. The Commission is composed of the following persons: Reichsrat Dr. Oskar von Miller, Member of the House of Lords of Bavaria, President of the Verein Deutscher Ingenieure, Director of the Museum, and *Chairman of the Commission*; Count von Podewils-Dürniz, former Secretary of State of Bavaria, Honorary President of the Museum; Geheimrat Prof. Dr. von Dyck, Rector Emeritus of the Königliche Bayerische Technische Hochschule; Hofrat Dr. Wilhelm von Borscht, Lord Mayor of Munich; Herr Ph. Gelius, Architect of the Museum;

Herr Alexander Shirman, Director of the Library of the Museum; Dr. Fuchs; Herr Ingenieur Orth; Herr Trautwein; and Dr. Ross, the *Secretary of the Commission*. The first day was devoted almost entirely to the study of the Museum, Art Gallery, and Library of the Institute, to the Carnegie Technical Schools and the University of Pittsburgh. In the evening the Commission attended a banquet of the Chamber of Commerce given at the Hotel Schenley, primarily to hear a report from the Flood Commission of Pittsburgh. The second day was devoted to visiting the Homestead Steel Works, and the works of the Westinghouse Electric and Manufacturing Company. The members of the Commission expressed great satisfaction at what they had been able to see and learn. One of them remarked "If the people of Pittsburgh do not acquire culture it will not be because they lack the opportunity."

DR. C. H. EIGENMANN has returned from South America and reports himself to be in as good health as can be expected of one, who has suffered, as he has, from repeated attacks of tropical fever. When a man goes fishing in Venezuela and Colombia he is almost certain to be bitten by mosquitoes, and then the fever follows. Dr. Eigenmann reports having obtained a goodly collection of fishes, among them a number of species which he thinks are undoubtedly new to science, and one or two of which are species which hitherto have been very rare in collections, known only by single individuals. It is entirely too soon to state, except in the most preliminary manner, what have been the results of the expedition.

IN anticipation of the celebration of Founder's Day, which will occur on April the 25th, a partial re-arrangement of some of the exhibits has been made and a number of interesting objects have been installed in the Museum. A group composed of three mounted skeletons of *Stenomylus hitchcocki* Loomis, prepared and mounted by Messrs. O. A. Peterson and S. Agostini, has been placed in the Section of Paleontology in the Gallery of Mammals. In the Section of Recent Mammalia a fine group representing the White-bearded Gnu (*Connochætes albojubatus* Thomas) has been placed upon view. The group consists of a male, a female and young, all three standing, and a female lying down. They are specimens taken by Mr. Childs Frick upon the occasion of his expedition to British East Africa in 1910.

In the Section of Ornithology a fine group of Red-shouldered Hawks, representing a nest with the male and female bird and the young, has been placed upon exhibition. The specimens were taken in Allegheny County in the spring of 1911, and were mounted by Mr. Joseph A. Santens.

ON the evening of April the 17th Captain F. E. Kleinschmidt, who collected for the Carnegie Museum during the summer of 1911 in Alaska and Wrangel-land, gave an exhibition of moving pictures taken by him on his voyage. The large Music Hall was filled to its capacity, and had the night not been unusually inclement many would have been unable to find admission. It is the unanimous opinion of all, who witnessed the display of pictures and heard what Captain Kleinschmidt had to say, that the exhibition was the most beautiful and in some respects the most instructive of the entire year. The seal-herds, the groups of walruses resting upon the ice-floes, the chase of the polar bear, the wonderful views of the bird rookeries were a revelation. In the audience were a number of gentlemen who have pursued game not only with the rifle, but with the camera, and they were unanimous in declaring that Captain Kleinschmidt's pictures are the finest representations of big game photographed in the open which have thus far been taken. One gentleman in writing of the lecture said, "All that was needed was a lower temperature in the auditorium to make you imagine that you were actually in the arctic."

FROM the expedition in Utah there have been received interesting reports, showing that the quarry on Dinosaur Peak contains far more than was at first supposed. Thus far skeletons of at least twelve dinosaurs, large and small, belonging to various genera and species, have been found. Several of these are in such condition as to make it possible to set them up in their entirety, very few parts failing to be well represented. No such aggregation of dinosaurian remains, resting in practically undisturbed position, has ever as yet been found in the history of paleontology. The animals were for the most part firmly imbedded in the sand and gravel where they originally were deposited, and fossilization has taken place in such a manner as to preserve even some parts of the cartilaginous skeleton. We have also obtained impressions of portions of the skin of some of the individuals. A flood of light is thus thrown upon the whole subject.

MR. CARNEGIE, yielding to the request of His Majesty the King of Spain, has kindly resolved to present to the Royal Museum in Madrid a replica of the Diplodocus, which is in course of preparation.

The specimen intended for the Argentine Republic is being packed. No arrangements have as yet been made for forwarding and installing this specimen. The process of correspondence with Argentina is naturally slow.

THE death of Mr. Albert J. Barr has brought great sorrow to his associates composing the Committee upon the Museum and to the entire staff. A brief biographical sketch appears elsewhere in this issue of the Annals.

In Memoriam.

ALBERT J. BARR.

On February the 24th, 1912, Mr. Albert J. Barr, who had been from its establishment a member of the Board of Trustees of the Carnegie Institute, having been originally appointed by Mr. Carnegie, and who for many years was a member of the Committee upon the affairs of the Museum, suddenly departed this life.

Mr. Barr was born in Pittsburgh on January the 12th, 1851. His father was Colonel James P. Barr, who for many years was the owner and editor of the *Pittsburgh Post*. He received his early education at St. Philomena's Parochial School, and later in the Western University of Pennsylvania, now the University of Pittsburgh. Mr. Barr began his business career in 1870, in the Artisans Deposit Bank. In 1872 he became the Secretary of the Artisans Insurance Company of Pittsburgh, and later its President. In 1884 he married Miss Mary McDevitt, a daughter of the late James McDevitt. She survives him with two sons and three daughters. When his father died in 1886 Mr. Barr became the President of the Pittsburgh Post Printing and Publishing Company, which position he retained until in the late winter of the year 1911, when he retired from journalism. He held many positions of honor and of trust, having been during the administration of President Cleveland the Collector of the Port of Pittsburgh. He was also one of the Commissioners of the World's Columbian Exposition in Chicago, having been appointed by Governor Pattison to represent Pennsylvania. He was active in administering the affairs of Mercy Hospital, and was the Vice-president of the Board of Trustees of that hospital at the time of his death. He was also from its inception a member of the Board of Trustees of the Carnegie Hero Fund Commission. At the time of his death he was actively engaged in service as a member of the recently created Board of



ALBERT J. BARR.

[Born Jan. 12, 1851; Died Feb. 24, 1912.]

Viewers of Allegheny County. . Mr. Barr took a deep interest in the affairs of the Carnegie Institute, and rendered efficient service as a member of the standing committee on the Museum, the meetings of which he attended as often as his business engagements made it possible to do so.

Mr. Barr was genial in disposition, devoted to his friends, a kind father and neighbor. He was thoroughly public-spirited, and applied himself with energy and zeal to promoting all movements looking toward the welfare of his native city. His sudden and altogether unexpected death has brought deep sorrow not only to his family, but to the large circle of friends with whom he was associated in carrying on the philanthropies of the community, and especially to his associates in the Board of Trustees of the Carnegie Institute.

W. J. H.

VII. DESCRIPTIONS OF SEVENTEEN NEW
NEOTROPICAL BIRDS.

BY W. E. CLYDE TODD.

Through the activities of Messrs. M. A. Carriker, Jr., and José Steinbach the Carnegie Museum has acquired during the past three years more than six thousand specimens of birds from South America. The collections forwarded by Mr. Carriker came from Venezuela (various localities in the valleys of the Orinoco, lower Caura, and upper Cuyuni Rivers, and in the State of Lara), the islands of Trinidad and Curaçao, and the district of Santa Marta in Colombia. The collections received from Mr. Steinbach are nearly all from eastern Bolivia (Santa Cruz de la Sierra and Puerto Suarez). This material is being studied as rapidly as circumstances permit, and it is expected eventually to publish full lists, with critical notes and the field observations of the collectors. In the course of these investigations a number of apparently new forms have been detected, and it has seemed best to present descriptions of these in advance of the general report.

All measurements given in the present paper are in millimeters, and, so far as possible, Ridgway's *Nomenclature of Colors* has been used as a standard. For the privilege of examining much material needed for comparison in this connection the writer is indebted to the authorities of the American Museum of Natural History, the Academy of Natural Sciences of Philadelphia, the United States National Museum, and the Museum of Comparative Zoölogy, who have generously placed at his disposal the several collections respectively under their care.

Arremonops tocuyensis sp. nov.

Type, No. 36,569, Collection Carnegie Museum, adult male; Tocuyo, Estado Lara, Venezuela, January 21, 1911; M. A. Carriker, Jr.

Description.—Above plain olive; wings and tail dusky, externally edged with dull olive-green, the secondaries with cinnamon-rufous; lesser and median wing-coverts also edged externally with olive-green, the greater coverts more brownish; edge of the wing pale yellow; under wing-coverts white, tinged with yellow; pileum with two broad

lateral stripes of black mixed with brown, separated by a broad median stripe of smoke-gray, but tending to coalesce on the hindneck; broad superciliaries also smoke-gray, slightly paler than the median stripe; a transocular stripe of brownish black; sides of the head and neck smoke-gray; below white, the breast tinged with smoke-gray, and the flanks and under tail-coverts buffy cream-color; "iris brown; feet horn-color; bill black, leaden blue below."

Measurements of type.—Wing, 72 mm.; tail, 56; exposed culmen, 15; tarsus, 22.

Remarks.—The series of *Arremonops* from various localities in the Orinoco region and northern Venezuela is fairly uniform save for this one specimen, and agrees closely with a similar series from the Santa Marta district of Colombia, which had formerly been referred to *A. conirostris canens* Bangs. Naturally I assumed that the odd specimen belonged to *A. venezuelensis* Ridgway, inasmuch as it seemed to fit the description very well indeed. Imagine my surprise, therefore, when I came to examine the type of the latter, to find that it pertained to the ordinary bird of Venezuela and Colombia, to which I had been applying the name *canens*. The question at once arose as to the true application of this latter name—a matter which I am able to discuss from a re-examination of the type specimen, kindly loaned by Mr. Bangs. After a critical comparison of this specimen I feel very sure that it is an unusually large and richly colored individual of the common *Arremonops* of the region. I base this statement on the ground that several examples in the series before me approach it in both these respects. In this view of the case the name *venezuelensis*, having a few months' priority over *canens*, will supplant the latter as the proper name for this form—assuming that it differs from true *conirostris*, described by Bonaparte (*Conspectus Avium*, I, 1850, 488) from "Brasil." This author's type should be examined, as he speaks of it as being "subtus albo-rufescens."

It is of course possible, on the other hand, that the unique type of *A. tocuensis* may be an unusually small and dull-colored individual of *venezuelensis*, but I find no specimens of the latter which approximate it in its distinctive characters. It is of about the same size as *A. superciliosus*; the back has very little greenish tinge—decidedly less than *venezuelensis*; and the sides of the head, and the median and superciliary stripes are smoke-gray, not slate-gray, as in the latter.

***Sporophila haplochroma* sp. nov.**

Type, No. 37,748, Collection Carnegie Museum, adult male; Cincinnati (Santa Marta district), Colombia, June 14, 1911; M. A. Carriker, Jr.

Description.—Above plain olive, inclining to bistre on the rump and upper tail-coverts; tail also olive; wings and their coverts clove-brown, edged externally with the color of the back; below dull olive, fading to buffy white on the center of the abdomen, and to buffy olive on the flanks and under tail-coverts; under wing-coverts dull buffy; "bill blackish horn; feet horn-color; iris brown."

MEASUREMENTS.

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exposed Culmen.
37643	♀	Cincinnati	June 1, 1911	51	39	9
37747	♀	Cincinnati	June 14, 1911	54	40	10
37748	♂	Cincinnati	June 14, 1911	56	44	10
72552 ¹	♀	Minca	Aug. 1, 1899	50	38	10.5
72553 ¹	♀	Minca	Aug. 1, 1899	53	42	10

Remarks.—This species somewhat resembles *S. obscura* Tacznowski,² from Ecuador, Peru, Bolivia, and Argentina, two specimens of which are now before me, but differs in its decidedly darker and more uniform under parts, as well as in its darker bill. The two specimens from Minca are much more brownish above and below than the type and other specimens taken at the same time, but this is probably due to their being in fresher plumage. These two skins are the ones which Dr. J. A. Allen referred provisionally to *Phoniopara bicolor* (*Bulletin American Museum Natural History*, XIII, 1900, 165), but which on re-examination prove referable rather to *Sporophila*, the culmen being more decidedly arched and the mandible proportionally heavier than in any species of "*Phoniopara*" (*i. e.*, *Tiaris*) I have examined. At any rate, all of these specimens are certainly very different from authentic examples of *Tiaris bicolor omissa* from northern Venezuela. The type is marked as a breeding bird, and is slightly darker, with a blacker bill, than the females.

¹ Collection American Museum.

² Mr. C. E. Hellmayr writes me that he is at a loss to understand Mr. Sharpe's remark in the *Hand-List*, V, 1909, 209, footnote, to the effect that *S. obscura* and *S. simplex* are identical, for he (Hellmayr) certainly never made any such statement!

***Saltator orenocensis rufescens* subsp. nov.**

Type, No. 36,635, Collection Carnegie Museum, adult female (?); Tocuyo, Estado Lara, Venezuela, January 25, 1911; M. A. Carriker, Jr.

Subspecific characters.—Similar in general to *Saltator orenocensis orenocensis* Lafresnaye, but averaging larger, with a decidedly stouter bill; forehead and sides of crown, bordering the broad white superciliaries, black; and entire under parts (except the throat) strongly shaded with buffy clay-color.

MEASUREMENTS.

Saltator orenocensis orenocensis:—

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exposed Culmen.	Depth of Bill.
31911	♂im.	Ciudad Bolivar.	Sept. 19, 1909.	84	78	16	12
33460	ad.	San Felix.	Feb. 8, 1910.	93	85	16	12.5
33477	♂ad.	San Felix.	Feb. 9, 1910.	90	81	16.5	12
33478	♂ad.	San Felix.	Feb. 9, 1910.	94	84	17	12.5
33537	♂ad.	San Felix.	Feb. 11, 1910.	92	86	16.5	13
33579	♀ad.	San Felix.	Feb. 15, 1910.	88	79	17	12.5
34257	♂ad.	San Felix.	June 2, 1910.	93	82	17.5	12.5
Average (of six adults)				91.6	83	16.75	12.8

Saltator orenocensis rufescens:—

36608	♂ad.	Tocuyo.	Jan. 23, 1911.	94	89	19.5	13
36635	♀ad.	Tocuyo.	Jan. 25, 1911.	96	90	19.5	14
36636	♂ad.	Tocuyo.	Jan. 25, 1911.	97	90	19.5	14

Remarks.—*Saltator orenocensis* was described by Lafresnaye (*Revue Zoologique*, 1846, 274) from the Orinoco region, but until Mr. George K. Cherrie sent in a series to the Tring Museum in the late nineties it was almost unknown in collections. The Trinidad specimen recorded by Dr. Sclater (*Proceedings Zoological Society of London*, 1856, 77), like many others of so-called "Trinidad" make, probably came instead from the lower Orinoco, while Bonaparte's ascription of the species to Colombia (*Conspectus Avium*, I, 1850, 490) was almost certainly a *lapsus*. Count von Berlepsch and Dr. Hartert, in their extensive paper on the birds of the Orinoco region (*Novitates Zoologicae*, IX, 1902, 23), however, record the species from San Felix, near Cumaná, on the north coast of Venezuela, this being the first unquestioned record of its occurrence outside the lower Orinoco basin. The present record involves a great extension of the known range, and it is not surprising to find that the individuals collected represent a strongly marked subspecies. In *S. v. orenocensis* the breast and

middle of the abdomen are white, sometimes tinged with buffy, but always in strong contrast with the flanks, lower abdomen, and under tail-coverts, which are bright buffy clay-color. In the new form the latter color spreads over the entire under parts as far as the throat, the middle of the abdomen being merely a little paler. The size is greater also, the bill especially, while the crown, which is dark plumbeous, concolorous with the back in the Orinoco form, is margined laterally with a black stripe, meeting its fellow on the forehead. For comparison there have been available six adult specimens of true *orenoensis* from San Felix, Orinoco River, collected by Mr. Carriker in February, 1910, and therefore fully comparable as to season. These agree perfectly with Berlepsch and Hartert's figure of this form (*Novitates Zoologicae*, IX, 1902, pl. 12, fig. 3).

***Tangara guttata eusticta* subsp. nov.**

Type, No. 28,895, Collection Carnegie Museum, adult male; Boruca, Costa Rica, August 9, 1907; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Tangara guttata guttata* (Cabanis) of British Guiana and northern Venezuela, but under parts much more heavily spotted, especially the throat, the feather-edgings on the throat and breast being pale glaucous green; green color of flanks brighter and more extended; edgings of remiges and their coverts inclining to beryl-green; and average size somewhat less.

Measurements of type.—Wing, 67 mm.; tail, 49; exposed culmen, 11; tarsus, 19.

Remarks.—When Mr. Ridgway wrote the second volume of his *Birds of North and Middle America* he had only one very unsatisfactory specimen of this species from Costa Rica before him, which he doubtfully referred to "*chrysophrys*" of Sclater. There are twenty-two examples from this country in the Carnegie Museum, and the acquisition of a series of specimens from other parts of its range has shown that Mr. Ridgway erred in considering the Central American bird to be identical with that from Venezuela, from which it differs conspicuously in generally brighter coloration and much heavier spotting below, besides being slightly smaller. These remarks are based on five adult specimens from La Cumbre de Valencia, Lagunita de Aroa, and Anzoategui—localities in northern Venezuela which unquestionably pertain to typical "*chrysophrys*." A specimen from Mount Roraima, British Guiana (No. 54,058, Collection Academy of

Natural Sciences of Philadelphia), the type locality of *guttata*, does not differ in any perceptible respect from these Venezuelan skins, which agree fairly well with the figure in *Jardine's Contributions to Ornithology*, 1851, pl. 69. Hence, as later admitted by Dr. Sclater himself, *Calliste chrysochrys* Sclater becomes a synonym of *Callispiza guttata* Cabanis, and a new name is required for the Central American bird—unless, indeed, *Calliste guttulata* Bonaparte (*Comptes Rendus de l'Académie des Sciences*, XXXII, 1851, 76), from western Ecuador, belongs here, which seems unlikely, judging from the description alone (I have not seen specimens). Colombian skins will probably also be found referable to this latter form, or else intermediate between it and the Central American form here described.

***Tangara guttata trinitatis* subsp. nov.**

Type, No. 31,773, Collection Carnegie Museum, adult female; Heights of Aripo, Trinidad, August 31, 1909; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Tangara guttata guttata* from British Guiana and northern Venezuela, but under parts more heavily spotted, and forehead and sides of head more decidedly tinged with yellow.

Measurements of type.—Wing, 70 mm.; tail, 56; tarsus, 18.5 (tip of bill broken).

Remarks.—Mr. Ridgway has already (*Birds of North and Middle America*, II, 1902, 41) called attention to the peculiarities of Trinidad examples of this species, which seem well worthy of formal separation, on the basis of the differences above specified. The new form agrees with true *guttata* in having the green of the flanks duller and more restricted, and the narrow margins of the black breast-feathers pale Nile-blue (instead of pale glaucous green, as in the Central American form). The spotting below, while heavier than in true *guttata*, is not so heavy as in *eusticta*, and the forehead and sides of the head are more decidedly tinged with yellow.

There are thus three, and probably four, readily recognizable races of *Tangara guttata*.

***Schistochlamys atra aterrima* subsp. nov.**

Type, No. 36,818, Collection Carnegie Museum, adult male; Guarico, Estado Lara, Venezuela, February 6, 1911; M. A. Carriker, Jr.

Subspecific characters.—Similar to *S. atra atra*, but anterior portion

of crown, sides of head, throat, and upper breast deep black, instead of brown or brownish black, as in the southern form.

Measurements of type.—Wing, 84 mm.; tail, 80; exposed culmen, 16; tarsus, 25.

Remarks.—This subspecies is based on a series of eighteen specimens from northern Venezuela (La Cumbre de Valencia, Guarico, and Anzoategui), which differ as above pointed out from three skins from Bolivia in the collection. At first I thought that this difference was due to the Venezuelan skins being in fresher plumage, but an examination of the series in the American and United States National Museums has convinced me that this is not the case. A large series from Matto Grosso, Brazil, in the collection of the former institution, varies considerably, but as a series is sufficiently distinct from specimens from Trinidad and northern Venezuela. The browner color of the capistrum and throat, however, is the only character that can be relied on to separate the two races. *Tanagra atra* Gmelin (*Systema Naturæ*, I, i, 1788, 898) was based on D'Aubenton (*Planches Enluminées*, 714, fig. 2), whose type came from Cayenne. A specimen from this locality in the collection of the American Museum belongs clearly to the southern form, while two in the Carnegie Museum from the Orinoco region (San Felix and El Llagual) although obviously intermediate, are also best referred thereto. I have not seen Colombian examples, but presume that they will be found referable to *aterrima*. All the synonyms of this species would seem to pertain exclusively to true *atra*.

***Compsothlypis pitiayumi elegans* subsp. nov.**

Type, No. 36,953, Collection Carnegie Museum, adult male; Anzoategui, Estado Lara, Venezuela, February 21, 1911; M. A. Carriker, Jr.

Subspecific characters.—Resembling *C. pitiayumi pitiayumi* (Vieillot) of Paraguay, southern Brazil, and Bolivia, but averaging decidedly more brightly colored below, the throat and breast in adult males being orange-ochraceous (as in *C. p. speciosa* Ridgway), while the abdomen also is deeper yellow.

Measurements.—Average of ten adult males: wing, 54 mm.; tail, 40; exposed culmen, 10.

Remarks.—Professor Baird was apparently the first author to note the peculiarities of this form as shown by a specimen from

Trinidad (*Review of American Birds*, 1864, 170). Dr. Sharpe (*Catalogue Birds British Museum*, X, 1885, 260) sought to identify it with *Parula pitaiyumi pacifica* Berlepsch of western Ecuador, but this reference was emphatically repudiated by Messrs. Berlepsch and Hartert (*Novitates Zoologicae*, IX, 1902, 10), who, [however, forbore to give the form a name. With a series of twenty-one very satisfactory specimens before me I find no difficulty in distinguishing it from the southern race, of which the figure (Plate 11, fig. 1) in the *British Museum Catalogue* is a very good representation. Paraguay (*ex Azara*) is the type locality, and skins from that country agree with those from Bolivia (Santa Cruz de la Sierra, etc.) and southern Brazil in having the under parts paler, with the throat and breast much less strongly tinged with orange-ochraceous than in examples from Colombia (Santa Marta district), northern Venezuela, the Orinoco region, and Chacachacare Island, off Trinidad. There is no especial difference in size, however. The present form may readily be distinguished from *C. p. pacifica* of western Ecuador and *C. p. speciosa* of Central America, with which it agrees well in the color of the under parts, by the amount of white on the middle wing-coverts, these latter forms having very little or none of this color on these parts.

***Pheugopedius macrurus annectens* subsp. nov.**

Type, No. 37,137, Collection Carnegie Museum, adult male; Anzoategui, Estado Lara, Venezuela, March 4, 1911; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Pheugopedius macrurus macrurus* (Allen) from "Bogotá," Colombia, but size somewhat less, crown purer gray, back and wings duller rufous brown, and rectrices more distinctly barred.

Measurements.—Adult male: wing, 69 mm.; tail, 68; exposed culmen, 18.5; tarsus, 27. Adult female (No. 37,138): wing, 67 mm.; tail, 62 mm.; exposed culmen, 18; tarsus, 26.

Remarks.—Although reluctant to add another to the list of names in the *Pheugopedius mystacalis* group, and thereby possibly increase the confusion, I find myself unable to satisfactorily identify the two specimens above recorded with any of the described forms. They certainly differ from typical *P. mystacalis* from western Ecuador, of which I have examined four specimens, in somewhat larger size, the tail in particular being proportionately longer, while the general

coloration is not so bright. From *P. ruficaudatus* (Berlepsch) they differ only in the tail being browner and distinctly barred. The exact relationships of the various members of this group are involved in much obscurity, which the material I have examined is insufficient to dissolve, but it would not be surprising if *P. macrurus* should turn out to be only subspecifically separable from *P. mystacalis*.

Troglodytes solitarius sp. nov.

Type, No. 37,359, Collection Carnegie Museum, adult male; Paramo de Rosas, Estado Lara, Venezuela, March 21, 1911; M. A. Carriker, Jr.

Description.—Above plain brown (between mummy-brown and Prout's brown), becoming more rufescent on the upper tail-coverts; wing-coverts like the back; wings dusky black, the outer webs of the remiges with brown spots, giving the effect of bars in the closed wing, the tertiaries with both webs thus barred; tail grayish brown, irregularly barred with dusky black, as are also the longer upper tail-coverts; a broad buffy superciliary stripe, separated from the buffy (and more or less rufescent) cheeks by a broad postocular patch of rufescent brown; orbital ring (incomplete posteriorly) buffy white; cheeks with some dusky mottling; below dull white, the throat, breast, and sides tinged with buffy; flanks wood-brown; under tail-coverts white or buffy white, conspicuously barred with dusky black; under wing-coverts pale buffy; "iris brown; feet light brownish horn; bill black, whitish flesh-color basally below."

MEASUREMENTS.

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exp. Cul.	Tar.
37278	♂	Paramo de Rosas...	March 14, 1911...	50	37	13	17.5
37358	♀	Paramo de Rosas...	March 21, 1911...	47	33	13	17.5
37359	♂	Paramo de Rosas...	March 21, 1911...	50	37	13	18

Remarks.—This very distinct species seems to find its nearest relatives in *T. solstitialis* Sclater and *T. ochraceus* Ridgway. From the former it differs in being without any trace of barring below (except on the under tail-coverts), and from the latter in its much larger size, different proportions, whiter under parts, and deeper rufescent color above. Like the other members of this group, it is apparently confined to the higher elevations of the Venezuelan Andes, the three examples above listed all coming from the Paramo de Rosas,

at an elevation of from seven thousand five hundred to nine thousand feet.

***Craspedoprion intermedius* sp. nov.**

Type, No. 33,771, Collection Carnegie Museum, adult male; Rio Yuruan (12 miles from mouth), Venezuela, March 19, 1910; M. A. Carriker, Jr.

Description.—Above dull olive-green; greater wing-coverts edged externally with fulvous; remiges dusky brown, edged externally with pale olive-green, inclining to fulvous at the extremities of the inner secondaries; primary-coverts and alula also narrowly edged with olive-green; tail olive-brown, the feathers edged externally with olive-green; beneath pale yellowish olive-green, becoming primrose-yellow posteriorly, suffused or obsoletely streaked with pale grayish olive; under tail-coverts buffy yellow; "iris brown; feet leaden blue; bill black, flesh-colored below."

MEASUREMENTS.

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exp. Cul.	Tar.
32115	♂	La Lajita, Rio Mato.....	Oct. 28, 1909....	75	60	14	17
33771	♂	Rio Yuruan.....	Mar. 19, 1910....	70	58	13	17
33819	♂	Rio Yuruan.....	Mar. 28, 1910....	70	56	14	17.5
33875	♂	Rio Yuruan.....	Apr. 6, 1910....	70	58	14	17

Remarks.—This species is evidently nearest to *C. olivaceus* (Temminck) of southeastern Brazil, and may possibly have to stand as a subspecies of that form. The color of the upper surface and wing-coverts is the same in both, but in *C. intermedius* the under parts generally are brighter (although not so bright as in *C. æquinoctialis*), while the chin and throat are paler and more yellowish. Moreover, *C. intermedius* is a smaller bird, the bill in particular being smaller and narrower. The four specimens above recorded are very uniform, and obviously represent a form which is intermediate both in characters and in range between *C. æquinoctialis* and *C. olivaceus*.

***Myiobius modestus* sp. nov.**

Type, No. 33,605, Collection Carnegie Museum, adult male; Upata, Venezuela, February 22, 1910; M. A. Carriker, Jr.

Description.—Above dull greenish olive, the occiput with a partially concealed patch of sulphur-yellow; rump primrose-yellow; longer upper tail-coverts and tail black; wings and their coverts dusky

brown, margined externally with dull brownish olive; below pale yellow (between primrose- and straw-yellow), brightest on the middle of the abdomen, the throat, breast, and sides being shaded with buffy; tibiae and under tail-coverts brownish buffy; "iris brown; feet leaden horn; bill black, flesh-color below."

Measurements of type.—Wing, 62 mm.; tail, 60; exposed culmen, 10.5; tarsus, 18.

Remarks.—This form is based upon two adult and three immature birds from San Felix, Altagracia, and Upata, localities in the region lying immediately south of the Orinoco east of Ciudad Bolivar. These are evidently the same as the two skins from Caicara (farther up the Orinoco) doubtfully referred to *Myiobius barbatus atricaudus* Lawrence by Messrs. Berlepsch and Hartert (*Novitates Zoologicae*, IX, 1902, 49). Upon comparison with an ample series of the latter from Costa Rica, however, they prove to be very distinct, being decidedly paler olivaceous above, and more uniform below, with less of the buffy suffusion on the breast and sides, and the tibiae and under tail-coverts much paler, more buffy. From true *M. barbatus*, of which I have three examples before me, they are still more different, and may be distinguished at a glance by their deep black tails. Unfortunately I have been unable to compare them with *M. ridgwayi* Berlepsch, but the description of the latter differs in certain essential respects, and it is moreover fair to presume that Messrs. Berlepsch and Hartert, in the paper before referred to, would not have overlooked the possibility of their specimens being referable to this form.

In my judgment *Myiobius barbatus* is specifically distinct from *M. atricaudus*, from which the form here described may prove to be merely subspecifically separable. Furthermore, Mr. Hellmayr has, I think, gone too far in reducing *M. mastacalis* (Wied) (= *M. xanthopygus* (Spix)) to a subspecies of *M. barbatus* (cf. *Abhandlungen K. Bayer. Akademie Wissenschaften, München*, Kl. ii, XXII, 1906, 642). However, as I have not yet had the opportunity of examining all of the other described forms, I refrain for the present from formally indicating my views on their exact relationships.

***Myiochanes ardosiacus polioptilus* subsp. nov.**

Type, No. 36,457, Collection Carnegie Museum, adult male; Lagunita de Aroa, Estado Lara, Venezuela, December 29, 1910; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Myiochanes ardosiacus ardosiacus* (Lafresnaye) of Colombia, Ecuador, etc., but under parts averaging paler and duller, the chin, upper throat, abdomen, and under tail-coverts inclining to whitish, sometimes almost pure white, and the outer web of the outer rectrices conspicuously margined with white.

Measurements of type.—Wing, 88 mm.; tail, 72; exposed culmen, 15; tarsus, 13.5.

Remarks.—After examining a fair series of this interesting species I am satisfied that the differences above pointed out are geographical in their nature, and not due to either age or season. Immature birds of both forms, indeed, have the wing-coverts more or less tipped with whitish or buffy, but the subspecific characters still obtain. It is further significant that of two individuals from the Paramo de Rosas, taken at an elevation of between seven and eight thousand feet, one is perfectly typical of *M. a. ardosiacus*, while the other is intermediate. Hence I infer that the form here described is characteristic of the lower altitudes in northern Venezuela, but am unable to define the exact limits of its range. None of the specimens of this species which I have examined in this connection from Colombia, Ecuador, and Bolivia show any approach to *polioptilus* in their characters. Lafresnaye's type was a "Bogotá" skin, and as he was careful to state that it had no white on the parts which are of that color in *Sayornis nigricans*, there can be no doubt as to the application of his name.

The present subspecies is based on five specimens from Lagunita de Aroa and one from La Cumbre de Valencia, Estado Lara, Venezuela.

***Myiodynastes chrysocephalus cinerascens* subsp. nov.**

Type, No. 37,168, Collection Carnegie Museum, adult male; Paramo de Rosas, Estado Lara, Venezuela, March 7, 1911; M. A. Carriker, Jr.

Subspecific characters.—Similar to examples of *Myiodynastes chrysocephalus chrysocephalus* from the Santa Marta district of Colombia and lower altitudes in northern Venezuela, but entire upper parts much grayer, the back with little greenish tinge, but instead nearly concolorous with the crown; superciliaries pure white, with no buffy tinge; crown-patch pure citron-yellow, with no orange tinge; under parts less distinctly streaked, and decidedly paler, with less buffy suffusion on the throat, the abdomen being much paler yellow (between primrose- and sulphur-yellow) fading to pure white on the under tail-coverts.

Measurements of type.—Wing, 105 mm.; tail, 87; exposed culmen, 20.5; tarsus, 18.

Remarks.—Although only a single specimen from the Paramo de Rosas is available, this differs in so many important respects from a large series from other localities with which I have compared it that I have little hesitation in ascribing it to a heretofore unrecognized alticoline form of *Myiodynastes chrysocephalus*. The series of the latter examined includes a number of young birds, which are quite different from the skin from the Paramo de Rosas, which is unquestionably adult. In this series the back is decidedly olive-green, contrasting strongly with the grayish crown, while the abdomen and under tail-coverts are canary-yellow.

Myiodynastes chrysocephalus was originally described from Peru, from which country I have been unable to examine any material in this connection, but there are reasons for believing that when such comes to hand it will be found that the ordinary bird of Venezuela and Colombia is subspecifically separable. At any rate, it is certainly different from the Ecuador bird, which Messrs. Taczanowski and Berlepsch (*Proceedings Zoological Society of London*, 1885, 91) have described as a distinct subspecies, *M. c. minor*.

***Machetornis rixosa flavigularis* subsp. nov.**

Type, No. 36,547, Collection Carnegie Museum, adult male; Tocuyo, Estado Lara, Venezuela, January 20, 1911; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Machetornis rixosa rixosa* (Vieillot) from Brazil, Bolivia, etc., but under parts brighter yellow, the throat and breast but little paler than the abdomen; crown less purely gray, contrasting less strongly with the back.

Measurements of type.—Wing, 97 mm.; tail, 78; exposed culmen, 20; tarsus, 30.

Remarks.—This is a strikingly distinct form, perhaps entitled to specific rank. The characters upon which it rests are very constant in a series of twelve specimens from Venezuela (Orinoco valley and the north coast) as compared with a similar series from Bolivia, Brazil, Paraguay, and Argentina, in which the chin, cheeks, and throat are white or creamy white, brightening into yellow only on the breast and abdomen, instead of being decidedly yellow throughout. Four examples from the Santa Marta region of Colombia, although obviously referable to *flavigularis*, are a little paler than the Venezuelan

skins. So far as I can discover all the names which have been bestowed upon this wide-ranging species pertain to the southern form.

***Euchlornis aureipectus festiva* subsp. nov.**

Type, No. 35,220, Collection Carnegie Museum, adult male; La Cumbre de Valencia, Venezuela, October 21, 1910; M. A. Carriker, Jr.

Subspecific characters.—Similar to *Euchlornis aureipectus aureipectus* (Lafresnaye), but averaging larger, and under parts in adult male more extensively yellow, the green color of the sides of the breast and abdomen more restricted.

MEASUREMENTS.

Euchlornis aureipectus festiva:—

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exp. Cul.	Tar
34951	♂im.	La Cumbre de Valencia.	Oct. 3, 1910.	.95	68	12	24
35220	♂ad.	La Cumbre de Valencia.	Oct. 21, 1910.	.98	75	13	23
35221	♂ad.	La Cumbre de Valencia.	Oct. 21, 1910.	.96	70	13	23
34950	♀ad.	La Cumbre de Valencia.	Oct. 3, 1910.	.98	70	12	23
34952	♀ad.	La Cumbre de Valencia.	Oct. 3, 1910.	.96	73	12	22
35222	♀ad.	La Cumbre de Valencia.	Oct. 21, 1910.	.93	70	13	23

Euchlornis aureipectus aureipectus:—

43797 ¹	♂ad.	"Bogotá".....93	65	11	22
36783	♂ad.	Guarico.....	Feb. 3, 1911.	.86	66	12	22
36856	♂ad.	Guarico.....	Feb. 8, 1911.	.93	67	12	21
37149	♂ad.	Anzoategui.....	Mar. 4, 1911.	.89	65	12.5	22
36784	♀ad.	Guarico.....	Feb. 3, 1911.	.90	62	11.5	21
36945	♀ad.	Guarico.....	Feb. 15, 1911.	.92	65	11	22
37106	♀ad.	Anzoategui.....	Mar. 2, 1911.	.93	69	12	22

Euchlornis aureipectus decora:—

8798	♂ad.	El Libano.....	Apr. 22, 1899.	.87	63	12	20.5
37683	♂ad.	Cincinnati.....	June 7, 1911.	.84	64	12	20.5
37819	♂ad.	Las Taguas.....	June 26, 1911.	.82	62	11	19
37820	♂ad.	Las Taguas.....	June 26, 1911.	.86	64	11	20
8844	♀ad.	Valparaiso.....	May 26, 1899.	.84	62	12	20
37792	♀ad.	Las Taguas.....	June 19, 1911.	.84	64	11	21

Remarks.—That the form of *Euchlornis aureipectus* inhabiting the coast region of northern Venezuela should prove to be different from that found in the higher elevations of the interior is not surprising, in view of the fact that several other birds have been found to vary in the same limits. This species was described from "Bogotá," Colombia,

¹ Collection American Museum.

and the types, now in the collection of the Boston Society of Natural History, were examined by Mr. Bangs when he discriminated the Santa Marta form under the name *decora* (*Proceedings Biological Society of Washington*, XIII, 1899, 98). A small series of this latter form which I have studied in this connection exhibits the characters pointed out by Mr. Bangs when compared with a similar series from Guarico and Anzoategui, Venezuela, and a single skin from "Bogotá," Colombia. Hence I infer that these represent true *aureipectus*. The La Cumbre birds, however, are still larger, and the yellow of the throat and breast in the males is continued over the abdomen, with scarcely a suggestion of the break so prominent in the other two forms, in which the green color of the sides of the breast tends to form a sort of half-collar. The females apparently have no color-characters, but are larger than the same sex of the other two forms.

Piaya rutila panamensis subsp. nov.

Type, No. 7,100, Collection E. A. and O. Bangs (now in the Museum of Comparative Zoölogy), adult male; Loma del Leon, Panama, March 10, 1900; W. W. Brown, Jr.

Subspecific characters.—Similar to *Piaya rutila rutila* (Illiger), but cinnamon-rufous of breast more restricted, passing abruptly into hair-brown on the abdomen, which in turn deepens into slaty brown on the under tail-coverts.

Measurements of type.—Wing, 102 mm.; tail, 144; exposed culmen, 17.5; tarsus, 24.5.

Remarks.—Comparison of a series of *Piaya rutila* from Panama with another from Venezuela, Trinidad, and Cayenne shows that the former differs constantly in the respects above pointed out. In *P. rutila rutila* (type locality Cayenne) the posterior under parts are much browner, less grayish, while the cinnamon-rufous of the breast often invades the abdomen. All of the synonyms of *P. rutila* apparently apply to the typical form with the exception of *Coccyzus gracilis* Heine (*Journal für Ornithologie*, 1863, 356), which specific name may be retained for the Ecuador bird, which seems to differ in its paler coloration, judging from the examples I have seen.

For the privilege of describing this new form I am indebted to Mr. Outram Bangs.

Penelope colombiana sp. nov.

Type, No. 37,840, Collection Carnegie Museum, adult male; Las Taguas (near Santa Marta), Colombia, June 27, 1911; M. A. Carriker, Jr.

Description.—General color of upper parts dark glossy olive, inclining to bronzy on the scapulars, each feather laterally edged with white or buffy white; rump and upper tail-coverts chestnut, faintly mottled with darker color; primaries and their coverts dusky olive, externally margined with gray; secondaries and their coverts bronzy olive, the lesser and median coverts laterally edged with whitish like the feathers of the back, and the greater coverts edged externally with wood-brown; elongated feathers of crown and nape dusky olive, margined with grayish white; no conspicuous superciliary or malar stripes, but this latter region dusky gray; throat naked (scarlet in life); breast dark glossy olive, becoming bronzy posteriorly, each feather laterally margined with white; abdomen more rusty, deepening into chestnut on the tibiae and under tail-coverts, which are obscurely barred with dusky; under wing-coverts dusky olive; tail dark glossy olive above, dusky below, the middle rectrices coppery bronze, and all broadly tipped with chestnut, usually with faint dusky vermiculations; "bill blackish horn; iris brown; feet salmon-red" or "scarlet salmon."

MEASUREMENTS.

No.	Sex.	Locality.	Date.	Wing.	Tail.	Exp.	
						Cul.	Tar.
8766	♂	Valparaiso.....	March 10, 1899...	257	285	29	60
8767	♀	Valparaiso.....	March 13, 1899...	253	254	29	56
37698	♀	Cincinnati.....	June 8, 1911...	244	234	28	52
37840	♂	Las Taguas.....	June 27, 1911...	273	280	30	59

Remarks.—This fine new species has heretofore been confused with *Penelope argyrotis* (Bonaparte) of northern Venezuela, from which it is perfectly distinct, as shown by a comparison of specimens. In *P. argyrotis* the feathers of the crest are much broader, blunter, and browner, and only those growing on the forehead are margined with grayish white, while in the new species these feathers are linear and acuminate, and all margined with grayish white for their entire length. Moreover, the grayish white superciliary and malar stripes, so conspicuous in *P. argyrotis*, are entirely wanting in *P. colombiana*, these parts being almost the same as the crown. In the latter, also, the

feathers of the neck and mantle are more conspicuously edged (laterally) with white, and the middle rectrices are decidedly more coppery, while all are broadly tipped with chestnut, instead of narrowly tipped with buffy rufous, as in *argyrotis*. The abdomen and tibiae are also decidedly more rufescent than in the latter form.

Bonaparte's original description of *Pipile argyrotis* (*Comptes Rendus de l'Académie des Sciences*, XLII, 1856, 875) is very brief and unsatisfactory, but the species was later identified by Messrs. Sclater and Salvin (*Proceedings Zoölogical Society of London*, 1870, 528) from an examination of some of his authentic specimens. Meanwhile it had been given two other names. *Penelope montana* Reichenow (*Tauben*, 1862, 151, ex Lichtenstein, MS.), and *Penelope lichtensteinii* Gray (*Proceedings Zoölogical Society of London*, 1860, 269), both based upon material from Venezuela.

For comparison I have had five skins of *P. argyrotis* from Las Quiguas and La Cumbre de Valencia, Venezuela. As yet I have seen no specimens of *P. colombiana* except from the Santa Marta district of Colombia, but its range may possibly be much more extensive.

VIII. DR. DAVID ALTER, A NEARLY FORGOTTEN PENNSYLVANIAN, WHO WAS THE FIRST DISCOVERER OF SPECTRUM ANALYSIS.¹

BY W. J. HOLLAND.

A few years ago Dr. Frank Cowan of Greensburg, Pennsylvania, died, and through the kindness of a friend, who had known him for many years, the Carnegie Museum came into possession of his scientific collections. Among his treasures was a prism, which I have the pleasure of exhibiting. It was made out of a piece of glass which composed a part of a large mass found in the ruins of Bakewell's glasshouse after the disastrous fire, which on April 10th, 1845, nearly destroyed the city of Pittsburgh. It was made by Dr. David Alter, of Freeport, Pennsylvania, a physician of inquiring and ingenious mind, who was early in life attracted to the study of electricity and chemistry, having as a boy read the story of Franklin, and who, quite independently, and yet in fact before the discovery of Morse, invented a crude system of telegraphing.

There was no connection between himself and Morse, and Dr. Alter was most emphatic in disclaiming any credit for the introduction of the telegraphic apparatus which the genius of Morse evolved.

In the year 1853, Dr. Alter having made the prism, which I hold in my hand, began a series of experiments an account of which was published in November, 1854, in Silliman's *American Journal of Science and Art*, Second Series, Volume XVIII, p. 55. The title of the article is as follows:

"Article VI.—On certain Physical Properties of Light produced by the combustion of different metals in the Electric Spark, refracted by a prism; by David Alter, M.D., Freeport, Penn."

He began his article by saying: "We are indebted to the celebrated Mr. Fraunhofer for the fact that the solar spectrum is covered by numerous fixed lines, and that the light of some of the fixed stars differs from that of the sun in the number and situation of these lines.

¹ Read before the Academy of Natural Sciences of Philadelphia on the morning of the Centenary meeting, March 20, 1912.

In order to see some of these lines without the aid of a telescope, I ground a prism of flint glass with a large refracting angle (74°)."

He then proceeds to state the results of his observations upon sunlight, upon the light of a petroleum lamp, a tallow candle, the flame of alcohol, the electrical spark, and the various metals when subjected to the action of powerful electrical discharges, such as silver, copper, zinc, lead, tin, iron, bismuth, antimony, and brass (an alloy of copper and zinc), and an alloy of copper and silver.

He describes with minute particularity the appearance of the spectrum and the Fraunhofer lines when the light is affected by the presence of the various substances with which he experimented.

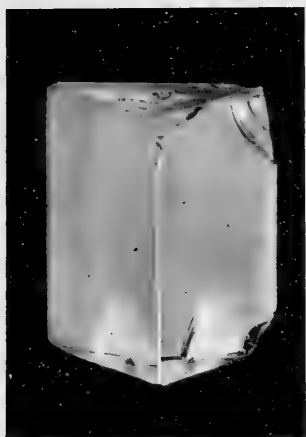
In May, 1855, there appeared in the same journal, 2nd Series, Vol. XIX, p. 213, an article the caption of which is as follows:

"Article XXI.—On Certain Physical Properties of the Light of the Electric Spark with certain Gases, as seen through a Prism, by D. Alter, M.D., Freeport, Pennsylvania."

In this article he clearly points out the applicability of the method of spectrum analysis to celestial phenomena. He says, "The colors also, observed in the aurora borealis, probably indicate the elements involved in that phenomenon. The prism may also detect the elements in shooting stars, or luminous meteors." Accompanying this article the author sent to Dr. Silliman two daguerreotypes of the dark lines in the solar spectrum which he had made. The art of photography had not advanced beyond daguerreotyping in those days.

And now it is interesting to know that these articles of Dr. Alter were reproduced in foreign scientific journals in abstract or their entirety. A half page abstract of the first article was published in the *Jahresbericht der Chemie* of Liebig & Kopp for the year 1854, p. 118; the second paper was reproduced in its entirety in *L'Institut* of Paris in the year 1856, p. 156, and in the Twenty-ninth Volume of the *Archives des Sciences Physiques et Naturelles*, p. 151, published in Geneva. An annotated abstract of the second article appeared in Liebig & Kopp's *Jahresbericht der Chemie* for the year 1855, p. 107. In the latter special attention is called to Dr. Alter's statement that it is possible by means of the spectrum to distinguish gases as well as metals.

It was not until the year 1859 that announcement was made of Kirchhoff's discovery that Fraunhofer's lines were due to the presence of various elements in the sun.



Prism made by Dr. David Alter, of Freeport, Pennsylvania,
with which he made his experiments in 1853.

My good friend Cowan in his pamphlet, which he gave forth in 1894, and which is now rare and hard to obtain, reflects severely upon Kirchhoff's failure to allude in any way to Dr. Alter's discoveries, which clearly antedated his own by five years, and which Dr. Cowan is inclined to think must have been known to the distinguished German physicist. Be that as it may, it is established by testimony which cannot be controverted, that five years before Kirchhoff announced the possibility of determining the existence of various substances in the solar photosphere, a modest and unassuming investigator, living in the retirement of a small village on the banks of the Allegheny, definitely described the possibility of determining various metals and gases by their lines in the spectrum, and had pointed out that this method of investigation might be employed in the case of heavenly bodies, and had succeeded in daguerreotyping the lines in the solar spectrum.

Priestley, one of the fathers of modern chemistry, sleeps the long sleep on the banks of one of the beautiful rivers of this commonwealth; and Alter, the first discoverer of spectrum-analysis, also rests beneath the sods of this state, on the banks of another of its fair streams, to which the French long ago gave the name of "la belle rivière."

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7. *Evening Telegraph of Pittsburgh*, Oct. 11, 1881, "A Dead Philosopher. Dr. Alter's Life and Labors," by Dr. Frank Cowan of Greensburg, Pa. Subsequently reissued in pamphlet form by Dr. Cowan from his private press at Greensburg under the title "David Alter, the Discoverer of Spectrum Analysis—A Sketch of his Life and Labors," pp. 16 (1894).
8. "Dr. David Alter: Scientist, Discoverer of Spectrum Analysis and Inventor of the First Electric Telegraph and Electric Motor." By James B. Laux. Published in the *Freeport Journal*, June 2, 1911. (Upon the occasion of the erection by his townsmen of a monument in memory of Dr. Alter.)

IX. TWO MUMMY-LABELS IN THE CARNEGIE MUSEUM.*

BY PROFESSOR HAMILTON FORD ALLEN.

(Plates XVI and XVII.)

Mummy-labels,¹ which were attached to mummies for purposes of identification, were used in Egypt mainly in the second and third centuries of the Roman rule, though Krebs² assigns one to the fourth century. Very few of the labels are dated, but, of those which bear a date, the earliest is from the reign of Trajan and the latest from the "year 1" of the reign of Macrianus and Quietus.³ These tickets were attached to mummies sent by water to some necropolis, where they were kept before burial, and, if more than the simple particulars were needed, a papyrus screed was sent with the body. The majority of the bodies thus tagged were those of Egyptians of the middle and lower classes, and the labels are written mainly in Demotic, Demotic and Greek, or in Greek alone. The Demotic form in addition to the particulars which are also given in Greek, makes some mention of a god in a prayer or ascription of praise.

The fullest form of the Greek label is Εἰς (place-name) ταφή τοῦ (or τῆς) δείνα τοῦ (υἱοῦ) or τῆς (θυγατρὸς) δείνα μητρὸς δείνα ἀπὸ (place-name) ἔτων (ἐβίωσεν ἔτη) ἰθ̄ (or other letters to represent the number of years). This is the fullest form of the label, but the form which occurs most frequently omits the names of the places to which the mummy is to be sent and from which it comes, and leaves out the word ταφή as well, so that there is left the name of the dead with the names of the father and mother and the number of years lived. But the name of the father or mother, or of both, may be omitted, and the number of years lived may be left out, till nothing is left but the name of the dead.

When the word ταφή is omitted from the beginning, the name of the dead may be in the genitive case, as Θεάνου,⁴ or Ταβανάβριος, or it

* Read before the Archeological Institute of America, December 27, 1911.

¹ H. R. Hall, *Proceedings of the Society for Biblical Archaeology*, 1905, pp. 13-20, 48-56, 83-91, 115-122, 159-165.

² Krebs, "Griechische Mumienetiketten aus Ägypten," *Zeitschrift für Ägyptische Sprache und Altertumskunde*, vol. XXXII (1894), pp. 36 ff.

³ Spiegelberg, "Ägyptische und Griechische Eigennamen aus Mumienetiketten der Römischen Kaiserzeit," Leipzig, 1901, p. 3.

⁴ This and the following are given by Hall, numbers 18, 22, 21, 5.

may be in the nominative case, as $\text{Τβήσις θνγ (άτηρ) Τβήσεως θνγ (υτρός)}$ 'Ροδοκλείας, or Ταμένε , because the writer does not think of the loss of ταφή . Since the writer does not know Greek declension he gives the to him common form of the nominative used without declension; for there were very few Greeks among those who bore these labels. If we have a Greek unilingual label we may be able to find the Egyptian form of the name from its occurrence in some bilingual (Demotic and Greek) label, or in some unilingual (Demotic) label, or on an ostrakon, or in some papyrus. But when all these aids fail and we can not establish any combination of Egyptian words or sounds which the name might represent we must leave the question open for a later day to settle.

Occasionally the title⁵ or calling of the dead is given after his name, as $\text{ἀγορανόμος, γραμματεὺς, ἱερεὺς, προφήτης, πλωθεντής, etc.}$

Though the fullest form of label, and the simplest form, which gives merely the name of the dead, seem to be the least frequent, the content of the inscriptions varies considerably, the variation being due perhaps to differences of time and place. For example the method of noting the number of years lived varies as follows, $\text{ἐβίωσεν ἔτη, ἐβίωσεν ἐτῶν, ἐβίωσεν ὡς ἐτῶν, βιώσαντος ἐνιαυτοῦ, ὡς ἐτῶν, ἐτῶν,}$ and L (the sign for ἐτῶν), while the number of years is either represented by letters and symbols, or by words ($\text{ἐνιαυτοῦ ἐνὸς ἡμίσους}$), or by both together.

According to Hall a majority of the mummy-labels in the museums are from Akhmim (Panopolis) and Bompæ (Sûhag), though this is merely due to chance, Bompæ, Psonis and other towns being near Akhmim. But Schmidt⁶ says that only a small part of the labels sold as "from Achmim" are really from that place, the majority being from Athribis (Sohag), the present Schech Hammed.

The specimen contained in the Carnegie Museum which is represented on Plate XVI, is a wooden tablet,⁷ perforated at one end, 13.5×6 centimeters in size. The inscription is in Demotic and Greek written lengthwise. The label is very black, provenance unknown.

⁵ Spiegelberg, p. 71*.

⁶ Carl Schmidt, "Ein Griechisches Mumienetikett aus Achmin," *Zeitschr. f. Ägypt. Spr. u. Altertumskunde*, vol. XXXIV (1896), pp. 79-81.

⁷ Carnegie Museum, Pittsburgh, Pa., Accession Number 4599. Because of the light yellow color of the wood the inscription could not be made clear in a photograph. The illustration is from a copy made by Mr. Sidney Prentice, the draughtsman of the Museum.

The Greek inscription is as follows:

Πορούσιος Ἀρεμήφιος μητρὸς Τβήσιος ἐβίωσεν L (ἔτη) N (= 50).

(Burial) of Porousis (the son) of Haremephis (and) of (his) mother Tthesis. He lived fifty years.

The translation of the Demotic is as follows:

His soul lives before Osiris—

Sokar, the great god, the lord of Abydos, Pe-worschi,
the son of Har-mêhef. His mother (was) Te-bêš.

He died with fifty years.

In this label, though the word *ταφή* is omitted from the beginning, *Πορούσιος*, the name of the dead, is in the genitive case. *Πορούσιος* is the Grecized form of the Demotic Pe-worschi = He (who belongs to the) Watcher, Watcher being an epithet of Osiris.⁸ Spiegelberg does not give this form of the name (and I have not found it in the few books at my disposal), though he gives other names formed with the same root. *Ἀρεμήφιος* is a common enough name.⁹ It is the Greek form of Har-mêhef = Horus fills him. *Τβήσιος*, the name of the mother, is also common.¹⁰ It is for the Egyptian Te-bêš = She (who belongs to the god) Bes. We have also the simple form *Βήσιος*,¹¹ without the feminine demonstrative, and the forms *Βής*, *Βήσας*, *Σενβήσιος* (daughter of *Βήσιος*), *Σρενβήσιος*, and *Ταβής*.

The specimen represented on Plate XVII is a wooden tablet,¹² perforated at one end, 12 × 6 centimeters in size. The inscription is in Greek incised crosswise,¹³ provenance unknown.

The inscription is as follows:

Τκουαλατείνε¹⁴ Ἐπωνύχου ἐτῶν ἸΘ̄.

Tkoualateine (wife or daughter) of Eponychos of years 19.

Ἐπωνύχος is a common name, occurring frequently in the indices of the various collections of papyri and of Wilcken's Griechische Ostraka. According to Wessely¹⁵ it is from the Demotic Efonch (= he lives),

⁸ Spiegelberg, p. 20*, No. 147, and p. 65*, No. 468.

⁹ Hall, No. 50; Krebs, No. 35, 70, and Spiegelberg, p. 2*, a dozen times.

¹⁰ Hall, No. 10; Spiegelberg, No. 369 and 369a.

¹¹ Spiegelberg, No. 39-43, 264, 364 (p. 45*), 328.

¹² Carnegie Museum, Accession Number 1917; photograph of the original.

¹³ Of the one hundred and seventeen labels given by Spiegelberg in his plates but four are written crosswise.

¹⁴ The σ in the second line of the inscription must be read as ε; for the bar of the ε, which the maker forgot to incise, may still be seen on the label. Similar omissions are found in Le Blant, *Tablari Égyptiennes*, *Revue Archéologique*, N. S., vol. XXVIII (1874) and XXIX (1875), No. 29; and in Hall, No. 15.

¹⁵ Spiegelberg, *zur Paläographie und Papyruskunde*, Leipzig, 1901, p. 41. Cf. Spiegelberg, p. 10*.

ΠΟΡΟΥΤΟΣ ΔΡΕΜΗΦΙΟΣ
 ΜΑΤΡΟΣ ΤΡΗΓΟΣ
 ΕΒΛΩΝΕΝ

Γ/02 Γ-7 Γ/0111411 ΕΚΙ
 ΞΥΛΑΚΑΝ ΓΑΜΑΝ ΓΨ - 42. ΓΑΙΡΑ Γ/0
 < 102 ΓΑΤ 8 ΜΥ Ε ΜΥ ΧΟ ΓΩ - 63
 8 ΜΥ ΓΑ Ε ΚΚ 5

Wooden Mummy-label. (Carn. Mus. Acc. No. 4599.)



Wooden Mummy-label. (Carn. Mus. Acc. No. 1917.)

This appears as a proper name, Ἐβωνχ, in Crum's Coptic Ostraca.¹⁶ Wessely says that the name appeared as Ἐφένυχος, Ἐφόνυχος, Ἐφωνύχου, and later, when it was related to the Greek ὄνυξ, the form Ἐπώνυχος arose. In Achmim the forms Ἐπώνυχος, Ἐπόνυχ, Ἐπώνυχ were used; in the Fayum Ἀπὺγκις, Ἀπέγγις, Ἀπίγγις, Ἀπῶνεχ, Πυγγῆς; in Oxy-rhynchos Ἀφῶγγις, Τιαφῶγγις, Ἀπῶγγις.

Τκουλατεῖνε, however, seems to be an unusual name. In it we may have Τ, the feminine demonstrative, as in the name Τε-bê's of the first label given above, and κουα suggests the Coptic kouī (= little), which would give Tkoua, The little one. What then is λατεῖνε? In this one is tempted to see Latina, added, for some unknown reason, as an epithet of Tkoua; or ῥατεινέ (= ἔρατεινή, lovely or beloved) by apharesis¹⁷ of initial ε after final α, change of ρ to λ, and final ε for η. Such a use of ἔρατεινή would be somewhat analogous to the use of εὐψύχει, εὐμορε,¹⁸ ἐπ' ἀγαθῶ,¹⁹ εἰς αἰμίγηστον τὸ ὄνομα,²⁰ in mummy-labels as well as in inscriptions on Greek graves. It is an objection to this theory, however, that these formulæ stand at the end of the inscription, rather than after the name of the dead.

Neither of these suggestions can be considered as certain.²¹ It will be better to consider Τκουλατεῖνε merely as a proper name and leave the solution of its form and meaning to the time when more of the very numerous²² mummy-labels have been published and our knowledge of Egyptian proper names is established on a broader foundation.

WASHINGTON AND JEFFERSON COLLEGE,
WASHINGTON, PA.,

January 27, 1911.

¹⁶ London, 1902.

¹⁷ Cf. Mayser, "Grammatik der Griechischen Papyri aus der Ptolemäerzeit," Leipzig, 1906, pp. 144, 188, 62.

¹⁸ Goodspeed, "Mélanges Nicole," p. 180.

¹⁹ Spiegelberg, Plate XXX, No. 99.

²⁰ Le Blant, No. 35.

²¹ Dr. Preisigke, of Strassburg, writes, "The name Τκουλατεῖνε is new to me as well as to Professor Spiegelberg, to whom I showed it. I do not consider ἔρατεινή possible. The text in such mummy-labels cannot be exactly determined." Dr. Wessely writes, "j'y trouve l'élément ὄναλατ(ε)ινε valatine, c'est à dire le nom déformé Valentin; $\begin{matrix} \tau\kappa\upsilon\upsilon(\iota) \\ \sigma\upsilon\alpha\lambda\alpha\tau\iota\nu\epsilon \end{matrix}$ —simplement écrit τκουλατ(ε)ινε—signifierait alors "la petite Valentin." Dr. Schubart suggests that the name may possibly be the Latin *Collatina* with the Egyptian article.

²² Spiegelberg, p. v, note 4.

X. NOTES UPON THE FAMILIES AND GENERA OF THE NAJADES.

BY ARNOLD E. ORTMANN, PH.D.

(Plates XVIII-XX.)

In accordance with the observations recorded in a number of shorter notes on the *Najades* published recently by the writer (Ortmann, 1910a, 1910b, 1910c, 1910d, 1911a) it is evident that the system of Simpson (1900b) should be thoroughly revised, and that the soft parts of every species of mussels should be studied. In preparation for a monograph of the *Najades* of Pennsylvania this has been done by the writer, and the general results have been recently published in the first part of this work (Ortmann, 1911b). But since it will take some time before the subsequent parts, dealing with the single species, will be ready for publication, and since the writer has examined, in addition, a great number of species not found in Pennsylvania, it seems well to publish these results as early as possible, combining the same with an attempt to rearrange the system to suit the new points of view. In the present paper, a general synopsis of the system will be given, in it assigning to each species, which has been examined, its proper place.

Remarks as to the Figures.—For the majority of the genera, text-figures have been introduced to illustrate their principal characters. If possible, the type-species has been selected. These figures have been drawn from actual specimens, and are about natural size, but they have been generalized and are of a diagrammatic character, the chief features being emphasized. This refers chiefly to the gill-filaments (where they are given, as in the *Margaritanidæ*) and the septa. The latter always are heavier than in nature, to bring out their characteristic features. In all figures the lettering is uniform, and the letters have the following meaning:

<i>an</i> = anal opening;	<i>o</i> = outer gill;
<i>br</i> = branchial opening;	<i>p</i> = pes (foot);
<i>f</i> = flaps of margin of mantle;	<i>pp</i> = papillæ on margin of mantle;
<i>i</i> = inner gill;	<i>sa</i> = supra-anal opening.
<i>mp</i> = marsupium;	

The main figure always represents the soft parts seen from the left side, with the left half of the mantle removed.

The *Najades* have been divided into three families: *Margaritanidæ*, *Unionidæ*, *Mutelidæ*. The first is holarctic; the second is known from Eurasia and North America, but probably exists also in Africa; the third is restricted to Africa and South America.¹

Family I. MARGARITANIDÆ Ortmann.

Diaphragm incomplete, formed only by the gills: outer lamina of outer gills only in part connected with the mantle, posteriorly free for a considerable distance. Anterior end of inner gills separated from the palpi by a wide gap. The margins of the mantle do not unite or approach each other anywhere, and there is no tendency to form branchial and anal siphons, and no supra-anal opening is present. Gills without water-tubes, interlamellar connections irregularly scattered, or forming irregular, oblique rows, or incomplete septa, which run obliquely to the direction of the gill-filaments. Marsupium formed by all four gills. Glochidia small, semicircular and globular, without hooks, but with irregular small teeth at the ventral margin.

Family II. UNIONIDÆ Swainson (*restricted*).

Diaphragm complete, formed only by the gills: the outer lamina of the outer gills connected with the mantle at its posterior end. Anterior end of inner gills separated from the palpi by a more or less wide gap. Margins of the mantle drawn together by the gill-diaphragm, but not united, thus separating the anal from the branchial opening, and the anal is generally closed above by the union of the margins of the mantle (it rarely remains open), and, when closed, it always leaves a supra-anal opening (which is very rarely obliterated). Gills always with water-tubes, formed by interlamellar connections developed as continuous septa, running parallel to the gill-filaments. Marsupium formed by all four gills, or by the outer gills alone, or by parts of the outer gills. Glochidia of various shapes, suboval, subtriangular, or celt-shaped, with or without hooks on the ventral margin.

¹ The writer is convinced that the *Najades* will prove to be a most important group for the reconstruction of the ancient geographical features of the earth. As long as our knowledge of the systematic relations was obscure, or even directly wrong, any attempt in this direction must have been a failure.

This family is divided into three subfamilies, as follows:

1. Subfamily UNIONINÆ Ortmann.

Rarely no supra-anal opening formed, it is generally present, separated from the anal opening by a shorter or moderately long mantle-connection. Marsupium formed by all four gills or by the two outer ones, when charged, only moderately swollen, and its edge not distending. No secondary water-tubes developed within the marsupium. Glochidia rather small, or of medium size, subovate, without hooks; or subtriangular, with hooks.

2. Subfamily ANODONTINÆ Ortmann.

Supra-anal opening always well separated from the anal opening, often by a very long mantle-connection. Marsupium formed only by the two outer gills, when charged, greatly swollen, and an extra thickness of tissue at the edge permitting the gills to distend. Within the marsupial gill, the water-tubes are divided during the breeding season into two lateral (secondary) water-tubes lying toward each face of the gill, and a central ovisac, which is closed at the base of the marsupium. Glochidia rather large, subtriangular, with hooks.

3. Subfamily LAMPSILINÆ Ortmann.

Supra-anal opening always separated from the anal opening by a mantle-connection of medium length, rarely entirely closed. Marsupium formed by the two outer gills, or by parts of the latter, generally situated in their posterior portion. When charged, the marsupium extends beyond the original edge of the gill, an extra thickness of tissue at the edge permitting a bulging out. Water-tubes of marsupium not subdivided, when charged. Often special structures (papillæ or flaps) on the edge of the mantle, chiefly of the female, in front of the branchial opening. Glochidia of various sizes and shapes, small to rather large, either subovate, without hooks, or celt-shaped, with two spines on each valve.

Family III. MUTELIDÆ Gray (*emended*).²

Diaphragm complete, formed anteriorly by the gills, posteriorly by a firm union of the margins of the mantle. Anterior end of inner gills

² As has been stated in a previous publication (Ortmann, 1911a), the nomenclature of this family and its subfamilies is only provisional, until additional genera (chiefly *Mutela* itself) have been investigated.

in contact with the palpi. Branchial and anal siphon sharply separated by the union of the margins of the mantle. Anal opening open, or closed above, in the latter case without forming a supra-anal opening. In some genera the margins of the mantle unite also in front of the branchial opening. Gills with very indistinct intercommunicating water-tubes, and interrupted interlamellar connections; or with well-developed water-tubes and septa, parallel to the filaments. Marsupium formed only by the inner gills. The larvæ are glochidia or lasidia.

This family is divided into two subfamilies.

1. Subfamily HYRIINÆ Ortmann.

Anal opening closed above. Marsupium with septa-like, interrupted, interlamellar connections, forming incomplete, communicating water-tubes. Non-marsupial gills with poorly developed interlamellar connections. Larva a glochidium.

2. Subfamily MUTELINÆ Ortmann.

Anal opening open or closed. Marsupium with well-developed, continuous septa, forming well-defined water-tubes; also non-marsupial gills with septa and water-tubes. Larva a lasidium (?).

There is no doubt, that of these three families that of the *Margaritanidæ* is the most ancient; the lack of any tendency to form siphons, the incomplete diaphragm, the absence of real septa and water-tubes in the gills, the absence of a division of function in the gills (all four gills in the female are used both for breathing and for receiving the eggs), are peculiarities, which establish the primitive character of this family.

The forward step in the development of the *Unionidæ* consists chiefly in the specialization of the marsupial structure. In the most primitive forms, all four gills are used as marsupia, but later on a division of labor is effected, so that in the female some gills serve only the purpose of respiration, while others, or parts of them, become organs used in propagation. But always, in this family, the inner structure of the gills is more complex than in the *Margaritanidæ*, which is expressed, by the development of septa and water canals;³

³ In *Margaritana monodonta* a slight tendency is shown to develop septa, but here the septa are entirely different from those of the *Unionidæ*, not running parallel to the gill-filaments, as in the latter, but diagonally to them.

and secondly by the fact that the structure of the marsupium in the *Unionidæ* becomes highly specialized, or, to express it concisely, this family makes a special effort to bring the marsupial apparatus to the highest degree of efficiency. All differentiation is connected with two purposes: the lengthening of the breeding season, and the change of the discharge of the glochidia from a "natural" to an "unnatural" manner, if such an expression may be allowed. As regards the first, the subfamily of the *Unioninæ* is as yet in an undifferentiated condition, possessing a short breeding season (being *tachytictic*), without specialization.⁴ But in the *Anodontinæ* and *Lampsilinæ* the breeding season is extended over the winter and the glochidia, after they are fully developed, are not discharged immediately, but retained for a long period in the marsupium (*bradytictic*). This renders it necessary to develop special devices in the marsupium, and the most urgent need apparently is to provide the necessary oxygen for the glochidia enclosed in the marsupia. It is now interesting to observe how this purpose is accomplished in two different ways by the two subfamilies. In the *Anodontinæ*, the lateral, secondary water-tubes cut off from the central ovisac, undoubtedly have the purpose of keeping up a lively current of water around the swollen marsupial mass. Nothing similar to this is known in the *Lampsilinæ*, but in the case of these the whole marsupium bulges out beyond the original edge of the gill, and this bulging mass is enclosed in a rather thin membrane, favoring osmotic processes. Further, there is a tendency to locate the marsupium in the posterior part of the gill, and to push it toward the lower posterior end of the shell, so that it is close to the branchial opening, where fresh and pure water enters the animal. In addition, a number of the *Lampsilinæ* develop special papillæ and flaps on the edge of the mantle, just at the place toward which the marsupium is pushed, and these structures surely have the purpose of producing a lively current of water over the marsupium. Furthermore, the thin membrane enveloping the protruding part of the marsupium, and its position near the branchial opening, are apparently connected with the peculiar discharge of the glochidia in the *Lampsilinæ*, which is through the edge of the marsupium, through holes

⁴ Haas (1910e, p. 19) comparing the marsupium of *Anodonta* and *Unio* expresses the opinion that that of *Anodonta* is more primitive than that of *Unio*, which is entirely erroneous: just the opposite is the case, that of *Anodonta* being much more complex and specialized. As long as views like this prevail, we cannot expect to arrive at a proper understanding of the system of the *Najades*.

which form there for this purpose. This "unnatural" discharge is known only in the *Lampsilinæ*, and is unknown in the *Anodontinæ* and *Unioninæ*. Finally the family of the *Unionidæ* differs from the *Margaritanidæ* and is more highly advanced in the formation of rudimentary siphons. But in this respect this family is not very progressive. It has the anal and branchial openings separated only by the (complete) gill-diaphragm, and in addition, it has the anal closed above, thus giving it an incomplete tubular shape. Beyond this, there is no progress in this family. The presence of a supra-anal opening is, in my opinion, only incidental to the closing of the anal.

The members of the third family, the *Mutelidæ*, have gone in another direction in their development. If the expression may be permitted, they lay chief stress upon the better development of the siphons, while in the differentiation of the gill-functions they have started out from the beginning with another idea, which, however, has not attained a very high degree of perfection. With regard to this it may be said that they have restricted the marsupial function to the inner gills, and very likely the anterior connection of these gills with the palpi is incidental to this function. Not much advance is to be observed in the gill structure, and only two types are met: incomplete septa and intercommunicating water-tubes (a rather primitive condition) in one group (*Ilyriinæ*); and complete septa and water-tubes in the other group (*Mutelinæ*). Very likely the latter structures are not homologous to the septa and water-tubes of the *Unionidæ*, but have been acquired independently, since their finer structure is different. With regard to the siphons, which attain within this family their highest perfection among the *Najades*, we have first of all a complete separation of anal and branchial openings by a firm mantle-connection, which forms the posterior continuation of the gill-diaphragm, and in addition we have a tendency to close both the anal above, and the branchial below, by mantle connections. It is true that this tendency is not yet perfect in many *Mutelidæ*, but it is developed within this family, so that in the most highly specialized genera we have two real-tubular siphons, formed by complete coalescence of the edges of the mantle.

I think the above account of the phylogenetic tendencies within the various divisions of the *Najades* will make it clear that the morphological characters upon which our new system is founded are

characters which are *essential*, since they indicate the various "ideas" in the specialization within each group, and advance our understanding of the phylogenetic progress and the systematic affinities of the *Najades*.

It may not be amiss to point out that it is absolutely impossible to recognize this system in the characters of the hard parts, the shells. It is true that certain types of shell are characteristic within smaller groups, and that there are cases, where we are able to recognize a genus, for instance, by the shape of the shell. But if we come to compare the subfamilies and families, we find that various types of shell turn up in them again and again. This goes so far that certain species resemble each other so much externally that they have been confused or placed together even by our greatest authorities, while they actually may belong to entirely different groups according to the soft parts. For this reason I have deliberately omitted to give shell characters for the families and subfamilies, for this is simply impossible.

One character of the shells, however, may be of greater value, and this is the *beak-sculpture*. As will be seen below, I shall use it repeatedly for the definition of genera. But it has been largely misunderstood, and is even now not very clear. Simpson, in distinguishing a concentric and a radial beak-sculpture, made a great mistake in uniting under the latter two types of sculpture, the radial and the *zig-zag*, while he united the double-looped with the concentric sculpture. According to my studies, which, however, are not yet fully satisfactory, the following seem to be the real conditions: The original and simplest beak-sculpture consists of *concentric* bars. A few (one to two) of them are, when the beaks are well preserved, always present, even in *zig-zag* or radially sculptured beaks. In many forms other bars of the same character are added, and no complications are observed. In other forms the later bars become *double-looped*. This character is generally inaugurated by the fact that the posterior part of the simple bar, which lies upon the posterior ridge of the shell, is emphasized. It becomes more pronounced, often tuberculiform, and is drawn out in the direction of the posterior ridge, toward the lower posterior angle of the shell. This produces an angular projection in the posterior part of the original bar, which by contrast with the anterior part, which does not project, gives the appearance of the bar consisting of two parts, or two loops, till we finally come to a beak-sculpture which distinctly consists of a double loop, the two parts

separated by a distinct reëntering angle. In some forms these two parts become tuberculiform, and the connecting bars disappear, so that the beak sculpture appears composed of isolated tubercles (*Unio pictorum*). A further step in advance is that the anterior part of the double-looped bar breaks up into tubercles, and finally into zig-zag bars. The manner in which this is accomplished remains yet to be studied, but always, in the zig-zag sculpture, the posterior loop, which lies upon the posterior ridge, is the most conspicuous part of the whole beak sculpture. Thus the zig-zag sculpture is the most extreme condition of a line of development, which goes from the simple concentric bar, through the double-looped, to the zig-zag condition. In certain forms with zig-zag sculpture, all three stages are clearly present on the same shell (*Nodularia douglasia*), and possibly this may be observed always in such cases.⁵

Entirely different from this is the *radial* sculpture, but I have reason to believe that it also goes back to the concentric type. At any rate, I have seen in specimens of the genus *Lamellidens* that there are also originally one to two simple concentric bars. But after these only the lateral parts of the bars, which anteriorly and posteriorly curve up toward the beak, are developed, while the middle part upon the disk becomes obliterated. Then these lateral parts, which have a direction from the beak toward the basal margin, are emphasized, developing more strongly, and their direction remaining a radial one. Since there are two groups of radiating ridges (an anterior and a posterior), the median ones naturally must interfere with each other upon the middle of the disk, and must come in contact there at a more or less sharp angle, when fully developed. This is in fact the case, wherever we see radial sculpture well developed. There are always two sets of radiating folds or ridges, one originating in front, the other behind the beak, which cover the disk interfering with each other in the middle of the shell. In some cases, however, this is not very clear, and such cases possibly present the highest type, with the original features obliterated. The radial sculpture is another extreme standing at the end of a line of development starting from simple concentric loops.

These conditions are worthy of being studied more closely. In regard

⁵ In certain cases it seems that double-looped sculpture may again be simplified by the re-entering angles becoming less sharp and only sinuate in the latest bars. But this is surely a sign of the incipient obliteration of sculpture.

to its systematic value, the beak-sculpture, when properly understood, indicates certainly systematic affinity, but is not fit to be used for the distinction of larger groups, since it is very likely that the different types were developed rather early, and are found side by side among the more primitive groups of *Najades*, the *Unioninæ* for instance. Yet in the more advanced groups often only one type is found. Thus, for instance, among the *Anodontinæ* and *Lampsilinæ*, we possess only the first type up to the double-looped structure, while the zig-zag structure is practically absent, and no trace of the other type (the radial) is ever found. On the other hand, it seems that in the *Mutellidæ* only the radial type is present, provided there is any sculpture at all. In addition, conditions become yet more complex by the fact that the beak-sculpture in general seems to be a character which is subject to obliteration, and anywhere within the system we may expect to meet forms which have reduced their beak-sculpture to a lesser or greater degree, often to complete disappearance. Thus we may say, in a general way, that beak-sculpture, although important and indicating the minor affinities, is unfit to be used for the distinction of the larger groups.

Family MARGARITANIDÆ.

I recognize only one genus in this family, to which a number of species have been assigned by Simpson, of which, however, the structure of four only is known.

Genus MARGARITANA Schumacher, 1817

Simpson, 1900*b*, p. 674.

Margaritana margaritifera (Linnæus).

Some twenty specimens are at hand, from the drainage of the upper Little Schuylkill River in Schuylkill County, Pennsylvania, collected by myself; soft parts of another specimen from the Auma creek, near Weida, Saxe-Weimar, Germany (drainage of Elster river); and three complete specimens from the Perl-Bach at Postfelden, near Falkenstein, Bavarian Forest, Germany. For these German specimens I am indebted to Mr. W. Israël.

Published figures: Photograph of soft parts in shell, by Carl (1910, pl. 4, figs. A and B); of gills, by Ortman (1911*b*, p. 285, fig. 1, and pl. 87, fig. 11).

I have found that the German specimens agree in every particular with the American form. Certain characters not observed in my specimens (marsupium and glochidia) I have gathered from the literature (chiefly Harms, 1907 and 1909).

Margins of mantle free all around from the anterior to the posterior end and with no tendency to unite anywhere. Branchial opening indistinctly separated from the anal, a horizontal ridge running from the posterior insertion of the outer lamina of the outer gill to the margin of the mantle, but the margins of the mantle are not held together by the diaphragm. Anal opening not closed above, and no supra-anal

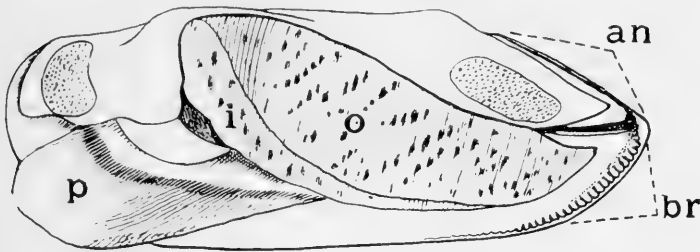


FIG. 1. *Margaritana margaritifera* (Linnæus). Specimen from the Perl-Bach, Postfelden, Bavarian Forest, Germany. (Carn. Mus., No. 61, 4,987.)

formed. Branchial opening ill-defined anteriorly, on the inner edge with strong papillæ, which disappear anteriorly, and then the inner edge of the mantle is smooth. Inner edge of anal opening almost smooth.

Palpi large, subfalciform, drawn out and pointed behind, their posterior margins united for about one-half to three-fourths of their length.

Gills long and broad, the inner the wider, chiefly so anteriorly. Outer gill becoming gradually narrower in front, its anterior end at the highest point of the line of attachment of the mantle, high above the palpi. Inner gill narrowing more suddenly anteriorly. Its anterior end is found in front and below that of the outer gill, but separated from the palpi by a wide gap.⁶ Edge of inner gills with a longitudinal furrow, which is absent in the outer gills (this character is present in all *Najades* examined, and will not be mentioned again).

⁶ This character is variable, and sometimes (as in the specimen which served as original for our figure) the gap is rather short.

Outer lamina of outer gills not entirely connected with the mantle, but its posterior part is free for about one-fourth, or slightly less, of its length. Inner lamina of inner gill free from the abdominal sac with exception of its anterior end. Behind the foot, the two inner laminae of the inner gills are connected. Thus the diaphragm (separation of branchial and suprabranchial-cloacal cavities) is formed only by the gills, and it is incomplete posteriorly, and does not reach the margin of the mantle, although the medially united free ends of the gills project to near the margin of the mantle.

Gills without water-tubes and without septa. The interlaminar connections are patch-like, irregular in shape and position, and only here and there a diagonal arrangement, from the base toward the edge and forward, is indicated, which, however, does not follow the direction of the gill-filaments, and does not form continuous septa.

Color of soft parts grayish, inclining to blackish. Foot brown, paler on edge; through the middle runs a black band, sharply marked off from the whitish abdomen, but gradually shading into the brown of the foot. Gills brownish-gray anteriorly, shading to black posteriorly. Mantle brownish-white, edge black, broadly so behind. From the posterior end of the attached part of the outer lamina of the outer gill there runs to the posterior margin of the mantle a white line, bordered below with black.

No gravid females are at hand, and thus the writer cannot say anything about the marsupium and the glochidia. However, these have been described by others (see Harms, 1907 and 1909). The marsupium is formed by all four gills,⁷ and the glochidia are very small (0.0475 mm.), semicircular, globular, without true hooks, but with a number of small teeth on the ventral margin.

The breeding season in Pennsylvania is in June and August (Conner, 1909, p. 112), in Germany in July and August (Harms, 1907, p. 814), and probably twice in succession during this time (Harms, 1909, p. 332).

Margaritana sinuata (Lamarck).

The anatomical structure of this species has been described by Haas (1910b, p. 181), who created for it the new genus *Pseudunio*. Although

⁷ Simpson (1900b, p. 674) says that the marsupium is formed only by the outer gills, and refers (footnote 2) to von Wahl. I have consulted this paper (Wahl, 1855), but cannot find in it anywhere a description or mention of the marsupium of *Margaritana*.

Haas omitted to say anything about the gill-structure, his description of the margins of the mantle, of the diaphragm, and other parts renders it absolutely certain that this species must be placed in the family *Margaritanidæ*. Haas points out certain differences from *Margaritana margaritifera*, of which the most important is the fact that the shell has lateral hinge-teeth. Since we have other genera among the *Najades* in which the hinge-teeth are variously developed, and since it is absolutely clear, that *Margaritana margaritifera*, without lateral teeth, must have descended from forms with such teeth, I think the differences in *Unio sinuatus* should be regarded as only of specific value, and I see no reason why we should not place it with *Margaritana*, with which some of its most essential and important characters are known to agree, while all the known differences are such as in other groups are known to be of minor value.

Margaritana sinuata thus would represent a somewhat more ancient type than *M. margaritifera* (see Ortmann, 1911c, p. 6).

Margaritana monodonta (Say).

I have received, from B. Walker, one complete specimen, and the soft parts of three others, all from the Cumberland River in Pulaski, Russell, and Cumberland Counties, Kentucky.

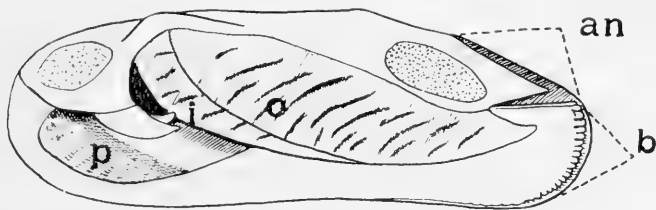


FIG. 2. *Margaritana monodonta* (Say). Specimen from Cumberland River, Rowena, Russell Co., Ky. (Carn. Mus., No. 61, 4,960.)

We may compare the description of the soft parts by Lea (Obs., X, 1863, p. 422), which, however, mentions among the important features only the posterior end of the gills, the branchial and anal openings.

Margins of the mantle, branchial and anal openings as in *M. margaritifera*. No supra-anal present. Posterior margins of palpi connected for about one-third of their length. Gills rather long (corresponding to shape of shell), the inner the wider, chiefly so ante-

riorly. Anterior ends of the two gills as in *M. margaritifera*. Outer lamina of outer gill not entirely connected with the mantle: posteriorly a part of it is free (about one-seventh of length of gill, but probably more, since this part in all my specimens is considerably contracted). Inner lamina of inner gill as in *M. margaritifera*, and thus the structure of the diaphragm is essentially the same.

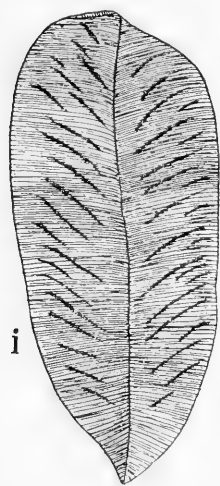


FIG. 2a. Left gills of another specimen from same locality.

Both gills are quite delicate. The two laminae are not connected by septa running parallel to the gill-filaments, but the inter-laminar tissue forms septa of another type: they run obliquely, diagonally, from the base of the gill downward and forward. Of these septa some are longer, others shorter, and toward the edge of the gill they sometimes curve a little in the direction of the filaments. The septa thus are rather irregular, and being quite distant from each other, no regular water-tubes are formed.

A difference in the arrangement of the septa, which might be due to sex, could not be observed in the specimens at hand. None of them was gravid, so that nothing can be said about the arrangement of the ova in the gills, and about the glochidia. The fact, that in all specimens the structure of the two gills is practically identical, suggests, however, that all four gills are used as marsupia.

Color of soft parts whitish, edge of mantle blackish all around, but chiefly at the anal and branchial openings. Gills transparent, but not blackish. Foot grayish-white in its distal part, this gray color marked off in a sharp line from the basal white part.

M. monodonta agrees in most characters with *M. margaritifera*, and chiefly in the general form of the margin of the mantle, the branchial and anal openings, the diaphragm, and the structure of the gills. The chief difference is found in the diagonal, incomplete septa of the gills, which, however, unmistakably correspond to the irregular diagonal rows of interlaminar connections in *M. margaritifera*. In this respect, *M. monodonta* represents a stage of development slightly more in advance of that of *M. margaritifera*, and this would support the view

expressed by Walker (1910a, p. 137) that it is an "offshoot of the more ancient *margaritifera*-stock." In its general appearance it looks rather like a depauperated form, while the gill-structure has attained a slightly higher stage of differentiation. It also differs slightly in the lesser development of the papillæ of the branchial opening, and the great reduction of the black color suffusing most of the soft parts of *M. margaritifera*, and, of course, also in shell characters. If we should accept the genus *Pseudunio* proposed by Haas for *U. sinuatus*, we would have, as a simple logical consequence, to create a new genus for *M. monodonta*, for the difference of the gill-structure of the latter is much more important than any of the differences known in *M. sinuata*. It represents a phylogenetic step in advance. But having to deal only with four species, I see no reason why we should not leave them together in the genus *Margaritana*.

Margaritana hembeli (Conrad).

Eighteen specimens from Hunters Creek, Evergreen, Conecuh Co., Alabama, have been investigated. They were collected by H. H. Smith on February 10, 1911.

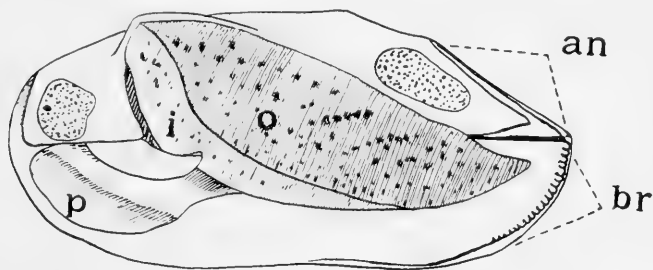


FIG. 3. *Margaritana hembeli* (Conrad). Specimen from Hunters Creek, Evergreen, Conecuh Co., Ala. (Carn. Mus. No. 61, 5,022.)

Margins of mantle, branchial and anal openings, and gills much as in *M. margaritifera*. Papillæ of branchial rather small. Posterior margins of palpi connected for about three-fourths of their length.

Interlaminar connections of gills irregularly scattered, here and there with a tendency to fall into oblique, irregular rows. On the whole this tendency is less developed than in *M. margaritifera*, but there is some variation in this respect in different individuals. I was unable to dis-

cover any marked differences in the structure of the gills which might be due to sex. No gravid females were found.

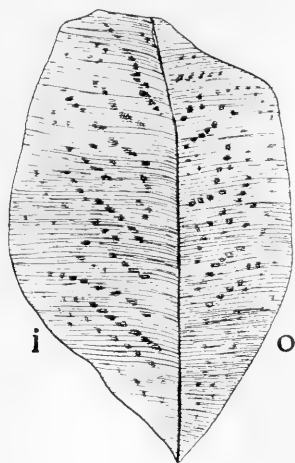


FIG. 3a. Left gills of another specimen from same locality.

Color of soft parts brownish-white; foot grayish-brown, the darker part suddenly marked off in a sharp line from the white abdominal sac; palpi and gills brownish, the latter more grayish posteriorly; mantle pale brown, its margin whitish with brown-black edge, most intense posteriorly; a black line on mantle separating anal and branchial cavities.

This is a true *Margaritana*, much resembling in structure *M. margaritifera*. But it has well-developed lateral hinge-teeth, and thus must be considered as a more primitive type. It has no closer relationship with *M. monodonta*, and cannot be connected with it. In shell-sculpture, *M. hembeli* is quite unique. Its distribution (in southern Alabama and Louisiana) offers a very interesting problem.

Family UNIONIDÆ.

Subfamily UNIONINÆ.

Simpson's (1900b) North America genera: *Quadrula*, *Tritogonia*, *Pleurobema*, and *Unio* belong to this subfamily. Further, I have shown (Ortmann, 1911c) that the European *Unio* also belongs here, as well as the Asiatic genera *Parreysia* and *Lamellidens*. I have further demonstrated, that the European *Unio* is not identical with the North American *Unio*, and that for the latter the generic name of *Elliptio* should be used. The genus *Tritogonia* is simply a synonym of *Quadrula* in Simpson's sense (see Sterki, 1907, p. 48, and Ortmann, 1911b, p. 329).

In the structure of the soft parts there is not much differentiation in all these forms. The most important is that in some all four gills are used as marsupia (see Plate XVIII, fig. 1), in others only the two outer ones (see Plate XVIII, figs. 2, 4, 5). The systematic value of this character has been doubted (see Frierson, 1909, p. 107). Yet I believe

that it is of prime significance. In all my investigations I have never come across an exception or variation in the marsupium. It is true that in species which have normally all four gills marsupial, sometimes only two gills are found *charged*. But all authors, who record such cases, only mention the fact that the gills were charged, without saying anything about the *structure* of the gills. I have also met with such cases: but invariably a closer investigation revealed the fact that the other gills which were not charged also possessed marsupial structure, and consequently were *capable* of being charged with eggs.

On the other hand, in those cases, where the outer gills alone serve as marsupium, it was not the simple fact that they alone were filled with eggs in the breeding season, which was ascertained. It was the investigation of the structure of the gills, which induced me to judge the character of the marsupium. Lefevre and Curtis (1910, p. 83) are inclined to regard my observations in *Pleurobema coccineum* as due to accidental conditions. But this is surely not so. I have seen now a great number of individuals of this species with the outer gills alone charged, and I have seen and examined many more, females in the sterile condition, which invariably had marsupial structure only in the outer gills, while the inner gills were different, and not built to receive eggs. Not a single exception was observed.

Further it is quite evident that the arrangement of four gills serving as marsupia is found in a number of groups, the species of which are undoubtedly closely allied. This is clear in the peculiar *Quadrula plicata*-group, in the *metanevra*-group and others. Then again, a marsupium formed by the outer gills alone is characteristic of other natural groups. To me the most interesting case was that of *Pleurobema coccineum*. Here I discovered first that this supposed *Quadrula* differs from the *Quadrula*-type; I also discovered that this species intergrades with *Q. obliqua* and *Q. pyramidata*. This being the case, I concluded that the latter also should have a marsupium like *coccinea*. And this proved to be true!

Nevertheless the character of the marsupium should not be too implicitly relied upon. There is no question that the condition in which the four gills serve as marsupia is more primitive than the stage where only the outer gills are marsupial.⁸ But it seems to me that

⁸ The functional and morphological progress from the four-gill-marsupium to the two-gill-marsupium has been correctly understood and expressed by Haas (1910c, p. 19).

there is or has been a general tendency to restrict the marsupium to the outer gills, and that this forward step in a quite natural direction has been made independently in various groups. That is to say, the *Unio*-type of marsupium has repeatedly developed from the *Quadrula*-type by parallel evolution.

Of the other features of the soft parts only three furnish some help for the distinction of genera. The first and most important is the character of the placenta, revealing differences which are of prime value, but affect only a few forms, as will be seen below. The second is the separation of the anal and supra-anal openings. Although characteristic of certain forms (in one case these openings are not at all separated), it is somewhat variable in others, even individually. Thus we can use this character only to a limited degree. The third is the connection of the inner lamina of the inner gills with the abdominal sac. Here there seems to be a difference between certain forms of the Old and the New World. But, unfortunately, too few of the former are known for me to express a final judgment.

Thus the soft parts alone would furnish only few criteria for the distinction of genera, and we should direct our attention to the shell. Here we have indeed great variety, and the shapes of the shell have been largely used heretofore for the definition of genera. The most important feature, in my opinion, is the beak-sculpture, which, however, has been largely misunderstood by Simpson. In fact in this primitive subfamily we have, side by side, all the different types of beak-sculpture, and, as we shall see, they may be used to great advantage.

Since various types of shell-structure are frequently combined with various types of soft parts, it would not do to make only a few large generic divisions. For if we recognize, for instance, only two main genera according to the character of the marsupium, the same types of shell would turn up in either of them, which surely would give an incomplete or wrong impression of affinities. Thus, in my opinion, it is advisable to admit a larger number of genera founded upon both the structure of the soft parts as well as of the shells. Such a scheme is introduced here, at first, tentatively, but I hope it finally will prove to be the most convenient.

Finally I should mention the glochidia of these forms. The latter are known in a number of North American species, where they always are of a primitive shape (see Plate XIX, fig. 1). They are also

known in European forms, where they incline toward the type of the subfamily *Anodontinæ*. I have no doubt that this finally will be a very important systematic criterion, but unfortunately we do not know the glochidia of a single Asiatic species.

The following provisional division into genera in accordance with what has been hereinbefore said is here submitted:

- a₁. Beak-sculpture ranging from the concentric to the zig-zag type. Mantle connection between anal and supra-anal absent, deciduous, short, or of medium length. Inner lamina of inner gills free from abdominal sac.
- b₁. Mantle connection absent or short. Beak-sculpture concentric to zig-zag. Glochidia subovate, without hooks.
- c₁. All four gills serving as marsupia. Mantle connection between anal and supra-anal present, short and deciduous.⁹
- d₁. Ovisacs and placenta¹⁰ subcylindrical, the latter rather persistent, generally red. Shell simple, without sculpture upon disk. Beak-sculpture simple, concentric..... **Fusconaja**.
- d₂. Ovisacs and placenta leaf-shaped (compressed and lanceolate), the latter rather poorly developed, generally white. Shell with sculpture of various patterns. Beak-sculpture concentric, double-looped, or zig-zag.
- e₁. Shell with oblique undulations upon the disk. Beak-sculpture concentric, nearly obliterated, or of zig-zag pattern and extending more or less upon the disk..... **Crenodonta**.
- e₂. Shell-sculpture tuberculous or nodulose. Beak-sculpture concentric and disappearing upon the disk, or of the double-looped or zig-zag pattern, more or less extending upon the disk. **Quadrula**.
- c₂. Marsupium formed by the outer gills only.
- d₁. Mantle-connection above anal opening absent, no supra-anal formed. Shell tuberculous, beak-sculpture of zig-zag pattern, much broken up, extending somewhat upon the disk. Nacre deep purple..... **Rotundaria**.
- d₂. Mantle connection between anal and supra-anal present, short, or deciduous. Beak-sculpture concentric, obliterated toward the disc.
- e₁. Shell tuberculous. Soft parts of a peculiar orange color. Placenta pink (at least in one species)..... **Plethobasus**.

⁹ Under this division apparently belong two species occurring in Georgia and Florida, *infucata* Conrad and *kleiniana* Lea, the soft parts of which have been partly described by Lea (Obs., X, 1863, pp. 404 and 407). In these species we observe the most beautifully developed zig-zag sculpture among North American forms. The soft parts are imperfectly known, but the marsupium is formed by all four gills. Probably they should form a genus by themselves.

¹⁰ Called "egg plates" by Lillie (1895), and "conglutinates" by Lefevre and Curtis (1910).

- e*₂. Shell without sculpture. Soft parts more or less whitish, rarely slightly colored. Placentæ whitish, rarely slightly colored.
- f*₁. Shell elongate and oblique, with the beaks placed rather anteriorly, or rounded, squarish, or even elevated. Epidermis light, brownish, rarely dark brown, with or without rays. Nacre light colored. Beak-sculpture concentric, poorly developed. **Pleurobema.**
- f*₂. Shell more or less elongate, but not oblique, beaks not much anterior. Epidermis dark or light, generally without rays, or rays indistinct.
- g*₁. Shell with rather dark epidermis, sometimes faintly rayed. Nacre often dark (pink to purple). Beak-sculpture concentric, with an angle upon the posterior ridge, but not double-looped, often faint and rudimentary. **Elliptio.**
- g*₂. Shell with lighter epidermis (often with dark bands), rays practically absent. Nacre whitish. Beak-sculpture rather distinct, concentric, bars not angled behind, but regularly curved up. **Uniomorus.**
- b*₂. Mantle-connection between anal and supra-anal openings well developed, but generally shorter than the anal. Shell not sculptured upon the disk, elongated, but not oblique. Beak-sculpture sharply double-looped or of the zig-zag type. Glochidia subtriangular, with hooks. . . **Unio.**
- a*₂. Beak-sculpture of the radial pattern. Mantle connection between anal and supra-anal present, rather long. Inner lamina of inner gills connected with abdominal sac.
- b*₁. All four gills marsupial. Beak sculpture radial, well developed, more or less extending upon the disk. **Parreysia.**
- b*₂. Two outer gills only marsupial. Beak-sculpture concentric-radial, rudimentary. **Lamellidens.**

Genus *FUSCONAJA* Simpson. 1900.

Simpson, 1900*b*, p. 784 (as section).

I consider this the most primitive type of the *Unionidæ* known to me.

Shell simple, rounded, ovate, quadrate, or triangular, with more or less elevated beaks, well developed hinge-teeth, and rather deep beak-cavities. Outer surface without sculpture. Epidermis lighter or darker brown, with hair-like, dark rays, sometimes fused into spots when young. Beak-sculpture simple, concentric, slightly angled upon the posterior ridge, but not double-looped, not extending upon the disk, and often obliterated.

Soft parts of primitive structure. Supra-anal separated from the

anal, but mantle-connection between them very short, and deciduous, often absent. Inner lamina of inner gills free from abdominal sac. All four gills marsupial. There is hardly any difference in structure between the inner and outer gill. When gravid, the water-tubes (ovisacs) do not expand much, and their lumen remains nearly cylindrical. Placentæ also subcylindrical, generally red in color, rather persistent, and discharged whole. Glochidia rather small, subovate, without hooks.

Type: *F. trigona* (Lea), which (*cf.* Walker, 1910*b*, p. 24) should bear the name *undata* (Barnes).

***Fusconaja undata* (Barnes).**

About a half dozen specimens of the form from Lake Erie have been examined, and in July, 1910, I found a few gravid specimens. Mr. H. E. Wheeler sent two males, and six females (one of the latter gravid) from the Ouachita River, Arkadelphia, Arkansas, collected March 21, 1911.

This form agrees in all essential points with *F. rubiginosa*. The ova, placentæ, and sexual glands have the same red color. The soft parts are less inclined to orange, are paler, and often whitish and cream-colored. Simpson (in Baker, 1898, p. 76) gives a rather meager description. The glochidia are unknown, all specimens found by myself had only eggs.

The gravid female from Arkadelphia was just beginning to charge the gills. This early date (March 21) should be noted.

***Fusconaja rubiginosa* (Lea).**

Numerous specimens, in all conditions, have been examined, all collected in the smaller creeks of the Ohio drainage in western Pennsylvania.

This species is typically tachytictic, but the breeding season is rather long, from the middle of May to the beginning of August. In the case of single individuals it is probably much shorter.

Descriptions of the soft parts have been given by Lea (Obs., X, 1863, p. 416) and Simpson (in Baker, 1898, p. 78).

Edges of the mantle drawn together by the gill-diaphragm, thus separating the anal and branchial openings. Anal opening closed above by a very short mantle-connection, thus forming a very large supra-anal; but this mantle-connection is very inconstant and de-

ciduous, often absent, sometimes torn. Branchial opening with papillæ on inner edge, anal with distinct, but small papillæ. Palpi subfalciform, pointed behind, their posterior margins connected for about one-third to one-half of their length.

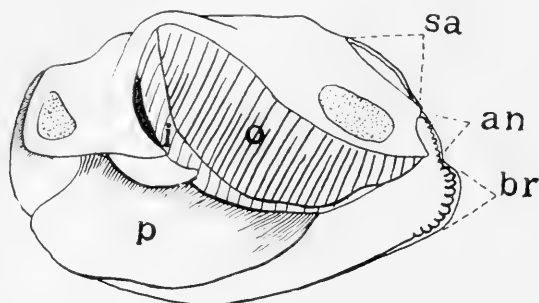


FIG. 4. *Fusconaja rubiginosa* (Lea). Male, from South Fork of Tenmile Creek, Waynesburg, Greene Co., Pa. (Carn. Mus., No. 61, 4,509.) Coll. May 6, 1910.

Gills short and rather wide, with curved lower margins (corresponding to the shape of the shell), the inner gill wider. Outer gill attached at its anterior end at the highest point of the attachment-line of the mantle, far above the palpi; inner gill with its anterior end slightly in front and below that of the outer gill, widely separated from the palpi.

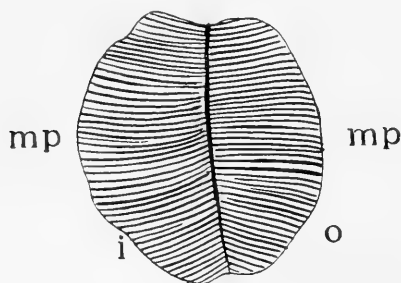


FIG. 4a. Left gills of a sterile female from same locality.

Outer lamina of outer gills entirely connected with the mantle. Inner lamina of the inner gill free from the abdominal sac, except at its anterior end. Behind the foot, the two inner laminae of the inner gills are connected up to their posterior end.

Thus a complete gill-diaphragm is formed, which reaches backward close to the posterior margin of the mantle.

Both gills possess well developed septa and water-tubes, running parallel to the gill-filaments. In the male, the septa are rather distant and the water-tubes are wide. The septa are merely lines of connection of the interlaminar tissue. In the female, all four gills are marsupial, the septa are better developed, thicker and longer (in the

transverse direction), more independent structures, with an epithelium thrown up into folds. They are much closer together, and form much narrower water-tubes, which, when gravid, become ovisacs. There is no noticeable difference in the width of these water-tubes in the inner and outer gill. When charged, the ovisacs do not expand much, and their lumen remains subcylindrical, so that the whole marsupium does not swell to any considerable degree, and its edge does not distend and remains sharp.

The ova are red in color, and are lodged in the ovisacs in the shape of well developed placentaë (sticking together by their membranes). The placentaë, conforming to the shape of the ovisacs, are subcylindrical, and are discharged whole through the anal opening.

The glochidia (see Ortmann, 1911*b*, pl. 89, fig. 2) are rather small, of suboval shape, without hooks. Length and height about equal, 0.15 mm.

The color of the soft parts is somewhat variable, but generally a yellowish-orange. The margin of the mantle, the distal part of the foot, and the adductor muscles, are deeper in color (intense orange-brown), while the gills are pale yellowish or brownish. The gills of the gravid female appear red when charged with the ova, and inside of the whitish abdominal sac the gonads are very often red. In certain specimens the color of the soft parts is altogether paler, the bright orange tints being missing, but this difference in color does not depend on sex.

***Fusconaja cerina* (Conrad).**

One male specimen at hand, received from L. S. Frierson. It is from Bayou Pierre, De Soto Parish, Louisiana.

Structure in all points like that of *F. rubiginosa*, and agreeing also in minor details, such as the papillaë of the anal and branchial openings, separation of anal and supra-anal, inner laminaë of the inner gills, and palpi.

A female was not at hand. But Mr. Frierson writes to me concerning this species: "eggs in four gills," and "*cerina* has the body white in about half, but red in the other half of the specimens. Some have red eggs. But red eggs and red body are not correlated."

Thus it seems that this species stands very close to *F. rubiginosa*, a relationship, which has been assumed by others on the ground of the characters of the shell.

Fusconaja lananensis (Frierson).

Frierson (1901, p. 76) describes the soft parts as: "salmon-colored, scarlet when cut" (probably sexual glands). "Eggs carried in all four gills, very red." This, together with the general shape of the shell, renders it almost certain that this species should be placed here.

Fusconaja subrotunda (Lea).

I have investigated numerous individuals in all conditions collected by myself in the Ohio and Allegheny Rivers in western Pennsylvania, and some additional ones from the Ohio between Pittsburgh and Cincinnati.

The breeding season falls in June and July.

The soft parts have been described by Lea (Obs., X, 1863, p. 427).

This species agrees well with *F. rubiginosa*, but special mention should be made of the anal opening, which has fine crenulations, and shows the same variability as regards the short mantle-connection separating it from the supra-anal. The structure of the gills (see Ortmann, 1911b, pl. 86, figs. 1-3) is essentially the same as in *F. rubiginosa*.

The ova are generally red, but in rare instances they are pale pink or white. The placenta are also subcylindrical, and are discharged whole. The glochidia are similar to those of *F. rubiginosa*, but slightly higher than long.* Length 0.13 mm.; height 0.15 mm.

In the color of the soft parts, two types may be distinguished. Normally there is much orange color present, which is most intense (deep orange-red) on the foot, the mantle margins, and the adductors, while the rest, chiefly the gills, are more brownish. When charged the gills are red. In the other type of color all parts are whitish or yellowish, or brownish-white, the latter color chiefly on those parts, which are orange in the other type. Yet there are intergrades between these two types, the orange color gradually passing into the brown. In western Pennsylvania, the orange type prevails. There is no relation of these colors to sex.

The color of the gonads deserves special mention in this species for comparison with the next. In all specimens examined it is either whitish or paler or deeper red, the latter of a distinct crimson hue, identical with the color of the eggs, but generally more intense. This crimson is found both in the male and in the female, so that it seems that also the sperm is thus colored.

Fusconaja ebena (Lea).

Of this species I have examined only very few typical representatives, found by myself in the Ohio River at Portsmouth, Scioto County, Ohio (Sept., 1910).

The soft parts of a gravid female have been figured by Lefevre and Curtis (1910, pl. 1, fig. 4). Although this figure is correct, the structure of the gills is not well represented, and the septa are not visible.

I was inclined to regard this form as only a variety of *F. subrotunda*, but Dr. Sterki differs from me in this, and he calls my attention to the fact that the color of the gonads in *F. ebena* is not *crimson*, as in *subrotunda*, but distinctly *purple*. I have been able to verify this. Although I had before me not more than half a dozen *F. ebena*, and although I found the gonads white in some, the others had them more or less (lighter or darker) purple, differing distinctly in hue from specimens of *subrotunda*, which I had at hand simultaneously. This matter, however, should be further investigated.

In other respects *F. ebena* agrees with *F. subrotunda*, and also has the two types of color of the soft parts, whitish and orange. I have never seen gravid females, but Lefevre and Curtis (1910, p. 97, fig. 1) have figured the glochidium, which is identical with that of *F. subrotunda*, and has practically the same dimensions (length 0.14; height 0.15).

Fusconaja kirtlandiana (Lea).

Numerous specimens, chiefly from the Beaver drainage in western Pennsylvania have been investigated, among them only one gravid female with glochidia (found in the beginning of August).

This agrees in every detail with *F. subrotunda*. The only difference is that the orange type of color of the soft parts is rather infrequent, while the whitish prevails. The only gravid female was of the orange type, and had crimson gills. Glochidia identical. Length 0.13; height 0.15 mm. (see Ortmann, 1911b, pl. 89, fig. 1).

I am very much inclined to consider this as being only a variety of *F. subrotunda*.

Genus CRENODONTA Schlueter. 1836.

Simpson, 1906b, p. 766 (as section).

Shell rounded, ovate, subquadrate, or trapezoidal, with more or less elevated beaks, well developed hinge-teeth, and rather deep beak-

cavities. Outer surface with a peculiar sculpture: heavy, oblique folds run across the disk chiefly in its posterior half (it may be that these folds are continuations of the posterior angle of the bars of the beak sculpture). Epidermis lighter or darker, brown to blackish, without distinct rays. Beak-sculpture either simply concentric, slightly angled upon the posterior ridge, and disappearing toward the disk, or continued upon the disk in a zig-zag pattern, much broken up, and irregular. The soft parts are primitive in structure. Supra-anal separated from the anal, but the mantle-connection between them very short and often absent. Inner lamina of inner gills free.¹¹ All four gills are marsupial, but there is a slight differentiation in the structure of the inner and outer gills, the water-tubes of the inner gill being slightly wider than those of the outer gill. When gravid, the ovisacs expand a little more, so that their lumen becomes transversely enlarged, giving to the placenta a compressed, leaf-like shape. Placenta whitish, not very solid, and not persistent, and the glochidia are discharged in loose masses. Glochidia small, subovate, without hooks.

Type *C. plicata* (Say).¹²

Crenodonta approaches the following genus more than the preceding, in fact, it is *very* closely allied to *Quadrula*. The chief differential character is the sculpture of the shell.

***Crenodonta plicata* (Say).**

Of this species, which is commonly called *Quadrula hippopæa* (Lea). I have investigated numerous specimens from the shores of Lake Erie in Pennsylvania and Ohio. Gravid females were found in July, 1910, but only eggs were present in them, and no glochidia.

Since there was at hand much more complete material of the following form, of which this is undoubtedly only a local race, I prefer to only give particulars of the anatomy of *C. undulata*, here only stating that *C. plicata* is absolutely identical with it in every respect.

***Crenodonta undulata* (Barnes).**

A large number of specimens from the Ohio drainage in western Pennsylvania are at hand. This species is tachytictic, and the breed-

¹¹ I have never seen it connected, although it is said to be so sometimes.

¹² This species has been misunderstood hitherto. The type locality of *plicata* is Lake Erie, and thus the only known *Crenodonta* from Lake Erie should bear this name, but this is the form called *hippopæa* by Lea. The *plicata* of authors (incl. Simpson) should be *Cr. peruviana* (Lamarck).

ing season lasts from the middle of May to the middle of July. The discharge of the glochidia has been observed on July 8, 1909.

The soft parts have been described by Lea (Obs., X, 1863, p. 417), but incorrectly in several particulars. They also have been described by Simpson (in Baker, 1898, p. 82).

Margin of the mantle drawn together by the gill-diaphragm, thus separating the anal and branchial openings. Anal and supra-anal separated by a very short mantle-connection, which is sometimes absent (torn?). Branchial opening with strong papillæ, anal also with papillæ, which, however, are much finer, and sometimes appear only as crenulations. Palpi of the usual shape, their posterior margins connected only at base or up to one-third of the length.

Gills broad, the inner the wider, their anterior ends as usual. Diaphragm normal, and inner lamina of the inner gills free from the abdominal sac, except at the anterior end.

Gills with well-developed septa and water-tubes, as usual. In the female, marsupial structure is observed in all four gills, the septa being better developed, with folded epithelium, closer together, and the water-tubes being narrower. Yet in the outer gill the water-tubes are somewhat narrower than in the inner gill, which is chiefly noticeable at the base of the gills. In the gravid female, the gills swell moderately, so that the ovisacs assume a lanceolate, leaf-like shape, while the edges of the gills remain sharp and do not distend. Eggs whitish, filling the ovisacs in rather poorly connected masses, although a placenta-like cohesion is seen. But later on this placenta-structure is lost, and the glochidia are discharged in rather loose, irregular masses.

Glochidia of suboval shape, without hooks. Length 0.21; height 0.22 mm. (see Lea, Obs., VI, 1858, pl. 5, fig. 22, but not quite correct in shape; Ortmann, 1911*b*, pl. 89, fig. 3).

Color of soft parts whitish, foot, margin of mantle and gills pale brownish or yellowish. No trace of any brilliant colors (red or orange).

***Crenodonta perplicata* (Conrad).**

One male, and two females, from Bayou Pierre, De Soto Parish, Louisiana, collected Aug. 6, 1910, have been received from L. S. Frier-son. One of the females proved to be gravid, and in the act of discharging glochidia. Three males, three females, and two young ones from Ouachita River, Arkadelphia, Arkansas, have been sent by H. E. Wheeler.

This form is very likely the southern representative of the foregoing. It agrees with it in every respect. In one of the specimens from Louisiana and three from Arkansas the supra-anal was separated from the anal, in the others this separation was absent. The inner edge of the anal is finely crenulated. The posterior margins of the palpi are connected for about one-third of their length, and the inner lamina of the inner gills is free from the abdominal sac.

The gill-structure of the females is identical with that of *C. undulata*. The gravid female had only a few glochidia in the outer gills, while the inner ones were yet partly charged, and both suprabranchial canals, as well as the cloacal chamber, were filled with masses of loose glochidia, partly sticking together, but not in the shape of placentæ.

Glochidia like those of *C. undulata*. Length 0.20; height 0.21 mm.

Crenodonta heros (Say).

According to the description and figure given by Lea (as *multiplicatus*, Obs., VII, 1860, p. 222, pl. 30, fig. 105), this species without doubt belongs here.

Crenodonta trapezoides (Lea).

I have received, from L. S. Frierson, one male and two females from Bayou Pierre, De Soto Parish, Louisiana (collected Aug. 6, 1910),

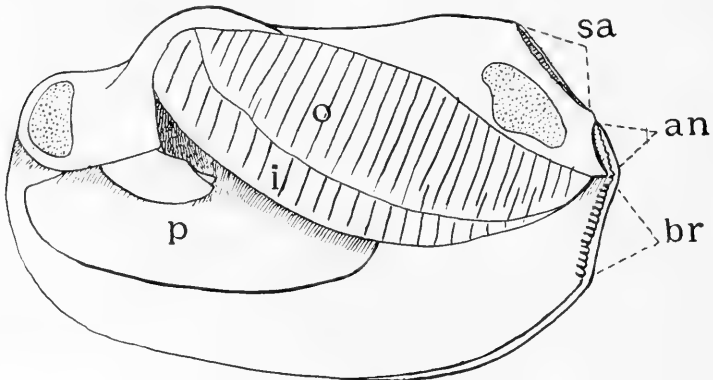


FIG. 5. *Crenodonta trapezoides* (Lea). Male, from Bayou Pierre, De Soto Parish, La. (Carn. Mus., No. 61, 4,586.)

from A. A. Hinkley two females from Pearl River, Jackson, Hinds Co., Mississippi (collected Nov. 5, 1910), and from H. E. Wheeler a male

and a female from Ouachita River, Arkadelphia, Clark Co., Arkansas. None of the females was gravid.

The description of the soft parts given by Lea (Obs., X, 1863, p. 436) is incomplete.

The anal opening is separated from the supra-anal by a moderately long connection of the margins of the mantle, which varies slightly, and is a little longer than the anal, but always much shorter than the supra-anal. In two cases this connection was absent. Branchial with well developed papillæ, anal with minute papillæ. Inner lamina of inner gills free, except at the anterior end. Posterior margins of palpi connected for about one-half of their length.

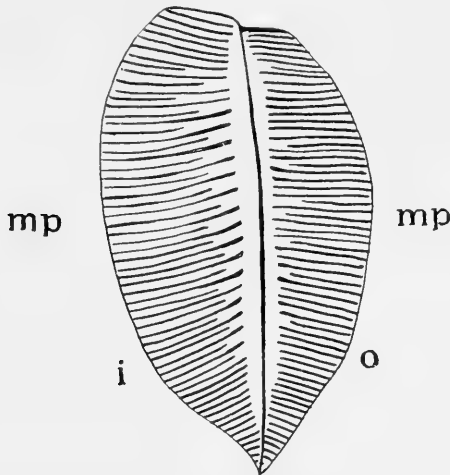


FIG. 5a. Left gills of a sterile female of *C. trapezoides*, from Pearl River, Jackson, Hinds Co., Miss. (Carn. Mus., No. 61, 4,924.)

Septa of the gills of the male rather distant from each other, and water-tubes wide. In the female the septa are much more crowded, and the water-tubes are narrow, chiefly so in the outer gill. In the inner gill of the female, near the base, the septa are a little more distant, but toward the edge they become more crowded by intercalation of additional ones, so that in the marginal half of this gill the water-tubes are almost as narrow as those of the outer gill. Altogether the marsupial character of the crowded septa is not so distinctly pronounced in the inner gill, although all four gills are built to receive eggs and to serve as marsupia, a fact, which is evidenced by the struc-

ture of the septa and the epithelium, which is folded and wrinkled as usual in marsupial gills.

Soft parts whitish. Frierson writes to me that in this species "eggs are in two gills sometimes, mostly in all four." Of those sent to me (five females), the structure of the gills was alike, in every case all four gills had the marsupial structure as described above.

In this species I see the nearest approach to a tendency to restrict the marsupial function to the outer gills, in so far as the water-tubes are slightly wider in the inner gills. But still the latter partake in the formation of the marsupium, and are distinctly marsupial at least in their marginal half.

This species stands rather isolated also with regard to the characters of the shell, but the features of *Crenodonta* are clearly seen, and I think that the most closely allied form is *C. heros*.

Genus QUADRULA Rafinesque. 1820.

Simpson, 1900b, p. 765 (restricted).

Shell rounded, quadrate, or subrhomboidal, sometimes elongated, with rather high beaks, well developed hinge-teeth, and deep beak-cavities. Outer surface more or less sculptured, with tubercles, pustules, or ridges, but without the characteristic oblique folds of *Crenodonta*. Epidermis lighter or darker, generally with rays, and often with beautiful color-patterns caused by the breaking up of the rays. Beak-sculpture concentric, double-looped, or zig-zag, poorly developed, or extending upon part of the disk.

Soft parts primitive in structure. Supra-anal separated from the anal by a short mantle-connection, the latter sometimes absent. Inner lamina of inner gills free. All four gills marsupial (see Plate XVIII, fig. 1), but the water-tubes of the inner gills sometimes a little wider than those of the outer gills, although this difference is occasionally hardly noticeable. When gravid, the ovisacs expand moderately, giving a compressed, leaf-like shape to the placenta. Placenta (where known) whitish, not very solid, and not persistent. Glochidia, in the few cases known, small, or medium, subovate, without hooks.

Type *Q. metanevra* (Rafinesque).

The species belonging to this genus may easily be separated into three groups:

1. *Pustulosa*-group.

Shell more or less rounded and swollen over the disk, with pustules

(rarely smooth), which are irregularly scattered, and have no connection with the beak-sculpture. Beak-sculpture poorly developed, simply concentric.

Q. pustulosa, sphaerica, refulgens, mortoni.

2. *Lachrymosa*-group.

Shell subquadrate or subtrapezoidal, sometimes somewhat elongate. Generally profusely sculptured upon the disk with tubercles, pustules, and ridges of a more definite arrangement. This sculpture is continuous with the beak-sculpture, which is quite distinct, and of the double-looped type. Shell with a rather distinct, but narrow, posterior ridge and in front of this flattened, or with a broad and shallow depression. Epidermis rayed, rays not broken, but irregular, and with the tendency to spread over the epidermis.

Q. lachrymosa, aspera, tuberculata.

3. *Metanевра*-group.

Shell subquadrate, or subtrapezoidal, sometimes quite elongated. Surface generally sculptured with tubercles and pustules of a more or less distinct arrangement, the sculpture continuous with the beak-sculpture, which is of the double-looped or zig-zag type. Shell with a distinct, broad, and high posterior ridge, depressed in front of this, but without distinct and broad radial furrow. Epidermis rayed, rays broken up into characteristic triangular spots.

Q. metanевра, sparsa, cylindrica.

Quadrula pustulosa (Lea).

I have investigated about half a dozen specimens from the Ohio drainage in western Pennsylvania, West Virginia, and Ohio, and (var. *schoolcraftensis* Lea) from Lake Erie in Ohio. Further I had ten specimens, males and females, from Ouachita River, Arkadelphia, Clark Co., Arkansas (H. E. Wheeler). Both males and females were seen, but none of the latter gravid.

The soft parts have been described by Simpson (in Baker, 1898, p. 87).

Anatomy similar to that of the genera *Fusconaja* and *Crenodonta*, chiefly the latter. Anal and supra-anal separated by a short mantle-connection. I never found the latter absent. Branchial opening with papillæ, anal crenulated. Palpi of the usual shape, their posterior margins connected for about one-third of their length.

Gills short and broad (according to shape of shell), the inner gill

the wider. Anterior attachment of gills as usual. Diaphragm normal. Inner lamina of inner gills free from abdominal sac except at anterior end.

Gills with well-developed septa, which are rather distant in the male. In the female, all four gills are marsupial, the septa being close together, and the water-tubes narrow. In the inner gill the septa are slightly less crowded near the base, but they have the characteristic marsupial structure (see Ortmann, 1911a, pl. 7, fig. 1).

The glochidia are figured by Lefevre and Curtis (1910, p. 97, fig. F). Length 0.23; height 0.32, which is unusually large for this group of genera.

The color of the soft parts is grayish, or yellowish white.

Quadrula sphærica (Lea).

Three sterile females from Pearl River, Jackson, Hinds Co., Mississippi, are at hand, collected on Nov. 5, 1910, by A. A. Hinkley.

Structure essentially as in *Q. pustulosa*. Anal opening with fine crenulations, almost smooth. In all three specimens all four gills possess the marsupial structure, and the water-tubes of the inner gills are also not quite so narrow as those of the outer gills, chiefly near the base.

By its shell this species is very closely allied to the foregoing, and the soft parts are practically identical. I hardly think they are specifically distinct, and among the specimens of *pustulosa* from Ouachita River, mentioned above, there are intergrades between the two forms.

Quadrula refulgens (Lea).

One male, collected together with *Q. sphærica*, is before me.

Since there is only a male, the characteristic *Quadrula*-structure cannot be made out. But I have no doubt that this is a *Quadrula* on account of its close affinity to *Q. sphærica*. In fact all the details, both of the shell and the soft parts, are identical with the latter, except that the shell is more compressed (lenticular) in *Q. refulgens*. My specimen is more rounded in outline than the original figure of Lea, and thus more nearly approaches *Q. sphærica* in this character. I should not be astonished, if *refulgens* should turn out to be a mere "form" of *sphærica*.

Quadrula mortoni (Conrad).

Three males and two females, one of the latter gravid, from Bayou Pierre, De Soto Parish, Louisiana, collected by L. S. Frierson, Aug. 6, 1910.

Agreeing in every detail with *pustulosa* and *spharica*, to which it is allied. The inner edge of the anal opening is almost smooth.

In the gravid female, eggs and glochidia were present, the latter of the usual shape, of medium size, subovate, without hooks. The glochidia are quite young and their shape is not very distinctly seen. They were of whitish color, and distributed in an irregular way in certain ovisacs both of the outer and inner gills, many ovisacs being empty. No exact measurements of the glochidia can be given.

The date for the breeding season should be noted.

Quadrula lachrymosa (Lea).

One male and four females from the Wakarusa River, Lawrence, Douglas Co., Kansas, received from R. L. Moodie, and one female collected by myself in the Ohio River, at St. Marys, Pleasants Co., West Virginia. No gravid females have been seen.

Soft parts described by Simpson (*cf.* Baker, 1898, p. 84).

Similar to the preceding species. Inner edge of the anal opening irregularly and indistinctly crenulated, almost smooth. Posterior margins of palpi connected for over one-half, almost two-thirds, of their length.

All four gills are marsupial, septa of the inner ones slightly less crowded than those of the outer ones (see Plate XVIII, fig. 1).

Soft parts whitish.

Quadrula aspera (Lea).

Three males, one female (all small, or of medium size) from Bayou Pierre, De Soto Parish, Louisiana, collected by L. S. Frierson, and one very large female from Pearl River, Jackson, Hinds Co., Mississippi, collected by A. A. Hinkley.

An incomplete description is given by Lea (*Obs.*, X, 1863, p. 437).

Agreeing in every respect with *Q. lachrymosa*, to which it is closely allied. Even the minor details (anal opening, palpi, etc.) are absolutely identical. No gravid females have been seen.

Quadrula tuberculata (Barnes).

Fifteen specimens have been investigated, collected by myself in the Ohio drainage in western Pennsylvania; nine more have been received from H. E. Wheeler from the Tennessee drainage in northern Alabama, and the Ouachita River in Arkansas. Females are among them, but not in the gravid condition.

Simpson has created for this species the genus *Tritogonia*, which he removed far from *Quadrula*. The shape of the shell is indeed somewhat strange at the first glance, but it is possible, without much difficulty, to correlate shape and sculpture with that of such species as *lachrymosa*, *aspera*, and chiefly with certain southern forms, which probably also belong here (*forshei* Lea, *speciosa* Lea, *apiculata* Say).

In the structure of the soft parts, this species is essentially a *Quadrula*. The anal opening is separated from the supra-anal by a rather short mantle-connection; the latter was found absent in one case only (out of twenty-four). Branchial with well developed papillæ, anal with fine, but distinct crenulations, which sometimes resemble fine papillæ. Inner lamina of inner gills free from abdominal sac, except at its anterior end. Posterior margins of palpi connected for one-half, or even more, of their length.

Gills rather long, but also rather wide; their anterior attachment as usual. Septa well developed, rather distant from each other in the male. In the female they are more crowded in all four gills, and the water-tubes are narrow, but there is a slight difference between the inner and outer gill, the water-tubes of the former being slightly wider near the base of the gills. In the marginal portion there is hardly any difference in the water-tubes of the two gills (see Ortmann, 1911*b*, pl. 86, fig. 4). In all four gills the septa are distinctly marsupial in structure: they are heavy, and have a folded epithelium.

No gravid females have been seen by the writer, and the glochidia are still unknown.

The color of the soft parts is grayish or yellowish (or brownish) white.

Simpson (1900*b*, p. 608) says of his genus *Tritogonia*: "in the female there is a thickened flap of the mantle which fills the circular posterior expansion of the shell, and which has a small flap inside." I have never seen anything answering to this phrase in my specimens. The chief expansion of the shell is at the anal opening, and the margin of this opening corresponds to it, and thus the anal is larger in the female,

than in the male. The "inside flap" can only be the inner edge of the mantle, which is present, however, in the male also. The true position of this species was first indicated by Sterki (1907, p. 48).

Quadrula metanevra (Rafinesque).

Thirteen specimens of either sex, one a gravid female, were examined in the laboratory, all from the Allegheny and Ohio Rivers in western Pennsylvania; additional specimens were examined in the

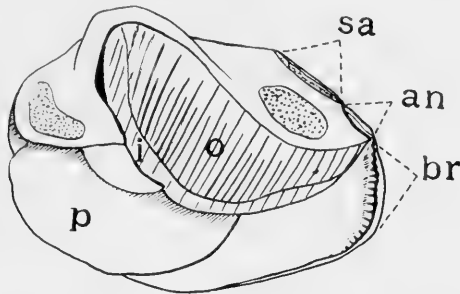


FIG. 6. *Quadrula metanevra* (Rafinesque). Male, from Allegheny River, Kelly, Armstrong Co., Pa. (Carn. Mus., No. 61, 4,549.) Coll. May 20, 1910.

field, in the Ohio River in West Virginia and Ohio, and two (male and female) were received from the Ouachita River in Arkansas (H. E. Wheeler).

The gravid female was found on June 22, 1909, and had only eggs.

Margins of the mantle connected so as to separate anal and supra-anal openings; this connection is short, but in no case was found to be absent. Supra-anal very large. Branchial with well developed papillæ, anal practically smooth, or only with mere traces of irregular crenulations. Palpi with the posterior margins connected for about one-fourth to one-third of their length.

Gills short and wide, their anterior attachment as usual. Dia-

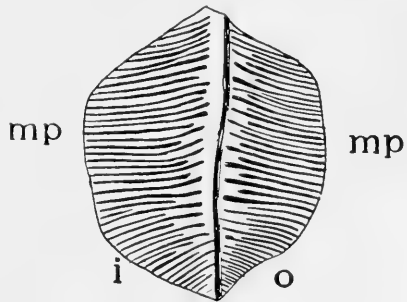


FIG. 6a. Left gills of a sterile female, from same locality.

phragm normal. Inner lamina of inner gills free from abdominal sac, except at anterior end.

Septa and water-tubes well developed. In the female all four gills are marsupial, and possess the typical structure. In the basal portion of the inner the water-tubes are somewhat wider, but there is hardly any difference in their width in the marginal part of the two gills, since the water-tubes of the inner gills become narrower by intercalation of additional ones. In the gravid female the gills swell moderately, but their edges remain sharp. The eggs form only poorly developed placenta in the ovisacs, and the shape of the latter is compressed and lanceolate (leaf-like).

The eggs are whitish. I have not seen glochidia, but according to Lefevre and Curtis (1910, p. 97, fig. E) they are normal in shape and size. Length 0.18; height 0.19 mm.

Color of soft parts whitish. As usual, the edge of the mantle, chiefly along the posterior part, is more or less blackish or brownish. Gills paler or darker grayish or brownish white. Foot brownish white. The posterior part of the abdominal sac is often suffused with black.

Quadrula sparsa (Lea).

One male and one sterile female, from the Cumberland River in Cumberland and Pulaski Counties, Kentucky, at hand, received from B. Walker.

Identical in every detail with *Q. metanevra*, to which it is also allied by the shell. The agreement extends so far, that minor details are also identical, as the smooth edge of the anal, the shape of the palpi, and the black pigment of the posterior part of the abdominal sac.

In the male supra-anal and anal were not separated, but this region was somewhat injured, so that the mantle-connection may have been torn.

Charged marsupia and glochidia unknown.

Quadrula cylindrica (Say).

Nine specimens (males and females) from the Ohio drainage of western Pennsylvania have been examined in the laboratory, and several more in the field, taken from the Ohio River in western Pennsylvania and Ohio. Two males were received from H. E. Wheeler, from the Ouachita in Arkansas.

Although the shape of the shell is very unique in this species, it clearly belongs to the *metanevra*-group, as has been recognized already by Simpson, and the soft parts bear out this affinity, since they are identical in all essential characters. Of course, according to the shape of the shell, the gills are very long and narrow. The mantle connection between anal and supra-anal was always found present. The inner edge of the anal is practically smooth. The posterior margins of the palpi are united for about one-half of their length.

All four gills have a marsupial structure in the female, and the inner gill has the water-tubes a little wider in the basal part than the outer gill. No gravid specimens have been found.

The color of the soft parts of this species is very remarkable. The general ground color is yellowish orange, with black markings. The abdominal sac is whitish, with blackish gray markings, chiefly posteriorly. The foot is grayish at the extremity, shading into black, the black ending in a sharp horizontal line, which is followed by grayish orange. The palpi are yellowish, with a gray edge, the gills are grayish brown, the mantle transparent gray, shading to grayish yellow on the margin, with a blackish brown edge, which becomes deep black and very wide posteriorly at the siphons. The adductors are pale yellowish to orange. The color varies in different specimens in so far that in some the ground-color is paler yellow, while in others it is of a more intense yellow, inclining to orange.

Breeding season and glochidia unknown.

Genus ROTUNDARIA Rafinesque. 1820.

Simpson, 1900b, p. 794 (as subgenus).

Shell rounded or quadrate, with elevated beaks, very deep beak-cavities, and well developed hinge-teeth. Outer surface sculptured with tubercles and nodules. Epidermis brown, without rays. Beak-sculpture consisting of numerous rather close bars, the first few concentric, those following developing a strong angular loop on the posterior ridge, and an anterior loop, which soon breaks up into an irregular zig-zag pattern of more or less isolated tubercles. This sculpture extends somewhat upon the disk and mingles with the first tubercles of the disk. Nacre more or less violet, which may be a specific character.

Soft parts primitive in structure. The anal is never closed above,

and no supra-anal is present. Inner lamina of inner gills free. Of the gills, only the outer ones are marsupial in the female, and the water-tubes in them are much closer than in the non-marsupial gills. Glochidia unknown.

Type *R. tuberculata* (Rafinesque).

This genus is more primitive than any of the foregoing because of the absence of a supra-anal opening. In the structure of the marsupium it is a little more advanced, and is related to the following genera. In the characters of the shell it is rather peculiar, but reminds somewhat of certain types of *Quadrula*. We can do justice to these conflicting characteristics only by recognizing this as a valid genus.

Rotundaria tuberculata (Rafinesque).

Three males and three females from the Ohio drainage in western Pennsylvania, and one female from the Ohio River at St. Marys, Pleasants Co., West Virginia, all collected by myself, have been investigated.

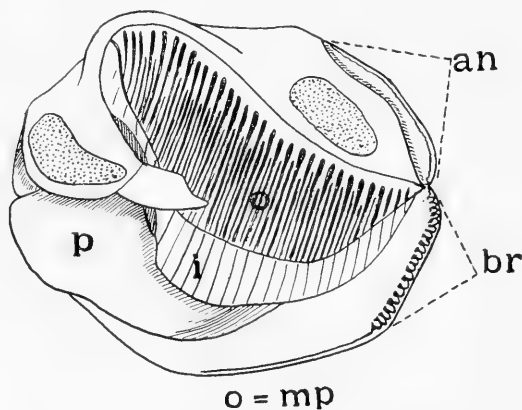


FIG. 7. *Rotundaria tuberculata* (Rafinesque). Sterile female, from Allegheny River, Kelly, Armstrong Co., Pa. (Carn. Mus., No. 61, 4,562.) Coll. July 25, 1910.

The soft parts have been described by Simpson (in Baker, 1898, p. 86), but very poorly.

Although there are only a few specimens at my disposal, the characters given for the genus are uniformly found in all of them. The most marked character is the absence of a supra-anal. Since Simpson

also mentions this character, I think we may take it as settled that this form does not possess a supra-anal. As regards the marsupium, I can only say that in all four females at hand only the outer gills show the marsupial structure.

In conclusion there is nothing remarkable in the structure of the soft parts. The branchial opening is unusually large, and has papillæ on the inner edge, while the large anal has a practically smooth inner edge. The palpi are normal, and their posterior margins are united for one-third to one-half of their length. The gills, conforming to the shape of the shell, are rather short and wide, and their anterior ends are normal, the diaphragm is complete, and the inner lamina of the inner gills is free from the abdominal sac, except at the anterior end. The gills have the usual structure, and the female marsupial structure is found only in the outer gills, where the septa are much more crowded, and the water-tubes much narrower, than in the non-marsupial gills.

A gravid female has never been found, and consequently the glochidia remain unknown.

The color of the soft parts is grayish or brownish white, with exception of the margin of the mantle, which is brownish, and becomes deep black in the region of the branchial and anal openings.

Genus PLETHOBASUS Simpson. (1900.)

Simpson, 1900*b*, p. 764 (as section).

Shell rounded, oval, or slightly elongate, with moderately elevated beaks, and moderately deep beak-cavities, and well developed hinge-teeth. Outer surface sculptured with nodules or tubercles, which often are transversely elongated. Epidermis yellowish to brown, without distinct rays. Beak-sculpture rudimentary, consisting (as far as known) of a few concentric ridges, which do not extend upon the disk. Nacre whitish or pinkish.

Soft parts primitive in structure. Anal separated from the supra-anal by a short mantle-connection. Inner lamina of inner gills free. Only the outer gills are marsupial in the female, in other respects the gills have the usual structure. When gravid, the outer gills swell moderately, and their edges do not distend. Placentæ lanceolate (leaf-like) and compressed; they are rather persistent, and are discharged whole. Glochidia small, semioval, without hooks.

Type *P. asopus* (Green).

Possibly the color of the soft parts and of the eggs (placentæ) is also characteristic. (See below.)

This genus greatly resembles in shell-structure the genus *Quadrula*, chiefly the *pustulosa*-group and the genus *Rotundaria*. But in the marsupium it is more advanced than the former, and in the color of the soft parts and the eggs it suggests affinity with *Fusconaja*. It surely is a connecting link between the more primitive *Unioninæ* and those of the type of the genus *Pleurobema*. Simpson has recognized the peculiar character of *P. æsopus*, and I think his section *Plethobasus* is entitled to generic rank.

***Plethobasus æsopus* (Green).**

Some fifty specimens have been examined, chiefly from the Allegheny River in Armstrong Co., Pennsylvania. Among them were gravid females, and the latter were found exclusively in the month of July. The species is typically tachytictic.

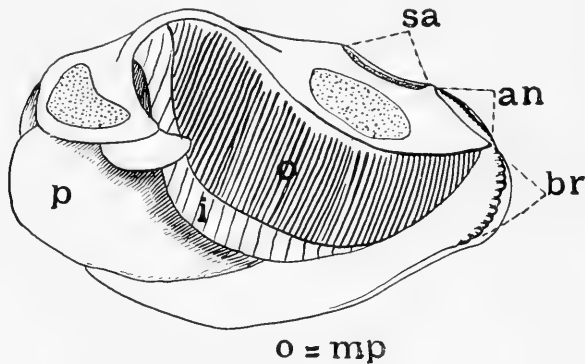


FIG. 8. *Plethobasus æsopus* (Green). Sterile female (just discharged), from Allegheny River, Kelly, Armstrong Co., Pa. (Carn. Mus., No. 61, 4,598.) Coll. July 25, 1910.

Anal and supra-anal separated by a very short mantle-connection, which was found missing in a small number of cases. Branchial opening with strong papillæ, anal with very fine papillæ. Palpi of usual shape, their posterior margins connected for about one-third of their length.

Gills long and broad, the inner the wider. Anterior attachment as usual. Diaphragm normal. Inner lamina of inner gills free. Septa

and water-tubes well developed, septa rather distant in the male. In the female, only the outer gill is marsupial, with crowded septa, while in the inner gill the septa are like those of the male.

When gravid, the water-tubes (ovisacs) of the outer gill swell moderately, and assume a lanceolate shape, and consequently the placenta have this shape. The edge of this gill does not distend. The eggs and placenta are pink or red, and the placenta preserve their shape, and are discharged whole. This discharge has been actually observed in two cases (July 25, 1910).

Glochidia of the usual shape, rather small, semioval, without hooks.¹³

Color of soft parts very characteristic. All specimens seen had a peculiar, pale orange ground-color. The foot, margins of the mantle, and adductors were darker, often deep orange. The abdominal sac is whitish, the palpi and gills pale grayish brown, the gills with more or less of the orange hue. The color may be more or less intense, but some shade of orange always prevails. When gravid, the red color of the placenta contained in the gills blends with the orange of the latter, producing a very peculiar lilac tint.

***Plethobasus cooperianus* (Lea).**

Only two specimens with soft parts have been observed, the one from the Ohio River in Beaver Co., Pennsylvania, the other from the Ohio at Parkersburg, Wood Co., West Virginia. Both proved to be females.

The anatomy of this species is practically identical with that of *P. asopus* agreeing in all particulars, chiefly also in the peculiar color of the soft parts. This color is so characteristic that it alone suggested to me the relationship of *cooperianus* and *asopus*, which was confirmed by the subsequent anatomical investigation. No gravid females have been observed, and nothing is known about the color of the placenta and the shape of the glochidia.

Genus PLEUROBEMA Rafinesque. 1820.

Simpson, 1900b, p. 745 (amended).

Shell rounded, subquadrate, oval, or somewhat elongate, but then oblique, with the beaks placed anteriorly. Beaks generally somewhat

¹³ The glochidia were observed only in one case, in one of the discharging females, and apparently were discharged prematurely (a phenomenon observed by others). They were young and incompletely formed (soft), but their shape could be made out. The size was about 0.18 mm., but it was impossible to make exact measurements.

prominent, with moderately deep beak-cavities; hinge-teeth well developed. Outer surface without sculpture. Epidermis generally lighter or darker brownish, sometimes yellowish, with more or less distinct rays, which may be arranged in blotches, or may be fine lines, or entirely absent. Beak-sculpture obscure, consisting of a few concentric ridges, not extending upon the disk. Nacre generally whitish, or red.

Soft parts practically identical with those of *Plethobasus*, except in color, which is generally paler, sometimes yellowish, even with a suggestion of pale orange (in *P. clava*), but in most cases without this. The eggs are, where known, white, and the placentæ are distinct, and seem to be persistent. Glochidia small, suboval, without hooks.

Type *P. clava* (Lamarck).¹⁴

It is an unhappy coincidence, that the type species does not represent the normal condition of the genus, but a rather extreme form of it. In general, we may say that *Pleurobema* resembles *Quadrula* in the soft parts, and *Fusconaja* in the shape of the shell, with the exception that it has reached the advanced stage of having only the outer gills marsupial. It differs from the following genera (*Elliptio* and *Unio-merus*) only by the characters of the shell, chief among which is the general outline, which is of the short, rounded, quadrate, or oblique type, while *Elliptio* and *Unio-merus* have the elongate and straight type of shell. Simpson (1900b, p. 760, footnote 2) had difficulty in defining this genus, and there are indeed species which are to a degree intermediate between *Pleurobema* and *Elliptio*. *P. clava* is a peculiar type. Since I have not had any opportunity to investigate these doubtful forms, I have made the present arrangement of the genera to suit the material at hand, but I shall not be astonished if further studies will necessitate changes.

***Pleurobema riddelli* (Lea).**

One young male, and one larger female (sterile) are before me, from Pearl River, Jackson, Hinds Co., Mississippi, collected by A. A. Hinkley.

I was a little uncertain about the identification of this species, but since Mr. Walker, to whom I sent these specimens, also thinks that they are *riddelli*, I believe the identification is right.

¹⁴The species of *Pleurobema* described by Rafinesque are unrecognizable, but L. Agassiz (1852) has made this the type.

Structure of the soft parts like those of the following species, which see. Color of soft parts also of similar type. Mantle-connection separating anal and supra-anal very short. Anal with fine crenulations, branchial with papillæ. Posterior margin of palpi connected for about one-half of their length.

Gills of the usual structure, in the female only the outer gills are marsupial (see Plate XVIII, fig. 2).

In the soft parts there are no characters which assign this species to a definite genus, except that they indicate, that it is not *Fusconaja* and not *Quadrula*. It has been placed by Simpson in the latter genus. In the shape of the shell it most resembles the *coccineum-obliquum*-group of *Pleurobema*, from which it is distinguished by the rather distinct posterior ridge. I think, *P. riddelli* comes in here, but stands rather isolated by itself. The dark color of the epidermis is also unusual in this genus.

***Pleurobema coccineum* (Conrad).**

Numerous specimens have been examined from the smaller creeks of the Ohio and Lake Erie drainage in western Pennsylvania, among them some fifty gravid females. The species is tachytictic, and the breeding season lasts from the end of May to the end of July.

The soft parts have been described by Simpson (in Baker, 1898, p. 79), but the account given of the marsupium is wrong.

Margin of the mantle, branchial, anal, and supra-anal openings of the usual conformation, as also the gills and palpi. Branchial with papillæ, anal with distinct, almost papillæ-like crenulations. The mantle-connection between the anal and supra-anal was found absent in some cases. Posterior margins of palpi connected for one-half, or even more, of their length.

Only the outer gills are marsupial.¹⁵ When gravid, the outer gills swell only moderately, the edges remaining sharp. The ovisacs are compressed and lanceolate and the placentæ, which are distinctly developed, have the same leaf-like shape; they are always white, and are permanent, being discharged whole. This discharge has been observed several times. Glochidia rather small, subovate, without

¹⁵ Lefevre and Curtis (1910, p. 83) suggest that the fact that I found only the outer gills charged may be due to a partial discharge of the marsupia in consequence of beginning suffocation. This supposition is untenable. I observed many specimens in the field. Moreover, even in females, which have the marsupium not charged, it is easily seen that only the outer gills have marsupial structure.

hooks (see Ortmann, 1911*b*, pl. 89, fig. 4). Length and height about the same: 0.15 mm.

Color of soft parts grayish or yellowish white. Among the numerous specimens investigated not one has been found which showed any traces of orange color.

Pleurobema obliquum (Lamarck).

A large number of specimens from the Ohio and Allegheny in Pennsylvania, and the Ohio in West Virginia and Ohio have been investigated. Gravid females have been found only a few times in June.

Structure of soft parts absolutely identical with that of *P. coccineum*, but glochidia have not been observed.

I do not think that this form is specifically distinct from *P. coccineum*. It is the form of the large rivers, which is represented in the headwaters and smaller streams by *P. coccineum*. In the Allegheny River in Armstrong Co., Pennsylvania, these two forms are connected by all kinds of intergrades.

Pleurobema pyramidatum (Lea).

Not more than a dozen specimens of typical *pyramidatum* have been seen, found always associated with the foregoing form. Females were among them, but none gravid. I also received one male and three females of this form from Arkadelphia, Arkansas, collected by H. E. Wheeler.

This is merely an extreme variety of *P. obliquum*, connected with it by frequent transitional forms, and consequently the anatomy is absolutely identical.

Pleurobema clava (Lamarck).

About twenty-five specimens, among them gravid females, have come under observation. They are all from the Ohio drainage in western Pennsylvania. This species is gravid in June and July.

The soft parts have been described by Lea (Obs., X, 1863, p. 441), but only those of the male.

Anatomy like that of the other species of *Pleurobema*. It should be mentioned that the mantle-connection between the anal and supra-anal is rather short, and was always found present. The anal is rather distinctly, but finely, papillose. Posterior margins of palpi connected for only a short distance.

The outer gills alone are marsupial, and the placentaë are rather distinct. Glochidia (see Ortmann, 1911*b*, pl. 89, fig. 5) of small size, subovate, without hooks. Their length and height is about the same, 0.16 mm.

Color of soft parts whitish, with foot and gills grayish, and the margin of the mantle black posteriorly. In other specimens the foot

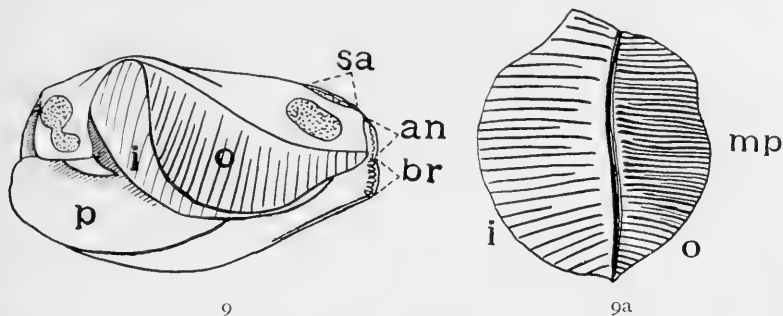


FIG. 9. *Pleurobema clava* (Lamarck). Male, from Sandy Creek, Sandylake, Mercer Co., Pa. (Carn. Mus., No. 61, 4,589.) Coll. June 27, 1910.

FIG. 9a. Left gills of sterile female, from Shenango River, Pulaski, Lawrence Co., Pa. (Carn. Mus., No. 61, 4,591.) Coll. Oct. 4, 1910.

is pale orange, as are also the margins of the mantle and adductors. The gills are grayish brown. There are all intergrades between these extremes. The placentaë are white, cream-color, or pale orange.

***Pleurobema decisum* (Lea).**

According to the similarity of the shell, and the notes on the anatomy furnished by Lea (Obs., X, 1863, p. 405), this species belongs here.

Genus *ELLIPTIO* Rafinesque. 1819.

Simpson, 1900*b*, p. 700 (as section).

Shell more or less elongated, with straight longitudinal axis, not oblique. Beaks not very near the anterior end, not very prominent, with shallow beak-cavities; hinge-teeth well developed. Outer surface without sculpture.¹⁶ Epidermis generally rather dark, brown to black, without rays, or with indistinct rays, chiefly so when young. Rays straight, simple, and fine. Beak-sculpture tending to become

¹⁶ If *U. spinosus* belongs here, the diagnosis should be modified in this particular.

obsolete; when present, consisting of few fine concentric ridges, to which may be added, toward the disk, a small number of slightly heavier bars, with a posterior angle upon the posterior ridge of the shell; these bars run about parallel to the growth lines. Sometimes the bars are slightly sinuate in front of the posterior angle, but they never are distinctly of the double-looped type. Nacre from white through all shades of pink and red to deep purple and violet, with the dark shades prevailing.

Soft parts practically identical with those of *Plethobasus* and *Pleurobema*, with only the outer gills marsupial. Mantle-connection between anal and supra-anal short, or somewhat longer. Inner lamina of inner gills free. Color of the soft parts whitish, often greatly suffused (chiefly the gills and mantle) with black. Eggs, where known, whitish, placenta rather distinct. Glochidia small, subovate, without hooks (see Plate XIX, fig. 1).

It may be mentioned as an additional character, that in all these forms the anal has rather distinct papillæ.

Type: *E. crassidens* (Lamarck.)¹⁷

We may regard *Elliptio* as a special branch of *Pleurobema*, distinguished from the latter only by the characters of the shell. It probably is not descended directly from a *Quadrula*- or *Fusconaja*-like type with four marsupial gills, but it has gone through the intermediate *Pleurobema*-stage first.

The species of *Elliptio* easily fall into several groups.

In *E. crassidens* and *beadleianus*, the typical shape of the shell is not so distinctly developed: it is not greatly elongated, and approaches yet somewhat the subquadrate or subtrapezoidal type of certain *Fusconaja*- and *Pleurobema*-species. The beak sculpture in these forms is rather obscure.

Next to this stands the group of *E. complanatus* (including *productus* and *jayensis*), where the typical characters of the genus are fully developed.

A third type is furnished by *E. gibbosus*, and a fourth by *E. popei*.

Elliptio crassidens (Lamarck).

Numerous specimens both males and females have been examined, all from the Ohio and Allegheny Rivers in western Pennsylvania.

¹⁷ *Unio (Elliptio) nigra* Rafinesque, 1820, is Rafinesque's type (first species), and this is undoubtedly a synonym of *U. crassidens* Lamarck, 1819. The large, heavy shell of the Ohio with red nacre cannot be anything else.

There were only three gravid females among them, which were found on June 22, 1909.

Anatomy normal: margin of the mantle, siphons, gill-structure, and marsupium typically Unionine. In a few cases the rather short

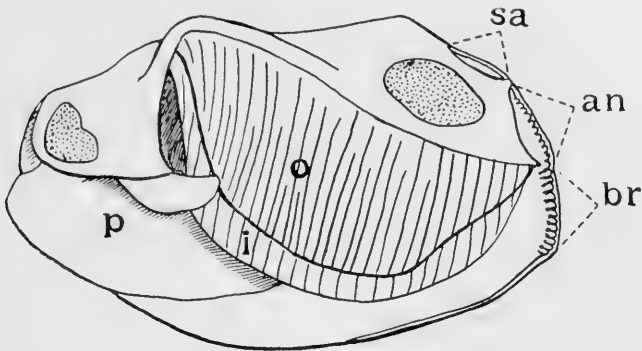


FIG. 10. *Elliptio crassidens* (Lamarck). Male, from Allegheny River, Kelly, Armstrong Co., Pa. (Carn. Mus., No. 61, 3,777.) Coll. July 3, 1908.

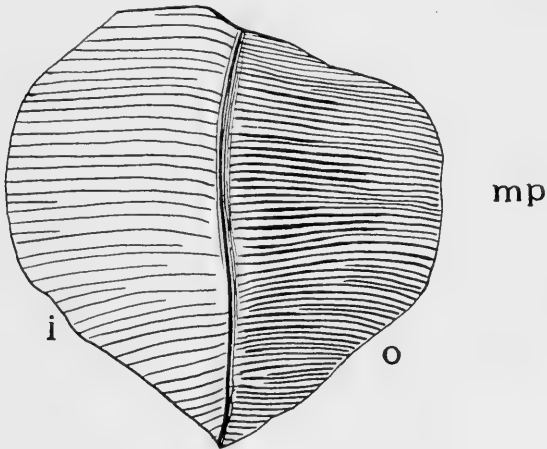


FIG. 10a. Left gills of a sterile female, from same locality. (Carn. Mus., No. 61, 3,055.) Coll. Sept. 5, 1907.

mantle-connection between the anal and supra-anal was found to be absent. Anal with small, but quite distinct, papillæ. Palpi with the posterior margins connected for a short distance.

Marsupium formed by the outer gills; when gravid moderately swollen, with rather well-developed, leaf-like placentæ. Glochidia (see Ortmann, 1911b, pl. 89, fig. 6) small, suboval, without hooks. Length 0.13; height 0.15 mm. The color of the abdominal sac is whitish, the foot pale gray or brownish gray, the mantle pale liver-brown, whitish toward the margins, edge brown, black posteriorly. Gills gray or dirty brown. Adductors whitish, palpi grayish.

***Elliptio beadleianus* (Lea).**

Two males and two females, from Pearl River, Jackson, Hinds Co., Mississippi, have been received from A. A. Hinkley.

This species, which has been placed by Simpson (1900b, p. 786) in the genus *Quadrula*, is not a *Quadrula*, because only the outer gills have marsupial structure. In other respects its anatomy is indistinguishable from that of other forms belonging in the genera of the type of *Pleurobema*, etc. The shape of the gravid marsupium, of the placentæ, and of the glochidia is unknown.

The supra-anal opening is well separated from the anal, but the separating mantle-connection is short. The inner edge of the anal has fine, but distinct, papillæ, that of the branchial has larger papillæ. The posterior margins of the palpi are connected for one-third or one-half of their length (this is the most prominent difference from the allied forms). The inner lamina of the inner gills is free, as usual.

Although the structure of the gills unquestionably removes this species from *Quadrula* and *Fusconaja*, it is hard to assign it a place in the other genera. We must rely entirely upon the shell, and this is rather an indifferent criterion. However, I think the shape of the shell is more like that of *crassidens* than that of any other form. It is somewhat more elongate than the *Fusconaja-Pleurobema*-type, straight, with the beaks not much anterior, with a dark epidermis, and with a tendency to develop red nacre, characters which are all found in *E. crassidens*. The posterior ridge is also present in both species.

I consider *E. beadleianus* a peculiar type, standing nearest to *E. crassidens*. Probably other species go with it, as for instance *chickasawhensis* Lea and *askewi* Marsh (of the latter two, Frierson writes to me that they are "next to inseparable"). All these differ from *crassidens* in being smaller, possessing more regularly swollen lateral faces of the disk, lacking corrugations on the posterior slope, and having a lighter nacre. Also the whole shell and the hinge are less massive in structure. Their beak-sculpture is unknown.

Color of soft parts of *E. beadleianus* whitish; foot grayish; gills and palpi grayish-brown, as is also the mantle, except the margin, which is whitish, with the edge blackish posteriorly.

***Elliptio* (?) *spinosus* (Lea).**

The anatomy has been described by Lea (Obs., X, 1863, p. 413). It is similar to that of *E. crassidens*, but Lea mentions some peculiarities in the ovisacs, which I do not understand. The shell is of the *crassidens*-type, but its spines are unique and would possibly justify the erection of a separate genus: *Canthyria* Swainson, 1840.

***Elliptio complanatus* (Dillwyn).**

Numerous specimens of this species, males, sterile and gravid females, have been investigated from the Delaware, Susquehanna, and Potomac drainages of eastern Pennsylvania and Maryland. The species is tachytictic, and the breeding season begins at the end of April, and lasts to the middle of June, possibly a little longer.

The soft parts have been described by Lea (Obs., X, 1863, p. 412).

In the shell, this is a typical *Elliptio*, with the typical shape of this genus, and its typical beak-sculpture. In the soft parts, we find the edges of the mantle forming the usual openings. Anal and supra-anal are separated by a moderate mantle-connection, shorter than the anal, which has never been found missing. The branchial has large papillæ, while the anal has much finer ones. Posterior margins of palpi connected for a short distance.

Gills corresponding to the shape of the shell, rather long and moderately wide, the inner rather wider. Diaphragm of the usual shape, inner lamina of inner gill free, except at anterior end. Septa and water-tubes well developed, the latter wide in the male. In the female only the outer gills are marsupial, and their septa are much crowded. When gravid, this gill swells only moderately, the edge remaining sharp, and the ovisacs assume a leaf-like shape, as also do the placentæ (figured by Lillie, 1895, pl. 1, fig. 1), which are not very solid when glochidia are present. The latter are always white, rather small, subovate, without hooks. They are longer than high. Length 0.20, height 0.19 mm. (see Plate XIX, fig. 1).

Color of soft parts of the grayish white type, foot darker, also gills, the latter often suffused with black posteriorly.

Elliptio jayensis (Lea).

Five males and twelve females (all sterile) from Lake Monroe, Sanford, Orange Co., Florida, collected by O. T. Cruikshank, in April, 1907.

The soft parts are of the usual structure, and agree in every particular with those of *E. complanatus*. Anal and supra-anal separated by a mantle-connection, which is slightly longer than in the more primitive forms, but still considerably shorter than the anal. Anal with rather well developed papillæ, which are almost as large as the papillæ of the branchial opening. Posterior margins of palpi connected at base only. Inner lamina of inner gill free, except at anterior end. Only the outer gills are marsupial.

The beak-sculpture of this species is not quite of the normal *Elliptio*-type, in that in the case of the later bars a sinuation is seen in front of the posterior angle. This sinuation is variable, and never assumes the shape of a distinct, reëntering angle, and thus the beak-sculpture cannot be called double-looped.

There are over one hundred shells (without the soft parts) at hand, many of which might as well be called *E. buckleyi* (Lea). All these shells undoubtedly are the same species, and were collected together.

The old ones most resemble *buckleyi* (see: Simpson, 1892, pl. 58, figs. 6 and 7, and pl. 59, fig. 1), while those of medium size and the young ones are *jayensis* (Simpson, *ibid.*, pl. 61, fig. 4). It is remarkable that there are no young *buckleyi* in the lot, while there are dozens of *jayensis*. I am very much inclined to regard *buckleyi* as being only the older adult form of *jayensis*.

Elliptio productus (Conrad).

Nine specimens have been investigated, males and sterile females, from the Potomac drainage in southern Pennsylvania and Maryland.

The soft parts agree in all essential respects with those of *E. complanatus*. Conforming to the shape of the shell, the gills are extremely long and narrow. Branchial, anal, and supra-anal as in *complanatus*; anal and supra-anal separation slightly longer than usual; anal with the same distinct papillæ. Structure of palpi and gills the same. No gravid females have been found.

Color of soft parts like that of *complanatus*.

Beak sculpture practically identical, and there is no doubt that this species is an offshoot of the *complanatus*-stock.

Elliptio gibbosus (Barnes).

Numerous specimens from the Ohio and Lake Erie drainage in western Pennsylvania have been seen, and two males and two females from Arkansas. Gravid females were found in the months of May, June, and July, and in one case as late as August 13. This is a typical tachytictic form.

The soft parts have been discussed by Lea (Obs., X, 1863, p. 417) and Simpson (in Baker, 1898, p. 70).

The beak-sculpture in this species is also similar to that of *E. complanatus*, but it is slightly heavier, though less distinct; that is to say: the ridges are thicker, but less well defined.

Soft parts essentially identical with the other species described in this genus. It, however, should be mentioned that in a very few cases the mantle-connection between the anal and the supra-anal was found missing. The anal has distinct papillæ.

When gravid the marsupium swells moderately, but the edge remains sharp. The ovisacs are leaf-shaped, and the placentæ are moderately well-developed, but when the glochidia are formed, they seem to be less distinct. Color of eggs and glochidia always white. Glochidia (see Lea, Obs., XIII, 1874, pl. 21, fig. 10; and Ortmann, 1911b, pl. 89, fig. 7) rather small, suboval in shape, without hooks. Length 0.20, height 0.22 mm.

Color of soft parts grayish white. Foot, gills, and mantle gray, edge of the latter black posteriorly. Marsupium cream-white.

Elliptio popei (Lea).

Two gravid females, from Valles River, Mexico, collected by A. A. Hinkley in December and January, 1906-1907,¹⁸ were received from L. S. Frierson.

The beak-sculpture is somewhat different from that which is typical of this genus. In the two specimens before me, it is poorly developed, although the beaks are well preserved. It consists of two to three fine concentric ridges, which are somewhat interrupted in the middle, giving a faint appearance of double loops. But it is not by any means double-looped, since no reëntering angles are present.

The soft parts are typical. The anal and supra-anal are separated by a mantle-connection, which is shorter than the anal. Anal with well-developed papillæ; papillæ of branchial larger than those of anal.

¹⁸ See Hinkley, 1907, pp. 68 and 79.

Posterior margins of palpi connected for a short distance. Inner lamina of inner gills free, except anteriorly.

Both of my specimens are gravid, but have only eggs. Marsupium formed by the outer gills, only moderately swollen, with sharp edge. Placentæ moderately well developed.

Hinkley collected these specimens in December and January. Here we would have a so-called "summer breeder," which breeds in mid-winter. But we know now, that not the season of the year, but the shortness of the breeding season is important, and according to all analogies, *E. popei* should be a form with short breeding season.

Genus UNIOMERUS Conrad. (1853.)

Conrad, 1853, p. 268.—Simpson, 1900b, p. 739 (as section).

Shell moderately elongated, with straight longitudinal axis, not oblique, and beaks not very near the anterior end. Beaks not very prominent, beak-cavities shallow, hinge-teeth well developed. Outer surface without sculpture. Epidermis light yellowish to brown, often with dark concentric bands, without rays. Beak-sculpture rather distinct, concentric, bars rather numerous, not angled behind, but curved up toward the posterior side of the beaks, and not parallel to the growth lines. Nacre whitish or grayish, not inclining to purple or red. Soft parts practically identical with those of *Elliptio*. Gravid females are unknown, but in sterile females only the outer gills are marsupial in structure. The anal has, in the type species, only crenulations, and the mantle-connection between anal and supra-anal is rather long.

Type *U. tetralasmus* (Say).¹⁹

This genus stands very close to *Elliptio*, and, like this, may be regarded as descended from *Pleurobema*.

Uniomerus tetralasmus (Say).

One male and two females (sterile) from Bayou Pierre, De Soto Parish, Louisiana, have been received from L. S. Frierson.

The soft parts do not offer anything remarkable, when compared with those of *Pleurobema* and *Elliptio*. The supra-anal is separated from the anal by a rather long mantle-connection, the latter, however, is

¹⁹ The first species given by Conrad is *declivis*, which, according to Simpson, together with six of the other so-called species named, are synonyms, or varieties, of *tetralasmus*.

shorter than the supra-anal, but distinctly longer than the anal. Inner edge of anal with fine crenulations, that of branchial with papillæ. Inner lamina of inner gills free, except anteriorly. Posterior margins of palpi connected for about one-fourth of their length. Marsupium formed by the outer gills, and of the usual structure. Color of soft parts whitish.

Genus UNIO Retzius. (1788.)

Simpson, 1900b, p. 679 (restricted).

Shell ovate, or more or less elongated, with straight longitudinal axis, not oblique, and beaks not very close to the anterior end. Beaks not very prominent, with shallow beak-cavities. Hinge-teeth well-developed. Outer surface without sculpture. Epidermis light or dark, with, or without, rays. Beak-sculpture distinctly of the double-looped type, or even zig-zag, with a distinct reëntering angle of the bars in front of the posterior angle. Often the sculpture is rudimentary, and consists of tubercles indicating the lower angles of the original loops.

Soft parts much like those of *Pleurobema*, *Elliptio*, and *Uniomerus*. Mantle-connection between anal and supra-anal moderately long (generally almost as long as the anal). Inner lamina of inner gills free, except at anterior end. Marsupium formed by the outer gills, with the usual structure (see Plate XVIII, figs. 4, 5). Gravid females have not been seen by the writer, but the glochidia are described by European authors as being moderately large, subtriangular, with a hook on the ventral point of each valve.

Type *U. pictorum* (Linnæus).

This genus chiefly differs from the foregoing genera in the shape of the glochidia and in the beak-sculpture. Although the marsupium is similar to the North American genera *Pleurobema*, *Elliptio*, and *Uniomerus*, I do not think that this indicates close relationship, but that it is due to parallelism of development. The genus *Unio* of the Old World has started from certain *Unioninæ* (with four gills serving as marsupium) in an independent line of descent. We do not yet know the forms which probably were ancestral to *Unio*. The shape of the glochidium indicates that somewhere near *Unio* was the starting point for the development of the subfamily *Anodontinæ*.

Unio pictorum (Linnæus) 1758.

See also Ortmann, 1911c, p. 21.

A large number of specimens, both males and females, are at hand, from various parts of Germany and Hungary, received from W. Israël.

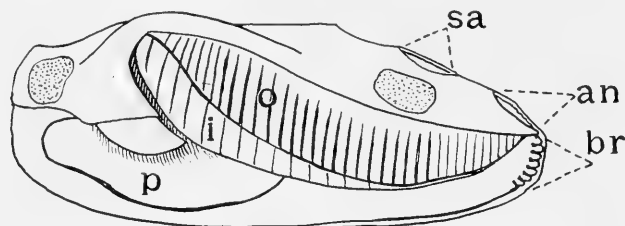


FIG. 11. *Unio pictorum* (Linnæus). Male, from Saale River, Rudolstadt, Germany. (Carn. Mus., No. 61, 4,934.)

Branchial opening separated from the anal by a complete diaphragm formed only by the gills. Anal opening closed above by the union of the margins of the mantle, forming a supra-anal; this mantle-connection is rather long, slightly longer than the anal, and about as long as the supra-anal. Inner edge of branchial with distinct papillæ, that of the anal almost smooth, or with very minute crenulations. In front of the branchial the inner edge of the mantle is practically smooth. Palpi subfalciform, their posterior margins united for about one-third of their length, or slightly more.

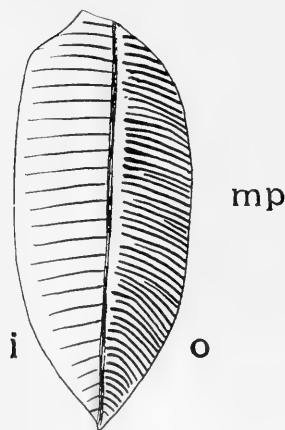


FIG. 11a. Left gills of a sterile female, same locality.

Gills (corresponding to the shape of the shell) rather long and narrow, the inner the wider, chiefly so anteriorly. Anterior end of the gills as usual, that of the inner widely distant from the palpi. Outer lamina of outer gill entirely connected with the mantle, inner lamina of inner gill free from abdominal sac, with exception of its anterior end.

Both gills with well-developed water-tubes and continuous septa. The septa of the inner gill of the male (see Plate XVIII, fig. 3) and

female (see Plate XVIII, fig. 4) are rather distant from each other; in the outer gill of the male, they are slightly more crowded. But in the female the septa of the outer gill are very close, forming narrow water-tubes (see Plate XVIII, fig. 4). The epithelial lining of the latter water-tubes is marsupial in character. Thus the marsupium is formed by the outer gills alone practically throughout their whole extent; for small sections at the anterior and posterior ends of the gill, which have wider water-tubes, pass gradually into the marsupial part, and may be disregarded.

Gravid females are not at hand. According to previous observations of other authors (Harms, 1908, p. 696, fig. 1, and 1909, pp. 322 and 334; Haas, 1910a, p. 107), the glochidia are subtriangular, with hooks. Size 0.29 mm.

Unio tumidus Retzius.

The soft parts of four males and six females from Germany and Hungary are at hand, received from W. Israël.

Structure essentially identical with that of *U. pictorum*. No gravid females have been observed. The glochidia have been figured by Schierholz (1889, pl. 4, fig. 63).

Unio crassus Retzius.²⁰

Many specimens have been studied, received from W. Israël from the drainage of the river Elster in Thuringia, Germany.

In this species also the soft parts are identical with those of *U. pictorum*. The non-marsupial part at the anterior and posterior ends of the outer gills of the female is sometimes a little larger, but there are specimens exactly like *U. pictorum* in this respect. Glochidia have not been observed, and have not been described so far as I know.

Unio crassus musivus (Spengler).²¹

One male, and four females from Germany and Hungary have been sent to me by W. Israël.

Absolutely identical in structure with *U. crassus*. A female from the river Begas, Hungary, had a few ovisacs near the middle of the

²⁰ For nomenclature, see Thiele, 1909, p. 35.

²¹ This form is not *batavus* Maton and Rackett, 1907 (see Haas, 1910a, p. 108, and 1910c, p. 167), but is surely *batavus* Lamarck, 1819, which name, consequently, cannot be used. As Haas (1910d, p. 62) has shown, the oldest name is *musivus*, Spengler, 1793.

right outer gill filled with eggs. There were also eggs in the supra-branchial canal. No glochidia were seen. The water-tubes had no lateral water-tubes developed.

Unio crassus consentaneus (Rossmæssler).

A male from the drainage of the Danube in Bavaria, and three males and four females from the Danube in Hungary, were sent to me by W. Israël.

Agrees in all particulars with the foregoing forms. (A cross-section of the gills of the female is seen on Plate XVIII, fig. 5.)

Genus PARREYSIA Conrad. (1853.)²²

Simpson, 1900b, p. 840.—Ortmann, 1910b, p. 139.

Shell subovate or subquadrate, with rather high beaks, moderately deep beak-cavities, and well developed hinge-teeth. Epidermis bright, sometimes rayed. Beak-sculpture of the radial type: two sets of radial ridges run from in front and from behind the beaks in the direction of the lower margin. The two sets of radial ridges meet in the middle of the shell in an acute angle, and sometimes extend well upon the disk.

Soft parts partly primitive, partly more advanced. Supra-anal separated from the anal by a well developed mantle-connection, which is rather long. Inner lamina of inner gills entirely connected with the abdominal sac. All four gills are marsupial in the female, with well developed septa and water-tubes, which latter are somewhat narrower in the outer gill than in the inner. In the male, the septa are distinctly more distant than in the female. During pregnancy, the gills swell but little, and the edges remain sharp, and the ovisacs remain simple.

Placentæ subcylindrical, only slightly compressed, and not very solid. Glochidia not observed.

This genus, in the structure of the soft parts, corresponds to *Fusconaja*, *Crenodonta*, and *Quadrula*, to which it is apparently related, but represents another type of development of beak-sculpture, which may be derived from the simple *Fusconaja*-sculpture. Some minor features of the soft parts indicate that it has advanced a little along its

²² Determined only by the type-species, *multidentata* Philippi = *corrugata* Mueller (see Conrad, 1853, p. 267). The investigated species, *wynegungaënsis* Lea is closely allied to the type.

own line, which is also indicated by the full development of the beak-sculpture. It may be possible, that species forming connecting links with *Fusconaja* still exist in eastern Asia. The investigation of additional, related types is much to be desired, and we should try especially to become acquainted with the glochidia.

***Parreysia wynegungaënsis* (Lea).**

A number of specimens from Bombay, India, have been sent to me by L. S. Frierson. As to the description, I refer to my previous publications (Ortmann, 1910b, p. 139, and 1911a, p. 106, pl. 6, fig. 4, pl. 7, fig. 3).

Genus *LAMELLIDENS* Simpson. (1900.)

Simpson, 1900b, p. 854.—Ortmann, 1911a, p. 106.

This genus bears about the same relation to *Parreysia*, as does *Unio* and *Elliptio* to *Fusconaja* and *Quadrula*. A complete diagnosis cannot be given at the present time, but the differences known to exist in the only species examined are the following: Outer gills alone marsupial, the shell more elongated, with the beak-sculpture rudimentary.

As to the latter character, I may mention that I have seen, in a specimen of *L. consobrinus*, as well as in specimens of *L. marginalis* (Lamarck) in the Carnegie Museum, that the sculpture starts with a few (one or two) fine, concentric bars, and, following these, other bars are added, of which, however, only the lateral (anterior and posterior) parts are developed, which assume a direction radiating from the anterior and posterior side of the beak. These radiating ridges are very short, and I think they give us a clue as to the derivation of the radiating sculpture from the concentric. I think the *Lamellidens*-sculpture represents a phylogenetically older stage of beak-sculpture, while in other characters the form investigated is somewhat more advanced.

***Lamellidens consobrinus* (Lea).**

One single sterile female from India has been investigated; I received it from L. S. Frierson. For the anatomy see my previous publication (Ortmann, 1911a, p. 106, pl. 7, fig. 4).

Subfamily *ANODONTINÆ*.

To this subfamily belongs, first of all, the European genus *Anodonta*, which is the typical genus, and which also occurs in North America, and probably likewise in Asia. In North America there are a number of additional genera, in some respects even more primitive than *Anodonta*, of which I have examined the following: *Alasmidonta*, *Strophitus*, *Symphynota*, *Arcidens*, *Anodontoides*, *Lastena*. They are all adopted from Simpson's Synopsis, and I do not see any reason for changing these generic divisions.

In the soft parts, they all very closely resemble each other. The fundamental idea, the physiological meaning of the anatomical peculiarities of this group, which governs its structure, is the following: these forms are *bradyctitic*, and the breeding season becomes a long one, and the glochidia, after having fully developed, are not discharged, but kept in the marsupium over winter.²³ This makes necessary a special apparatus for supplying the glochidia with the necessary oxygen during this period. The problem is solved by the development of a special apparatus to secure the circulation of water within the gills, which, in the diagnosis (p. 224), has been called that of the "lateral water-tubes." This apparatus exists only during the breeding season, but it has been found in all species the gravid females of which have been investigated. In sterile females traces of it are also generally discernible, since the lateral parts of the water-tubes often show indications of its presence in the conformation of their epithelium (see Plate XVIII, fig. 6). This is the most essential character of the subfamily.

Other characters are furnished by the development of thickened tissue along the edge of the marsupium, which permits the distending of this gill during pregnancy, and this character is also generally easily seen in sterile females. Further, the mantle-connection separating the anal and supra-anal is generally well, often very well, developed; the inner gill has the inner lamina free or connected with the abdominal sac. These latter two characters are of secondary value, but they help somewhat in the distinction of genera. The marsupium is always formed by the outer gills, the glochidia are rather large, subtriangular, and possess hooks. There are no generic distinctions observable in these characters, although the shape and size of

²³ Very few *Anodontinæ* are known from countries without a winter, but such are present. It would be very interesting to study their behavior in this respect.

the glochidia varies somewhat in the different species (see Plate XIX, figs. 2, 3, 4). In only one genus, *Strophitus*, the anodontine-structure of the marsupium has undergone a marked change, and has made a step in advance. Here each ovisac, which remains simple in other genera, is subdivided into a number of secondary compartments running in a direction transverse to the gill. There are also further peculiarities in the marsupium of this genus, which concern the mutual cohesion of the eggs and glochidia.²⁴

Strophitus is the only genus, which must be separated from the rest on solely anatomical grounds. In the case of all other genera the only criteria are the differences of the shells sometimes supplemented by minor characters of the soft parts.

The shell, in this subfamily, is quite variable in shape, but in most forms it is not very thick, or it is even quite thin. The hinge is extremely variable, showing all stages from a complete development to complete reduction. If present, the hinge-teeth are peculiar: the pseudocardinals are supplemented, in the left valve by an additional (generally a third) tooth, which is formed by a projection of the *interdentum*, and extends *below* the corresponding part of the right valve. Sometimes this supplementary tooth is rudimentary, and it may be well separated from the posterior pseudocardinal, or may be fused with it.

A very important feature of the shell seems to me the beak-sculpture, which indicates two, possibly three, lines of development within this sub-family.

We would thus obtain the following scheme of classification:

- a₁. Beak-sculpture double-looped, with a more or less sharp sinuation or re-entering angle. Mantle connection between anal and supra-anal moderate or very long. No tendency to unite the inner lamina of inner gills with abdominal sac.
- b₁. Hinge-teeth more or less developed, at least pseudocardinals present. Shell not very thin.
 - c₁. Beak-sculpture not tubercular, and no sculpture upon the disk, but sometimes upon the posterior slope. **Symphynota.**
 - c₂. Beak-sculpture tubercular, and strong tubercles and other sculpture upon the disk. **Arcidens.**
- b₂. Hinge-teeth completely absent. Shell smooth and thin. **Anodonta.**
- a₂. Beak-sculpture concentric, fine. Hinge-teeth practically absent. Mantle-

²⁴ It is possible that the structural differences of *Strophitus* are connected with the fact recently discovered by Lefevre and Curtis (1911) that the glochidia of this genus do *not* pass through a parasitic stage on fishes.

- connection between anal and supra-anal moderately long. No tendency to unite the inner lamina of inner gills with abdominal sac. . . . **Anodontoides.**
- a*₃. Beak-sculpture concentric, heavy. Mantle-connection between anal and supra-anal moderate. Certain forms with tendency to connect the inner lamina of inner gills with abdominal sac.
- b*₁. Hinge-teeth more or less developed, at least the pseudocardinals present. Marsupium with simple ovisacs. Shell subrhomboidal. . . . **Alasmidonta.**
- b*₂. Hinge-teeth rudimentary. Marsupium of gravid female unknown. Shell elongated. **Lastena.**
- b*₃. Hinge-teeth rudimentary. Marsupium with ovisacs subdivided into transverse compartments. Shell subovate. **Strophitus.**

The most primitive types are undoubtedly *Symphynota* and *Alasmidonta*, and among them species with fully developed hinge-teeth are found. The most extreme modification of the soft parts is seen in *Strophitus*, while the most extreme specialization in the shell is represented by *Anodonta* (most successful adaptation to the life in quiet water with muddy bottom). *Arcidens* is peculiar in its shell sculpture. *Anodontoides* is a connecting form between *a*₁ and *a*₃, but with the whole shell-structure more inclining toward *a*₁. *Lastena* is yet rather doubtful in its position.

It must be pointed out that comparatively few forms have been investigated, and that further knowledge will possibly furnish the means for a better understanding of the phylogeny of this subfamily. There surely should be *Anodontina* in Asia (aside from *Anodonta* proper), which possibly might be more primitive than any of those investigated hitherto. For the present, the most ancient types are known from North America, but I do not think that the subfamily originated in this continent. The shape of the glochidia indicates, that it started probably from a form near the European genus *Unio*, and this makes it more likely that the ancestral form lived in the Old World.

Genus SYMPHYNOTA Lea. (1829.)

(Simpson, 1900b, p. 662.)

Shell ovate or elliptic, compressed, with smooth disk, but sometimes with ribs upon the posterior slope. Beak-sculpture distinct, consisting of a few concentric bars, followed by others, which are distinctly sinuated,²⁵ or double-looped. Hinge with teeth, the pseudocardinals always present, the laterals present, imperfect, or absent.

Soft parts of typical structure: outer gills alone marsupial, when

²⁵ See description of beak sculpture of *S. costata*.

charged their edges distending, lateral (secondary) water-tubes present, ovisacs not subdivided. Placentæ very poorly developed, and only indicated when eggs are present. Inner lamina of inner gills free from abdominal sac.

Type *S. compressa* Lea. Very close to this stands *S. viridis* (Conrad). These two species are normally hermaphrodites, while the other two (*S. complanata* (Barnes) and *S. costata* (Rafinesque)) are gonochorists.

This genus is the most primitive among the *Anodontinae* with double-looped beak-sculpture. Simpson divides it into subgenera, which are well characterized, although there is not much need of a division of the genus on account of the small number of species.

***Symphynota compressa* Lea.**

Numerous specimens from northwestern Pennsylvania and other parts have been investigated.

This is a typical bradyctictic form, and the breeding season is normal, beginning in August, and ending in May (and June in Lake Erie).

The soft parts have been described by Lea (Obs., X, 1863, p. 423, as *pressus*), and Simpson (in Baker, 1898, p. 59).

Anal and supra-anal separated by a well-developed mantle-connection, which, however, is shorter than the anal. Inner edge of anal distinctly crenulated, that of the branchial with papillæ; farther in front the edge is practically smooth, only in the beginning fine crenulations are seen. Palpi subfalciform, their posterior margins united for about one-half of their length.

Gills broad, the inner the broader. Anterior end of inner gill about half way between the palpi and the anterior end of the outer gill. Gill-diaphragm normal. Inner lamina of inner gill free, except at anterior end.

Gills with well-developed septa and water-tubes. This species being normally hermaphroditic (see Ortmann, 1911*b*, p. 309), the gills have always (with extremely rare exceptions) the female structure, that is to say, in the inner gill the septa are rather distant, and the water-tubes are wide, and the outer gill is marsupial. When sterile, the septa are crowded, with marsupial epithelium, and the water-tubes are narrow. When gravid this gill swells considerably, and at the edge the tissue distends, so as to render the edge rounded off or truncated. Within this gill, each water-tube develops the characteristic

lateral, or secondary, water-tubes, while the middle portion forms the ovisac, which is also closed at the base of the gill. The eggs fill the ovisacs in densely crowded masses, and in certain places a placenta-like cohesion may be observed. But when the glochidia are mature, they are perfectly free, and no indications of placenta are seen. Glochidia subtriangular, almost semicircular, longer than high, with hooks. Length 0.34; height 0.28 mm. (see: Lea, Obs., VI, 1858, pl. 5, fig. 23; and Ortmann, 1911*b*, pl. 89, fig. 10).

Color of soft parts whitish, edge of mantle black, chiefly so posteriorly. The foot is pale brownish yellow, the gills grayish. The abdominal sac is often pinkish. The charged marsupium varies greatly in color, this variation depending at least in part on the stage of development of the embryos. It may be white, cream-color, pinkish, pale orange, or various shades of brown.

***Symphynota viridis* (Conrad).**

Numerous specimens have been investigated from the Potomac, Susquehanna, and Delaware drainages of eastern Pennsylvania.

Breeding season from August to May.

Soft parts described by Lea (Obs., XIII, 1874, p. 71). They are in every particular identical with those of *S. compressa*. This species also is hermaphroditic (Ortmann, 1911*b*, p. 310), and specimens with the male structure of the gills have never been found. Glochidia (Lea, *ibid.*, pl. 21, fig. 4) are about of the same shape as those of the foregoing species, but slightly larger. Length 0.36; height 0.30 mm. Color of soft parts as in *compressa*; marsupium cream-color, pale orange, or brown.

***Symphynota complanata* (Barnes).**

Eight specimens from northwestern Pennsylvania, collected by myself, have been investigated; in addition, three from the Kansas River, Lawrence, Douglas Co., Kansas (R. L. Moodie), and one from the Ohio at Portland, Meigs Co., Ohio (collected by myself). Among them were males, sterile and gravid females.

Breeding season not completely known, but the dates at hand agree with those of other species. Eggs were found in the marsupium in September.

Lea (Obs., X, 1863, p. 448) has described the soft parts; Simpson's (in Baker, 1898, p. 61) description is partly incorrect (scalloped edge

of marsupium). A figure of the gravid female has been published by Lefevre and Curtis (1910, pl. 1, fig. 6), but the essential structure of the marsupium is not brought out.

Mantle-connection between anal and supra-anal about as long as the anal, supra-anal slightly longer. In other respects, the soft parts are essentially identical with those of the other species of the genus. Glochidia of similar size, but shape more distinctly triangular, not so long in comparison with height. Length and height 0.34 mm. (see Lea, Obs., VI, 1858, pl. 5, fig. 29, and Lefevre and Curtis, *l. c.*, p. 97, fig. A. The measurements given by Lefevre and Curtis, 0.29×0.30 , are at variance with mine; see also Ortmann, 1911b, pl. 89, fig. 11).

Color whitish when young, but foot and gills browner when old. Abdominal sac brown-orange, marsupium pale yellow to brown.

***Symphynota costata* (Rafinesque).**

Many specimens from western Pennsylvania have been investigated, and two gravid females from Hurricane Creek, Gurley, Madison Co., Alabama (H. E. Wheeler, Sept. 13, 1910).

Breeding season from August to May. Eggs were found only in August and September.

Soft parts described by Lea (as *Margaritana rugosa*, Obs., X, 1863, p. 446) and Simpson (in Baker, 1898, p. 58).

Soft parts like those of *S. compressa*. It is noteworthy that the anal is very large, and the mantle-connection between anal and supra-anal comparatively short, much shorter than the anal. Glochidia (see Lea, Obs., VI, 1858, pl. 5, fig. 26; Lefevre and Curtis, 1910, p. 97, fig. B, length 0.35; height 0.39), larger, more distinctly triangular, higher than long. Length 0.34; height 0.37 mm.

This species is remarkable on account of its beak-sculpture, which does not conform to the double-looped type characteristic of this genus. In *S. costata*, the later bars (toward the disk) are rather heavy and straight, with hardly an indication of a sinuation. The earliest bars are concentric as usual. But between the earliest and the latest, are some bars, which show an indication of sinuation more or less well-developed.

This condition shows that we must not lay too much stress upon beak-sculpture as a general systematic character. *S. costata* is un-

doubtedly a *Symphynota*, but the beak-sculpture is abnormally developed. The situation of the bars, however, indicates that this species originally had double-looped sculpture.

Color of soft parts rather remarkable. Orange tints are often found, similar to those seen in certain forms of *Alasmidonta*. The ground-color is yellowish brown; foot, margins of mantle, and adductors, often deep orange. The gills are brown, the edge of the mantle, as usual, blackish. The marsupium, when charged, varies from yellowish to brown.

Genus *ARCIDENS* Simpson. (1900.)

Simpson, 1900b, p. 661.

Shell subrhomboid, inflated, with full beaks. Disk sculptured. Beak-sculpture strong, distinctly double-looped, the loops tubercular, and the tubercles are continued in two radiating rows upon the disk. In addition, there are oblique folds upon the disk, and the posterior slope is also sculptured. Hinge with teeth, pseudocardinals present and well developed, laterals obliterated, but traces of them may be seen.

Soft parts, as far as known, anodontine in structure, and similar to the genus *Symphynota*. Gravid females have not been observed.

Type: *A. confragosus* (Say).

The genus is incompletely known, but very probably it is to be placed near *Symphynota*.

***Arcidens confragosus* (Say).**

I have one male and two females from Bayou Pierre, De Soto Parish, Louisiana, collected on Aug. 6, 1910, by L. S. Frierson, further the gills of an additional female from the same place, collected a little later, and one female from Pearl River, Jackson, Hinds Co., Mississippi, collected Nov. 5, 1910, by A. A. Hinkley. None of the females was gravid.

The soft parts of the male have been described by Lea (Obs., X, 1863, p. 448). Supra-anal long, well separated from the anal by a mantle-connection, which is shorter than the anal. Inner edge of anal crenulated, inner edge of branchial with papillæ. Diaphragm complete and normal. Inner lamina of inner gills free, except at

anterior end. Posterior margins of palpi connected for not quite one-half of their length.

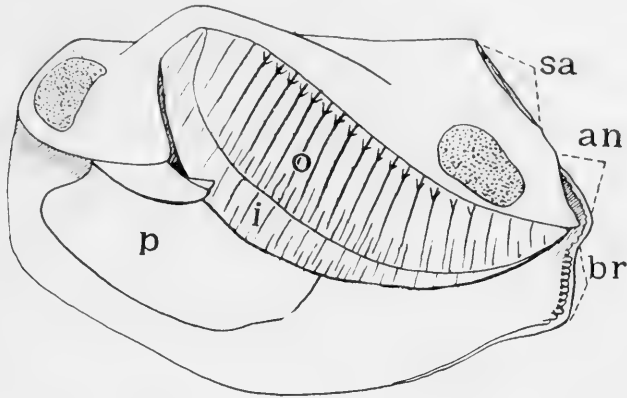


FIG. 12. *Arcidens confragosus* (Say). Male from Bayou Pierre, De Soto Parish, La. (Carn. Mus., No. 61, 4,701.)

Gills anodontine in structure. Simpson (1900b, p. 661) describes the marsupium in peculiar terms ("of a peculiar, granular texture"). Although I have not seen gravid females, the sterile females I possess offer nothing unusual or different from other *Anodontinæ*. Only the outer gills are marsupial, and their septa are much crowded, forming very narrow water-tubes, while in the inner gill the septa are much more distant. The septa of the outer gills are typically anodontine, and an indication of secondary water-tubes is present in the sterile female (see pl. XVIII, fig. 6). Besides, at the edge of the marsupial gill, there is a thick mass of tissue, which indicates, that in the gravid female the edge is capable of distending.

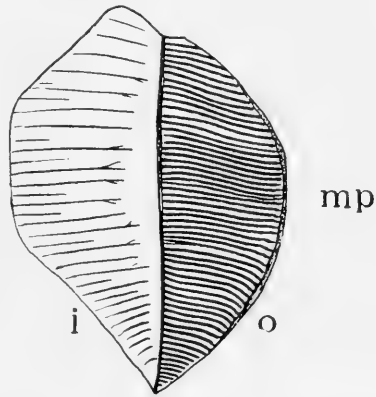


FIG. 12a. Left gills of a sterile female, from Pearl River, Jackson, Hinds Co., Miss. (Carn. Mus., No. 61, 4,928.)

Genus ANODONTA Lamarck. (1799.)

Simpson, 1900*b*, p. 620.

Shell elliptical, or elongated; thin; flat, or inflated, with smooth disk. Beak-sculpture distinct, but not very heavy, of the double-looped type, the loops separated by a sinuation, or a reëntering angle. Hinge-teeth completely absent.

Only the outer gills are marsupial. When charged, the edge distends, and secondary water-tubes are present. Ovisacs not subdivided. No placentæ are developed. Inner lamina of inner gills free from abdominal sac. Mantle-connection between anal and supra-anal generally very long, longer than either opening.

Type *A. cygnea* (Linnæus).

In the reduction of the hinge-teeth, in the long mantle-connection between anal and supra-anal, and the whole structure of the shell, this genus represents a very extreme specialization of the anodontine type. In the free inner lamina of the inner gill it is rather primitive.

A large number of species are recognized by Simpson (1900*b*), but in Europe the species-making in this group has gone beyond all the bounds of reason. A healthy reaction is, however, setting in, with regard to this genus as well as the European genus *Unio* (see Kobelt, 1908, p. 91; Thiele, 1909, p. 33; Israël, 1909, p. 26; Haas, 1910*c*). As will be shown below, the European genus *Pseudanodonta*, which has been split off, is also unsatisfactorily supported. It remains to be seen, whether the species from western North America and Asia have the same structure of the soft parts. Certain Chinese forms differ in the beak-sculpture.

Anodonta cygnea (Linnæus).

See also Ortmann, 1911*c*, p. 22.

A large number of specimens of both sexes, including gravid females, from various places in Germany and Hungary have been sent to me by W. Israël.

I agree with Israël (1909) in regarding all *Anodontas* of central Europe (except *complanata*), as *one* species. The form *cellensis* is surely only the senile form of ponds, and *anatina* is the form of small creeks. The name of this species should be *cygnea* and not *piscinalis*.

Supra-anal and anal openings widely separated, the one about as long as the other, but the united part of the margin of the mantle

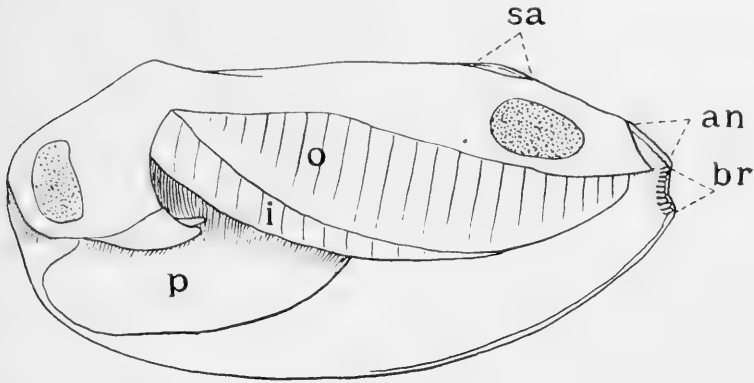


FIG. 13. *Anodonta cygnea* (Linnæus). Male, from Obra South Canal, Sepno, Prov. Posen, Germany. (Carn. Mus., No. 61, 4,956.)

between them longer than either, with slight variations in length. Anal with crenulations, branchial with papillæ. Palpi with the posterior margins united for one-fourth or one-third of their length. Gills and diaphragm as usual, inner lamina of inner gills free, except at anterior end.

In the male, the septa of both gills are rather distant; in the sterile female the septa of the outer gill are very crowded, forming very narrow water-tubes (see Plate XVIII, fig. 7). The whole outer gill is marsupial, and at its edge there is heavy tissue which permits the distending of the gill when charged. Within the marsupium each water-tube is divided, in the breeding season, into three tubes, two narrow lateral (secondary) water-tubes lying toward the faces of the gill, and a central larger

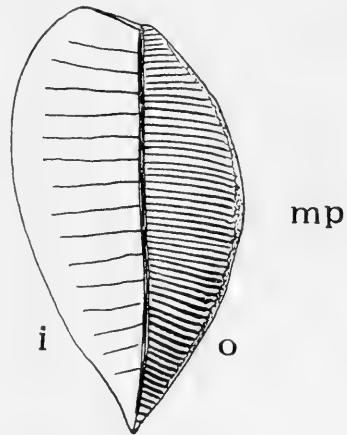


FIG. 13a. Left gills of a sterile female, from Mogelnitza River, Prov. Posen, Germany. (Carn. Mus., No. 61, 4,953.)

tube; the latter forms the ovisac, containing the eggs and embryos, and this ovisac is also closed at the base of the marsupium by a fine membrane.²⁶

The eggs and glochidia fill the ovisacs without forming placentæ, and the glochidia are discharged through the anal opening in rather irregular masses. Glochidia²⁷ rather large, triangular, with hooks. They are about as long as high, 0.35 mm. (see Plate XIX, fig. 2).

Having seen only alcoholic material I refrain from describing the colors of the soft parts.

Anodonta complanata Rossmæssler.

See also Ortmann, 1911c, p. 22.

Six specimens from Dinkelsbuehl, Bavaria, and ten specimens from Buda-Pest, Hungary, are at hand, received from W. Israël. Among them are gravid females.

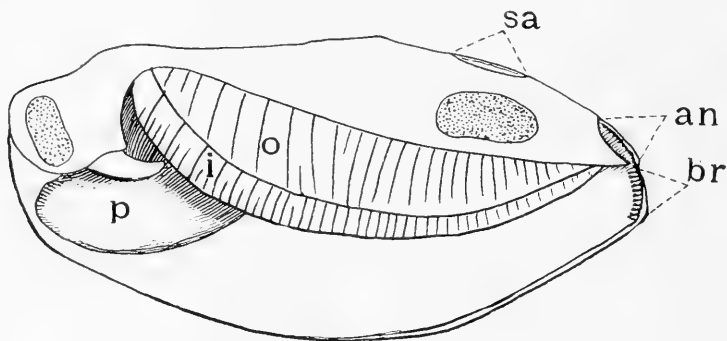


FIG. 14. *Anodonta complanata* Rossmæssler. Male, from Wærnitz River, Dinkelsbühl, Bavaria. (Carn. Mus., No. 61, 4,958.)

Inner edge of anal opening with very fine papillæ. Gills (see Plate XVIII, fig. 9) essentially of the same structure as *Anodonta cygnea*,

²⁶ That the lateral water-tubes are actually parts cut off from the original water-tube by folds is conclusively shown by fig. 8, Plate XVIII. This is a slide made from a female, in which the eggs were just beginning to go into the marsupium. Attention should be called to the fact that in this species I never found the lateral water-tubes complete. This may be due to the fact that all my material was collected early in the breeding season. Nevertheless, some of the specimens had fully developed glochidia.

²⁷ The glochidia have been figured by Fleming (1875, pl. 4, fig. 4) and Schierholz (1880, pl. 2, fig. 26), their measurements, 0.35 mm., have been given by Harms (1909, p. 332) and Haas (1910a, p. 110).

but septa more irregular in the non-marsupial gills. In the marsupial gill of the female, the septa are crowded, even more so than in *A. cygnea*. The tissue of the gills is generally more delicate in *A. complanata*, but the various elements are similar to those of *A. cygnea*. The glochidia (see Plate XIX, fig. 3, also Schierholz, 1889, pl. 2, fig. 29; Fleming, 1875, pl. 3, fig. 11) are smaller, longer than high, with shorter hooks; thus the outline is less distinctly triangular, and less pointed. I find the length to be 0.34, the height 0.32; while Haas (1910a) gives 0.33 mm., but does not say in which dimension.

For this species, Bourguignat (1880, pp. 11-13) has created the genus *Pseudanodonta*, founded originally upon the shape of the shell and differences in the hinge. The first character is quite pronounced, but cannot be regarded under any condition as a generic character; the second does not exist at all, which is best shown by the fact that it has been dropped entirely by subsequent authors (Haas). Other writers have added to the distinctive characters, which have been condensed by Haas (1910a, p. 110; and 1910c, p. 170).

According to Germain, the beak-sculpture is said to be different. *Pseudanodonta* is reported to have three to five tubercular ridges, which are absent in the true *Anodonta*, while in *Anodonta*, there are flexuous ridges, but never tubercular ridges ("les *Pseudanodontes* ont . . . trois à cinq rides tuberculeuses . . . qui manquent chez les véritables *Anodontes*. Chez les *Anodontes*, les sommets sont parfois ornés de rides flexueuses, mais jamais de rides tuberculeuses"). This statement is an intentional exaggeration of the actual conditions, worded with the purpose to obscure the similarities, and to emphasize the differences. The fact is that in both *Anodonta*

and *Pseudanodonta*, the beak-sculpture is of the same type, and consists of a number of double-looped bars, of which, in *complanata*, the posterior loop is slightly more swollen, but not tubercular. Haas also described the beak-sculpture of *Pseudanodonta* as "consisting of a few isolated, rather elevated tubercles," which is positively wrong, as is shown by the specimens before me.

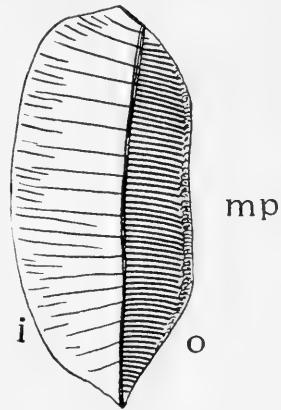


FIG. 14a. Left gills of a sterile female from same locality.

According to Clessin, differences are said to be present in the gills. Clessin (1876, p. 446) asserts that the tissue of the gills in *Pseudanodonta* is more delicate, that the transverse striæ ("Querstreifen") are more deeply incised, and that the less conspicuous longitudinal striæ ("Längsstreifen") are straighter and that the breeding compartments ("Brutfächer") are more quadrate ("bilden vollkommener Quadrate").

The tissue of the gills is indeed more delicate, which is due chiefly to the slighter development of the interlaminar tissue. The gill-filaments are finer, and the interfilamentar grooves (probably the "Querstreifen" of Clessin) are deeper. What he calls "Längsstreifen," is probably produced by the longitudinal rows of water pores (ostia). Such a striation is indeed less distinct in a face view of the gills, in consequence of the stronger development of the filaments. They are not so distinctly visible as in *A. cygnea*, but nevertheless they are present. I cannot, however, under any conditions, see that they are straighter than in *A. cygnea*; on the contrary, they are slightly more irregular. What Clessin means by the statement that the "Brutfächer" are more quadrate, I cannot imagine. If he means the compartments formed by the septa, I can only say that, in a face view, they are not quadrate at all, either in *Anodonta* or in *Pseudanodonta*; if he means in a cross-section, they are quadrate or approximately quadrate only in the outer gill of the sterile female, both in *Pseudanodonta* and *Anodonta*, while in all other gills, non-marsupial gills of the male and female, and marsupial gill of the gravid female, they are in both genera anything else but quadrate.²⁸

As has been said above, in *Pseudanodonta* the gill-structure is essentially the same as in the typical *Anodonta*, and all anatomical elements are present in both forms. The gills of *A. complanata* are indeed more delicate, chiefly in consequence of the slighter development of the interlaminar tissue; the gill filaments are finer, closer together, with deeper interfilamentary grooves, so that this layer on the outside of the gill is slightly thicker (compare Plate XVIII, figs. 7, 8, and 9). The consequence is that the rows of ostia, which are distinctly visible in *A. cygnea* in a face view, are rather indistinct in *A. complanata*. But when held up against the light, they also become distinct in the

²⁸ It almost appears as if Clessin had compared the marsupial gill of a sterile female of *Pseudanodonta*, with a non-marsupial gill of *Anodonta*. But I am not sure of this, since his terms are rather vague.

latter. Besides there is no difference whatever in the gills. The slight differences mentioned cannot be regarded, under any conditions, as of generic value, in face of the great similarity of structure. The presence of papillæ on the anal opening (Haas, 1910a, p. 110) in *Pseudanodonta* is a character, which at most has merely specific value. There remains only the glochidium (see Plate XIX, fig. 3) to be considered. There are, indeed, certain differences between the glochidia of *A. complanata* and *cygnea*, but as far as they are known in other members of the genus and subfamily, such differences are encountered elsewhere, without being considered as of generic value. The glochidia are undoubtedly built upon the same plan in both species.

A. complanata not only is a true *Anodonta*, but judging by the shape of the beak and beak-sculpture belongs to that *group* in the genus, of which *A. cygnea* is the type. We cannot separate it generically from the latter, without disregarding natural affinities.

Anodonta imbecillis Say.

I have investigated twenty-three specimens from northwestern Pennsylvania (Allegheny and Lake Erie drainages), and two from Lawrence, Douglas Co., Kansas (R. L. Moodie). All were females in structure, and many were gravid. This species is hermaphroditic.

Typically bradyctitic, and gravid from September to May. In Lake Erie the time of discharging the glochidia is postponed even further, this act having been observed as late as July 12.

The anatomy has been described by Lea (Obs., X, 1863, p. 449).

Of all American forms this species resembles most closely the European *Anodontas* in the shape of the shell. It differs, however, in being hermaphroditic. The soft parts present no special features, and they agree both with the European *A. cygnea* and the North American *A. grandis*. The anal opening is almost smooth.

Glochidia smaller than those of *cygnea*, slightly higher than long (length 0.30; height 0.31 mm.), of the usual shape, with hooks (see Lea, Obs., VI, 1858, pl. 5, fig. 36; Ortmann, 1911b, pl. 89, fig. 13).

Color of soft parts whitish, foot yellowish brown; gills pale brown; edge of mantle blackish. Charged marsupium brown.

Anodonta henryana Lea.

Seven specimens from a branch of the Rio Grande, Mercedes, Hidalgo Co., Texas, collected May 15, 1907, by Dr. D. A. Atkinson.

Soft parts and glochidia described by Lea (Obs., VIII, 1860, p. 373).

I think my specimens belong to this species, although they are all remarkably shortened and truncated posteriorly. They are all gravid, with glochidia. Possibly this species also is hermaphroditic.

Soft parts absolutely identical with those of *A. imbecillis*, and the glochidia also are practically identical. Length 0.29; height 0.30 mm. (The difference from the measurements given for *A. imbecillis* may be due to the personal equation of the observer.) The shell of this species reveals that it undoubtedly belongs to the same group as *A. imbecillis*.

Anodonta grandis Say.

Numerous specimens of the typical form as well as of several varieties have been investigated. They come from western Pennsylvania, Kansas, northern Alabama, and Louisiana.

The breeding season begins in August and September, and ends very early in spring, for in April the majority of the females have already discharged their glochidia. But occasionally gravid females are found as late as the end of May (latest date, May 22).

The soft parts have been described (as of *A. plana*, *decora*, *ovata*) by Lea (Obs., X, 1863, p. 452) and by Simpson (in Baker, 1898, p. 52, chiefly as to color).

Mantle-connection between anal and supra-anal very long, anal small, its inner edge crenulated. Branchial opening with papillæ, inner edge in front of branchial smooth. Posterior margins of palpi connected for one-third to one-half of their length. Anterior end of inner gills midway between that of the outer gills and the palpi, so that it is widely remote from the palpi. Diaphragm normal. Inner lamina of inner gills free except at anterior end. Septa of the gills distant in the male and the non-marsupial gills of the female. Marsupium formed by the outer gills, which swell greatly when charged, distending at the edges so as to appear truncated, and developing lateral water-tubes, while the ova are contained in the central ovisacs; the latter are not subdivided. No placentæ are formed, and the glochidia are discharged loose, in irregular masses.

Glochidia very large, the largest known to me, even larger than those of *A. cygnea*, subtriangular, slightly higher than long (length 0.36; height 0.37 mm.) with hooks. The glochidia figured by Lea (Obs., VI, 1858, pl. 5, figs. 32-34) as of *A. lewisi*, *ovata*, *decora*, differ somewhat from each other, while they actually should be all alike.

Color whitish. Foot orange-yellow, palpi and gills brown. Edge of mantle brown, black behind. Charged marsupium yellowish white (with eggs) to liver-brown (with glochidia).²⁹ The orange tint of the foot is variable, lighter or darker.

Anodonta cataracta Say.

About twenty-five specimens from various places in the Atlantic drainage of eastern Pennsylvania have been investigated.

The breeding season begins in August, in which month I repeatedly found gravid females with eggs. I have no other observations of my own, but Conner (1907, p. 88) gives October to May as the breeding season.

Lea (Obs., II, 1838, pl. 15, fig. 46) has figured the animal, but his figure is practically useless.

The soft parts resemble in every respect those of *A. grandis*. I have seen the glochidia of specimens from the Delaware River, collected by C. H. Conner on March 19, 1911, and they agree with the figure published by Lefevre and Curtis (1910, p. 97, fig. C); the dimensions are: length 0.36; height 0.37 (identical with those of the glochidia of *A. grandis*). The colors of the soft parts are also the same.

I have my doubts as to the specific distinctness of this form from *A. grandis*. At any rate, it is merely the eastern representative of the western *grandis*, and does not have any close affinity to the European species and the *Anodontas* of the Pacific slope of America, as Walker (1910a, p. 135) believes, and there is no reason to think that "it was a co-immigrant with *Margaritana margaritifera* to the east coast of North America" (from Europe). *A. cataracta* is, if anything, an eastern offshoot of the *A. grandis*-stock of the central basin.

Genus ANODONTOIDES Simpson. (1898.)

(Simpson, 1900b, p. 658.)

Shell subelliptical, thin, inflated, with smooth disk. Beak-sculpture distinct, but not very heavy, consisting of concentric ridges curved up behind, not double-looped. Hinge-teeth absent, or represented by the merest rudiments.

Soft parts much like those of *Anodonta*. Outer gills alone marsupial, when charged distending at the edges, and secondary water-tubes present, ovisacs not subdivided. No placenta developed. Inner

²⁹ Sometimes the light color is preserved in the glochidial-stage.

lamina of inner gills free from abdominal sac. The mantle-connection separating anal and supra-anal shorter than in *Anodonta*.

Type *A. ferussacianus* (Lea).

This is practically an *Anodonta* with concentric beak-sculpture. The general make-up of the shell is much like *Anodonta*, while the beak-sculpture is suggestive of the *Alasmidonta*-group, without being so heavy.

***Anodontoides ferussacianus* (Lea).**

Numerous specimens of the typical form, as well as of the var. *subcylindraceus* (Lea) have been investigated, the former from the Ohio drainage in western Pennsylvania, and the Cumberland River in Kentucky, the latter from Lake Erie.

Bradyctictic. The breeding season begins in August and ends in May; discharging specimens were found on May 14.

Soft parts described by Lea (Obs., X, 1863, pp. 449 and 451), and Simpson (in Baker, 1898, p. 73), but the latter is mistaken with reference to the marsupium of *ferussacianus*, while the description of that of *subcylindraceus* (p. 74) is correct.

Anatomy essentially that of *Anodonta*, but it should be mentioned that the mantle-connection between anal and supra-anal is only about as long as the anal as well as the supra-anal. The inner edge of the anal is finely, but distinctly papillose. The posterior margins of the palpi are only connected for a short distance, and the anterior end of the inner gill is about half-way between that of the outer gills and the palpi. The marsupium has the same structure as in *Anodonta*, and the glochidia (Ortmann, 1911*b*, pl. 89, fig. 12) are rather small for the subfamily, subtriangular, and about as long as high (0.32 mm.). They have hooks, although Lea (Obs., VI, 1858, pl. 5, fig. 35) figures and describes them as without hooks.

I find that by a singular oversight I failed to make any field-notes on the color of the soft parts of this species but from alcoholic material and according to my recollection it is grayish white with the foot and the gills inclining to brownish. The marsupium containing glochidia is brown.

Genus ALASMIDONTA Say. (1818.)

(Simpson, 1900*b*, p. 666.)

Shell elliptical, or generally rhomboidal, inflated, with a well-developed posterior ridge. Disk generally smooth, but sometimes

with a faint sculpture upon the posterior slope. Beak-sculpture heavy and coarse, the later bars are often very thick and swollen, concentric, often angled behind, not double-looped. Hinge with teeth, pseudocardinals always present, laterals present or absent; in the former case sometimes abnormally developed.

Only the outer gills are marsupial, when charged, distending at edges, secondary water-tubes present, and ovisacs not subdivided. No placenta developed. Inner lamina of inner gills free from abdominal sac, or more or less connected with it. Mantle-connection between anal and supra-anal not very long.

Type *A. undulata* (Say).

This genus is rather primitive, especially in the character of the shell, and stands on about the same level as *Symphynota*, representing another parallel branch, characterized by the heavy, concentric beak-sculpture. The tendency to a union of the inner lamina of the inner gills with the abdominal sac indicates a slight advance in structure.

Alasmidonta heterodon (Lea).

About thirty specimens collected in April near Philadelphia have been investigated. Among them were many gravid females. Conner (1909, p. 112) found this species gravid in February.

An imperfect description of the marsupium and the glochidia has been given by Lea (Obs., X, 1863, p. 442).

The soft parts do not offer anything remarkable. The mantle-connection between anal and supra-anal is shorter than the anal. Anal with crenulated inner edge. Inner lamina of inner gills free. Posterior margins of palpi connected for about one-half of their length. The anterior end of the inner gill is separated from the palpi, but nearer to them than to the anterior end of the outer gill. Marsupium typically anodontine in structure. Glochidia (Ortmann, 1011b, pl. 89, fig. 8) the smallest known to me in this subfamily. They are subtriangular, much longer than high, with strong hooks. Length 0.30; height 0.25 mm.

Color of soft parts whitish; charged marsupium brown.

This is in every respect the most primitive type known to me in this subfamily.

Alasmidonta minor (Lea).

One male, and one gravid female (with glochidia), from Cumberland River, Pineville, Bell Co., Kentucky, have been communicated to me by B. Walker.

Of this form I have only the soft parts, and their structure is like that of other species of this genus. The mantle-connection between anal and supra-anal is almost as long as the anal, and the supra-anal is only slightly longer than the mantle-connection. The anal is finely crenulated, and the branchial has papillæ. Posterior margins of palpi connected for a short distance. Inner lamina of inner gills free. Anterior end of inner gill about half-way between the palpi and the anterior end of the outer gill.

Marsupium as usual, with distended edges, and secondary water-tubes. Glochidia as small as in the foregoing species, and of the same shape. Length 0.30; height 0.25 mm. (see Plate XIX, fig. 4).

Color whitish, edge of mantle spotted with black and white in the region of the branchial, anal, and supra-anal. Marsupium brown.

I have had no opportunity to examine the shell of this species, but it seems that it is related to *A. heterodon*.

***Alasmidonta undulata* (Say).**

Numerous specimens from the Atlantic drainage in eastern Pennsylvania have been in my hands.

The breeding season begins in the middle of July, and lasts till the middle of June, so that the end of one season, and the beginning of the next are not very far apart. Of specimens found in July, 18th and 22d, all had only eggs; while those found on June 14 (only two) had fully developed glochidia.

Soft parts typical. Mantle-connection between anal and supra-anal rather long, slightly longer than the anal and than the supra-anal. Branchial with papillæ, anal crenulated. Posterior margins of palpi connected for one-half or slightly less than one-half of their length.

Diaphragm normal. Inner lamina of inner gills entirely connected with the abdominal sac, and only in a few cases was a small hole observed at the posterior end of the foot. Anterior end of inner gill about half-way between the outer gill and the palpi.

Marsupium normal; when charged, having distended edges, secondary water-tubes, and undivided ovisacs. Glochidia (Ortmann, 1911b, pl. 89, fig. 9) moderately large, higher than long, with strong hooks. Length 0.34; height 0.36 mm.

Abdominal sac whitish; foot paler or darker orange-brown; palpi whitish to orange-brown. Gills grayish brown, shading into orange. Mantle transparent gray, shading into brownish or brownish orange.

on the margin anteriorly, into white posteriorly. Edge of mantle brown, posteriorly orange, mottled with black spots. Adductors grayish to orange. The orange tints are often rather pale, inclining toward grayish yellow. Marsupium charged with eggs pale yellow; with glochidia brownish.

***Alasmidonta marginata* (Say).**

Of this species, and of its eastern variety *varicosa* (Lamarck) a large number of specimens have been investigated, both from the Ohio and the Atlantic drainages in Pennsylvania.

Bradyctictic, breeding season beginning in August, and lasting until May. Discharging specimens have been found on May 3.

The anatomy has been discussed by Lea (Obs., X, 1863, p. 446) and Simpson (in Baker, 1898, p. 63).

Soft parts essentially like those of *A. undulata*, to which species it is indeed closely allied. The mantle-connection between anal and supra-anal is much shorter. I have found the inner lamina of the inner gills always connected with the abdominal sac, although Lea (*l. c.*) says that it is sometimes more or less free at the posterior end. Posterior margins of palpi connected at base only.

Glochidia (see Lea, Obs., VI, 1858, pl. 5, fig. 27) rather large, higher than long, with hooks. Length 0.33; height 0.36 mm.

Color entirely like that of *A. undulata*, with a strong tendency toward orange tints; posterior margin of the mantle spotted with black and orange. Marsupium, according to contents, yellowish white to brown.

Genus **LASTENA** Rafinesque. (1820.)

(Simpson, 1900*b*, p. 654.)

Shell elongated; not inflated; without distinct posterior ridge. Disk smooth. Beak-sculpture concentric, bars irregular, coarse, middle part nearly straight. Hinge with rudimentary teeth, pseudocardinals only vestigial, laterals absent.

Soft parts only of male and sterile female known, but as far as can be seen anodontine in structure. Inner lamina of inner gills free. Mantle-connection between anal and supra-anal rather short.

Type *L. lata* (Rafinesque).

According to the characters of the shell, this genus stands between

Alasmidonta and *Strophitus*. It has the beak-sculpture³⁰ of the genera of the *Alasmidonta*-group, and approaches *Strophitus* in the hinge. It is very much to be regretted that gravid females are not at hand, and that the structure of the charged marsupium and the glochidia remain unknown. The sterile females, which I have seen, make it clear that only the outer gills are used as marsupia, and that they have a structure like that found in sterile females of the *Anodontinae* in general.

***Lastena lata* (Rafinesque).**

I have received, from B. Walker, the soft parts of two males and two sterile females from the Cumberland River in Pulaski and Cumberland Cos., Kentucky.

Anal and supra-anal separated by a rather short connection of the mantle. Anal finely crenulated, branchial with papillæ. Posterior margins of palpi connected for a short distance.

Gills and gill-diaphragm normal, and *not* as described by Simpson.³¹ Gills long and rather narrow, the inner one decidedly wider in front, its anterior end distinctly in front and below the anterior end of the outer gill, but separated from the palpi by a short, but distinct interval (it is connected with the descending part of the mantle attachment line for about three-fourths of its length, while one-fourth is occupied by the interval). Posteriorly, *the gills do not project freely, but are entirely of the usual shape*. Inner lamina of inner gills free from the abdominal sac with exception of the anterior end.

Septa and water-tubes normally developed. Marsupium formed by the outer gills, with the water-tubes narrow, and the septa close together, thick, and with strongly wrinkled epithelium. In the females at hand, no indications of secondary water-tubes could be seen. The thickened tissue at the edge of the gill was also not well developed. Both specimens are small (under medium size, about 40 and 45 mm. long), and seem never to have been gravid.

Color (of alcoholic material) whitish, edge of mantle brown, black behind.

³⁰ This sculpture is somewhat variable. It begins with simple concentric bars upon which a few heavier bars follow, slightly sinuated in the middle and angled behind, and then follow a few more upon the disk, quite heavy, but indistinct. The latter are sometimes absent, and sometimes even the sinuated bars are very rudimentary. The sculpture resembles somewhat that of *Strophitus*.

³¹ Simpson (1900b, p. 654) says: "inner and outer (gill) about alike in size and form, projecting free slightly behind."

Genus STROPHITUS Rafinesque. (1820.)

(Simpson, 1900b, p. 616.)

Shell subelliptical, subovate, or subrhomboidal, inflated, with indistinct posterior ridge. Disk smooth. Beak-sculpture concentric, consisting of a few rather heavy bars curving sharply up behind, forming an angle there. Hinge-teeth quite rudimentary, only mere vestiges of pseudocardinals present, which sometimes disappear altogether.

Inner lamina of inner gills free, or more or less connected. Mantle-connection between anal and supra-anal rather short. Marsupium formed by outer gills, when charged having the edge distended and secondary water-tubes. But the ovisacs do not remain simple, and are subdivided into a number of compartments running cross-wise in the gill from face to face; each compartment containing the ova and glochidia is well defined; placentulæ solid, persistent until they are discharged.

Type *S. undulatus* (Say).³²

This genus offers in the marsupial structure the highest specialization known among the *Anodontinæ*. In the hinge and the inner lamina of the inner gill we also see indications of a high stage of development. The beak-sculpture and other characters of the shell assign it a place in the *Alasmidonta*-series.

***Strophitus edentulus* (Say).**

I have examined a great many specimens from all over Pennsylvania, from the Ohio, as well as the Lake Erie, Delaware, Susquehanna, and Potomac drainages. I have also seen specimens from the Erie drainage in Huron Co., Ohio (O. E. Jennings coll.), from the Potomac drainage in Maryland (collected by myself), from Lawrence, Douglas Co., Kansas (R. L. Moodie), and of the form called *shafferiana* Lea, from the Cumberland River in Kentucky (B. Walker).

Bradyctitic. The breeding season begins in July (earliest date July 11), and ends in April and May. Discharging specimens have

³² It is not clear what the original *Anodonta undulata* of Say is. Most authors (including Simpson) have taken the common *Strophitus* of the Atlantic drainage for it; but this is not different from the western *edentulus* Say. Conner thinks he has re-discovered the real *undulatus* in the tide waters of the Delaware river, but I can only see a local form of *edentulus* in it (I have not seen its soft parts). The form I have investigated is surely the *edentulus* of Say.

been found on April 22 and 24, and May 6 and 11. The latest date for gravid females in spring is May 22.³³

Lea (Obs., II, 1838, pl. 15, fig. 47) has published a very poor figure of the soft parts, and descriptions of the latter (Obs., X, 1863, pp. 450 and 453).

Mantle-connection rather short, shorter than the anal. Inner edge of anal crenulated, that of branchial papillose. Posterior margins of palpi connected at base only.

Diaphragm normal. Inner lamina of inner gills very variable. In most cases it is connected anteriorly for about one-half of the length of the abdominal sac, in other cases the connection is much longer, and not unfrequently the inner lamina is entirely connected. Anterior end of inner gill about halfway between that of the outer gill and the palpi. Septa of the gills distant from each other in the male and the non-marsupial gills of the female. The outer gill alone is marsupial, with much more crowded septa. When gravid, the gills swell greatly, distend at the edges, and lateral water-canals are formed. In addition, the ovisacs are divided into compartments as described above. Placentulæ containing two to ten (or more) ova or glochidia. The placentulæ and glochidia have been figured by Lea (VI, 1858, pl. 5, figs. 37 and 38). The latter are not very large, subtriangular, longer than high, and have hooks. Length 0.36; height 0.30 mm.

Color of soft parts quite variable, but with the same tendency as *Alasmidonta undulata* to have certain parts (foot, edge of mantle, and adductors) orange. Some specimens (chiefly young ones) are more or less uniformly grayish or yellowish white, while others exhibit all shades from yellowish through brownish orange to bright orange. Gills mostly paler or darker brown, shading to orange. Mantle edge blackish, with the same orange and black spots as *Alasmidonta undulata*. Marsupium, according to contents, pale yellow, or creamy, to brown.

Subfamily *LAMPSILINÆ*.

A large number of forms belong here, which, as far as we know, are all found in North America, extending southward into Central America. Indeed, Simpson associates with these a number of Asiatic and African

³³ According to Lefevre and Curtis (1911) the "interim" is in July in Wisconsin, probably corresponding to the higher latitude. In 1911 I found gravid and discharging females in West Virginia on May 11, 12, and 13, but on May 23, 24, and 25 no gravid females were any more seen.

genera (*Pseudospatha*, *Hyriopsis*, *Chamberlainia*, *Cristaria*, *Lepidodesma*, *Pilsbryconcha*), but of all these the soft parts are unknown, and we may entertain strong doubts as to their belonging here.

In order to understand the structure of the *Lampsilinæ*, and their further differentiation, we must recall their essential characteristics and their purpose. We have seen that the soft parts are accommodated to two functions: (1) owing to the extended breeding season (in bradytictic forms) that of securing the proper aëration of the gravid marsupium, (2) the discharge of the glochidia through the edge of the marsupium. The latter physiological character is unique, and is found only in this subfamily. The former occurs in the *Anodontinæ*, but we have seen that it is there brought about in another way.

Very likely the adaptations to these two peculiar functions are connected in a degree. We see that it is the general tendency among the *Lampsilinæ* to move the marsupium toward the edge of the gill, and even beyond the latter. This has the effect that it is removed, more or less, from the natural outlets, and comes in close contact with the outer water flowing over the gills. Under these conditions it is easily understood that the habit was acquired to discharge the glochidia not by the long way (the suprabranchial canals), but by the shortest, by making them go through holes in the edge of the marsupium (see Plate XVIII, fig. 10). Thus we may say that the lampsiline marsupium serves two purposes, and is built according to a type which meets first the necessity of aërating the marsupium, and which in consequence of the structure so assumed, made another peculiar way of discharge desirable.

To supply breathing water for the glochidia, however, is of chief importance, and thus the further differentiation within this subfamily is easily understood, when keeping this point in view. Allowance should be made for certain expressions used in the following statement, and they should be excused by my desire to make the facts as clear as possible.

Among the *Lampsilinæ*, there are at least *four types of marsupial structure*, which represent as many different attempts to find a way of supplying breathing water to the marsupium. They all agree in having as a common feature the extrusion of the marsupium beyond the edge of the gill, and its investiture by only a very thin membrane, so that osmotic processes are greatly facilitated. In addition, in three of these types, there is also developed the tendency to move the

marsupium toward the posterior part of the gills and the shell, in order to have it as close as possible to the branchial opening and the inflowing water.

Of the four types of marsupium, three are found only in comparatively a few forms, while the fourth is more widely distributed, and gives origin to a new line of development. The first three may be called rather indifferent attempts on the part of the forms concerned, to solve the problem. The problem has been solved by them, indeed, but the way in which they did it did not contain any further possibilities. In the fourth case, the attempt was more successful, and opened the way for a series of additional improvements.

1. In *one case* (*Ptychobranthus*), the marsupium remains in a primitive stage in this respect, that it is pushed only slightly beyond the edge of the gill, and is not moved backward, but occupies the whole gill. But here in order to insure proper aëration by increasing the surface of the marsupium, while the latter remains rather thin, the whole marsupium is thrown into a number of folds which permit the water to easily reach the ovisacs, which are subcylindrical and not much swollen.

2. In the *second type* (*Obliquaria* and *Cyprogenia*), the task has been accomplished by reducing the number of ovisacs. This would have had the result of restricting the number of ova that could be accommodated in the marsupium, but this disadvantage is counterbalanced by a tendency to greatly elongate the ovisacs, in the direction beyond the edge of the gill. This feature is only slightly developed in *Obliquaria*, while it reaches its greatest perfection in *Cyprogenia*, and here there is not room enough within the shell for the extremely elongated ovisacs and thus they have to coil up in a spiral.

3. In the *third type* (*Dromus*), the marsupium originally is rather simple, the ovisacs remaining subcylindrical or being only slightly compressed. Here a better aëration is accomplished by a peculiar arrangement of the glochidia within each ovisac. They are not distributed through the mass of the placenta, but are situated along the edge of the slightly compressed placenta, thus facing the outer walls of the marsupium, where they are nearer the breathing water. In addition *Dromus* has developed a peculiar warping and folding of the marsupium, which also apparently has the object of increasing the surface offered to the water. But this latter feature is exhibited only in old specimens. It reminds somewhat of the structure of *Ptycho-*

branchus, but I think it has been independently acquired, and does not indicate close relationship.

4. In the *fourth type* (all other genera), an entirely different arrangement to provide aëration for the marsupium has been effected. While in the first three types structural modifications of or within the marsupium are introduced to bring the glochidia close to the breathing water, here the marsupium itself remains rather simple, and it is the water supply which is increased and intensified.

The marsupium forms in this case a rather swollen, generally kidney-shaped mass, in which the ovisacs are transversely dilated, so as to give them a leaf-like shape. The tendency to locate the marsupium in the posterior part of the gill and to cause it thus to approach the posterior end of the shell, close to the branchial opening and close to the incoming water, is common to all these genera. In other respects, there is no further differentiation of the marsupium. But a new device begins to develop, having for its aim the increase of the flow of the water over the marsupium, and this is accomplished by special structures on the edge of the mantle, just in front of the branchial opening. In the simplest cases (*Obovaria*, *Nephronajas*, *Amygdalonajas*, *Plagiola*, *Paraptera*, *Proptera*), the inner edge of the mantle is only slightly dilated, forming a fine lamella, but the presence of a (muscular) thickening, and often of pigment, indicates, that the edge has here a peculiar function. In other genera (*Medionidus*, *Eurynia*, *Lampsilis*), this part of the inner edge of the mantle is greatly developed, and carries special appendages in the shape of strong papillæ or flaps, which have the function of producing by their contractions, a lively current of water over the surface of the marsupium, which lies immediately inside of them. Finally, in the genus *Truncilla*, the inner edge of the mantle, which also has papillæ, is removed from the outer edge, thus enclosing a separate compartment, which may possibly be regarded as a kind of reservoir.

Thus it becomes evident that of these four arrangements acquired by the *Lampsilina* to provide breathing water for the glochidia, the last was the most advantageous, because it included the possibility of further development and improvements such as we find realized in the various genera just mentioned.

5. There remains yet a *fifth type* of structure, that found in *Frier-sonia*. Here the marsupium is truly lampsiline, resembling somewhat the *Obovaria*-type, but it is not so swollen, and instead of being blunt,

the edge is here sharp. The water-tubes (ovisacs) have a peculiar curve backward toward a point near the posterior end of the marsupium. For the present, I cannot correlate this structure with any special function, and must leave it for future study to decide what the meaning of this feature is.

We may arrange the genera of this subfamily as follows:

- a*₁. Marsupium thin, not kidney-shaped, ovisacs subcylindrical or very slightly compressed. Placentæ generally rather solid. Inner edge of mantle in front of branchial opening not distinctly differentiated. Shell rounded, ovate, or subelliptical, sometimes with outer sculpture. Male and female shells practically alike.
- b*₁. Marsupium occupying the whole of the edge of the outer gill, folded. Placentæ subcylindrical, club-shaped, short. Shell subelliptical.
- Ptychobranchus.**
- b*₂. Marsupium occupying only a part of the outer gill. Placentæ moderately elongated or very long, subcylindrical, or very slightly compressed. Shell more or less rounded, generally with tubercles.
- c*₁. Marsupium consisting of comparatively few, elongated ovisacs, extending from near the base of the gill beyond its edge. Placentæ subsolid, subcylindrical.
- d*₁. Placentæ moderately long, slightly curved. Marsupium just behind the middle of the gill.....**Obliquaria.**
- d*₂. Placentæ very long, spirally coiled up. Marsupium in, or slightly in front of the middle of the gill.....**Cyprogenia.**
- c*₂. Marsupium consisting of a large number of ovisacs, occupying the larger posterior section of the outer gill. Placentæ slightly compressed near base, tapering, and becoming subcylindrical toward the margin.
- d*₁. Ovisacs straight. Placentæ almost entirely beyond the edge of the gill, subsolid. Glochidia much longer than high, arranged on the outer faces of the marsupium. Edge of marsupium blunt, in old specimens warped and folded. Shell rounded, disk nodular.
- Dromus.**
- d*₂. Ovisacs strongly curved back in the distal part. Placentæ for a great part enclosed between the original gill laminae, not solid. Glochidia not longer than high, distributed uniformly through the placental mass. Edge of marsupium sharp, pointed behind, not folded. Shell subelliptical, disk smooth.....**Frieria.**
- a*₂. Marsupium thick, more or less kidney-shaped, ovisacs dilated and compressed. Placentæ not very solid. Inner edge of mantle in front of branchial opening, more or less differentiated. Shell rounded, elliptical, or elongated, swollen or compressed, generally without any outer sculpture. Male and female shells more or less different in shape.
- b*₁. Inner edge of mantle slightly lamellate and crenulated, but without distinct papillæ or flaps. Male and female shell differing only slightly in shape, sometimes hardly at all.

- a*₁. Shell rounded, ovate, or subelliptical, without or with indistinct posterior ridge. Glochidia of normal size and shape, subovate.
- d*₁. Shell rounded or ovate, swollen. Epidermis brownish, rarely greenish, with indistinct rays. **Obovaria.**
- d*₂. Shell subovate or subelliptical, compressed, or only slightly swollen. Epidermis greenish or yellowish, with more or less distinct rays. **Nephronajas.**
- e*₂. Shell ovate, triangular, swollen, or subelliptical and compressed. Glochidia of abnormal size or shape.
- d*₁. Shell subovate or subtriangular, with a strong posterior ridge.
- e*₁. Glochidia of normal shape, but abnormally small size. Shell subovate or elongate. **Amygdalonajas.**
- e*₂. Glochidia spatulate, with gaping margins, large. Shell subtriangular **Plagiola.**
- d*₂. Shell subovate or subelliptical, more or less compressed, often winged, without distinct posterior ridge.
- e*₁. Glochidia of normal shape, but abnormally small. Shell rather thin. **Paraptera.**
- e*₂. Glochidia celt-shaped, with two spines on each valve. Shell thin or rather thick. **Proptera.**
- b*₂. Inner edge of mantle with papillæ or flaps. Male and female shell distinctly, and often greatly different in shape.
- c*₁. Inner edge of mantle parallel with and close to the outer edge. Shell ovate, elliptical, or elongated. Glochidia subovate.
- d*₁. Inner edge of mantle with papillæ.
- e*₁. Shell with nodulous plications upon the posterior slope. **Medionidus.**
- e*₂. Shell without sculpture. **Eurynia.**
- d*₂. Inner edge of mantle forming a ribbon-like flap. **Lampsilis.**
- c*₂. Inner edge of mantle in front of the branchial opening more or less remote from outer edge in the female. Shell variable, not ovate or elliptical. Glochidia almost semicircular. **Truncilla.**

In all these genera, we have a beak-sculpture, which is rather rudimentary, and, when developed, either of the concentric or the double-looped type. Beak-sculpture in this subfamily is apparently a character becoming more or less obliterated, and thus cannot be used for general systematic purposes, although it is available as a subsidiary character in a few cases.

Genus **PTYCHOBANCHUS** Simpson. (1900.)

(Simpson, 1900*b*, p. 612.)

Shell subelliptical, somewhat elongated. Disk smooth, sometimes with ridges on the posterior slope. Beak-sculpture indistinct, consisting of a few ridges, the first concentric, the others slightly double-

looped. Epidermis brownish, usually painted with hair-like rays, forming here and there squarish spots. Hinge-teeth well developed. Male and female shell alike externally, but internally the female shell has an oblique depression for the marsupium.

Soft parts with the inner lamina of the inner gills variable, free, except at the anterior end, to entirely connected, with all intergrades between these two extremes. Edge of the mantle not differentiated in front of branchial. Marsupium formed by the whole of the outer gills, with more crowded septa than the non-marsupial gills. Ovisacs only slightly extended beyond the edge of the gill, occupying only the marginal part of the gill, rather short, subcylindrical, and club-shaped (swollen at distal end); the whole marsupium is thrown into a number of folds (six to twenty). Placentæ very solid. Glochidia suboval, rather small.

Type: *P. phaseolus* (Hildreth).

This genus, in many respects, is the most primitive among the *Lampsilinæ*, but the folds of the marsupium represent a special structure.

***Ptychobranchnus phaseolus* (Hildreth).**

I have seen many specimens from the Ohio and Lake Erie drainages in Pennsylvania, and one gravid female from the Ouachita River, Arkadelphia, Clark Co., Arkansas (H. E. Wheeler, coll. Febr. 6, 1911).

Bradytictic, gravid from autumn to spring.

The soft parts have been described and figured by Lea (Obs., VII, 1860, pl. 29, fig. 101) and Lefevre and Curtis (1910, pl. 1, fig. 1).

Edge of mantle closed between the anal and supra-anal, the connection is short, but was never found missing. The branchial has papillæ, the anal is finely crenulated. In front of the branchial opening the inner edge of the mantle is first finely crenulated, but then becomes entirely smooth. Palpi of usual shape, their posterior margins connected for about one-fourth of their length.

Gills long and moderately wide, the inner the wider. Their anterior attachment as usual, with the end of the inner gill slightly in advance of that of the outer, but widely separated from the palpi. Diaphragm normal, inner lamina of inner gill very variable: generally it is more or less free, and may be attached to the abdominal sac only at the anterior end, or for a greater distance; but in one case (out of thirty-two) it was found to be entirely connected. Thus, in this species, this character is inconstant.

Septa of the non-marsupial gills as usual. Marsupium formed by the outer gills in almost their whole length; only small sections are left free anteriorly and posteriorly; but in young individuals larger sections are non-marsupial. In the basal half the whole outer gill is non-marsupial, and has rather wide water-tubes, but the marginal half becomes marsupial, with much narrower water-tubes (ovisacs), and along the edge of the gill the ovisacs bulge out beyond it. This bulging out is only moderate. The placentæ are in the distal half of the gill; they are subcylindrical and club-shaped, being thicker toward the edge. The whole marsupium is thrown into a number of folds, increasing its surface, and further, in the distal part of the gill, the filaments are stretched or flattened out, so that the membranes enclosing the placentæ become much thinner in this region than usual. Along the edge of the marsupium, the protruding ovisacs appear as a folded series of beads. The number of the ovisacs and of the folds is variable, and increases with age. Also in the sterile female the beads and folds are indicated on the edge of the marsupium.

Placentæ quite solid and permanent. They are discharged whole through holes formed at the end of the ovisacs (repeatedly observed). A brown stain is developed in the placentæ, chiefly on their surface, which possibly indicates a hardening of the gelatinous matter. The eggs and glochidia are imbedded uniformly through the placental mass, but they are most crowded at the swollen ends.

Glochidia (see Lea, Obs., VI, 1858, pl. 5, fig. 12;³⁴ and Ortmann, 1911b, pl. 89, fig. 14) rather small, subovate, without hooks, higher than long. Length 0.17; height 0.19 mm.

Color of soft parts whitish, foot grayish, gills whitish, or grayish brown. Edge of mantle brown, broadly black posteriorly. Marsupium, when charged, blackish or purplish brown, inclining sometimes more to blackish, sometimes more to purple. Beads at edge more vividly colored, red or purple. A line of black markings near the edge, immediately below the protruding beads, on each side.

³⁴ The poor quality of Lea's figures of the glochidia is clearly shown in this instance. The figure of the glochidium of *phaseolus* (fig. 12) stands next to that of *Eurynia recta* (fig. 11), and is distinctly larger than the latter, while actually the glochidium of *E. recta* is by far the larger of the two. Also the outlines of these two glochidia are not quite correctly rendered.

***Ptychobranthus foremanianus* (Lea).**

The soft parts of this species have been described by Lea (Obs., X, 1863, p. 443), and have been figured by him under the synonym *woodwardianus* (Obs., VII, pl. 29, fig. 103), and this species surely belongs in this genus.

***Ptychobranthus clintonensis* Simpson.**

This species also belongs here, as is shown by Simpson's description (1900a, p. 79).

***Ptychobranthus subtentus* (Say).**

Soft parts of one male and one gravid female were received from the Cumberland River, Burnside, Pulaski Co., Kentucky (B. Walker).

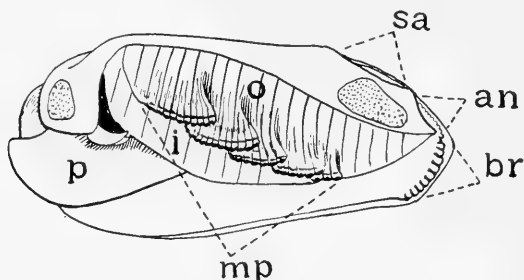


FIG. 15. *Ptychobranthus subtentus* (Say). Gravid female from Cumberland River, Burnside, Pulaski Co., Ky. (Carn. Mus., No. 61, 4,971.) (Anal and supra-anal conjectural.)

The soft parts of this species are entirely like those of *P. phaseolus*. The only difference I detect is in the extent of the marsupium, which consists of only five folds in my specimen, and does not occupy all of the outer gill, but leaves free a small section in front, and a somewhat larger one behind. Since I have only one female, I cannot tell whether this is always so, but I think it is unimportant, since likewise in *P. phaseolus* a considerable portion of the posterior end of the outer gill is non-marsupial in young individuals.³⁵ The anal seems to be almost smooth, and nothing can be said about the supra-anal, since these parts are badly injured in both specimens. Posterior margins of palpi connected only at base. Inner lamina of inner gills in both

³⁵ This is most noticeable in a young gravid female of *P. phaseolus* from Arkadelphia, Arkansas.

specimens free, except in front, where it is connected for a short distance in the female, and for a somewhat longer distance in the male. The glochidia are like those of *P. phaseolus*, but slightly larger. Length 0.18; height 0.22 mm. (see Plate XIX, fig. 5).

The color of the soft parts is the same as in *P. phaseolus*. Marsupium blackish purple, pale along the beaded edge, with black markings like those in *P. phaseolus*.

This species is placed by Simpson (1900b, p. 591) in the genus *Medionidus*, but he states that the soft parts were unknown to him. If we disregard the peculiar sculpture of the posterior slope of this shell, the structure of the hard parts is very similar to that of *P. phaseolus*. In some shells of *P. subtentus* in the Carnegie Museum I have even seen the slight depression inside of the shell, which corresponds to the marsupium.³⁶

Genus OBLIQUARIA Rafinesque. (1820.)

(Simpson, 1900b, p. 610.)

Shell rounded oval, inflated. Disk with a row of large knobs, running from the beak to the center of the base, those of one valve alternating with the knobs of the other. Posterior slope corrugately sculptured. Beak-sculpture consisting of two or three rather heavy, but not sharply defined, concentric bars, which seem to be continued by the knobs of the disk. Epidermis greenish-yellow to brown, painted with numerous, delicate, wavy, and broken rays, which may be entirely absent. Male and female shells essentially alike.

Inner lamina of inner gills free, except at the anterior end. Edge of mantle not differentiated in front of the branchial. Marsupium consisting of a few (generally less than ten) ovisacs, occupying a position just behind the center of the outer gill, beginning near the base of the gill, and reaching far beyond the edge. They are large, subcylindrical, and slightly curved, and have the rather solid placenta of the same shape. Glochidia lying all through the placental mass, of medium size, almost subcircular.

Type *O. reflexa* Rafinesque.

Obliquaria is a primitive genus of the *Lampsilinae*, which, in order to solve the problem of the aëration of the glochidia, has reduced the

³⁶ Sterki (1898, p. 31, and 1903, p. 103) describes in *Ptychobranchus* "a deep, oblique sulcus on the inside of each valve in the female, the space occupied by the marsupium." This sulcus very often consists of a series of impressions corresponding to the marsupial folds. The same feature is observable in *P. subtentus*.

marsupium to a few ovisacs, compensating for the reduction in their number, by an increase in their length. The tendency to move the marsupium backward toward the branchial opening is but slightly indicated.

Obliquaria reflexa Rafinesque.

Three males and one sterile female from the Ohio in Beaver Co., Pennsylvania, and another sterile female taken at Portsmouth, Scioto Co., Ohio, have been collected by myself. I received a sterile female from the Ouachita River, Arkadelphia, Clark Co., Arkansas, collected by H. E. Wheeler, February 6, 1911; and two males and four gravid females from Bayou Pierre, De Soto Parish, Louisiana, collected by L. S. Frierson, August 6, 1910.

Soft parts described by Lea (Obs., X, 1863, p. 429) and figured by Lefevre and Curtis (1910, pl. I, fig. 3).

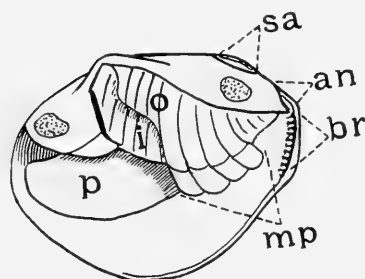


FIG. 16. *Obliquaria reflexa* Rafinesque. Gravid female, from Bayou Pierre, De Soto Parish, La. (Carn. Mus., No. 61, 4,755.)

Branchial, anal, and supra-anal as usual, mantle connection between the two latter moderately long, but shorter than the small anal. Branchial with papillæ, anal crenulated. Toward the front the papillæ of the branchial disappear suddenly, and the edge of the mantle is smooth, with a few indistinct crenulations just in front of the branchial. Palpi normal, their posterior margins connected only at base.

Gills short and broad, the inner wider anteriorly. Diaphragm normal; inner lamina of inner gills free from abdominal sac except at anterior end, where a portion less than half the length of the abdominal sac is connected. Anterior ends of gills normal.

Septa and water-tubes of both gills of the usual structure in the male. In the female, the marsupium is formed by a part of the outer gill lying just behind the middle of the gill, and not extending to the posterior end of it. The most characteristic feature is that the marsupium consists only of a small number (four to six in my specimens, but reported up to eight) of ovisacs, which, when empty, are hardly

narrower than the normal water-tubes, but have much heavier septa, with the usual marsupial structure of the epithelium. When charged the ovisacs swell so as to be considerably wider than the normal water-tubes. The marsupium protrudes beyond the original edge of the gill to a considerable degree, and the single ovisacs are subcylindrical, and are somewhat curved backward. The ova and glochidia fill the ovisacs in the shape of rather solid placentæ, and are packed close together through all of the placental mass (see Lefevre and Curtis, 1910, pl. 4, fig. 28). Probably the subcylindrical placentæ are discharged whole, although this has not been observed. The placentæ can be taken out whole (see *ibid.*, pl. 4, fig. 26), and in one of my specimens the holes through which placentæ had been recently discharged, have been seen (see Plate XVIII, fig. 10). The marsupium begins near the base of the gill, so that a considerable part of it is enclosed within the two original laminae of the gill.

Lefevre and Curtis (1910, p. 97, fig. M) have figured the glochidium, and give its dimension as 0.225×0.23 mm. I find that this is substantially correct. The glochidia are of medium size, almost subcircular (their shape may be best compared with a circle a small section of which is cut off). Length and height about the same: 0.22 mm. (see Plate XX, fig. 1).

Color of soft parts whitish, with the edge of the mantle brownish, chiefly so in the region of the branchial and anal openings. Marsupium white.

There is much uncertainty as to the breeding season of this species. Lea (Obs., III, 1842) mentions ova as formed in the ovarium in autumn, and Sterki (1898, p. 20) found them in October. Lefevre and Curtis (1910, p. 89) place this species among the forms with a short breeding season, but without giving particulars. The sterile females collected by myself were all found in the month of September, at a time when most other bradyctictic forms are gravid. The gravid females from Louisiana, collected by Frierson on August 6, were in part discharging, so that this would tend to show that the breeding season *ends* at that time. The statements made by Lea and Sterki might suggest that the breeding season begins rather late, in winter, and this assumption would agree with the facts at hand. Yet recorded observations are entirely too few, and attention should be directed to this question. The sterile specimen from Arkansas, collected in February, does not contribute to the solution of the question.

According to its known affinities and the gill-structure, this species should be bradytictic, and not tachytictic, as Lefevre and Curtis believe. But its primitive character makes it appear possible that in its breeding habits it may also be primitive, although I do not believe that it is a characteristic tachytictic form, for it possesses adaptations to a long breeding season.

Genus *CYPROGENIA* Agassiz. (1852.)

(Simpson, 1900*b*, p. 609.)

Shell rounded-triangular, inflated, often with a posterior ridge and a depression in front of it (especially in the young shell). Disk with nodular sculpture. Beak-sculpture obsolete (according to Simpson) slightly double-looped.³⁷ Epidermis greenish-yellow, painted with delicate rays, which break up into mottlings and spots. Male and female shell alike.

Inner lamina of inner gills free from abdominal sac, except at anterior end. Edge of mantle in front of branchial with fine crenulations, which soon disappear anteriorly, but without special structures. Marsupium consisting of rather few (generally less than ten) ovisacs, lying in the center, or a little before the center, of the outer gills. The ovisacs begin near the base of the gill, and reach far beyond the edge. They are extremely long, and coil up spirally, in a backward and inward direction. The placentaë are very solid, subcylindrical like the ovisacs, and spiral. Glochidia distributed all through the placental mass, of medium size, almost semicircular.

Type *C. irrorata* (Lea).

The structure of this genus can easily be traced back to *Obliquaria*. The same general plan is observed in the structure of the soft parts, except that the marsupium is unusually elongated, and, in order to be accommodated in the shell, it is coiled up.

Cyrogenia irrorata (Lea).

I collected, September 24, 1910, two males and one gravid female in the Ohio River at Portsmouth, Scioto Co., Ohio, and received from B. Walker, three gravid females from the Cumberland River in Cumberland Co., Kentucky.

No particulars as to the breeding season are known, but my specimen

³⁷ Although I have several specimens with tolerably well preserved beaks, I have never seen the beak-sculpture clearly.

from Portsmouth had eggs only, and thus the beginning of the breeding season is shown to be in autumn.

The soft parts have been described and figured by Lea (Obs., I, 1834, pl. 5, figs. 6 and 7; and Obs., X, 1863, p. 433), but the figure is very poor.³⁸

Branchial, anal, and supra-anal as usual, the latter two separated by a very short mantle-connection. Branchial with papillæ, anal finely crenulated. In front of the branchial, the inner edge of the mantle has a series of fine crenulations which soon disappear, this edge becoming smooth. Palpi normal, posterior margins connected at base only.

Gills short and broad, the inner much wider than the outer throughout its whole length. Diaphragm normal, inner lamina of inner gills free from abdominal sac, except at the anterior end. Anterior attachment of gills as usual.

Septa and water-tubes in both gills normally developed, the latter moderately wide in the male and the non-marsupial gills of the female. Marsupium formed by a section in the middle of the outer gill; in fact this section is a little more toward the anterior end of the gill. Ovisacs few (three to eight in my specimens; up to eleven reported by other authors; Simpson gives for the genus twenty-three as maximum), hardly different in width from the rest of the water-tubes, that is to say in the longitudinal direction. But, when charged, they swell somewhat in the transverse direction, so as to become subcylindrical. The ovisacs project to an extreme degree beyond the edge of the gill. Although they begin near the base of the gill, and although a considerable part is enclosed between the original laminæ of the gill,

³⁸ Lea's figures are quite characteristic of the marsupium itself, but the position of the latter in the animal (fig. 7) is wrong. Apparently the anterior and posterior ends of the body are inter-changed. The marsupium does not coil *forward*, as this figure shows, but *backward*.

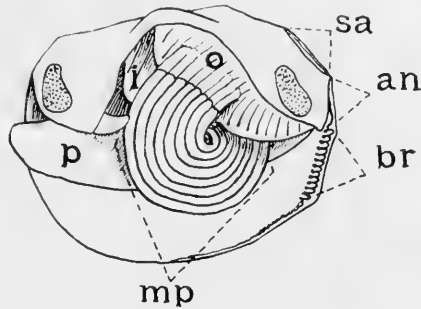


FIG. 17. *Cyrogenia irrorata* (Lea). Gravid female, from Ohio River, Portsmouth, Scioto Co., O. (Carn. Mus., No. 61, 4,763.)

this part is very small when compared with the prolonged portion. The latter curves backward in a circle, and is rolled up spirally, the spiral forming about one and a half to two turns, but only the posterior ovisacs complete the whole revolution, while the anterior ones stop earlier, the first after completing the circle about once. The distal parts of the spiral wind up in the direction toward the median line of the body, so that in a view from the outside, they are hidden under the outer gill and the first whorl of the marsupium.

The ova fill the ovisacs in the shape of closely packed masses, forming distinct and very solid placentæ, red in color, rarely white. Glochidia rather small, almost semicircular, distinctly longer than high, without hooks. Length 0.18; height 0.15 mm. (see Plate XIX, fig. 6). Sterki (1898, p. 19) gives the dimensions as length 0.21; height 0.17; diameter 0.14 mm. He also says that the glochidial shell is "considerably longer than high and has numerous distinct, crowded, concentric lines of growth." I have not seen the latter. The shape of the glochidia approaches to a degree, that of *Dromus*, but the disproportion between length and height is much less.

Color of soft parts whitish. Abdominal sac and mantle suffused with black. Edge of mantle brown with black spots, this mottling extending all around. Marsupium, when charged, red, or (according to Sterki) sometimes white.

Genus DROMUS Simpson. (1900.)

(Simpson, 1900b, p. 614.)

Shell very much like that of *Cyprogenia*. Beak-sculpture obsolete, described by Simpson as consisting of interrupted, concentric ridges, but I have never seen them distinctly.

Inner lamina of inner gills partly free from abdominal sac, connected near the anterior end for about one-third, or more, of the length of the abdominal sac. Edge of the mantle in front of branchial without special structures. Marsupium consisting of numerous ovisacs, which occupy the larger posterior portion of the outer gill, leaving a smaller anterior section non-marsupial. The ovisacs are comparatively short, subcylindrical, or only slightly compressed, and lie practically entirely beyond the original edge of the gill. In older individuals, the marsupium becomes warped and folded. Placentæ solid, subcylindrical, or slightly compressed, rather short. Glochidia placed chiefly toward

the outer walls of the marsupium, around the edges of the placenta, which are central. Glochidia of peculiar shape, small, much longer than high.

Type *D. dromas* (Lea).

This is a highly interesting genus, with several quite unique features (general shape of marsupium, arrangement of glochidia and placenta, shape of glochidia), but there is no question that it belongs to the more primitive types of the *Lampsilinæ*. In young specimens, where the marsupium is not folded, the marsupium resembles somewhat that of *Obovaria*, but without being so swollen. The general shape of the shell, as well as the shape of the glochidia can only be compared with that of *Cyprogenia*. I do not think that the folded marsupium indicates closer relationship to *Ptychobranthus*, since here the folds are of a different character. In the absence of special structures on the edge of the mantle, this genus shows only a low stage of specialization, without pointing to any particular affinity with other forms.

Dromus dromas (Lea).

I am indebted to B. Walker for seven complete specimens, and the soft parts of nine others, all from the Cumberland River, in Pulaski, Russell, Wayne, and Cumberland Cos., Kentucky. One of the soft parts was a male, the others were all gravid females with glochidia.

They all were collected late in the season of 1910, so that the beginning of the breeding season is in autumn.

The description of the marsupium given by Simpson (1900*b*, p. 615) is entirely inadequate and directly misleading, and in one particular ("bases of the ovisacs slightly rounded") unintelligible.

Anal opening separated from the supra-anal by a very short and deciduous mantle-connection: only in two young and one older specimen was the latter preserved; but the others had been rather roughly handled and the posterior region of the mantle was

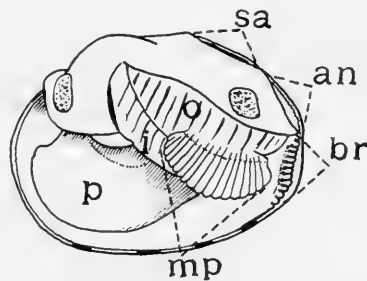


FIG. 18. *Dromus dromas* (Lea). Gravid female, young (shell 41 mm. long), from Cumberland River, Albany Landing, Cumberland Co., Ky. (Carn. Mus., No. 61, 4,970.)

generally more or less injured.³⁹ Anal large, with crenulations. Branchial large, with papillæ; toward the front papillæ gradually changing to crenulations, which soon disappear, so that the anterior inner edge of the mantle is smooth. Palpi of usual shape, but small; their posterior margins united for about one-half, or less, of their length.

Gills conforming to the shape of the shell, rather short and broad, the inner much the wider anteriorly. The anterior attachment of the gills is as usual. Gill-diaphragm normal. Inner lamina of inner gills free from abdominal sac, except anteriorly, where it is connected for about one-third to almost one-half of the length of the abdominal sac.

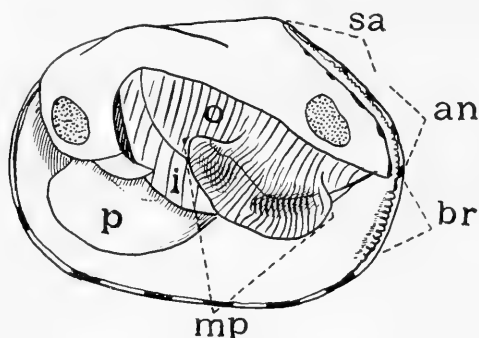


FIG. 18a. Gravid female, medium size (shell 55 mm. long), from Cumberland River, Eadsville, Wayne Co., Ky. (Carn. Mus., No. 61, 4,968.)

Gills with well-developed water-tubes and septa. Those of the male, and the non-marsupial gills of the female, with distant septa and wide water-tubes. Marsupium formed by the posterior section of the outer gill; more than half of the gill takes part in it; a larger section in front and a smaller behind remain non-marsupial. The marsupial part bulges out considerably beyond the original edge of the gill, about as wide again as the gill, and in this section the septa are much more crowded, and the ovisacs are narrow. When gravid, the ovisacs swell only slightly, so that they are very little compressed, and chiefly so near their base. The placentæ have the same subcylindrical and only slightly compressed shape. Practically the whole of each ovisac

³⁹ But in some it was positively absent. This is also a rather primitive condition, not observed in any other form of the *Lampsilina*.

lies in the outbulging part of the gill, and only the basal ends extend very little in between the original gill-laminæ.⁴⁰

In young specimens, the marsupium is simple, and forms a smooth, compressed (not much swollen) body, marked off from the anterior and posterior non-marsupial parts of the gill by irregular folds. In larger specimens, however, this marsupial mass begins to warp, and finally is folded up into a number of irregular folds. The strongest folds are near the anterior end of the marsupium. In none of my specimens does the marsupium occupy the whole margin of the gill.

The placenta are quite solid and permanent, and possess a peculiar structure (see Plate XVIII, fig. 11). In all specimens at hand glochidia are developed, and they appear arranged around a central axis (placenta), the color of which is white or red. The latter color, if present, is restricted to this axis, and the glochidia themselves are transparent white, and form a fringe around the narrow edges of the placenta. They seem to be connected with them by fine threads, possibly their embryonal threads.⁴¹ Since the placenta themselves almost touch the septa, the glochidia are thus crowded toward the lateral faces of the marsupium. Whether this arrangement is already present in the eggs, is unknown to me. It is, however, certain that this arrangement can only have the purpose of bringing the glochidia as close as possible to the wall of the marsupium, in order to give them the best chance to be near the current of fresh water going over the marsupium. This is one of the little special devices for the proper aëration of the glochidia.

Glochidia of unique shape; they are much longer than high, and

⁴⁰ Simpson says that the marsupium occupies the "base" of the outer gills. This is a very ambiguous expression, but apparently is intended to imply that it is situated on the margin of the gills, while the "base" is non-marsupial. This is a very peculiar feature of *Dromus*, and not met with in any other genus. Only *Ptychobranchus* has the same condition slightly indicated.

⁴¹ The glochidia adhere rather firmly to the placental mass by their threads and it is hard to isolate them, except with caustic potash.

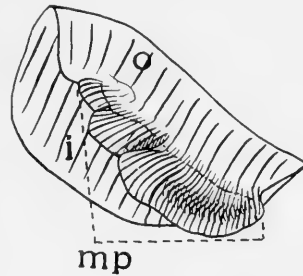


FIG. 18b. Left gills of a large gravid female (shell 60 mm. long), from Cumberland River, near Rowena, Russell Co., Ky. (Carn. Mus., No. 61, 4,966.)

might be called bean-shaped. No hooks are present. Length 0.19; height 0.10 mm. (see Plate XIX, fig. 7).

Color of soft parts whitish. Foot yellowish white, basal part (abdominal sac) gray or blackish. Gills gray or grayish white. In the gravid female, the marsupium is white or red. Mantle more or less suffused with black, whitish toward margins and front parts. Its edge has alternating chestnut-brown and black spots. Anal opening inside of this maculated edge with a white, followed by a black band.

Genus *FRIERSONIA* *gen. nov.*

Shell subelliptical, without distinct posterior ridge. Disk not sculptured. Beak-sculpture of the double-looped pattern, consisting of six to eight fine bars, of which the later ones are distinctly double-looped, and the latest are interrupted (unconnected) in the middle. Epidermis greenish-yellow, with rather distinct, simple rays. Male and female shells hardly different.

Inner lamina of inner gills connected with abdominal sac. Edge of mantle in front of branchial slightly lamellate, with fine and distinct crenulations, disappearing gradually in front, but without papillæ. A brown streak of pigment along this part of the edge. Marsupium consisting of many ovisacs, occupying the larger posterior section of the outer gill. When gravid, the ovisacs swell very little, and they are only slightly compressed in the basal part, which is largely enclosed between the laminae of the gill. The ovisacs reach considerably beyond the edge of the gill, and in this region they are curved backward in a peculiar manner, subcylindrical, and tapering toward a point directed backward at the hind end of the marsupium. The marsupium has also a remarkably sharp edge. Placentæ not very solid. Glochidia lying all through the placental mass, of medium size, and subovate in shape.

Type *F. iridella* (Pilsbry and Frierson).

According to the arrangement in the key (p. 304) this genus would appear to fall into the same group with the preceding genera. But this is hardly the case. It has in common with the genera with which it has been associated in the key only the fact that the marsupium is *not* of the simple kidney-shape shown by the genera which follow in the key. The sharp edge of the marsupium, its posterior point, and the recurved ovisacs are quite unique. For the present, I do not understand the meaning of this structure, but it may be connected with the

discharge of the glochidia. In shell characters *Frieria* shows nothing very characteristic, but it approaches more nearly the *Nephronajas*- and *Euryntia*-types than any other.

Frieria iridella (Pilsbry and Frierson).

Lampsilis iridella, Pilsbry and Frierson, 1908, p. 81 (figure published in 1907, on pl. 12); Pilsbry, 1909, p. 534.

I have the soft parts of three gravid females, one with eggs, two with glochidia, from Valles River, Valles, San Luis Potosi, Mexico, and owe them to the courtesy of L. S. Frierson. They were collected by A. A. Hinkley in December and January, 1906-1907.⁴² *Cotypes of species.*

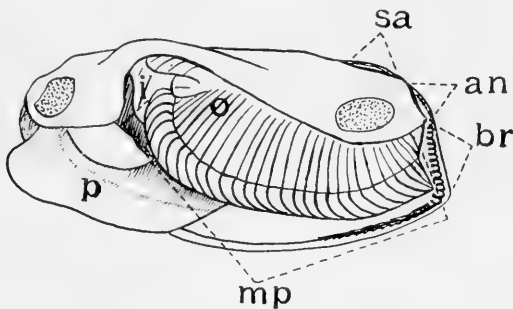


FIG. 19. *Frieria iridella* (Pilsbry and Frierson). Gravid female, from Valles River, Valles, San Luis Potosi, Mexico. (Carn. Mus., No. 61, 4,495.)

To the characters of the soft parts mentioned in the generic diagnosis the following should be added: Anal and supra-anal separated by a rather short mantle-connection (these parts are greatly injured in all three specimens, but the remnants of the connection may be seen in one specimen). Anal finely crenulated. Branchial with papillæ. Palpi rather large, of usual shape, posterior margins connected about one-half of their length. Diaphragm and anterior attachment of gills normal. Gills of gravid female rather long, the outer marsupial gill covering all of the inner gill, except its anterior end. Septa and water-tubes as usual. Marsupium quite long, and formed by a greater part of the outer gill than usual, yet there is a portion at the anterior end and a very small one at the posterior end, which are non-marsupial. Ovisacs over fifty. The sharp edge of the marsupium

⁴² See Hinkley, 1907, p. 68.

and the peculiar posterior point are quite evident in all three specimens, and the same is true of the peculiar curve of the ovisacs, so that these features cannot be accidental. Glochidia higher than long. Length 0.20; height 0.22 mm. (see Plate XIX, fig. 8).

Colors largely faded in my alcoholic material. One specimen has a peculiar brown line across the middle of the foot. The edge of the marsupium has brownish black pigment in spots.

This species and genus is one of the most peculiar with which I am acquainted. I would have considered it a *Nephronajas*, but since I have investigated another Mexican *Nephronajas* (see below), it is clear it cannot belong to this genus. The generic name is selected in recognition of the valuable help in my work received from Mr. L. S. Frierson.

Genus OBOVARIA Rafinesque. (1819.)

(Simpson, 1906b, p. 599.)

Shell rounded or ovate, higher than long, or only slightly longer than high, inflated, without distinct posterior ridge. Disk not sculptured. Beak-sculpture poorly developed, consisting of few subconcentric bars, of which the later ones have sometimes the tendency to become sinuate, but are not distinctly double-looped. Epidermis yellowish to brownish, rarely greenish, with indistinct, simple rays or without rays. Male and female shell slightly different in shape, the female being generally a little expanded on the post-base, but this difference is sometimes hardly noticeable.

Inner lamina of inner gills entirely connected with abdominal sac. Edge of the mantle very little differentiated in front of the branchial. It is slightly lamellar, with fine crenulations; and this part is generally emphasized only by the thickening of the margin of the mantle and the presence of a streak of dark pigment; there are never papillæ on it. Marsupium consisting of many ovisacs, occupying the posterior part of the outer gill. The ovisacs, when charged, swell transversely, so as to become lanceolate and compressed. They reach from near the base of the gill to, and a good deal beyond, the edge of the gill, and the whole marsupium assumes a kidney-shape. Placentæ not very solid. Glochidia all through the placental mass, of medium size and subovate.

Type *O. retusa* (Lamarck).

This is another primitive type of the *Lampsilinæ*, leading, however, toward the more highly developed forms of the subfamily. The

marsupium in this genus is not very peculiar, though assuming the characteristic kidney-shape of the higher *Lampsilinae*. The task of aërating the glochidia is taken up by the edge of the mantle in front of the branchial opening. However, the latter is as yet very little differentiated morphologically, but the thickened (muscular) margin and the pigment indicate that it actually has a special function. The shell of *Obovaria* presents no remarkable features, though it is possibly archaic, for it reminds of certain forms of *Fusconaja* and *Quadrula*.

This genus is divided by Simpson into two subgenera, which are very well defined.

Subgenus *Obovaria* (*sens. strict.*).

Shell rounded, rather upright, beaks more or less in the middle of the upper margin. Pseudocardinals normal and divergent.

Type *O. retusa* (Lamarck).

Subgenus *Pseudoön* Simpson (1900b, p. 601).

Shell ovate, oblique, beaks quite anterior. Pseudocardinals (at least in old shells) oblique, almost parallel to the laterals.

Type *O. ellipsis* (Lea).

At first glance, *O. ellipsis* looks very different from typical *Obovaria*, and I was for some time inclined to unite it with *Nephronajas*; but *O. castanea* clearly forms a connection with the typical forms.

Simpson (*l. c.*) describes the soft parts of *Pseudoön*, and says: "mantle having a wide, thickened, double border, the inner edge being toothed throughout below." This is incorrect. The inner edge is slightly widened and crenulated only for a short distance in front of the branchial. Simpson also says that the ovisacs are "tinted with purple below." I have not seen this in *O. castanea*, although *O. ellipsis* has a slight purplish gray pigment at the edge of the marsupium; but this should not be described as "purple."

***Obovaria retusa* (Lamarck).**

On August 29, 1908, I found a gravid female with eggs in the Ohio River in Beaver Co., Pennsylvania, and on September 22, 1910, I secured two males and two gravid females, with glochidia, in the Ohio River at Portland, Meigs Co., Ohio.

The soft parts have been described by Lea (*Obs.*, X, 1863, p. 433).

Anal and supra-anal separated by a short mantle-connection. Anal crenulated, branchial with papillæ. In front of the branchial the inner edge of the mantle in the female is slightly dilated and lamelliform,

with fine crenulations. It is defined on the inner side by a narrow stripe of black pigment. In the male this lamella is also present, but much weaker. Farther in front the edge of the mantle is smooth. Palpi small, normal, their posterior margins connected only at the base.

Gills short and broad, the inner ones broader. Diaphragm normal. Inner lamina of inner gills entirely connected with abdominal sac. Anterior attachment of gills as usual.

Septa and water-tubes in both gills normally developed. Marsupium restricted to a small section in the posterior half of the outer gill, leaving more than half of the anterior portion and a small posterior section non-marsupial. Ovisacs fifteen to twenty (in my specimens); when charged not narrower than the normal water-tubes in the longitudinal direction, but expanding in the transverse direction, so that their lumen becomes lanceolate and compressed, the whole marsupium thus appearing swollen and kidney-shaped. The marsupium extends considerably beyond the original edge of the gill, and about three-fourths of the length of the ovisacs is within the laminae of the

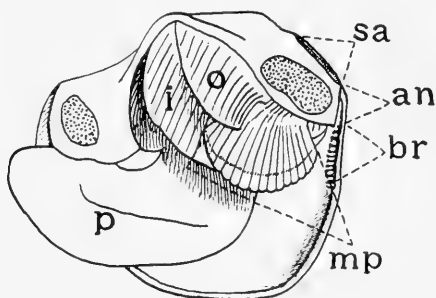


FIG. 20. *Obovaria retusa* (Lamarck). Gravid female, from Ohio River, Portland, Meigs Co., O. (Carn. Mus., No. 61, 4,773.)

gill, while one-fourth lies beyond the latter. Edge of marsupium blunt, without pigment. Placentæ not well developed; eggs and glochidia rather loose.

Glochidia rather large, suboval, without hooks. Length 0.22; height 0.27 mm. (see Plate XIX, fig. 9).

Color of soft parts whitish, only edge of mantle brown, with a black streak in front of the branchial. Charged marsupium whitish.

Obovaria circulus (Lea).⁴³

About a dozen specimens from the Ohio drainage of western Pennsylvania have been investigated, among them gravid females. Several additional specimens were examined from the Ohio River in Ohio. Gravid females were found in the month of September, and on May 27. In the latter case, discharging individuals were secured, with holes in the edge of the marsupium.

Structure of soft parts essentially the same as in *O. retusa*. In the sterile female, the ovisacs are slightly narrower than the regular water-tubes. Number of ovisacs up to thirty and more. As in the preceding species the edge of the mantle in front of the branchial is in the female slightly lamellar and crenulated, but has only a brown (not blackish) mark along it.

Glochidia (see Ortmann, 1911*b*, pl. 89, fig. 15) similar to those of *O. retusa*, but smaller. Length 0.20; height 0.23 mm.

Obovaria unicolor (Lea).

I have received from A. A. Hinkley three males and eight gravid females, taken from the Pearl River, Jackson, Hinds Co., Mississippi, on Nov. 5, 1910. This species agrees in every particular with *O. circulus*, except that the glochidia are smaller. Length 0.16; height 0.21 mm. (see Plate XIX, fig. 10).

Obovaria (Pseudoön) ellipsis (Lea).

Two females were collected in the Ohio River in Beaver Co., Pennsylvania, on August 29, 1908, one sterile, the other just beginning to fill the marsupium with eggs. Three males, one sterile, and six gravid females were secured in September, 1910, in the Ohio River in Ohio. Thus the beginning of the breeding season is normal.

The soft parts are much like those of the other species of the genus. Anal and supra-anal separated for a short distance. Anal crenulated, branchial with papillæ. In front of the branchial the inner edge of the mantle of the female is slightly lamelliform, with fine crenulations. This part does not reach to the middle of the lower margin, and farther in front the edge is smooth. Posterior margins of palpi connected only at base. Inner lamina of inner gills connected with abdominal sac.

⁴³ This includes *O. lens* (Lea), which is not specifically distinct.

Marsupium formed by about the posterior half of the outer gill, kidney-shaped, consisting of as many as forty and more ovisacs, its edge slightly pigmented.

Glochidia similar to those of the other species. Length 0.19; height 0.22 mm. (see Plate XIX, fig. 11).

Color whitish, edge of mantle inclining to blackish, chiefly in the region of the branchial and anal, and more intense in the male sex. Pigment on edge of marsupium purplish gray, not sharply marked.

Obovaria (Pseudoön) castanea (Lea).⁴⁴

Twelve males, one sterile, and five gravid females (with glochidia) from the Ouachita River, Arkadelphia, Clark Co., Arkansas, have been sent by H. E. Wheeler. They were collected on February 6 and March 21, 1911.

Identical in all essential respects with *O. ellipsis*. Marsupium formed by twenty to thirty ovisacs and its edge not pigmented. A grayish streak along the inner edge of the mantle in front of the branchial. Glochidia of the same shape as those of *O. ellipsis*, but smaller. Length 0.15 mm.; height 0.19 mm.

Genus NEPHRONAJAS Crosse and Fischer. (1893.)

(Simpson, 1900b, p. 591.)

Shell ovate or subelliptical, distinctly longer than high, compressed or slightly inflated, without, or with, indistinct posterior ridge. Disk not sculptured. Beaks moderately anterior, never in the middle of the shell, and never very near the anterior end. Beak-sculpture poorly developed, consisting of a few faint bars, which have a tendency to become double-looped, with the central part between the loops obliterated. Epidermis yellowish to greenish, generally with distinct

⁴⁴ There is some doubt as to the identity of my specimens. B. Walker has a number of sets of a shell from Alabama, Mississippi, Louisiana, and Arkansas, of which he sent me specimens, and some of which have been labeled by Simpson *castanea*, but which are certainly different from the present form, and probably do not belong to this genus at all. Although I have not seen Lea's type, I believe that I have the real *castanea*, for the reason that all authors (Lea, Obs., I, 1834, p. 91; Call, 1895, p. 9; Simpson, 1900b, p. 602) who have discussed this species, emphasize its similarity to *O. ellipsis*. Lea's words: "This small species is allied to *U. circulus* (*nob.*) in colour and to *U. ellipsis* (*nob.*) in form" are entirely sufficient to recognize it. There is no other form known to me, of which this could be said. Also Vanatta (1910, pp. 102 and 103) quotes *O. castanea* from the Ouachita River in Arkansas.

green rays. Male and female shells differing in shape, but the difference often hardly noticeable.

Soft parts agreeing with those of *Obovaria* in every respect; the glochidia also of the same type.

Type *N. plicatula* Charpentier.

In its anatomical structure this genus is indistinguishable from *Obovaria*. The differences are all in the shell. But while *Obovaria* is primitive in its shell, *Nephronajas* inclines toward the genera of the *Lampsilis*-type, in fact its species have been considered, at least temporarily, to belong to *Lampsilis*. The subgenus *Pseudoön* of *Obovaria* connects this genus with *Obovaria*, and so we have an almost complete series.

The nomenclature of this genus is doubtful. Of the species, which belong here, two (*ligamentina* and *perdix*) stand according to Simpson's system in *Lampsilis*, and a third (*sapotalensis*) in *Nephronajas*. Since *Lampsilis* is retained for other forms, only *Nephronajas* is available. But the anatomy of the type species of *Nephronajas* (*plicatula*) remains as yet unknown, and it is possible that it may differ in anatomy from *sapotalensis*. In the latter case, of course, *Nephronajas* could not be used for the present genus, and a new name would have to be chosen.

***Nephronajas ligamentina* (Lamarck).**

Numerous specimens from the Ohio drainage in western Pennsylvania have been investigated. In addition specimens have been seen from the Ohio River in West Virginia and Ohio (collected by myself), from the Cumberland River in Kentucky (var. *gibba*), received from B. Walker, and from the Ouachita in Arkansas, received from H. E. Wheeler.

Typically bradyctitic. The breeding season begins in August, and specimens with eggs are present in this month and the beginning of September. Later on only glochidia are observed. Specimens with glochidia have again been observed in May, and the discharge must take place in this month, for in June and July no gravid females have ever been found, although numerous specimens have been investigated.

The soft parts have been discussed by Lea (Obs., X, 1863, p. 424) and Simpson (in Baker, 1898, p. 108).

Anatomy in every particular like that of *Obovaria*. The inner edge

of the mantle of the female in front of the branchial is very slightly lamellate and finely crenulated. It is even less developed than is generally the case in *Obovaria*. The edge of the mantle is brown all around, often very pale, often darker, and becomes blackish in the region of the branchial and anal. Marsupium generally quite large and swollen, with as many as forty ovisacs, or even more. At its edge there is generally brownish or blackish pigment, but this may be indistinct, or even lacking. For an account of the glochidia see Lea, Obs., VI, 1858, pl. 5, fig. 18; Ortmann, 1911b, pl. 89, fig. 16. Length 0.22; height 0.24. Lefevre and Curtis (1910, pl. 4, figs. 24 and 27) have figured the placentæ, but they are distinguishable only when the eggs are present, later the cohesion is lost.

Nephronajas perdix (Lea).

I have received three gravid females from B. Walker. They are from the Cumberland River, Burnside, Pulaski Co., Kentucky.

This species agrees completely with *N. ligamentina*, and with *Obovaria* in general. In this species also the inner edge of the mantle of the female in front of the branchial is slightly lamellar and indistinctly crenulated, and emphasized by a streak of black pigment. Glochidia rather large. Length 0.25; height 0.29 mm. (see Plate XIX, fig. 12).

The affinity of this species with *N. ligamentina* has been recognized by Lea and Simpson, and thus it is not astonishing that the anatomy should prove to be the same.

Nephronajas sapotalensis (Lea).⁴⁵

Three males, and two sterile females, from Hueyapam River, Hacienda de Cuatotalapam, Canton Alayucan, State of Vera Cruz, Mexico, taken July 23, 1910, have been examined. I received these specimens from A. G. Ruthven, and they belong to the Museum of the University of Michigan at Ann Arbor. One female has been kindly deposited in the Carnegie Museum.

⁴⁵ B. Walker writes to me about these specimens: they "agree exactly with Crosse and Fischer's figure of their *computatus*, which according to von Martens is probably only a variety of *sapotalensis*, differing mainly in having the pseudocardinals slender, while in *sapotalensis* they are heavy." The type locality of *sapotalensis* is Sapotal River, near Tlocatalpam, Mexico. This is not far from the locality of my specimens, and in the same general drainage system (Papaloapan and San Juan Rivers)-

In every respect like the two preceding species. Mantle-connection between anal and supra-anal shorter than anal, the latter with crenulations, the branchial with papillæ. Inner mantle edge of the female in front of branchial very slightly lamellate, with fine crenulations, and a black streak accompanying it. Palpi with posterior margins connected at base. Inner lamina of inner gills entirely connected with abdominal sac. Marsupium formed by numerous (twenty and more) water-tubes, occupying a section of the posterior half of the outer gill. In the sterile females at hand, the margin of the marsupium is rounded, projecting slightly beyond the edge of the gill, beaded, and marked with brownish black pigment. Placentæ and glochidia unknown.

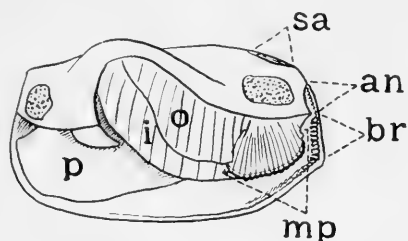


FIG. 21. *Nephronajas sapotalensis* (Lea). Sterile female, from Hueyapam River, State of Vera Cruz, Mexico. (Carn. Mus., No. 61, 5,000.)

Color whitish, with the margin of the mantle brown and blackish in the region of the anal and branchial, a blackish streak in front of the branchial, and black pigment on the edge of the marsupium.

Genus *AMYGDALONAJAS* Crosse and Fischer. (1893.)

Simpson, 1900*b*, p. 604 (as subgenus).

Shell ovate-triangular, inflated, truncated at posterior slope, with a distinct and often sharp posterior ridge. Disk not sculptured. Beak-sculpture consisting of a few fine ridges, of which the later ones are more or less distinctly sinuated or double-looped. Epidermis yellowish green, with a pattern of broken or arrow-marked rays. Male and female shells differing but little, the female shell somewhat inflated at the post-basal region.

Inner lamina of inner gills entirely connected, or free for a short distance. Inner edge of mantle in front of branchial in the female,

slightly lamellar for a certain distance, with fine crenulations. Marsupium apparently like that of *Obovaria* (I have seen only sterile females). Glochidia (according to Lefevre and Curtis, 1910, p. 97, fig. G), of suboval outline, but extremely small.

Type *A. cognata* (Lea), a Mexican species, of which the soft parts are unknown.

This genus stands close to *Obovaria* and *Nephronajas*, and has essentially the same structure of the soft parts. It differs, however, in the shape of the shell, and most emphatically in the glochidia. A final definition of the genus depends on the investigation of the anatomy of the type-species.

***Amygdalonajas elegans* (Lea).**

Two males were found in the Ohio River in Beaver Co., Pennsylvania, by myself. From L. S. Frierson, I received three males and three sterile females from Bayou Pierre, De Soto Parish, Louisiana, collected Aug. 6, 1910.

The soft parts are described by Simpson (in Baker, 1898, p. 93).

Anal and supra-anal separated by a rather long mantle-connection, about as long as the anal. Anal crenulated, branchial with papillæ. In front of branchial, the inner edge of the mantle in the female is narrowly lamellar, with fine crenulations, this part reaching to about the middle of the lower margin. Posterior margins of palpi connected for about one-third of their length.

Gills and diaphragm of the usual shape. Inner lamina of inner gills sometimes entirely connected with the abdominal sac, sometimes free for a short distance (maximum about one-fourth the length of abdominal sac); often only small holes at posterior end of foot are left open.

Gills of the usual structure. In the female the marsupium is formed by the posterior part of the outer gills (a little over one-half). Ovisacs numerous, projecting beyond edge of gill. Charged marsupium not observed. The glochidia have been described and figured by Lefevre and Curtis (1910, p. 97, fig. G), and are characterized by their extremely small size. Length 0.075; height 0.09 mm.

Color of soft parts whitish, with the edge of the mantle blackish, mottled with black and white in the region of the branchial and anal. Along the inner edge in front of the branchial is a streak of black pigment.

Genus *PLAGIOLA* Rafinesque. (1819.)

(Simpson, 1900b, p. 603.)

Shell subtriangular, somewhat inflated, but peculiarly compressed toward the beaks, with a distinct posterior ridge, and a narrow, truncated, posterior slope. Disk not sculptured. Beak-sculpture indistinct, consisting of a few, fine, concentric, and slightly and indistinctly double-looped ridges. Epidermis yellow, greenish, or brownish, painted with rays, which are broken into lunate, or squarish, blotches. Male and female shells slightly different in shape, the female smaller, more inflated, and slightly swollen in the post-basal region.

Inner lamina of inner gills free for a greater or smaller distance. Inner edge of mantle in front of branchial for a certain distance slightly lamellar and with fine teeth, but without papillæ in the female. Marsupium like that of *Obovaria*, kidney-shaped. Placentæ lanceolate, not very solid. Glochidia very large, spatulate, gaping at the anterior and posterior margins.

Type *P. securis* (Lea).

In the soft parts, this genus stands essentially upon the same stage of development as *Obovaria* and *Amygdalonajas*. Its chief characteristics are the shape of the shell and of the glochidia. The latter are quite unique, and possibly indicate a transition toward the glochidia of *Proptera*.

***Plagiola securis* (Lea).**

About half a dozen specimens from the Ohio and Allegheny in western Pennsylvania have been collected by myself. I received from B. Walker a gravid female from the Cumberland River in Kentucky, and another from H. E. Wheeler from the Ouachita River in Arkansas.

In September and October this species is regularly found gravid, so that the beginning of the breeding season is normal.

The soft parts have been described by Lea (Obs., X, 1863, p. 43).

Anal and supra-anal separated by a mantle-connection of medium length. Inner edge of anal crenulated, that of branchial with papillæ. In the female, the inner edge of the mantle in front of the branchial is slightly lamellar, with fine teeth, which are rather distant, but without papillæ. Posterior margins of palpi connected for about one-fourth of their length.

Gills and diaphragm of usual shape. Inner lamina of inner gills more or less free. The maximum observed was free for about three-

fourths of the length of abdominal sac, the minimum was only a small hole at the posterior end of the foot, but this was only on one side of the body; on the other side the lamina was free for a little less than half the length of the abdominal sac.

Gills of the usual structure. Marsupium kidney-shaped when charged, occupying the posterior half or more of the outer gill, with numerous (thirty and more) ovisacs, of the *Obovaria*-type. Ovisacs compressed, lanceolate, with poorly developed placentæ. Glochidia distributed all through the placentæ, of unusual shape (see Lea, Obs., VI, 1858, pl. 5, fig. 6;⁴⁶ Lefevre and Curtis, 1910, p. 97, fig. H; Ortmann, 1911*b*, pl. 89, fig. 17). They are quite large, subspatulate, (dilated and rounded off toward the ventral margin), and their anterior and posterior margins are distinctly gaping. Lefevre and Curtis give the measurements as follows: length 0.23; height 0.31; while my maximum measurements are: length 0.26; height 0.35 mm.

Color whitish. Edge of mantle brownish black, chiefly so in the posterior region. The black pigment is emphasized along the edge in front of the branchial.

Genus PARAPTERA Ortmann. (1911.)

(Ortmann, 1911*b*, pp. 301, 334, 338.)

Shell thin, elliptical, or obovate, when young with a distinct posterior wing, rather compressed, without posterior ridge. Disk without sculpture. Hinge-teeth feebly and often imperfectly developed. Beak-sculpture fine, consisting of a few concentric bars, followed by a few others, which are double-looped. In the latter, only the posterior loop is distinct, while the anterior is obliterated. Male and female shells slightly different, the female shell more expanded at post-base.

Inner lamina of inner gills entirely connected with abdominal sac. Edge of the mantle of the female slightly lamellar in front of branchial, with crenulations, but not with papillæ. Marsupium kidney-shaped, swollen, consisting of many ovisacs occupying the posterior part of the outer gills. Placentæ not very solid. Glochidia very small, of suboval shape.

Type *P. gracilis* (Barnes).

Another genus having the structure of *Obovaria*, distinguished only by the shape of the shell and the glochidia. The latter are very remarkable, and can only be compared with those of *Amygdalonajas*.

⁴⁶ This figure is not drawn to scale, and is much too small.

Paraptera gracilis (Barnes).⁴⁷

I myself collected about a dozen specimens with soft parts in the Ohio and Lake Erie in western Pennsylvania, and received, from R. L. Moodie, a male from the Kansas River in Kansas, and from L. S. Frierson a male and a sterile female from Bayou Pierre, Louisiana.

The breeding season seems to have certain peculiarities. The species is undoubtedly bradytictic, but the season begins rather late. I found specimens with the marsupium partly charged as early as August 30, but these, as well as others found in September and October, all had only eggs, but no glochidia. In spring, a discharging female has been observed as early as May 22, but others were found fully charged with glochidia as late as July 7, 8, and 11.⁴⁸ Thus the breeding season must last from the end of August to about the middle of July, with only a very short interval.

Incomplete descriptions of the soft parts have been published by Lea (Obs., X, 1863, p. 434) and Simpson (in Baker, 1898, p. 99).

Anal and supra-anal separated by a mantle-connection which is slightly longer than the anal. Anal crenulated, branchial with papillæ. In the female the inner edge of the mantle in front of the branchial is lamellar, somewhat dilated, with fine crenulations, running forward for about one-third the length of the margin of the mantle. No papillæ are present. Palpi with the posterior margins united at the base only.

Gills and diaphragm of normal shape. Inner lamina of inner gills connected throughout with abdominal sac. Structure of gills normal. Marsupium formed by the posterior part of the outer gill, kidney-shaped, and swollen. Ovisacs numerous (thirty to forty), lanceolate. Placentæ not very solid, glochidia distributed all through the mass, very small, of suboval shape. Length 0.08; height 0.09 mm. (See

⁴⁷ Lea (Obs., VIII, 1862, p. 79, pl. 9, fig. 224) described *U. dolosus*, which Simpson (1900b, p. 568) makes a synonym of *U. purpuratus* Lea, but states that the glochidia are pouch-shaped (*Lampsilis*-type), not wedge-shaped as in *Paraptera purpurata*. Simpson dismisses this by saying (*l. c.*, footnote 2) that the "form of embryos in a given species is often not constant." This is a very serious mistake, for there is nothing more constant for the species than the glochidium. Call (1895, p. 19) makes *dolosus* a synonym of *gracilis*, and I think that he is right. Simpson (*l. c.*, p. 574) does not report *gracilis* from the Alabama drainage, but it surely is there (as *dolosus*). I have myself seen two specimens from the Coosa River at Wetumpka, collected by H. H. Smith in October, 1901.

⁴⁸ Those collected July 7 and 8 are from Lake Erie, but the one collected July 11 is from the Ohio River.

Lefevre and Curtis, 1910, p. 97, fig. K, where the measurements given are: length 0.07; height 0.09; Ortmann, 1911*b*, pl. 89, fig. 19, and Coker and Surber, 1911, pl. 1, fig. 2).

Soft parts whitish. Edge of mantle in the region of anal and branchial brownish black. A black streak runs along the inner edge for a certain distance in front of the branchial.

Paraptera (?) fimbriata (Frierson).⁴⁹

A gravid female (with eggs) from Valles River, Valles, San Luis Potosi, Mexico, was received from L. S. Frierson (*cotype*).

This specimen was collected in December, 1906, or January, 1907,⁵⁰ and the presence of eggs (beginning of breeding season) in "winter" should be noted.

I refer this species to this genus only tentatively. The structure of the soft parts is in every respect like that of *P. gracilis*. However, other genera have a similar structure. No glochidia were present, but the eggs are remarkably small (about 0.10 mm.), and this would indicate similarly small glochidia.

Further there is no doubt that *Lampsilis salinasensis* Dall (1909, p. 181, pl. 30, fig. 3) is the same species. This has been placed by Dall in Simpson's subgenus *Proptera* on account of shell-characters, and there is indeed much similarity of the shells, so that we may regard *P. fimbriata* as a *gracilis* less typically developed, with a stronger shell and better developed hinge-teeth. This species is certainly not a typical *Lampsilis* as shown by the absence of special structures on the edge of the mantle.

Genus PROPTERA Rafinesque. (1819.)

Simpson, 1900*b*, p. 566 (as subgenus).

Shell subsolid or rather thin, obovate or subelliptical, strongly winged behind, sometimes also in front, inflated or subcompressed, without distinct posterior ridge. Disk without sculpture. Hinge-teeth generally well-developed. Beak-sculpture much like that of *Paraptera*. Male and female shells slightly different, female more developed in the postbasal region.

Inner lamina of inner gills entirely connected with abdominal sac. Edge of the mantle in the female slightly lamellar in front of branchial,

⁴⁹ Frierson, 1907, p. 86, pl. 12.

⁵⁰ Hinkley, 1907, p. 68.

with crenulations, but without papillæ. Marsupium kidney-shaped, swollen, consisting of many ovisacs, occupying the posterior part of the outer gill. Placentæ not very solid. Glochidia rather large, celt-shaped, with two spines, one at each of the ventral corners.

Type *P. alata* (Say).

This genus stands in all characters except the glochidia, by the side of *Paraptera*. The shape of the glochidia is unique.⁵¹

***Proptera alata* (Say).**

About a dozen specimens from the Ohio and Lake Erie in western Pennsylvania have been studied, and a gravid female from the Kansas River in Kansas (R. L. Moodie).

The breeding season begins unusually early, eggs having been found in the marsupium on June 22. Glochidia have been seen in July, August, September, and October, and then again in May. This refers to specimens from the Ohio drainage. In Lake Erie, specimens with glochidia have been found in May, and discharging specimens as late as July 7 and 8. The beginning of the breeding season in Lake Erie has not been observed. Thus the end of one and the beginning of another breeding season seem to overlap, of course not in the same individual, and probably not in the same locality.

The soft parts have been described by Lea (Obs., X, 1863, p. 403) and Simpson (in Baker, 1898, p. 98).

It is hardly necessary to describe the anatomy in detail, since it agrees in every respect with that of *Paraptera gracilis*, with the exception of the mantle-connection between anal and supra-anal, which is here slightly shorter, and the glochidia. The latter (see Lea, Obs., VI, 1858, pl. 5, fig. 25; Lefevre and Curtis, 1910, p. 97, fig. D, and pl. 4, fig. 25; Ortmann, 1911b, pl. 89, fig. 18; and Coker and Surber, 1911, pl. 1, fig. 3) are so fundamentally different, that the creation of the genus *Proptera* is justified. Their dimensions are, according to Lefevre and Curtis: length 0.23; height 0.41. The specimens measured by me were not so large, being in length 0.20; height 0.38 mm.

⁵¹ According to Coker and Surber (1911), *Lampsilis capax* (Green) has the glochidium similar to that of the species of *Proptera*. It should be ascertained whether the margin of the mantle of this species is that of *Lampsilis* or that of *Proptera*, before we assign it to *Proptera*.

***Proptera purpurata* (Lamarck).**

One male, and two sterile females from Bayou Pierre, De Soto Parish, Louisiana, have been sent by L. S. Frierson, and three males from Ouachita River, Arkadelphia, Clark Co., Arkansas, by H. E. Wheeler.

Description of soft parts given by Lea (Obs., X, 1863, p. 436).

This species is closely allied to the foregoing, and is its representative form in the south. The close relationship is borne out by the soft parts, which are absolutely identical. I have not seen the glochidia, but they have been described and figured by Lea (Obs., XIII, 1874, p. 73, pl. 21, fig. 13). They much resemble those of *P. alata*, but since Lea does not give the proportions, a closer comparison is impossible.

***Proptera lævissima* (Lea).**

I myself found a young male in the Ohio River, Portsmouth, Scioto Co., Ohio, and received, from R. L. Moodie, four males, and three gravid females from the Kansas River, Lawrence, Douglas Co., Kansas.

Soft parts described by Lea (Obs., X, 1863, p. 425).

Simpson places this species near *L. gracilis*, but the shape of the glochidia (see Plate XX, fig. 2) shows that it belongs to *Proptera*, and is related to *P. alata*. The soft parts, although similar in the genera *Proptera* and *Paraptera*, are more like *Proptera*, because of the shorter mantle-connection between the anal and the supra-anal. The glochidia are of the *Proptera*-type, but they differ distinctly from those of *P. alata* in being considerably smaller, and in having the ventral margin broader and more curved. The difference in shape is well expressed in Lea's figure (Obs., VI, 1858, pl. 5, fig. 24; see also Coker and Surber, 1911, pl. 1, fig. 1) while that of size is not. Length 0.12; height 0.18 mm. (Coker and Surber give length 0.095 mm.; height 0.15 mm.).

Genus MEDIONIDUS Simpson. (1900.)

(Simpson, 1900b, p. 588.)

Shell elongated. Posterior slope plicately or nodulously wrinkled. Beak-sculpture of the double-looped type, indistinct. Epidermis yellowish green, with green rays and blotches. Shell of the female different from that of the male, somewhat swollen just behind the middle of the base.

Inner lamina of inner gills free from abdominal sac, except at anterior end. Inner edge of mantle in front of branchial, with a series of rather distant, thin, but long, papillæ, resembling thick hairs. Marsupium formed by comparatively few ovisacs (six to eight), swollen, kidney-shaped, and occupying only a small part of the outer gill, immediately behind the middle. Ovisacs rounded at the end, projecting beyond the edge of the gill, not very sharply marked off from each other. Placentæ not solid. Glochidia subovate.

Type *M. conradicus* (Lea).

This is a doubtful genus. The description of the marsupium of *M. parvulus* (Lea, Obs., XI, 1867, p. 45) is similar to that of the type-species. In *M. penicillatus*, Lea (Obs., VII, 1860, p. 203) describes the marsupium as larger, but in a foot-note he mentions that in another specimen it was as small as that of *conradicus*. In *M. acutissimus*, the marsupium occupies, according to Lea (Obs., X, 1863, p. 411); the whole length of the gill. Simpson also says in the generic diagnosis, that the marsupium sometimes extends nearly the whole length of the gill. If thus the shape of the marsupium as described above should be inconstant, the most important generic character would be taken away, and *Medionidus* would fall as a synonym under *Eurynia*, with which genus it is indeed closely related in all other respects. Possibly in this case it would be best to make it a subgenus of *Eurynia*, on account of certain other peculiarities, such as the free inner lamina of the inner gills and the shell-sculpture.

***Medionidus conradicus* (Lea).**

A male and a gravid female have been sent me by B. Walker, from the South Fork of the Cumberland River, Burnside, Pulaski Co., Kentucky.

Anal and supra-anal separated by a mantle-connection of medium length. Anal crenulated, branchial papillose. In front of the branchial the edge of the mantle carries in the female distinct, long, slender, hair-like papillæ almost as far forward as the middle of the lower margin. These papillæ are also present in the male, but considerably shorter. Palpi with the posterior margins connected at the base.

Diaphragm and gills of usual shape. Marsupium small, consisting of six to eight indistinctly separated ovisacs, forming an almost globular swelling just behind the middle of the outer gill. Glochidia rather large, subovate, or almost subspatulate. Length 0.22; height 0.28 mm. (see Plate XX, fig. 3).

Color of soft parts whitish. Margin of mantle brown all around, most intensely posteriorly. The edge of the mantle in front of the branchial and the papillæ are black, the black color extending broadly upon the inside of the mantle.

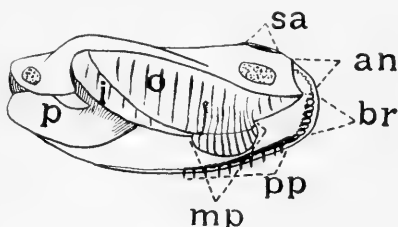


FIG. 22. *Medionidus conradicus* (Lea). Gravid female, from South Fork of Cumberland River, Burnside, Pulaski Co., Ky. (Carn. Mus., No. 61, 4,989.)

Both specimens at hand have a distinct *byssus* (the male is 18 mm., the female 27 mm. long). Compare Lea (Obs., X, 1863, p. 410; and *M. acutissimus*, *ibid.*, p. 411).⁵²

Genus EURYNIA Rafinesque. (1820.)

Simpson, 1900*b*, p. 534 (as subgenus).

Shell subelliptical, often rather elongated. Outside of shell not sculptured. Beak-sculpture of the double-looped type, rarely sub-concentric, often quite obsolete. Epidermis generally yellowish or greenish, with more or less distinct rays, rarely darker and blackish. Shell of the female quite distinct from that of the male, more or less swollen, or expanded in the post-basal region.

Inner lamina of inner gills generally wholly connected with abdominal sac, rarely more or less free. In the female the inner edge of the mantle in front of the branchial has always distinct papillæ, which may be large or small, more or less numerous, and differently arranged. In the male a similar structure is observed, but in a rudimentary condition.

⁵² A byssus-thread is frequently found in young *Unionida*, as observed by various authors and myself. This is undoubtedly a *real* byssus. Whether it is in any way connected with the embryonic "byssus" or larval thread, remains to be ascertained. According to Lillie (1905, pp. 52-54) the latter is not homologous to the byssus of other Lamellibranchiata, and is a larval organ serving originally the function of excretion and secondarily the function of attachment. In *Medionidus*, the byssus seems to be almost regularly present, and to be persistent. In other species (*Nephronajas ligamentina*, *Lampsilis ventricosa*, and others) where I have seen it, it is present only in young specimens. See also Isely (1911, p. 77).

Marsupium kidney-shaped, swollen, formed by many ovisacs, occupying the posterior part of the outer gill. Edge of marsupium blunt, projecting beyond the original edge of the gill, beaded, often pigmented. Placentæ not solid. Glochidia subovate, of medium size, or rather large.

Type *E. recta* (Lamarck).

This genus represents typically that group of the *Lampsilinae*, in which the aëration of the glochidia is regulated by special structures on the edge of the mantle in the shape of papillæ. These papillæ show several distinct types of arrangement, and according to them (together with other characters) subgenera may be distinguished.

1. Subgenus **Carunculina** Simpson, 1898 (see Simpson, 1900*b*, p. 563).

On the edge of the mantle, in front of the branchial, a rather short group of crowded papillæ, resembling a caruncle. Inner lamina of inner gills more or less free from abdominal sac. Beak-sculpture concentric, rather distinct, bars curving up behind and somewhat angular.

Type *E. parva* (Barnes).

The beak-sculpture is so peculiar in these forms that *Carunculina* might be entitled to generic rank.

2. Subgenus **Micromya** Agassiz, 1852 (see Simpson, 1900*b*, p. 524).

On the edge of the mantle in front of the branchial there is a shorter or longer row of rather irregular, larger and smaller papillæ, reaching not quite to the middle of the lower margin. Inner lamina of inner gills connected with abdominal sac, or more or less free. Shell small, or of medium size, subovate, or subelliptical, not very long, and not much pointed behind. Beak-sculpture distinctly sinuated or double-looped, but often obsolete; the posterior loop often showing a tendency to be open.

Type *E. fabalis* (Lea).

Simpson has two species in his genus *Micromya*, *M. fabalis* and *cælata* (Conrad). The anatomy of the latter is unknown. The type-species has a structure essentially identically with a number of species, which stand in Simpson's *Lampsilis*. Since the latter name is used here in another sense, the name *Micromya* becomes available for this assemblage of species.

3. Subgenus **Eurynia** (*sens. strict.*).

On the edge of the mantle in front of the branchial a long row of quite regular, uniform, smaller or larger papillæ, reaching to about the middle of the lower margin. Inner lamina of inner gills connected with abdominal sac, but a small hole at the posterior end of the foot is sometimes left open. Shell of medium size or large, subelliptical, elongated, more or less pointed behind. Beak-sculpture sinuated, or double-looped, the posterior loop often open behind.

Type *E. recta* (Lamarck).

Eurynia (Carunculina) parva (Barnes).

Three gravid females, from the outlet of Conneaut Lake in Crawford Co., Pennsylvania, are at hand.

These specimens were collected on June 17, 1909, and contained only eggs and no glochidia, thus showing that the breeding season must begin unusually early.

The soft parts have been described by Lea (Obs., VII, 1860, p. 221) and a figure is given (pl. 29, fig. 102), which shows the shape of the marsupium and the position of the "caruncle." Other descriptions of the soft parts are those of Call (1895, p. 35) and Simpson (in Baker, 1898, p. 110).

As I have previously stated (Ortmann, 1911*b*, p. 314) a very small supra-anal seems to be present in one of my specimens, while in the others it appears entirely closed. No additional material has come to hand. The anal is finely crenulated, the branchial has papillæ. In front of the branchial, the inner edge of the mantle carries a group of distinct and crowded papillæ of various sizes (see Ortmann, 1911*b*, p. 317) occupying only a short space on the edge of the mantle, which further in front is smooth. Palpi connected at base only.

Diaphragm and gills of usual structure. Inner lamina of inner gills free for more than one-half of the length of the abdominal sac. Marsupium kidney-shaped, occupying about the posterior half of the outer gill, formed (in my specimens) by eleven to sixteen beaded ovisacs, projecting beyond the gill.

Glochidia not observed. They have been figured by Lea (Obs., XIII, 1874, pl. 21, fig. 2), and have the usual subovate shape found in this genus.

Color of soft parts whitish. Anal and branchial with brown and black margins. Group of papillæ brown-black, with a black mark on

its base upon the mantle. My specimens show no pigment at the edge of the marsupium.

Eurynia (Carunculina) texasensis (Lea).

I have only the soft parts of a male, sent by L. S. Frierson from Bayou Pierre, De Soto Parish, Louisiana.

In this species a distinct supra-anal is present, longer than the mantle-connection, which equals the anal. Inner lamina of inner gills free from the abdominal sac for more than half the length of the latter. In front of the branchial there is a group of fine, crowded papillæ, accompanied by a black mark. This structure indicates that the female probably has a "caruncle" similar to that of *E. parva*.

In other respects, there is revealed no appreciable difference from the latter species, but the female is as yet unknown.

Eurynia (Carunculina) paula (Lea).

Eurynia (Carunculina) glans (Lea).

These two species belong here according to Lea's description (Obs., X, 1863, pp. 402 and 405).

Eurynia (Micromya) fabalis (Lea).

Three males and one sterile female from the Ohio drainage of western Pennsylvania have been investigated.

The soft parts have been described by Lea (Obs., X, 1863, p. 423).

Anal and supra-anal are separated by a mantle-connection of moderate length, shorter than the anal. Anal crenulated, branchial with papillæ. In front of the branchial, there are in the female upon the inner edge of the mantle from eight to ten moderately large, subconical papillæ, somewhat distant from each other, extending forward a certain distance, but not to the middle of the lower margin. (See Ortmann, 1911b, p. 317.) They are accompanied by a streak of black pigment. Palpi connected only at base of posterior margins. Inner lamina of inner gills free for one-fourth to one-half of the length of the abdominal sac (differing in this from other species of the subgenus).

Marsupium formed by the posterior part of outer gills (a little less than one half of the length), a very small portion non-marsupial at posterior end. Ovisacs at least seventeen. Charged marsupium and glochidia not seen. Edge of marsupium whitish in my specimen.

In the male, the structure is similar, but the papillæ on the edge of the mantle are very small.

Color of soft parts whitish, edge of mantle brownish black, most intense behind, with a black streak along the base of the papillæ.

Eurynia (Micromya) trabalis (Conrad).

Three complete specimens and the soft parts of nine others from the Cumberland River in Pulaski, Wayne, and Cumberland Cos., Kentucky, have been received from B. Walker; from the same source came five other soft parts from Obey River, Celina, Clay Co., Tennessee. All are gravid females with glochidia.

On the inner edge of the mantle in front of the branchial are ten to fourteen subcylindrical papillæ of medium size, which are distant from each other, subequal, with a few smaller ones between them and in front of them. Inner lamina of inner gills connected with abdominal sac. Marsupium formed by about the posterior half of the outer gill, with an unusually long section non-marsupial at the posterior end. Ovisacs eight to twenty-four. Edge of marsupium broadly and intensely black. Glochidia rather large, subovate. Length 0.22; height 0.27 mm. (see Plate XX, fig. 4).

All other characters are like those of *E. fabalis*.

Eurynia (Micromya) vibex (Conrad).

I have investigated a sterile female of the var. *nigrina* (Lea) from Lake Monroe, Sanford, Orange Co., Florida, collected by O. T. Cruikshank in April, 1907.

On the inner edge of the mantle in front of the branchial there are about ten subcylindrical, subequal papillæ of medium size, rather distant from each other, with a few smaller ones anteriorly and posteriorly to them, not reaching the middle of the lower margin. Marsupium formed by about the posterior half of the outer gill. Ovisacs twenty, with blackish ends. Charged marsupium and glochidia unknown, but the latter have been figured (as of *U. rutilans*) by Lea (Obs., VI, 1858, pl. 5, fig. 4).

In other respects this species is like *E. trabalis*.

Eurynia (Micromya) lienosa (Conrad).

I have three males and three gravid females (with glochidia) from Pearl River, Jackson, Hinds Co., Mississippi, collected by A. A.

Hinkley, Nov. 5, 1910; and two males from the Ouachita River, Arkadelphia, Clark Co., Arkansas, collected by H. E. Wheeler, Feb. 6, 1911.

In front of the branchial there are about ten to twelve cylindrical papillæ of medium and unequal size, the smallest near the branchial, the largest forward. They are slightly distant from each other, and stop suddenly before reaching the middle of the lower margin. Marsupium formed by the posterior half (or more) of the outer gill. Ovisacs fifteen to twenty-two. No black pigment on margin of marsupium. Glochidia rather large, subovate. Length 0.20; height 0.27 mm. (see Plate XX, fig. 5).

In all other respects like *E. trabalis* and *E. vibex*.

Eurynia (Micromya) iris (Lea).

Four males one sterile and six gravid females have been investigated, coming from the Ohio and Lake Erie drainages in western Pennsylvania.

Gravid females have been found in the months of September and May; sterile females in May, June, and July. Thus the breeding season seems to be normal.

The soft parts (of *iris* and *novi-eboraci*) have been described by Lea (Obs., X, 1863, p. 419) and Simpson (in Baker, 1898, p. 106).

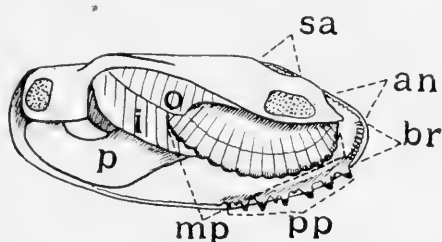


FIG. 23. *Eurynia (Micromya) iris* (Lea). Gravid female from Little Beaver Creek, Enon Valley, Lawrence Co., Pa. (Carn. Mus., No. 61, 2,159.) Coll. May 11, 1907.

In front of the branchial (see Ortmann, 1911*b*, p. 317) there are four to ten large, conical papillæ, which are quite distant from each other, with a few smaller ones between them. They do not reach to the middle of the lower margin. Marsupium formed by the posterior half (or less) of the outer gill, with a very small non-marsupial section at the posterior end. Ovisacs thirteen to twenty-two. Edge of

marsupium with black pigment. Glochidia rather large, suboval (see Lea, Obs., VI, 1858, pl. 5, fig. 14, as *novi-eboraci*, and Ortmann, 1911b, pl. 89, fig. 20). Length 0.22; height 0.28 mm.

In all other respects like the foregoing species. Inner lamina of inner gills entirely connected, but in one case a small hole at posterior end of foot has been observed.

Eurynia (Micromya) vanuxemensis (Lea).

Two gravid females were donated by B. Walker. They are from Shoals Creek, Lauderdale Co., Alabama, and were collected by H. H. Smith on November 3, 1909.

On the inner edge of the mantle in front of the branchial there are ten to fifteen cylindro-conical, rather large papillæ, irregular in size, standing rather close together upon a slightly dilated part of the edge. This part is not very long, but longer than the branchial opening. Farther in front, the dilated part narrows suddenly, and becomes smooth. A rather broad black band accompanies the papillæ. The marsupium occupies one-half or a little more of the outer gills, with a very small non-marsupial section at the posterior end. Ovisacs large, nine to thirteen, their ends marked with brown pigment. Glochidia as usual in this group. Length 0.22; height 0.28 mm. (see Plate XX, fig. 6).

All the rest of the soft parts like those of the preceding species.

Eurynia (Micromya) picta (Lea).

Soft parts of two gravid females from the South Fork of the Cumberland River, Burnside, Pulaski Co., Kentucky, were received from B. Walker.

Upon the edge of the mantle in front of the branchial there are numerous, crowded, irregular, subconical papillæ. The posterior ones, close to the branchial, are small, and increase in size forward, then stop suddenly, and beyond this there are a few very small ones, until finally the edge of the mantle becomes smooth. The papillæ do not reach the middle of the lower margin. Marsupium formed by a little less than half of the outer gill, with a small non-marsupial section behind. Ovisacs ten to fourteen, with black pigment at ends. Glochidia as usual. Length 0.22; height 0.27 mm. (see Plate XX, fig. 7).

All other parts like those in the foregoing species.

Eurynia (Eurynia) nasuta (Say).

Numerous specimens have been investigated, partly from Lake Erie, partly from the Delaware drainage in eastern Pennsylvania and New Jersey.

According to Conner (1907, p. 88) this species breeds all the year round, that is to say, the end of one breeding season overlaps the beginning of the next in midsummer. This refers to the Delaware drainage in eastern Pennsylvania. For this region I have only a few observations (in the months of September and May). From Lake Erie I have specimens with eggs collected at the end of August (beginning the breeding season), and others with glochidia collected in May, June, and as late as July 7. On the latter date specimens in the act of discharging were observed. But there is surely an "interim" in Lake Erie, at least in July, for of all the specimens collected on July 8, 12, 22, and 23, not a single one was gravid, although numerous sterile females were among them.

The soft parts have been described by Lea (Obs., X, 1863, p. 403), but in error the marsupium is said to occupy the whole length of the gill. The papillæ of the edge of the mantle have been described by Ortmann (1911b, p. 317).

The inner edge of the mantle of the female has in front of the branchial a rather regular row of numerous (as many as thirty and more) rather closely set, subequal papillæ, which are rather small, subconical, and run forward to almost the middle of the ventral margin, where they disappear gradually and pass into the smooth anterior part of the edge. This row is not accompanied by a distinct black band, but there is brownish pigment in this region. Marsupium formed by over half (up to three-fourths) of the outer gills, with a very small non-marsupial section behind. Ovisacs fifteen to forty, their ends having no black pigment. Glochidia (Lea, Obs., XIII, 1874, pl. 21, fig. 2), similar in shape to those of the preceding species, rather large. Length 0.25; height 0.29 mm. (see Plate XX, fig. 8).

Mantle-connection between anal and supra-anal rather long, longer than the anal. Inner lamina of the inner gills connected with the abdominal sac, often with a small hole at the posterior end of the foot. Posterior margins of palpi connected only at base.

Eurynia (Eurynia) subrostrata (Say).

According to Lea's description (Obs., X, 1863, p. 439, glochidia XIII, 1874, pl. 21, fig. 1, as *nashvillensis*), and, relying principally upon the figure given by Lefevre and Curtis (1910, pl. 1, fig. 2), this species belongs here.

Eurynia (Eurynia) recta (Lamarck).

Numerous specimens from the Ohio drainage and Lake Erie in western Pennsylvania, from Ohio and Arkansas have been investigated.

Bradyctic. The breeding season begins about the middle of August, and ends unusually late, in July (latest date July 23). Specimens with fully developed glochidia have repeatedly been found in

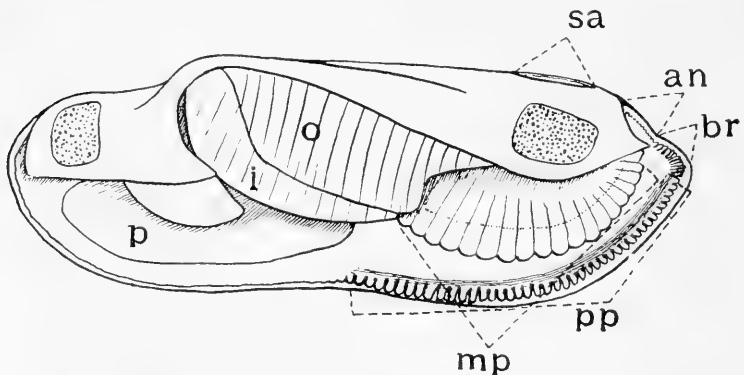


FIG. 24. *Eurynia (Eurynia) recta* (Lamarck). Gravid female, from Lake Erie, Cedar Point, Erie Co., O. (Carn. Mus., No. 61, 4,458.) Coll. August, 1909, by Chas. Brookover.

July, and for specimens with eggs the earliest date is August 13. Although there is apparently an interim of a few weeks, the seasons come very near to overlapping. But for single individuals there is very likely a longer interval between the breeding seasons, for sterile females are very frequent in August and September, and the majority do not become gravid till October. I cannot detect any difference in this matter in Lake Erie. At any rate, the beginning and end of the breeding season are not later than in the Ohio, in fact the latest date for the end (July 23) is from the Ohio drainage.

The soft parts have been discussed by Lea (Obs., X, 1863, p. 426)

and Simpson (in Baker, 1898, p. 102), and a figure of them has been published by Lefevre and Curtis (1910, pl. 1, fig. 5).

The inner edge of the mantle of the female in front of the branchial has (see Ortmann, 1911*b*, p. 318) a row of regular, rather crowded, subequal papillæ, which are large and conical, and run forward to about the middle of the ventral margin, where they disappear suddenly. The anterior part of the inner edge is smooth. The papillæ increase somewhat in size from the branchial forward, and the largest papillæ stand near the anterior end of the row. A distinct brownish black streak accompanies this row, and the papillæ have the same color at their bases, while they are whitish at their tips.

Marsupium occupying less than the half of the posterior section of the outer gill, with a very small non-marsupial section behind. Ovisacs fifteen to thirty, without black pigment at their ends. Glochidia (Lea, Obs., VI, 1858, pl. 5, fig. 11; Lefevre and Curtis, 1910, p. 97, fig. L; Ortmann, 1911*b*, pl. 89, fig. 21) as in the preceding species; I have found their length to be 0.22; height 0.28 mm.; while Lefevre and Curtis give length 0.20; height 0.24 mm.

In other respects like the last species, but inner lamina of inner gills always entirely connected, and mantle-connection between anal and supra-anal shorter than anal.

Genus LAMPSILIS Rafinesque. (1820.)

(Simpson, 1900*b*, p. 526 (restricted).)

Shell ovate to elliptical, or elongated. Outside of shell not sculptured. Beak-sculpture of the sinuated or double-looped type, finer or coarser, sometimes the posterior loop open behind, or the sculpture is obsolete. Epidermis generally yellowish or greenish, mostly rayed, often very beautifully so. Female shell quite distinct from that of the male, with a strong inflation and dilatation in the post-basal region, producing a distinct posterior truncation of the shell.

Inner lamina of inner gills entirely connected with abdominal sac, but sometimes a small hole is left at the posterior end of the foot. In the female, the edge of the mantle in front of the branchial is developed into a ribbon-like flap, generally produced anteriorly into a free, projecting lobe, which has a lacerated appearance. Along the edge of the flap, there may or may not be crenulations or teeth, but never real papillæ. On the inside, the flap is beautifully colored,

generally with a black streak, and often has a peculiar eye-spot at the posterior end, close to the branchial. In the male a similar structure is found in a rudimentary condition.

Marsupium kidney-shaped, swollen, formed by many ovisacs, occupying the posterior part of the outer gill. Edge of marsupium blunt, beaded, generally pigmented. Placentæ not solid. Glochidia subovate, rather large.

Type *L. ovata* (Say).

In the specialization of the edge of the mantle in front of the branchial this genus represents the highest type of *Lampsilinae*.

Lampsilis anodontoides (Lea).

I have one male and two gravid females from the Colorado and Rio Grande Rivers in Texas (D. A. Atkinson coll. May, 1907); five specimens (males and females) from Kansas River, Lawrence, Douglas Co., Kansas (R. L. Moodie); one young male and one gravid female from Ouachita River, Arkadelphia, Clark Co., Arkansas (H. E. Wheeler, coll. Feb. 6, 1911).

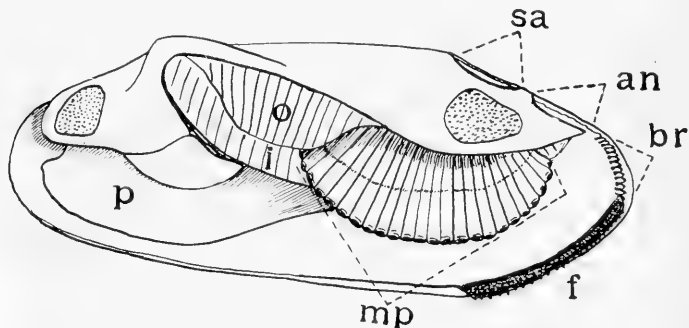


FIG. 25. *Lampsilis anodontoides* (Lea). Gravid female, from Rio Grande, Mercedes, Hidalgo Co., Tex. (Carn. Mus., No. 61, 2, 155.)

The gravid females all have glochidia, and show that the species is bradyctictic, carrying the larvæ over the winter.

The soft parts have been described by Lea (Obs., X, 1863, p. 406) and Simpson (in Baker, 1898, p. 101).

Mantle-connection between anal and supra-anal of medium length, shorter than the anal. Anal crenulated, branchial with papillæ. In front of the branchial the inner edge is in the female lamellar and dilated, forming a ribbon-like expansion, which is (in alcoholic speci-

mens) either merely suddenly truncated in front, or forms a small free lobe, variable in my more or less contracted specimens. Along its edge this expansion is crenulated, but has no papillæ, and the whole inner side of this flap is of a brownish black color, sometimes a distinctly brown streak between two black streaks is seen. No eye-spot has been observed. The flap extends over about one-third of the lower margin, and farther in front the inner edge of the mantle is smooth.

Posterior margins of palpi connected for about one-fourth of their length. Gills and diaphragm of usual shape and structure. Inner lamina of inner gills connected with abdominal sac.

Marsupium kidney-shaped, occupying about the posterior half of the outer gill, composed of numerous (about thirty) ovisacs. Margin of marsupium with blackish pigment. A very small section of the gill posteriorly is non-marsupial. Glochidia (Lea, Obs., VI, 1858, pl. 5, fig. 2) rather large, subovate. Length 0.20; height 0.26 mm. (see Plate XX, fig. 9).

Color of soft parts whitish, with little brown on the edge of the mantle, and the markings on the flap and the marsupium as described above.

According to the shape of the shell, this species was always supposed to be closely related to *Eurynia recta*, but I doubt whether there is actually a close relationship between these two species. The mantle-flap of *L. anodontoides* is entirely different from the papillæ of *E. recta*. However, in *L. anodontoides* the mantle-flap has not yet attained the typical development of the genus, and the anterior free end is in particular rather indistinct. Probably it is the most primitive form of *Lampsilis* and connects this genus with more *Eurynia*-like ancestors, but it cannot be placed in *Eurynia* on account of the lack of papillæ on the edge of the mantle.

***Lampsilis fallaciosa* Smith.**

I have not seen the soft parts of this form, but I doubt very much whether it is specifically distinct from *L. anodontoides*. Among my specimens from Kansas River, there are some, to which this name might be applied. Among other material likewise in the Carnegie Museum I cannot sharply distinguish these two forms.

Simpson (1900a, p. 75) says: "in *L. fallaciosa* there is a horny, brown, raised streak on the inside of the mantle behind, that I do not find in *anodontoides*." This "streak," however, is also present in

anodontoides (my specimens from Texas are typical and undoubted *anodontoides*), and it is not at all "horny," and corresponds to the flap described above.

***Lampsilis luteola* (Lamarck).**

Many specimens from the Lake Erie and Ohio drainages in western Pennsylvania, and also from Kansas and Arkansas, have been investigated.

Bradytictic, and may be found gravid practically all the year round. The breeding season begins at the beginning of August, and ends in July, and may overlap with the next toward the end of July. But in July there is an indication of an interim, gravid specimens being quite rare. In the Ohio drainage, the females have generally discharged their glochidia by the beginning of July, and only single belated individuals are met with later. In Lake Erie, discharging females were found more frequently in July, as late as July 12. No gravid females have ever been found between July 12 and August 4 by myself.

The soft parts have been described by Lea (*Obs.*, X, 1863, p. 402) and Simpson (in Baker, 1898, p. 104).

Mantle-connection between anal and supra-anal of medium length, shorter than anal. Anal crenulated, branchial with papillæ. In front of branchial the female has on the inner edge of the mantle a typically developed flap (see Ortmann, 1911*b*, p. 321). It has the shape of a ribbon-like keel, with irregular, rather distant teeth, but no papillæ,⁵³ and its anterior end projects considerably, even when contracted, and has great powers of expansion. The marginal teeth are largest at the free lobe, which appears lacerated. There are a number of irregular teeth on the edge of the mantle in front of the lobe, but soon the edge becomes smooth. On the inner side of the flap there is a broad streak of black pigment. Eye-spot (in alcoholic material) indistinct. The flap extends over about one-third of the lower margin.

Posterior margins of palpi connected for about one-fourth of their length. Gills and diaphragm normal. Inner lamina of inner gills entirely connected, rarely a very small hole remaining at the posterior end of the foot.

Marsupium kidney-shaped, occupying about the posterior half of

⁵³ When strongly contracted by the action of alcohol, the teeth become thicker, and appear like papillæ, but when expanded, they are flat (not sub-cylindrical).

the outer gill, with a very small posterior non-marsupial section. Ovisacs numerous, fifteen to forty, or more. Margin of marsupium with black pigment. Glochidia (Lea, Obs., VI, 1858, pl. 5, fig. 10) rather large, suboval. Length 0.23; height 0.28 mm.

Color of soft parts whitish, foot more yellowish, gills white to brownish. Margin of mantle blackish posteriorly. Color of flap and marsupium as mentioned above.

Lampsilis radiata (Gmelin).

I have not seen more than half a dozen specimens, and among them only one gravid female with eggs, but no glochidia (August 22). They were all from the Susquehanna drainage in Pennsylvania.

According to Conner (1907, p. 88, and 1909, p. 112) this species breeds "all the year round," but the conditions probably will prove to be the same as in *L. luteola*. The beginning of the breeding period is indicated by my specimen.

The soft parts agree in all essential respects with those of *L. luteola*. They have been figured by Lea (Obs., II, 1838, pl. 15, fig. 48 and 49), but fig. 48 does not represent the typical shape of the flap.

The glochidia have been figured by Lea (Obs., VI, 1858, pl. 5, fig. 20).

Lampsilis claibornensis (Lea).

Two males and two gravid females, Pearl River, Jackson, Hinds Co., Mississippi, A. A. Hinkley coll., Nov. 4, 1910.

Soft parts absolutely identical with those of *L. luteola*. Glochidia: length 0.21; height 0.27 mm.

The glochidia have been figured by Lea as *obtusus* (Obs., VI, 1858, pl. 5, fig. 1), and as *claibornensis* (Obs., XIII, 1874, pl. 21, fig. 9). The same author (Obs., X, 1863, p. 406) says of *obtusus* (= *claibornensis*) that it "has large dark papillæ below the branchial opening." This is not so in my specimens, which have the typical *luteola*-flap. Lea's description of *claibornensis* (*ibid.*, p. 436) is better.

Lampsilis hydiana (Lea).

Three gravid females, Bayou Pierre, De Soto Parish, Louisiana. L. S. Frierson coll., August 6, 1910.

One of these has eggs, indicating the beginning of the breeding season; the other two have glochidia, and one of these has the marsupium only partly charged, possibly discharged in part. This

apparently indicates the over-lapping of the seasons in this species also.

The description of the soft parts given by Lea (Obs., XIII, 1874, p. 72) is very incomplete. But judging from the specimens before me they are absolutely identical with those of *L. luteola*. Glochidia: length 0.21; height 0.27 mm. (see Plate XX, fig. 10).

***Lampsilis ovata* (Say).**

The soft parts of about half a dozen specimens have been preserved, but many more have been examined in the field. They were all from the Ohio drainage in Pennsylvania.

Gravid females have been found in August, September, and October. Lea (Obs., X, 1863, p. 435) describes the soft parts.

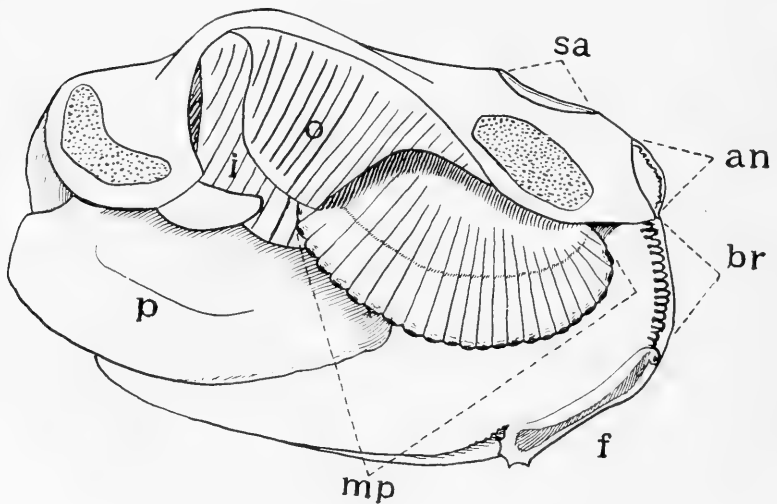


FIG. 26. *Lampsilis ovata* (Say). Gravid female, from Allegheny River, Kelly, Armstrong Co., Pa. (Carn. Mus., No. 61, 2,997.) Coll. Sept. 27, 1907.

The flap in front of the branchial opening is greatly developed. When contracted, it has only a rounded, toothed lobe at the anterior end. But when expanded (see figure of *L. ventricosa*, Ortmann, 1911b, p. 320, fig. 8) it is much longer. The edge of the lamellar expansion is practically smooth, but the free lobe has irregular teeth. An eye-spot is present at the posterior end, but this is indistinct in the contracted condition. Anterior to the free lobe the inner edge of the mantle is slightly crenulated, and then smooth.

Mantle-connection, anal, branchial, and gills like those of *L. luteola*. Inner lamina of inner gills entirely connected, or with a small hole at posterior end of foot. Posterior margins of palpi connected for one-third, or slightly more, of their length.

Marsupium occupying the posterior half (more or less) of the outer gill, greatly swollen, kidney-shaped, with pigment on margin. Ovisacs numerous, up to thirty or more. Glochidia (figured by Lea, Obs., VI, 1858, pl. 5, fig. 15)⁵⁴ large, subovate; length 0.24, height 0.28 mm.

Color of soft parts like that of *L. ventricosa*, generally paler, with the orange tints prevailing on the margin of the mantle and flap. Black line on inside of flap sometimes wanting.

Lampsilis ventricosa (Barnes).

Numerous specimens have been investigated from western Pennsylvania, and a gravid female from Hurricane Creek, Gurley, Madison Co., Alabama (H. E. Wheeler coll., Sept. 13, 1910).

Bradyctictic; the breeding season commencing at the beginning of August, and ending in July, so that the species is gravid "all the year round," with the seasons possibly slightly overlapping in July. But the majority of the females discharge their glochidia in May and June, and in July only a few belated ones are found. The Lake Erie form (*canadensis* Lea) has about the same breeding season, but gravid females were not found in July.

The soft parts have been described (as *occidens*) by Lea (Obs., X, 1863, p. 418), and Simpson (in Baker, 1898, p. 95). The flap of the mantle has been figured rather well by Lea (Obs., VII, 1860, pl. 30, fig. 107) and by Ortmann (1911b, pp. 319 and 320, figs. 7 and 8). The anatomy is in every respect like that of *L. ovata*, of which this is probably only a variety.

Color grayish white, gills pale brownish, foot pale yellow or brown. Marsupium white, with black edge. Margin of the mantle mottled black and brown, the brown often shading to orange. Mantle-flap gray on outside, inside pale orange or brownish, with a black longitudinal line, and an eye-spot (black in white field) at posterior end.

⁵⁴ Here again a mistake occurs in Lea's figures. In fig. 13 of the same plate he figures the glochidium of *occidens* (= *L. ventricosa*), and the latter is considerably larger than that of *L. ovata*. The fact is, however, that the glochidia of these two forms are practically indistinguishable in size and shape, and the slight differences in our measurements may easily be regarded as matters of personal equation in the case of the observer.

Glochidia (Lea, Obs., VI, 1858, pl. 5, fig. 13, as *occidens*, and Ortman, 1911b, pl. 89, fig. 23): length 0.25; height 0.29 mm.

Lampsilis excavata (Lea).

Two males, Pearl River, Jackson, Hinds Co., Mississippi (A. A. Hinkley).

Structure of soft parts as in the foregoing species. Since no females are at hand, the shape of the mantle-flap, the marsupium, and glochidia could not be ascertained, but the latter have been figured by Lea (Obs., XIII, 1874, pl. 21, fig. 6). My two males have a rudimentary mantle-flap, consisting of a narrow lamellar keel, with a black streak on the inside, ending anteriorly in a short, angular projection. This is similar to the males of *L. ovata* and *ventricosa*. The posterior margins of the palpi are united for from one-third to one-half of their length.

This form undoubtedly falls into the same group with the foregoing species.

Lampsilis multiradiata (Lea).

Six males and six females (three gravid) are at hand, from the Ohio drainage of western Pennsylvania.

Breeding season probably as in the preceding species; in fact I have found gravid females in May, June, July, August, September, and October. Discharging females were found as late as August 9.

Females with eggs were secured in the beginning of September. Thus it seems that the seasons overlap later than in *L. luteola* and *ventricosa*, in August.

Soft parts (described by Lea, Obs., X, 1863, p. 426, and Simpson, in Baker, 1898, p. 96) absolutely identical with those of *L. ovata* and *ventricosa*, only there are a number of teeth along the edge of the flap. Colors also similar, but the orange on the margin of the mantle and flap prevalently very bright. Glochidia (Lea, Obs., VI, 1858, pl. 5, fig. 17): length 0.25; height 0.29 mm.

Lampsilis cariosa (Say).

Four males and four females (two gravid) from the Susquehanna and Delaware drainages in eastern Pennsylvania. Many more investigated in the field.

The breeding season begins in the first half of August. In 1910, I was unable to find any gravid females on August 7, in the Susque-

hanna at York Haven, while on August 14, at Selinsgrove, they were frequent, but had only eggs. Conner's notes (1909, p. 112) are unreliable, for he has confounded this species with *L. ochracea*, as I discovered from specimens he sent to me. He gives for *ochracea* (which would be this species) that it is gravid in April, May, and June. My observations are incomplete, but there seems to be an interim at least at the beginning of August. Perhaps the conditions are similar to those in the allied species.

Lea's figure (Obs., II, 1838, pl. 15, fig. 45) of the soft parts is entirely useless, but the soft parts agree fully with the preceding species. The color is much like *L. ventricosa*, but the margin of the mantle and inner side of the flap are generally of a beautiful chestnut tint. Black line on flap sometimes wanting.

I have only one specimen with glochidia, and even in this they are too young to be correctly measured. But they seem to have the general shape and size of those of the foregoing species.

***Lampsilis orbiculata* (Hildreth).**

Three females, two of them gravid, from the Ohio River in Beaver Co., Pennsylvania, have been examined.

This species was found gravid with eggs in August (10 and 24), and with glochidia in September, and thus the beginning of the season agrees with that of the other species of this genus.

Although this species is placed by Simpson close to *L. ligamentina*, it is not at all related to the latter, which is a *Nephronajas*, while this is a true *Lampsilis*, as is shown by the presence of a typical flap (Ortmann, 1911b, p. 321). This flap has numerous teeth along its edge, and projects at the anterior end in a free lobe. It also has black pigment on the inside. An eye-spot has not been seen, but this may be obscured on account of the contracted condition of my specimens.

All the rest of the soft parts are like those of the foregoing species. The glochidia (Ortmann, 1911b, pl. 89, fig. 22) are peculiar in so far that I have on my slides two sizes of them. The smaller is more frequent, length 0.19; height 0.21 mm., and among them are rather rarely larger ones, length 0.20; height 0.25 mm. No intergrades seem to be present. It is not entirely impossible that by some accident in making the slide, the glochidia of another species have become mixed with this one, but this is not very likely. There are no glochidia having the dimensions of the larger ones, except those of *L. anodontoides*.

Genus TRUNCILLA Rafinesque. (1819.)

Simpson, 1900b, p. 516.

Shell subovate, inflated, often subtriangular, and with a strong posterior ridge or radiating furrow. Outside of shell not sculptured or only with low tubercles. Beak-sculpture delicate, often obsolete, double-looped. Epidermis yellowish greenish, rayed, rays often broken. Shell of the female very distinct from that of the male, with a strong inflation or projection in the post-basal region, which changes the outline of the shell considerably, very often giving the latter odd shapes. In the region of this inflation, the shell often becomes horny, or its margin is toothed.

Inner lamina of inner gills entirely connected with abdominal sac. In the female, the inner edge of the mantle in front of the branchial is not parallel to the outer edge, but is more or less remote from it, often quite distant, and it has finer or coarser papillæ. Toward the middle of the lower margin, the two edges again approach each other, and are normal farther forward. The mantle between the two edges is peculiarly spongy. Thus an inner compartment is formed in front of the branchial opening. In the male, the two edges of the mantle do not have this structure, or it is only merely indicated.

Marsupium swollen, kidney-shaped, formed by many ovisacs, occupying the posterior section of the outer gill. Edge of marsupium blunt, beaded, but not pigmented. Placentæ not solid. Glochidia differing from those of *Eurynia* and *Lampsilis*, being of medium size, almost semicircular, and about as long as high.

Type *T. triquetra* Rafinesque.

The peculiar compartment formed inside in front of the branchial certainly is connected with the care of the glochidia, and possibly is to be regarded as something like a water-reservoir. This is the most highly specialized type of the *Lampsilinæ*, but it is a side branch, probably not descended from *Eurynia*- or *Lampsilis*-like forms, but from a more primitive type. The development of the inner compartment has influenced the shape of the female shell greatly and has, so to speak, deformed it, and in this genus we have represented the greatest dimorphism between the shells of the male and the female, which occurs.

Walker (1910c) recently has given a synopsis of the species of the genus, and divides, them, according to the shell, into three groups:

(1) those with the entire post-basal area occupied by the marsupial expansion; (2) those with the marsupial expansion restricted to the posterior ridge; (3) those with the marsupial expansion in front of the posterior ridge. These divisions undoubtedly are natural, and Walker thinks that the first represents the most primitive condition,⁵⁵ from which the other two are to be derived.

Having regard to the shell only, this view is quite plausible, but in studying the structure of the soft parts, it becomes evident, that it is scarcely tenable. Although I have seen comparatively few species, it is certain that the simplest structure is found in *T. triquetra*, which represents the second group of Walker. In this species the typical features of the genus are barely indicated. From this form we can imagine that the other two have been derived, and have descended in apparently two parallel lines; in the one (represented by *T. haysiana* in our material), the marsupial swelling advances forward from the posterior ridge, in the other (represented by *rangiana*, *florentina* and *capsaformis*) it becomes greatly enlarged, and often corneous. In the latter forms, the inner compartment of the soft parts is most capacious, and developed to its greatest extent, and consequently these must be the most advanced types within the genus. (Possibly, however, some of the third type may be as highly specialized, but in another direction.)

***Truncilla triquetra* Rafinesque.**

Twelve males, two sterile, and seven gravid females are at hand, from the Ohio drainage in western Pennsylvania.

The gravid females were found in September and October, but further details as to the breeding season are not known.

The soft parts have been described by Lea (Obs., X, 1863, p. 420). (See also Ortmann 1911b, p. 321.)

Anal and supra-anal separated by a mantle-connection of medium length, but shorter than the anal. Anal with fine crenulations, branchial with papillæ, which stand somewhat remote from the outer edge. The latter is, corresponding to the teeth on the margin of the shell, toothed or scalloped. In the female, the inner edge of the

⁵⁵ He compares the general shape of the shell with the female of *Lampsilis*, and thinks that it is closely allied to it. I rather believe, that the roots of *Truncilla* are to be sought in forms which stood between *Amygdalonajas* and *Eurynia*. Some characters of the shell resemble strongly those of *Amygdalonajas*.

mantle in front of the branchial is also somewhat distant from the toothed outer edge, and bears four to ten, rather distant, subconical, small papillæ, which are smaller than the papillæ of the branchial, and decrease in size forward. Along this part of the edge runs a black streak, and the papillæ also are black or brown. The space between the two edges is blackish-brown, lighter toward the outer edge. Before the middle of the lower margin is reached, the two edges approach each other, and thence forward are normal, the inner one smooth. In the male, the two edges are subparallel and close together, as is normal, and there are only a few small papillæ in front of the branchial.

Posterior margins of palpi connected at base only. Gills and diaphragm of normal structure. Inner lamina of inner gills entirely connected with abdominal sac.

Marsupium formed by over half of the posterior part of the outer gill, with hardly any non-marsupial part behind, greatly swollen,

kidney-shaped, higher in front than behind, and slightly deformed to suit the shape of the shell, presenting a broad face outwardly and downwardly, and having a blunt edge toward the median line of the animal, where the two marsupia come into contact. Margin of marsupium without pigment. Ovisacs numerous, thirty to forty. Glochidium of medium size, almost semicircular; length and height 0.21 mm. (See Ortmann, 1911*b*, pl. 89, fig. 24; Lea's figure, *Obs.*, VI, 1858, pl. 5, fig. 19, is not correct.)

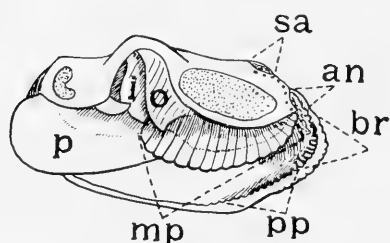


FIG. 27. *Truncilla triquetra* Rafinesque. Gravid female, from Allegheny River, Aladdin, Armstrong Co., Pa. (Carn. Mus., No. 61, 3,358.) Coll. Sept. 18, 1908.

Color of soft parts whitish. Margin of the mantle with black spots in the posterior parts, black inside of the branchial opening, and with black streak in front of the latter, farther in front brown.

The characteristic structure of the inner edge of the mantle is very poorly developed in this species, and if it were not for the other species, its significance would hardly be realized. Nevertheless, according to shell characters, this is a true *Truncilla* (being besides the type).

Truncilla haysiana (Lea).

Four males, one sterile, and one gravid female have been received from B. Walker, they are from the Cumberland River in Kentucky.

Agrees in every particular with *T. triquetra*, with exception of the inner edge of the mantle in front of the branchial in the female. Here the papillæ of the branchial are not markedly distant from the outer edge, but in front of them the inner and outer edges of the mantle diverge considerably, both describing a short curve in opposite directions, coming together again before they reach the middle of the ventral margin. They enclose a lanceolate or broadly ovate space of spongy structure and black-brown in color. The inner edge has four to six distinct papillæ in its anterior part, which are brown. Back of them, toward the branchial, lies upon the edge a very remarkable, pure white caruncle, which, in the alcoholic material at hand, is rounded, without distinct shape or structure except a few crenulations. Inside of the inner edge runs a black streak. The color of the mantle around the branchial papillæ and forward along the edge is dark black and brown, and thus the caruncle is sharply marked off by its color. Anteriorly the margin of the mantle is brown, and in the region of the anal and supra-anal it is spotted with brown. In the male the two edges of the mantle are very little distant from each other, the inner has small papillæ, one of which is pure white, but is much smaller than the corresponding caruncle of the female.

Marsupium more regularly kidney-shaped, than in *T. triquetra*. Glochidia similar, but larger; length 0.24; height 0.23 mm. (see Plate XX, fig. 11).

Truncilla penita (Conrad).

This species, which, according to Walker (1910c, p. 77), belongs to the *triquetra*-group, has been described by Lea (Obs., X, 1863, p. 440). It has below the branchial "a small white fleshy mass . . . of a sub-sigmoid form, rounded at the bottom, and pointed at the top, and furnished with some crenulations in the middle." There is no doubt that this mass is similar and homologous to the white caruncle described above in *T. haysiana*. I have not seen anything like it in *T. triquetra*. But the presence of this organ, the function of which is unknown to me, serves to connect more closely the two groups to which *T. triquetra* and *haysiana* belong.

***Truncilla rangiana* (Lea).**

Six males, four sterile and four gravid females, from the upper Allegheny River drainage in Pennsylvania, are at hand.

The gravid females, with eggs and glochidia, were found in September.

This form is generally regarded as a variety of *T. perplexa*, but Walker (1910c) separates it as a species. All specimens examined by me are true *rangiana*, but they do not agree with the characters given in Walker's key (*l. c.*, p. 80), since the color and texture of the marsupial expansion is, in old females, quite different from the rest of the shell, being horny and lacking in lime. In young females, this is not the case.

As to the soft parts, see Ortmann (1911b, p. 322), and also those of *perplexa*, described by Lea (Obs., X, 1863, p. 420).

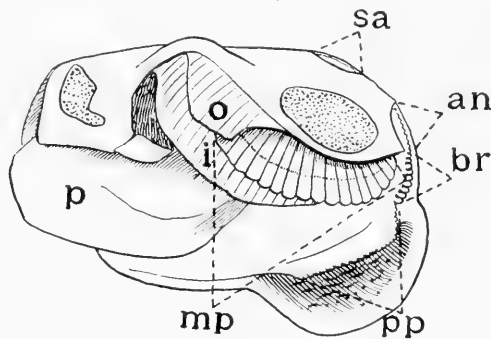


FIG. 28. *Truncilla rangiana* (Lea). Gravid female, from French Creek, Cochran-ton, Crawford Co., Pa. (Carn. Mus., No. 61, 3,363.) Coll. Sept. 2, 1908.

Anal, supra-anal, palpi, structure of gills, and marsupium generally as in *T. triquetra*. The marsupium is greatly swollen, rather low and long, not so much deformed. Glochidia (figured as of *perplexa* by Lea, Obs., VI, 1858, pl. 5, fig. 21) are also similar; length 0.26; height 0.23 mm., but my measurements are not very accurate, since all the glochidia I have are very young and delicate.

In the female, the two edges of the mantle diverge greatly in front of the branchial, the outer one curving outward, and forming a great, almost semicircular lobe, with a smooth edge; while the inner one runs almost straight downward and forward; the two edges coming together

again at about the middle of the lower margin. The inner edge has crowded, very fine papillæ, which decrease anteriorly, and the anterior part of the edge is smooth. The space between the two edges is of a peculiar spongy structure, full of what appear as finely rounded or elongated pores.

In the male the two edges of the mantle are subparallel and close together, as usual, and the inner one has very minute papillæ.

The color of the soft parts is generally whitish or yellowish white. Outer edge of mantle grayish posteriorly, in the region of the anal and supra-anal blackish, not spotted. Papillæ of branchial brown, but this color does not run forward along the inner edge, and the inner edge itself and the spongy space between the two edges is snow-white.

***Truncilla florentina* (Lea).**

One gravid female has been received from B. Walker. It is from Shoals Creek, Lauderdale Co., Alabama, collected Nov. 2, 1909, by H. H. Smith.

Soft parts practically identical with those of *T. rangiana*, but the color of the margin of the mantle is different. Here both edges of the mantle are black-brown all around, and the space between the two edges is deep black. There is also in this region a deep black streak on the inside of the inner edge. The outer edge is slightly scalloped, corresponding to the dentate margin of the shell. In the specimen at hand, the spongy space is covered with numerous low granules, which I do not see in *T. rangiana*.

Glochidia like those of the other species; length 0.23; height 0.22 mm. (see Plate XX, fig. 12).

In this species also the post-basal expansion is somewhat different in texture from the rest of the shell, contrary to Walker's statement. It resembles very closely the structure seen in *T. capsæformis*.

***Truncilla capsæformis* (Lea).**

One male and one sterile female, received from B. Walker, from the South Fork of Cumberland River, Burnside, Pulaski Co., Kentucky, are at hand.

Soft parts essentially those of *T. rangiana* and *florentina*, and in color agreeing with those of *T. florentina*, although the streak of pigment on the inside of the inner edge of the mantle is absent. There are also low granules upon the spongy space, but they are finer

than in *T. florentina*. The inner edge scarcely shows papillæ, but this may be due to lack of development or to the state of preservation of the specimens. The outer edge is slightly wavy, but has no teeth.

Charged marsupium not observed, but the marsupium is indicated in the sterile female by a series of white beads along the posterior half of the edge of the outer gill.

In the male the two edges of the mantle are subparallel and only slightly distant from each other, and posteriorly the color of the margin of the mantle consists of black spots, which are hardly noticeable in the female.

There remains the Family *Mutelidæ*, with its two subfamilies (see above, p. 225) to be treated. My studies on these have been previously published (Ortmann, 1911a), and are yet rather incomplete. Since I have not investigated additional material, I cannot add anything to these preliminary results, and do not need to repeat them here. But my next undertaking will be to study the South American material of this family belonging to the Carnegie Museum, and these investigations will be published in due time.

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EXPLANATION OF PLATE XVIII.

Anatomy of Najades: sections of gills.

Photographed with Bausch & Lomb Objective, 32 mm.

FIG. 1. *Quadrula lachrymosa* (Lea). Sterile female.—Ohio River, St. Marys, Pleasants Co., W. Va., coll. Sept. 20, 1910.—Carn. Mus., No. 61, 4,541. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing marsupial structure in both gills.

FIG. 2. *Pleurobema riddelli* (Lea). Sterile female.—Pearl River, Jackson, Hinds Co., Miss., A. A. Hinkley coll., Nov. 5, 1910.—Carn. Mus., No. 61, 4,963. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing marsupial structure only in outer gill.

FIG. 3. *Unio pictorum* (Linnaeus). Male—Moschinska River, Prov. Posen, Germany, W. Israël don.—Carn. Mus., No. 61, 4,938. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing gill structure of the male.

FIG. 4. *Unio pictorum* (Linnaeus). Sterile female.—Lake Storkow, Prov. Brandenburg, Germany, W. Israël don.—Carn. Mus., No. 61, 4,939. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing marsupial structure in outer gill only.

FIG. 5. *Unio crassus consentaneus* (Rossmässler). Sterile female.—Danube River, Buda-Pest, Hungary, W. Israël don.—Carn. Mus., No. 61, 4,996. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing marsupial structure in the outer gill only. (This section is more toward the base of the gills than in Fig. 4.)

FIG. 6. *Arcidens confragosus* (Say). Sterile female.—Bayou Pierre, De Soto Par., La., L. S. Frierson coll.—Carn. Mus., No. 61, 4,701. Horizontal cross section through left outer gill, showing marsupial structure of the sterile female, with indications of the places of the lateral water-tubes.

FIG. 7. *Anodonta cygnea* (Linnaeus). Sterile female.—Obra South Canal, Sepno, Prov. Posen, Germany, W. Israël don.—Carn. Mus., No. 51, 4,956. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing marsupial structure of the sterile female in the outer gill.

FIG. 8. *Anodonta cygnea* (Linnaeus). Gravid female.—Mogelnitz River, Prov. Posen, Germany, W. Israël don.—Carn. Mus., No. 61, 4,953. Horizontal cross section through left outer gill (marsupium), being partially filled with ova, and showing the beginning of the formation of the lateral water-tubes by folds arising from the septa.

FIG. 9. *Anodonta complanata* Rossmässler. Gravid female.—Woernitz River, Dinkelsbuehl, Bavaria, Germany, W. Israël don.—Carn. Mus., No. 61, 4,958. Horizontal cross section through left inner (*i*) and outer (*o*) gill, showing character of the marsupium in the outer gill, charged with glochidia. The lateral water-tubes are somewhat irregular in this specimen, the marsupium being only partly filled.

FIG. 10. *Obliquaria reflexa* Rafinesque. Gravid female, partly discharged.—Bayou Pierre, De Soto Par., La., L. S. Frierson coll. Aug. 6, 1910.—Carn. Mus., No. 61, 4,755. Vertical cross section through a discharged ovisac of the right marsupium, showing opening at its distal end.

FIG. 11. *Dromus dromas* (Lea). Gravid female.—Cumberland River, Rowena, Russell Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,969. Horizontal cross section through marsupial part of left outer gill, showing arrangement of the placenta and the glochidia.

EXPLANATION OF PLATE XIX.

Glochidia of Najades.

Photographed with Bausch & Lomb Objective, $\frac{3}{8}$ inch.

FIG. 1. *Elliptio complanatus* (Dillwyn).—Meniolagomeka Creek, Smith Gap, Monroe Co., Pa., coll. June 14, 1910.—Carn. Mus., No. 61, 4,631.

FIG. 2. *Anodonta cygnea* (Linnaeus).—Moschinska River, Prov. Posen, Germany, W. Israël don.—Carn. Mus., No. 61, 4,954.

FIG. 3. *Anodonta complanata* Rossmæssler.—Danube River, Buda-Pest, Hungary, W. Israël don.—Carn. Mus., No. 61, 4,999.

FIG. 4. *Alasmidonta minor* (Lea).—Cumberland River, Pineville, Bell Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,977.

FIG. 5. *Ptychobranthus sublentus* (Say).—Cumberland River, Burnside, Pulaski Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,971.

FIG. 6. *Cyprogenia irrorata* (Lea).—Cumberland River, Albany Landing, Cumberland Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,973.

FIG. 7. *Dromus dromas* (Lea).—Cumberland River, Eadsville, Wayne Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,968.

FIG. 8. *Frierersonia iridella* (Pilsbry and Frierson).—Valles River, Valles, San Luis Potosi, Mexico, A. A. Hinkley, coll. Dec., 1906—Jan., 1907.—Carn. Mus., No. 61, 4,495.

FIG. 9. *Obovaria retusa* (Lamarck).—Ohio River, Portland, Meigs Co., O., coll. Sept. 22, 1910.—Carn. Mus., No. 61, 4,773.

FIG. 10. *Obovaria unicolor* (Lea).—Pearl River, Jackson, Hinds Co., Miss., A. A. Hinkley coll. Nov. 5, 1910.—Carn. Mus., No. 61, 4,929.

FIG. 11. *Obovaria (Pseudoön) ellipsis* (Lea).—Ohio River, Portsmouth, Scioto Co., O., coll. Sept. 24, 1910.—Carn. Mus., no. 61, 4,777.

FIG. 12. *Nephronajas perdix* (Lea).—South Fork Cumberland River, Burnside, Pulaski Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,985.

The scale at the bottom of the plate represents one millimeter divided into tenths.

EXPLANATION OF PLATE XX.

Glochidia of Najades.

Photographed with Bausch & Lomb Objective, $\frac{2}{3}$ inch.

FIG. 1. *Obliquaria reflexa* Rafinesque.—Bayou Pierre, De Soto Par., La., L. S. Frierson coll. Aug. 6, 1910.—Carn. Mus., No. 61, 4,755.

FIG. 2. *Proplera lævissima* (Lea).—Kansas River, Lawrence, Douglas Co., Kan., R. L. Moodie don.—Carn. Mus., No. 61, 4,481.

FIG. 3. *Medionidus conradicus* (Lea).—South Fork Cumberland River, Burnside, Pulaski Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,989.

FIG. 4. *Eurynia (Micromya) trabalis* (Conrad).—Cumberland River, Rowena, Wayne Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,990.

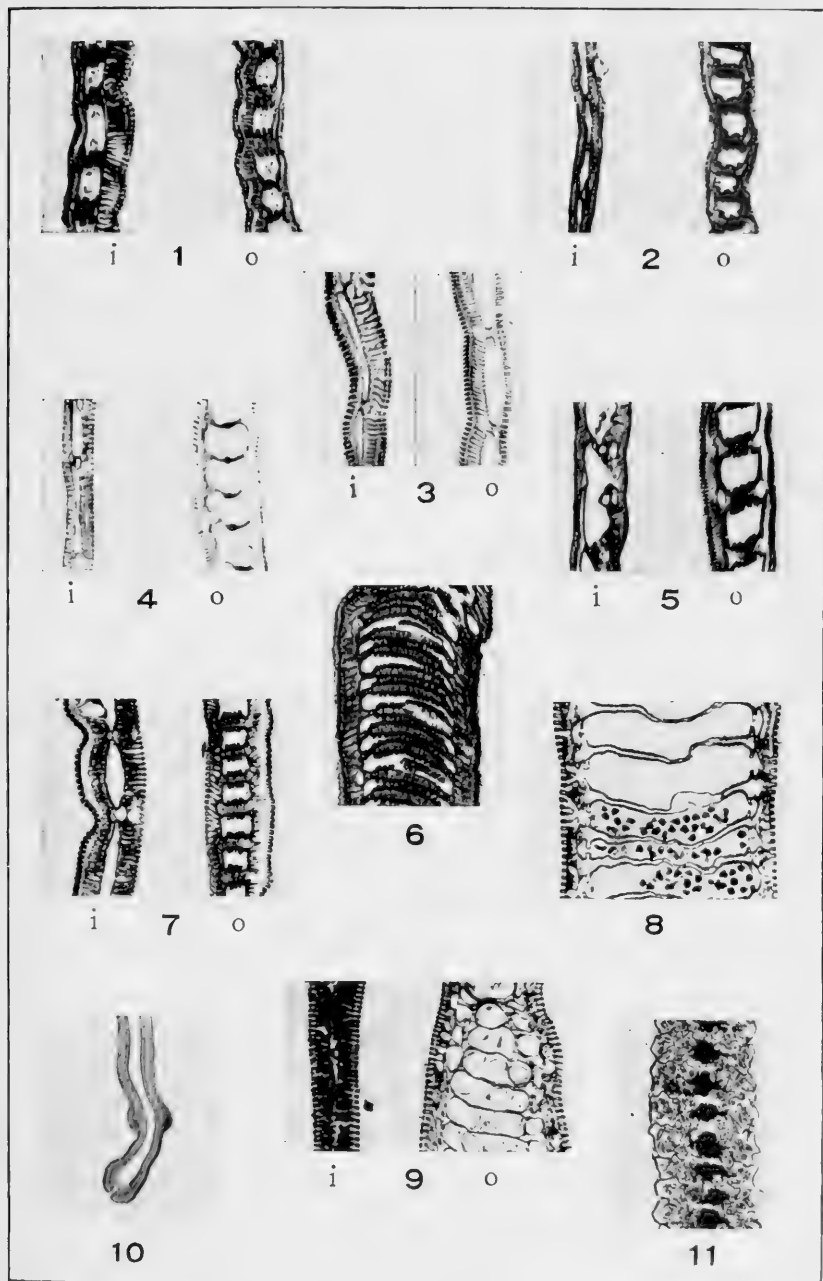
FIG. 5. *Eurynia (Micromya) lienosa* (Conrad).—Pearl River, Jackson, Hinds Co., Miss., A. A. Hinkley coll. Nov. 5, 1910.—Carn. Mus., No. 61, 4,930.

FIG. 6. *Eurynia (Micromya) vanuxemensis* (Lea).—Shoals Creek, Lauderdale Co., Ala., H. H. Smith coll. Nov. 3, 1909.—Carn. Mus., No. 61, 4,492.

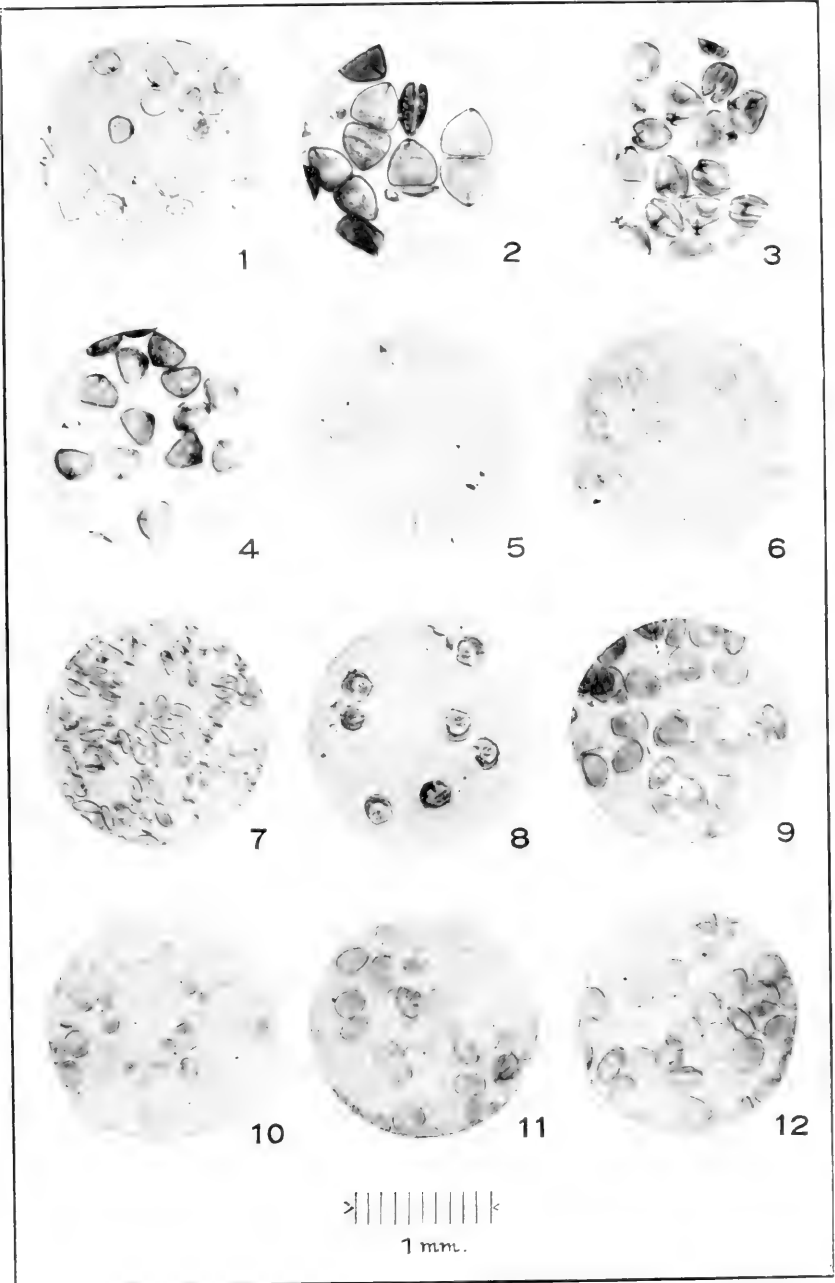
FIG. 7. *Eurynia (Micromya) picta* (Lea).—South Fork Cumberland River, Burnside, Pulaski Co., Ky., B. Walker don.—Carn. Mus., No. 61, 4,995.

FIG. 8. *Eurynia nasuta* (Say).—Lake Erie, Presque Isle Bay, Erie Co., Pa., coll. June 3, 1908.—Carn. Mus., No. 61, 3,264.

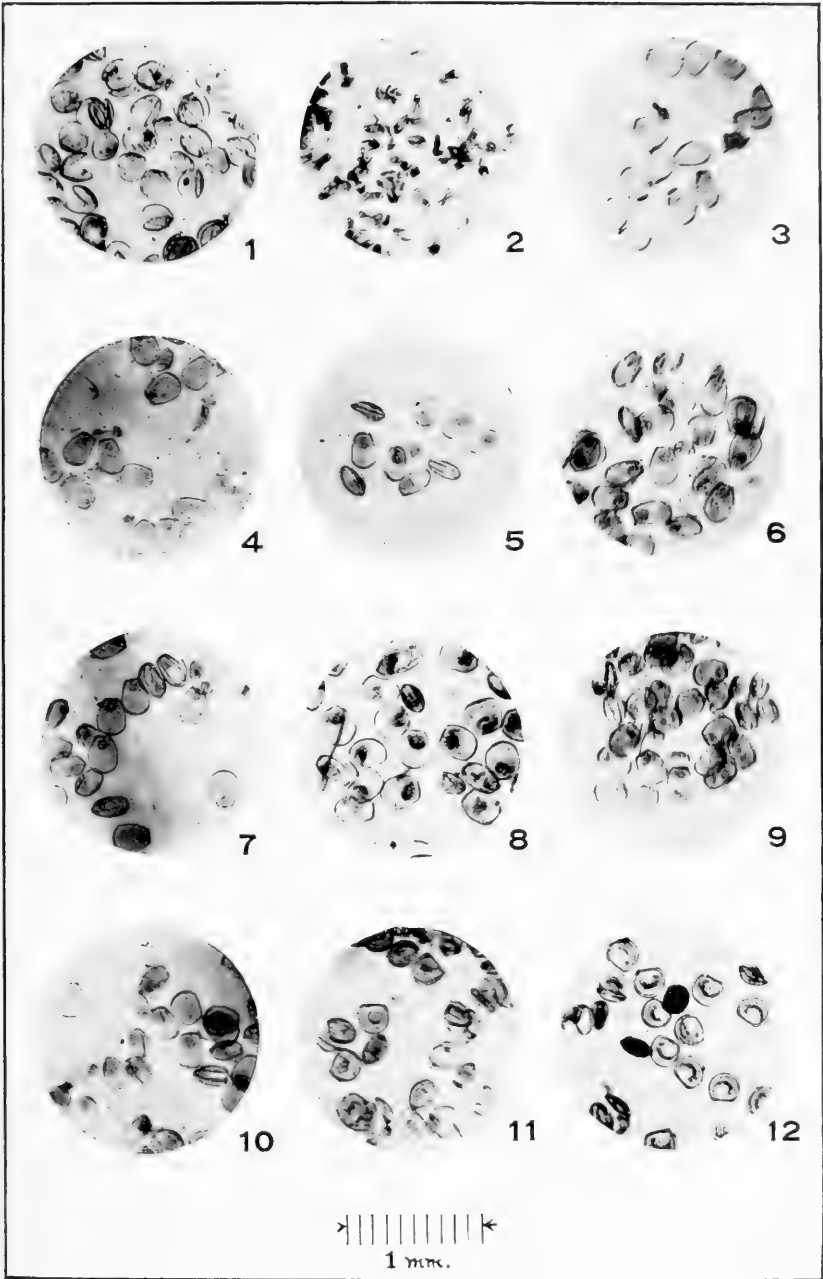
FIG. 9. *Lampsilis anodontoides* (Lea).—Colorado River, Bay City, Matagorda Co., Tex., D. A. Atkinson coll. May 20, 1907.—Carn. Mus., No. 61, 2,157.



Anatomy of Najades. Sections of Gills.



Glochidia of Najades.



Glochidia of Najades.

FIG. 10. *Lampsilis hydiana* (Lea).—Bayou Pierre, De Soto Par., La., L. S. Frierson coll. Aug. 6, 1910.—Carn. Mus., No. 61, 4,869.

FIG. 11. *Truncilla haysiana* (Lea).—Cumberland River, Burnside, Pulaski Co., Ky., B. Walker don.—Carn. Mus., No. 61, 5,001.

FIG. 12. *Truncilla florentina* (Lea).—Shoals Creek, Lauderdale Co., Ala., H. H. Smith coll. Nov. 2, 1909.—Carn. Mus., No. 61, 4,491.

The scale at the bottom of the plate represents one millimeter divided into tenths.

XI. A GROUP OF STENOMYLINS RECENTLY PREPARED AND EXHIBITED IN THE CARNEGIE MUSEUM.

BY O. A. PETERSON.

(Plates XXI and XXII.)

Paleontology is gradually reaching a stage where fossil remains are not necessarily dry and unprofitable to the layman. There is apparently no reason why the specialist should not impart to the public his views of prehistoric life through carefully prepared specimens. By such activities paleontology, which is generally regarded as rather dull and unintelligible, would take its true position as a valuable factor in the education of the people.

From the remains of *Stenomylus*, which the Carnegie Museum has recently obtained in the Miocene deposits of western Nebraska, it was decided to construct a group of skeletons mounted to represent as nearly as possible a life-like pose. For this purpose three skeletons were selected, those of a male, a female, and a young animal. The skeletons have been successfully and very creditably mounted by Mr. S. Agostini of the section of paleontology. In order to add to the group, Mr. Theodore A. Mills was detailed to make models from the skeletons to represent the animals in the flesh. These models are about one fourth of the natural size and are exhibited in the same case (see pls. XXI and XXII). The male is represented with the head erect, the female with the head down, and the young is placed in front of the latter two. This is true both of the skeletons and the models.

It has already been ascertained through the studies of Professor Loomis and Mr. Peterson¹ that these graceful little camels most probably lived in an upland country. Their skeletons, when compared with such recent forms as the llama, indicate analogies, which warrant us in regarding them as having been somewhat similar to these animals in their habits. The dentition shows plainly that they cropped grass. However, in certain directions these Miocene camels were much further

¹ ANN. CAR. MUS., Vol. IV, 1906, p. 41, 286; *Amer. Jour. Sci.*, Vol. XXIX, 1910, p. 297; ANN. CAR. MUS., Vol. VIII, 1911, p. 267.

specialized than recent forms. Their long-crowned molars seem to indicate that the creatures had continued to feed for many generations on hard grasses on open prairies throughout long geologic times, and that thus was brought about a development decidedly more advanced than is found in any of the recent forms. Many other features of the skull are also entirely different. The shorter humerus and longer radius and ulna are marked advances made by the fossil forms, while the phalanges are shorter, and there is much less indication of the tylopod pads than in the llama. The limbs were even slenderer than in the llama and the heavy muscles of the limbs were placed close to the body. There were undoubtedly short, blunt hoofs, and possibly incipient cushions, though in a much less developed state than in the recent tylopods, as stated above.

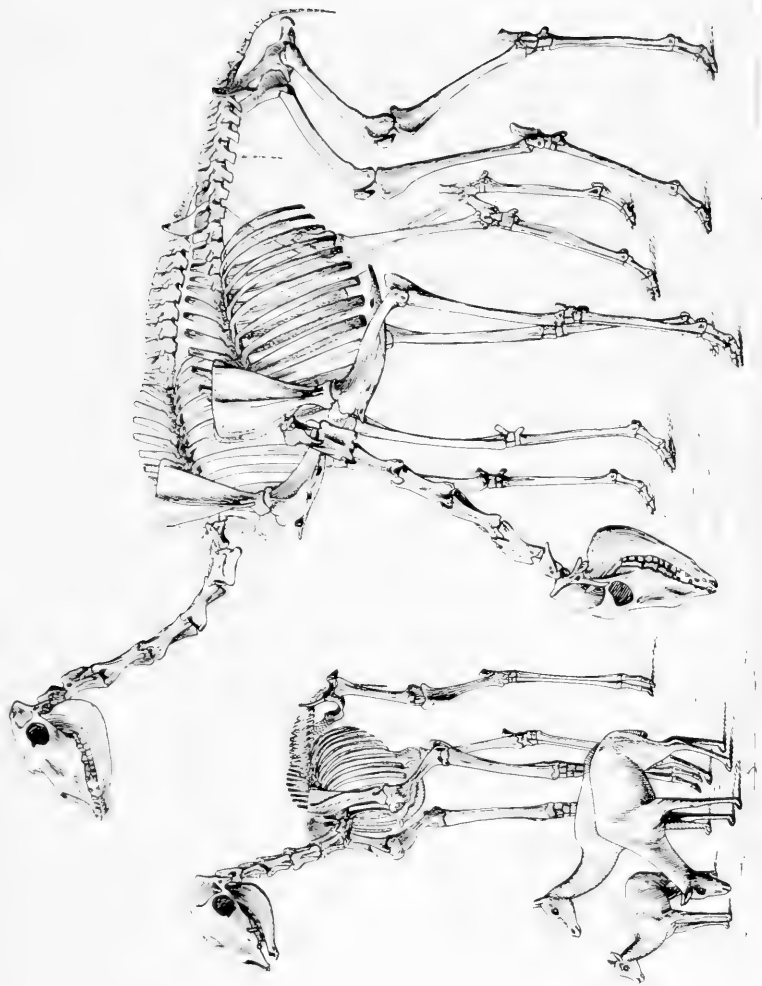
In previous publications it has been stated that the skeletons of these small animals were found by the dozens imbedded in a Miocene sediment of packed sand in Sioux County, Nebraska (see ANN. CAR. Mus., Vol. VII, 1911, pl. XLI). That they were gregarious in habit, there can be very little doubt. It requires only a slight stretch of imagination to picture a herd of *Stenomylins*, pursued by some carnivore (*Daphænodon*), taking to a stream of water and attempting crossing to the opposite shore, but finding the current too swift, being taken ruthlessly along, never again to reach the land alive. The deposition of these skeletons of all ages and sexes, sometimes found in most perfect preservation, appears to agree best with the idea that they were laid down in a bend, or against a sandbar of a stream and were covered up very rapidly. They might possibly have been covered up by rapidly moving sand on land.

The cause of the extinction of this fleet-footed grazing quadruped is little short of an enigma. When we compare its osteology with the living forms we are obliged to admit that the skeletons of *Stenomylus* show us a form in many respects better equipped for life in an open country than the forms which occupy the plains at the present time. Paleontological evidence tends to lead us to regard the evolution of grazing types as far more favorable to continued existence than browsing types. The latter were more or less hindered through the gradual changes of the flora from the softer and more succulent vegetation in the earlier Tertiary to the harder grasses in the late Miocene and Pliocene times. What then was the cause of the extinction of *Stenomylus*, an animal already so specialized as

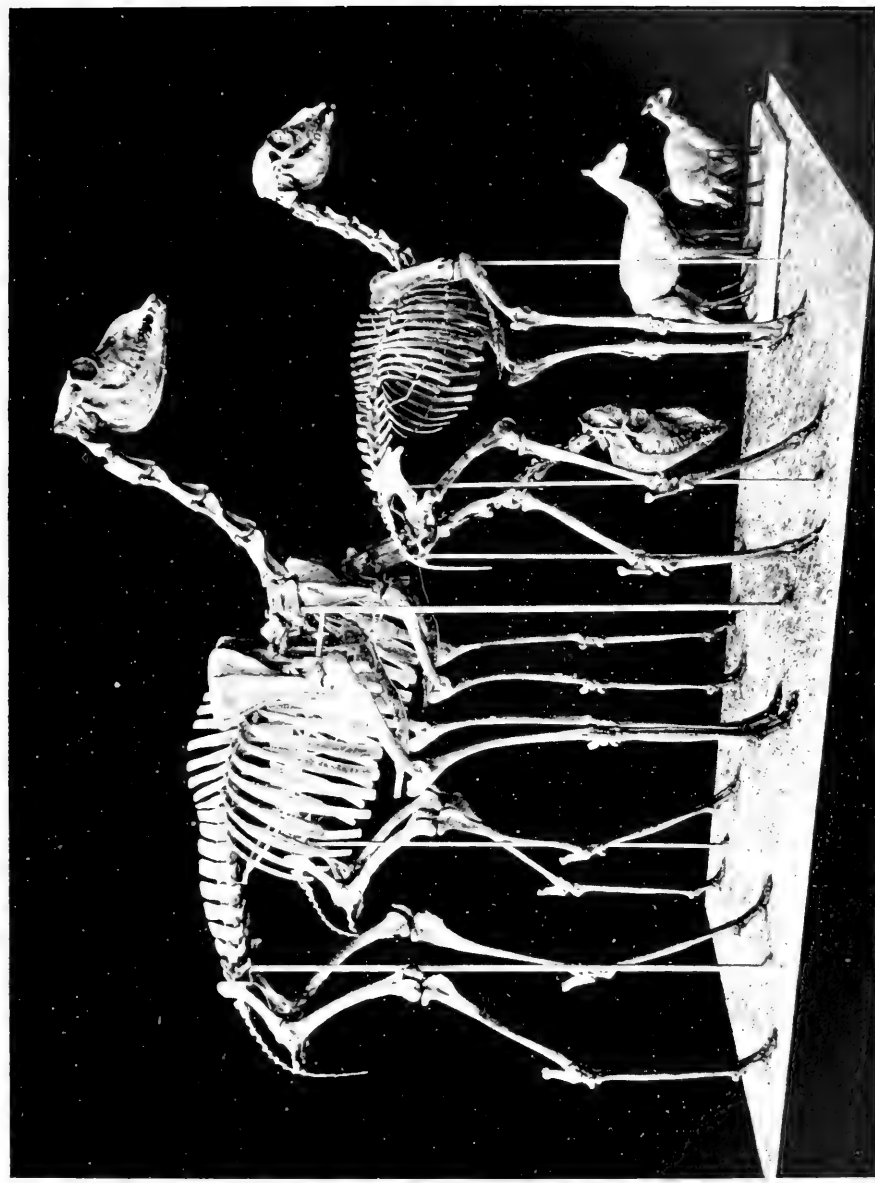
apparently to be completely equipped for an open country habitat? Although a number of causes combined may be suggested, we may never know the true one. In his admirable work, "The Age of Mammals," Professor Osborn has called attention to observations by Darwin, Gregory, Chestnut, and Willcox of the devastating effects on animal life which have been brought about by great droughts at certain seasons in different parts of the world. A long succession of dry seasons in a given locality is certain to have a telling effect on the fauna. An invasion of a new and destructive type of carnivore may also be a potent factor in the extinction of certain herbivorous types. We have not as yet clear evidence of the immediate ancestors of the llama of South America. Although the precursors of the latter undoubtedly occupied the same general region in which *Stenomylus* lived, we are not, as yet, ready to advance any explanation, or even give a working theory as to why *Stenomylus* did not survive on the vast plains of North America or migrate with other branches of the *Camelidæ*.

In an extensive collection of these fossil remains it is found, as in the study of recent zoölogy, that the contour of the skull varies greatly in the young and the fully adult. The direct side view of the cranium of the young *Stenomylus* presents a characteristically juvenile appearance (see Fig. 1). The occiput is less angular than in the adult, the brain-case as a whole is more ovate, there is a complete lack of the sagittal crest, and a more rapid convexity fore-and-aft from the occiput to the region between the orbits. The latter are very nearly as large as in the adult specimens, while the nasal depressions are distinctly less deep. The facial region is apparently shorter, so that the orbit has a more anterior position in the immature skull. The horizontal ramus of the lower jaw tapers more rapidly anteriorly and the vertical portion is proportionally greater than in the adult. The dentition is represented by the milk molars except p^1 ; the latter is seen in the side of the maxillary upon excavating the bone. The canine is in place. The premaxillaries are lost and the extreme anterior portion of the mandible is also broken off.

The skeleton represents an animal about half-grown (see Plates XXI and XXII). The epiphyses of the centra of the vertebral column were found dislocated and the ends of the limb bones were detached by suture, though in their relative positions. The pelvis was also found in sections, that is, with the ilium, ischium and pubis entirely



Male, female, and young of *Stenomytus Hillocki* Loomis. Mounted by S. Agostini. Small models representing the animals in the flesh by F. A. Mills.



Mounted group of skeletons of *Stenomylus Hitchcocki* Loomis. Collected by O. A. Peterson. Mounted by S. Agostini.

separated at the acetabulum, but lying in their respective positions in the sediment. The caudal region, the patella, and a number of foot bones were lost and are represented by casts; otherwise the skeleton belongs to one individual.

The skeleton of the male has already been described in a previous publication² and calls for no further mention here except to say that

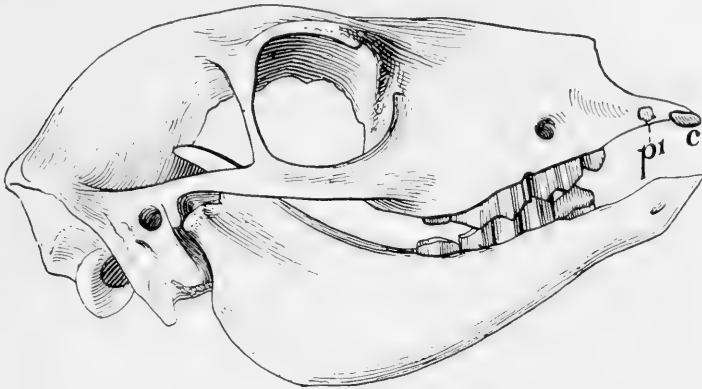


FIG. 1. Skull of young specimen of *Stenomylus hitchcocki* Loomis.

it is composed of parts of six different individuals. It was originally mounted on a separate base, and temporarily placed in the collection of the paleontological exhibit until it could be used in the present group. The skeleton of the female on the other hand pertains to one individual, except the right scapula, the sternum (No. 2,787), and a number of ribs. The distinguishing features of the female skeleton are seen in the less robust development of the different parts, and the larger pelvic cavity. Altogether the group expresses life and action, such as we may well imagine to have been common to these small and very graceful animals.

MEASUREMENTS.

	Male. Cm.	Female. Cm.	Young. Cm.
Length of skeleton from ischial tuberosity to and including the scapula at the glenoid cavity.....	57	53	39
Height of skeleton at 6th dorsal vertebra.....	69	63	50

² Peterson, O. A., ANN. CAR. MUS., Vol. VII, 1911, pp. 268-271.

XII. TERTIARY FISH-REMAINS FROM SPANISH GUINEA IN WEST AFRICA.

BY C. R. EASTMAN.

Plates XXIII-XXIV.

In May, 1911, a shipment of natural history specimens was received by the Carnegie Museum which had been collected by Rev. A. I. Good, a missionary stationed at Benito, in Spanish Guinea, and by him forwarded to Director W. J. Holland in the fall of 1910.

The collections made by Mr. Good for the Carnegie Museum are chiefly entomological, but, included among the lot of insects and other objects illustrating the natural history of the region, were found a number of slabs of dark-colored fissile shale, containing an abundance of carbonaceous matter, with here and there a few small-sized concretions, valves of Entomostraca, and portions of Teleost fish-skeletons, these last being comparatively numerous.

The amount of carbonaceous matter present in the rock is so great that the shales might properly be called bituminous, and appearances indicate very strongly that they are of lacustrine, or perhaps estuarine origin, certainly not marine, and were deposited in a rather shallow basin. No means are at hand for determining the geological age of the strata except the evidence furnished by the remains of the fishes embedded within the shale, and they betoken an early Tertiary horizon, probably at least as early as the dawn of the Eocene. The geology of the region about Benito has not been studied or described, so far as the writer is aware, but it is a well-known fact that isolated patches of Tertiary rock occur frequently along the eastern and western coasts of Africa, and their distribution is indicated in a general way by Walcot Gibson in a sketch-map of the geology of the continent to be found in the first volume of the new *Encyclopedia Britannica*.¹

¹ The marine strata of the early Tertiary of South Togo, in West Africa, have furnished a number of vertebrate remains which are described by Dr. Ernst Stromer, of Munich (*Zeitschr. deutsch. geol. Ges.*, Vol. LXII, 1910, pp. 478-508). More recently the same writer has contributed a note entitled "Funde fossiler Fische in dem tropischen Westafrika" (*Centralbl. f. Min., etc.*, Jahrg. 1912, no. 3, pp. 87, 88), which mentions the discovery of fragmentary Teleost and Silurid fish-remains from near the mouth of the River Benito in Spanish Guinea, without, however, offering detailed descriptions of them.

Although dissociated parts of fish skeletons are present in considerable abundance in the fragmentary blocks of shale which make up the collection, and the appearance of these detached parts suggests that the remains have been subjected to a moderate amount of current action prior to fossilization, yet the number of species represented does not exceed three or four, and even the best preserved individuals are far from being complete. Nevertheless, the Clupeoid nature of most of the remains is easily recognizable, and in the case of the largest and best preserved species it is possible to work out nearly the entire structural organization by combining the data derived from a study of several individuals whose parts fortunately supplement one another.

Scanty as these newly discovered remains are, their bearing upon broad philosophical problems, such as the origin of modern fresh-water faunas on either side of the Atlantic, conditions affecting distribution in times past, and the theory of a former land connection between tropical America and Africa, is of prime importance. This must necessarily be so by virtue of their being the first indication yet reported of a post-Triassic fish-fauna in tropical or South Africa. We cannot forbear to note that only a few years ago, in 1905, our want of knowledge on such matters drew from Dr. Boulenger the following remarks: "It remains a matter for serious regret that we should still be without any information as to the precursors of the African fishes. In spite of diligent search over a considerable portion of the great continent, no remains of any post-Triassic fishes have yet been discovered in Tropical and South Africa, and our acquaintance with Tertiary Teleosts generally is still almost as scanty and fragmentary as it was twenty years ago, although much has been done by Dr. Smith Woodward in elucidating the affinities of such remains as have been exhumed. Under the circumstances we have to fall back on our imagination to explain the fauna, and much hazardous speculation has been indulged in."²

The species of fossil Teleosts in Mr. Good's collection which lends itself most readily to examination is evidently new to science, and belongs to the genus *Diplomystus*. It is described in the following pages under the appellation of *D. goodi*, the writer having pleasure in naming it at the suggestion of Dr. W. J. Holland in honor of the

² Boulenger, G. A., The Distribution of African Fresh-water Fishes. Presidential Address, Rept. Brit. Assoc. Adv. Sci., South African Meeting, 1905.

discoverer. A smaller form represented by several badly crushed and distorted individuals resembles more or less closely some of the remains which Dr. D. S. Jordan has recently described from the bituminous (Tertiary?) shales at Riacho Doce, State of Alagoas, Brazil, under the generic title of *Ellipes*. The latter is doubtfully distinct from *Diplomystus*, but may perhaps be retained provisionally as a subgenus of the latter. A single specimen in the collection is doubtfully identifiable as belonging to *Enchodus*.

Regarding the Brazilian fish-remains described by Dr. Jordan, their discoverer, Professor J. C. Branner, offers the following comments in his paper on the Geology of Alagoas, which accompanies that of Dr. Jordan in volume VII of the ANNALS of this Museum.

"Dr. Jordan feels some doubt in regard to the exact age of the beds, and he ventures only to say that 'the shales of the Riacho Doce were deposited in an estuary and that their age is Cretaceous or Lower Eocene, possibly Upper Cretaceous.'

"These fishes form the most important collection of fossils thus far made in the state of Alagoas, and they also make an interesting and valuable contribution to our knowledge of the coast sediments of eastern Brazil" (*loc. cit.*, p. 18).

Now it is an interesting and significant fact that species of the same genus, or at least of very closely related genera, should occur respectively in fresh-water deposits of the eastern coast of South America and western coast of Africa, the presumption being that the strata are approximately contemporaneous,—that is to say, early Tertiary. This coincidence points to a similarity of the fresh-water fish-faunas of the two continents extending as far back as the dawn of Tertiary time, and also suggests a correspondence of geological history between the land-masses on either side of the Atlantic.

An hypothesis which has recently found strong adherents among ichthyologists is that put forward by von Ihering and others, which postulates a late Cretaceous or early Tertiary land-bridge between tropical Africa and South America, possibly in contact with Guiana in the latter continent. This conjectural land-mass, "Helenis," may be supposed to have been populated by the ancestors of modern fresh-water fishes of tropical America, among others by the Lepidosirenidæ, Characinidæ, Cichlidæ, and Siluridæ. A submergence of the area called Helenis took place during Tertiary times, which brought about important changes in the ichthyic fauna, such for instance as

are described by Dr. Eigenmann as follows: " This land-mass sank beneath the surface of the ocean, forcing the fauna in two directions, towards Africa and towards South America, exterminating all types not moved to the east or the west. From these two rudiments have developed the present diverse faunæ of Africa and South America, each reinforced by intrusives from the ocean and neighboring land areas by autochthonous development within its own border. The one fauna cannot be said to have been derived directly from the other. The connection between Africa and South America existed before the origin of the present genera and even before the origin of some of the present subfamilies and families, some time before the earlier Tertiary. There has never been any exchange between Africa and South America since that time."³

Elsewhere in the same article the author whom we have just quoted remarks: " There has been a remarkable parallelism in the evolution of genera of cichlids, characins, and catfishes on the two continents. . . . The Cichlidæ are abundant in tropical America and Africa, a few species of Cichlidæ being also found in India. There is no means by which these two forms could have crossed the existing gap between Africa and South America. There has been no exchange of species in recent times, for there is no species or genus common to the two continents. The South American and African elements of these two families must have been derived from some intermediate land-mass or must have gone from one continent to the other over a land-bridge."

It may not be amiss to consider here somewhat briefly the present and former distribution of the genus *Diplomystus*, which is a typical example of the double-armored herrings. *Diplomystus dentatus*, the type species, was described by E. D. Cope in 1877 from the Middle Eocene (Green River) fresh-water deposits, and at the same time two previously described Clupeoids which accompany it in the same horizon and locality were transferred to the new genus. These were the so-called *Clupea humilis* and *C. altus* of Leidy. Cope recognized that the species comprised by *Diplomystus* might be divided into two sections, distinguished by the form of their dorsal ridge-scales. " In section I," he observes, " these shields are transverse and their posterior borders are pectinate, a median tooth being especially prominent. In section II, the scuta are not wider than long, and

³ Eigenmann, C. H., The Fresh-water Fishes of South and Middle America *Pop. Sci. Monthly*, Vol. LXVIII, No. 6, 1906, p. 528.

have but one, a median tooth, which is the extremity of a long median longitudinal carina. The species of section I are *D. dentatus*, *D. analis* and *D. pectorosus*; those of section II are *D. humilis* and *D. altus*."⁴

It remained for President Jordan, thirty years later, to give validity to the distinction just noticed by elevating Cope's "section II" of the genus *Diplomystus* to the rank of an independent genus (or subgenus, as suggested in the ANNALS OF THE CARNEGIE MUSEUM, Vol. VII, 1910). This was named *Knightsia*,⁵ the species chosen for its type being the previously described *Clupea humilis* of Leidy, afterward renamed *C. pusilla* by Cope. Dr. Jordan substituted the new specific title *cocena* for that bestowed upon the species by the original author, the combinations of *Clupea humilis* and *Clupea pusilla* being preoccupied among recent fishes. In this connection it should be remarked that the name *Diplomyste* Bleeker (= *Diplomystax* Günther, and *Diplomystes* Duméril) refers to an existing genus of South American Silurids, and is not to be confused with the term proposed by Cope. *Copeichthys* of Dollo (Results Voyage Belgica, 1904, p. 159) is a synonym of *Diplomystus*, the former name having been substituted under an erroneous idea that Cope's term was preoccupied.

Other occurrences of *Diplomystus* in the fossil state are in the Upper Cretaceous of the Lebanon, Istria, Dalmatia, and Brazil; in the Lower Oligocene (Osborne beds) of the Isle of Wight; and in the supposed late Cretaceous or early Tertiary fresh-water shales at Riacho Doce, Brazil (two species described by Jordan as *Ellipes branneri* and *E. riacensis*).⁶

Besides the above mentioned fossil forms, a recent Diplomystid which has been described under the name of *Clupea (Hyperlophus)*

⁴ Cope, E. D., A Contribution to Our Knowledge of the Ichthyological Fauna of the Green River Shales, *Bull. U. S. Geol. Survey Territ.*, Vol. III, 1877, p. 808.

⁵ Univ. Cal. Publ., V, No. 7, p. 136, 1907.

⁶ Regarding *Ellipes* Dr. Jordan remarks in the paper above cited: "In any event I think that we are justified in recognizing *Ellipes*, *Potamalosia*, *Hyperlophus* and *Knightsia* as distinct subgenera, even if we should wish to place all double-armored herrings in the single genus, *Diplomystus*" (*l. c.*, p. 25).

In Dr. Jordan's scheme Cope's species *D. longicostatus*, from the Upper Cretaceous of Bahia, Brazil, finds a place under the new generic or subgeneric caption of *Ellipes*. It is doubtful, however, if the proposed separation can be maintained in actual practice, as the majority of specimens fail to disclose the characters relied upon for distinctive criteria.

*spratellides*⁷ occurs in the river system of New South Wales, and is said also to inhabit certain rivers along the western coast of South America, especially in Chili. The distinctive character of the so-called "*Hyperlophus*," as contrasted with *Clupea*, consists in the presence of a series of enlarged dorsal scutes extending between the occiput and origin of the dorsal fin. In other words, it is a double-armed herring, and differs from the single-armed in precisely the same manner as does *Diplomystus*, and from the last-named genus it has not been possible to prove any separation at all. Smith Woodward⁸ is, therefore, apparently justified in claiming *Hyperlophus* to be a synonym of *Diplomystus*, although Dr. Jordan,⁹ without arguing the question, has expressed a contrary opinion, saying: "Dr. Woodward regards *Hyperlophus* as a synonym of *Diplomystus*, which is quite unlikely. One may be too hasty in regarding living forms as identical with extinct genera, as well as too hasty in separating them."

So much, then, for the general facts of distribution. It is now in order to present a description of the new species of *Diplomystus* from a supposed early Tertiary horizon at Benito, on the western coast of tropical Africa.

***Diplomystus goodi*, sp. nov.**

A deep-bodied species of moderate size, attaining a total length of about 15 cm., and resembling *D. longicostatus* (from South America) in that the caudal region is comparatively short and tapering. Dorsal region much elevated, the margin rising to the origin of the dorsal fin, behind which it abruptly descends; frontal profile steep. Maximum depth of the trunk equaling twice the length of the head with opercular apparatus. Abdominal vertebræ about sixteen in number, caudals not more than twelve or thirteen.

Pectoral fins small, and the much smaller pelvic pair opposed to the middle of the dorsal; the latter fin with about fifteen rays, and situated as in *D. longicostatus*; anal fin with about ten rays, arising considerably behind the posterior end of the dorsal. Ventral ridge-scales comparatively small in advance of the pelvic fins, but much larger beyond

⁷ Ogilby, J. Douglas, In Records of the Australian Museum, Vol. II, 1892, p. 24.

⁸ Woodward, A. S., Doubly-armoured Herrings. *Ann. Mag. Nat. Hist.* (6), Vol. X, p. 412.

⁹ Jordan, D. S., Description of a Collection of Fossil Fishes from the Bituminous Shales at Riacho Doce, State of Alagôas, Brazil. *ANNALS CAR. MUS.*, Vol. VII, No. 1, 1910, p. 25.

the pelvic fins, all smooth, and with only one spiniform projection, without serrations. Neural spines in advance of the dorsal fin with broad antero-lateral expansions, as in the type species. Scales of the flank thin, in most cases poorly preserved.

This species is represented in the collection by a number of more or less incomplete individuals, the better preserved of which are shown slightly reduced in size in Plates XXIII and XXIV, fig. 2. A composite drawing or restoration has not been attempted, but it is evident that an understanding of all the characters can only be gained by a synthesis of details exhibited by a number of fragmentary specimens. One must also be careful not to be misled by deceptive appearances, due to accident, or conditions of preservation. For instance, owing to weathering, or the effects of chemical action, the number of ribs and fin-rays sometimes appears to be larger than is natural, they having been split up. This condition is faithfully represented in respect to the dorsal fin-rays and anterior neural spines of the specimen shown in Plate XXIII, fig. 1. A similar splitting of the ribs, hæmal spines, and fin-supports is often observable in fishes from the Green River shales and elsewhere.

Diplomystus sp. ind.

A second Clupeoid species, probably of *Diplomystus*, but much smaller than that already described and of inferior preservation, is indicated by a number of crushed and otherwise distorted individuals, the total length of which does not exceed five or six centimeters. Very likely they are the fry of some larger form at present unknown, but differing from *D. goodi* in the lesser depth of the abdominal region. Their present condition does not, however, permit anything like an adequate description.

The manner in which the outline of the body is deformed in these fishes, a process which has sometimes been called "telescoping," suggests a slow current in the waters while sedimentation was in progress. Similar appearances are common in various Mesozoic and other horizons, especially in the Triassic sandstones of eastern North America, where the rock-making materials are supposed to have been laid down in shallow estuaries or brackish-water embayments partially cut off from the sea. It has not been thought worth while to illustrate these much dilapidated fish-remains.

Enchodus (?) sp.

A small-sized species which may be provisionally referred to this genus, but the precise relations of which cannot be determined with certainty, is indicated by the greater part of the caudal region and tail of a single individual, as shown in Plate XXIV, fig. 1. The form of body, as far as can be inferred from the portion preserved, is very similar to that of *E. longidens* (Pictet), from the Upper Cretaceous of Mount Lebanon, and it agrees also in size with the latter. The caudal fin in the African form is longer and more deeply furcate than in the Syrian species, and the dorsal fin is more remotely situated.

In the solitary specimen under examination more than a score of vertebræ are seen to be preserved in natural sequence, but it is impossible to tell whether these constitute the entire number of caudals, for the reason that the anal fin is not shown in its entirety. Of the dorsal only about ten of the widely spaced fin-supports, and the distal extremities of a few finely articulated fin-rays are to be seen. A few intermuscular bones are preserved above and below the axis, and the structure of the vertebral centra together with their spinous processes, and the relations of these latter to the median fin supports (interneurals and interhæmals) are in harmony with our determination of this species as belonging to the genus *Enchodus*, or to some closely related form. The remote position of the dorsal, its comparatively feeble fin-supports, and short caudal peduncle prevent an assignment of this species to the genus *Diplomystus*. The fact that *Enchodus* is an Upper Cretaceous genus must be granted some weight in ascribing the age of the fish-bearing beds at Benito to the early Tertiary.

We may conclude this paper with a few general remarks concerning *Diplomystus*, and other related doubly-armored herrings. True Clupeoids first appear at the beginning of the Cretaceous, and are probably descended from typical Jurassic Leptolepids, as indicated by their closely similar skeletal structure. The acquisition of enlarged ridge-scutes along the ventral margin, a character peculiar to *Clupea* and its allies, dates from the Lower Cretaceous, and toward the close of that period forms had become introduced and attained a wide distribution which possessed dorsal ridge-scutes as well as the ventral series. These are marine species, from Asia Minor, southern Europe, and Brazil, belonging to the genus *Diplomystus*. In North America a number of fresh-water species are found as early as the Middle Eocene.

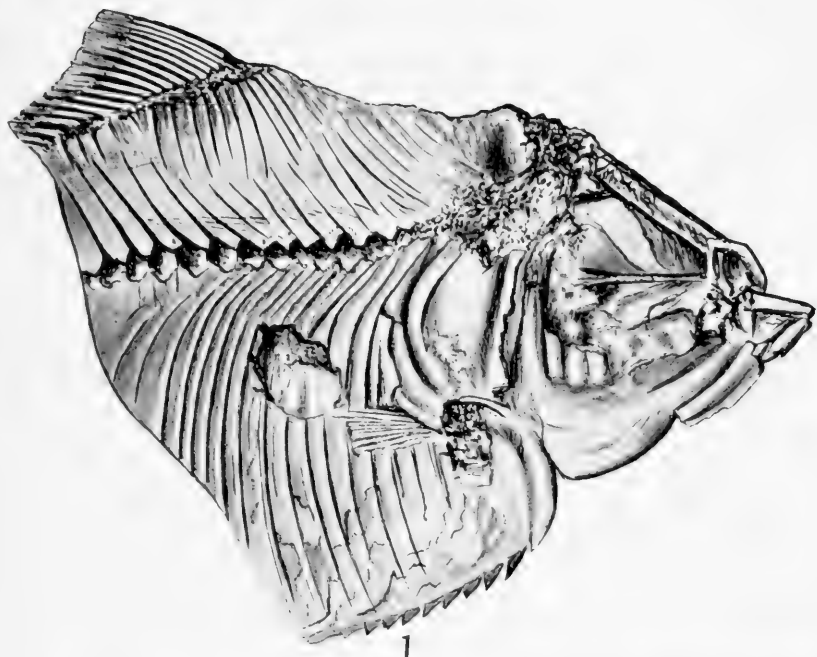
In South America and Africa related forms are known from supposed early Tertiary fresh-water strata, and at the present day the genus *Diplomystus* itself survives in the rivers of Chili and New South Wales.

The type-species *D. dentatus* Cope, and the scarcely separable *D. analis* and *D. pectorosus*, have the dorsal ridge-scutes broader than long, and finely denticulated at their posterior border. In species having a slenderer and more elongate form of body, like the so-called *D. humilis* and *D. aitus* of Leidy, the dorsal scutes are narrow and simple, with one pointed projection. This distinction is considered by Jordan to be of generic, or at least subgeneric importance, and the two last-named species are transferred from *Diplomystus* proper to the closely related genus or subgenus *Knightia* of Jordan. The type species of "Knightia" is *K. eocæna* Jordan, = *Diplomystus pusillus* Cope, = *Clupea humilis* Leidy.

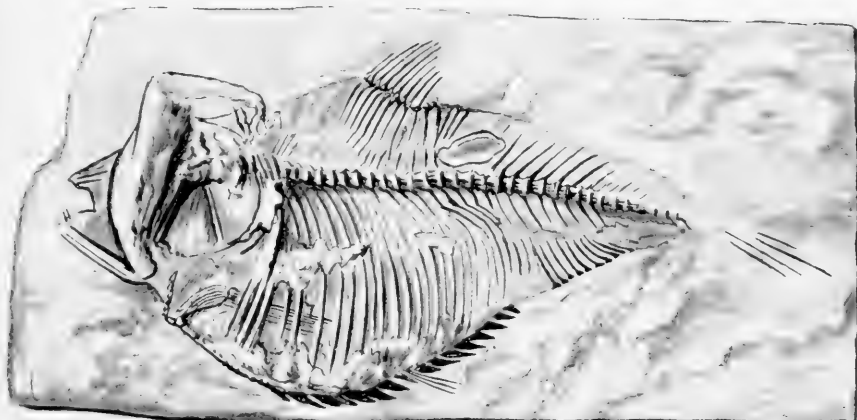
A second closely related genus or subgenus, named *Ellipes*, has recently been established by Jordan upon the evidence of Brazilian Clupeoids from late Cretaceous and supposed early Tertiary horizons. The type species is named *E. branneri*, a small fish presenting much the same configuration as the type of *Diplomystus*; and accompanying it in the same horizon is the so-called *E. riacensis*, which is slenderer and more elongate, and hence approaches *D. eocæna* (= "Knightia") in general aspect. In the opinion of Dr. Jordan, *D. longicostatus* Cope, from the Upper Cretaceous of Brazil, should also be classed under *Ellipes*, but from this view the present writer dissents. When one has to deal with material that in the main is of fragmentary nature, and when much inconstancy is to be observed among the characters recognized as having specific value, it seems advisable to hold to a broad conception of genera and families, and to avoid drawing distinctions of such narrow margin as to obscure natural relationships

EXPLANATION OF PLATES.

- Pl. XXIII, Fig. 1. *Diplomystus goodi*, sp. nov. × 1/1.
 Pl. XXIII, Fig. 2. *Diplomystus goodi*, sp. nov. × 5/4.
 Pl. XXIV, Fig. 1. *Enchodus*, sp. ind. × 4/5.
 Pl. XXIV, Fig. 2. *Diplomystus goodi*, sp. nov. × 1/1.



1



2

Diplomystus goodi Eastman, sp. nov.

Fig. 1 (type) $\times \frac{1}{4}$. C. M. Cat. Foss. Vert., No. 5250.

Fig. 2 (cotype) $\times \frac{1}{4}$. C. M. Cat. Foss. Vert., No. 5253.

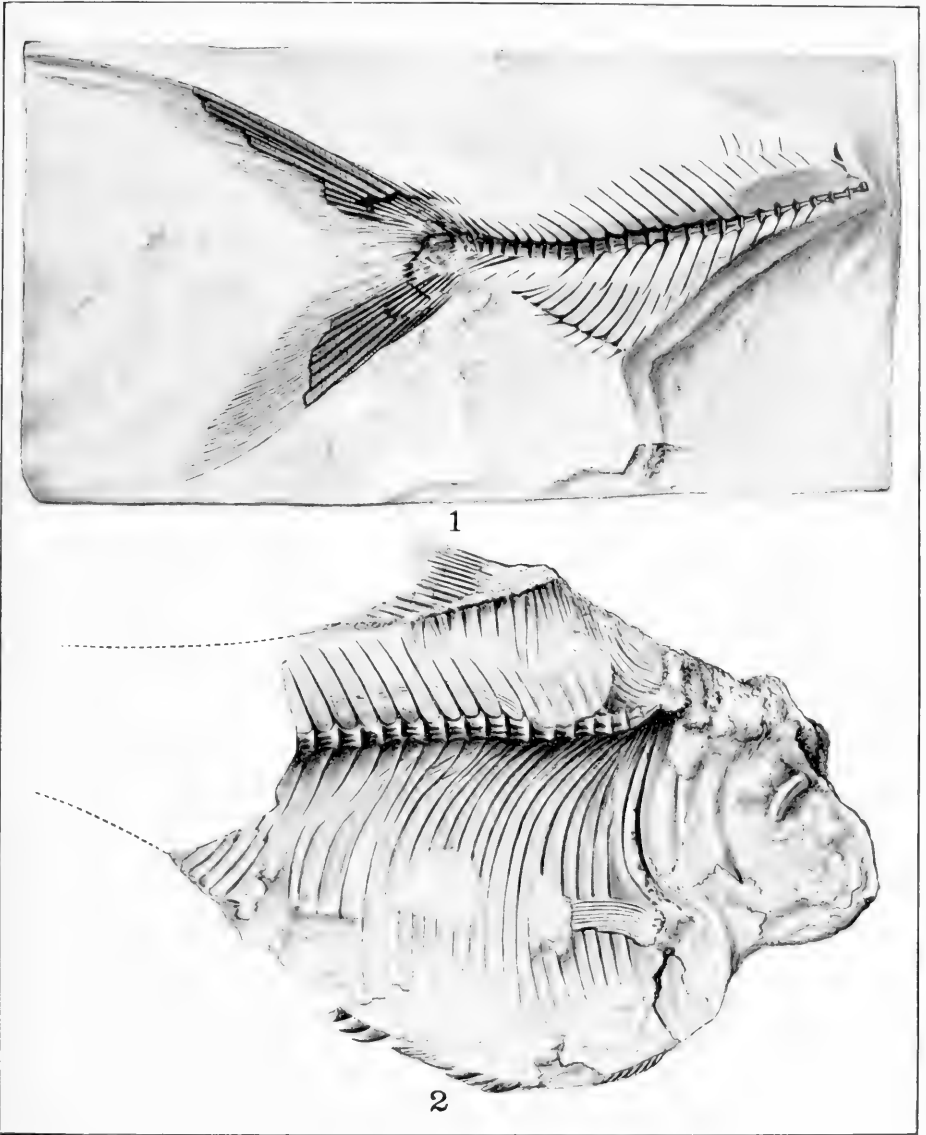


Fig. 1. *Enchodus* sp. ind. $\times \frac{1}{3}$. C. M. Cat. Foss. Vert., No. 5254.

Fig. 2. *Diplomystus goodi*, sp. nov. $\times \frac{1}{3}$. C. M. Cat. Foss. Vert., No. 5251.

ANNALS

OF THE

CARNEGIE MUSEUM

VOLUME VIII. NOS. 3-4.

EDITORIAL NOTES.

ON August 20 the Director of the Museum sailed from New York for Buenos Aires, whither he went in order to install in the National Museum in La Plata a replica of the *Diplodocus* presented by Mr. Carnegie to President Roque Saenz Peña as a gift to the Argentine nation. In consequence of lengthy absence from his office, entailed by his mission abroad, the publication of the last part of the eighth volume of the *Annals* has been necessarily somewhat delayed. The Editor, however, makes no apology, believing that under the circumstances none is necessary.

THE journey to Argentina, which began on August the 20th, consumed nearly three months. The Editor was accompanied by Mr. Arthur S. Coggeshall. We arrived in Buenos Aires on September the 19th; we sailed on our return journey on the morning of October the 26th, and reached New York again on the morning of November the 19th. Our reception in Argentina was most cordial and we experienced the most delightful hospitality during our stay. The Director of the Museum was kindly received by President Peña, being presented by Mr. John W. Garrett, who with distinguished ability at the present time represents our country in Argentina. The editor of the *ANNALS* has long been acquainted with Mr. Garrett, and recalls with pleasure the hearty welcome which he received when he presented himself at the American legation and the facetious remark

made by his friend as he entered: "I like this old *Diplodocus*; it brought us together in Berlin, and again in Rome, and now it brings us together in far away Argentina." Dr. J. V. Gonzalez, the President of the University of La Plata, Dr. S. Lafone-Quevedo, the Director of the National Museum of La Plata, and their amiable assistants, vied with each other in manifestations of their generous appreciation of Mr. Carnegie's gift. It was the high privilege of the writer to meet many of the most distinguished and able men of Argentina and he is filled with a lively sense of the fact that before this rapidly growing republic there lies a brilliant future, in which not merely material but intellectual success of a high order is destined to be achieved. The nation which is developing in temperate South America combines within itself some of the very best elements of humanity. Under favoring skies, with a soil of marvellous fertility, and vast natural resources, as yet barely touched, the day cannot be far distant when this people, justly proud of their past, shall rise to take their place among the great nations of the earth. Already they occupy a commanding position, and Buenos Aires, with its population of a million and a quarter of souls, is, next to Paris, the largest city inhabited by men of the Latin races upon the globe.

THE work which has been carried on in our great quarry in Uinta County, Utah, during the past summer has resulted in a number of extraordinary discoveries. Mr. Earl Douglass, in charge of the work, continued his excavations westward across the top of the eminence known as Dinosaur Peak, exposing in the course of his labors the skeleton of a sauropod dinosaur which he reports to have been lying in practically undisturbed position, with all the vertebræ in place and in serial order from the head to the extremity of the tail. The animal apparently is new to science, but a final decision cannot be reached until the remains have been brought to the Museum, extricated from the matrix, and subjected to careful examination. Peculiarly gratifying is the discovery of three dinosaurian skulls in a good state of preservation. The results of the labors of Mr. Douglass and his associates during the past two years are represented by one hundred tons of rock containing the remains of Jurassic dinosaurs, which are in process at this writing of being shipped to the Museum, and which, by the time this number of the ANNALS appears, we trust

may be lodged in safety under the roof of the Institute in Pittsburgh. The work of extracting the bones, studying them, and assembling them for exhibition will necessarily consume much time and labor.

It is with great pleasure that we have welcomed at the Museum Mr. Childs Frick, who has safely returned from his long and arduous journey through the wilds of Abyssinia. Mr. Frick has added a large number of specimens to the collections of the Museum. Of particular interest is a fine series of skins of *Tragelaphus buxtoni* Lydekker, an equally good series of the Abyssinian Ibex, and a large number of finely preserved skins of *Colobus guereza*, which when mounted will form a beautiful group. In addition to these specimens there are a multitude of others representing the mammalian fauna of the regions through which he traveled.

The group of zebras collected by Mr. Frick on the occasion of his first journey and mounted by Mr. J. A. Santens has been placed upon exhibition, and the African Buffaloes collected at the same time have been set up in most lifelike positions and before this page is printed will likewise be displayed in the gallery of mammals. The latter group has been mounted by Mr. R. H. Santens. Other groups belonging to the Frick collection of East African mammals will follow as quickly as they can be mounted.

OUR grateful thanks are due to the founder of the Institute for renewing during this year his generous gifts for the promotion of paleontological researches. Without the grants, which he in his kindness makes, our work in this important field of human endeavor would come to an end. He has been the life and the soul of all our activities, and we trust that he may long be spared to the world of which he has been so eminent a benefactor.

MR. W. E. C. TODD returned to the Museum in November, after his long journey to the western coast of Labrador. He brought back with him over thirteen hundred specimens representing the avifauna of the region, and succeeded in ascertaining a great many facts of interest in relation to the geographical distribution and the breeding habits of the birds of eastern North America. He likewise secured for the Museum a considerable collection of mammals. In making his

expedition he was aided by a grant from the National Geographical Society and by contributions given by a number of friends of science, whose generosity is deeply appreciated.

THE expedition to the northern shores of Lake Superior undertaken by the botanist of the Museum, Mr. O. E. Jennings, during the past summer and fall, yielded a very large return in the form of carefully selected specimens. Dr. Jennings has in course of preparation a report which it is believed will embody much information touching the ecology of species and their geographical distribution.

MR. O. A. PETERSON was engaged during the summer and early fall in making collections of Eocene mammals in the Uinta beds of Utah. He reports himself as having been very successful in securing skeletons, in some cases quite complete, representing genera hitherto only known by fragments, and some which have not hitherto been known or described. He left his collections in the care of Mr. Douglass to be forwarded to the Museum at the same time that the remains obtained in the dinosaur quarry are shipped in to the Museum.

IT was a great pleasure a few weeks ago to meet Mr. Albert I. Good, who upon his return from West Africa brought with him a large collection of insects and a collection of small mammals from Benito, West Africa. We have also received a considerable number of coleoptera collected by Dr. H. L. Weber in Kamerun. The entomological collections are constantly growing.

WE are deeply indebted to Mr. H. J. Heinz, who has consented to deposit with the Museum as a loan for the coming year his entire collection of ivory carvings, which is one of the largest and most beautiful collections of its kind in existence on this side of the Atlantic.

DR. ARNOLD E. ORTMANN during the past season made two excursions to the headwaters of the streams flowing east and west from the central mountain ranges of Virginia and West Virginia. He was particularly fortunate in obtaining near the type locality specimens of two species of Unionidæ originally found by Professor E. D. Cope and described by Lea, which up to this time have been

only known by the specimens which are contained in the collection of Lea.

FROM Mr. G. A. Link we have received from time to time interesting collections of birds and insects made by him in the Isle of Pines. We are happy to report that Mr. Link is apparently recovering his health. By the advice of physicians he was sent by the Museum to the Isle of Pines in the hope that a stay there would lead to his recovery from an ailment brought on partly by confinement and arsenical poisoning in the laboratory. He reports himself as greatly improved, and he is occupying his time in adding to our collections many things which no doubt will prove to be of great interest when the specimens receive careful study.

DR. C. H. EIGENMANN spent the summer at the Museum, arranging and classifying the collections under his care and in preparing papers upon some of the new material which has recently been acquired. He reports that as the result of his expedition to Colombia last spring he obtained thirty species of fishes hitherto undescribed. Preliminary descriptions of these will be published by the Indiana State University, and a full account of the fishes obtained by him on the occasion of this journey and a second expedition to Colombia, which is now in the field, will be published together with full illustrations by this Museum.

WE are indebted to Mrs. George Lauder for the gift of a splendid geode containing amethysts, which was brought from Uruguay to Scotland, and which the kind donor there purchased for the Museum. It is one of the largest, if not the largest, and finest specimen of its kind ever displayed, and we deeply appreciate the generous gift.

XIII. THE PLATED NEMATOGNATHS.¹

BY MARION DURBIN ELLIS.

In the following pages are given a list of all known species of the Callichthyidæ, the "Sopra Serras," "Cascaduras," or "Hassars" as they are called by the natives of South America, and lists of the specimens at present in the collections of the Carnegie Museum and of the Indiana University.

The specimens in the Carnegie Museum were acquired through purchase from Mr. J. D. Anisits, who collected in Paraguay; from the expeditions of the Indiana University and Carnegie Museum to Guiana; and from the extended expedition of the Carnegie Museum through various parts of Brazil, Uruguay, Argentina, and Paraguay. The collections acquired from Dr. Anisits were enumerated in the ANNALS OF THE CARNEGIE MUSEUM, Vol. II, pp. 110-157. An account of the Guiana Expedition is given in Vol. V of the MEMOIRS. The expedition to Central South American is outlined in Volume VII of the ANNALS, pp. 285-314.

I have given a reference to the first description of each species, and, if this is incomplete, a reference to a better one.²

Family CALLICHTHYIDÆ.

Callichthyoidei BLEEKER, Nederl. Tijdschr. Dierk., I, 1863, 82.

Siluridæ proterapodes GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 4. *Hypostomatinae* in part.

¹ Contributions from the Zoölogical Laboratory of Indiana University, under the direction of C. H. Eigenmann, No. 123.

² After this paper had been finished, and before it could be published, Mr. C. T. Regan issued a revision of the genus *Corydoras* (inclusive of *Osteogaster*) with a list of the specimens in the British Museum (*Ann. and Mag. Nat. Hist.*, (8) X., 209-220, Aug., 1912), and Mr. Alipio de Miranda Ribeiro published Volume IV of his "Fauna Brasiliense, Peixes," and an account among other things of the *Callichthyidæ* in the "Historia Natural" of the "Comissão de Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas," Sept., 1912. The publication of these papers necessitated a partial revision of Mrs. Ellis' manuscript, which was done by Dr. Eigenmann. It is worthy of note that Regan's list contains fourteen species represented by seventy-four specimens. The collections examined by Mrs. Ellis contain sixteen species represented by over six hundred specimens. An additional species, *Hoplosternum magdalene* Eigenmann, is described in the appendix to this paper.—*Editor*.

Callichthyidæ GILL, Arrangement of Family of Fishes, 1872, 19.—EIGENMANN and EIGENMANN, South American Nematognathi, Occasional Papers, Cal. Acad. Sci., I, 1890, 449; A Catalogue of the Freshwater Fishes of South America, Proc. U. S. Nat. Mus., XIV, 1891, 43 and 44. EIGENMANN, Rept. Princeton Univ. Exp. Patagonia, III, 1910, 401-403.

The Callichthyidæ range from the Magdalena and Orinoco to the Rio de la Plata. The family is composed of ten genera containing forty-seven species, twenty-eight of which are placed in the genus *Corydoras*. Günther placed *Callichthys*, the single genus recognized by him, in the group *Hypostomatina* of his *Siluridæ proterapodes*. He gave brief descriptions of eleven species, which he suggests might well be arranged in three subgenera, *Callichthys*, *Scleromystax*, and *Corydoras*. Eigenmann and Eigenmann (l. c., 1890) recognize seven genera and twenty-five species. Their revision is the most complete account of the family published. It contains the complete synonymy up to 1890, with partial or complete descriptions of all species, as well as keys to the genera and species. The catalog published by the Eigenmanns in 1891 lists the same seven genera and twenty-five species. The list published in 1910 by Eigenmann includes the ten genera recognized in this paper and thirty-four of the species. The species added since 1910 are *Corydoras multimaculatus*, *C. ehrhardti* of Steindachner; *Corydoras kronei* Miranda Ribeiro; *Corydoras garbei*, *C. microps venezuelanus*, *C. meridionalis*, *C. nattereri*, *C. triseriatus*, and *C. flaveolus* of von Ihering; *C. micracanthus*, *microcephalus*, *polystictus*, *melanistius*, *undulatus*, *melanotænia*, and *macrosteus* of Regan; *Hoplosternum schreineri*, *Decapogon verissimi* and *urostriatum*, and *Corydoras virescens* of Ribeiro. The following are described as new in this paper: *Cascadura maculocephala*, *Chænothorax eigenmanni* and *Hoplosternum magdalænæ* Eig. (cf. Appendix). *Corydoras eigenmanni* von Ihering is considered synonymous with *Corydoras kronei* Miranda Ribeiro; *Corydoras meridionalis* von Ihering with *Corydoras ehrhardti* Steindachner; and *Corydoras microps venezuelanus* von Ihering with *Corydoras æneus* (Gill). Several of those described by Regan are probably also synonyms.

Genus SCLEROMYSTAX Günther.

1. *Scleromystax barbatus* (QUOY and GAIMARD).

(Plate XXV, figs. 1-2.)

Callichthys barbatus QUOY and GAIMARD, Voy. Uranie et Phys., Zool., 1824, 234.
—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, 322 (Rio Janeiro).

- 3477 C. M. Two, 60 mm. (male) and 62 mm. (female), Iguape, São Paulo, Dec. 13, 1908. Coll. Haseman.

Genus *CALLICHTHYS* Linnæus.

2. *Callichthys callichthys* (Linnæus).

Silurus callichthys LINNÆUS, Syst. Nat., Ed. X, 1758, 307 (America).

Callichthys callichthys EIGENMANN and EIGENMANN, Occasional Papers, Cal. Acad. Sci., I, 1890, 452.

- 3458 C. M. Eight, 24 to 43 mm., Alagoinhas, Rio Catu, March 4, 1908. Coll. Haseman.
- 3459 C. M. Three, 98 to 102 mm. Penedo, Rio San Francisco, April 2, 1908. Coll. Haseman.
- 3460 C. M. Six, 40 to 105 mm. Entre Rios, June 1, 1908. Coll. Haseman.
- 3461 C. M. Six, 47 to 80 mm. Barra da Pirahy, July 5 and 12, 1908. Coll. Haseman.
- 3462 C. M. One, 89 mm. Cubatão, August 1, 1908. Coll. Haseman.
- 3463 C. M. Four, 78-134 mm. Xiririca, Rio Ribeiro da Iguape, in mud, Dec. 1, 1908. Coll. Haseman.
- 3464 C. M. One, 78 mm. Urucum Mts., Corumba, May 2, 1909. Coll. Haseman.
- 3465 C. M. One, 40 mm. Corumbá, April 27, 1909. Coll. Haseman.
- 3466 C. M. One, 136 mm. Iguape, Dec. 16, 1908. Coll. Haseman.
- 4883 I. U. M. One, 96 mm. Rio Grande do Sul. Coll. von Ihering.
- 9884 I. U. M. One, 48 mm. Campo Grande, June, 1901. Coll. J. D. Anisits.
- 10139 I. U. M. One, 158 mm. S. America. Coll. J. D. Anisits.
- 10150 I. U. M. Two, 80 and 104 mm. Bahia Negra. Coll. J. D. Anisits.
- 11302 I. U. M. Two, 94 and 100 mm. Trinidad, W. I.
- 1570 C. M., 11985 I. U. M. Small creek near Holmia, B. G., 1908. Coll. Eigenmann.
- 1571 C. M. One, Chipoo Creek, British Guiana. Coll. Wm. Grant.
- 1572 C. M. One, Nickaparoo Creek. Coll. Wm. Grant.
- 1573 C. M., 11986 I. U. M. Upper Essequibo River, British Guiana, 1908. Coll. Eigenmann.

1574 C. M., 11987 I U. M. Kumaka, Demerara, British Guiana, 1908. Coll. Eigenmann.

3. *Callichthys arcifer* Hensel.

Callichthys arcifer HENSEL, Wieg. Archiv., 1868, I, 373 (Rio de Janeiro).

No specimens.

CASCADURA,³ gen. nov.

Breast as in *Callichthys*, mouth subterminal as in *Callichthys*, the occipital process not meeting the dorsal plate, the nuchal plates not meeting along the middle line between the dorsal and occipital process. Fontanels very large, the bridge between them over the eye. Anterior fontanel about as large as the eye, the posterior a little longer than the eye, cutting into the occipital bone. In general appearance this genus resembles *Hoplosternum*, from which it differs in its concealed coracoid processes.

4. *Cascadura maculocephala*, sp. nov. (Plate XXV, fig. 3.)

3539 C. M. Type, 66 mm. Uruguayana, Feb. 7, 1909. Coll. Haseman.

Head to end of opercle 3.3; depth 3.2; width 4; D. I, 7; A. I, 6; P. I + 8; lateral plates $\frac{25}{23}$; eye 7 in the head, 3.8 in the interorbital space.

Deepest and widest at the base of the first dorsal rays. Snout depressed, body compressed. Dorsal profile quite steep to the dorsal, gently sloping downwards and backwards to the caudal. Ventral profile nearly straight to the anal, sloping abruptly back and upwards to the caudal; nuchal and lateral plates leaving a naked area above and below, 1.5 the width of the eye. Breast, belly and head covered with skin, only the upper half of the opercle naked.

Width of head 1.2 in its length, depressed in front; eyes lateral. Fontanel twice the length of the eye, a bridge at the middle over the eye, posterior fontanel cutting into the occipital. Isthmus jugular, 2.6 in the head. Snout blunt and square, its length 2.1 in the head. Upper lip vertical, overhanging the weak lower jaw. Teeth very

³ Popular designation in parts of South America.

small, in a single row along the edge of the lower jaw, wanting above. Two long rictal barbels, the outer reaching the length of the eye beyond the base of the pectorals; the inner reaching twice the length of the eye beyond the base of the ventrals.

Naked area of the back and entire ventral side visible from the sides. Lateral plates not reaching the dorsal or anal by about half the diameter of the eye. An irregular row of twelve small azygous plates reaching from the adipose to the dorsal. Free edge of scutes armed with two irregular rows of stout spines; smaller backward directed spines scattered over the surface of the scutes near their middle.

Origin of the dorsal a little in front of the vertical from the base of the ventrals. Dorsal spine very weak, base of the dorsal 1.8 in the height of the longest ray, which is 3.2 in the length. Spine of the adipose reaching the base of caudal. Caudal the diameter of the eye longer than the head. Origin of the anal on the vertical from the fifth azygous plate in front of the adipose. Anal spine very weak; the longest ray reaching 1.5 diameters of the eye beyond the caudal. Pectorals 1.5 in the head, reaching a little beyond the base of the ventrals. Ventrals not reaching the anal by one diameter of the eye. Rays of the dorsal, anal, and caudal with short stiff bristles.

Color light gray above to dull yellowish below. Top of head gray with numerous dark brown spots. An interrupted row of dark spots down the lateral line. Ventral side white. Barbels and fins, especially the ventrals and pectorals, dusky to almost blackish.

Genus HOPILOSTERNUM Gill.

5. *Hoplosternum littorale* Handcock.

Hoplosternum littoralis HANDCOCK, Zoölogical Jour., IV, 1828, 244 (Demerara).—

EIGENMANN and EIGENMANN, Occasional Papers, Cal. Acad. Sci., 1890, 456.

3467 C. M. One, 159 mm. San Luiz de Caceres, May 22, 1909. Coll. Haseman.

3468 C. M. One, 183 mm. Manãos. Nov. 25, 1909. Coll. Haseman.

3469 C. M. Four, 115 to 199 mm. Santarem, Dec. 6 and 7, 1909. Coll. Haseman.

One, 147 mm. Race course trenches, Georgetown, British Guiana, 1910. Coll. Ellis.

- 9886 I. U. M. One, — mm. Estancia la Armonia, January, 1900.
Coll. J. D. Anisits.
- 9888, 9889 I. U. M. Two, 209 and 175 mm. Campos Grande.
February, 1901. Coll. J. D. Anisits.
- 9890 I. U. M. One, about 147 mm. Matto Grosso or Asuncion.
Coll. Dr. Carl Ternetz.
- 10152 I. U. M. One, 88 mm. Bahia Negra. Coll. J. D. Anisits.
- 11304 I. U. M. One, 195 mm. Trinidad, W. I.
- 1585 C. M., 11993 I. U. M. Botanic Garden, Georgetown, British
Guiana, 1908. Coll. Eigenmann.
- 1576 C. M., 11988 I. U. M. Georgetown Market, British Guiana,
1908. Coll. Eigenmann.
- 1575 C. M. One, 192 mm. Mahaica, 1908. Coll. Eigenmann.

6. **Hoplosternum thoracatum** (Cuvier and Valenciennes).

- Callichthys thoracatus* CUVIER and VALENCIENNES, Hist. Nat. Poiss., XV, 1840, 309,
pl. 443 (Mana, Martinique).
- Hoplosternum thoracatum* Gill, Ann. Lyc. Nat. Hist. New York, VI, 1858, 36;—
EIGENMANN and EIGENMANN, Occasional Papers, Cal. Acad. Sci., I, 1890, 458.
- 3470 C. M. One, 38 mm. San Luiz de Caceres, May 24, 1909.
Coll. Haseman.
- 3471 C. M. Seven, 31 to 45 mm. Maciel, Rio Guaporé, July 9 and
28, 1909.
- 3472 C. M. One, 75 mm. (without caudal). San Joaquín, Bolivia,
in a mud-hole, Sept. 7, 1909. Coll. Haseman.
- 3473 C. M. Two, 171 and 174 mm. Manãos, Nov. 26 and 27, 1909.
Coll. Haseman.
- 3474 C. M. Seven, 45 to 172 mm. Santarem, Dec. 7 and 20, 1909.
Coll. Haseman.
- 3475 C. M. One, 180 mm. Bragança, Dec. 29, 1909. Coll.
Haseman.
- 3476 C. M. Four, 79 to 90 mm. San Francisco, June 10, 1909.
Coll. Haseman.
- Four, 60 to 70 mm. Gluck Island, British Guiana, 1910.
Coll. Ellis.
- 4229 I. U. M. 173 mm. Tabatinga.
- 2084 I. U. M. One, 108 mm. Cudajas.
- 1577 C. M., 11989 I. U. M. Chipoo Creek, British Guiana, 1908
Coll. Wm. Grant.

- 1578 C. M. One, below Packeoo Fall, 1908. Coll. Wm. Grant.
 1579 and 1580 C. M., 11990 I. U. M. Gluck Island, British Guiana,
 1908. Coll. Eigenmann.
 1581 C. M., 11991 I. U. M. Kumaka, Demerara, British Guiana,
 1908. Coll. Eigenmann.
 1582 C. M., 11992 I. U. M. Mud Creek in Aruka River, British
 Guiana, 1908. Coll. S. E. Shideler.
 1583 C. M. Two, probably Chipoo Creek, 1908. Coll. Wm. Grant.
 1584 C. M. One, Botanic Garden, Georgetown, British Guiana,
 1908. Coll. S. E. Shideler.

7. *Hoplosternum melampterum* (Cope).

- Callichthys melampterus* COPE, Proc. Acad. Nat. Sci. Phila., 1871, 275, Pl. XIV,
 fig. 4 (Ambyiacu River).
Hoplosternum melampterum EIGENMANN and EIGENMANN, Occasional Papers, Cal.
 Acad. Sci., I, 1890, 455, in key only.
Callichthys pectoralis BOULENGER, Proc. Zool. Soc. London, 1895, 525.
 10151 I. U. M. Two, 54 and 77 mm. Corumbá. Coll. Anisits.
 10199 I. U. M. Two, 27 and 34 mm. (without caudal), Rio Paraguay.
 Coll. Anisits.
 9855 I. U. M. One, 72 mm. (without caudal), Rio Branco, Matto
 Grosso, 1895. Coll. Anisits.

8. *Hoplosternum schreineri* Ribeiro.

- Hoplosternum schreineri* RIBEIRO, Fauna Brasiliense, Peixes, IV, 1912, 150 (Pará).

Genus DECAPOGON Eigenmann and Eigenmann.

a. Caudal uniform.

- b. Barbels extending beyond tips of pectorals. *adpersum* (Steindachner) 9.
 bb. Barbels not reaching margin of opercle. *verissimi* Ribeiro. 10.
 aa. Caudals with five parallel bands. *urostriatum* Ribeiro. 11.

9. *Decapogon adpersum* (Steindachner).

(Plate XXXI, figs. 2, 2a, 2b.)

- Callichthys adpersus* STEINDACHNER, "Ichthyologische Beiträge," V, 1876, 87, Pl.
 XI, figs. 2-2b (Santarem to Tabatinga).
Decapogon adpersum EIGENMANN and EIGENMANN, Occasional Papers, Cal. Acad.
 Sci., I, 1890, 461.
 3454 C. M. One, 122 mm., Santarem, Dec. 7, 1909. Coll. Haseman.
 4225 I. U. M. One, 85 mm. (to base of caudal only), Brazil.

10. *Decapogon verissimi* Ribeiro.

Decapogon verissimi RIBEIRO, Fauna Brasiliense, Peixes, IV(1), 1912, 154 (Pará).

11. *Decapogon urostriatum* Ribeiro. (Plate XXVI, fig. 1.)

Decapogon urostriatum RIBEIRO, Comm. Linhas Tel. Est. de Matto-Grosso ao Amazonas, Anexo, No. 5, Hist. Nat. Zool., 1912, 16 (Manãos).

[This species was described as new by Mrs. Ellis in her manuscript, and as the above cited description is not readily accessible, the following description may stand.—*C. H. Eigenmann.*]

3540 C. M. One, 140 mm. Manãos, Nov. 27, 1909. Coll. Haseman.

3541 C. M. Two, 136 to 145 mm. Manãos, Nov. 27, 1909. Coll. Haseman.

Head to the end of the opercle 3.5; depth 3.5; width 4.5; D. I, 7; A. I, 5; lateral plates $\frac{25}{25}$; eye 6 in the head, 3.5 to 3.7 in the inter-orbital.

Deepest and widest below the dorsal spine. Dorsal profile steep in front of the dorsal, thence almost straight to the adipose. Ventral profile gently bowed. The caudal peduncle sharply constricted, and quite narrow. Scutes leaving a naked strip in front of the anal. Coracoid processes meeting below, leaving a narrow wedge-shaped naked strip between them in front and a similar longer one behind. The left coracoid overlaps the right in the largest specimen.

Width of head 1.5 in its length, depressed in front; eyes lateral, suborbital exposed. Fontanel making a shallow niche in the occipital. Eye 1.25 to 1.5 in the fontanel. Isthmus close to the coracoid 3.5 to 4.5 in the head. Snout narrowly rounded, 2 to 2.2 in the head, 2.8 in its distance from its tip to the dorsal. Mouth narrow, slightly inferior. Teeth wanting above; in a narrow band below. Two long rictal barbules, the outer just reaching the opercle, the inner almost reaching the posterior margin of the scapula. Two pairs of short barbules and a rudiment of a third pair on the lower lip; the outer, longest, half as long as the diameter of the eye.

Scutes entirely covering the sides; four to seven azygous plates in front of the adipose dorsal. Free edges of the scutes slightly ctenoid, their surface hispid.

Dorsal spine strong and flattened, 4.5 to 5 in the length. Third dorsal ray longest, equal to the dorsal spine. Tip of anal reaching—

or not quite reaching—the caudal. Anal spine short, or not quite equal to the eye; first anal ray with short stiff bristles. Pectoral spine heavy, with retrorse teeth on its inner margin and short stiff antrorse hairs without; about 4 to 4.5 in the length; reaching or not quite reaching the ventrals. Ventrals short, about five in the length. Caudal very deeply emarginate, the diameter of the eye less than the head.

Light brown, yellowish below, two to four dark brown spots behind the eye. A whitish spot at the ventral end of each of the upper series, and at the dorsal end of each of the lower series of lateral plates, forming a whitish stripe graduated from the head caudal. Dorsal, pectorals and ventrals dusky. Caudal spot blackish, continued to the tips of the middle caudal rays. Caudal when expanded with five parallel, horizontal black stripes, the middle on the middle caudal rays, the next ones, from the accessory rays across the rays to the tips of the third and fourth above and below the middle. The outer two bands across the lobes near their tips. Anal whitish with two diagonal blackish bars including the spine, the first rays, and the tips of the last rays. Adipose blackish along its free margin.

Genus *DIANEMA* Cope.

12. *Dianema longibarbis* Cope.

Dianem alongibarbis COPE, Proc. Acad. Nat. Sci. Phila., 1871, 276, pl. 7, fig. 1-15 (Ambyiacu River).

No specimens.

Genus *CHÆNOTHORAX* Cope.

13. *Chænothorax taiosh* (Castelnau).

Callichthys taiosh CASTELNAU, Anim. de l'Am. du Sud, Poissons, 1855, pl. 19, fig. 1.

Brochis taiosh EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d Ser., I, 1888, 165 (name only).—EIGENMANN and EIGENMANN, Occasional Papers, Cal. Acad. Sci., I, 1890, 463, in key.

Chænothorax taiosh EIGENMANN, Rept. Princeton Univ. Exp. Patagonia, III, 1910, 403 (name only).

No specimens.

14. *Chænothorax bicarinatus* Cope.

Chænothorax bicarinatus COPE, Proc. Am. Philos. Soc., 1878, 679 (Peruvian Amazon).

No specimens.

15. *Chænothorax semiscutatus* (Cope).

Corydoras semiscutatus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 280, pl. 6, fig. 1 (Ambyiacu River).

Chænothorax semiscutatus EIGENMANN, Rept. Princeton Univ. Exp. Patagonia, III, 1910, 402.

No specimens.

16. *Chænothorax eigenmanni*⁴ sp. nov. (Plate XXVI, fig. 2.)

3542 C. M. Type, 51 mm. Caceres, May 26, 1909. Coll. Haseman.

3543 C. M. Cotype, 55 mm. Caceres, May 26, 1909. Coll. Haseman.

Head 2.9 to 3; depth 2.7; width 5; D. I, 12; A. I, 6 or 7; P. I, 7; lateral plates $\frac{24}{22}$; eye 3.5 to 3.7 in the head, 1.7 in the interorbital.

Compressed throughout, dorsal profile only slightly arched from the snout to the base of the dorsal plate. Scutes leaving a naked area along the ventral side, and along the dorsal side in front of the adipose. Coracoid processes reaching backwards almost to the ventral and not expanded on the breast, leaving a naked area equal to the eye in width in front of the ventrals.

Entire snout and suborbitals unmailed. Eyes lateral, interorbitals slightly convex; fontanel long, 1.5 times the eye, not quite reaching the nares in front, just reaching the base of the occipital process behind. Occipital process weak, reaching little more than half the distance from its base to the dorsal. Eye 2.5 in the pointed snout. Mouth small. A pair of equal barbels at the rictus, reaching back to the vertical from the middle of the eye or a little beyond, fused at the base for a distance of half the length of the eye. A pair of short barbels, two-thirds the length of the eye, at the symphysis.

Scutes almost entirely covering the sides. One very small azygous plate just in front of the adipose. The distal half of the exposed parts of the scutes roughened with short backwardly directed spines.

Dorsal spine equidistant from the snout and the upper caudal lobe; slender, curved backwards; smooth in front, toothed behind; 1.3 to 1.4 in the head; about equal to the first rays. Base of the dorsal a little less than the head; last dorsal rays reaching the adipose.

⁴Named for Dr. C. H. Eigenmann, under whose care and direction this paper and my paper on the genera *Hemigrammus* and *Hyphessobrycon* have been written.

Adipose spine very straight, slightly longer than the eye; slightly less than the base of the fin. Anal spine weak, rough in front. First three anal rays longest, reaching well beyond the base of the caudal. Pectoral spine straight, equal to the dorsal spine, smooth on the outer side, toothed within. Pectorals long, reaching to the middle of the short ventrals. Ventrals reaching the second scute in front of the anal in the cotype, much shorter in the type. Caudal forked, upper lobe longest, 2.3 in the length.

Dark above, yellowish on the belly and lower one-third of the sides, whitish under the head and along the lateral line. Pectoral spine dusky, pectoral and caudal light. Dorsals, anal, and ventrals with a distinct reddish tinge not quite as dark as the upper parts of the body.

Genus BROCHIS Cope.

17. *Brochis dipterus* Cope.

Brochis dipterus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 278 (Ambyiacu River).

No specimens.

18. *Brochis cœruleus* Cope.

Brochis cœruleus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 277, pl. 7, fig. 2, and pl. 4, fig. 3 (Ambyiacu River).

No specimens.

Genus ASPIDORAS von Ihering.

19. *Aspidoras rochai* von Ihering. (Plate XXVI, fig. 3.)

Aspidoras rochai VON IHERING, Notas Prelim., I, 1907, 30.

3455 C. M. Three, 23-34 mm. (without caudal), Rio Agua Branca, Nov. 6, 1907. Coll. Haseman.

3456 C. M. One, 42 mm., Rio Zinga, Nov. 7, 1907. Coll. Haseman.

3457 C. M. Five, 31-48 mm. Rio Paiaia, Nov. 8, 1907. Coll. Haseman.

Genus CORYDORAS Lacépède.

KEY TO THE SPECIES OF CORYDORAS.

a. Caudal plain.

- b. Coracoid processes moderately expanded on the breast in both sexes, leaving only a narrow naked area between them; occipital process triangular, pointed at the tip; a dark band extending from the upper caudal lobe forward, one or more longitudinal series of dark spots along the sides near the lateral line. . . . *elegans* Steindachner. 20.

bb. Coracoid process scarcely encroaching on the breast or belly, the naked area more than a third as wide as the distance between the base of the pectoral spines (except in large specimens of *armatus*).

c. Sides of the body with a median longitudinal stripe.

d. Eye 1.5 in the snout, 4 in the head, 2 in the interorbital. First two dorsal rays as long as the dorsal spine. Occipital process truncate, about twice as wide at the base as at the tip. Lateral stripe extending from the middle caudal ray forward, distinct and constant. "Head 3.5, depth 2.6 to 2.8; D. I, 7-8; A. I, 7; V. 6; P. I, 6-7. Lateral plates $\frac{23}{20}$."

nattereri Steindachner. 21.

dd. Eye 2 in the snout, 3.5 in the head, 1.3 in the interorbital. First dorsal ray only as long as the dorsal spine. The width of the occipital process at its base about equal to its length, about three times its width at its tip. Lateral band dusky, not intense. Head 3.5; depth 3; D. I, 7.5; A. I, 6.5; lateral plates $\frac{24}{22}$*juquia* von Ihering. 22.

ddd. Eye 2-2.25 in the snout, 4-5 in the head, 2-2.5 in the interorbital. First three to five dorsal rays as long as the dorsal spine. Tip of the occipital process narrow, about 4 in the length, or the width of its base. Lateral stripe wide, variable in intensity, sometimes weak near the caudal, Head 2.6-3.8; depth 2.5 to 3; D. I, 7-8; A. 7-8; P. I, 8-9; V. 6; lateral plates $\frac{22-23}{20}$.

microps Eigenmann & Kennedy. 23.

dddd. Eye 2.75 in the snout, 5.5 in the length, about 2 in the interorbital. Snout 2 in head; suborbital a little narrower than diameter of eye; barbel nearly or quite reaching gill-opening. Dorsal I, 7; spine about three-fifths length of head, three or four rays longer than spine; edge of fin slightly convex; base nearly equal to distance from adipose fin, which is preceded by three or four median scutes. Anal I, 6. Pectoral spine extending to base of pelvic. Scutes 24/22; humeral shields widely separated below, and each separated by one scute from base of pelvic fin. Brownish above, yellowish below; a broad blackish lateral band; fins immaculate. Habitat Colombia (Regan).

melanotania Regan. 24.

dddd. Eye 3 in the snout, 6 in head, 3 in the interorbital; suborbital 1.5 the diameter of the eye; barbels reaching gill-opening; occipital plate longer than broad. D. I, 7, spine .5 of length of head or less, five or six rays longer than the spine; base less than distance from adipose, which is preceded by three or four median scutes; A. I, 6; pectoral spine to base of pelvis.

- Scutes $\begin{smallmatrix} 23-24; \\ 23-21 \end{smallmatrix}$; humeral shields not in contact, separated by one scute from base of pelvic fin. Brownish above, yellowish below; a broad dark lateral band tapering backwards. Fins dusky (Regan).....*macrosteus* Regan. 25.
- cc. Sides of the body without a longitudinal stripe.
- e. Body without small spots, with or without a large dark blotch under the dorsal.
- f. Dorsal spine weak, slightly decurved, very little longer than the snout; 2 or more in the head. Depth 2.8 to 4; head 3.6, eye 2 in the snout, 2-2.5 in the interorbital, 4.5 to 4.75 in the head. Base of the dorsal shorter than the distance between the dorsal and adipose. Four or five azygous plates. Dark above, light below; usually the first seven or eight scutes are dark, forming a large blotch under the dorsal; opercle, humeral, and nuchal plates iridescent blue. D. I, 7; A. I, 6; lateral plates $\frac{22}{20}$*æneus* (Gill). 26.
- ff. Dorsal spine straight and well developed; longer than the snout plus the diameter of the eye; 1.2 in the head. Depth 3 to 2.5; eye 1.5 to 2 in the interorbital.
- virescens* Ribeiro. 27.
- ee. A row of small blackish, often bluish, iridescent spots down either side of the lateral line, upper scutes with small scattered more or less rectangular spots. Dorsal spine very strong, equal to the depth, 2.3 to 2.8 in the length. Pectoral spine not so long. Eye large, 1.5 in the snout, 1.75 in the interorbital and 3-3.25 in the head. Base of the dorsal equal to the distance between the dorsal and adipose. Caudal peduncle rather sharply constricted. D. I, 7; A. I, 6; P. I, 7-8; V. 6; four to five azygous plates.....*armatus* (Günther). 28.
- ecc. Longitudinal series of small dark spots on sides of body and on rays of dorsal fin; other fins immaculate. Head 3.25-3.5; depth 2.33-2.5; snout strongly decurved, a little longer than diameter of eye; eye 3 in head, 1.5 in interorbital; suborbital narrow; barbel nearly reaching gill-opening. D. I, 7; spine nearly as long as head, soft rays decreasing from first, which is as long or a little longer than spine; two azygous plates in front of adipose; A. I, 6; pectoral spine as long as head, extending to middle of ventrals. Plates $\frac{21-22}{19-20}$ (Regan).
- polystictus* Regan. 29.
- aa. Caudal with vertical cross-bars.
- g. Sides without dark markings, or with a dark stripe or a few large spots along the middle of the upper series of scutes. One to three or four large spots lying across the lateral line in two species and a single spot below the lateral line in another. Anal unmarked. Head plain.

- h. Head and body without dark markings.
- i. No azygous plates, adipose spine without fin; a faint pale band on each side; clavicle and operculum with blue reflections; a large black spot on the distal part of the dorsal rays. Head 3.1, 1.3 in the depth; D. I, 7; A. I, 6; V. 6; P. 1.5; lateral plates $\frac{22}{21}$; eye 3 in the head, 1.33 in the interorbitals (Cope). *acutus* Cope. 30.
- ii. Three or four azygous plates in front of the adipose. Top of the head brown, a yellowish band across the eyes, body otherwise without color. Dorsal with five longitudinal rows of dark spots. Head 4; depth 3; D. I, 7; A. 7; V. 6; P. I, 9. Lateral plates $\frac{23}{20}$*aurofrenatus* Eigenmann & Kennedy. 31.
- hh. Body with a dark stripe or a few large dark blotches.
- j. Dorsal spine less than 2 in the head, a little longer than the pectoral spine.
- k. "Fontanel long, reaching forward to the anterior border of the eye, backwards to the base of the occipital process. Four or five azygous plates. Strongly compressed, head and depth nearly equal, 3 to 2.5 in the length. Snout 1.3 to 1.5, eye 4.5 to 5, and interorbital 3 to 3.75 in the head. A blackish gray stripe along the upper half of the body, beginning just under the dorsal and ending on the base of the caudal. Upper scutes each with a dark vertical bar. Near the upper end of the first five to ten lower plates is a blackish spot or short oblique stripe. Dorsal plain. D. I, 8; V. I, 6; C. 16; A. I, 7; P. I, 10; lateral plates $\frac{23}{21}$ " (Steindachner).....*treillii* Steindachner. 32.
- kk. Fontanel small, not reaching the occipital process. Two or three, rarely four, azygous plates. Body slender, depth 3 to 3.1; head 3 to 3.25 and 3.5; eye 3.5 to 4 in the head, 1.6 to 1.7 in the interorbital, and 1.5 in the snout. Interorbital 2.2 to 2.3 in the snout. A very large blackish brown spot on the anterior part of the body, frequently reaching back to the second or third dorsal ray, usually broader below, ending on the lower side of the lateral line. A second smaller longer dark spot lies along the lateral line in the vicinity of the adipose; often a small caudal spot, which sometimes fuses with the other spots. D. I, 8; A. 7; V. 7; lateral plates $\frac{22 \text{ or } 23}{21 \text{ or } 20}$ (Steindachner).
ehrdardi Steindachner. 33
- jj. Dorsal spine about 2 in the head, the diameter of the eye less than the pectoral spine and about equal to the fourth or fifth dorsal ray. Fontanel slender and rather long. Depth 3.2 to 3; head 3.3. Snout long and pointed, 1.6 in the head, quite steep in front.

Eye 3 in the snout, 4.6 in the head and 1.5 in the narrow interorbital. Three indistinct spots along the back, at the base of the dorsal spine and first dorsal rays and base of the last dorsal rays and at the base of the adipose spine. Spots often confluent; many small scattered chromatophores over the head and sides. Dorsal with three or four cross-bars. D. I, 8; A. I, 6;

lateral plates $\frac{23}{21}$ *flaveolus* von Ihering. 34.

gg. Sides variously striped or spotted; most species with a series or a few scattered spots below the lateral line. Dorsal always and anal usually marked. Usually some grouping of the chromatophores on the face.

l. A large intense black spot at the base of the dorsal spine, or on the first few dorsal rays, or on both.

m. Dark spot at the base of the dorsal spine, sides of the body with numerous small black dots.

n. Anal plain; a black spot at the tip of each dorsal ray. The small dark dots on the sides lacking along the lateral line; Face with blue reflections. Form stout, profile steep in front. Head 3 in the length; 1.4 in the depth; eye 3 in the head, 1.6 in the interorbital. Dorsal spine long, reaching the adipose when depressed. Four flat azygous plates. D. I, 7; A. I, 6; V, 6; P, I, 7. lateral plates $\frac{21}{19}$ (Cope)..... *amphibelus* Cope. 35.

mm. Anal barred, or spotted, or hyaline, dorsal or part of dorsal dark, the color sometimes extending upon the sides below. Occiput and a bar through the eyes continued on the cheeks blackish. Opercle and humeral process silvery. Depth 2.6 to 3; head 3.25-3.33; eye large, 1.5 in the snout, 3.3-4 in the head, 1.66 in the interorbital, two to four azygous plates. Dorsal spine about equal to the head. D. I, 7 or 8; A. 7 or 8; V. 6; P. I, 8-9; lateral plates $\frac{23-25}{21-23}$.

punctatus (Bloch). 36.

mm. Dark spot in the anterior part of the dorsal fin. Sides with several longitudinal rows of small spots.

o. An indefinite light stripe along the lateral line, anal with dark spots or small dark dots.

p. A series of small spots in the light stripe along the lateral line, upper parts of the head, upper two-thirds of the body, caudal, dorsal, adipose, and anal with gray (iridescent in life) point-like dots, snout short; fontanel short; eye very small, 4 in the head. Interorbital equal to the snout, 2 in the head. Dorsal spine shorter than the pectoral spine. Pectoral spine equal to the head. Three azygous

plates. Depth at genital opening 2.5 to 2.6; head 3 to 3.3; D. I, 8; A. I, 6; P. I, 8-9; lateral plates $\frac{21}{20}$

(Steindachner) *julii* Steindachner. 37.

pp. Body brownish above the pale lateral stripe, yellowish to white below. Three longitudinal series of small dark spots along the side. Black dorsal spot over the entire length of the first three rays, the rest of the dorsal whitish, with several oblique series of small dark spots, some at the tips of the rays. Anal with two or three series of small spots. Fontanel oval, small. Eye 4 in the head, 2 in the interorbital; snout 1.75 in the head. Dorsal spine slender, shorter than the pectoral spine, which equals the distance from the tip of the snout to the posterior margin of the eye. Three azygous plates. Head 3; depth 2.5 to 2.6; D. I, 7; A. I, 6-7; V. I, 5; P. I, 9; lateral plates $\frac{23}{21}$. (*agassizii* Steindachner).

trilineatus Cope. 38.

ppp. A series of three to six dark brownish or purplish spots along the side and a second series on the back; dorsal dusky anteriorly, sometimes with spots on rays; lower fins immaculate. Head 4; depth 3-3.5; eye 2.5-3 in the snout or interorbital, 6-7 in the head; suborbital narrow; barbels nearly or quite reaching gill-opening. Dorsal I, 8; spine one-half the length of head; fin small, rounded, its base less than its distance from adipose fin, which is preceded by one or two median scutes. Anal I, 6. Pectoral spine not reaching base of pelvic fin. Scutes 25/22; humeral shields widely separated below, each separated by two scutes from base of pelvic fin. Yellow, with a series of three to six dark brownish or purplish spots along the side and a second series on the back; dorsal dusky anteriorly, sometimes with spots on rays; caudal barred; lower fins immaculate. 1-8 (types 35-50 mm. Salta, Argentina, Coll. Borelli, and Steinbach).

micracanthus Regan. 39.

pppp. A series of four to five dark oblong spots, the third below the adipose, a similar series on the back; dorsal dusky anteriorly, usually with spots on the rays, anal sometimes with a spot. Head 3.75; depth 3; eye 4.5 in head, near middle of head; interorbital 2.5 in the head. Suborbital narrow; barbel nearly reaching gill-opening. Dorsal I, 6-7; spine .60 to .66 the

- length of head; first and second rays longest, the edge of fin slightly convex; base about equal to distance from adipose fin, which is preceded by one or two median scutes. Anal I, 6. Pectoral spine extending to base of pelvics. Scutes 22 $\frac{23}{20}$; humeral shields not in contact below, each separated by one and one-half scutes from base of pelvic fin. A lateral series of four or five dark oblong spots, the third below the adipose fin; a similar series of spots on the back; dorsal dusky anteriorly and usually with spots on the rays; caudal usually barred with series of spots; lower fins immaculate, or anal sometimes with a spot. *microcephalus* Regan. 40.
- oo. Not as above. Three rows of elongate grayish violet spots over the upper two-thirds of the body. A nearly black, sharply outlined band along the upper half of the dorsal, not quite reaching the posterior margin of the fin. Snout not as deep and body more elongate than in *C. julii*. Snout and interorbital equal, 2 in the head, eye 5 to 6 in the head. Head 3.25 to 3.5; depth at the genital opening, 3 to 3.25 (rarely 4); D. I, 8; A. I, 6; lateral plates $\frac{22 \text{ to } 25}{22 \text{ to } 23}$ (Steindachner). *raimundi* Steindachner. 41.
- mmm. A dark spot at the base of the spine and another near the tip of the first three rays. A second spot on the sides near the back at the base of the last dorsal rays, and a third just under the adipose spine. Four or five large dark spots along the lateral line and two or three much smaller ones below it, one just beyond the tip of the pectorals and a second above the anal. Anal unmarked. Dorsal spine short, 1.6 in the head, equal to the snout plus half the eye, shorter than the pectoral spine. Snout 2 in the head. Eye 2 in the snout, 3.5 to 4 in the head, and 1.7 to 1.9 in the interorbital. One or two azygous plates. Head 3 to 3.3; depth 2.66 to 3; D. I, 8; A. I, 6; lateral plates $\frac{22}{21}$ *garbei* von Ihering. 42.
- ll. Dorsal variously marked with interrupted cross-bars (young of *kronei* with the dark bars more or less confluent in front near the base), face with distinct markings.
- g. Snout with marblings or worm-shaped marks.
- r. Marbling extending over the head, neck, and humeral processes in the female and to the vertical from the last dorsal rays in the males, more restricted in young and those of the type of *eigenmanni*. Male with a broad black band down the lateral line subtended by a satiny white stripe and then by a much narrower black stripe; the region above the lateral band brownish, crossed by one large blackish

blotch just below the last dorsal rays, and another just below the adipose. Markings of the female similar, except that the broad lateral band is irregularly interrupted and even reduced to a series of three or four backwardly pointing V's in some. The satiny white stripe is lacking. Dorsal fin in males reaching the adipose, when depressed; reaching the anterior azygous plate in females. Pectorals a little longer than the dorsal. Dorsal spine short, 2 in the head. Side of the snout with stiff bristles in the male. Snout long, 1.5 to 1.2 in the head. Eye small, 3 to 3.6 in the snout, 5 to 5.5 in the head, and 1.4 to 2 in the interorbital. Head a little greater than the depth, 3.4 to 3.5; depth 3.5 to 3.6, D. I, 7-8; A. I, 5.5 to 6; lateral plates $\frac{24-26}{22-23}$. Six azygous plates. . . *kronoi* Mirando Ribeiro. 43.

- rr. Head dark, with a worm-shaped mark on the snout; a large unbroken spot on the lower part of the side between the ventrals and anal. Dark stripe along the lateral line often ending in a caudal spot; dorsal region checkered. Four series of spots across the dorsal. Much like *nattereri* in morphological characters (von Ihering).

nattereri triseriatus v. Ihering. 44.

- qq. Snout thickly sprinkled with small dark dots or distinct round dark spots.
- s. Head with very numerous small black chromatophores; humeral processes dark; sides with a row of small dark spots on either side of the lateral line, three very large dark spots along the lateral line, a broken stripe along the middle of the upper series of plates, sometimes confluent in places with the large spots of the lateral line, occiput, dorsal plate, and back just behind the dorsal and adipose. Dorsal of male with five cross-bars. Anal and ventral with a large central dark spot. Pectorals cross-barred. Dorsal of the male reaching beyond the adipose, not quite reaching the adipose in the female. Pectorals reaching the tip of the ventrals in the male, reaching the middle of the ventrals in the females. Dorsal spine straight and strong, 1.1 to 1.2 in the head. Snout 2 in the head. Eye larger than in *kronoi*, 1.5 to 2+ in the snout, 3.5 to 4 in the head, and 1.7 to 1.8 in interorbital. One or two azygous plates. Head 3.3 to 3.5; depth 2.7 to 2.8; D. I, 7; A. I, 6; lateral plates $\frac{23}{20-21}$. . . *paleatus* (Jenyns). 45.
- ss. Dorsal with two or three interrupted cross-bars. Head and snout with numerous round brown spots a little smaller than the pupil. Sides with five or six irregular

longitudinal series of slightly larger spots both above and below the lateral line; a group of five or six fainter spots just above the anal. Adipose and anal with a series of small dark spots. Dorsal spine short, 1.5 in the head, shorter than the pectoral spine by three-fourths the diameter of the eye. Two azygous plates. Snout narrow, 1.6 to 1.8 in the head. Eye 1.9 in the snout, 3.5 to 3.8 in the head, 1.7 in the interorbital. Head 3.2 to 3.3; depth 2.5 to 3; D. I, 8; A. I, 6; lateral plates $\frac{22}{20}$ *mullimaculatus* Steindachner. 46.

- aaa.* An intense black hastate spot at the base of the caudal fin, margined behind with white, and terminating the black lateral band. A black or blackish line on either side from a short distance behind the ventrals to behind the anal.
- t.* Pectoral spine a little longer than the dorsal spine, weakly serrate along both margins. Lateral band and stripe on the ventral plates jet-black and very prominent. Eye large, 1.5 in the snout, 3.5 in the head, 2 in the interorbital. Head 3.3; depth 2.75; D. I, 7-8; A. 7-8; lateral line $\frac{22}{20}$.
hastatus Eigenmann and Eigenmann. 47.
- tt.* Pectoral spine longer than the dorsal spine, its surface striate, comparatively free from serrations. Lateral band a narrow, dusky line, and the stripe on the ventral plates rather faint, at least toward the anal. Eye large, 1 in the snout, 3 in the head, 1.66 in the interorbital. Head 3.5; depth 2.5; D. I, 7; P. I, 7; V. 7; A. I, 6. *australis* Eigenmann and Ward. 48.

20. *Corydoras elegans* Steindachner.

Corydoras elegans STEINDACHNER, "Ichthyologische Beiträge," V, 1876, 93 (Cudajas; Teffé).

4227 I. U. Three, about 49 to 55 mm. Cudajas.

21. *Corydoras nattereri* Steindachner.

(Plate XXXI, figs. 1, 1a, 1b.)

Corydoras nattereri STEINDACHNER, "Ichthyologische Beiträge," V, 1876, 95, pl. XI, fig. 1-1b (Rio Janeiro).—EIGENMANN AND EIGENMANN, Occasional Papers, Cal. Acad. Sci., I, 1890, 470.

- 3487 C. M. Eleven, 50 to 69 mm. Morretes, Jan. 2 and 3, 1908. Coll. Haseman.
- 3488 C. M. Five, 27 to 46 mm. São João da Barra, June 22, 1908. Coll. Haseman.
- 3489 C. M. Nineteen, 32 to 62 mm. Entre Rios, June 1, 1908. Coll. Haseman.

- 3490 C. M. Forty-three, 26 to 50 mm. Campos, June 15, 1908
Coll. Haseman.
- 3491 C. M. Two, 37 and 42 mm. Lagoa Feia Tocas, June 27, 1908.
Coll. Haseman.
- 3492 C. M. One, 43 mm. San Joaquin, Sept. 6, 1909. Coll. Haseman.
- 3493 C. M. Three, 49 to 51 mm. Campos, June 15, 1908. Coll. Haseman.
- 3494 C. M. Nine, 26 to 57 mm. Morretes, Jan. 4, 1909. Coll. Haseman.
- 3495 C. M. Ten, 27 to 41 mm. Entre Rios, June 1, 1908. Coll. Haseman.

22. *Corydoras juquiaë* von Ihering. (Plate XXVII, fig. 1.)

Corydoras juquiaë VON IHERING, Notas Preliminares, I, 1907, 37.

- 10996 I. U. M. Type, 66 mm., Rio Juquiá, Poci Grande, von Ihering.
- 3544 C. M. One, 77 mm., Xiririca, Rio Riberia, Dec. 8, 1908.
Coll. Haseman.

23. *Corydoras microps* Eigenmann and Kennedy.

Corydoras microps EIGENMANN and KENNEDY, Proc. Acad. Nat. Sci. Phila., July, 1903, 506 (Paraguay).

Corydoras undulatus REGAN, Ann. and Mag. Nat. Hist., (8) X, 1912, 217 (La Plata).

[Regan makes *Corydoras microps* Eigenmann and Ward a new species and makes the *Corydoras microps* of Eigenmann and Kennedy a synonym of *æneus*. It is possible that *microps* Eigenmann and Kennedy is a synonym of *æneus*. It is certain that most of the specimens recorded by Eigenmann and Ward are identical with those recorded by Eigenmann and Kennedy. It is possible that the spotted specimens, one of which is figured by Eigenmann and Ward, offer an excuse for the species *undulatus*. C. H. Eigenmann.]

- 10210 I. U. M. Four, 38 to 64 mm. Mountain brooks, Paraguay.
Coll. J. D. Anisits.
- 10153 I. U. M. Six, 25 to 36 mm. (Without caudal), Puerto Max, Forest lagoons. Coll. J. D. Anisits.
- 9892 I. U. M. One, type, 33 mm. (Without caudal), Rio Branco, Matto Grosso, June 1, 1901. Coll. J. D. Anisits.
- 9895 I. U. M. Two, cotypes, 25 and 26 mm. Arroyo Pypucu, June 1, 1901. Coll. J. D. Anisits.

- 9893 I. U. M. One, cotype, 53 mm. Aregua Laguna, Ypacari, June, 1901. Coll. J. D. Anisits.
- 10201 I. U. M. Five, 28 to 39 mm. Villa Rica. Coll. J. D. Anisits.
- 954a C. M. One, Aguadas near Arroyo Trementina. Coll. J. D. Anisits.
- 3478 C. M. Two, 41 and 44 mm., São Francisco, June 10, 1909. Coll. Haseman.
- 3479 C. M. Sixteen, 42 to 69 mm. Sapucay, April 2 and 5, 1909. Coll. Haseman.
- 3480 C. M. Thirteen, 34 to 70 mm. Urucum Mts., Corumbá, May 2, 1909. Coll. Haseman.
- 3481 C. M. One, 49 mm., Puerto Suarez, E. Bolivia. Coll. Steinbach.
- 3482 C. M. Four, 40 to 50 mm. Banhurie S. P., creek of Rio Tieté. Coll. Haseman.
- 3483 C. M. One, 51 mm. Cacequy, Jan. 31, 1909. Coll. Haseman.
- 3484 C. M. One, 40 mm. Corumbá, April 27, 1909. Coll. Haseman.
- 3485 C. M. Eleven, 41 to 61 mm. Salto das Cruzes, Rio Tieté, Sept. 22, 1908. Coll. Haseman.
- 3496 C. M. Two, 55 and 59 mm. Rio de Boa Ventura, June 16, 1909.

24. *Corydoras melanotænia* Regan.

Corydoras melanotænia REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 217 (Honda).

25. *Corydoras macrosteus* Regan.

Corydoras macrosteus REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 219 (Rio Piracicala, São Paulo, Brazil).

26. *Corydoras æneus* (Gill).

Hoplosoma æneum GILL, Ann. Lyc. Nat. Hist. New York, VI, 1858, 43 (Trinidad, W. I.).

(?) *Corydoras venezuelanus* VON IHERING, Rev. Mus. Paulista, VIII, 1910, 383 (Rio Cabriale, Venezuela).

11301 I. U. Three, 60 to 80 mm. Trinidad, W. I.

Gill's original description of *H. æneum* and the description of *C. venezuelanus* differ in a few particulars. *H. æneum* is said to be, "greatest height rather less than a fifth in the total length," while *C. venezuelanus* is given, greatest height 2.66 in the length to the base of the caudal. The interorbital is less than snout in *æneus* and slightly

more than the snout in *venezuelanus*. The three specimens of *aneus* at hand came from Trinidad, but agree even more perfectly with the description of *venezuelanus* than with that of *aneus*. The specimens from which *aneus* was described were 63.5 to 101.6 mm.; those from which *venezuelanus* was described were 35-45 mm., which may account for the variation in proportion of height to length found by the two authors.

27. **Corydoras virescens** Ribeiro. (Plate XXVII, fig. 2.)

Corydoras virescens RIBEIRO, Comm. Linh. Telegr. Est. de Matto-Grosso ao Amazonas, Ann. No. 5, Hist. Nat. Zoöl., 1912, 16 (Caceres).

- 3545 C. M. 47 mm. Caceres, May 26, 1909. Coll. Haseman.
 3523 C. M. Thirty-eight, 23-48 mm. Caceres, May 26, 1909. Coll. Haseman.
 3524 C. M. Nine, 23 to 45 mm. Jaurú, June 2, 1909. Coll. Haseman.
 3525 C. M. One, 24 mm. Rio Jaurú, June 3, 1909. Coll. Haseman.
 3526 C. M. Four, 34 to 43 mm. (without caudal), San Francisco, June 10, 1909. Coll. Haseman.
 3527 C. M. One, 45 mm. Rio Santa Rita, June 12, 1909. Coll. Haseman.
 3528 C. M. Twelve, 16 to 21 mm. (without caudal), Bastos, June 26, 1909. Coll. Haseman.
 3529 C. M. Two, 29 to 33 mm. Maciel, Rio Guaporé, July 9, 1909. Coll. Haseman.
 3530 C. M. One, 30 mm. Maciel, Rio Guaporé, July 23, 1909. Coll. Haseman.

[This species was described as new by Mrs. Ellis. The name has been suppressed, but her description is allowed to stand.—*C. H. Eigenmann.*]

Head to the end of the opercle 3 to 3.5; depth $2\frac{1}{2}$ to 3 (in very small); width 2 to 3.8; D. I, 8; A. I, 6; P. I, 7; lateral plates $\frac{22}{19}$ to $\frac{23}{20}$; eye 1.5 to 2 in the snout, 3 to 3.3 in the head, 1.3 to 2 in the inter-orbital.

Moderately compressed throughout, becoming much stouter with age; highest at the dorsal spine. Dorsal profile steep in front of the nares. Ventral profile nearly straight, or only gently bowed. Caudal peduncle rather sharply constricted. Coracoid processes not expanded

below; breast and belly in front of the ventrals naked. Scutes meeting along the mid-ventral line behind the ventrals; width of the head 1.1 to 1.25 in its length, eyes lateral. Frontal fontanel small, making a small niche in the occipital, reaching the level of the pupil in front. Snout naked beyond the suborbitals, bluntly conical, more perpendicular in front in young than in old specimens. Rictal barbels equal, reaching the vertical from the middle of the eye, those of the lower lip short. Mouth small and inferior.

Scutes entirely covering the sides. Four scutes meeting on the back just behind the dorsal; three azygous plates in front of the adipose. Scutes somewhat roughened over the surface and along the edge.

Origin of the dorsal a little nearer the snout than the caudal. Dorsal spine straight and well developed, about 1.2 in the head; a little rough in front, finely toothed behind, the first two rays very little longer than the spine. Pectoral spine half the diameter of the eye, longer than the dorsal spine, equal to the head, otherwise like the dorsal spine, reaching the second scute in front of the tips of the ventrals. Adipose spine very slightly curved. Anal spine weak, rough. Anal just reaching the lower caudal lobe. Ventrals short, 1.5 to 1.75 in the distance from their base to the anal. Caudal the diameter of the eye longer than the head.

Top of head, back, and upper part of sides dark, yellowish below. The dark color of the head, especially in smaller specimens, due to numerous scattered chromatophores, small on the snout, larger near the dorsal spine; the color of the sides due to a dark brown stripe, along the distal half of each scute, more distinct near the lateral line, diffuse near the dorsal line on the upper plates and vanishing near the ventral line on the lower plates. Opercle with light blue iridescence, which sometimes extends on to the humeral plate. Fins all unmarked, except the ventrals, which are slightly dusky.

28. *Corydoras armatus* (Günther). (Plate XXVII, fig. 3.)

Callichthys armatus GÜNTHER, Proc. Zool. Soc. London, 1868, 230, fig. 1 (Xeberos and Huallaga).

3531 C. M. Two, 44 and 45 mm. San Joaquin, Sept. 5, 1909. Coll. Haseman.

3532 C. M. Four, 54 to 61 mm. San Joaquin, Sept. 6, 1909. Coll. Haseman.

- 3533 C. M. One, 40 mm. Santarem, Dec. 9, 1909. Coll. Haseman.
 3534 C. M. Four, 43 to 44 mm. Santarem, Dec. 16, 1909. Coll. Haseman.

29. *Corydoras polystictus* Regan.

Corydoras polystictus REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 216 (Descalvadas, Matto Grosso).

30. *Corydoras acutus* Cope.

Corydoras acutus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 281 (Ambyiacu).
 No specimens.

31. *Corydoras aurofrenatus* Eigenmann and Kennedy.

Corydoras aurofrenatus EIGENMANN and KENNEDY, Proc. Acad. Nat. Sci. Phila., 1903, 507 (Aguada, near Arroyo Trementina).

- 9891 I. U. M. Type, 55 mm. Aguada, near Arroyo Trementina, Dec., 1900. Coll. J. D. Anisits.
 3497 C. M. Two, 48 and 59 mm. Caceres, May 26, 1909. Coll. Haseman.
 10193 I. U. M. One, 30 mm. Villa Rica.
 3498 C. M. One, 44 mm. Caceres, May 24, 1909. Coll. Haseman.
 3499 C. M. One, 41 mm. Caceres, May 23, 1909. Coll. Haseman.

32. *Corydoras treitlii* Steindachner.

Corydoras treitlii STEINDACHNER, Akad. Anzeiger, No. XXVII, 1906 (Paranahyba).
 No specimens.

33. *Corydoras ehrhardti* Steindachner.

Corydoras ehrhardti STEINDACHNER, Akad. Anzeiger, No. VIII, 1910, March 10 (Jaraguá).

Corydoras meridionalis VON IHERING, Rev. Mus. Paulista, VIII, Jan. 1, 1910, 380, (Colonia Hansa in Santa Catharina).

No specimens.

34. *Corydoras flaveolus* von Ihering. (Plate XXVIII, fig. 1.)

Corydoras flaveolus VON IHERING, Rev. Mus. Paulista, VIII, 1910, 386 (Rio Piracicaba above waterfall of same name).

- 3521 C. M. One, 65 mm. Sapucay, April 2, 1909. Coll. Haseman.
 3522 C. M. Two, 52 and 68 mm. Sapucay, April 3, 1909. Coll. Haseman.

35. *Corydoras amphibelus* Cope.

Corydoras amphibelus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 282 (Ambyiacu River).

No specimens.

36. *Corydoras punctatus* (Bloch).

Cataphractus punctatus BLOCH, Ausl. Fische, pl. 377, fig. 2.—BLOCH and SCHNEIDER, Syst. Ichthyol., 1801, 108.

Corydoras punctatus EIGENMANN and EIGENMANN, Occasional Papers Cal. Acad. Sci., I, 1890, 472; Eigenmann, Mem. Carnegie Mus., V, 1912, 220, pl. XXIV, fig. 3.

Corydoras melanistiis REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 216 (Essequibo).

Regan, perhaps properly, regards *Corydoras punctatus* Eigenmann as distinct from *Corydoras punctatus* (Bloch). Bloch's figure represents his *punctatus* with vertical series of spots on the caudal.

1560 C. M., 11977 I. U. M. Mud-flats of Demerara River below Wismar, British Guiana, 1908. Coll. Eigenmann.

1561 C. M., 11978 I. U. M., Erukin, British Guiana, 1908. Coll. Eigenmann.

1562 C. M., 11979 I. U. M. Malali, British Guiana, 1908. Coll. Eigenmann.

1563 C. M. One below Packeoo Falls, British Guiana.

1564 C. M., 11980, I. U. M. One, 29 mm. Tumatumari, British Guiana, 1908. Coll. Eigenmann.

1566 C. M., 11981 I. U. M. One, 50 mm. Kumaka, British Guiana, 1908. Coll. Eigenmann.

1567 C. M. Wismar. Coll. Eigenmann.

1568 C. M., 11982 I. U. M. Konawaruk, British Guiana, 1908. Coll. Eigenmann.

1569 C. M., 11983 I. U. M. Rockstone, British Guiana, 1908. Coll. Eigenmann.

1565 C. M., 11984 I. U. M. Creek below Potaro Landing, 1908. Coll. Eigenmann.

3500 C. M. Two, 51 and 55 mm., Santarem, Dec. 15, 1909, coll. Haseman; forty-five, 29 to 53 mm., Gluck Island, British Guiana, coll. Ellis; one, 33 mm., Hubabu Creek, British Guiana, coll. Ellis.

37. *Corydoras julii* Steindachner.

Corydoras julii STEINDACHNER, Akad. Anzeiger, XXVII, 1906 (Parahim, outlet of Lake Paranagua).

No specimens.

38. **Corydoras trilineatus** Cope. (Plate XXX, figs. 2, 2a.)

Corydoras trilineatus COPE, Proc. Acad. Nat. Sci. Phila., 1871, 281, pl. 6, fig. 2 (Ambyiacu).

Corydoras agassizii STEINDACHNER, "Ichthyologische Beiträge," V, 1876, 90 and 186, pl. 12, fig. 2-2a (Tabatinga).

No specimens.

39. **Corydoras micracanthus** Regan.

Corydoras micracanthus REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 211 (Salta, Argentina).

No specimens.

40. **Corydoras microcephalus** Regan.

Corydoras microcephalus REGAN, Ann. & Mag. Nat. Hist. (8), X, 1912, 211 (La Plata).

No specimens.

41. **Corydoras raimundi** Steindachner.

Corydoras raimundi STEINDACHNER, Akad. Anzeiger, February, 1907, No. VI, 84, (Victoria, in brooks tributary to Rio Paranahyba).

No specimens.

42. **Corydoras garbei** von Ihering. (Plate XXVIII, fig. 2.)

Corydoras garbei VON IHERING, Rev. Mus. Paulista, VIII, Jan. 1, 1910, 382 (Rio São Francisco).

3518 C. M. Twenty-two, 25 to 44 mm. Joazeiro, Nov. 28, 1907. Coll. Haseman.

3519 C. M. Twenty-nine, 29 to 39 mm. Lagoa Pereira, Dec. 23, 1907. Coll. Haseman.

3520 C. M. Two, 33 and 41 mm. Barreiras, Lagoas of Rio Grande, Jan. 3 and 4, 1908. Coll. Haseman.

43. **Corydoras kronei** Mirando Ribeiro. (Plate XXVIII, fig. 3; Plate XXIX, figs. 1-3.)

Corydoras kronei MIR. RIBEIRO, A Lavoura, Anno XI, No. 5, May, 1907, 189.

Corydoras eigenmanni VON IHERING, Notas Preliminares, S. Paulo, 9. Oct., 1907, 34.

10795 I. U. M. Two (type and cotype of *C. eigenmanni* von Ihering), 52 and 57 mm. Cubatão, Raiz da Serra, S. P. Coll. Haseman.

3501 C. M. Twelve, 29 to 42 mm. Alagoinhas, Rio Catu, March 4, 1908. Coll. Haseman.

- 3502 C. M. Fifteen, 43 to 85 mm. Raiz da Serra, Rio Mogy, July 27, 1908. Coll. Haseman.
- 3503 C. M. Six, 25 to 73 mm. Cubatos, Aug. 1, 1908. Coll. Haseman.
- 3504 C. M. One, 26 mm. Barreiras, Lagoas of Rio Grande, Jan. 3 and 4, 1908. Coll. Haseman.
- 3505 C. M. Thirteen, 25 to 66 mm. Aqua Quente, Nov. 27, 1908. Coll. Haseman.
- 3506 C. M. Three, 28 to 76 mm. Iporanga, Dec. 1, 1908. Coll. Haseman.
- 3507 C. M. Three, 52 to 85 mm. Ribeiro de Iguape, No. 25 of Krone collection, Dec. 13, 1908. Received from Haseman.
- 3508 C. M. Six, ♂, 70 to 104 mm. Morretes, Parana, Jan. 2, 1909. Coll. Haseman.
- 3509 C. M. Ten, ♀, 34 to 95 mm. Morretes, Parana, Jan. 2, 1909. Coll. Haseman.
- 3510 C. M. Eight, 53 to 100 mm. Morretes, Parana, Jan. 3, 1909. Coll. Haseman.
- 3511 C. M. One, 24 mm. Morretes, Parana, Jan. 4, 1909. Coll. Haseman.

The type and cotypes of *C. eigenmanni* are young females and have the markings more or less reduced on the sides. The present specimens afford very complete series from these paler individuals to the completely pigmented adult males.

44. *Corydoras triseriatus* von Ihering.

Corydoras natereri triseriatus VON IHERING, Rev. do Mus. Paulista, VIII, Jan. 1, 1911, 386 (Rio Doce).

No specimens.

45. *Corydoras paleatus* (Jenyns). (Plate XXX, figs. 1, 1a, 1b.)

Callichthys paleatus JENYNS, Voy. Beagle, IV, 1842, 113.

Corydoras paleatus EIGENMANN and EIGENMANN, Occasional Papers Cal. Acad. Sci., I, 1890, 471.

Corydoras marmoratus STEINDACHNER, Denk. Akad. Wiss. Wien, XLI, 1879, 45, pl. 5, fig. 1 (La Plata).

4884 I. U. M. Nine, 25 to 50 mm. Rio Grande do Sul, von Ihering.

3512 C. M. Fifty-six, 32 to 52 mm. Porto Alegre, Jan. 21, 1909. Coll. Haseman.

- 3513 C. M. Twenty-one, 18 to 55 mm. (without the caudal), Porto Alegre, Jan. 19 and 21, 1909. Coll. Haseman.
- 3514 C. M. Twenty, 27 to 57 mm. Cachoeira, Jan. 26, 1909. Coll. Haseman.
- 3515 C. M. One, 56 mm. Rio Jacahy, Jan. 27, 1909. Coll. Haseman.
- 3516 C. M. Twenty-two, 31 to 71 mm. Cacequy, Jan. 31, 1909. Coll. Haseman.
- 3517 C. M. Five, 33 to 58 mm. Uruguayana, February 7, 1909. Coll. Haseman.

46. **Corydoras multimaculatus** Steindachner. (Plate XXIX, fig. 4.)

Corydoras multimaculatus STEINDACHNER, Akad. Anzeiger, No. XVII, July, 1907, 291 (Rio Preto, Santa Rita).

- 3496 C. M. Two, 35 and 41 mm. Santa Rita, Jan. 24, 1908. Coll. Haseman.

47. **Corydoras hastatus** Eigenmann and Eigenmann.

Corydoras hastatus EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d Ser., 1888, 166 (Villa Bella). Occasional Papers Cal. Acad. Sci., I, 1890, 474 (Villa Bella).

No specimens.

48. **Corydoras australis** Eigenmann and Ward.

Corydoras australe EIGENMANN and WARD, Ann. Carnegie Museum, IV, 1907, 123 (Corumbá, tributary of Rio Pilcomayo).

- 948 C. M. One (cotype). Corumbá. Coll. J. D. Anisits.
- 3535 C. M. One, 21 mm. Puerto Suarez, Bolivia. Coll. Steinbach.
- 3536 C. M. Six, 21-29 mm. Puerto Suarez, Bolivia, May 6-7, 1909. Coll. Haseman.
- 3537 C. M. Nine, 21-28 mm. San Joaquin, Sept. 4, 1909. Coll. Haseman.
- 3538 C. M. One, 19 mm. Caceres, May 24, 1909. Coll. Haseman.
- 10129 and 10130 I. U. M. (type and cotype of *C. australis* Eigenmann and Ward), 15 and 19 mm. without caudal, Corumbá. Coll. J. D. Anisits.
- 10192 I. U. M. One, 20 mm. Rio Pilcomayo.

Genus OSTEOGASTER Cope.⁵

49. **Osteogaster eques** (Steindachner). (Plate XXX, figs. 3, 3a.)
Corydoras eques STEINDACHNER, "Ichthyologische Beiträge," V, 1876, 92, pl. 12, fig. 3-3a (Teffé; Cudajas).—EIGENMANN and EIGENMANN, Occasional Papers Cal. Acad. Nat. Sci., I, 1890, 466.
Osteogaster eques COPE, Proc. Am. Philos. Soc., XXXIII, 1894, 102.
 4226 I. U. M. One, female, 32 mm. Cudajas, a very poor specimen.

50. **Osteogaster splendens** Castelnau.

Callichthys splendens CASTELNAU, Anim. de l'Am. du Sud, Poissons, 1855, 39, pl. 18, fig. 3 (Rio Tocantins).

No specimens; known only from description and figure of Castelnau.

APPENDIX.

[After the foregoing paper had been set up and was ready to be printed, the Editor received the following description of a new species from Professor Eigenmann. It is appended to Mrs. Ellis' monograph for the purpose of bringing our knowledge of the group herein treated down to the moment of going to press, March 1, 1913.—*Editor.*]

51. **Hoplosternum magdalenæ** Eigenmann MS.

Callichthys (Hoplosternum) thoracatus (*non* Cuvier & Valenciennes) STEINDACHNER, Zur Fish-Fauna des Cauca und der Flüsse bei Guayaquil, 1880, 14. (Cauca near Caceres).

The specimens mentioned by Steindachner are much lighter in color and have the caudal spotted with dark, the base with a light bar, followed in one specimen with an ill-defined darker band. He had three specimens 7 cm. long. This species is quite distinct from *thoracatum* and is most nearly like *H. pectoralis* Boulenger from the Paraguay basin.

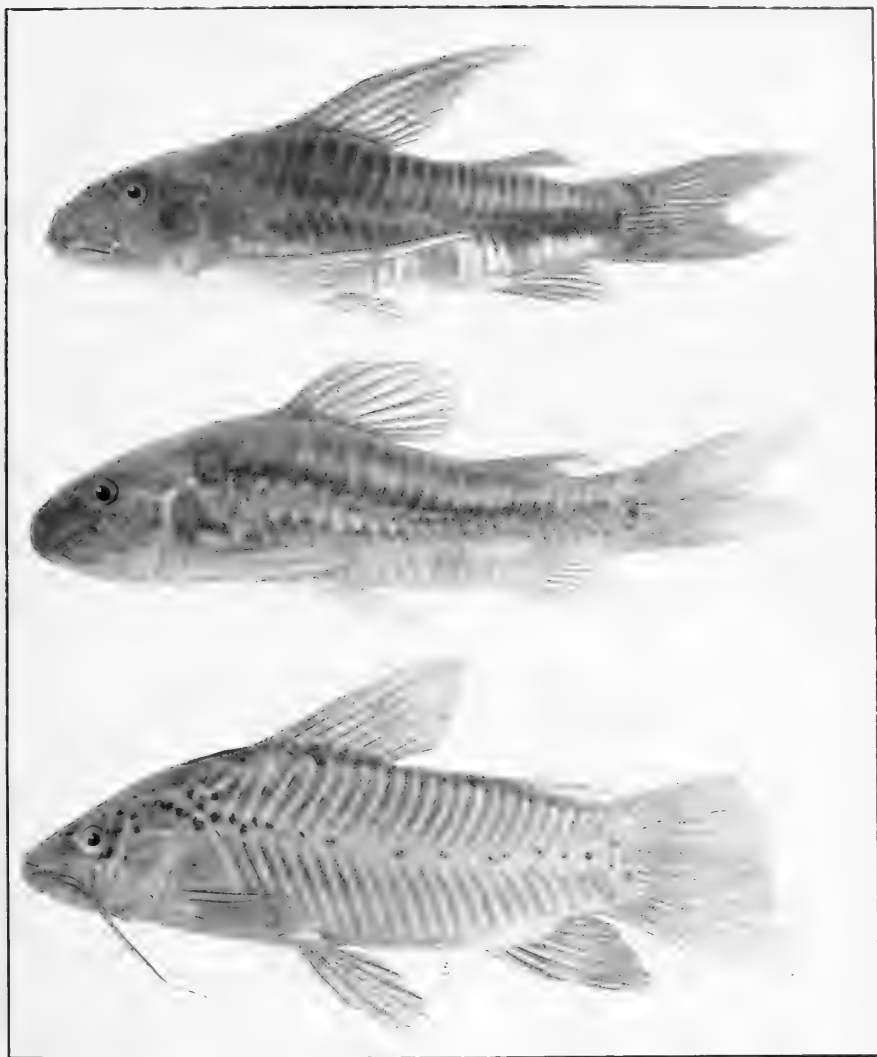
Type, 107 mm. Soplaviento, U. S. of Colombia, C. M. No. 5081.

Paratypes, 59 specimens. Soplaviento, C. M. No. 5082a-j; I. U. M. No. 12836.

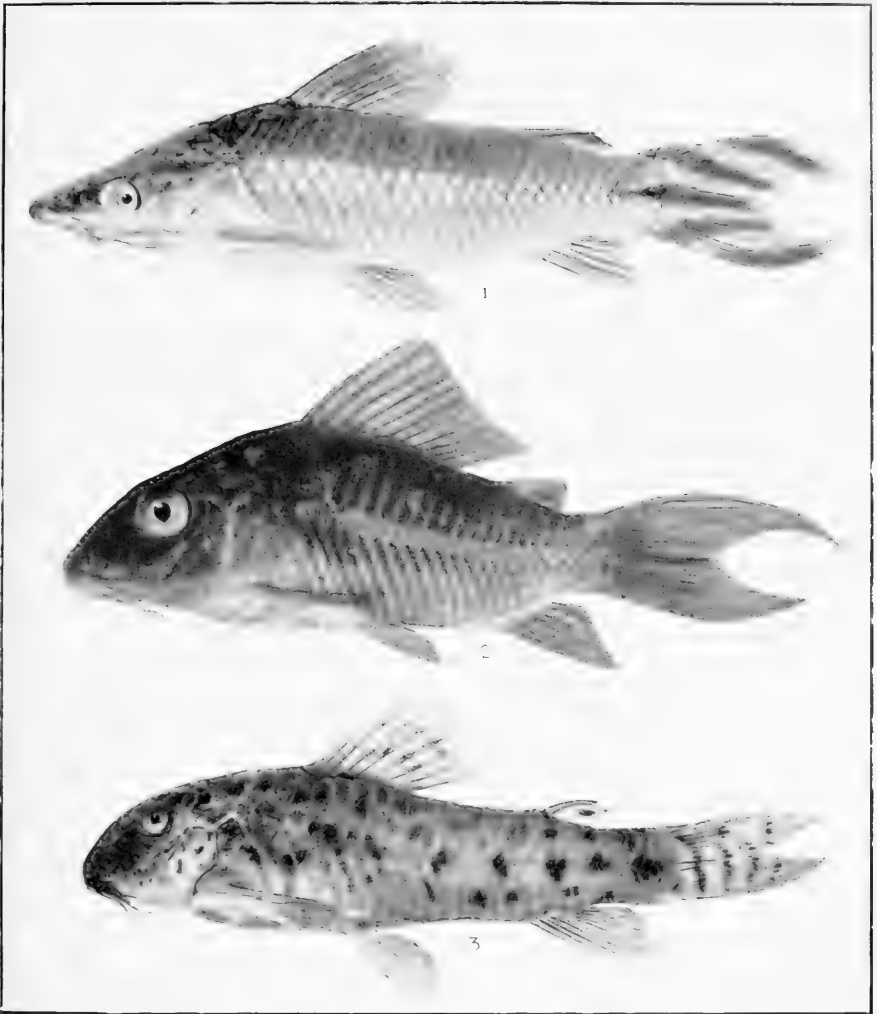
Paratypes, one specimen, Calamar Cienega. C. M. No. 5083.

Head to end of opercle 3-3.5 in the length; depth 3.5; D. I, 8; A. I, 6. Plates $\frac{25}{23}$ — $\frac{26}{23}$; eye 6 in head to end of opercle, 4 in interorbital

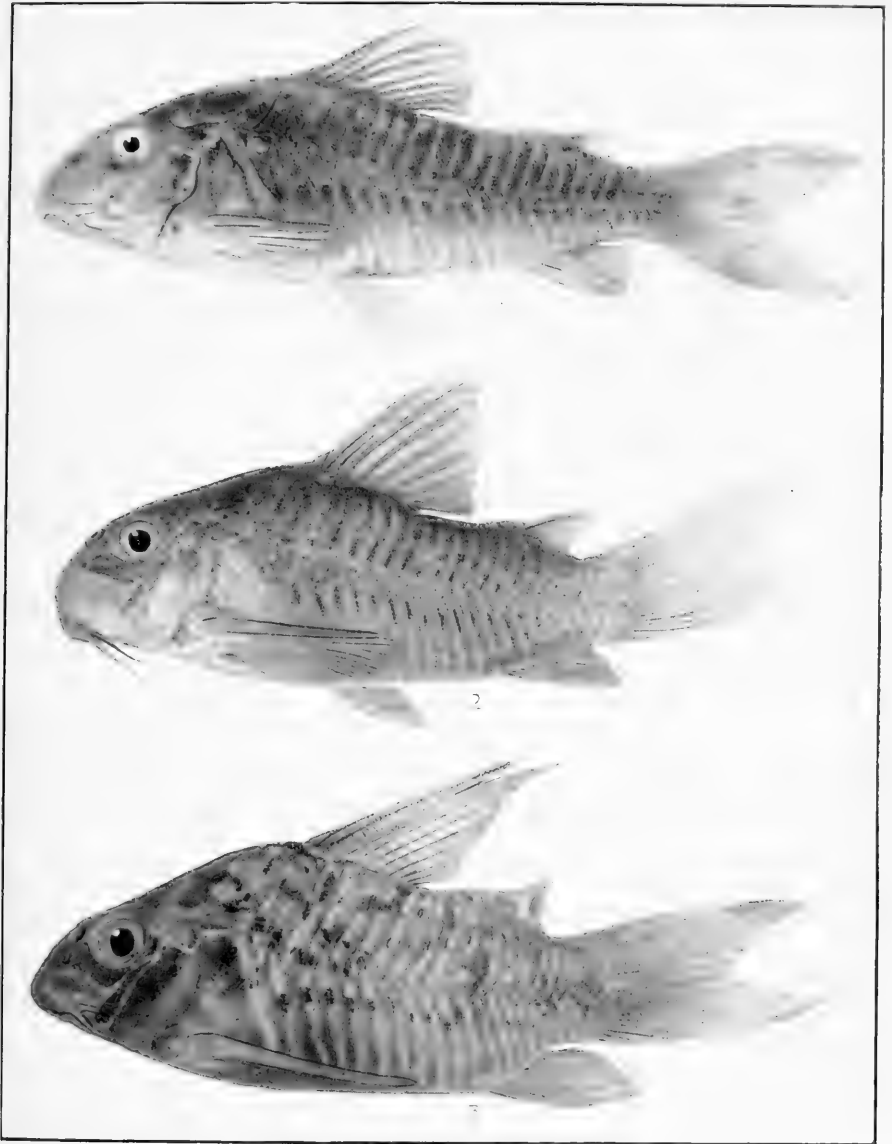
⁵ Mr. Regan considers *Osteogaster eques* Steindachner to be a *Corydoras* allied to *nattereri* and *macrosteus*. *Osteogaster splendens* Castelnau he considers to be a member of the genus *Brochis*.



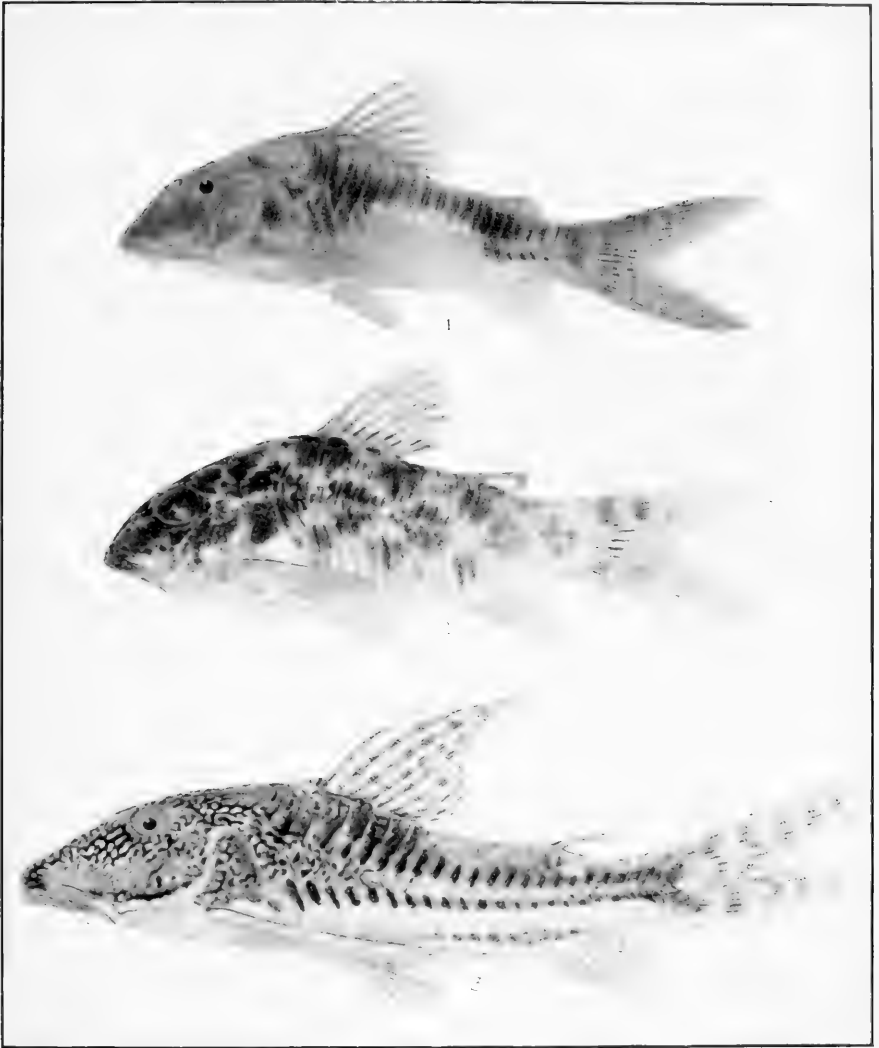
1. *Scleromystax barbatus* (Quoy & Gaimard). ♂, 60 mm., C. M. No. 3477.
2. *Scleromystax barbatus* (Quoy & Gaimard). ♀, 62 mm., C. M. No. 3477.
3. *Cascadura maculocephala* Ellis. (Type) 66 mm., C. M. No. 3539.



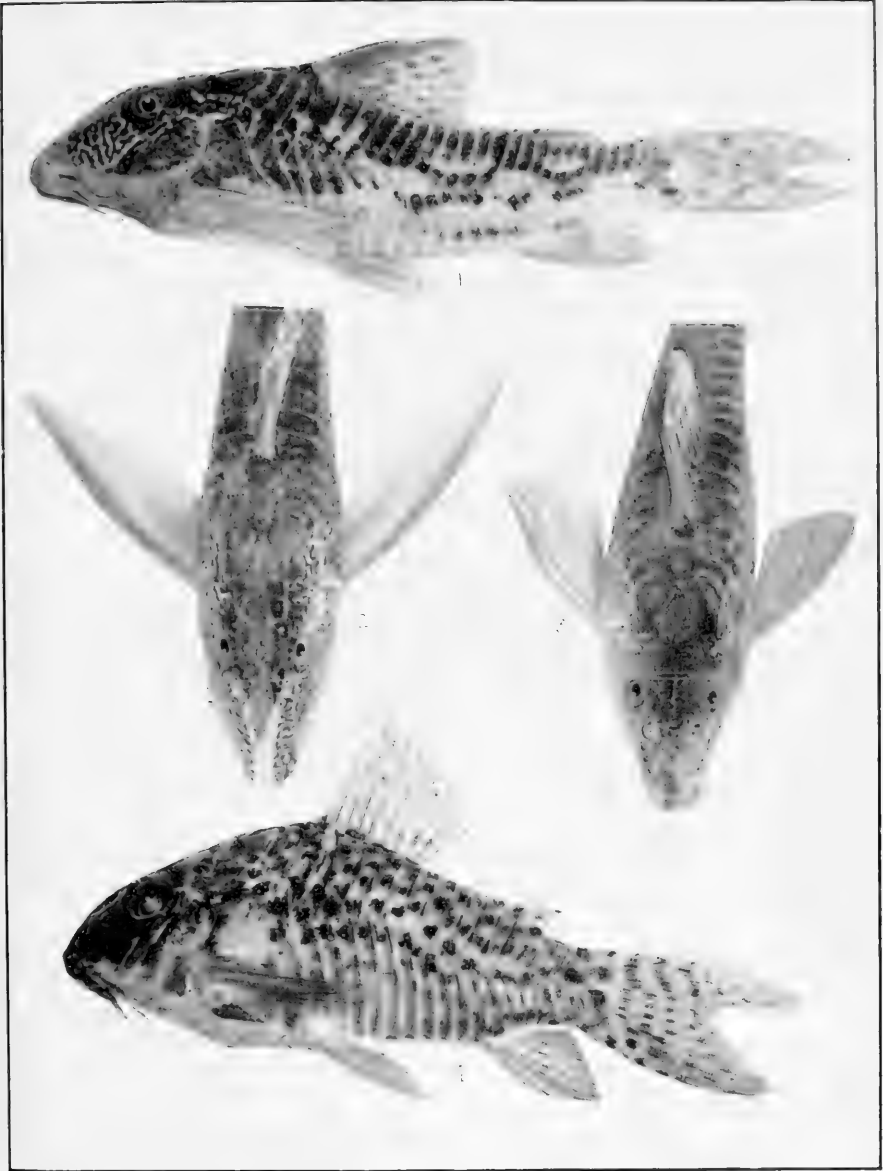
1. *Decapogon urostriatum* Ribeiro. 140 mm., C. M. No. 3540.
2. *Chaenothorax eigenmanni* Ellis. (Type) 51 mm., C. M. No. 3542.
3. *Aspidoras rochai* von Ihering. 47 mm., C. M. No. 3457.



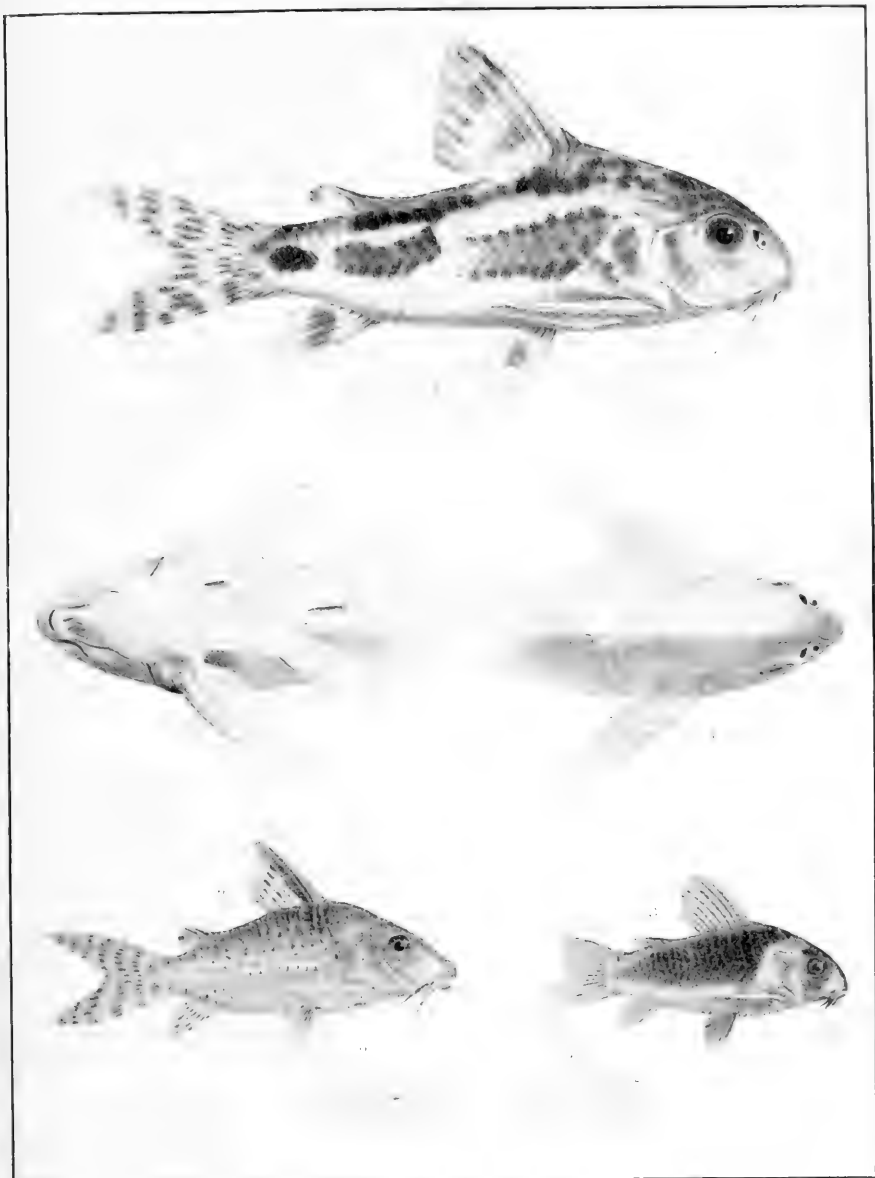
1. *Corydoras juquiae* von Ihering. 77 mm., C. M. No. 3544.
2. *Corydoras virescens* Ribeiro. 47 mm., C. M. No. 3545a.
3. *Corydoras armatus* (Günther). 57 mm., C. M. No. 3532.



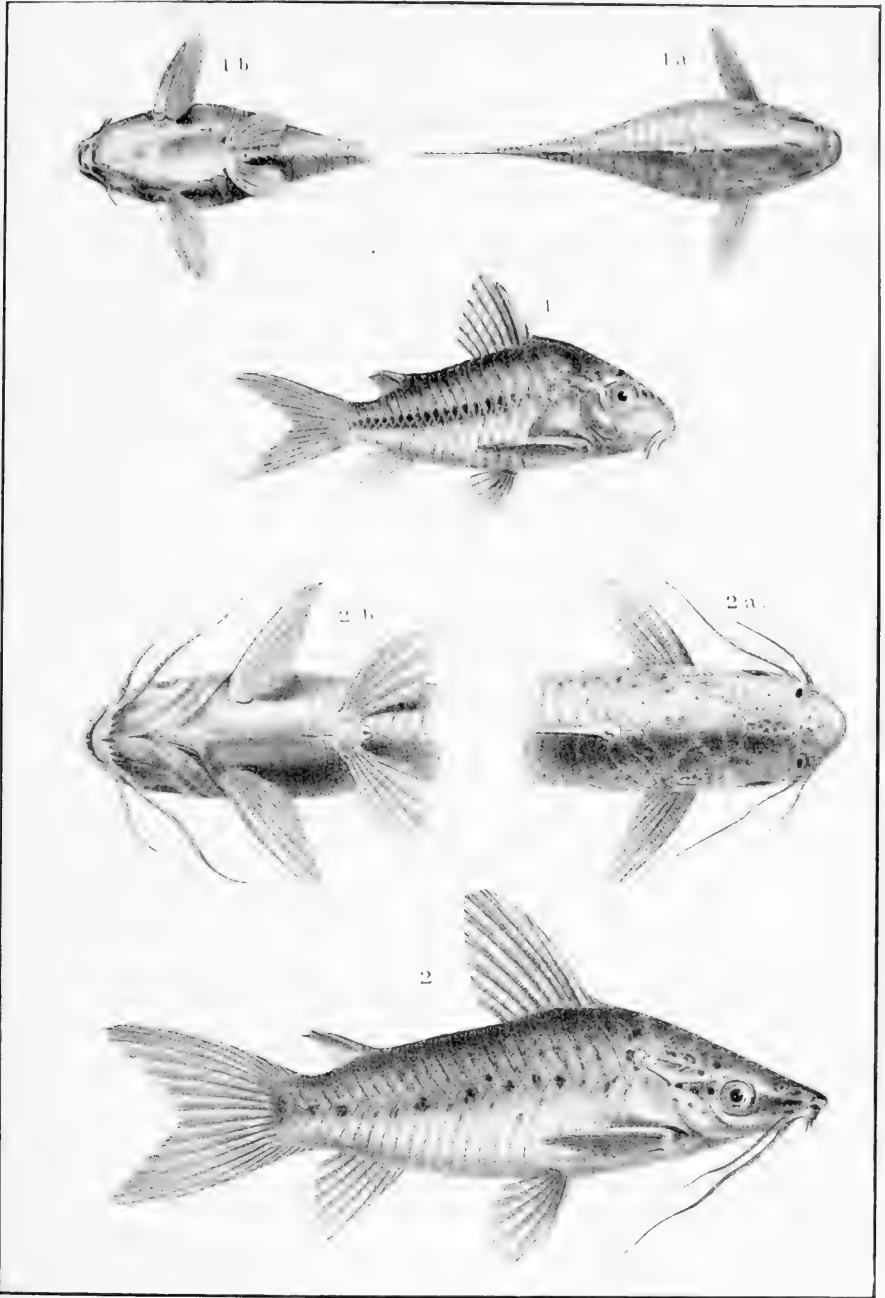
1. *Corydoras flavcolus* von Ihering. 60 mm., C. M. No. 3522.
2. *Corydoras garbei* von Ihering. 32 mm., C. M. No. 3519.
3. *Corydoras kronei* Ribeiro. ♂, 92 mm., C. M. No. 3508.



1. *Corydoras kroni* Ribeiro. ♀, 95 mm., C. M. No. 3509.
2. *Corydoras kroni* Ribeiro. ♂, 92 mm., C. M. No. 3508.
3. *Corydoras kroni* Ribeiro. ♀, 95 mm., C. M. No. 3509.
4. *Corydoras multimaculatus* Steindachner. 40 mm., C. M. No. 3496.



1, 1a, 1b. *Corydoras paleatus* (Jenyns). After Steindachner.
2, 2a. *Corydoras agassizii* Steindachner. After Steindachner.
3, 3a. *Osteogaster (Coryloras) eques* Steindachner. After Steindachner.



1, 1a, 1b. *Corydoras nattereri* Steindachner.
2, 2a, 2b. *Decapogon adpersum* (Steindachner). After Steindachner.
(Ichthy. Beiträge, Vol. V., Taf. XI.)



(5 in *pectoralis*); origin of dorsal nearly equidistant from tip of snout and spine of adipose fin (much nearer snout in *pectoralis* of equal size), six or seven azygous plates in front of the adipose spine; caudal emarginate; pectorals reaching to third or fourth plate beyond origin of ventrals (to ventrals in *pectoralis*); distance between pectorals considerably less than the length of the coracoids (equal to, or less than, length of coracoids in *pectoralis*); coracoids in contact along the median line, with a narrow V-shaped naked area between them posteriorly, very heavy and overlapping in front in the male. Barbel to middle of pectoral or a little further (to tip of ventrals in *pectoralis*). Fontanel oval in young, circular in adult; occipital not reaching fontanel by two-thirds to one and one-half diameters of the fontanel. Slaty blue-black, but little lighter below.

XIV. A NEW SPECIES OF THE GENUS CAMBARUS FROM
THE ISLE OF PINES.

BY A. E. ORTMANN, PH.D.

Cambarus (Procambarus) atkinsoni sp. nov.

Diagnosis.—Rostrum concave above, with a marginal spine on each side. Sides of carapace with a lateral spine on each side behind the cervical groove. Areola wide, shorter than half of the anterior section of the carapace. First peræopods with long, subcylindrical, slightly compressed chelæ, covered with subequal, subsquamate granules. Fingers about as long as palm. Third peræopods hooked in the male. First pleopods of the male of the first form with the inner part pointed and setiform, but not horny, much longer than the broad and blunt inner part, with a small horny spine at the anterior margin. A strong shoulder on the anterior margin. Inner face flattened, slightly dilated. Annulus ventralis of the female transversely oval, slightly elevated.

Description of male of the first form.—Rostrum concave above, without median keel, margins elevated, slightly convergent, with a distinct marginal spine on each side. Acumen short, triangular. Postorbital ridges subparallel, terminating in a spine anteriorly. Carapace slightly compressed, punctate, but not granulated. Suborbital angle triangular, bluntly pointed. Branchiostegal spine present. A distinct, sharp, but not very large spine on each side behind the cervical groove. Areola broad and short, with four to five irregular rows of punctations, distinctly shorter than half of the anterior section of the carapace (including rostrum). Abdomen about as wide as the carapace, and slightly longer. Basal segment of telson with four or five spines on each side. Anterior end of epistoma broadly triangular. Antennæ with the flagella longer than the carapace, but shorter than the whole body. Antennal scale broadest in the middle. First peræopods elongated, subcylindrical. Hand elongated, slightly compressed, with subparallel margins. Surface of hand sharply granulated all around, granules subsquamate, closely set, and subequal. Fingers about as long as the palm, both of them

on outer and inner faces with a smooth, longitudinal ridge. Hand with short, inconspicuous and deciduous hairs, which are densest on the fingers, but nowhere beard-like. A few longer setæ on the cutting edges of the fingers. Carpopodite short, subcylindrical, with a very indistinct sulcus on the upper side, granulated like the hand, granules largest on inner side, where some of them are subspiniform. Mero-podite subtriangular in cross-section, granules on inner and outer surface obsolete, one or two granules near distal end of upper margin subspiniform, and the lower surface with two rows of small spinules. Ischiopodite of third peræopods with a strong hook. First pleopods of the *Procambarus*-type, rather short and straight. Anterior margin with a distinct and prominent shoulder near the tips. Outer and inner part in contact up to close to the tips. Tip of outer part rounded and blunt, with a minute soft spine posteriorly at the extremity. Tip of inner part straight, tapering to a setiform point, which is not horny, and is considerably longer than the tip of the outer part. This setiform part bears at its base, on the anterior side, and in front of the shoulder, a short, slightly procurved, horny spine, which has two tips, the larger blunt, the smaller pointed. On the inner side, the inner part of the copulatory organ is flattened, with hairs radiating from an indistinct oblique rib, and is slightly dilated, but only very little wider than the basal part of the organ.

Male of the second form.—Chelæ smaller, hooks of third peræopods small, and the copulatory organ having in place of the horny spine a small, soft, blunt tubercle, and the tip of the inner part less distinctly setiform.

Female.—Chelæ not so long, hand shorter, rather long-ovate and not subcylindrical, with finer granulations. Annulus ventralis transversely subovate, slightly elevated, with the usual curved fissure, which divides the annulus longitudinally into two unsymmetrical parts, the larger part more elevated than the smaller.

Measurements.—Largest male, first form: Total length, 52; carapace, 25; anterior section of carapace, 19; posterior section of carapace, 6; abdomen, 27; length of hand, 22; width of hand, 6.5 mm. Largest female: Total length, 44; carapace, 21; anterior section of carapace, 16; posterior section of carapace, 5; abdomen, 23; length of hand, 14; width of hand, 5 mm.

Locality.—Tributaries of Rio de los Indios, Los Indios, Isle of Pines. Carnegie Mus. Cat. Nos. 74.924 (Types), and 74.925 (Cotypes).

Altogether there are thirteen males of the first form, eight males of the second form, and nine females.

The specimens were collected on May 25, 1910, by Dr. D. A. Atkinson of Pittsburgh, and the specific name is given in honor of the discoverer.

Remarks.—This species is morphologically and geographically interesting. It stands closest to *C. cubensis* Erichson, but differs principally in the much less dilated inner face of the copulatory organ. In the latter respect it comes nearer to the continental forms, *C. williamsoni* Ortman and *C. pilosimanus* Ortman from Guatemala, and *C. mexicanus* Erichson from Mexico. But it has not the copulatory organs of these species, the chief difference being discovered in the long setiform tip of the inner part, which is also found in *C. cubensis*.

C. williamsoni, *pilosimanus*, and *mexicanus* resemble each other in the copulatory organs, but *C. mexicanus* is more remote from the others (and also from *C. atkinsoni* and *cubensis*) because of the absence of spines on the margins of the rostrum and the sides of the carapace. *C. williamsoni* and *pilosimanus* have two spines on each side of the carapace, and their areola is much narrower than in *C. atkinsoni*, and also narrower than in *C. cubensis*. In *C. atkinsoni* the areola is distinctly wider and shorter than in *C. cubensis*, and in this character, and in the more concave surface of the rostrum, and the slightly longer acumen of the latter, aside from the differences in the shape of the copulatory organs, *C. atkinsoni* differs from *C. cubensis*. *C. cubensis* also has the spines on the sides of the carapace often rudimentary or absent.¹

C. atkinsoni forms in the copulatory organs a connection between the Cuban forms and those of the mainland, which is interesting, because the geographical range is also intermediate. But the copulatory organs of *C. atkinsoni* distinctly indicate the *cubensis*-type in its beginning. In the shape of the rostrum, its marginal spines, and in the lateral spines of the carapace, *C. atkinsoni* is rather indifferent; in the shape of the areola it is distinctly more primitive than any of the species allied with it. The Guatemalan forms are in this respect even more advanced than *C. cubensis*, while both *C. atkinsoni* and *cubensis* are more highly specialized in the copulatory organs than the Guatemalan forms.

¹ See Faxon, in *Bull. Mus. Comp. Zool.*, LIV, 1912, pp. 458-459.

The fine point on the tip of the outer part of the copulatory organ in *C. atkinsoni* is a special feature of this species, which has not been observed in any of the other species of the subgenus *Procambarus*, but in specimens of *C. cubensis* before me I see in its place a slight and insignificant swelling.

C. digueti Bouvier, from western Mexico, which is also a *Procambarus*, is morphologically too remote from all these species, so that we do not need to compare it in detail.

Including this new species, the subgenus *Procambarus* consists now of the following six species: *C. digueti* Bouvier (western Mexico), *C. williamsoni* Ortmann (Guatemala), *C. pilosimanus* Ortmann (Guatemala and British Honduras), *C. mexicanus* Erichson (eastern Mexico), *C. atkinsoni* Ortmann (Isle of Pines), *C. cubensis* Erichson (Cuba). Of these, however, *C. williamsoni* and *pilosimanus* are very closely allied, and may possibly be on y forms of the same species.

XV. SEDUM CARNEGIEI, A NEW SPECIES OF THE
FAMILY CRASSULACEÆ FROM THE HERBARIUM
OF THE CARNEGIE MUSEUM.

BY RAYMOND HAMET.

On the frontier of Thibet Captain H. J. Walton discovered an extremely interesting new species of the family *Crassulaceæ*, the place of which in the botanical world is as yet unknown, the type of the species being found in the Herbarium of the Carnegie Museum. I am happy to dedicate this plant to Mr. Carnegie as proof of my sincere admiration.

Sedum Carnegiei Raymond Hamet, sp. nov.

Planta perennis?, tuberculo parvo globoso e radicibus paucis crassiusculis instructo, apice foliorum rosulam et caulem floriferum gerente. Rosulæ folia admota, alterna, glabra, sessilia, infra insertionem in calcar non producta, plusve minusve late obovata, marginibus integerrimis, obtusissima, paulo longiora quam latiora. Caules floriferi unici pro quoque tuberculo, simplices, erecti, graciliusculi, glabri. Caulium floriferorum folia alterna, satis remota, glabra, infra insertionem in pseudo-calcar producta; pseudo-calcar breviusculum, latum, obtusum, integerrimum; lamina ovato-oblonga, vel oblonga, marginibus integerrimis, obtusa, longior quam latior. Inflorescentia caulem terminans, in spica simplice. Pedicelli glabri, sub-nulli, quam calyx breviores. Flores pauci (4-5-8). Bractee foliis similes. Calyx glaber, segmentis 5, quam tubus longioribus, infra insertionem in calcar non productis, ovatis vel ovato-oblongis, marginibus integerrimis, obtusis, longioribus quam latioribus. Corolla glabra, quam calyx vix longior, segmentis 5, quam tubus longioribus, oblongis, basi paulo dilatatis, apice obtusis, marginibus integerrimis, longioribus quam latioribus, nervo principale unico ad filamenti oppositipetali basin duos nervos laterales oppositos edens. Stamina 10, glabra; filamenta oppositipetala infra corollæ medium inserta, gracilia, sublinearia; antheræ oppositipetalæ corollæ medium superantes. Carpella 5, glabra, inter eos longissime connata, apice in

stylos quam carpella breviores attenuata. Squamæ 5, subobovatae, supra medium in pseudo-unguicula lata coartatae, apice obtusissimae, marginibus integerrimis, paulo latiores quam longiores. Placentæ lineares carpellorum marginibus internis oblique dispositæ. Folliculi 5, divergentes.

Tuberculum 9 mm. longum, 8.5 mm. latum.—Caules floriferi 38–43 mm. longi.—Rosulæ folia 2.60–3.30 mm. longa, 2–2.60 mm. lata.—Caulium floriferorum foliorum pseudo-calcar 0.40–0.50 mm. longum; lamina 2.80–5.20 mm. longa, 1.50–2.40 mm. lata.—Inflorescentia 10–27 mm. longa, 4–8 mm. lata.—Pedicelli 0.50–0.80 mm. longi.—Calycis pars concreta 0.40–0.60 mm. longa; pars libera 1.70–2.75 mm. longa, 0.80–1 mm. lata.—Corollæ pars concreta 0.30–0.40 mm. longa; pars libera 1.80–2.80 mm. longa, 1.05–1.25 mm. lata.—Staminum oppositipetalorum filamentorum pars concreta 0.50–0.70 mm. longa; pars libera 1–1.75 mm. longa, 0.20–0.25 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0.30–0.60 mm. longa; pars libera 1.20–2 mm. longa, 0.25 mm. lata.—Carpellorum pars concreta 1.25–1.75 mm. longa; pars libera 1–1.30 mm. longa.—Styli 0.30–0.40 mm. longi.—Squamæ 0.40–0.50 mm. longæ, 0.50–0.80 mm. latæ.

Plant perennial?, with small globose tubers from a few rather broad roots, bearing at the apex a rosette of leaves and a floriferous stem. Leaves of the rosette close, alternate, glabrous, sessile, not produced into a spur below the insertion, more or less broadly obovate, with an entire margin, very obtuse, slightly longer than wide. Floriferous stems single for each tubercle, simple, erect, somewhat slender, glabrous. Leaves of the floriferous stems alternate, remote, glabrous, produced into a false spur below the insertion; the false spur rather short, broad, obtuse, entire; leaf-blade ovate-oblong, or oblong, with an entire margin, obtuse, longer than wide. Inflorescence terminating the stem, in a simple spike. Pedicels glabrous, nearly lacking, shorter than the calyx. Flowers few (4–5–8). Bracts similar to the leaves. Calyx glabrous, segments 5, longer than the tube, not produced below the insertion into a spur, ovate or ovate-oblong, with entire margin, obtuse, longer than broad. Corolla glabrous, hardly longer than the calyx, segments 5, longer than the tube, oblong, a little dilated at the base, apex obtuse, with margin entire, longer than broad, with the single principal nerve sending out two lateral opposite nerves towards the base of the filament opposite the petals.

Stamens 10, glabrous; the filaments opposite the petals, inserted below the middle of the corolla, slender, sub-linear; the anthers opposite the petals, exceeding the middle of the corolla. Carpels 5, glabrous, much connate, at the apex attenuate into styles shorter than the carpels. Scales 5, sub-obovate, constricted above the middle so as to be falsely unguiculate, very obtuse at the apex, entire margined, somewhat broader than long. The linear placenta obliquely disposed at the internal margin of the carpels. Follicles 5, divergent.

Tubers 9 mm. long, 8.5 mm. broad.—Floriferous stems 38–43 mm. long.—Leaves of the rosettes 2.60–3.30 mm. long, 2–2.60 mm. broad.—The spur of the leaves of the floriferous stems 0.40–0.50 mm. long; the blade 2.80–5.20 mm. long, 1.50–2.40 mm. broad.—Inflorescence 10–27 mm. long, 4–8 mm. broad.—Pedicels 0.50–0.80 mm. long.—The united part of the calyx 0.40–0.60 mm. long, the free part 1.70–2.75 mm. long, 0.80–1.00 mm. broad.—The united part of the corolla 0.30–0.40 mm. long, the free part 1.80–2.80 mm. long, 1.05–1.25 mm. broad.—The united part of the filaments of the stamens opposite the petals 0.50–0.70 mm. long; the free part 1–1.75 mm. long, 0.20–0.25 mm. broad.—The united part of the filaments of the stamens alternate with the petals 0.30–0.60 mm. long; the free part 1.20–2.00 mm. long, 0.25 mm. broad.—The united part of the carpels 1.25–1.75 mm. long; the free part 1–1.30 mm. long.—Styles 0.30–0.40 mm. long.—Scales 0.40–0.50 mm. long, 0.50–0.80 mm. broad.

Thibet frontier, Kyi Chu Valley, 15 miles east of Lhasa, Aug., 1904. Capt. H. J. Walton. Type in Herbarium of the Carnegie Museum.

Note.—For the English translation of the Latin description Dr. O. E. Jennings of the Carnegie Museum is responsible.—*Editor.*

XVI. ON TWO NEW SPECIES OF FISHES COLLECTED BY
MISS LOLA VANCE IN PERU.

BY C. H. EIGENMANN.

1. *Cyclopium vanceæ* sp. nov.

Evidently related to *C. sabalo* Cuvier & Valenciennes. Head 4; depth 7.5; D. 7; A. 6; interorbital 5 in the head, equal to distance of anterior nares from snout, less than distance between eyes and posterior nares; distance between snout and dorsal 2.75-3 in the length; distance of anal from caudal 5-5.5 in the length; dorsal rounded, the first ray not produced; outer pectoral ray not produced, not reaching middle of ventrals; origin of ventrals nearly under origin of dorsal; tips of ventrals not reaching over two-thirds to anus; adipose fin scarcely evident. Outer teeth of the premaxillary narrow, single pointed; teeth of the lower jaw, like those of the inner series of the premaxillary, bifid. Barbel not quite reaching gill-opening. Brownish, slightly marbled.

Type 76 mm., C. M. No. 4856, paratype 66 mm., C. M. No. 4857. Small stream in highlands, southeast of Tarma. Named for Miss Lola Vance, who collected these specimens.

Miss Vance also collected *Cyclopium taczanowskii* Boulenger in the Rio Perené, C. M. No. 4853a-c, and from streams flowing into the Pancartambo, C. M. No. 4854a-h; and *Cyclopium sabalo* Cuvier & Valenciennes from a small stream in the highlands southeast of Tarma, Peru.

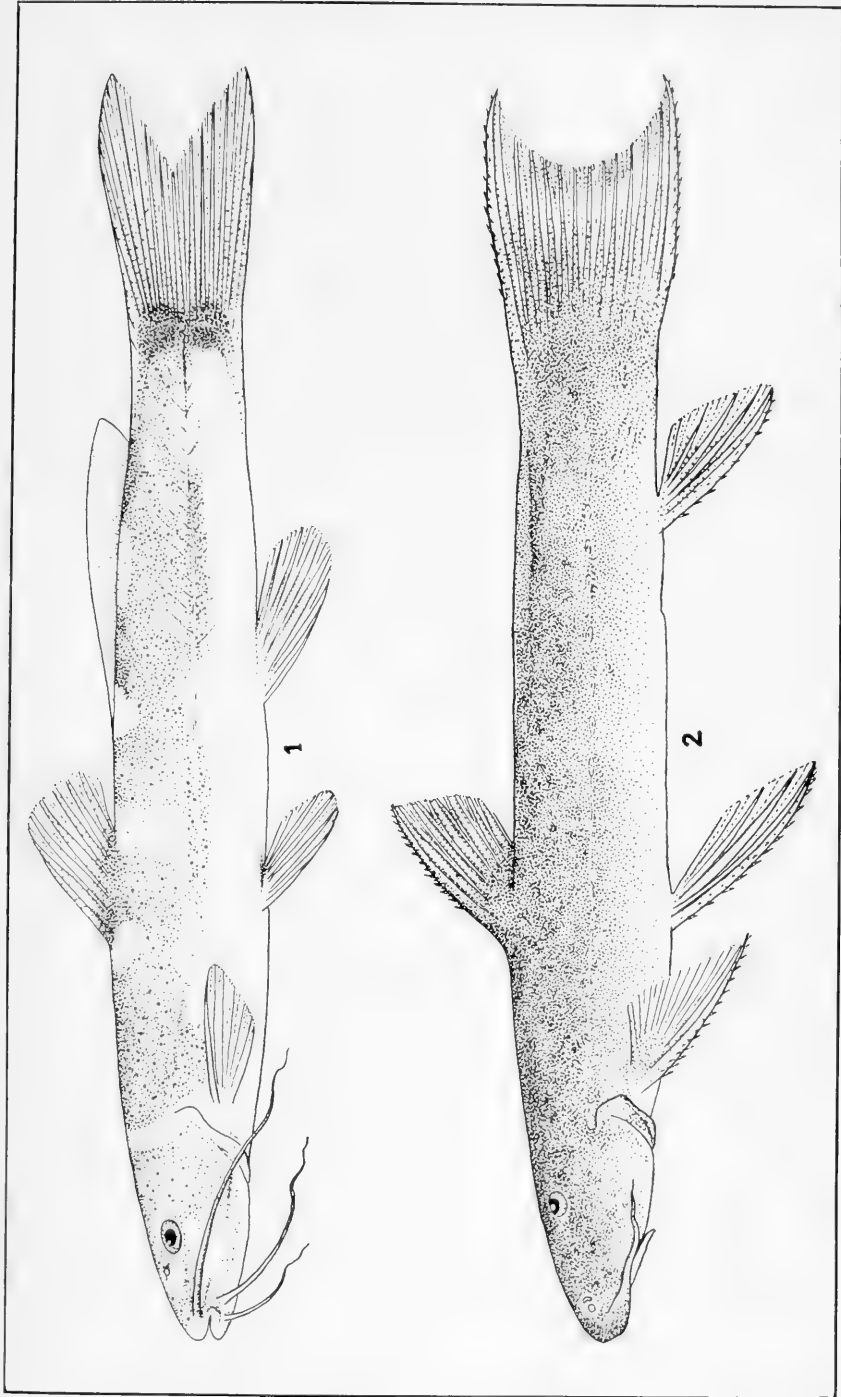
2. *Rhambdella montana* sp. nov.

Paralleling in general appearance *Cyclopium sabalo*, with which it was associated. Head 4.75; depth 7.6; D. 7; A. 9; eye 2 in snout; 5.5 in head; 1.75 in interorbital. Adipose dorsal 4.5 in the length; maxillary barbel reaching past middle of pectoral; width of head 1.3 in its length. Jaws equal; premaxillary band of teeth of equal width throughout, without a backward projecting angle at the side; pectorals not quite reaching ventrals; ventrals to below end of dorsal, about two thirds to anal; distance of dorsal fin from snout 2.5 in the length;

caudal but slightly forked, the lobes equal, about equal to length of head; anal very short, rounded, the tips not reaching the vertical from the end of the adipose. First dorsal and pectoral rays not spinous. Fontanel a narrow slit, to base of occipital process.

Upper parts dusky, a narrow light band across the nape, a light spot on the back in front, another behind the dorsal, a third in front of the adipose and a fourth behind it; the dark of the back descending farthest behind the pectoral, behind the dorsal and under the adipose; end of caudal peduncle dark; a dusky streak from eye to base of maxillary.

Type 47 mm., C. M. No. 4858; paratype 46 mm., C. M. No. 4859. Queta. Small brook in highlands southeast of Tarma.



1. *Rhamdella montana* Eigenmann. Type, 47 mm., Car. Mus. No. 4858*d*.

2. *Cycloptum vaneræ* Eigenmann. Type, 76 mm., Car. Mus. No. 4856*d*.

XVII. SOUTH AMERICAN LOCUSTS (ACRIDOIDEA). II.

BY LAWRENCE BRUNER.

The present paper is based chiefly on a rather extensive collection of these insects made by J. Steinbach in eastern Bolivia and south-western Brazil, a region but little explored heretofore. Other material, however, is also at hand and included that was taken by J. D. Haseman and one or two other collectors in the employ of the Carnegie Museum. A few of the insects, here reported also, are some that were set aside for further study during the preparation of my two former papers published in these ANNALS. As stated in the preface to my last paper (ANNALS, Vol. VIII) reports are also in the course of preparation by me treating both the Grylloidea and Phasgunurids or long-horned grasshoppers, taken by the same collectors and in the same territory. Of these latter there are likewise apparently many new forms.

As in the former reports a number of synoptical tables of genera and species are included where it is thought they will materially aid the student in the recognition of these insects.

Family TETRIGIDÆ.

Genus CRIMISUS Bolivar.

Crimisus BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 246 (1887); HANCOCK, Genera Ins., fasc. 48, p. 40 (1906); BRUNER, Ann. Carnegie Mus., VII, p. 91 (1910).

1. *Crimisus patruus* Bolivar?

Crimisus patruus BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 246 (1887); HANCOCK, Genera Ins., Fasc. 48, p. 40 (1906).

Habitat.—The present collection contains a single female specimen which is doubtfully referred to this species. It bears the label "Chapada (village) Matto Grosso, Brazil, March, H. H. Smith."

Genus SCLEROTETTIX Bruner.

Sclerotettix BRUNER, Ann. Carnegie Mus., VII, pp. 91, 104 (1910).

2. *Sclerotettix steinbachi* sp. nov.

This insect is intermediate between *tibialis* and *variegatus* in size and general appearance, but when viewed with a magnifying glass it exhibits a number of points of difference. Wings only slightly surpassing the apex of the pronotum, which is conspicuously extended beyond the tips of the hind femora.

Of medium size, the body a little depressed and with the surface strongly and closely granulose, on the disk and sides of pronotum also quite conspicuously rugoso-nodulose. Median carina of the pronotum visible throughout, but not especially prominent even in front, plainly undulate behind the shoulders; lateral carinæ not prominent as in *tibialis*; lower lateral margins of the pronotum gently turned outwards, rounded. Head rather narrow and embraced by the front part of the thorax almost to the prominent eyes; vertex a little narrower than one of the eyes viewed from above, viewed laterally not quite reaching the anterior margin of the eyes, quite strongly and broadly sulcate, the surface conspicuously granulose, the median longitudinal carina conspicuous and continuous with the upper end of the frontal costa; antero-lateral carinæ also prominent, arcuate and reaching nearly (♀) or quite (♂) to the middle of the inner margin of the eyes; frontal costa arcuately prominent between the antennæ, suddenly lowered above towards the fastigium, sulcate and quite strongly and evenly divergent below. Pronotum with two very coarse and deep transverse sulci, between which the median carina is most prominent; lateral carinæ in advance of the transverse sulci fairly prominent, cristate, gently convergent posteriorly, back of the sulci less prominent; disk gently convex anteriorly, plane caudad. Middle femora clypeate, a trifle more than one and one-half times as long as the greatest width, the lower carina quite prominent and with its edge only gently undulate, the upper carina terminating in a broad tooth. Hind femora robust and moderately elongate, the outer disk occupying only about half of the lateral field and provided with about six prominent very oblique and several nodose rugæ; the hind tibiæ heavy, noticeably dilated apically and furnished with a few strong irregularly arranged tooth-like spines.

General color dark fuscous above, varied on front, on the disk between lateral carinæ in front, on sides of pronotum in advance of tegmina, on anterior and middle legs, and on the base and external disk of hind femora and hind tibiæ with pale testaceous; lower sulcus and outer

portion of hind femora below the outer disk mostly black; tibiæ annulated with fuscous; antennæ infuscated, faintly annulate with pallid; venter varied with pallid.

Length of body, ♂, 6.5 mm., ♀, 8 mm.; of pronotum, ♂, 9 mm., ♀, 11 mm.; of hind femora, ♂, 4.75 mm., ♀, 5.65 mm.

Habitat.—Puerto Suarez, Bolivia, one ♂ and one ♀ taken during November, 1908, to January, 1909, at an elevation of 150 meters above sea-level by J. Steinbach. Types in Carnegie Museum, Pittsburgh.

Genus METRODORA Bolivar.

Metrodora BOLIVAR, Ann. Soc. Ent. Belg., XXXI, pp. 247, 248 (1887)—in part; HANCOCK, Genera Ins., fasc. 48, p. 41 (1906); BRUNER, Ann. Carnegie Mus., VII, pp. 91, 109 (1910).

3. *Metrodora lutosa* Bolivar?

Metrodora lutosa BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 248 (1887); HANCOCK, Genera Ins., fasc. 48, p. 41 (1906).

Habitat.—A single imperfect female specimen of the genus is referred to Bolivar's species *lutosa*. It was taken at Rio de Janeiro and bears the accession number 2966.

Genus ALLOTETTIX Hancock.

Allotettix HANCOCK, Ent. News, X, p. 276 (1899); MORSE, Biol. Cent.-Amer., Orthopt., II, p. 12 (1900); BRUNER, Ann. Carnegie Mus., VII, pp. 91, 114 (1910).

4. *Allotettix chapadensis* Bruner.

Allotettix chapadensis BRUNER, Ann. Carnegie Mus., VII, p. 117 (1910).

Habitat.—Puerto Suarez, Bolivia, at an elevation of 150 meters above sea-level. A single specimen was collected during the month of November, 1909, by J. Steinbach.

5. *Allotettix bolivianus* sp. nov.

Most nearly related to *Allotettix cayennensis* Bolivar and *A. chapadensis* Bruner, but differing from both of them in several respects, as will be seen by a reference to the subjoined synoptical table and a comparison of the descriptions of the three species.

Body very coarsely rugose and strongly granulose; viewed laterally the median carina of pronotum markedly undulate nearly to the tip of the abdomen, viewed from above the disk between the shoulders

in nowise transversely wrinkled or marked with well-defined rows of granuli as in *chapidensis*. Occiput gently embraced by the pronotum, strongly rugoso-granulose, the vertex a little depressed and provided with a coarse median longitudinal carina, which reaches from a point even with the hind margin of the prominent eyes and projects beyond their front margin; frontal costa prominent, evenly rounded, the sulcation beginning a little below the fastigium, to which this portion is connected by a downwardly directed straight ridge. Antennæ arising on a line drawn between the lower edge of the eyes. Hind femora rather coarsely nodulose externally above; the tibiæ about normal, six-spined externally. Median femora with the lower carina rather strongly undulate, about two and three-fourths times as long as wide.

General color fuscous, the tibiæ, mouth-parts, and under side somewhat modified with testaceous. The disk of pronotum marked on each side between the tegmina by an oblique, narrow, ferruginous band.

Length of body, ♀, 6.75 mm., of pronotum, 11 mm., of hind femora, 4 mm., total length, 13.5 mm.

Habitat.—The type, a female, is labeled "Puerto Suarez, Bolivia, 150 M., Nov., 1908–January, 1909." It was collected by J. Steinbach, and is deposited in the Carnegie Museum.

The collection also contains a male specimen similarly labeled, but approaching more closely to a female bearing the label *Allotettix chapadensis* with Chapada as a habitat. Undoubtedly the two forms are rather closely related.

Genus MITRITETTIX Hancock.

Mitritettix HANCOCK, *Genera Ins.*, fasc. 48, p. 57, footnote (1906); BRUNER, *Ann. Carnegie Mus.*, VII, pp. 91, 118 (1910).

Mitraria BOLIVAR (*nec* Rafinesque), *Ann. Soc. Ent. Belg.*, XXXI, p. 253 (1887).

6. *Mitritettix productus* (Bolivar).

Mitraria producta BOLIVAR, *Ann. Soc. Ent. Belg.*, XXXI, p. 253 (1887).

Mitritettix productus HANCOCK, *Genera Ins.*, fasc. 48, p. 57, footnote (1906).

Habitat.—A single female specimen of this insect is at hand. It was taken at Santarem, Brazil, during July, and bears the accession number 2966.

Genus PARATETTIX Bolivar.

Paratettix BOLIVAR, *Ann. Soc. Ent. Belg.*, XXXI, p. 240 (1887); HANCOCK, *Genera Ins.*, fasc. 48, p. 55 (1906).

7. *Paratettix borellii* Giglio-Tos.

Paratettix borellii GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 28 (1897); HANCOCK, Genera Ins., fasc. 48, p. 56 (1906).

Habitat.—There is a male specimen of the genus at hand that is referred to Giglio-Tos' species *borellii*. It comes from Puerto Suarez, Bolivia, and was taken by J. Steinbach during the month of November at an elevation of 150 meters above sea level.

Genus PROTOTETTIX Bolivar.

Prototettix BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 255 (1887); HANCOCK, Genera Ins., fasc. 48, p. 65 (1906).

8. *Prototettix fossulatus* Bolivar.

Prototettix fossulatus BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 256 (1887).

Habitat.—Only a single male example is at hand from Chapada, Matto Grosso, Brazil.

Genus TETTIGIDEA Scudder.

Tettigidea SCUDDER, Bost. Journ. Nat. Hist., VIII, p. 476 (1862); BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 290 (1887); HANCOCK, Tettig. N. A., pp. 138-161, Pl. X, (1902); *IB.*, Genera Ins., fasc. 48, p. 67 (1906); BRUNER, Ann. Carnegie Mus., VII, pp. 92, 123 (1910).

9. *Tettigidea granulosa* sp. nov.

An insect of about the size and general appearance of *T. chapadensis*, but differing from that insect in its slightly more robust form, more coarsely granulose pronotum, and in having the pallid marking on the tegmina circular instead of oblique. There are also other differences as may be noted by the following brief characterization.

Insect viewed laterally very straight above, the dorsum of pronotum showing scarcely a trace of undulation. Head rather deep up and down, embraced by the pronotum to the hind margin of the eyes; the latter prominent, but not large, the top of head between them very perceptibly undulate and with its surface closely granulated; antennæ rather long and slender; frontal costa viewed in profile evenly rounded above the ocellus and deeply sulcate to the very top; vertex a very little advanced beyond the anterior edge of the eyes. Hind femora a little passing the tip of valves of ovipositor, moderately robust. The pronotum extending past the femora and the wings longer than the pronotum.

General color dark fuliginous, with faint indications of pallid markings on the hind femora and the apical portion of the pronotum; the posterior femora with a rather broad subbasal pale annulus, and the anterior and middle legs faintly annulated. Venter together with the lower valves of the ovipositor pallid.

Length of body, ♀, 11 mm., of pronotum, 12.25 mm., of hind femora, 7.5 mm.

Habitat.—One female specimen labeled "Sta. Cruz de la Sierra, Bolivia, 450 m., J. Steinbach" is at hand. This type is in the Carnegie Museum.

10. *Tettigidea gracilicornis* Bruner.

Tettigidea gracilicornis BRUNER, Ann. Carnegie Mus., VII, pp. 125, 128 (1910).

Habitat.—The single male specimen at hand was collected by J. Steinbach during the month of November, 1909, at Puerto Suarez. It was found at an elevation of 150 meters above sea-level.

11. *Tettigidea chapadensis* Bruner.

Tettigidea chapadensis BRUNER, Ann. Carnegie Mus., VII, pp. 125, 130 (1910).

Habitat.—Likewise only a single male. It comes from Chapada, Brazil, and bears the accession number 2966.

12. *Tettigidea costalis* Bruner.

Tettigidea costalis BRUNER, Ann. Carnegie Mus., VII, pp. 126, 133 (1910).

Habitat.—This species is also represented by a single male specimen. It was collected by J. D. Haseman at São Luiz da Caceres, Matto Grosso, Brazil, during the month of May, 1909.

Genus SCARIA Bolivar.

Scaria BOLIVAR, Ann. Soc. Ent. Belg., XXXI, p. 301 (1887); HANCOCK, Genera Ins., fasc. 48, p. 69 (1906); BRUNER, Ann. Carnegie Mus., VII, p. 140 (1910).

13. *Scaria producta* Hancock.

Scaria producta HANCOCK, Genera Ins., fasc. 48, p. 70 (1906).

Habitat.—The single male specimen at hand comes from Santarem, Brazil. It is a representative of accession number 2966.

Genus PAUROTARSUS Hancock.

Paurotarsus HANCOCK, Psyche, IX, p. 42 (1900); IB., Genera Ins., fasc. 48, pp. 70-71 (1906); BRUNER, Ann. Carnegie Mus., VII, p. 142 (1910).

14. *Paurotarsus amazonus* Hancock.

Paurotarsus amazonus HANCOCK, Psyche, IX, pp. 42-43, figs. 1a-1d (1910); *IB.*, Genera Ins., fasc. 48, p. 71, fig. 26 (1906).

Habitat.—The only specimen at hand, a female, was collected by J. D. Haseman. It bears the label "Rio Machupo, near Rio Guaporé, Bolivia," and was taken August 29, 1909.

Family EUMASTACIDÆ.

Genus SCIRTOMASTAX Saussure.

Scirtomastax SAUSSURE, *REV. SUISSE DE ZOOLOGIE*, XI, p. 97 (1903); BURR, M., *Genera Ins.*, fasc. 15, p. 16 (1903).

This tropical American genus of locusts was erected by Dr. Henri de Saussure for the reception of an apterous Eumastacid coming from Ecuador. Later Dr. Malcolm Burr referred two others there, viz. *Eumastax surinama* and *E. rosenbergi*. Now a single female representative of what would seem to be a fourth species is at hand from eastern Brazil. These insects may be separated by the annexed table.

SYNOPSIS OF THE SPECIES OF SCIRTOMASTAX.

- A. Entirely apterous.
- b. Brownish or testaceous. Antennæ black; sides of head black with post-ocular yellow band.....*cordilleræ* Saussure.
 - bb. Olivaceous. Antennæ pallid; sides of head concolorous and without the yellow band back of eyes.....*brasiliensis* sp. nov.
- AA. Tegmina present but rudimentary. Wings wanting.
- b. Color entirely fuscous. Pronotum behind gently triangulately emarginate, the median carina present.....*surinama* Burr.
 - bb. Color fuscous, but with the pronotum ferruginous. The latter behind roundly emarginate, its median carina absent.....*rosenbergi* Burr.

15. *Scirtomastax brasiliensis* sp. nov.

Entirely apterous. Most nearly related to *S. cordilleræ* Saussure, but differing from that insect slightly in dimensions and quite markedly in color.

Insect fairly slender. Head large; vertex subangulate, a little advanced beyond the upper extremity of the eyes; frontal costa sulcate throughout, of about equal width at upper and lower extremities and at the ocellus, but narrowed between, the lateral walls of equal prominence throughout. Antennæ robust, clavate, a little shorter than the anterior femora, pallid throughout as compared to

black. Rest of insect as characterized for the genus. Hind tibiæ numerously spined, ranging from 21 to 25 on both margins, the inner row much larger and alternating in size.

General color above brownish olive, below together with the face, lower margins of the pronotum, and legs, greenish yellow. Hind femora with apical portion fasciate with fuscous, the longitudinal carinæ minutely serrate, infuscated.

Length of body, ♀, 20 mm., of hind femora, 12.5 mm.

Habitat.—Rio Sapão, Bahia, Brazil, a single female, where it was taken January 30, 1908, by J. D. Haseman. The type is in the Carnegie Museum.

Family PROSCOPIDÆ.

The locusts which comprise the present family, with a single exception, *Taxiarchus septentrionalis* Bruner from Costa Rica, Central America, are confined to the South American continent, where the various representatives are to be found from the Isthmus of Panama to middle Argentina and Chile, and from the Atlantic to the Pacific oceans. As a group these insects are very distinct from all other locusts, but possibly bear the nearest resemblance to some of the representatives of the Eumastacidæ, which latter family is also represented to a limited degree over the same territory. The general body structure of the Proscopidæ is more nearly that of some of the slenderer apterous Phasmoidea than of other locusts. None of them are fully winged, and representatives of but two genera, so far as at present known, viz: *Anchotatus* and *Astroma*, exhibit traces of these organs.

The material contained in the collections now being studied and which forms the basis of the present paper represents several genera and nearly a score of species. Three of these, and possibly a fourth, seem to be new to science and are described herewith.

In the separation of these insects no single set of characters thus far employed by the various authors who have studied them seem to be entirely dependable. Vertex characters, length of antennæ, and of the basal joint of these organs, comparative form and prominence of the eyes, form of head, the characters on the pronotum, and position of the anterior legs, hind tibiæ and their spine characters and number, —all of these seem to vary so much from the rule as laid down for the several genera and species that they hardly prove satisfactory diagnostic characters.

Another thing, which adds somewhat to the confusion of the student of these insects, is the fact that some individuals of the same species become imagoes with their fourth molt, while others go through an additional molt, which results in a much larger, but not necessarily more mature-looking individual. Frequently the spines on the two margins of the hind tibiæ of a single individual may vary a dozen or even more as to number.

In their food-habits these insects seem to be general feeders, although when better known it may be ascertained that some of the genera and species prefer special plants.

For the convenience of future students of the family the annexed synoptical key of genera has been translated and modified from Brunner von Wattenwyl (Verh. d. k. k. Zool.-Bot. Gesell. in Wien, 1890) who was the first and only entomologist who attempted a monographic revision of the family. Possibly at some future date the present writer may attempt another revision of the group, provided a sufficient amount of material can be secured to form the basis of such a study.

SYNOPSIS OF THE GENERA OF PROSCOPIDÆ.

A. Tarsi provided with a pulvillus. Claws simple, acuminate. Rudimentary wings wanting (except in the genus *Anchotata*).

b. Pronotum cylindrical, not separated from the prosternum.

c. Antennæ in both sexes twice as long as the rostrum, the first joint being about equal to the eyes in length. (Posterior tibiæ above, internally 13-20-spined, externally provided with an apical spine.)

Prosarthria Brunner.

cc. Antennæ a little longer than the rostrum, or in the female shorter than it, the first joint about one-half the length of the eyes.

d. Posterior tibiæ above without an apical spine on the inner margin.

Anterior legs inserted at or near the middle of the pronotum.

e. Posterior tibiæ above provided with an apical spine on the outer margin.

f. Rostrum in both sexes straight. Anterior legs inserted in the middle, or slightly in advance of the middle, of the pronotum. Posterior femora moderately robust.

Proscopia Klug.

ff. Rostrum bent downward. Anterior legs inserted a trifle back of the middle of the pronotum. Posterior femora at base very robust. *Apioscelis* Brunner.

ee. Posterior tibiæ above without an apical spine on the external margin.

f. Posterior tibiæ entirely unarmed below. Rostrum in the

- male about one-half the length of the eyes. Eyes globose. First joint of the antennæ less than one-fourth of the length of the eyes. Last ventral segment of the male abdomen obtuse. . . . *Corynorhynchus* Brunner.
- ff.* Posterior tibiæ below armed towards the apex with some spines. Rostrum in the male longer than the eyes. Eyes depressed. First joint of the antennæ not less than one-third the length of the eyes. Last ventral segment of the male abdomen more or less produced. . . . *Tetanorhynchus* Brunner.
- dd.* Posterior tibiæ above provided on the inner margin with an apical spine. Front legs inserted on the anterior third of the pronotum. Posterior tibiæ furnished externally with an apical spine. First joint of the antennæ less than one-fourth the length of the eyes. . . . *Stiphra* Brunner.
- bb.* Pronotum more or less depressed, separated from the sternum by a longitudinal suture.
- c.* Head in advance of the mouth subconstricted, the front viewed from the side sinuate. Pronotum with its anterior margin subdilated. Posterior tibiæ provided on the outer margin with an apical spine. Last ventral segment of male abdomen not produced.
- d.* Pronotum almost twice the length of the head. Mesopleura dentate. Posterior tibiæ entirely unarmed below. . . . *Taxiarchus* Brunner.
- dd.* Pronotum a little more than one-half longer than the head. Mesopleura entire.
- e.* Meso- and meta-notum divided. Posterior tibiæ above provided with an apical spine on the inner margin, below spined towards the apex or unarmed.
- f.* Rudimentary wings present in the female. Rostrum correct, as long as the rest of the head, or a little shorter. Posterior femora above with the apical margins obtuse. . . . *Anchotatus* Brunner.
- ff.* Rudimentary wings wanting. Rostrum decurved, either longer or shorter than the eyes. Posterior femora with both margins normally produced into a spine. . . . *Epigrypa* Brunner.
- cc.* Meso- and meta-notum, although the median segment is not divided, strongly dilated. Posterior tibiæ above on both margins without apical spines, below unarmed. . . . *Hybusa* Erichson.
- cc.* Head gradually acuminate, the front viewed from the side straight. Pronotum with the anterior margin not dilated. Posterior tibiæ above with both margins lacking apical spines (below spined towards the apex). Subgenital plate of male abdomen lengthily produced. (Posterior femora with the terminal margins obtuse. Form very slender.) *Cephalocæma* Brunner.

44. Tarsi without pulvillus, the claws compressed, their base and apex of equal width, the apex of which is provided with a deflexed point. Rudimentary wings present in the female. *Astroma* Charpentier.

Genus CORYNORHYNCHUS Brunner.

Corynorhynchus BRUNNER, Verh. der k. k. Zool.-Bot. Ges. in Wien, XXXIX, p. 101 (1890).

This genus was erected to contain several species of walking-stick-like locusts that occur in Brazil. They differ from other representatives of the family in that the females have the rostrum of the vertex more or less clavate. At least five species have thus far been recognized.

16. *Corynorhynchus radula* (Klug).

Proscopia radula KLUG, Horæ Phys. Berol., p. 20, No. 4, pl. 3, fig. 4 (1820); BURMEISTER, Handb. Ent., II, p. 604, No. 3 (1838).

Corynorhynchus radula BRUNNER, Monogr. Proscop., p. 16, fig. 4a-e (1890).

Proscopia ruficornis KLUG, Horæ Phys. Berol., p. 24, pl. IV, fig. 11 (1820).

Habitat.—There are several specimens in the collection, which are placed here, both sexes being represented. They were collected at Rio de Janeiro.

Another male specimen of this genus was taken at Chapada, near Matto Grosso, Brazil. This latter may belong to a distinct species, since it is considerably larger, being all of 80 mm. in length.

Two of the females also may belong elsewhere, since the apex of their rostrum is somewhat differently shaped from that of typical specimens of *radula* as figured by Brunner in his monograph of the family.

Genus TETANORHYNCHUS Brunner.

Tetanorhynchus BRUNNER v. WATTENWYL, Verh. d. k. k. Zool.-Bot. Ges. in Wien, XXXIX, pp. 92, 104 (1890); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 18 (1897); REHN, Proc. Acad. Nat. Sci. Phil., 1904, p. 677.

The genus *Tetanorhynchus* was erected by Carl Brunner von Wattenwyl to contain certain forms of the slender, apterous, stick-like locusts, which occur chiefly in tropical South America east of the Andes Mountains and between the Amazons and the northern regions of the Argentine Republic. As stated in my remarks introductory to the family Proscopidæ all of these insects are rather variable in their characters. The genera as well as the species, as at present understood, cannot be definitely separated by the characters which

have been chosen for that purpose. Brunner von Wattenwyl included six species, Giglio-Tos added two others, while Rehn described two more. The material now being studied likewise seems to contain two additional forms which can best be placed in the genus *Tetanorhynchus*.

As stated by Brunner von Wattenwyl the representatives of this genus bear a strong resemblance to those of *Cephalocæma* Burmeister, and differ in some of its representatives only in the separation of the dorsal and ventral portions of the pronotum by a well-defined, continuous, longitudinal groove on each side. As shown in the description of *T. gracilis*, which follows, even this character is not permanent, for occasional individuals occur, in which there is a complete separation of these parts. This character seems to be one which, to a certain extent at least, belongs more frequently to immature than to mature individuals. There are at hand two nymphs of one of these insects from Puerto Suarez, Bolivia, which in all other characters are *Tetanorhynchus*, but in which the separation is as complete as in any *Cephalocæma*.

Additional forms undoubtedly occur over the vast region which seems to be their home. Being entirely apterous and possibly also more or less closely confined to certain host plants, as well as regions determined by climatic conditions and surface configuration, careful collecting and study will no doubt result in a much better knowledge of the family as a whole, and also to the addition of many new forms. The annexed synoptical key will aid the student in the separation of the dozen recognized species of *Tetanorhynchus*:

SYNOPSIS OF THE SPECIES OF TETANORHYNCHUS.

- A. Rostrum of the vertex of female shorter or at least no longer than the remainder of the head. (The posterior tibiæ above on the inner margin with not more than 20 or 21 spines.)
 - b. Rostrum of the vertex of the female much longer than one-half of the remainder of the head. Posterior tibiæ below on the outer margin spined towards the apex.
 - c. Rostrum of the female with all the carinæ prominent, viewed from the front cruciform or cross-shaped. (Posterior tibiæ above on the inner margin 10-11 spined. Subgenital plate but little produced.)
 - punctatus* Klug.
 - cc. Rostrum of the female with the carinæ, especially the lower ones, less prominent, viewed from the front quadrate or lamellate. (Posterior tibiæ above on the inner margin variously spined.)
 - d. Form graceful, especially in the males.

- e. Rostrum viewed from the front lamellate, the upper carinæ much more prominent than the lower ones. Margins of hind tibiæ about 20-spined. *sublævis* Brunner.
- cc. Rostrum viewed from the front quadrate, the carinæ of nearly equal prominence.
- f. Apex of the rostrum more or less acuminate.
- g. Rostrum with its carinæ crenulate. Hind tibiæ of female internally 15-17-spined, externally 19-spined. *propinquus* Brunner.
- gg. Rostrum with its carinæ smooth. Hind tibiæ of the male 15-16-spined, of female 20-spined.
bihastatus Rehn.
- ff. Apex of rostrum blunt.
- g. Rostrum of the male vertex longer (4-6 mm.). Hind tibiæ with fewer spines (10-15 in number).
- h. Size larger (♂, 68-83 mm., ♀, 92-115 mm.). Hind tibiæ with 11-15 spines on both margins.
humilis Giglio-Tos.
- hh. Size smaller (♂, 65 mm., ♀, 90 mm.). Hind tibiæ 10-12-spined on both margins.
gracilis sp. nov.
- gg. Rostrum of the male vertex shorter (2.65 mm.). Hind tibiæ with more spines (20-21 in number).
curtirostris sp. nov.
- dd. Form of male robust, body glabrous. Anterior and middle femora heavy. *smithi* Rehn.
- bb. Rostrum of the female but little longer than one-half of the remainder of head. Posterior tibiæ below entirely unarmed. *incertus* Brunner.
- AA. Rostrum of the vertex of the female longer than the remainder of the head. (The posterior tibiæ above on the inner margin sometimes with more than 20 spines.)
- b. Pronotum densely granulate. Posterior tibiæ above armed internally with 24 spines. *longirostris* Brunner.
- bb. Pronotum impress-punctate. Posterior tibiæ above armed internally with from 13 to 22 spines.
- c. Smaller (♀, 80 mm. long). Rostrum towards the apex attenuate, the apex obtuse. Posterior tibiæ both internally and externally 13-spined. *angustirostris* Brunner.
- cc. Larger (♀, 124-138 mm. long). Rostrum with the apex strongly clavate. Posterior tibiæ internally and externally 14-22-spined. Subgenital plate of male compressed, a little shorter than the rostrum, acuminate. *borelli* Giglio-Tos.

17. *Tetanorhynchus punctatus* (Klug).

Proscopia punctata KLUG, Horæ Phys. Berol., p. 19, No. 3, pl. 3, fig. 3 (1820);
BURMEISTER, Handb. Ent., II, p. 604, No. 5 (1838).

Tetanorhynchus punctatus BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, pp. 104, 105, pl. 4, figs. 5d-e (1890).

Proscopia subparalela WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 489, No. 24 (1870).

♂ *Proscopia acuminata* KLUG, Horæ Phys. Berol., p. 23, No. 10, pl. 4, fig. 10 (1820); BURMEISTER, Handb. Ent., II, p. 605, No. 10 (1838).

Nymph. *Proscopia striata* KLUG, l. c., p. 23, No. 9, pl. 4, fig. 9 (1820); BURMEISTER, l. c., p. 605, No. 9 (1838).

Habitat.—A single male taken at Corumbá is referred here. It was collected by H. H. Smith during the month of April.

In size and general appearance this insect resembles the males labeled as *T. sublævis* from the same locality.

18. *Tetanorhynchus sublævis* Brunner.

Tetanorhynchus sublævis BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, p. 105, No. 2; pl. 4, figs. 5a-c (1890); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—Corumbá, Brazil, two males, collected during March and April by H. H. Smith. These specimens are very similar to those coming from the same locality and determined as *propinquus* and *punctatus*. The latter, however, has the rostrum decidedly shorter.

19. *Tetanorhynchus propinquus* Brunner.

Tetanorhynchus propinquus BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, pp. 105, 106, No. 3 (1890); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—Six males taken by H. H. Smith at Corumbá, Brazil, are referred to this species on account of the number of spines on the hind tibiæ. They also were taken in March and April.

It is a difficult matter to determine just which of the opposite sexes belong together in this genus, unless collected *in coitu*.

20. *Tetanorhynchus bihastatus* Rehn.

Tetanorhynchus bihastatus REHN, Proc. Acad. Nat. Sci. Phil., LVI, p. 677 (1905); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—Five females coming from Corumbá, Brazil, are referred to Rehn's *T. bihastatus*. They also were collected by H. H. Smith during March and April.

21. *Tetanorhynchus humilis* Giglio-Tos.

Tetanorhynchus humilis GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 18 (1897); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—Two males and two females of this genus are at hand,

which seem to fit Giglio-Tos' description of *T. humilis*. The males come from Santa Cruz de la Sierra, Bolivia, where they were collected at an elevation of four hundred and fifty meters above sea-level by J. Steinbach. The females were collected at Puerto Suarez, Bolivia, during November by the same person.

22. *Tetanorhynchus gracilis* sp. nov.

In size very similar to *T. longicornis*, described in the present paper, but differing from it in the slightly more robust stature and the longer rostrum of the vertex and much shorter antennæ and subgenital plate. Like that insect the present species also shows marked *Cephalocæma* characteristics. In fact one specimen has the sternum distinctly separated from the pronotum, but otherwise does not differ from the other individuals now being studied.

Head coarsely punctulate, gently constricted slightly behind the depressed eyes, the occiput quite noticeably canaliculate at middle back of the eyes, between them carinated. Rostrum quadrate, evenly tapering, as high as wide, gently depressed, the angles bluntly carinated; above convex at base, sulcate apically, at sides basally with a heavy longitudinal carina that gradually tapers towards the apex. Frontal costa inconspicuous, somewhat similar to that of *longicornis*. Sides of head rounded, without angles or carina. Antennæ about one-fourth shorter than the rostrum, the basal joint a trifle over a third the length of the eyes. Pronotum subcylindrical, rather strongly punctured, the surface somewhat glabrous, in the middle scarcely carinated, but with a narrow space free from punctulation. Abdomen with the basal joint punctulate, smooth beyond and the apical segments faintly 5-carinate as in *T. longicornis* and several of the species of *Cephalocæma*. Last ventral segment or subgenital plate compressed, acuminate, and canaliculate above, the lower middle strongly carinated, but the sides scarcely so. Supra-anal plate short, roundly triangular. Legs slender. Hind tibiæ 10-12-spined. General color olive-green, more or less testaceous below.

Length of body, ♂, about 65 mm., of head, 12 mm., of rostrum, 4.5-6 mm., of pronotum, 12 mm., of anterior femora, 8 mm., of hind femora, 20 mm., of hind tibiæ, 20 mm., of subgenital plate, 4 mm.

Length of body, ♀ (?) 90 mm., of head, 14 mm., of rostrum, 5.5-6.5 mm., of pronotum, 16.5 mm., of anterior femora, 13 mm., of hind femora, 29 mm., of hind tibiæ, 31 mm.

Habitat.—There are several specimens of the male at hand that come from Chapada, near Cuyaba, Matto Grosso, Brazil, also a couple of males that were taken at Corumbá, Brazil, H. H. Smith collector. The type is the property of the Carnegie Museum.

There are several female specimens before me which may belong with the male described above. They were taken at Corumbá, as were also some of the males. They are placed here with some doubt because of the greater number of tibial spines (19–21) and the different style of pronotal punctulation (variolose). Otherwise the rostrum and antennal characters agree with those of the males. The measurements of one of these females is given above.

23. *Tetanorhynchus longicornis* sp. nov.

This insect is unusually slender so far at least as the male is concerned. It may be recognized from the other species of the genus by the extreme length of the antennæ, which are fully one-half longer than the rostrum of the vertex. Subgenital plate long, acuminate, and with its sides fairly strongly compressed, prominently carinated below and at middle of sides, the upper edges margined.

Head long and slender, evenly narrowing from base to the eyes, viewed in profile the front is but little sinuate; the occiput moderately transversely rugulose, provided with a low blunt median longitudinal and two supplementary lateral (one on each side) carinæ. Sides of head also provided with a strong rounded carina that extends from the outer margin of the base of the clypeus to the back edge of the eyes; frontal costa prominent throughout as a rounded ridge or carina, the upper end of which branches at the ocellus and gradually fades away between the heavy anterior borders of the eyes. Rostrum quadrate, transversely wedge-shaped, about one-third longer than the depressed eyes, gently tapering and with the apex rounded, the lateral margins both above and below coarsely carinated, the upper disk convex and somewhat transversely rugose, lower disk flattened or gently sulcate, smooth; the outer sides sulcate and provided with a slender median carina that extends two-thirds of its length. Eyes strongly depressed, a little more than twice as long as broad. Antennæ elongate, fully twice the length of the rostrum, the basal joint one-half the length of the eyes. Pronotum sub-depressed, not separated from the sternum by lateral grooves, the surface rather profusely and finely punctulate, near the middle of the dorsum

somewhat transversely so, the middle provided with a fairly conspicuous percurrent carina. Abdomen apically above dimly 5-carinate as in some of the species of *Cephalocœma*. Supra-anal plate short, bluntly rounded at apex; subgenital plate as described above. Legs slender. Margins of hind tibiæ 20-21-spined.

General color dark olive-brown, with the lateral margins of the head and prothorax flavous. Legs and underside testaceous.

Length of body, ♂, 64 mm., of head above, 10.5 mm., of rostrum, 2.65 mm., of pronotum, 12.5 mm., of anterior femora, 9 mm., of hind femora, 22 mm., of hind tibiæ, 22 mm., of subgenital plate, 6 mm.

Habitat.—A single male, the type, is at hand. It was collected by J. D. Haseman at Formosa, Bahia, Brazil, February 15th, 1908. The type is deposited in the Carnegie Museum.

This insect in some of its characters approaches the genus *Cephalocœma*, but in others certainly is distinctly a *Tetanorhynchus*.

24. *Tetanorhynchus smithi* Rehn.

Tetanorhynchus smithi REHN, Proc. Acad. Nat. Sci. Phila., LVI, p. 678 (1904); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—The present species is represented by at least eight male specimens, which come from Corumbá, Brazil, where they were collected by H. H. Smith during March and April. There are also at hand three females from the same locality and bearing similar dates which I am inclined to label *smithi*, although they are comparatively small and slender (85-88 mm. long) to go with the males. Possibly these may be "subimagoes" or individuals which have matured with the fourth instead of the fifth molt, as mentioned on a former page of this paper.

25. *Tetanorhynchus incertus* Brunner.

Tetanorhynchus incertus BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, 105, 106, No. 4 (1890); KIRBY, Syn. Cat. Orthopt., III, p. 86 (1910).

Habitat.—There is a single female specimen of this insect at hand which H. H. Smith took during October. It comes from Rio de Janeiro.

As Brunner von Wattenwyl suggests, this insect has some characteristics of *Corynorhynchus* as well as of the present genus.

Genus CEPHALOCŒMA Serville.

Cephalocœma SERVILLE, Ins., Orthopt., p. 577 (1839); BURMEISTER, Abhandl. Ges. Halle, XV, p. 3 (1880); BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, pp. 93, 114 (1890); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, pp. 19-21 (1894).

The locusts referred to this genus belong to South America and are found between the equator and about 36° south latitude. They differ from the species of *Tetanorhynchus* and *Corynorhynchus* chiefly in having the sternum of the prothorax separated from the dorsal portion by well-defined lateral, longitudinal sulci, and in the front being straight rather than sinuose. About twenty species have been described thus far.

26. **Cephalocœma costulata** Burmeister.

Cephalocœma costulata BURMEISTER, Abhandl. Naturf. Ges. Halle, XV, p. 9, No. 3 pl. I, figs. 3-7 (1880); BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, pp. 115, 116 (1890); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, pp. 19, 20 (1897); BRUNER, Second Rept. Locust Comm. B. Aires, p. 20, pl. 6 (1900); IB., Proc. U. S. Nat. Mus., XXX, p. 619, pl. 36, fig. 1 (1906).

Habitat.—Chapada and Corumbá, Brazil where the dozen or more specimens were taken from April to September inclusive by H. H. Smith. Most of this material is immature.

This seems to be the most abundant as well as most widely distributed species of the genus.

27. **Cephalocœma** sp.?

There is still another species of the genus *Cephalocœma* at hand. It is represented by a single female coming from Chapada, Brazil, where it was taken by H. H. Smith in December. This insect exhibits several of the characteristics described by Rehn in connection with his *Cephalocœma chapadensis* (Proc. Acad. Nat. Sci. Phila., 1904, p. 681). The measurements of the female of *chapadensis* are 75.5 mm. long while the present specimen is 92 mm. long. Rehn's insect had a head 15.5 mm. long while this one has it 16.5 mm. in length. The spine formula for the hind tibiæ is 10-10 in our specimen, while Rehn's is given as 12 externally and 9 or 10 internally. The rostrum of this specimen has the sides parallel, the apex blunt and viewed from in front quadrate, the carinæ rather prominent and cruciate. Its length a little less than the remainder of the head, or 8 mm. In stature this specimen is moderately robust, at least more noticeably so than in *C. costulata* Burmeister. If not *chapadensis* it might be known temporarily as *C. cuyabensis* Bruner.

28. **Cephalocœma calamus** Burmeister.

Cephalocœma calamus BURMEISTER, Abhandl. Ges. Halle, XV, p. 11, No. 4 (1880); BRUNNER, Verh. Zool.-Bot. Ges. Wien, XL, pp. 115, 116, No. 4 (1890).

Habitat.—There are nine specimens at hand which are referred here, some of them doubtfully. They come from Chapada and Corumbá, Brazil, and Puerto Suarez, Bolivia. They were taken during the period from November to April inclusive.

The rostrum in some of the males is apparently broken off at about its middle, but otherwise these individuals do not appear to differ greatly from normal specimens.

29. *Cephalocæma borelli* (Giglio-Tos).

Prosarthria borellii GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 4 (1894).

Cephalocæma borellii GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 19 (1897); KIRBY, Syn. Cat. Orthopt., III, p. 89 (1910).

Habitat.—Three male and three female specimens which were taken at Chapada, near Cuyaba, Matto Grosso, Brazil, are referred here. They were collected by H. H. Smith during the months of June and July.

The female specimens appear to be immature, as they measure but 85 mm. in length instead of 113 mm., as given for this species in the original description.

Genus STIPHRA Brunner.

Stiphra BRUNNER V. WATTENWYL, Verhandl. d. k. k. Zool.-Bot. Ges. Wien, XXXIX, p. 21, fig. 6 (1890).

The insects which comprise the present genus are especially noted for their compactness. Three species have been described heretofore, and now a fourth is added. Their distribution seems to be confined to middle and southern Brazil and eastern Bolivia. The annexed table will assist in their separation.

SYNOPSIS OF THE SPECIES OF STIPHRA.

- A. Middle tibiæ on their basal fourth provided with a lobe or expansion. {Metanotum plane. (Rostrum of the female truncate, a little longer than the eyes.) [Bahia, Brazil] *lobata* Brunner.
- AA. Middle tibiæ on their basal fourth not lobate. Metanotum tuberculately elevated on its posterior margin.
 - b. Rostrum of female vertex at least twice as long as the eyes; in the male acuminate and longer than the eyes. Metanotum except the marginal tubercle plane. [Prov. Santa Catharina, Brazil] .. *tuberculata* Brunner.
 - bb. Rostrum of the female vertex not known; of the male truncate, or broadly rounded and shorter than the eyes. Metanotum strongly arched.
 - c. Larger (♂, 72 mm.). Vertex truncate. [Bolivia] .. *gibbosa* Guerin.
 - cc. Smaller (♂, 48 mm.). Vertex broadly rounded. [Bom Fim, Bahia.] *brevirostris* sp. nov.

30. *Stiphra brevirostris* sp. nov.

Most nearly related to *S. gibbosa* Guerin, from which it differs in its smaller size and much shorter and rounded, instead of truncate, rostrum of the vertex.

Stature moderately robust. Head strongly constricted back of the eyes, nearly or quite as long as the pronotum, somewhat transversely rugose above, smooth elsewhere; the eyes prominent, almost as wide as long, separated above by a space about equal to one-half of their longest diameter; the fastigium of the vertex or rostrum quite strongly depressed, broadly rounded in front, the lateral edges blunt. Occiput longitudinally grooved at middle almost to the back margin of the eyes, and from that point forward extends a blunt carina, which reaches the tip of the rostrum. Antennæ a little more than twice as long as the rostrum, subclavate, the basal joint less than one-fourth as long as the eyes. Pronotum glabrous, transversely rugoso-punctate, the anterior legs arising about one-third its length from the front, anterior margin a little flaring at sides, roundly and widely emarginate at middle; meso- and meta-notum broadly dilated, also punctulate, the latter strongly arched and rugoso-punctulate, provided with a median and two lateral longitudinal ridges on each side of its disk. Abdomen minutely punctulate, rather robust and tapering but little caudad. Last ventral segment short, compressed. Legs short, the anterior and middle pairs very robust apically. Hind tibiæ 13-15-spined externally, 10-12-spined internally.

General color dark olive-green, the legs paler. Antennæ pale at base, black beyond.

Length of body, ♂, 38 mm., of head, 7 mm., of rostrum, 0.9 mm., of pronotum, 6 mm., of anterior femora, 4.75 mm., of hind femora, 13.5 mm.

Habitat.—Bom Fim, Bahia, Brazil, "Fazenda de Amoratu," November 20, 1907, J. D. Haseman collector. The only specimen at hand is the type, a male. It is the property of the Carnegie Museum.

Family TRYXALIDÆ.

This is one of the principal families of locusts in most countries. In South America it comes next to the Cyrtacanthacridæ (Acridiida) both in the number of its representatives and their importance economically. In the material here reported upon we find some new forms, including two new genera.

Since no complete synoptic key of these South American genera has heretofore appeared, one, which may be accepted as preliminary, has been prepared, and is now presented.

SYNOPSIS OF THE SOUTH AMERICAN GENERA OF TRYXALIDÆ.

- A. Foveolæ of the vertex below or wanting. The face usually very oblique.
- b. Antennæ with the joints depressed or flattened, usually more or less decidedly ensiform in one or both sexes.
- c. Wings of male more or less strongly fenestrate on the humeral field.
- d. Sides of the fastigium of the vertex strongly rounded or arcuate, the apex not acuminate. Tegmina acuminate or decidedly obliquely truncate. Posterior femora with the apical angles horizontally produced, acuminate. Head conical, face rather strongly oblique. Foveolæ of the vertex indistinct, triangular.
- e. Vertex longer than the eyes. Tegmina of the male broader than the length of the pronotum. Wings of the male very broadly fenestrate. . . . *Hyalopteryx* Charpentier.
- cc. Vertex shorter than the eyes. Tegmina of the male narrower than the length of the pronotum. Wings of male less broadly fenestrate.
- f. Tegmina acuminate, the wings tinted with dilute red. Lateral carinæ of the pronotum interrupted.
Eutryxalis Bruner.
- ff. Tegmina obliquely truncate at apex; wings hyaline and more or less infuscated. Pronotum with the lateral carinæ continuous, uninterrupted.
- g. Larger, general color green. . . . *Truxalis* Linnæus.
- gg. Smaller, general color testaceous or ferruginous.
Orphula Stål.
- dd. Sides of the fastigium of the vertex straight or but gently rounded, the apex more or less acuminate. Tegmina broadly rounded or but feebly truncated at the apex.
- e. Fastigium of the vertex above depressed or sulcate, without a median longitudinal carina.
- f. Lateral carinæ of the pronotum less prominent than the median, more or less divergent, especially on the metazona; the prozona and metazona about equal in length, the lateral lobes deeper than long.
- g. The lateral carinæ nearly or quite as well developed on the prozona as on the metazona. Eyes more or less truncate in front.
- h. Apical half or two-thirds of tegmina membranous. Antennæ longer.
- i. Tegmina moderately broad, the apex feebly truncated; disk of wings tinged with yellowish.

- j.* Antennæ with their basal joints depressed, giving to these organs a subensiform appearance.
Parorphula Bruner.
- jj.* Antennæ with the joints scarcely or not at all depressed, filiform.
Sisantum Bruner.
- ii.* Tegmina narrow, their apex rounded; disk of wings fuscous, the anterior border apically black-banded.
Orphulina Giglio-Tos.
- hh.* Apical third only of tegmina membranous; wings clear or but little infuscated. Antennæ shorter.
- i.* Posterior tibiæ with more (13-14) spines in outer row; tegmina with a decided humeral vitta; eyes rather large, but feebly bulging. . . . *Parachlæbata* Bruner.
- ii.* Posterior tibiæ with fewer spines in the outer row (10-11); tegmina without a decided humeral vitta; eyes of moderate size, somewhat bulging.
Orphulella Giglio-Tos.
- gg.* Lateral carinæ of pronotum but feebly developed on the prozona when compared with those on the metazona; eyes subglobular, large.
Linoceratium Bruner.
- ff.* Lateral carinæ of the pronotum not converging near the middle, almost or quite as prominent as the median, the sides of the pronotum not compressed at middle. Tegmina and wings sometimes, but not always, abbreviated. *Dichromorpha* Morse.
- ee.* Fastigium of the vertex above rounded, provided with a longitudinal median carina.
- f.* General color dark brown or fuscous varied with testaceous. Wings strongly bordered with fuliginous. Lateral carinæ of pronotum faint and irregular.
- g.* Wings with the anterior ulnar vein branched at base. Antennæ of male clavate. Humeral field of wings not broadly scalariform or fenestrate. Wings red and black. *Toxopterus* Bolivar.
- gg.* Wings with the anterior ulnar vein not branched at base. Humeral field of wing very broadly scalariform or fenestrate. Wings dull orange or sulphurous and black. *Peruvia* Scudder.
- ff.* General color green or testaceous. Lateral carinæ of

pronotum prominent, straight. Wings largely hyaline except for the roseate disk.

Cocytotettix Rehn.

cc. Wings of male not fenestrated in humeral field, the radial veins not incassate. Lateral carinae parallel or gently divergent to the rear.

d. Pronotum provided with a pair of supplemental carinae on the disk.

Sinipta Stål

dd. Pronotum without the supplemental carinae on the disk.

Leurocerus Bruner.

bb. Antennae filiform. Lateral carinae of pronotum parallel.

Amblytropidia Stål.

AA. Foveolae of the vertex visible from above; but sometimes very inconspicuous. Face generally less oblique than in the alternate category.

b. Inner apical spurs of hind tibiae subequal in length. Antennae, at least of male, nearly or quite as long as the hind femora.

c. Body robust, apterous or subapterous, somewhat similar in form to the representatives of *Caleles* Bruner. Vertex longitudinally carinate [Galapagos Islands].....*Closteridea* Scudder.

cc. Body provided with wings, of normal form. Vertex not longitudinally carinate. [Not insular in distribution.]

d. Wings colored. Basal joints of antennae depressed. Tegmina without a trace of an intercalary vein.

{ *Fenestra* Giglio-Tos.
{ *Dichroattettix* Bruner.

dd. Wings hyaline or transparent. Basal joints of the antennae not depressed. Tegmina provided with a more or less well developed intercalary vein.

e. Foveolae of the vertex very inconspicuous. Antennae elongate.

f. Fastigium of the vertex provided with a prominent median longitudinal carina. *Apolobamba* gen. nov.

ff. Fastigium of the vertex without a prominent median longitudinal carina.

g. Pronotum without lateral carinae or with carinae that are very widely interrupted in the middle. Insects moderately graceful in form.

h. Valves of the ovipositor short and very blunt [Paraguay].....*Amblyscapheus* Bruner.

hh. Valves of the ovipositor normal in form [Peru].....*Compsacris* Bolivar.

gg. Pronotum provided with well developed lateral carinae that are usually continuous. Insects more robust in form..*Staurorhectus* Giglio-Tos.

ee. Foveolae of the vertex distinct. Antennae shorter.

f. Size of insects larger (♂, 17-18 mm., ♀, 21-22 mm.); form rather robust.

- g. Lateral foveolæ of the vertex sublanceolate. Pronotum deplanate above. *Isonyx* Rehn.
- gg. Lateral foveolæ of the vertex quadrate. Pronotum rounded above. *Borellia* Rehn.
- ff. Size of insects smaller (♂, 12 mm., ♀, 16 mm.). Form more graceful. *Stereolettix* Rehn.
- bb. Inner apical spurs of hind tibiæ very unequal in length. Antennæ of neither sex never nearly as long as the hind femora.
- c. Lateral foveolæ of the vertex well developed, varying from nearly square to sublinear.
- d. Pronotum with the lateral carinæ very inconspicuous or missing, the lateral lobes not ridged.
- e. Hind tibiæ with seven spines externally, the inner spur quite straight, much longer than its mate and very similar in form to that of *Scyllina*. Foveolæ three times as long as wide. *Alota* gen. nov.
- cc. Hind tibiæ eight-spined externally, the inner spur evenly curved and tapering, about a third longer than its mate. Foveolæ nearly square. *Pellopedon* Bruner.
- dd. Pronotum with well developed lateral carinæ and on the lateral lobes raised ridges.
- e. Tegmina and wings more or less abbreviated. Fastigium of the vertex provided with a faint median longitudinal carina. *Meloscirtus* Bruner.
- cc. Tegmina and wings fully developed. Fastigium of the vertex not carinated longitudinally. *Stirapleura* Scudder.
- cc. Lateral foveolæ of the vertex obscure, linear.
- d. Larger. Lateral carinæ of the pronotum more or less interrupted between the anterior and posterior sulci; diverging strongly both anteriorly and posteriorly. *Scyllina* Stål.
- dd. Smaller. Lateral carinæ but little or not at all interrupted and but little divergent. *Euplectrotettix* Bruner.¹

Genus TRUXALIS Fabricius.

Truxalis FABRICIUS, Syst. Ent., p. 279 (1775); STÅL, Recens. Orthopt., pp. 92, 104 (1873), and others.

31. *Truxalis brevicornis* (Linnaeus).

Gryllus brevicornis LINNÆUS, Cent. Ins., Part, p. 15 (1763).

Truxalis brevicornis FABRICIUS, Syst. Ent., p. 279 (1775).

Other synonymy is given in a former paper by me (ANNALS CARNEGIE MUS., VIII, p. 9).

¹ The genus *Tristira* Bruner possibly belongs to this division and somewhere near *Meloscirtus*. This, however, is only a surmise, as no specimen is at hand, and the description does not mention the spur characters.

Habitat.—Specimens are at hand from Bahia, Brazil, and Puerto Suarez, Bolivia. Those coming from the former region (three females) bear the label "Bom Fim (Rio Sapaõ) Bahia, Nov. 10, 1908," and were collected by J. D. Haseman. The other lot (one male and two females) was taken by J. Steinbach during November, 1908, and January, 1909.

Genus ORPHULA Stål.

Orphula STÅL, Recens. Orthopt., I, p. 105 (1873); BRUNER, Ann. Carnegie Mus., VIII, p. 9 (1911).

32. *Orphula pagana* (Stål).

Gomphocerus (*Hyalopteryx*) *pagana* STÅL, Freg. Eug. Resa., Ins. Orthopt., p. 339 (1860).

Truxalis (*Orphula*) *pagana* STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphula pagana GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp., Torino, IX, No. 184, p. 9 (1894).

Habitat.—The material taken by J. Steinbach at Santa Cruz de la Sierra, Bolivia, contains three males and four females of this insect. There is also a single female collected by J. D. Haseman at Sapucay, Paraguay.

One of the females coming from Sta. Cruz de la Sierra, Bolivia, is dull black throughout.

Genus ORPHULELLA Giglio-Tos.

Orphulella GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, no. 184, p. 10 (1894); SCUDDER, Can. Ent., XXXI, pp. 177-188 (1899); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 31, 74 (1902, 1904); IB., Ann. Carnegie Mus., VIII, pp. 9-20 (1911).

33. *Orphulella* (?) *crassa* Bruner?

Orphulella crassa BRUNER, Ann. Carnegie Mus., VIII, p. 17 (1911).

There is a male specimen at hand which I am inclined to place here. It comes from "Sete Lagoas, Minas Geraes, Brazil," where it was taken on May 3, 1908, by J. D. Haseman. While not quite typical in some respects, it agrees very closely with a male coming from Rio de Janeiro and labeled *O. crassa* by myself, when the types were at hand for comparison.

This species, *O. crassa*, also bears a rather strong resemblance to the insects described by me as *Orphula meridionalis* and *O. guatemalæ*, as well as with the *Oxycoryphus azteca* Saussure. The *Oxycoryphus*

mexicanus of Saussure is also related. It is quite possible that these insects, along with two or three others, should be placed in a distinct genus, or at least subgenus, under *Orphulella*.

The *Orphula gracilicornis* Bruner (*Ent. News*, XXI, p. 301, July, 1910) which was later referred by J. A. G. Rehn to *Sisantum* (*Ent. News*, XXII, pp. 251-252, June, 1911) might better be placed here also.

34. *Orphulella obscura* Bruner.

Orphulella obscura BRUNER, Proc. U. S. Nat. Mus., XXX, p. 627 (1906); Ann. Carnegie Mus., VIII, pp. 10, 12 (1911).

Habitat.—Rio Sapaõ, Bahia, Brazil, a single female specimen, which was taken on January 30, 1908, by J. D. Haseman.

35. *Orphulella pelidna* (Burmeister)?

Gomphocerus pelidnus BURMEISTER, Handb. Ent., II, p. 650 (1838).

Stenobothrus pelidnus THOMAS, Rept. U. S. Geol. Surv. Terr., V, p. 95 (1873).

Orphula pelidna MCNEILL, Proc. Dav. Acad. Nat. Sci., VI, pp. 235-239 (1897).

Orphulella pelidna SCUDDER, Can. Ent., XXXI, pp. 179, 187 (1899).

Habitat.—The single female specimen at hand bears the label "Blue Hills, Nassau, Bahama Is.—Worthington." A number of records credit it as being indigenous to various of the West Indian Islands.

36. *Orphulella elongata* Bruner.

Orphulella elongata BRUNER, Ann. Carnegie Mus., VIII, pp. 11, 14 (1911).

Habitat.—Two females and three males are before me, which were collected at Puerto Suarez, Bolivia, by J. Steinbach, and a single female, which comes from Santa Cruz de la Sierra, Bolivia, also taken by Steinbach.

37. *Orphulella punctata* (De Geer).

Acridium punctatum DE GEER, Mem. Ins., III, p. 593, pl. 42, fig. 12 (1773).

Truxalis punctata STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphulella punctata GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp., Torino, IX, No. 184, p. 12 (1894); BRUNER, Ann. Carnegie Mus., VIII, pp. 11, 15 (1911).

Habitat.—The material at hand all comes from Santa Cruz de la Sierra and Puerto Suarez, Bolivia. It was collected by J. Steinbach.

38. *Orphulella expandens* (Walker).

Stenobothrus expandens WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 758 (1870).

Orphulella expandens KIRBY, Syn. Cat. Orthopt., III, p. 122 (1910); BRUNER, Ann. Carnegie Mus., VIII, pp. 11, 16 (1911).

Orphulella elegans GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 12 (1894).

Habitat.—This insect also was taken at Santa Cruz de la Sierra, Bolivia, by J. Steinbach.

39. *Orphulella intricata* (Stål).

Orphula intricata STÅL, Recens. Orthopt., I, p. 106 (1873).

Orphulella intricata GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184 (1894).

Habitat.—A number of specimens are at hand labeled Provincia del Sara, Bolivia.

Genus DICHROMORPHA Morse.

Dichromorpha MORSE, Psyche, VII, p. 326 (1896); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 31, 85 (1902, 1904); IB., Second Rept. Locust Comm. B. Aires, p. 28 (1900).

40. *Dichromorpha australis* Bruner.

Dichromorpha australis BRUNER, Locusts of Argentina, p. 29 (1900).

Dichromorpha viridis GIGLIO-TOS (*nec* Scudder), Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 24 (1897).

Habitat.—The collections made by J. Steinbach in Prov. del Sara, Bolivia, contain two males of this insect.

Genus TOXOPTERUS Bolivar.

Toxopterus BOLIVAR, Anal. Soc. Esp. Hist. Nat., XIX, p. 313 (1890).

These locusts with highly colored wings belong to tropical South America, and have their center of distribution in Peru, Bolivia, and the adjoining portions of Brazil. Up to the present but a single species has been known. A second one is now added.

41. *Toxopterus miniatus* Bolivar.

Toxopterus miniatus BOLIVAR, Anal. Soc. Esp. Hist. Nat., XIX, p. 314 (1890); BRUNER, Ann. Carnegie Mus., VIII, p. 23 (1911).

Habitat.—Specimens of this insect are at hand from both Sapucay, Paraguay, and Santa Cruz de la Sierra, Bolivia.

42. *Toxopterus orientalis* sp. nov.

About the same size as *T. miniatus* Bolivar, but readily distinguished from that insect in its noticeably more robust form, the heavier and decidedly depressed antennal joints, in the well-defined lateral carinæ

of the pronotum and in having the disk of wings ochre-yellow instead of deep orange-red. The fenestrate area of the wings in the present species is a little more regularly veined than in *miniatus*.

Vertex between the eyes rounded, longitudinally carinate, the fastigium about as long as wide, the antero-lateral carinæ straight, meeting in front at an acute angle; lateral foveolæ triangular, small, basal, barely visible from above. Frontal costa prominent above, viewed in profile roundly produced between the antennæ, the sides a little narrowed between the ocellus and antennæ, but evenly divergent below that point, reaching the base of the clypeus, sulcate throughout; facial or lateral carinæ broadly arcuate, their lower ends a little farther apart than the upper. Occiput and vertex gently ascending. Eyes fairly prominent, their length equal to the anterior margin of the cheeks. Pronotum only gently rugulose, with well-defined lateral carinæ, which are more widely separated on the hind than on the anterior lobe; and with the lobes subequal in length. Tegmina and wings completely developed, about reaching the apex of the hind femora, the former coriaceous, moderately broad, and with the costal field well developed, broadly rounded and supplied on the basal one-fourth with a small lobe, the apex obliquely truncate. Wings with a regularly fenestrate costal field. Hind femora rather robust, much coarser than in the same sex of *miniatus*; tibiæ also heavier than in the allied species.

General color of insect above brunneo-ferruginous; face uniformly pale greenish yellow; venter, except pale median line, pectus, and lower margin of middle and hind femora together with the coxæ black, tibiæ also black. Wings on disk and basally dull chrome-yellow, the apex and a narrow border towards hind angle infuscated. Antennæ, except the apex which is black, brunneo-testaceous.

Length of body, ♂, 22.5 mm., of pronotum, 5.25 mm., of tegmina, 18 mm., of hind femora, 16 mm.

Habitat.—The only specimen at hand is labeled "Rio de Janeiro" where it was taken by H. H. Smith during November. The type is in the Carnegie Museum.

Genus AMBLYTROPIDIA Stål.

Amblytropidia STÅL, Recens. Orthopt., I, pp. 93, 107 (1873); BRUNER, Biol. Cent.-Amer., II, pp. 29, 62 (1902, 1904); IB., Ann. Carnegie Mus., VIII, pp. 24-30 (1911).

43. *Amblytropidia corumbæ* Bruner.

Amblytropidia corumbæ BRUNER, Ann. Carnegie Mus., VIII, pp. 25, 28 (1911).

Habitat.—There is at hand a single female specimen, which was taken at Puerto Suarez, Bolivia, by J. Steinbach during the month of November.

44. *Amblytropidia chapadensis* Rehn.

Amblytropidia chapadensis REHN, Proc. U. S. Nat. Mus., XXX, p. 371 (1906); BRUNER, Ann. Carnegie Mus., VIII, pp. 25, 29 (1911).

Habitat.—J. Steinbach collected a single female specimen at Santa Cruz de la Sierra, Bolivia, which is referred here. It was taken at an elevation of 450 meters above sea-level.

45. *Amblytropidia interior* Bruner.

Amblytropidia interior BRUNER, Ann. Carnegie Mus., VIII, pp. 26, 29 (1911).

Habitat.—The single male at hand was taken at the same place as the preceding species.

Genus FENESTRA Giglio-Tos.

Fenestra GIGLIO-TOS (*nec* Bruner), Zool. Jahrb., Syst., VIII, p. 807 (1895); REHN, Proc. Acad. Nat. Sci. Phila., LVIII, p. 31 (1906).

Dichroaettix BRUNER, Second Rept. Locust Comm. B. Aires, pp. 22, 32 (1900).

46. *Fenestra bohlsi* Giglio-Tos.

Fenestra bohlsi GIGLIO-TOS, Zool. Jahrb., Syst., VIII, p. 807 (1895); REHN, Proc. Acad. Nat. Sci. Phila., 1906, p. 31.

Dichroaettix viridifrons BRUNER, Second Rept. Locust Comm. B. Aires, pp. 22, 32 (1900).

Habitat.—A single female of this insect is at hand. It was collected at Santa Cruz de la Sierra, Bolivia, by J. Steinbach. The elevation of the locality is 450 meters above sea-level.

Genus APOLOBAMBA² gen. nov.

Related to *Amblytropidia* Stål and *Leurocererus* Bruner, but readily distinguishable from both of these genera in a number of respects, as may be seen by referring to the accompanying synoptical table of the Tryxaline genera of South American locusts.

Insects of medium or small size, form slender, tegmina and wings complete, passing both the abdomen and hind femora at least in the

² A geographical name.

males, the former sparsely veined on the apical half, more closely so on the basal half, without a well developed intercalary vein, the costal margin full and broadly rounded on the basal three-fourths, contracted beyond, and with the apex rounded as in *Stenobothrus*. Wings without the fenestrate area of *Toxopterus* and allies. Top of the head furnished with a percurrent longitudinal carina. Antennæ filiform, rather long. Frontal costa sulcate and expanding below. Pronotum rugoso-punctate, very gently divergent on the hind lobe, the two lobes about equal in length; without definite lateral carinæ, but with the rugæ tending to form several longitudinal parallel ridges both on the disk and on the lateral lobes. Pinnæ regular. Hind femora with the apical portion graceful, passing the apex of the abdomen by the length of the genicular portion, the lobes rather small but acuminate, the superior carina terminating in a small triangular tooth. Hind tibiæ slender, 7-spined externally, 10-spined internally; internal spurs much larger than the outer ones, but the former not very different in size.

The type of this genus is the species *pulchra* and is described herewith.

47. *Apolobamba pulchra* sp. nov.

This insect may at once be recognized by the conspicuously orange-red color of the pectus, venter, and lower edge and sulcus of the hind femora, the pallid tint of the lower portion of the lateral lobes of the pronotum, and the pale anterior and middle legs.

Head moderately large, a little wider than the front edge of the pronotum; viewed in profile the front is rather oblique. Eyes small, not prominent, straight in front, rounded behind, but little longer than the anterior edge of the cheeks immediately below them. Vertex rather wide, nearly equal to the short diameter of the eyes, rounded, and provided with a well marked carina that reaches from the fastigium to the pronotum; fastigium provided with antero-lateral walls, which meet in front at somewhat less than a right-angle; viewed from above the foveolæ represented only by a few coarse punctures on a partially visible ridge of even width over the antennal foveæ. Frontal costa fairly prominent, its sides parallel to the ocellus, divergent below, sulcate to the middle of the face, coarsely punctulate below, as is also most of the face between the lateral carinæ; these last straight and gently divergent below, reaching and continuing upon the mandibles. Antennæ moderately robust, but filiform, about 20-jointed, nearly one and one-half times the length of the head and pronotum

taken together. Pronotum subcylindrical, the median carina prominent throughout, severed only by the last sulcus, hind margin angulate, lateral lobes granulately rugose, a little higher than long, their lower edge sinuose and obliquely docked in front. Tegmina as described under generic diagnosis. Legs normal. Abdomen graceful, gently tapering, the apex of the last ventral segment entire, gently acuminate; cerci evenly tapering, a little longer than the supra-anal plate, which latter is triangular and has the middle strongly longitudinally sulcate and the margins more or less sinuate. Mesosternal lobes separated by a quadrate space, which is about as long as broad, and equal to the lobes themselves.

General color of insect above dark brownish, verging into dull black on the occiput, upper portion of the sides of the pronotum, and the base of the tegmina. Front and cheeks varied with dull brown; lower part of the lateral lobes of the pronotum and pleura together with the coxæ, femora, and tibiæ of anterior and middle legs, pale testaceous. Inner face largely, upper edge entirely, and the superior portion of the outer disk of the hind femora narrowly, pallid, the latter most conspicuously so. Remaining portion of the outer disk, together with the genicular portion and base of tibiæ, black. Pectus, venter, and under side of hind femora bright orange-red. Abdomen above fuscous, varied at sides with pallid maculations. Antennæ black; palpi pallid with narrow fuscous fasciæ. Wings hyaline, becoming somewhat embrowned or infuscated along the costal margin and apically. Tibiæ brownish, with a wide pale subbasal annulation; spines pallid, with black apical half; tarsi pallid, annulate with fuscous.

Length of body, ♂, 16.5 mm., of pronotum, 3.35 mm., of tegmina, 16 mm., of hind femora, 10 mm.

Habitat.—The single specimen at hand was collected by J. Steinbach at Santa Cruz de la Sierra, Bolivia, at an elevation above sea-level of 450 meters. It also bears the accession number 4546.

The type is the property of the Carnegie Museum.

Genus STAUORHECTUS Giglio-Tos.

Staurorhectus GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 26 (1897); BRUNER, Ann. Carnegie Mus., VIII, p. 31 (1911).

48. *Staurorhectus intermedius* Bruner.

Staurorhectus intermedius BRUNER, Ann. Carnegie Mus., VIII, p. 31 (1911).

Habitat.—Santa Cruz de la Sierra, Bolivia, a single male specimen.

Genus *ALOTA*³ gen. nov.

The insect upon which the present genus is based comes from Bolivia. Its general aspect is that of an *Orphulella*. On closer inspection, however, it proves to be very different. In fact it is found to belong close to the *Scyllinæ*. Its chief characteristics are a medium sized head with prominent eyes, a slightly depressed, somewhat acuminate vertex, which is deeply sulcate, and provided in front with well-defined, visible foveolæ, which are much longer than wide; the front, pronotum, and pleura are very coarsely and deeply punctulate; the pronotum is sub-sellate and without lateral carinæ; the tegmina are long and narrow, profusely veined at the base and along the dorsal field, without an intercalary vein, and rounded at apex; the wings lack the fenestrate character of *Orphulella* and allies; the hind femora are wide and robust on the basal half, but slender beyond, with regular pinnæ externally, the genicular lobes rounded at apex; tibiæ adorned with comparatively few, but large, spines; the mesosternal space or interval is unusually wide.

A more complete diagnosis follows in connection with the specific description given below.

49. *Alota boliviana* sp. nov.

Size below the medium, slender, with narrow tegmina and wings, which pass both the abdomen and femora, the apex of former rounded. Front, pronotum, and pleura strongly punctulate. General color dull wood-brown, paler below. Hind tibiæ pale glaucous.

Head small, scarcely as wide as the front end of the pronotum, the front strongly oblique. Eyes prominent, rounded behind, more nearly straight in front, their longest diameter almost a third greater than the anterior margin of the cheeks, separated above by a space nearly or quite one and one-half times the width of the frontal costa between the antennæ; fastigium of the vertex a little longer than broad, triangular, quite deeply sulcate, the antero-lateral carinæ prominent and meeting in a slightly acute angle; lateral foveolæ visible from above, about twice as long as wide. Frontal costa fairly prominent, a little narrowed next to the fastigium, wider between the antennæ, narrowed a trifle in the vicinity of the ocellus and divergent below and continued to the clypeus, somewhat sulcate, punctulate above and below. Lateral or facial carinæ prominent, continuous from the ocelli

³ This is also a geographical name.

to the base of the mandibles, gently arcuate and divergent. Antennæ missing, the basal joint large, nearly as broad as the vertex, possibly filiform. Pronotum gently selliform, the two lobes about equal in length, the anterior one rounded above and without traces of lateral carinæ, the posterior one depressed and with well-defined shoulders but not carinate at sides, hind margin rectangulate, median carina visible throughout, severed by the last transverse sulcus. Tegmina narrow, somewhat coriaceous, and closely nerved on the dorsal field of the basal half, beyond less closely veined and somewhat membranous, without intercalary vein. Abdomen carinate above, evenly tapering, the apex bluntly acuminate, cerci and supra-anal plate simple. Hind femora fairly large and robust basally, slender beyond, the genicular lobes rounded at apex; tibiæ 7-spined externally; inner spurs very unequal in size, reminding one of the genera *Stirapleura* and *Scyllina*. Interspace between the mesosternal lobes nearly twice as wide as long and somewhat greater than the width of the lobes themselves.

General color as mentioned above, the front, legs, including the hind femora, and lower side, pale brunneo-testaceous, the abdomen a little paler with a series of obscure triangular dorsal maculations, one on the base of each of segments 1-7; base of hind tibiæ and interior lower edge of femoral genæ a little obscured.

Length of body, ♂, 15 mm., of pronotum, 3.1 mm., of tegmina, 14 mm., of hind femora, 10 mm.

Habitat.—Rio Machupo, near Rio Guaporé, Bolivia, Aug. 29 (Haseman collector). The only specimen at hand, the type of both the genus and species, is deposited in the Carnegie Museum.

This insect on account of its coarsely pitted front, pronotum, and pleura seems to fall near *Ligurotettix* Bruner.

Genus STIRAPLEURA Scudder.

Stirapleura SCUDDER in Wheeler, Ann. Rept. U. S. Geol. and Geogr. Surv. Merid., Append. JJ., p. 290, (1876).

50. *Stirapleura bruneri* Rehn.

Stirapleura bruneri REHN, Proc. Acad. Nat. Sci. Phil., 1906, p. 49.

Stirapleura signatipennis BRUNER (*nec* Blanchard), Second Rept. Locust Comm. B. Aires, pp. 34, 36, fig. 12 (1900).

Habitat.—There are at hand five specimens, one male and four

females. They come from Santa Isabel, Rio Negro, Uruguay. They were collected by J. D. Haseman on February 12, 1909.

Genus *SCYLLINA* Stål.

Scyllina STÅL, Recens. Orthopt., I, pp. 94, 112 (1873); for further synonymy see Ann. Carnegie Mus., VIII, p. 35.

51. *Scyllina conspersa* (Bruner).

Plectrotettix conspersa BRUNER, Biol. Cent.-Amer., Orthopt., II, p. 100 (1904); **IB.**, Proc. U. S. Nat. Mus., XXX, pp. 635, 636 (1906).

Scyllina conspersa REHN, Proc. Acad. Nat. Sci. Phila., 1906, p. 47.

Habitat.—Santa Isabel, Rio Negro, Uruguay, February 12, 1909, J. D. Haseman collector. The single female at hand was in a box with three specimens of *Schistocera paranensis* Burmeister. It bears the label "by the billions, a great pest in all central southern S. America this year—eats everything except leaves of coffee plant."

The above record in connection with the present species, and that referring to the following one, would tend to show that most, if not all, of the South American species belonging to the genus at times increase so as to become pests. Similar observations have also been made and recorded concerning some of the Mexican and Central American representatives of the genus.

52. *Scyllina* sp.?

The collection made by J. D. Haseman contains also several half-grown nymphs of this genus of locusts. They were taken along the Rio Novo, in the province of Goyaz, Brazil. All of the specimens are of the same size and appearance, being flavous and very heavily marked with black. They evidently belong to *S. smithi* Rehn, or a closely allied form, the representatives of which vary but little in size and color. Mr. Haseman states that there were "millions in grass." They were taken February 4, 1908.

53. *Scyllina brunneri* (Giglio-Tos).

Pseudostauronotus brunneri GIGLIO-TOS, Zool. Jahrb., Syst., VIII, p. 809 (1895).

Plectrotettix brunneri BRUNER, Biol. Cent.-Amer., Orthopt., II, p. 100 (1904); **IB.**, Proc. U. S. Nat. Mus., XXX, p. 636 (1906).

Scyllina brunneri REHN, Proc. U. S. Nat. Mus., XXX, p. 385 (1906).

Habitat.—Four males and one female taken by J. Steinbach are referred to this variable species. They were collected at Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters above the sea.

Family ŒDIPODIDÆ (LOCUSTIDÆ).

The old family Œdipodidæ (now Locustidæ) is but poorly represented in South American countries. Most of its representatives are to be met with either on the more elevated portions of the Andean chain or the arid and semiarid portions of Chile and Argentina. The collections now being studied contain but four forms.

Genus DISSOSTEIRA Scudder.

Dissosteira SCUDDER, Wheeler's Ann. Rept. Geol. and Geogr. Surv., W. 100th Merid., Append. JJ., p. 291 (1876).

54. *Dissosteira carolina* (Linnæus).

Gryllus (Locusta) carolinus LINNÆUS, Syst. Nat. (Ed. x), I, p. 433, n. 51 (1758).

Acrydium carolinum DEGEER, Mém. Ins., II, p. 491, pl. 41, figs. 2, 3 (1773).

Gryllus carolinus FABRICIUS, Syst. Ent., p. 291, n. 22 (1775).

An extended synonymy is given in Kirby's *Synonymic Catalogue of Orthoptera*, III, pp. 231-232 (1910).

Habitat.—This insect is mentioned in the present paper on the strength of a fully grown nymph bearing the label "Jamaica, W. I." It is a portion of the Carnegie Museum accession number 2306.

This specimen must be accidental on that island, since I find no former reference to this locust having been taken in the West Indies or South America.

Genus LACTISTA Saussure.

Lactista SAUSSURE, Mém. Soc. Geneve, XXVIII, no. 9, pp. 54, 102 (1884); *IB.*, I. c., XXX, no. 1, p. 20 (1888); BRÜNER, Biol. Cent.-Amer., Orthopt., II, pp. 116, 167 (1905).

55. *Lactista australis* sp. nov.

A moderately robust insect with pale yellowish hyaline disk on wings. Most closely related to the *L. pulchripennis* of Saussure, but decidedly smaller.

Body compressed, but deep and robust about the thorax. Pronotum rather strongly rugose above and somewhat less so at hind margin of sides, with a strong cristate median carina, which is profoundly cut by the hind transverse sulcus plainly in advance of the middle; posterior lobe strongly divergent caudad, the hind margin of the disk very gently acute-angled in the male and a trifle obtuse-angled in the female; lower posterior angle provided with a well-defined downwardly

projecting tooth. Head a little narrower than the anterior portion of the pronotum, the occiput gently ascending, provided with two large and deep subquadrate pits, in advance of these and immediately between the eyes on the vertex are two smaller pits, and in front of these the fastigium is also profoundly sulcate, with heavy bounding walls, which are continuous with the carinæ of the frontal costa; lateral foveolæ triangular, well defined; upper end of the frontal costa also quite deeply pitted, sulcate throughout, and with the sides gently approaching below the ocellus for a short distance. Tegmina and wings normal, considerably surpassing both the apex of the abdomen and hind femora in the two sexes. Hind femora moderately robust. Interspace between the mesosternal lobes about twice as wide as long, and about equal to the lobes themselves.

General color cinereo-testaceous, varied with black and fuscous maculations. Tegmina prominently fasciate with fuscous and grayish testaceous; the apical third vitreous obliquely towards the base. Wings with the basal half, or a trifle more, pale greenish yellow, followed by a fairly conspicuous fuscous band, which is most prominent back of the humeral field and well towards the anal angle, on the costal margin continued towards the apex, but not basally; the apex vitreous, but with the veins black. Hind femora externally largely cinereous, but with two well defined oblique fuscous bands, internally mostly black with two transverse pale bands; the knees black. Hind tibiæ pallid, somewhat tinged with plumbeous; the base and apex as well as a submedian area infuscated, giving to them a decidedly fasciate appearance. Antennæ pale at base, fuscous beyond.

Length of body, ♂, 14 mm., ♀, 23 mm.; of pronotum, ♂, 3.75 mm., ♀, 5 mm.; of tegmina, ♂, 19 mm., ♀, 22 mm.; of hind femora, ♂, 10 mm., ♀, 12.5 mm.

Habitat.—The two specimens at hand, male and female, were collected at Bonda (village seven miles east of Santa Marta), Colombia, in June by H. H. Smith. The types belong to the Carnegie Museum.

The female specimen here described is the insect referred to on page 169 of Vol. II, *Biologia Centrali-Americana, Orthoptera*, as *L. pulchripennis* Saussure.

Genus SPHINGONOTUS Fieber.

Sphingonothus FIEBER, Kelch. Orthopt. Oberschles, p. 2 (1852).

Sphingonotus FIEBER, Lotus, III, p. 124 (1853).

While the present rather extensive genus is confined chiefly to the Orient, at least a half-dozen recognized forms belong to the Western Hemisphere.

56. **Sphingonotus haitensis** (Saussure).

Ædipoda haitensis SAUSSURE, Rev. Zool., (2) XIII, p. 323 (1861).

Sphingonotus haitensis SAUSSURE, Mem. Soc. Genève, XXVIII (9), pp. 196, 202, No. 7 (1884); IB., l. c., pp. 77, 81, No. 10 (1888).

Habitat.—There are two male specimens at hand, the one coming from the Isle of Pines, and the other from Watling's Island, in the Bahamas. It has also been reported from other West Indian islands and Mexico.

Genus **CÆLOPTERNA** Stål.

Cæloptera STÅL, Öfv. Vet.-Akad. Förh., XXX, No. 4, p. 53 (1873).

57. **Cælopterna acuminata** (De Geer).

Acrydium acuminatum DE GEER, Mém. Ins., III, p. 501, No. 19, pl. 42, fig. 10 (1773).

Cælopterna acuminata STÅL, Recens. Orthopt., I, p. 145, No. 1 (1873).

Cælopterna stalii SCUDDER, Proc. Bost. Soc. Nat. Hist., XVII, p. 277, No. 34 (1875).

Epacromia selecta WALKER, Cat. Derm. Salt. Brit. Mus., V, Suppl., p. 84 (1871).

Habitat.—This widely distributed South American locust is represented by a large number of specimens of both sexes. Some of the localities are: Morro do Pará, Bahia; Alcobaca, Rio Tocantins in Grão Pará; Santa Rita, Lagoa de Rio Preto, Bahia, in Brazil; and Santa Fe de la Sierra, Puerto Suarez, and Villa Bella, in Bolivia.

This locust is aquatic in habit, as attested by its dilated hind tibiæ, and by the fact that it is only taken near the water. It is drawn to lights at night, where it is most readily collected.

Family **OMMEXYCHIDÆ**.

The locusts belonging to this family are all confined to the South American continent, with their center of distribution pretty well to the southward. Forms occur from the eastern slopes of the Andes Mountains in Peru and Bolivia to the Atlantic and from the Amazon River in the north to at least as far southward as the Rio Negro and Bahia Blanca in Argentina. The genus *Ossa* Giglio-Tos, replaced by *Parossa* Bruner (ANN. CARNEGIE MUS., VIII, p. 38, 1911) is an aberrant form with smooth pronotum, and in which the wings are fully developed and transparent. All of the others, so far as known, have the thorax strongly spined or tuberculate and generally with

either strongly abbreviated or even rudimentary wings. As mentioned by the present writer in the ANNALS, the different species are frequently confined to special food-plants, upon which they sometimes congregate in large numbers. Several of them are known to attack tobacco and closely allied plants.

Genus OMMEXECHA Serville.

Ommexechea SERVILLE, Ann. Soc. Nat., XII, p. 285 (1831); BOLIVAR, Rev. Chilena Hist. Nat., III, p. 54 (1899); BRUNER, Second Rept. Locust Comm. B. Aires, p. 47 (1900).

58. *Ommexechea servillei* Blanchard.

Ommexechea servillei BLANCHARD, Ann. Soc. Ent. France, V, p. 613, pl. 22, figs 2, 3 (1836).

Habitat.—There is a single male before me, which comes from Santa Cruz, de la Sierra, Bolivia. It was taken by J. Steinbach at an elevation of 450 meters above sea-level.

59. *Ommexechea giglio-tosi* Bolivar.

Ommexechea giglio-tosi BOLIVAR, Rev. Chilena Hist. Nat., III, p. 54, 55 (1899).
Ommexechea brunneri GIGLIO-TOSI, Boll. Mus. Zool. Anat. Comp. Torino, No. 302, p. 27, in part (*nec Ommexechea brunneri* Bolivar).

Habitat.—A single male specimen of this locust is at hand. It was taken at the same locality as the preceding by J. Steinbach.

Genus SPATHALIUM Bolivar.

Spathalium BOLIVAR, Ann. Soc. Esp., XIII, p. 21, 30, 403 (1884).

60. *Spathalium bolivari* Bruner.

Spathalium bolivari BRUNER, Ann. Carnegie Mus., VIII, pp. 39-41 (1911).

Habitat.—A very much mutilated specimen from Santarem, Brazil, is at hand. It is part of accession number 2966, and was taken during December.

Family CYRTACANTHACRIDÆ (ACRIDIIDÆ).

This is by far the most extensive family of short-horned grasshoppers, or locusts. It is especially well represented in South America, where more than one hundred and thirty genera have already been recognized. The present collection contains its share of them, as will be seen by the following records.

Genus PRIONOLOPHA Stål.

Prionolopha STÅL, Recens. Orthopt., I, p. 27 (1873).

For further synonymy see Kirby's *Syn. Cat. Orthopt.*, III.

61. *Prionolopha serrata* (Linnæus).

Gryllus (Bulla) serratus LINNÆUS, Syst. Nat., Ed. X., p. 427 (1758).

For synonymy see ANN. CARNEGIE MUS., VIII, p. 43.

Habitat.—There are five males and four females at hand. They were taken at Puerto Suarez and Santa Cruz de la Sierra, Bolivia.

Genus MUNATIA Stål.

Munatia STÅL, Bihang Svensk. Akad. Handl., III (14), p. 28 (1875).

62. *Munatia minor* (Giglio-Tos).

Procolpia minor GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp., Torino, IX, No. 184, p. 17 (1894).

Habitat.—The single male specimen before me as I write comes from San Antonio de Guaporé, on the Rio Guaporé.

Genus COLPOLOPHA Stål.

Colpolopha STÅL, Æfv. Vet.-Akad. Förh., XXX, No. 4, p. 274 (1873).

63. *Colpolopha latipennis* Stål.

Colpolopha latipennis STÅL, Bihang. Till K. Sv. Vet.-Akad. Handl., V, No. 9, p. 19 (1878).

Habitat.—A single female is at hand. It was taken at Bogotá, U. S. of Colombia.

Genus DIEDRONOTUS Bolívar.

Diedronotus BOLIVAR, Boll. Soc. Espan., VI, p. 396 (1906).

See remarks on the genus in these ANNALS, VIII, pp. 47-49.

64. *Diedronotus angulatus* Stål.

Diedronotus angulatus STÅL, Recens. Orthopt., I, p. 44 (1873).

Habitat.—This common insect is represented by six males and five females. They come from Puerto Suarez, Santa Cruz de la Sierra and Provincia de Sara, Bolivia. They show several of the color variations common to the species.

65. **Diedronotus discoideus** (Serville).

Tropinotus discoideus SERVILLE, Ann. Sci. Nat., XXI, p. 273, No. 2 (1831).

For other synonymy see Kirby's *Syn. Cat. Orthopt.*, III, p. 360.

Habitat.—Two females labeled with Sapucay, Paraguay, as their habitat are referred here. They were collected by J. D. Haseman.

66. **Diedronotus lævipēs** (Stål).

Tropidonotus lævipēs STÅL, Obs. Orthopt., III, p. 20 (1878).

Diedronotus lævipēs BRUNER, Ann. Carnegie Mus., VIII, p. 49 (1911).

Habitat.—A single male specimen of this insect is among the collections taken at Santa Cruz de la Sierra, Bolivia. It was collected by J. Steinbach.

Genus **CORYACRIS** Rehn.

Coryacris REHN, Proc. U. S. Nat. Mus., XXXVI, p. 111 (1909).

67. **Coryacris angustipennis** (Bruner).

Elæochlora angustipennis BRUNER, Second Rept. Locust Comm. B. Aires, p. 58 (1900).

Coryacris diversipes REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 111-114, figs. 1, 2 (1909).

Habitat.—Four males and two females taken by J. Steinbach belong here. They come from Santa Cruz de la Sierra, Bolivia.

68. **Coryacris conspersipennis** Bruner.

Coryacris conspersipennis BRUNER, Ann. Carnegie Mus., VIII, p. 53 (1911).

Habitat.—A female representative of this species is at hand coming from Puerto Suarez, Bolivia. It was collected during May by J. D. Haseman.

Genus **ELÆOCHLORA** Stål.

Elæochlora STÅL, Öfv. Vet. Akad. Förh., XXX, No. 4, p. 52 (1873); PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 343 (1887).

The insects which comprise the genus *Elæochlora* are all large and showy. In their distribution they are confined to the South American continent between the latitudes of 10° north and 35° south, and from the Atlantic to the Pacific Oceans. The various species readily separate into two well defined groups based on structure. Those belonging to the one group have their center of distribution in eastern Brazil, Paraguay, Argentina and the adjoining parts of southeastern Bolivia. The species of the other group occur chiefly in Venezuela,

U. S. of Colombia, western Brazil, Ecuador, Peru, and Bolivia. In their habits these insects are more or less social, and frequently occur in family groups. Some of the species are known to prefer special food-plants, which they attack rather than others. Aside from the main characters used for their separation into the two principal groups, as indicated in the annexed synoptical table, the females of the various forms are quite difficult to separate. On the other hand the males of most species are very distinct and quite easily differentiated. About a score of forms have thus far been recognized.

W. F. Kirby in his *Synonymic Catalogue of the Orthoptera*, Vol. III, p. 365, names the species *scabra* Thunberg as the type of the genus. It seems to me, however, that a species in which both sexes are described should be chosen instead. Why not take either *viridicata* or *trilineata* of Serville for this purpose, both of which were also included by Stål, the author of the genus.

SYNOPSIS OF THE SPECIES OF ELÆOCHLORA.

- A. Spines on the inner margin of the hind tibiæ more or less strongly curved and but little longer than those on the outer margin. Tegmina and wings often abbreviated even in the males, always much shorter than the abdomen, and with the apex of the former more or less rounded in both sexes. Wings hyaline, or flavous.
- b. Tegmina of males plainly shorter, often very much shorter, than the abdomen.
- c. Tegmina and wings decidedly shorter than the abdomen.
- d. General color olivaceous. Hind femora of normal form. Hind margin of pronotum acute or subacute.
- e. Sides of pronotum marked much as in *pulchella*, *viridicata* and allies. Tegmina pale-bordered throughout [Sta. Cruz de la Sierra, Bolivia].....*brachyptera* sp. nov.
- ee. Sides of pronotum uniformly green. Tegmina not pale-margined at the apex [State of São Paulo, Brazil].
arcuata Rehn.
- dd. General color brunneo-testaceous, varied with piceous and black. Hind margin of pronotum very obtuse-angled even in the male. Hind femora short and robust [Chapada, Brazil].
brevipennis Bruner.
- cc. Tegmina but little shorter than the abdomen.
- d. Smaller (♂, 28-33 mm.). Median carina of the pronotum viewed in profile straight [Corumbá, Brazil].....*pulchella* Rehn.
- dd. Larger (♂, 37 mm.). Median carina of the pronotum viewed in profile arcuate [Santa Catherina, Brazil].
fruhstorferi Bolivar.

- bb.* Tegmina and wings of males as long as or longer than the abdomen.
- c.* Tegmina rapidly and evenly tapering apically. The fastigium of the vertex smaller.
- d.* Apex of the tegmina rounded [Brazil].
parvispina Pictet et Saussure.
- dd.* Apex of the tegmina oblique [Chapada, Matto Grosso, Brazil].
humilis Rehn.
- cc.* Tegmina not as rapidly tapering apically. The fastigium of the vertex larger.
- d.* Median carina of the pronotum subobsolete, the posterior margin of its disk obtusangulate (♀), rectangulate (♂) [Brazil].
trilineata Serville.
- dd.* Median carina of the pronotum distinct, the posterior margin of its disk rectangulate (♀), frequently acutangled (♂) [Argentina].....*viridicata* Serville.
- AA.* Spines on inner margin of the hind tibiæ nearly straight and much longer than those on the outer margin. Tegmina subacuminate, in the male surpassing, in the female almost or quite as long as the abdomen. Wings usually orange or reddish. Anterior margin of the pronotum at middle sinuate or emarginate.
- b.* Wings for the most part testaceous or pale yellow; anterior margin of the pronotum sinuate.
- c.* Larger (♀, 68 mm.) [Brazil].....*scabra* Thunberg.
- cc.* Smaller (♀, 51 mm.) [Bogotá, Colombia].....*granulosa* Stål.
- bb.* Wings dark yellow, orange, or red. Anterior margin of pronotum emarginate.
- c.* Wings ochraceous or crocus-yellow.
- d.* Size smaller (♂, 31 mm.). Wings ochraceous with infuscated apex [Brazil].....*spoliata* Walker.
- dd.* Size larger (♂, 36 mm.). Wings saffron-yellow with a greenish apex [Brazil].....*hymenæa* Gerstæcker.
- cc.* Wings orange-red, tile-red, or vermilion.
- d.* Sides or lateral lobes of pronotum and cheeks conspicuously bilunate with white. Front on each side of frontal costa also largely white. Anterior and posterior margins of the tegmina greenish white. Wings brick-red with infuscated apical region [Bogotá, Colombia].
picticollis Gerstæcker.
- dd.* Sides or lateral lobes of pronotum and cheeks concolorous. Costal margin of the tegmina also concolorous, not pallid.
- e.* Disk and base of the tegmina concolorous, without paler lunules or maculæ.
- f.* Tegmina with only the dorsal or hind margin pale vittate.
- g.* Wings orange-red, the apex broadly infumate. [Cumbase, Peru].....*hilaris* Gerstæcker.
- gg.* Wings vermilion-red, rather broadly banded towards the apex with fuscous [U. S. of Colombia].
psittacina Gerstæcker.

- ff.* Tegmina provided also with a subcostal pallid vitta [Bogotá, Colombia] *bivittata* Gerstæcker.
- ce.* Disk and base of tegmina marked with pale maculæ or lunules.
- f.* Males with two circular white lunules in the disk toward the base [Colombia]. *bilunata* Gerstæcker.
- ff.* Base of male tegmina marked with a single pale lunule or patch.
- g.* Tegmina provided on the disk near the base with a single bright yellow, black-bordered spot [Venezuela]. *jucunda* Walker.
- gg.* Tegmina provided at base on the costal margin with an elongate ivory-white patch [Santa Cruz de la Sierra, Bolivia]. *basalis* sp. nov.

69. *Elæochlora brachyptera* sp. nov.

Belonging in the section of the genus with *E. trilineata*, *viridicata*, *pulchella*, and *arcuata*, but most closely related to the last. It differs from *arcuata*, however, in the somewhat shorter tegmina and wings, and in having the lateral lobes of the pronotum colored more like those in *viridicata*.

Pronotum both arcuate and somewhat more strongly tectate than usual in the species of the genus. Viewed in profile the median carina is quite well arched and separated into lobes by the profound transverse sulci. Head with the occiput a little elevated and rounded, not embraced by the anterior margin of the pronotum to the same extent as in its allies; fastigium of the vertex triangular, its sides rather heavy and meeting in front, so as to form almost a rectangle, the hind end of disk depressed transversely; eyes of moderate size and prominence, separated at the vertex by a space equal to the greatest diameter of one of them and the same as the length of the front margin of the cheeks. Antennæ fairly heavy and subsensiform, somewhat longer than the head and pronotum taken together, but not quite the length of the hind femora. Frontal costa but little produced between the antennæ, its sides heavy and evenly divergent below, sulcate throughout; when viewed in profile the front is rather oblique, but almost straight; the facial carinæ prominent and straight, as are also the anterior margins of the cheeks, which are nearly parallel to the latter and extend upwards along the front margin of the eyes as yellow lines, which assist in inclosing a long, narrow, smooth area between the facial carinæ and the sides of the head. Pronotum quite strongly rugose and tuberculate as in *pulchella*, its anterior margin entire and

subangulately but gently advanced upon the occiput, the hind margin of the disk somewhat obtuse-angled; viewed from above widest at hind end of anterior third, where there is a prominent outwardly directed tooth-like tubercle on either side. Tegmina about half as long as the abdomen, moderately heavily and profusely veined, their dorsal edges barely overlapping at middle. Abdomen carinate above, tapering, the last ventral segment elongate, acuminate, carinated at middle; supra-anal plate elongate-triangular, tectate, its apex blunt, but with its middle gently sulcate throughout. Hind femora about normal, passing the tip of the abdomen by the length of the knees, the tibiae with the inner row of spines curved, a little heavier and longer than those on the outer margin. Anterior and middle legs moderately robust.

General color of body above brownish olive varied with black, ferruginous, dirty white, pink and flavous. Antennae reddish on outer three-fourths, but paler basally, where they are tinged with greenish yellow. Front pale olive-green, the carinae bright citron-yellow; cheeks and occiput castaneous, paler, and with a ferruginous tinge in middle of latter. Pronotum with a longitudinal median band of reddish brown bordered on each side by black, remainder of disk olive-green; the lateral lobes below the shoulder black, bordered widely in front, below, and along the hind margin, with dirty white; lateral tubercles and adjacent, surface flavous. Tegmina with greenish and yellow veins, the disk black and widely bordered by pallid, which varies from cream-white to dull pink. Dorsal carina of abdomen deep ferruginous, bordered at sides by a pair of elongate pale spots upon each segment. Hind femora pale brunneo-ferruginous, the lunules lightly infuscated; hind tibiae dark oil-green, outer spines pallid, with black tips, inner spines mostly dusky, tarsi and apex of the tibiae above vinaceous. Venter and pectus bright yellow.

Length of body, ♂, 37 mm., of pronotum, 11.5 mm., of tegmina, 12 mm., of hind femora, 20 mm., greatest width of pronotum, 6.25 mm.

Habitat.—Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters above sea-level, a single male which was collected by J. Steinbach.

The type belongs to the Carnegie Museum.

70. *Elæochlora pulchella* Rehn.

Elæochlora pulchella REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 124-126, figs. 11, 12 (1909).

Habitat.—A single male and four females are at hand from Puerto Suarez, Bolivia, where they were collected by J. Steinbach.

71. ***Elæochlora picticollis*** (Gerstæcker).

Xiphocera picticollis GERSTÆCKER, Stett. Ent. Zeit., XXIV, p. 188, No. 10 (1873).

Elæochlora picticollis PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 343 (1887).

Habitat.—The only specimen at hand, a male, comes from Bogotá, U. S. of Colombia. It bears the accession number 2306.

72. ***Elæochlora* sp.?**

The material collected by J. Steinbach in the "Provincia del Sara," Bolivia, contains two female specimens of this genus. On account of the absence of males from the same locality it is impossible to determine the species to which they belong. They were collected at an elevation of 450 meters above sea level. This much, however, can be said concerning their identity: they belong to that section of the genus with the emarginate anterior margin of the pronotum and the much longer spines on the inner edge of the hind tibiæ than on the outer. Whether or not they represent a described species is difficult to decide from the material at hand.

73. ***Elæochlora bivittata*** (Gerstæcker).

Xiphocera bivittata GERSTÆCKER, Stett. Ent. Zeit., XXIV, p. 187 (1873).

Elæochlora bivittata KIRBY, Syn. Cat. Orthopt., III, p. 366 (1910).

Habitat.—Bogota, U. S. of Colombia, two males. Also a part of accession number 2306, Carnegie Museum.

74. ***Elæochlora basalis* sp. nov.**

Most closely related to *E. jucunda* Walker, coming from Venezuela, but readily separated from that species by the position and color of the pale spot located at the base of each elytron, as indicated in the synoptic table of species which accompanies this paper.

Insect of medium size and moderate robustness. Tegmina and wings slightly passing the apex of the hind femora. Head fairly large, the occiput but little elevated; eyes prominent, separated at the vertex by a space scarcely equal to their shortest diameter, the fastigium horizontal, shallowly sulcate, its sides meeting at front in a slightly acute angle; frontal costa rather prominent between the

antennæ and above, somewhat less so at the ocellus and below, its sides evenly divergent below, sulcate throughout, viewed in profile the front somewhat sinuose; facial carinæ prominent, straight and gently divergent, anterior margin of cheeks scarcely carinated, not quite as long as the greatest diameter of the eyes. Pronotum rugosopunctate, the median carina coarse, interrupted, and more or less tuberculate or nodose, lateral carinæ also minutely nodulose; anterior margin nodulose, emarginate at middle, the posterior margin acute-angled, the disk of hind lobe flattened. Tegmina of moderate width, gently tapering, subacuminate, the veins inconspicuous, but numerous, the dorsal edge straight. Hind femora moderately robust, evenly tapering, and with the carinæ, but more especially the lower ones, serrate, the genicular lobes broadly rounded; hind tibiæ about as long as the femora, the inner spines fully twice the length of the outer ones, nine to eleven in number on both margins. Abdomen tapering but little. Last ventral segment evenly tapering, carinated at middle, acuminate, directed to the rear. Supra-anal plate elongate triangular, tectate, deeply and profoundly longitudinally sulcate. Prosternal spine erect, elongate pyramidal, the apex acute. Antennæ moderately heavy, about as long as the hind femora, the joints on basal third somewhat depressed. Pleura and sides of abdomen rather strongly punctulate. Entire insect rather prominently hirsute, but this characteristic is best observed on the legs.

General color above including the legs olive-green. Dorsum from fastigium of the vertex across the occiput, the disk of the pronotum and almost to the tips of the tegmina with a rather wide pale band, which is bordered on the pronotum and tegmina with black, more widely so on the former, but becoming narrower on the latter to their middle, where this color runs out. Inside of this the median field of the tegmina is largely vinaceous, while the remainder is dark grass-green, except for a conspicuous elongate ivory-white patch, which is located at the base of the costal border so as to be partly covered when the insect is at rest and the wings in position. Hind tibiæ deep brownish purple. Underside and front pale testaceous. Wings for the most part tile-red inclining to orange. Antennæ testaceous, tinged with olive-green basally.

Length of body, ♂, 37 mm., of pronotum, 10.75 mm., of tegmina, 30 mm., of hind femora, 23 mm., greatest width of pronotum, 5 mm.

Habitat.—There are two male specimens at hand, which were taken at Santa Cruz de la Sierra, Bolivia, by J. Steinbach.

The type is deposited in the Carnegie Museum.

Genus *CHROMACRIS* Walker.

Chromacris WALKER, Cat. Derm. Salt. Brit. Mus., IV, p. 643 (1870).

75. *Chromacris miles* (Drury).

Gryllus (*Locusta*) *miles* DRURY, Illustr. Exot. Ent., II, p. 79, pl. 42, fig. 2 (1773).

Habitat.—There are five specimens of this locust among the material now under consideration, three males and two females. They were taken in the U. S. of Colombia; Provincia del Sara and Santa Cruz de la Sierra, Bolivia; and also at Galhua, Rio Sapão, western Bahia, Brazil.

The specimen from the last named locality, a female, is unusually small.

76. *Chromacris stolli* (Pictet et Saussure).

Rhomalea stolli PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 348 (1887).

Chromacris stolli BRUNER, Proc. U. S. Nat. Mus., XXX, p. 651, pl. 38, fig. 2 (1906).

Habitat.—The collection contains a male from Sapucay, Paraguay.

Genus *XESTOTRACHELUS* gen. nov.

The present genus, which is a member of the *Chromacris* group, is represented by at least two well defined species, the representatives of which are found in central and southwestern Brazil. They are *X. hasemani*, described herewith, and *Zoniopoda robusta* Bruner (ANN. CARNEGIE MUS., VIII, pp. 58, 60-62, Dec., 1911). The former may be considered as the type of the genus.

Composed of robust and brightly or strikingly colored insects a trifle above medium in size. With some of the general appearances of the representatives of both *Taniopoda* and *Chromacris*, but with the thoracic structure and color-pattern of the latter. Head smooth, large, high or deep, and rounded above, and on sides back of the eyes. Latter comparatively small and not prominent, considerably longer than wide, but shorter than the anterior margin of the cheeks below them, separated at the vertex by a space fully equal to, or even greater than, the shortest diameter of the eyes; fastigium depressed, and with blunt convergent antero-lateral carinæ, which continue as the bounding walls of the frontal costa, the sulcation forming a rather

prominent longitudinal canal, which is also continuous with that of the frontal costa. Frontal costa most prominent above, but continuous to the clypeus, its sides pinched just below the ocellus, but immediately widening. Front with a few coarse punctures and transverse rugæ or wrinkles. Antennæ a trifle robust, filiform, about 22- to 23-jointed, considerably exceeding the combined length of the head and pronotum, and under a magnifier exhibiting numerous coarse sensoria. Pronotum with the anterior lobe smooth and rounded above and the sides parallel, the hind lobe strongly divergent, rugoso-punctulate, the disk flattened; transverse sulci deep, coarse and continuous, separating the lobe into nearly equal rounded ridges, the front margin straight and quite widely reflexed, sometimes gently emarginate at middle, hind margin obtusangulate. Tegmina and wings somewhat abbreviated to fully developed and passing the tip of the abdomen, the venation coarse, but comparatively sparse. Legs rather long but not especially robust. The hind femora about reaching the tip of the abdomen. Interspace between the mesosternal lobes much broader than long, the inner margin of the lobes widely rounded. Prosternal spine elongate pyramidal, acuminate. Tip of male abdomen blunt, the last ventral segment short. Valves of the ovipositor hooked, of normal form and medium size.

The two known species of the genus may be separated as follows:

SYNOPSIS OF THE SPECIES OF *XESTOTRACHELUS*.

- A. Only moderately robust. Tegmina complete, the apex broadly rounded, their veins greenish. Hind lobe of pronotum greenish yellow conspersed with black; hind tibiæ vinaceous.....*hasemani* sp. nov.
 AA. Very robust. Tegmina a little abbreviated, more or less acuminate, their veins vinaceous yellow. Hind lobe of pronotum brunneo-testaceous, unicolorous; hind tibiæ internally and below flavous, above and externally coral-red.....*robusta* Bruner.

77. *Xestotrachelus hasemani* sp. nov.

Moderately robust, but less so than the insect described by the present writer as *Zoniopoda robusta*.⁴ Tegmina complete and with the veins olive-green.

Head but little wider than the anterior edge of the pronotum, its sides about parallel, not so robust as in this sex of *robusta*, the occiput evenly rounded. Other characters as described for the genus. Head

⁴ *Annals Carnegie Museum*, VIII, pp. 60-62 (1911).

perpendicularly banded or vittate. Middle of face, vertex, and occiput with a wide blackish band bordered on either side by a narrower one of yellow and deep orange-red, sides of head and posterior half of cheeks likewise colored, borders of eyes and outer face of mandibles dark greenish black. Eyes castaneous. Front lobe of the pronotum mostly shining pitchy black, the median carina narrowly flavous; hind lobe greenish olive, quite profusely conspersed and streaked with fuscous as in several species of *Diponthus*. Pleura olivaceous, strongly tinged with piceous. Anterior and middle legs fuscous with a vinaceous tinge above, flavid below. Hind femora dark olive-green with greenish yellow pennæ and carinæ, the genicular portion, excepting the lobes, infuscated, the latter vinaceous. Hind tibiæ vinaceous except at the base where they are grayish fuscous. Abdomen and lower side vinaceous. Antennæ black. Wings not spread but plainly red and black, and presumably of a similar pattern to those of *robusta*.

Length of body, ♀, 35 mm., of pronotum 8 mm., greatest width of pronotum 8.5 mm., depth of lateral lobes, 7.25 mm., length of tegmina, 27.5 mm., length of hind femora, 18 mm.

Habitat.—Calhao, Rio Sapão, western Bahia, Brazil, February 7, 1908, a single female collected by J. D. Haseman. The type is deposited in the Carnegie Museum.

Genus ZONIOPODA Stål.

Zoniopoda STÅL, Recens. Orthopt., I, pp. 32, 51 (1873); BRUNER, Proc. U. S. Nat. Mus., XXX, p. 652 (1906); *IB.*, Ann. Carnegie Mus., VIII, pp. 57-59 (1911).

78. *Zoniopoda iheringi* Pictet et Saussure.

Zoniopoda iheringi PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 356 (1887).

Habitat.—One male from Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters above sea-level, collected by J. Steinbach. Also a female from Sapucay, Paraguay, during the month of April, where it was collected "on sides of mountains in woods" by J. D. Haseman.

79. *Zoniopoda basalis* sp. nov.

A moderately large almost uniformly grass-green locust, without definitely banded legs, and in which the hind wings are largely red or reddish. The characteristic feature of the species is an eye-like orange spot at the base of each of the tegmina.

Head about as wide as the anterior margin of the pronotum; the front and the lower portion of the cheeks somewhat rugulose, remainder smooth; occiput slightly elongate; eyes of moderate size, prominent, slightly longer than wide, separated above by a space about twice as wide as the frontal costa between the antennæ; anterior edge of cheeks one-third longer than the eyes; fastigium of the vertex gently depressed, the antero-lateral margins bordered by arcuate carinæ, the surface flat, depressed, rugoso-punctate, partially divided by a short anterior median longitudinal carina. Frontal costa with parallel sides, the surface rugose, fading below the median ocellus; facial or lateral carinæ not prominent, fading above at the lower edge of the antennal scrobes. Antennæ filiform, about as long as the hind femora. Pronotum strongly rugoso-punctate, the anterior and posterior lobes about equal in length; transverse sulci continuous, but not strongly impressed, the median carina present only as slightly elevated rugosities between the sulci; disk of hind lobe flattened, separated from the lateral lobes by a shoulder, but not carinate; front margin advanced upon the occiput, the middle rather widely emarginate; hind margin obtusangulate. Pleura rugoso-punctulate. Tegmina and wings fully developed, as long as the abdomen, the former coriaceous, closely and irregularly nerved, but with few longitudinal veins, which are separated from the closely veined areas as in *Titanacris*. Wings tinted with red. Legs about normal, the hind femora graceful, about three-fourths the length of the abdomen; hind tibiæ somewhat coarse, the inner spines much heavier than the outer ones, eleven in number, the external margin eight-spined. Prosternal spine small, pyramidal, the apex directed gently forward.

General color grass-green, the eyes and antennæ ferruginous. Tips of tibiæ and tarsi tinged with pink. Apical fourth of tegmina slightly infuscated. Immediate base of tegmina on costal field marked with an orange circular spot bordered by smoky brown. A narrow black band at base of genicular area of hind femora preceded by an indefinite pale band.

Length of body, ♀, 57 mm., of pronotum, 10.5 mm., of tegmina, 44 mm., of hind femora, 27 mm.

Habitat.—The only specimen at hand comes from Santa Cruz de la Sierra, Bolivia, where it was taken at an elevation of 450 meters by J. Steinbach. The type is in the Carnegie Museum.

This insect would fall in the first section of the synoptic table of

species given on pages 57-58 of Vol. VIII, of the ANNALS under *cc.* with *juncorum*, from which it differs in wing-color, etc.

Not having seen specimens of the genus *Clرازella* Pictet and Saussure, which seems to be rather closely related to *Zoniopoda*, the writer hesitates to place any of the several green species thus far called *Zoniopoda* under the former genus. The species described above, however, is very much too large for the *Clرازella patagona* of Pictet and Saussure.

Genus PRIONACRIS Stål.

Prionacris STÅL, Bihang. till K. Svensk. Vet-Akad. Handl., V, No. 4, pp. 19, 55 (1878); BRUNER, Ann. Carnegie Mus., VIII, p. 62 (1911).

The genus *Prionacris* Stål belongs to tropical South America. Its representatives are most common in southern Brazil, Paraguay, and eastern Bolivia. Thus far three species have been described, and now a fourth is added. These forms may readily be separated by the subjoined synoptical key:

SYNOPSIS OF THE SPECIES OF PRIONACRIS.

- A. Disk of wings tinged with rosaceous; general color of insect yellowish olive [New Grenada and other S. American regions]. *compressa* Stål,
- AA. Disk of wings not tinged with rosaceous; general color somewhat variable, usually dark olive or brownish.
 - b. Pronotum bordered with a series of black maculations; the disk above also more or less strongly maculate with fuscous. Hind wings tinged with flavous [S. E. Bolivia]. *atromaculata* sp. nov.
 - bb. Pronotum not bordered with dark maculations, the disk likewise immaculate. Hind wings tinged with either blue or green.
 - c. Wings tinged with cærulean [Upper Amazons]. . . . *cærulescens* Bolivar.
 - cc. Wings tinged with green [Paraguay and southern Brazil]. . . *erosa* Rehn

80. *Prionacris atromaculata* sp. nov.

Similar to the other species in general form, but differing from all of them in its yellow-disked, shorter wings, and by having its pronotum strongly bordered with black maculations. Body rather closely hirsute.

Head large and bulldog-like, reminding a person strongly of the representatives of the genus *Rhincoderma*, its width decidedly greater than the anterior edge of the pronotum, rather closely and strongly punctulate, except on the occiput and upper portion of the cheeks. Eyes prominent in both sexes, plainly longer than wide, separated

above by a space little greater than the longest diameter of one of the eyes; fastigium of the vertex rugoso-punctate, depressed, with a longitudinal medianal sulcus or depression bordered by inconspicuous antero-lateral carinæ, which meet in an obtuse angle slightly above the base of the antennæ; frontal costa flat, narrowing and fading below the ocellus, where its presence is indicated by a rounded ridge to the base of the clypeus. Lateral or facial carinæ not especially prominent, somewhat sinuose, but not divergent towards the lower corners of the front. Antennæ filiform, gently surpassing the hind margin of the pronotum. The latter rugoso-punctate, more or less compressed laterally, tectate; viewed in profile the crest gently arcuate and cut into about a dozen teeth; transverse sulci profound, the last situated somewhat in advance of the middle; the anterior middle somewhat obtuse-angulately advanced upon the occiput, the hind margin acute-angled. Tegmina and wings only gently passing the tip of the abdomen in both sexes. Legs normal. Hind tibial spines small, ten to eleven on the outer margin. Prosternal spine of moderate size, compressed, acuminate, directed gently to the rear.

General color of legs and body greenish yellow varied with brown. Pronotum conspicuously bordered with a series of roundish black spots, the disk brownish, and more or less regularly marked with similar spots; teeth of the crest likewise black. Tegmina fuscous, showing a tendency to transverse maculation, owing to the presence or absence of pale transverse nervures. Hind femora marked with black lunules and a narrow pregenicular transverse band, which is slightly interrupted above. Hind tibiæ flavous above, and gradually changing externally to gray lead-color and black, which is the tint of the inner side; the tarsi grayish above, pallid below. Antennæ brownish ferruginous. Eyes varying from flavous to castaneous.

Length of body, ♂, 41 mm., ♀, 46 mm.; of pronotum, ♂, 8 mm., ♀, 10 mm.; of tegmina, ♂, 34 mm., ♀, 38 mm.; of hind femora, ♂, 19 mm., ♀, 21 mm.

Habitat.—Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters (J. Steinbach, collector).

81. *Prionacris cœrulescens* Bolivar?

Prionacris cœrulescens BOLIVAR, Anal. Soc. Españ., XIX, p. 319 (1890).

Habitat.—A single female specimen from the "Provincia del Sara, Bolivia," is referred with some doubt to Bolivar's species. It was

collected by J. Steinbach at an elevation of 450 meters above sea-level, and bears the accession number 4546, also "♀ No. 7 with its 4 ova." The latter, no doubt, were saved when the specimen was prepared.

Genus *LOPHACRIS* Scudder.

Lophacris SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 353 (1869); PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 363 (1887).

82. *Lophacris olfersi* (Burmeister).

Acridium olfersii BURMEISTER, Handb. Ent., II, p. 628, No. 4 (1838).

Lophacris olfersii SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 354, No. 1 (1869); KIRBY, Syn. Cat. Orthopt., III, p. 378 (1910).

Titanacris olfersii PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 363 (1887).

Acridium semirubrum SERVILLE, Ins. Orthopt., p. 653, No. 13 (1839).

Habitat.—The three males and one female at hand bear the simple label "South America." Undoubtedly they were taken in Brazil or the Guianas.

Having been preserved in spirits they have lost their beautiful and striking colors.

Genus *TROPIDACRIS* Scudder.

Tropidacris SCUDDER, Proc. Bost. Soc. Nat. Hist., XII, p. 346 (1869); STÅL, Recens. Orthopt., I, pp. 31, 48 (1873); PICTET et SAUSSURE, Mitth. Schweiz. Ent. Ges., VII, p. 358 (1887); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 211, 240 (1907).

These, with one exception, largest of American locusts are found throughout the tropical portions of both North and South America, where at least six distinct species and two or three varieties are known. Great confusion exists concerning their synonymy and can only be approximately worked out with a good series of specimens from many localities.

83. *Tropidacris collaris* (Stoll).

Gryllus (Locusta) collaris STOLL, Spectres Saut., p. 39, pl. 21b, fig. 80 (1813).

For additional synonymy see Kirby's *Synonymic Catalogue of the Orthoptera*, Vol. III, p. 379.

Habitat.—There are six specimens at hand, coming from various Brazilian localities.

84. *Tropidacris dux* (Thunberg).

Gryllus dux THUNBERG, Mém. Acad. Petersb., IX, pp. 393, 402, No. 6 (1824).

For further synonymy see Kirby's *Catalogue*.

Habitat.—Specimens are at hand from La Pinta, Venezuela; and Santa Cruz de la Sierra, Bolivia; one male and three females.

Genus OPTHALMOLAMPIS Saussure.

Ophthalmolampus SAUSSURE, Rev. Zool., (2), Vol. XI, p. 394 (1859); STÅL, Bihang till Svensk. Akad. Handl., V, p. 42 (1878).

The representatives of the present genus are fairly numerous throughout tropical South American countries, where they live among the exuberant vegetation in and about the edges of the extensive forests, which are characteristic of that region. At least a dozen so-called species are already known, while another is now added. The genus is most closely related to *Nautia*, *Tæniophora*, and *Trybliophorus*. There is also indication of one or two additional genera among this group of locusts, which is characteristic of the tropical American jungles. The species of *Ophthalmolampus* may be separated by the following synoptical table:

SYNOPSIS OF THE SPECIES OF OPTHALMOLAMPIS.

- A. Tegmina and wings more or less abbreviated, varying from rudimentary to slightly less than the length of the abdomen.
- b. Tegmina and wings rudimentary, lateral, their dorsal edges distant [Peru].
cinctipennis Stål.
- bb. Tegmina and wings not rudimentary, their dorsal edges overlapping.
- c. Antennæ rather slender and filiform, usually not much, if any, longer than the hind femora.
- d. Pronotum provided with two longitudinal pale lines on each side of the middle, two dorsal and one on each lateral lobe.
- e. Size smaller (♀, 19 mm.). Antennæ fusco-violaceous [Northern Brazil].....*geniculata* Stål.
- ee. Size larger (♀, 26 mm.). Antennæ blood-red [Ega (Amazonas)].....*dichroa* Gerstæcker.
- dd. Pronotum furnished with but a single or no longitudinal pale lines on each side of the middle.
- e. One such line present on each side of the disk of the pronotum.
- f. Longitudinal pronotal lines white.
- g. Size smaller (♀, 24 mm.). Hind femora obscurely colored [Guiana].....*colubri* Saussure.
- gg. Size larger (♀, 27 mm.). Hind femora greenish yellow, the tubercles of upper carinæ black [Eastern Bolivia].....*albolineata* sp. nov.
- ff. Longitudinal pronotal lines flavous [Cumbase, Peru].
punicæ Gerstæcker.
- ee. Longitudinal pale lines wanting from pronotum and tegmina [Itaituba, Amazonas].....*modesta* Gerstæcker.

cc. Antennæ coarse or robust, decidedly longer than the hind femora.

d. Antennæ deep black [Demerara, British Guiana].

vitta-genæ Bruner.

dd. Antennæ deep carmine-red [Fonteboa (Amazonas)].

speciosissimus Gerstæcker.

A.1. Tegmina and wings fully developed, passing the tip of the abdomen.⁵

b. Size smaller (♀, 25 mm.). Head black [Bogotá, Colombia].

trochilus Gerstæcker.

bb. Size larger (♀, 33-34 mm.). Head olivaceous or ferruginous.

c. Head, prothorax, pleura, sternum, front and middle legs, and outer side of hind femora ferruginous. Inner side of latter reddish purple, the knees orange-colored and the tibiæ next to the tarsi sea-green [Iquitos (Amazonas)] *pulchripes* Gerstæcker.

cc. Head, prothorax, and tegmina cinnamon or olive-green. Sternum and legs ferruginous, the outer side of the anterior tibiæ strigate with shining black. Hind femora blackish olive, their superior carina, an external lower stripe, and a preapical internal band, ferruginous; the tibiæ blackish olive [Brazil] *bracteata* Gerstæcker.

85. *Ophthalmolampis albolineata* sp. nov.

Most nearly related to *O. colubri* Saussure, but somewhat larger and differently colored. Its habitat, too, is quite widely removed from that of Saussure's species.

Head about as wide as the anterior portion of the pronotum, a little shorter than the front lobe of the latter; face decidedly wider than long, the front coarsely and deeply punctulate below the transverse groove; eyes large and prominent, strongly divergent, separated at the vertex by a space no greater than the diameter of the second antennal joint; the fastigium depressed, rather small, plainly longitudinally sulcate; frontal costa smooth, not especially prominent between the antennæ, where it is about two and one-fourth times the width of the narrowest part of the vertex; antennæ slender, filiform, about as long as the tegmina; occiput punctulate. Pronotum sub-cylindrical, rugoso-punctulate, the posterior lobe gently expanding to the rear; transverse sulci well defined and severing the lateral pallid lines of the disk; anterior edge widely and angulately emarginate at middle, the hind margin broadly rounded. Tegmina for the most part coriaceous. Pleura strongly and coarsely punctulate, closely veined, gently tapering, about two-thirds the length of the abdomen. Hind femora robust at base, the carinæ prominently serrated, and the

⁵ The species *yersini* Saussure very likely belongs in the present section also, but the description is too incomplete to permit of its tabulation.

disk crenulately pinnate; the genicular lobes large and somewhat acuminate. Hind tibiæ and tarsi profusely hirsute, the spines of former small, seven in number externally, the latter with the second joint longer than the first and about equal to the third; prosternal spine minute, acuminate, located on a heavy quadrate base formed of the anterior half of the sternite. Mesosternal lobes separated by a space a little wider than the lobes and about as long as broad. Valves of the ovipositor slender, the upper pair straight and blunt, the lower ones slender, acuminate, about one-half the length and partly hidden between the basal half of the upper heavier pair.

General color pale greenish yellow, the occiput, disk of pronotum and dorsal area of tegmina cinnamon-brown. Face at base of antennæ provided on each side with a glossy pale or milky white area, which gradually widens and reaches the lower hind angle of the cheeks; another similar line commences with the middle of the hind margin of each eye and continues along the lateral margins of the disk of the pronotum to the base of the tegmina. Latter provided with two white lines embracing one of carmine, edged below by black, the superior white line also edged above by a black line; costal margin rather widely hyaline. Hind femora golden yellow externally, the carinal tubercles black; genicular area strongly infuscated, but with the lunules vinaceous and the lobes grayish olive. Hind tibiæ vinaceous, becoming deep purple internally towards the apex, near base colored like the genicular lobes of the femora, tarsi ferruginous. Antennæ black with two basal joints pallid.

Length of body, ♀, 27 mm., of pronotum, 6.2 mm., of tegmina, 12.5 mm., of hind femora, 14 mm.

Habitat.—Sta. Cruz de la Sierra, Bolivia, a single female specimen taken by J. Steinbach at an elevation of 450 meters above sea-level. The type is deposited in the Carnegie Museum.

Genus LEPTY SMA Stål.

Leptysma STÅL, Recens. Orthopt., I, pp. 42, 85 (1873); BRUNER, Proc. U. S. Nat. Mus., XXX, p. 657 (1906); *IB.*, Ann. Carnegie Mus., VIII, p. 71 (1911).

86. *Leptysma dorsalis* (Burmeister)?

Mesops dorsalis BURMEISTER, Handb. Ent., II, p. 610 (1838).

Leptysma dorsalis BRUNER, Ann. Carnegie Mus., VIII, p. 72 (1911).

Habitat.—There is a single male specimen of the genus *Leptysma*

at hand, which was collected at Santa Cruz de la Sierra, Bolivia. It is referred to Burmeister's species with some doubt.

87. **Leptyisma obscura** (Thunberg).

Truxalis obscura THUNBERG, Nova Acta Upsala, IX, pp. 77, 79 (1827).

Leptyisma obscura STÅL, Recens. Orthopt., I, p. 86 (1873); BRUNER, Proc. U. S. Nat. Mus., XXX, p. 658 (1906).

Habitat.—There is likewise a male of this species in the collection. It comes from the same locality as the preceding, and was taken by J. Steinbach at an elevation of 450 meters above sea-level.

Genus **STENACRIS** Walker.

Stenacris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 651 (1870); KIRBY, Syn. Cat. Orthopt., III, p. 413 (1910).

The insects which comprise the genus *Stenacris* are quite similar in their general appearance to those which are referred to the genus *Opsomala* of Serville. In the former genus the last ventral segment of the male abdomen is quite complex in structure, and varies very distinctly among the different species, while in the representatives of the latter genus it is quite simple and varies but little. About a dozen forms of *Stenacris* have been recognized heretofore. They come from the two Americas, where representatives occur between the parallels of 35° north and 30° south of the Equator.

88. **Stenacris cylindroides** (Stål).

Opsomala cylindroides STÅL, Eugenes Rosa, Orthopt., p. 325, No. 67 (1860).

Arnilla cylindroides STÅL, Recens. Orthopt., I, p. 85, No. 1 (1873).

Stenacris cylindroides KIRBY, Syn. Cat. Orthopt., III, p. 414 (1910).

Habitat.—A single female specimen of what is taken to be this locust is at hand from Barreiros, Bahia, Brazil. It was collected January 3, 1908, by J. D. Haseman.

Genus **OPSOMALA** (Serville).

Opshomala SERVILLE, Ann. Sci. Nat., XXII, p. 267 (1831).

Opsomala BURMEISTER, Handb. Ent., II, p. 610 (1838).

See Kirby in *Syn. Cat. Orthopt.*, III, p. 410 (1910), and Bruner, ANN. CARNEGIE MUS., VIII, p. 79 (1911), for additional synonymy.

89. **Opsomala interior** (Bruner).

Arnilla interior BRUNER, Biol. Cent.-Amer., Orthopt., II, p. 254 (1908).

Opsomala interior KIRBY, Syn. Cat. Orthopt., III, p. 410 (1910); BRUNER, Ann. Carnegie Mus., VIII, p. 81 (1911).

Habitat.—A pair of locusts coming from Puerto Suarez, Bolivia, are referred here. They were collected during the period including November, 1908, to January, 1909, by J. Steinbach. They come from a locality with an elevation of 150 meters above sea-level.

Genus OXYBLEPTELLA Giglio-Tos.

Oxybleptella GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 33 (1894); BRUNER, Ann. Carnegie Mus., VIII, pp. 70, 81 (1911).

90. *Oxybleptella sagitta* Giglio-Tos.

Oxybleptella sagitta GIGLIO-TOS, l. c., pl. 1, fig. 7 (1894).

For further synonymy see Bruner, l. c.

Habitat.—There are two female specimens of this genus before me as I write, both of which I am inclined to refer to Giglio-Tos' species. One was taken at Taquara, Brazil, and the other at Santa Cruz de la Sierra, Bolivia. The former specimen is a trifle smaller than the measurements given for this sex by Giglio-Tos, *i. e.*, length of body, 21.5 mm., of tegmina, 15 mm., of hind femora, 10 mm. It was collected in September, and is also labeled "Accession No. 2966." The other specimen is very noticeably larger, even exceeding the measurements given by Rehn for his *Oxybleptella pulchella* (*Proc. U. S. Nat. Mus.*, XXXVI, pp. 136-139, figs. 21, 22, 23 (1909)). This last specimen measures as follows: Length of body, 25 mm., of tegmina, 18 mm., of hind femora, 12 mm. In color the two insects are somewhat similar, only differing in minute particulars. The eyes of the larger individual are conspicuously banded parallel to their anterior margin alternately with brown and yellow, there being about ten such bands on the anterior two-thirds of the eye.

Genus INUSIA Giglio-Tos.

Inusia GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 30 (1897); BRUNER, Journ. N. Y. Ent. Soc., XIV, p. 151 (1906); *IB.*, Biol. Cent.-Amer., Orthopt., II, pp. 212, 259 (1907-8).

This is another tropical American genus of the subaquatic locusts. At least eight species have thus far been recognized. Representatives occur from middle Mexico to northern Argentina, as well as in some of the West Indian islands. Two of the species occur in the material now at hand.

91. *Inusia gracillima* Giglio-Tos.

Inusia gracillima GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302 p. 31 (1897); BRUNER, Biol. Cent.-Amer., Orthopt., II, p. 259 (1908).

Habitat.—The only specimen now before me comes from Sapucay, Paraguay. It is a male, and was taken by Haseman during the month of April.

92. *Inusia pallida* Bruner.

Inusia pallida BRUNER, Proc. U. S. Nat. Mus., XXX, p. 660 (1906); IB., Biol. Cent.-Amer., Orthopt., II, p. 259 (1908).

Habitat.—There is a male of this species at hand which was taken at Santa Cruz de la Sierra, Bolivia. It comes from an altitude of 450 meters above sea-level, and was collected by J. Steinbach.

Genus OXYBLEPTA (Stål).

Stenopola STÅL, Recens. Orthopt., I, p. 84 (1873) in part.
Oxyblepta STÅL, loc. cit., p. 84.

93. *Oxyblepta puncticeps* (Stål).

Opsomala puncticeps STÅL, Eugen. Resa, Orthopt., p. 325 (1860).
Stenopola (Oxyblepta) puncticeps STÅL, Recens. Orthopt., I, p. 84 (1873).
Oxyblepta puncticeps KIRBY, Syn. Cat. Orthopt., III, p. 415 (1910).

Habitat.—The present collection contains two females of this species. One comes from Puerto Suarez, Bolivia, and the other from Sapucay, Paraguay.

94. *Oxyblepta bohlsi* (Giglio-Tos).

Stenopola bohlsii GIGLIO-TOS, Zool. Jahrb., Syst., VIII, p. 813 (1895).
Oxyblepta bohlsii KIRBY, Syn. Cat. Orthopt., III, p. 416 (1910).

Habitat.—A male specimen was taken at Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters above sea-level by J. Steinbach.

Genus HENIA Giglio-Tos.

Henia GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, pp. 45, 55 (1898); BRUNER, Journ. N. Y. Ent. Soc., XIV, p. 152 (1906).

The only species of the genus known to the present writer is the following:

95. *Henia frenata* (Marschall).

Gryllus frenatus MARSCHALL, Ann. Wien. Mus., I, p. 212, No. 5, pl. 18, fig. 4 (1835).
Henia frenata GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, p. 56 (1898).

Habitat.—The collection contains two specimens, a pair, which are referred here. One is a nymph, and was taken during December, the other is mature, and was collected in July.

The specimens examined by the writer vary considerably in some structural features, and represent a single variable species, or else two or more distinct forms.

Genus PARACORNOPS Giglio-Tos.

Paracornops GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 31 (1894).

Cornops STÅL (*nec* Scudder), Bihang. Svensk. Akad. Handl., V, No. 4, p. 40 (1878).

At least six species of the genus *Paracornops* are known. They are scattered over southern Brazil and Paraguay.

96. *Paracornops aquaticum* Bruner.

Paracornops aquaticum BRUNER, Proc. U. S. Nat. Mus., XXX, p. 662 (1906).

Habitat.—This species is represented by a male specimen which J. D. Haseman secured on December 6, 1908, at Morro do Pará, Bahia, Brazil.

All the species of the genus *Paracornops* appear to be fairly common at certain localities where they frequent aquatic plants. They can be collected by beating such vegetation.

Genus COPIOCERA Burmeister.

Copiocera BURMEISTER, Handb. Ent., II, pp. 602, 611 (1838); STÅL, Bihang. Svensk. Akad. Handl., V, No. 4, p. 38 (1878); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 213, 263 (1907, 1908).

Glyphacris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 653 (1870).

The genus *Copiocera* is composed of medium-sized, slender, elongate locusts, in which the hind tibiæ are without the lamellate edges common to the insects belonging to several of the genera just mentioned on the foregoing pages. These insects also have the valves of the ovipositor of the females slender and finger-like, without digging edges. With the exception of a single species, all of its representatives belong to tropical South America. Eight species have been described heretofore, while a ninth is now added.

97. *Copiocera austera* Gerstæcker?

Copiocera austera GERSTÆCKER, Mitth. Ver. Neu Vorpomm., XX, p. 34, No. 28 (1889).

Habitat.—Three female specimens taken at Villa Bella, Bolivia, on October 10th, are referred here with some doubt. They were collected by J. D. Haseman, who has furnished the museum with a number of very interesting things.

98. *Copiocera collaris* sp. nov.

A decidedly smaller species than those heretofore described. Bright olive-green with a conspicuous large orange-red patch on each side of the pronotum and a similar tint on the veins of the costal area of the tegmina.

Head moderately large, smooth, its length nearly that of the pronotum, and its width a little greater than the anterior width of the pronotum; eyes quite prominent, but not large, separated above by a space a little wider than the frontal costa between the antennæ; the fastigium a little depressed, about as long as wide, and bounded antero-laterally by a well-marked carina; ocelli conspicuous, flame-red. Antennæ dusky, filiform, fully as long as the hind femora, their last four or five joints pallid. Frontal costa fairly prominent between the antennæ, fading below the ocellus, where it is present only as a tumid ridge which widens rapidly towards the clypeus. Lateral or facial carinæ quite prominent, gently sinuose above and strongly divergent below. Pronotum fairly strongly rugoso-punctate, sub-cylindrical, the hind lobe only gently divergent posteriorly, the transverse sulci prominent, continuous, the last decidedly back of the middle, the anterior edge rather broadly margined, roundly and broadly advanced upon the occiput, hind margin subangulate, the median carina present only on the hind lobe, where it is quite plain on the flattened disk. Tegmina and wings long and narrow, the apex of the former subacuminate. Anterior and middle legs slender; hind femora moderately robust, evenly tapering, the tibiæ much shorter than the femora, and only five- or six-spined externally. Valves of the ovipositor hirsute, cylindrical, and finger-like, the lower pair the longer and larger, straight, the upper ones slender and curved downward between the basal part of the upper ones. Prosternal spine strongly transverse, its apex arcuate, entire.

Color of insect prevailingly pale olive-green, marked with reddish on the pronotum and tegmina as indicated above. Abdomen without reddish markings at sides or above, but becoming darker in the dorsal area. Hind femora, including the genæ, uniformly greenish; hind tibiæ

dark plumbeous. Wings infuscated, the tegmina with olivaceous veins and veinlets on the disk and dorsal areas, but reddish or purplish on the costal area.

Length of body, female, 34 mm., of pronotum, 5.75 mm., of tegmina, 31.5 mm., of hind femora, 15 mm., of hind tibiæ, 11 mm.

Habitat.—The single specimen at hand was taken by J. Steinbach in the Province del Sara, Bolivia, at an altitude of 450 meters above sea-level. The type is the property of the Carnegie Museum.

Genus PÆCILOCLÆUS Bruner.

Pæciloclæus BRUNER, *Tire des Horæ*, Soc. Ent. Rossicæ, XXXIX, p. 11 (1910).

99. *Pæciloclæus flavipicta* sp. nov.

Related to *P. ornatus* Bruner⁶ from Peru, but quite distinct from that species in a number of respects. The characteristic features, however, seem to be the slightly larger size and brighter coloration. Entire body rather profusely hirsute, especially the tibiæ and tarsi.

⁶ *Tiré des Horæ Societatis Entomologica Rossicæ*, Vol. XXXIX, pp. 11-12.

In the make-up of the forms in the paper containing the description of this species the printer left out the following parts of the manuscript between lines 18 and 19 on page 12 of the reprint. Since this omission renders the description of *P. ornatus*, as well as of the new genus *Adelotettix* ambiguous, both descriptions are here copied in full:

"*Pæciloclæus ornatus*, sp. n.

"Size medium, the head of moderate size, about as wide as the anterior edge of the pronotum which embraces it almost to the eyes; the vertex rather narrow, in the female a trifle less than the width of the frontal costa between the base of the antennæ; the fastigium subhorizontal, a little longer than wide, its disk flattened, and provided with a minute transverse impression just back of the extreme anterior edge where it meets the upper extremity of the frontal costa. Latter fairly prominent between the antennæ, not sulcate above the ocellus, but provided with a few punctures, much less prominent below and shallowly sulcate, fading before reaching the clypeus; facial carinæ not especially prominent, divergent. Eyes not large, somewhat bulging, a little longer than wide. Anterior lobe of the pronotum subcylindrical, the hind lobe divergent, a little more than one-half the length of the anterior one, but much more profusely punctulate; anterior edge rather coarsely margined, undulate, hind edge of disk obtusangulate, the transverse sulci profound. Tegmina coriaceous, rather coarsely and profusely veined, about as long as the abdomen, the apex rounded; wings vitreous, infuscated apically, the apex broad, nearly truncate. Abdomen carinate, cylindrical, nearly equal throughout, the apex rather abruptly acuminate; the valves of the ovipositor slight, rather straight, and the lower pair embraced by the upper ones. Prosternal spine gross, transverse, quadrate, with a minute wart-like protuberance at middle near the posterior edge.

Head a little wider than the anterior edge of the pronotum, the occiput smooth, well rounded and slightly elevated above the plane of the pronotum; eyes prominent, subglobose, the greater diameter plainly exceeding the length of the anterior edge of the cheeks, separated on the vertex above by a space scarcely if any greater than the diameter of the basal antennal joint; fastigium subhorizontal, flat, about as long as wide, separated from the frontal costa by a transverse elevated ridge or carina; frontal costa prominent between the antennæ, viewed laterally evenly rounded, its sides parallel to just below the ocellus, where it becomes much narrower and inconspicuous to the base of the clypeus, plane above, sulcate below; front rather closely Space between meso- and meta-sternal lobes transverse. Hind femora rather slender, their apex about equalling that of the abdomen, genicular lobes slightly acuminate, the hind tibiæ six-spined externally, eight-spined internally, the first and second joints of their tarsi subequal; legs, and in fact the entire body, rather strongly hirsute. Antennæ filiform, about as long as the hind femora.

"Color quite gaudy; the head and pronotum dull black with a greenish tinge in some lights, conspicuously marked with dull orange on the head, the lower edges of the cheeks, the lateral carinæ of face, the frontal costa, a considerable portion of the clypeus, sides of the mandibles, a dot back of the middle of each eye, the disk of the fastigium and a V-shaped mark on the occiput just back of the vertex, on the pronotum a large patch near the middle of each lateral lobe and one at center of the disk both in front and behind; upper half of the pleura and dorsum of the abdomen nearly to its tip dull black; below flavous, inclining to dull orange. Tegmina on their basal two-thirds metallic blue-green with a faint longitudinal discal streak of flavous, the apical portion brownish, semi-membranous. Wings vitreous, slightly infuscated apically and towards the posterior border. Hind femora olivaceous, varied with flavous internally and below, on the disk externally the pinnae brownish, genicular area and immediate base of tibiæ red, the remainder of the latter dull cinereous, becoming infuscated apically and at the extreme apex together with their tarsi coralline. Anterior and middle legs dark flavous with faint traces of fuscous annulations. Antennæ fuscous tinged with red, the extreme apex pallid.

"Length of body, ♀, 24.5 mm., of pronotum, 4 mm., of tegmina, 15 mm., of hind femora, 12.5 mm.

"This insect so far as its coloration and wing length are concerned seems to be more closely related to *Zosperamerus* than it is to *Anniceris*, although its relatively much shorter hind tarsi remind one of the latter genus and *Leioscapheus* of Central America. Evidently a careful study of all the forest-dwelling locusts of middle America will bring to light a large number of additional species and genera of this group.

"**Adelotettix** gen. nov.

"A genus of moderately large, coarse dull colored locusts related to both *Abila* and *Adimantus* but quite distinct from both of these genera in a number of respects as may be seen by reference to the following diagnosis:

and strongly rugoso-punctulate; lateral or facial carinæ prominent, quite strongly divergent below. Antennæ slender, filiform, about as long as the hind femora, the basal joint quite robust and noticeably elongate. Pronotum rather evenly and closely punctulate, selliform, the anterior lobe about one-half longer than the posterior one, the median carina visible in front of the first and last transverse sulci, which are fairly deeply impressed; disk of hind lobe somewhat flattened, the posterior margin rounded. Tegmina coriaceous, rather profusely veined, nearly as long as the abdomen, of moderate width, the apex rounded; wings as in *ornatus*. Hind femora of moderate robustness, about as long as the abdomen, the carinæ smooth, pinnæ of outer disk regular, the genicular portion rather large, the lateral lobes rounded below and rectangulate at apex; hind tibiæ and tarsi rather large and robust; the former with seven spines externally and eight internally, the latter with joints one and two about equal in length. Valves of the ovipositor more robust than in *ornatus*. Prosternal spine quadrate at base, rapidly tapering, the apex acuminate;

"Face, pronotum, pleura and underside of meso- and meta-thorax rather closely and profoundly punctulate. The head large, exserted, the fastigium horizontal, flat and provided at front with a distinct median carina; eyes moderately large, elliptical, separated in the females by a space somewhat less than the width of the frontal costa between the antennæ. Frontal costa prominent above between the antennæ, smooth, in nowise sulcate, but provided with a few small punctures at its sides near the upper extremity, below the ocellus narrowed, gently sulcate and fading towards the clypeus. Antennæ and ocellus situated higher up on the front and closer than usual to the fastigium; the former moderately heavy but filiform, about 25-jointed, the apical four or five pallid as in *Copiocera*, *Rhcnoderma* and several other tropical American genera; lateral carinæ of the face prominent, evenly and strongly divergent, extending from the outer edge of the antennal sockets to near the apex of the mandibles. Pronotum with the two lobes about equal in length, the anterior lobe cylindrical, the posterior one divergent, the disk of the latter flat and with its hind edge obtusangulate, front edge broadly margined and roundly advanced upon the occiput, in some species with the middle shallowly and roundly emarginate. Tegmina surpassing the apex of abdomen, with parallel edges, coriaceous, rather profusely veined basally, but more sparsely so apically, the apex rounded. Hind femora rather short and fairly robust, considerably shorter than the abdomen, with smooth carinæ and regular pinnæ on external disk, the genicular lobes more or less angulate; hind tibiæ plainly shorter than the femora; robust, seven- or eight-spined on outer edge, the apical one wanting; the second tarsal joint about one-half the length of the first. Anterior and middle legs rather short. Prosternal spine somewhat robust, directed gently to the rear, its apex blunt. Interspace between the mesosternal lobes transverse. Valves of the ovipositor normal. Body and legs somewhat hirsute."

the space between mesosternal lobes slightly transverse, but narrower than the lobes themselves.

General color above olivaceous, becoming almost black on the pronotum and upper portion of pleura; legs mostly, lower part of pleura, abdomen, except immediate dorsum and underside, bright citron-yellow. Pronotum conspicuously marked with six large patches of lemony-ellow, two on each side, and two on the disk. Face, fastigium, vertex, and anterior portion of occiput inclining to flavous, the posterior portion of head dark olive. Tegmina olivaceous, becoming darker on costal field and towards the apex, where they shade into fuscous. Wings apparently somewhat infuscated. Genicular portion of hind femora ferruginous, the lunules somewhat infuscated; hind tibiae and tarsi vinous red. Antennae pale ferruginous, the apex concolorous.

Length of body, ♀, 28 mm., of pronotum, 5 mm., of tegmina, 18 mm., of hind femora, 15 mm., of hind tibiae, 12.5 mm.

Habitat.—The only specimen at hand, the type, comes from Santa Cruz de la Sierra, Bolivia, where it was taken at an elevation of 450 meters above sea-level by J. Steinbach. It is the property of the Carnegie Museum.

The type of *P. ornatus* is deposited in the Museum of Natural History, University of Moscow, Russia.

Genus HOLMALOSAPARUS Rehn.

Holmalosaparus REHN, Proc. Acad. Nat. Sci. Phila., LX, p. 17 (1908); BRUNER, Ann. Carnegie Mus., VIII, p. 90 (1911).

The locusts which belong to the present genus resemble quite closely the species of *Phæoparia*, but differ in a number of diagnostic characters. Only two forms have thus far been recognized. As stated in a former paper (ANNALS, VIII, p. 90) these insects belong to southern Brazil.

100. *Homalosaparus sordidatus* Rehn.

Homalosaparus sordidatus REHN, Proc. U. S. Nat. Mus., XXXVI, pp. 155-157, figs. 36, 37 (1909); BRUNER, Ann. Carnegie Mus., VIII, p. 91 (1911).

Habitat.—Only a single female specimen of this locust is contained in the collection now being reported upon. It comes from Guaicuhy, Minas Geraes, Brazil, where it was collected on December 15, 1907, by J. D. Haseman.

Genus BUCEPHALACRIS Giglio-Tos.

Bucephalacris GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 30 (1894); BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 641, 664 (1906); *IB.*, Ann. Carnegie Mus., VIII, p. 91 (1911).

The species of this genus, as stated in a former paper appearing in the ANNALS, are confined to a limited area in northern Argentina, Paraguay, southern Brazil, and eastern Bolivia. They are medium-sized insects of rather dull color and evidently live among the undergrowth in and about the margins of tropical forests. A synoptic key for the separation of the known species is given on page 91 of volume VIII of the ANNALS.

101. *Bucephalacris paraguayensis* Bruner.

Bucephalacris paraguayensis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 665 (1906).

Habitat.—A single female specimen is at hand from Santa Cruz de la Sierra, Bolivia. It was collected by J. Steinbach at an elevation of 450 meters above sea-level.

Genus COSCINEUTA Stål.

Coscineuta STÅL, Recens. Orthopt., I, pp. 33, 52 (1873); GIGLIO-TOS, Ann. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, p. 45 (1898); BRUNER V. WATTENWYL, Boll. Mus. Genova, XXXIII, p. 138 (1893); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 214, 273 (1908).

The present genus is composed of medium-sized and moderately robust insects of rather striking colors. Four species have been referred here. They occur in tropical America, where representatives have been recorded from Nicaragua, Island of St. Bartholomew, U. S. of Colombia, the Upper Amazons, and Peru.

102. *Coscineuta coxalis* (Serville).

Acridium coxale SERVILLE, Ins. Orthopt., p. 672 (1839).

Coscineuta coxalis STÅL, Recens. Orthopt., I, p. 52, No. 1 (1873); BRUNER, Biol. Cent.-Amer., Orthopt., II, p. 273, No. 1 (1908).

Habitat.—The present collection contains two females of this locust. They come from Bogotá, Colombia, and form a part of accession number 2306. Both specimens lack hind legs and antennæ.

Genus PHÆOPARIA Stål.

Phæoparia STÅL, Recens. Orthopt., I, pp. 36, 56 (1873); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, p. 46 (1898); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 215, 277 (1908).

Phæoparia is another tropical American genus of locusts. They are rather above medium in size, and all of them are strongly ferruginous in coloration. They evidently inhabit the forests and live among fallen leaves, or on the dead and dry leaves which cling to various kinds of herbage growing in such localities.

103. **Phæoparia linea-alba** (Linnæus).

Gryllus (*Locusta*) *linea-alba* LINNÆUS, Mus. Ludov. Ulric., p. 150, No. 40 (1764).
Phæoparia linea-alba STÅL, Recens. Orthopt., I, p. 57, No. 1 (1873); BRUNER, Biol. Cent.-Amer. Orthopt., II, p. 278 (1908).
Truxalis sanguineus THUNBERG, Mém. Acad. Petersb., V, p. 270 (1815).

Habitat.—The collections before me now contain one male and two females of this insect. They come from Bogotá, Colombia, and Dutch Guiana.

Genus ADIMANTUS Stål.

Adimantus STÅL, Bihang. Svensk. Akad. Handl., V, No. 4, p. 38 (1878); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, p. 46 (1898); BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 642, 666 (1906).

Three so-called forms, or species, of locusts are referred to the present genus. They are above medium in size and at the same time quite gaudily colored. The genus is confined to a region covering Paraguay, northern Argentina, eastern Bolivia, and southern Brazil.

104. **Adimantus ornatissimus** (Burmeister).

Oxya ornatissima BURMEISTER, Handb. Ent., II, p. 636, No. 4 (1838).
Adimantus ornatissima KIRBY, Syn Cat. Orthopt., III, p. 426 (1910).

Habitat.—There are specimens at hand coming from St. Logoas, Minas Geraes, Brazil; and Province del Sara and Santa Cruz de la Sierra, Bolivia,—four males and six females, collected by J. D. Haseman and J. Steinbach.

These locusts are said to feed on sugar-cane and at times to become quite destructive.

Genus ZYGOCLISTRON Rehn.

Zygoclistron REHN, Ent. News, XVI, p. 39 (1905); BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 642, 666 (1906); *IB.*, Ann. Carnegie Mus., VIII, p. 89 (1911).

The species of *Zygoclistron* occur over Paraguay, southern Brazil, and eastern Bolivia. As stated in a former paper (ANNALS, VIII, p. 99) these insects are probably partial to open forests, where they live among fallen leaves, etc.

105. *Zygoclistron trachystictum* Rehn.

Zygoclistron trachystictum REHN, Ent. News, XVI, pp. 39-41, figs. 1-3 (1905);
 IB., Proc. Acad. Nat. Sci. Phila., LIX, p. 181 (1907).

Habitat.—Two males of this locust are at hand. They come from Santa Cruz de la Sierra, Bolivia, where they were taken by J. Steinbach.

Genus *ORTHOSCAPHEUS* Bruner.

Orthoscapheus BRUNER, Proc. U. S. Nat. Mus., XXX, p. 671, (1906); IB., Ann. Carnegie Mus., VIII, p. 104 (1911).

Orthoscapheus is most closely related to *Jodacris* of Giglio-Tos, and, so far as at present known, contains but a single representative.

106. *Orthoscapheus roseipennis* Bruner.

Orthoscapheus roseipennis BRUNER, Proc. U. S. Nat. Mus., XXX, p. 672 (1906).
 ? *Osmilia coriacea* GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184,
 p. 18 (1894).

Habitat.—The collections coming from both Puerto Suarez, Bolivia, and Sapucay, Paraguay, contain examples of this species. (See remarks concerning this insect in the ANNALS, VIII, p. 104.)

Genus *JODACRIS* Giglio-Tos.

Jodacris GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XII, No. 302, p. 32, note (1897); BRUNER, Ann. Carnegie Mus., VIII, pp. 104, 105 (1911).

107. *Jodacris ferruginea* (Giglio-Tos).

Anniceris ferrugineus GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 30 (1894) in part.

Jodacris ferruginea GIGLIO-TOS, l. c., XII, No. 302, pp. 32, 33, footnote (1897) in part; BRUNER, Proc. U. S. Nat. Mus., XXX, p. 672 (1906); IB., Ann. Carnegie Mus., VIII, p. 105 (1911).

Habitat.—There are two females in the collection made at Santa Cruz de la Sierra, Bolivia, by J. Steinbach.

Genus *ABRACRIS* Walker.

Abracris WALKER, Cat. Dermapt. Salt. Brit. Mus., IV, p. 642 (1870); KIRBY, Syn. Cat. Orthopt., III, p. 428 (1910); BRUNER, Ann. Carnegie Mus., VIII, p. 107 (1911).

Omalotettix BRUNER, Proc. U. S. Nat. Mus., XXX, p. 642 (1906).

The species of *Abracris* are quite generally distributed over most of tropical America, where they are fairly common in and about the

edges of the more open forests. These insects are rather small and inconspicuous, being gray and dull brown in color. Living, as they do, among the litter on and near the ground, they are fairly well protected from birds and other vertebrate enemies, hence are the common "grasshoppers" in their respective regions. At least seven species have already been recognized, and a careful study of these insects throughout the regions, where the genus occurs, will no doubt add several others.

108. ***Abracris nebulosa*** (Bruner).

Jodacris (?) *nebulosa* BRUNER, Locusts of Argentina, p. 67 (1900).

Omalotettix nebulosa BRUNER, Proc. U. S. Nat. Mus., XXX, p. 673 (1906).

Abracris nebulosa KIRBY, Syn. Cat. Orthopt., III, p. 428 (1910).

Anniceris ferruginea GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, No. 184, p. 30 (1897) in part.

Habitat.—Santa Cruz de la Sierra, Bolivia, a single male, collected by J. Steinbach.

109. ***Abracris conspersipennis*** (Bruner).

Omalotettix conspersipennis BRUNER, MS., Biol. Cent.-Amer., Orthopt., II, p. 281 (1908).

Abracris conspersipennis BRUNER, Ann. Carnegie Mus., VIII, p. 110 (1911).

Habitat.—Four specimens, two males and two females, are at hand. They were taken at Santa Cruz de la Sierra, Bolivia, by J. Steinbach.

110. ***Abracris meridionalis*** (Bruner).

Omalotettix meridionalis BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 280, 281 (1908).

Abracris meridionalis KIRBY, Syn. Cat. Orthopt., III, p. 428 (1910); BRUNER, Ann. Carnegie Mus., VIII, p. 111 (1911).

Habitat.—Santo Antonio, Guaporé, Matto Grosso, Brazil, one female; and Santa Cruz de la Sierra, Bolivia, another female.

This is one of the larger species of the genus, and occurs over considerable territory.

Genus *SITALCES* Stål.

Sitalces STÅL, Bihang. Svensk. Akad. Handl., V, No. 9, p. 16 (1878); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 216, 291 (1908).

The species of *Sitalces* are also confined to tropical South America and the adjoining parts of Central America and the Island of Trinidad. Several species are known.

III. *Sitalces infuscatus* Bruner.

Sitalces infuscatus BRUNER, MS., Biol. Cent.-Amer., Orthopt., II, p. 291 (1908);
IB., Ann. Carnegie Mus., VIII, p. 123 (1911).

Habitat.—A pair, male and female, were taken by J. D. Haseman. The male was collected at Madeira Falls, Rio Madeira, Brazil, October 17; and the female at Villa Bella, Bolivia, October 12.

Genus SCHISTOCERCA Stål.

Schistocerca STÅL, Recens. Orthopt., I, p. 64 (1873); SCUDDER, Proc. Amer. Acad. Arts and Sci., XXXIV, p. 441 (1899).

The locusts, which comprise the present genus, are, with a single exception, confined to the American hemisphere, where the species are widely scattered from the northern boundary of the United States to at least as far south in Argentina and Chile as the forty-third degree of latitude. These insects are, however, most abundant in the tropical and subtropical countries, where several of the species at times become much dreaded pests. Kirby in his *Synonymic Catalogue of Orthoptera* (Vol. III, pp. 454-462) lists seventy-three species. Since that work was published two or three additional forms have been recognized. One of these latter is described in the present paper and a second is admitted as possibly new.

II2. *Schistocerca colombina* (Thunberg)?

Gryllus colombinus THUNBERG, Mém. Soc. Petersb., IX, pp. 399, 425, No. 92 (1824).
Acridium (Schistocerca) colombinum STÅL, Recens. Orthopt., I, p. 67, No. 17 (1873).
Schistocerca colombina SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 443, 449 (1899); BRUNNER & REDTENBACHER, Proc. Zool. Soc. Lond., 1892, p. 210.

For additional synonymy see Kirby, *Syn. Cat. Orthopt.*, III, p. 455.

Habitat.—A single female specimen bearing the label "Bogotá, Colombia," is referred here with considerable doubt. It belongs with accession number 2306.

There are also at hand a number of other specimens belonging to a former collection of the Carnegie Museum which has been in my possession for several years. These latter answer to Thunberg's description even better than does the individual just referred to above. They were collected at "Bonda (250 ft.) Dept. Magdalena, Colombia, S. A.," where they were taken by H. H. Smith. In their measurement the females exceed that given by Thunberg for his *Gryllus colombinus* ("Magnitudine fere grylli migratorii"). Some time ago I set these

larger insects aside under the MS. name *Schistocerca maculipennis*, owing to the decided and large maculations which occupy the disk and apical half of the tegmina. These insects are also characterized by the pale oblique border on the lower margins of the pronotum, as well as by the black dotted carinæ of the hind femora. The measurements are as follows: length of body, ♀, 61 mm., of pronotum, 13.5 mm., of tegmina, 60.5 mm., of hind femora, 32 mm. They also approach Scudder's *S. æqualis*, but seem to be distinct from it as well.

The present writer also possesses several specimens of a *Schistocerca* taken on Grenada Island in the West Indies, which have likewise been referred doubtfully to Thunberg's *colombina*. These latter insects, however, are much too small for it, being in the females 41 mm. long, with tegmina that are only 39 mm. long. In general structure and color-pattern these small Grenadan specimens are very similar to the very much larger ones coming from the United States of Colombia. The two should be described as distinct species, and will be later.

113. *Schistocerca magnifica* sp. nov.

By far the largest species of the genus. Readily recognized by its uniform grayish brown color and by having the tegmina largely hyaline and without traces of maculation. Hind tibiæ and tarsi tinged above with coral-red. Antennæ flavous. Entire body rather closely clothed with short pale hairs, especially is this true on the meso- and meta-sternum.

Head only medium in size, a little narrower above than the anterior margin of the pronotum, occiput short, embraced by the former almost to the hind margin of the eyes, the face above the base of clypeus about as long as wide, nearly square; eyes not prominent, narrow, about as long as the anterior edge of the cheeks immediately below them; latter below rather finely and closely punctulate, above together with the occiput smooth; face rugoso-punctate; vertex between the eyes about a third wider than the diameter of the basal antennal joint, the fastigium of moderate size and very deeply sulcate, plainly broader than long, separated from the upper end of the frontal costa by a transverse impressed smooth area of paler hue; frontal costa not prominent, the lateral walls meeting above between the base of the antennæ and evenly divergent below, the sulcation rather profound and continuous to the clypeus; lateral or facial

carinæ prominent, at their upper extremity somewhat sinuous, from a point opposite the median ocellus evenly divergent to the lower corners of the face. Antennæ filiform, a little longer than the head and pronotum taken together. Pronotum rather strongly rugoso-punctate, much more closely so on the hind lobe, the dorsum gently tectate, viewed in profile a trifle arcuate; median carina fairly coarse and prominent, distinctly severed by all three transverse sulci, the posterior one plainly in advance of the middle; anterior margin roundly advanced at middle upon the occiput, hind margin widely angulate; the sides of hind lobe decidedly divergent, giving the insect a robust appearance about the thorax. Meso- and meta-thorax moderately enlarged and rather closely and profoundly rugoso-punctulate. Tegmina large, long, for the most part membranous, rather sparsely veined on outer two-thirds, a little more closely so on the basal portion. Legs about normal, the hind femora not especially robust at base, but with coarse apical portion and heavy tibiæ, spines of the latter heavy, rather strongly curved and for the most part pallid, the upper carina of the femora rather prominently serrate. Prosternal spine slender, erect, as long as the coxal joints of anterior legs, the apex rounded.

Length of body, ♀, 60 mm., of pronotum, 15 mm., of tegmina, 71 mm., of hind femora, 33 mm., of antennæ, 19 mm., greatest width of pronotum, 12 mm.

Habitat.—This magnificent locust bears the label "Mathewtown, Great Inagua I., Bahamas, February 23, 1909, Worthington." The type is the property of the Carnegie Museum.

This is by far the largest species of the genus, if not the most beautiful, and must be a very attractive insect when alive. How it has thus far escaped collectors is an enigma to the describer. It is not very closely related to any of the other North American forms, nor does it approach those of South America any closer.

114. *Schistocerca inscripta* (Walker).

Cyrtacanthacris inscripta WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 550, No. 3 (1870).

Acridium inscriptum THOMAS, Syn. Acrid. N. Amer., p. 228 (1873).

Schistocerca inscripta SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 444, 461, No. 21 (1899); KIRBY, Syn. Cat. Orthopt., III, p. 455 (1910).

Habitat.—Jamaica, West Indies, three males and two females.

115. *Schistocerca alutacea* (Harris)?

Acridium alutaceum HARRIS, Rept. Ins. Mass., p. 139, No. 1 (1841); *IB.*, ed. 3, p. 173 (1862).

Acridium alutaceum GLOVER, Illustr. N. Amer., Orthopt., pl. VIII, fig. 13, pl. X, fig. 13 (1872); THOMAS, Syn. Acrid. N. Amer., pp. 169, 171 (1873).

Schistocerca alutacea BRUNER, Publ. Neb. Acad. Sci., III, p. 26 (1893); SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 445, 464, No. 27 (1899); REHN, Ent. News, XIII, p. 312 (1902).

Habitat.—There is a single *Schistocerca* nymph among some miscellaneous Orthoptera taken in the Bahamas. It is referred here as being more likely this than any other species.

116. *Schistocerca desiliens* Scudder.

Schistocerca desiliens SCUDDER, Proc. Amer. Acad. Arts & Sci., XXXIV, pp. 443, 445 (1899); BRUNER, Ann. Carnegie Mus., VIII, p. 126 (1910).

Habitat.—There are two females of this species in the collection coming from Santarem, Grão Pará, Brazil. They were taken on the 7th of December, 1909, by J. D. Haseman.

117. *Schistocerca paranensis* (Burmeister).

Acridium paranense BURMEISTER, Reise La Plata Staaten, I, p. 491 (1861).

Schistocerca paranensis BRUNER, First Rept. Locust Comm. Buenos Aires, pp. 1-79, and figs. (1898); *IB.*, Second Rept., pp. 1-11, 69, figs. 1, 31, 32 (1900).

Acridium (Schistocerca) perigrinum BERG (*nec* Olivier), An. Soc. Argent., IX, pp. 275-277 (1880).

Cyrtacanthacris approximans WALKER, Cat. Dermapt. Salt. Brit. Mus., III, p. 572, No. 44 (1870).

Habitat.—There are specimens of this insect before me coming from São Paulo, Brazil; Santa Cruz de la Sierra, Bolivia; and Rio Negro, Santa Isabel, Uruguay. The specimens coming from the last locality were taken February 12, 1909, and contained in a box with *Scyllina conspersipennis*, and bear the label "by the billions, a great pest in all central southern S. America this year—eat everything except leaves of coffee plant."

This is the chief destructive locust of Argentina and adjoining South American countries, Uruguay, Paraguay, Brazil, and Bolivia. In Chile most of the destruction is perhaps the work of *S. cancellata* Serville.

118. *Schistocerca gratissima* Rehn.

Schistocerca gratissima REHN, Proc. Acad. Nat. Sci. Phila., Feb., 1908, pp. 20-22, figs. 4, 5; BRUNER, Ann. Carnegie Mus., VIII, p. 128, note.

Habitat.—Specimens of this beautifully marked insect are at hand from Villa Bella and Rio Mamori, Bolivia, where they were taken by J. D. Haseman at the last named locality on September 20, 1909, and at the first mentioned locality on October 11, 1909.

The present writer referred this insect with doubt to Stoll's *Gryllus* (*Locusta*) *lineatus* (*Natuurl. Afbeeld. Besch. Springh.*, pl. XVb, fig. 57) in a former paper (*Proc. U. S. Nat. Mus.*, XXX, pp. 675, 676 (1906)).

Genus *DICHROPLUS* Stål.

Dichroplus STÅL, Recens. Orthopt., I, p. 88 (1873); BRUNNER, Ann. Mus. Genova, XXXIII, p. 145 (1893). For additional references see Kirby, Syn. Cat. Orthopt., III, p. 487.

The genus *Dichroplus* Stål takes the same place among South American locusts that his genus *Melanoplus* does among these insects in North America. The representatives of both genera are the common medium-sized spine-breasted grasshoppers of the meadows and open country. Some of the species become destructive in both continents.

119. *Dichroplus punctulatus* (Thunberg).

Gryllus punctulatus THUNBERG, Mém. Acad. Petérsb., IX, p. 408 (1824).

See additional synonymy in ANN. CARNEGIE MUS., VIII, p. 132.

Habitat.—The five specimens of the present species before me come from Santa Cruz de la Sierra, Bolivia. They were taken by J. Steinbach.

120. *Dichroplus bergii* (Stål).

Pezotettix bergii STÅL, Bihang. Svensk. Akad. Handl., V, No. 9, p. 7 (1878).

Dichroplus bergii GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 21 (1894); BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 679, 683 (1906).

Habitat.—A single female specimen is at hand. It was collected at Sapucay, Paraguay.

121. *Dichroplus exilis* Giglio-Tos.

Dichroplus exilis GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 23 (1894); BRUNER, Second Rept. Locust Comm. B. Aires, pp. 72, 75 (1900); IB., Proc. U. S. Nat. Mus., XXX, pp. 678, 681 (1906).

Habitat.—J. Steinbach's collection made at Santa Cruz de la Sierra, Bolivia, contains a single male specimen, which is referred here.

Genus *PARASCOPAS* Bruner.

Parascopas BRUNER, Proc. U. S. Nat. Mus., XXX, pp. 643, 689 (1906); IB., Ent. News, XXI, p. 307 (1910).

Scopas GIGLIO-TOS (*nec* Bonaparte), Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 29 (1894).

The locusts comprising the present genus are medium sized, short-winged insects. The described species are very similar in general appearance, but can be separated by the cercal characters of the males (see synoptic table, *Ent. News*, XXI, p. 307).

122. *Parascopas obesus* (Giglio-Tos).

Scopas obesus GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 29 (1894).

Habitat.—Two female specimens of *Parascopas* are before me as I write. They were taken at Puerto Suarez, Bolivia.

Genus *CHLORUS* Giglio-Tos.

Chlorus GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, XIII, No. 311, p. 50 (1898).

The present genus of the *Melanopli* was erected in 1898 by Giglio-Tos for the reception of his *Paradichroplus borellii* and Stål's *Pezotettix varicolor*. Since then two other species, *C. vittatus* and *C. brunneus*, have been added by me. Now a fifth form is at hand for characterization. With the exception of Stål's species, with Colombia as its habitat, they all occur in the region embraced by Paraguay, south-western Brazil, and eastern Bolivia. They may be separated by the following synoptic table. The species *borellii* is the type.

SYNOPSIS OF THE SPECIES OF *CHLORUS*.

- A. Larger (♂, 22–22.5 mm., ♀, 25–30 mm.).
- b.* Hind femora interiorly and below sanguineous.
- c.* General color green [Asuncion, Paraguay] *borellii* Giglio-Tos.
- cc.* General color brownish; the hind tibiae pale greenish yellow [Corumbá, Brazil] *brunneus* Bruner.
- bb.* Hind femora interiorly and below not sanguineous.
- c.* Dark greenish brown; sides of basal half of abdomen heavily marked with black. Hind femora deep green, lower sulcus greenish. *vittatus* Bruner.
- cc.* Dark wood-brown; sides of basal half of abdomen but lightly marked with black. Hind femora brown above, black internally and on upper portion of disk externally, the latter bordered below with flavous; lower sulcus dark gray. *bolivianus* sp. nov.
- AA. Smaller (♂, 12 mm., ♀, 16 mm.). Pale dirty yellow or olive-yellow [U. S. of Colombia] *varicolor* Stål.

123. *Chlorus bolivianus* sp. nov.

Very similar in size and general form to both *C. vittatus* and *C. brunneus*, but differing from them in color. Inner face of hind femora totally black, the lower sulcus deep blue-gray. Body rather profusely hirsute.

Head large, about as wide as the front edge of the pronotum. Eyes large and moderately prominent, in the male nearly as broad as long, the latter dimension almost a third greater than the length of the anterior edge of the cheeks; in the females decidedly longer than broad, the former dimension little if any greater than the length of the anterior edge of the cheeks below them; vertex between the eyes about twice (σ^7) or three times (♀) as wide as the diameter of the antennæ, the fastigium rather large and depressed, strongly sulcate, spatulately widened toward the front. Frontal costa rather prominent, a little narrowed above, roundly sulcate throughout, but more profoundly so at ocellus, sparsely punctulate above the ocellus. Antennæ filiform, a little heavy, slightly surpassing the hind margin of the pronotum in both sexes. Pronotum rather robust, very perceptibly divergent to the rear, viewed sidewise gently arcuate above, without definite lateral carinæ, the lateral lobes somewhat tumid viewed from above, transverse sulci fairly deeply impressed, all three cutting the median carina, the last plainly back of the middle; anterior edge above truncate, posterior margin broadly rounded. Tegmina rather large, almost as broad as long, the apex as well as the costal and dorsal edges evenly rounded, the inner margins almost touching, closely and finely veined, extending well over the basal abdominal segment. Abdomen normal, in the male gently clavate; male cerci evenly tapering on basal half, beyond which point they are nearly equal and abruptly bent inward and backward, the apical half somewhat flattened and obliquely docked from above. Legs a little coarse or robust, in the female about reaching, in the male a little surpassing, the apex of the abdomen; hind tibiæ 8-spined on the outer edge. Prosternal spine of medium size, slightly transverse, acuminate, and gently directed to the rear; interspace between the mesosternal lobes about as broad as long, but plainly narrower than the lobes themselves.

General color above rather dark wood-brown varied with patches of lighter hues and flecks and dashes of fuscous; front, anterior and middle legs, and underside testaceous; lower half of the lateral lobes

of the pronotum and middle of meso- and meta-pleura obliquely dirty white; a broad band back of the eyes and along the upper portion of the sides of the pronotum velvety black, in some specimens with an olivaceous tinge. Hind femora at the base and along the lower edge of outer disk flavous, remainder largely fuscous and black, except the lower edge and sulcus, which is deep gray, almost lead-color with a greenish tint. Hind tibiæ fuscous basally, becoming green tinted apically. Antennæ flavous at the base, changing to ferruginous apically.

Length of body, ♂, 22.5 mm., ♀, 30 mm.; of pronotum, ♂, 5.75 mm., ♀, 7.85 mm.; of tegmina, ♂, 4.5 mm., ♀, 5 mm.; of hind femora, ♂, 13 mm., ♀, 16.5 mm.

Habitat.—Santa Cruz de la Sierra, Bolivia, at an elevation above sea level of 450 meters, one male and two females, collected by J. Steinbach.

The types, male and female, are deposited in the Carnegie Museum.

Genus PARADICHOPLUS Bruner.

Paradichroplus BRUNNER v. WATTENWYL, Ann. Mus. Genova, XXXIII, p. 145 (1893); GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp., Torino, IX, No. 184, p. 20 (1894).

The present genus is composed of several medium-sized, nearly apterous locusts, which remind one very strongly of some of the North American genera of *Melanopli*. Its representatives are most abundant in the region comprised by southern Brazil, Paraguay, northern Argentina, and eastern Bolivia and Peru. The subjoined table will enable the student to separate the species described previously, as well as the three now characterized:

SYNOPSIS OF THE SOUTH AMERICAN SPECIES OF PARADICHOPLUS.

- A. Hind tibiæ provided with nine spines in the outer row.
- b. Lower sulcus and inner face of the hind femora largely reddish. Color variable.
- c. Prevailing color yellowish or flavous, the dorsum of the pronotum and abdomen dusky. Head black *bilobus* Giglio-Tos.
- cc. Prevailing color variable, but with the dorsum of the pronotum not entirely dusky. Head concolorous, or at least not greatly varied with fuscous.
- d. General color varying from apple-green to pale brownish olive, the dorsum of the pronotum and abdomen varied with fuscous. *andeanus* Bruner.

- dd.* General color greenish olivaceous, the dorsum of the pronotum and abdomen pallid, not varied with fuscous. *brunneri* Giglio-Tos.
- 4A. Hind tibiæ provided with eight spines in the outer row.
- b.* Hind tibiæ of the normal form, their lateral edges not acute and expanded toward the apex. Representatives denizens of woods or open fields removed from swampy grounds.
- c.* Larger (♀, 22-28 mm.).
- d.* Abdomen with 4 to 6 basal segments twice spotted at middle with black. Posterior femora internally sanguineous.
bipunctatus Giglio-Tos.
- dd.* Abdomen with basal segments not twice black-spotted at middle. Posterior femora internally pallid, not sanguineous.
olivaceous sp. nov.
- cc.* Smaller (♀, 18-21 mm.).
- d.* Color testaceo-ferruginous. Hind tibiæ orange-red; internal and external disks of hind femora infuscated or obscure.
rubripes Bruner.
- dd.* Color more or less markedly olivaceous. Hind tibiæ greenish; internal and external disks of hind femora not especially infuscated.
- e.* Genuicular area of hind femora marked with black lunules.
fusiformis Giglio-Tos.
- ee.* Genuicular area of hind femora pale ferruginous, without the dark lunules. *geniculatus* Bruner.
- bb.* Hind tibiæ expanded apically and with their lateral edges more or less acute. Representatives possibly subaquatic, or at least denizens of swampy grounds and fitted for swimming.
- c.* Hind femora banded internally and externally with black or fuscous.
- d.* Smaller (♀, 14 mm. long) [Rio Apa, Paraguay].
aberrans Giglio-Tos.
- dd.* Larger (♀, 21 mm. long) [Puerto Suarez, Bolivia].
steinbachi sp. nov.
- cc.* Hind femora without fuscous bands both internally and externally.
subaquaticus sp. nov.

124. *Paradichroplus subaquaticus* sp. nov

A medium sized rather hirsute insect, in which the general color is greenish olive, varied on the head and the pronotum with lines of dirty white or pale testaceous. Hind femora unicolorous, unbanded; the hind tibiæ decidedly expanded apically, and with the edges somewhat acute.

Head moderately large, a little wider than the front edge of the pronotum, the occiput short. Eyes prominent, large, a little longer than wide, their greatest diameter being almost twice as long as the

anterior edge of the cheeks below them, separated above by a space no greater than the diameter of the antennæ. Fastigium of the vertex depressed, spatulately sulcate, the sulcation partially separated from that of the frontal costa by an obscure transverse V-shaped carina. Frontal costa moderately prominent, broadly sulcate, and provided with coarse lateral walls which diverge evenly below, continuous to the base of the clypeus; lateral or facial carinæ prominent, straight, gently divergent below. Antennæ rather coarse and moderately elongate, reaching to the hind margin of the metathorax or a trifle beyond. Pronotum a little longer than broad, viewed laterally gently arcuate above, transverse sulci deep, the hind lobe somewhat expanded, only about one-half as long as the anterior one; both the anterior and posterior margins roundly emarginate, the latter much more broadly so. Tegmina small, lateral, gently spatulate, and provided with four percurrent veins, their apex reaching about half-way across the abdominal segment. Abdomen rather small, tapering but little towards the apex, which terminates in a blunt point, prominently carinate above, especially on the basal two-thirds; last ventral segment short, scarcely as long as its basal width; supra-anal plate rather simple, triangular, with a fairly profound median sulcus, which is quite broad at the base, but narrowed evenly toward the apex; marginal apophyses of preceding segment moderately large, about twice as long as broad, their apex broadly rounded, touching on their inner margins and projecting into the basal portion of the sulcus of the supra-anal plate; cerci pyramidal or subpyramidal, somewhat flattened, a little more than twice as long as their greatest basal width, directed to the rear and gently inwards, the apical fifth finger-like. Prosternal spine moderately large, the base quadrate, tapering to a rather acute point, which is gently directed to the front; interspace between the mesosternal lobes not quite as wide as long and plainly narrower than the lobes themselves. Legs decidedly large and robust, especially is this true of the femora of all three pairs; the hind femora projecting fully one-third of their length beyond the tip of the abdomen; hind tibiæ expanded apically, eight-spined externally, nine-spined internally.

All the legs olive-green, sides of pronotum above much darker, inclining to brownish but still with an olivaceous tint; the lower portion dirty white, the disk brownish olive with testaceous lines separating this field from the postocular dark bands; occiput of a

similar color, with testaceous lateral margins; face and cheeks olivaceous; antennæ inclining to ferruginous. Abdomen above brownish olive, the sides of the three basal segments prominently marked with piceous, lower side flavous. Hind tibiæ green, with spines largely black.

Length of body, ♂, 14 mm., of pronotum, 3.1 mm., of tegmina, 2.3 mm., of hind femora, 11 mm.

Habitat.—A single male specimen, the type, bears the label "Puerto Suarez, Bolivia, 150 M., Nov., '08-Jan., '09, J. Steinbach."

The structure of the hind tibiæ of this insect points to its possible aquatic or subaquatic habit. Its very minute and lateral tegmina also indicate a rather stationary existence, which would also be true with all of the other representatives of the genus. Possibly all of them are partial to certain food-plants from which they seldom stray.

125. ***Paradichroplus steinbachi*** sp. nov.

Most nearly related to *P. aberrans* Giglio-Tos, but a much larger insect than that species, as indicated in the synoptical table. Cinereo-ferruginous and more or less strongly conspersed with round fuscous dots on the pronotum and the basal abdominal segments above. Lower lateral margins of the former broadly ivory-white. Body moderately hirsute.

Head normal or small, the width about the same as that of the anterior edge of the pronotum. Eyes of moderate size, not prominent, decidedly longer than wide, their anterior margin nearly straight; vertex between the eyes about one and one-half times the diameter of the basal antennal joint, the fastigium rather short but broad, depressed, and widely but shallowly sulcate; frontal costa not especially prominent, a trifle broadest at its middle and sulcate throughout, the lateral walls coarse; facial carinæ prominent, divergent, gently sinuose. Antennæ filiform, a very little surpassing the hind margin of the pronotum. Pronotum evenly divergent posteriorly, without lateral carinæ and with but a slight median one; the anterior lobe a trifle more than twice the length of the posterior, the transverse sulci fairly prominent, the last alone continuous, the other two being interrupted by the inconspicuous median carina; anterior and posterior margins of the disk nearly straight. Tegmina minute, lateral, spatulate, about two and one-half times as long as their greatest width, sparsely veined, reaching three-fourths across the basal abdominal

segment. Abdomen carinated, of normal form, its apex reaching slightly beyond the tips of the hind femora. Valves of the ovipositor moderately slender, the apical portion well curved. Prosternal spine large and blunt, somewhat transverse, the base subquadrate. Mesosternal lobes separated by a space about as broad as long and approximately equal to the lobes themselves. Anterior and middle legs slender, normal; the hind femora robust, the hind tibiæ eight-spined externally and decidedly broadened apically with acute margins, as in *aberrans* Giglio-Tos and *subaquaticus* described in the present paper.

General color cinereo-ferruginous or brunneo-testaceous, varied with darker and lighter markings. Sides of the head back of the eyes and upper portion of the sides of the pronotum provided with a fairly well-defined brown band in part made up of an agglomeration of dots and irregular blotches of that color; below this on the pronotum are conspicuous ivory-white patches. Basal abdominal segments conspicuously marked at their sides with piceous patches. Hind femora twice banded both internally and externally with fuscous, most pronounced on the inner face; the lunules of the genicular area black above, lower sulcus flavous; tibiæ grayish green, their apex and the tarsi tinged with ferruginous. Antennæ ferruginous.

Length of body, ♀, 21 mm., of pronotum, 3.8 mm., of tegmina, 2.5 mm., of hind femora, 11 mm.

Habitat.—The only specimen at hand, the type, which is a female, bears the same label as does the type of *P. subaquaticus* described above.

Although from the same locality and presumably collected somewhere near the same date as was the insect described under the name *subaquaticus*, it does not seem at all probable that the two insects could be the sexes of a single species. The well marked bands on the hind femora of *steinbachi*, a female, and the entire absence of them in *subaquaticus*, a male, seems to me to be sufficient evidence upon which to separate them, since these marks as a rule are most pronounced in male specimens.

126. *Paradichroplus olivaceus* sp. nov.

A trifle larger than other described species of the genus, a uniformly brownish olive-colored insect of rather robust build.

Head fully as broad as the front edge of the pronotum; the eyes large and prominent, a little longer than the anterior edge of the

cheeks below them, their anterior margin straight, separated at the vertex by a space a trifle wider than the diameter of the basal antennal joint; fastigium of the vertex depressed, five-sided, shallowly sulcate and gently confluent with the sulcation of the frontal costa, which latter is fairly prominent and of nearly equal width throughout, continuous to the clypeus; facial carinæ strong, straight, a little divergent below. Antennæ slender, filiform, a trifle longer than the head and pronotum together. Pronotum very similar to that of *steinbachi*, but with the hind lobe relatively longer and with the hind margin very broadly and roundly emarginate instead of squarely truncate. Tegmina minute, lateral, spatulate, their tips gently surpassing the hind margin of the first abdominal segment. Abdomen about normal. Hind femora robust, gross, their tips reaching the apex of the abdomen. Hind tibiæ eight-spined externally, the lateral edges normal. Prosternal spine of fair size, pyramidal, the apex moderately acute, and gently directed to the front. Interspace between the mesosternal lobes wider than long, nearly equalling the lobes. Valves of the ovipositor not especially slender, nor yet robust, the apices quite strongly hooked and sharp.

General color as described above. Sides of the basal abdominal segments prominently marked with shiny black. Hind femora very faintly showing traces of dusky bands on upper margin; lunules of the genicular portion and sides of the basal portion of the hind tibiæ black. Lower face and sides of the pronotum faintly pallid. Lower surface a little more pallid than the remainder of the insect.

Length of body, ♀, 27 mm., of pronotum, 5 mm., of tegmina, 4.5 mm., of hind femora, 15 mm.

Habitat.—The type, together with another female, and a nymph were taken at Santa Cruz de la Sierra, Bolivia, at an elevation of 450 meters. They were collected by J. Steinbach.

Genus OSMILIA Stål.

Osmilia STÅL, Recens. Orthopt., I, p. 68 (1873); BRUNNER, Ann. Mus. Genova, XXXIII, p. 147 (1893); BRUNER, Biol. Cent.-Amer. Orthopt., II, pp. 222, 330 (1907-1908).

The various species of which the present genus is composed belong to tropical America. Nine species are recognized in Kirby's *Synonymic Catalogue of Orthoptera*. It might be stated here that these insects are so very similar in their general appearance and even in

their structure, that no attempt has thus far been made to make a synoptical key for their separation.

127. *Osmilia flavolineata* (De Geer).

Acridium flavolineatum DE GEER, Mém. Ins., III, p. 497, No. 13, pl. 42, fig. 4 (1773).

Acridium flavolineatum BURMEISTER, Handb. Ent., II, p. 634, No. 20 (1838).

Acridium (Osmilia) flavolineatum STÅL, Recens. Orthopt., I, p. 68, No. 18 (1873).

Osmilia flavolineatum BRUNER, Biol. Cent.-Amer., Orthopt., pp. 330, 331 (1908).

Habitat.—A pair, male and female, coming from Bogotá, Colombia, are placed here. They form part of accession number 2306.

128. *Osmilia violacea* (Thunberg)?

Gryllus violaceus THUNBERG, Mém. Acad. Petersb., IX, pp. 396, 413 (1824).

Acridium (Osmilia) violaceum STÅL, Recens. Orthopt., I, p. 68, No. 19 (1873).

Osmilia violacea GIGLIO-TOS, Boll. Mus. Zool. Anat. Comp. Torino, IX, No. 184, p. 18 (1894).

Habitat.—There are two males and six females of this genus before me that come from Santa Cruz de la Sierra, Bolivia, Paraguay, and several Brazilian localities. Although Kirby has included my former references to *violacea* among his synonymy of the previous species, I am still inclined to refer them to Thunberg's *violacea* on account of their bluish-tinted wings. I note that Giglio-Tos also referred an *Osmilia* from the same general locality to this species.

Genus RHYTIDICHROTA Stål.

Rhytidichrota STÅL, Recens. Orthopt., I, pp. 35, 54 (1873); BRUNER, Biol. Cent.-Amer., Orthopt., II, pp. 222, 237 (1907-1908).

Several apterous locusts of tropical South America that are below medium in size have been separated under the generic name *Rhytidichrota*. They occur in and about the margins of forests, where they live in moderate numbers among the low herbage.

129. *Rhytidichrota lævifrons* Stål.

Rhytidichrota lævifrons STÅL, Bihang. Svensk. Akad. Handl., V, No. 4, p. 78 (1878).

Habitat.—A pair of this locust was collected by J. D. Haseman on October 17th, 1909, at Madeira Falls, Rio Madeira, Brazil.

Genus PYCNOSARCUS Bolivar.

Pycnosarcus BOLIVAR, Boll. Soc. Esp., VI, p. 392 (1906).

Polysarcus SAUSSURE (*nec* Fieber), Rev. Zool., (2), XI, p. 392 (1859); BRUNER, Ann. Mus. Genova, XXXIII, p. 148 (1893).

130. **Pycnosarcus atavus** (Saussure).

Polysarcus atavus SAUSSURE, Rev. Zool., (2), XI, p. 393 (1859).

Pycnosarcus atavus KIRBY, Syn. Cat. Orthopt., III, p. 544 (1910); BRUNER, Ann. Carnegie Mus., VIII, p. 147 (1911).

Habitat.—There is a single nymph of this odd-looking locust at hand. It was taken at Rio de Janeiro, and bears the accession number 2966.

XVIII. A REVISION OF THE GENUS CHÆMEPELIA.

BY W. E. CLYDE TODD.

INTRODUCTION.

The present paper is the outgrowth of an attempt to identify the series of Ground Doves in the collection of the Carnegie Museum, a series which, although small, seemed to indicate the existence of several apparently undescribed forms. The confusion in which the various members of this genus were found to be involved, however, appeared to be such as to forbid satisfactory conclusions being reached until a thorough revision of the entire group could be made, and this task was accordingly undertaken. Through the cordial coöperation of the authorities of the larger museums in this country, and through the courtesy of several owners of private collections, the writer has been able to bring together no less than nineteen hundred and twenty specimens of this genus, representing all of the known forms, and including a number of types. Although in the nature of the case a considerable percentage of this material is not of the best quality, Ground Doves being especially difficult to make up into good skins, and although certain geographical areas (particularly in South America) are sparsely represented by specimens, it has been possible for the first time to work out to advantage the characters, relationships, and ranges of the various forms. The results of this study are embodied in the present revision, which has considerably exceeded the scope originally planned, and is now presented as an effort to correlate our knowledge of this group of birds into one harmonious whole.

Accordingly, there has been an attempt to make the list of references to the literature of the group as complete as possible. While time and effort have not been spared in this endeavor, it is of course too much to hope that absolute completeness has been attained, but it is believed that over ninety per cent of the references have been duly recorded. Although it is true that many of those here given are of no especial scientific importance, it is also true that such a thorough

search through the literature as their collation has involved, if undertaken by revisers generally, would tend to place systematic ornithology, and particularly nomenclature, on a much sounder basis. It has seemed best, therefore, to list all the references found, however trivial in character. Moreover, of all those appearing in the tables of synonymy on succeeding pages, less than a half-dozen have been taken at second-hand, and all but about fifty have been personally verified by the writer. For memoranda on the remainder he is indebted to Prof. Wells W. Cooke, Mr. Harry C. Oberholser, Dr. Charles W. Richmond, Mr. Joseph H. Riley, Mr. Austin H. Clark, Mr. Witmer Stone, Dr. Glover M. Allen, Mr. Waldron DeWitt Miller, and Mr. J. Warren Jacobs in this country, to Dr. A. Menegaux of Paris, France, and to Mr. Charles Chubb of London, England. To Messrs. Richmond and Oberholser he is also under additional obligations for numerous suggestions and much valuable criticism. To those persons who have placed material at his disposal for study in this connection he takes this opportunity of again returning thanks.

All measurements given are in millimeters, and, unless otherwise stated, are based on a series of not less than ten good specimens. Ridgway's *Nomenclature of Colors* has been used as a standard in preparing descriptions.

Genus CHÆMEPELIA Swainson.

The principal references to the genus, together with a list of the emended forms under which it has appeared, are given in this table.

Columba, part, LINNÆUS, Syst. Nat., ed. 10, I, 1758, 162; ed. 12, I, 1766, 279.—

GMELIN, Syst. Nat., I, ii, 1789, 769, and of earlier authors generally.

Goura, part, STEPHENS, Shaw's Gen. Zoöl., XI, i, 1819, 119.

Columbina SPIX, Avium Species Novæ, II, 1825, 57, 58, part (no type indicated).—

GRAY, List Gen. Birds, 1840, 58 (*Columba passerina* Linnæus designated as type).—ALLEN, Bull. Am. Mus. Nat. Hist., XXIV, 1907, 33, 44, 46 (crit.).—

ALLEN, Auk, XXV, 1908, 301 (crit.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XXVI, 1909, 300 (crit.).—ALLEN, Science, n. s., XXXIII, 1911, 336 (crit.).—INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE,

Smiths. Inst. Publ. No. 2013, 1911, 73 (crit.).—BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (list of South American forms).

Columbigallina (not of Oken, 1817) BOIE, Isis, 1826, 977 (type, *Columba passerina* Linnæus).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N.

Am. Birds, 1886, 181.—RIDGWAY, Man. N. Am. Birds, 1887, 214 (diag.).—

CORY, Auk, IV, 1887, 116.—CORY, Birds W. Indies, 1889, 217.—WATERHOUSE,

Ind. Gen. Avium, 1889, 50.—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893,

- 472, footnote (crit.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 2, 1895, 122.—COUES, Auk, XIV, 1897, 215, in text (crit.).—DUBOIS, Syn. Avium, II, 1902, 763 (syn.).—COUES, Key N. Am. Birds, ed. 5, II, 1903, 715 (diag.; crit.).—STONE, Auk, XXIV, 1907, 192 (crit.; =*Chamepelia* Swainson).—ALLEN, Bull. Am. Mus. Nat. Hist., XXIII, 1907, 327, in text (= *Chamepelia* Swainson); XXIV, 1907, 33, in text, 44, 46 (crit.; = *Columbina* Spix).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XXVI, 1909, 297 (= *Chamepelia* Swainson).—DABBENE, An. Mus. Nac. Buenos Aires, XVIII, 1910, 193.
- Chamepelia* SWAINSON, Zool. Journ., III, 1827, 361, part (diag.; no type specified; includes *Columba passerina* Linnaeus and *C. squamosa* Temminck).—LESSON, Man. d'Orn., II, 1828, 162 (ex Swainson).—SELBY, Jardine's Naturalist's Library, Birds, IX, 1835, 198, part (characters; type, *Columba talpicoli* [sic] Temminck).—SWAINSON, Class. Birds, II, 1837, 349 (diag.; *C. cinnamomina* Spix given as "example").—GRAY, List Gen. and Subgen. Birds, 1855, 100 (syn.; *Columba passerina* Linnaeus designated as type).—GRAY, List Birds Brit. Mus., Columbæ, 1856, 49, part (syn.).—GRAY, Hand-List Birds, II, 1870, 239 (syn.; list of species).—WALLACE, Geog. Distr. Animals, II, 1876, 333 (geog. distr.).—WATERHOUSE, Ind. Gen. Avium, 1889, 37.—STONE, Auk, XXIV, 1907, 192 (replaces *Columbigallina* Boie).—ALLEN, Bull. Am. Mus. Nat. Hist., XXIII, 1907, 327 (crit.; type); XXIV, 1907, 33, in text (crit.; type).—ALLEN, Auk, XXV, 1908, 301 (crit.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XXVI, 1909, 297 (replaces *Columbigallina* Boie), 300 (crit.).—KNOWLTON, Birds of the World, 1909, 432, in text.—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150.—ALLEN, Science, n. s., XXXIII, 1911, 336 (crit.).—INTERNATIONAL COMMISSION ON ZOÖLOGICAL NOMENCLATURE, Smiths. Inst. Publ. No. 2013, 1911, 73 (crit.).
- Chamepelia* (emendation?) LESSON, Traité d'Orn., 1831 (?), 474.—BONAPARTE, Geog. and Comp. List, 1838, 41.—SUMICHRAST, Naturaleza, V, 1881, 231.—MENECAUX, Bull. Mus. d'Hist. Nat., XV, 1909, 238.
- Chamaepelia* (emendation) SWAINSON, Class. Birds, II, 1837, 380, in index (correction of *Chamepelia*, p. 349).—GRAY, List Gen. Birds, ed. 2, 1841, 75 (syn.).—GRAY, Gen. Birds, II, 1845, 475, part (characters; list of species).—BONAPARTE, Consp. Avium, II, 1854, 77 (diag.).—BONAPARTE, Compt. Rend., XL, 1855, 20, in text.—SUNDEVALL, Tentamen, 1872, 100, excl. syn. part.—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389 (diag.).—WALLACE, Geog. Distr. Animals, II, 1876, 109 (geog. distr.).—MAYNARD, Birds E. N. Am., 1881, 245 (diag.).—COUES, Key N. Am. Birds, ed. 2, 1884, 569 (diag.).—WATERHOUSE, Ind. Gen. Avium, 1889, 39.—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 470 (diag.), 472 (syn.).—MAYNARD, Birds E. N. Am., ed. 2, 1895, 245 (diag.).—SHARPE, Hand-List Birds, I, 1899, 81 (list of species).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 249 (diag.).
- "*Chamepelia* Swainson" (*lapsus*) GRAY, List Gen. Birds, 1840, 58, in synonymy.—GRAY, List Birds Brit. Mus., Columbæ, 1856, 49, in synonymy.
- Chamaepelia* (emendation) GLOGER, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, I, 184-, 367.—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel,

- II, 1856, 295 (characters).—BAIRD, Report Pacific R. R. Survey, IX, 1858, 606.—GILL, Osprey, IV, 1900, 168, in text (crit.).
- "*Chamæpelea Swainson*" (*lapsus*) TSCHUDI, Fauna Peruana, Aves, 1845-6, 45.
- Chamæpelis* (emendation?) JARDINE, Jardine's Contr. Orn., 1849, 79.—HURDIS, Jardine's Contr. Orn., 1850, 6.—COUES and PRENTISS, Smiths. Report for 1861, 1862, 414.—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., VIII, 1865, 178.—LEOTAUD, Ois. Trinidad, 1866, 366.—ELLIOT, Standard Nat. Hist., IV, 1885, 247, in text.—DALGLEISH, Proc. Royal Phys. Soc. Edinburgh, X, 1888-89, 86.—REID, Bull. 25 U. S. Nat. Mus., 1884, 225.—QUELCH, Timehri, V, 1891, 106.—TESCHEMAKER, Avic. Mag., VI, 1908, 257.
- Chamaëpeleia* (emendation) REICHENBACH, Avium Syst. Nat., 1850, xxiv.—REICHENBACH, Tauben, 1862, 15.
- Talpacotia* BONAPARTE, Consp. Avium, II, 1854, 79 (diag.; type, by tautonymy, *Columba talpacoti* Temminck).—BONAPARTE, Compt. Rend., XL, 1855, 22, in text (diag.), 220.—WATERHOUSE, Ind. Gen. Avium, 1889, 217.—ALLEN, Auk, XXV, 1908, 301, 305, in text (crit.).
- Chamæpelis* (*lapsus*) SCLATER, Proc. Zoöl. Soc. London, 1857, 19.
- Chæmepelia* (*lapsus*) LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., VII, 1861, 301.
- Pyrgitoënas* REICHENBACH, Tauben, 1862, 13 (new name for *Chamæpelis* Swainson).
- Chamæopelia* (emendation?) SCLATER, Proc. Zoöl. Soc. London, 1864, 178.—TAYLOR, Ibis, 1864, 171.—SUNDEVALL, Öfv. Kongl. Vet.-Akad. Förh., "1869," 1870, 601.
- Chamæpilea* (*lapsus*) BRYANT, Proc. Boston Soc. Nat. Hist., X, 1866, 257.
- Chamæpeleia* (emendation) COOPER, Proc. California Acad. Sci., IV, 1870, 65.—COUES, Key N. Am. Birds, 1872, 226.—COUES, Check List N. Am. Birds, 1873, 75.—CORY, Birds Bahama Is., 1880, 228.—WATERHOUSE, Index Gen. Avium, 1889, 39.
- Peristera*, part, SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 134.
- Chæpelis* (*lapsus*) HENSHAW, Report Expl. W. 100th Meridian, V, 1875, 433, in synonymy.
- Chameæpelis* (*lapsus*) FIROR, Familiar Science and Fancier's Journal, n. s., V, 1878, 86.
- Leptopelia* HEINE, in HEINE and REICHENOW, Nomencl. Mus. Hein., Orn., 1890, 283 (new name for *Talpacotia* Bonaparte, on grounds of purism).—RICHMOND, Proc. U. S. Nat. Mus., XXIV, 1902, 691 (crit.).
- Columbogallina* (*lapsus*) LANTZ, Trans. Kansas Acad. Sci., XVI, 1899, 219.
- Chamaëpelis* (*lapsus*) VON IHERING, Anuario do Estado do Rio Grande do Sul, 1900, 146.
- Chamepella* (*lapsus*) BANGS, Auk, XXIV, 1907, 292.
- Chamapelia* (*lapsus*) ALLEN, Bull. Am. Mus. Nat. Hist., XXIV, 1907, 46, in index.

Bibliography.—The literature on this group dates back as far at least as 1654, when du Tertre referred to the "Ortolans of Martinique, which are little Turtle-doves no larger than larks" (translation). Willughby published a very good general account and recognizable plate of the same species in 1676, based on the Barbados bird, and it

is mentioned by several other early writers on the West Indies. Linnæus based his description of *Columba passerina* largely upon Catesby, who was the first to give an account of the bird from eastern North America. In the twelfth edition of his *Systema Naturæ* (1766) Linnæus gave a binomial name to the "Turtur parvus fuscus americanus" of Brisson, calling it *Columba minuta*. *Columba talpacoti* was formally described by Temminck and figured by Madame Knip in 1808-11, although it had been noticed by Azara a few years earlier. *Talpacotia rufipennis* was described by Bonaparte in 1854, and in 1877 the last specific member of the genus to be discovered, *Chamæpelis buckleyi*, was described by Messrs. Sclater and Salvin.

Meanwhile *Chæmepelia* or *Chamæpelis* of Swainson had come to be applied to the group, and as early as 1854 Bonaparte had critically treated the species involved, amplifying his review the following year in a paper entitled "Coup d'œil sur l'ordre des Pigeons." Bonaparte was the first author to recognize that *C. passerina* was a composite (as it was then regarded) or variable species, but unfortunately he made the mistake of referring *Columba minuta* Linnæus to it as a synonym, while at the same time redescribing the latter under two different names. For the species with partially feathered tarsi he proposed the genus *Talpacotia*—a name which has had but little currency—referring thereto *T. cinnamomea*, *T. godina* (both synonyms of the earlier *Columba talpacoti*), and his new species *T. rufipennis*. Thus, instead of clearing up the situation, Bonaparte considerably increased the confusion, and, indeed, most of the errors into which subsequent authors have fallen in regard to this group of birds are directly due to having blindly followed Bonaparte's lead.

Information concerning the ranges of the various species continued to accumulate, and after trinomials came into vogue several subspecies of *C. passerina* were described, but no important critical review of the genus as a whole again appeared until 1893, when Count Tommaso Salvadori published his great work on the Pigeons as Volume XXI of the *Catalogue of the Birds in the British Museum*. The index to the literature pertaining to the Ground Doves as given in this work is unusually full, but the author's conservatism in the matter of trinomials led him to merge all the subspecific names thus far proposed for *C. passerina* under one head, while at the same time admitting the existence of geographical variation. Yet if there ever was a case demanding the use of trinomials, surely it is this, and

Count Salvadori's account is thus quite inadequate and disappointing. Precisely the opposite course, however, has been followed by Dr. Percy R. Lowe, who has reviewed the *C. passerina* group within recent years. In this paper all the various forms are treated as full species, and the rules of nomenclature have been disregarded freely. Nevertheless Dr. Lowe's paper is an exceedingly timely and important contribution to the subject, and has been extensively used in the preparation of the present review.

Habits.—As implied by their name, the Ground Doves are birds of the open country, and spend much of their time on the ground. They are usually seen in pairs, but after the breeding season may gather into small flocks. As a rule they are not shy, and in some regions are actually most abundant in the neighborhood of human habitations, and in cultivated districts generally. In some sections they are shot for food, but as a rule their small size has operated to their advantage. In all the species (except *C. buckleyi*, whose nidification is not yet known) the nest is a frail affair of twigs and weed-stalks, placed in a low bush or on the ground, and the eggs are two in number, pure white.

Relationships.—The present genus would seem to find its proper position in the small group of neotropical genera called by Count Salvadori Peristerinæ, which name, however, requires to be changed to Claraviinæ, to correspond with the proper name of its principal genus. As characterized by this and most later authors the genus includes six species, but one of these is clearly not congeneric with the others, and before attempting to formulate any intelligible diagnosis of *Chamepelia* it becomes necessary to remove it therefrom under the name

EUPELIA genus novum.

Similar to *Chamepelia* Swainson, but bill relatively much longer and stouter, with base more turgid, and nostrils wider, more open; feet also somewhat stouter; inner web of seventh primary entire; and lesser coverts with a metallic band. Similar in style of coloration to *Columbina* Spix (*Columbula* of authors), but bill and feet stouter, and tail relatively shorter and not double rounded. Type, *Columba cruziana* Prévost and Knip, which will thus stand as *Eupelia cruziana*.

The genera of this group may now be re-arranged, as follows:

KEY TO THE GENERA OF CLARAVINÆ.

- A. Tall much longer than half the wing.
- a. Outer primary not abruptly attenuated.
 - b. Tail decidedly shorter than the wing.
 - c. Tail relatively longer, somewhat double rounded, the middle and outer rectrices shorter than the intermediate ones...*Columbina*.
 - c¹. Tail relatively shorter, simply rounded.
 - d. Bill stout; inner web of seventh primary entire...*Eupelia*.
 - d¹. Bill slender; seventh primary abruptly toothed on the inner web.....*Chamepelia*.
 - b¹. Tail decidedly longer than the wing.....*Uropelia*.
 - a¹. Outer primary abruptly attenuated.
 - b. Tail longer than the wing.....*Oxyptelia*.
 - b¹. Tail shorter than the wing.....*Claravis*.
- A¹. Tail short, little more than half the wing.....*Metriopelia*.

Eupelia is obviously related to both *Columbina* and *Chamepelia*, but sufficiently distinct from either to stand alone. *Chamepelia*, as above restricted, is a very homogeneous and easily defined group.

Generic characters.—Bill much shorter than the head, very small and slender, its base little expanded, the commissure faintly decurved throughout its length. Nostrils linear, overhung by a membrane, and opening immediately behind the median constriction. Inter-ramal space feathered to a point even with the anterior extremity of the nostrils. Wings short and rounded, the seventh, eighth, and ninth¹ primaries subequal and longest, the outermost decidedly shorter (except in *C. buckleyi*). Seventh primary abruptly toothed on the inner web, and seventh, eighth, and ninth primaries emarginate on the outer webs, toward their tips. Tertiaries much elongated, falling short of the primaries in the closed wing by much less than the length of the tarsus. Tail much shorter than the wing, evenly rounded, the rectrices with broad tips. Feet relatively weak; tarsus about equal to middle toe without claw; lateral toes subequal, barely reaching to the extremity of middle toe; hallux still shorter. Size small (wing not over 92 mm.), and sexes unlike; males plain grayish brown or vinaceous above, the crown with more or less cinereous or plumbeous; below vinaceous; the inner wing-coverts and tertiaries with irregular glossy metallic spots on their outer webs. Females much duller and browner, with little or no vinaceous. Five species, including twenty-two subspecies.

In *C. buckleyi*, *C. talpacoti*, and *C. rufipennis* there is a narrow line

¹ Counting from the *inside*.

of feathers on the sides of the tarsus, most prominent on the outer side and towards the heel. In *C. buckleyi* the tenth (outermost) primary is very nearly as long as the next three, instead of decidedly shorter. *C. talpacoti* and *C. buckleyi* agree with each other in having the wings uniform dusky, all the other species having the remiges more or less rufous. *C. passerina* differs from the other species in its prominently squamate head and breast, but this character is more or less evident in the juvenal stage of the remaining species, indicating their derivation from a common ancestral type.

Range.—Tropical America in general, north regularly to the Bermudas, South Carolina, Texas, and Arizona; south to Paraguay and northern Argentina.

Taxonomic history.—Following Linnæus, most of the earlier writers referred the species of this genus—of which *C. passerina* was the earliest and best known—to *Columba* of that author. Stephens, however, placed it in his genus *Goura*, and in 1825 Spix described two of the species under the generic heading *Columbina*, for which he gave no diagnosis and fixed no type. The following year Boie proposed the genus *Columbigallina*, with *Columba passerina* Linnæus as type. Passing by Spix's name, *Columbigallina* was taken up by the American Ornithologists' Union in 1886 as the earliest name for this genus, and not until 1907 was it discovered to be antedated by *Columbigallina* Oken, 1817. This "long, badly constructed name, without generic characters," however, met with but little favor outside of America, most European authorities falling back on *Chamepelia* Swainson, 1827. This author cited as "examples" of his new genus *Columba passerina* Linnæus and *Columba squamosa* Temminck, but designated no type, and it is further to be noted that one of the characters given in his diagnosis, "the sides of the tarsi feathered," does not apply to either of the above species. Because of this discrepancy Reichenbach proposed in 1862 to restrict Swainson's name to the species with feathered tarsi (for which Bonaparte had meanwhile established a genus of his own, *Talpacotia*), and to place *C. passerina* and its allies in a new genus, *Pyrgitoënas*, but such action was of course clearly invalid according to present rules. In 1841 Gray fixed the type of *Chamepelia*² as *Columba passerina* Linnæus.

² It should be noted, however, that in this instance Gray used the name in its corrected form, *Chamepelia*. Should this emendation be considered as a distinct name the fixation of the type of *Chamepelia* would have to date from J. E. Gray, 1855.

Leptopelia Heine and Reichenow, 1890, is merely a new name for *Talpacotia* Bonaparte, proposed on grounds of purism.

Very recently Dr. J. A. Allen has sought to revive *Columbina* of Spix for the present group, on the ground that Gray in 1840 designated *Columba passerina* as its type, thus fixing the name. But inasmuch as this specific name, as such, does not appear as one of the originally included species, but under the guise instead of *Columbina griseola*, which is now known to be a subspecies of *C. passerina*, Dr. Allen's position has been called in question. The matter was formally referred by the American Ornithologists' Union Nomenclature Committee to the International Commission on Zoölogical Nomenclature, and the decision of that body, recently published, is to the effect that Gray's designation of a type for *Columbina* in 1840 was invalid, and that the type remained to be fixed. Previously to the publication of this decision, but evidently with a knowledge of its contents, Dr. Allen proceeded to formally fix the type of *Columbina* as *Columbina griseola* (= *Columbina passerina griseola* [Spix]). It would seem, however, as if the Commission, in deciding that Gray's first designation of a type for *Columbina* was invalid, had overlooked the fact that a year later he designated types for both *Columbina* and *Chæmepelia* (*Columbina strepitans* and *Columba passerina* respectively)—designations which are open to no such objections as invalidated his original action. Hence Dr. Allen's latest formal fixing of the type is quite superfluous, and it is therefore possible to conserve *Chæmepelia* for this generic group, while *Columbina* will replace *Columbula* Bonaparte, 1854.

The orthography of the name has given rise to endless trouble. Swainson originally wrote the word "*Chæmepelia*"—an obvious slip for "*Chamæpelia*," compounded from χαμαί and πέλει. Ten years later, in his *Classification of Birds*, he unfortunately repeated the error, but discovered it in time to correct it in the index.³ Later authors have also been more or less unfortunate in their use of the word, and compositors and proof-readers have occasionally added to the confusion, as will be evident from the table of synonymy of the genus, wherein the word is spelled in no less than *eighteen* different

³ The writer takes this opportunity of expressing his lack of sympathy with any code of nomenclature which makes no provision for the correction of such a palpably absurd error as this, but instead carefully provides for its perpetuation, on the ground that science is not literature. But if science must appropriate the tools of literature, why not at least use them in the right way?

ways!⁴ Excepting in the generic synonymy above referred to, no effort has been made in the present paper to sort the references according to the use or non-use of the diphthong "æ" in the name, except sometimes in cases where only a single reference is involved.

Species and subspecies.—Twenty-two forms, referable to five specific types, are recognized in the present review. All of the species are subject to a great deal of sexual, individual, and age variation, and *C. passerina* in particular is unusually plastic and susceptible to varying conditions of environment. The difficulty of discriminating these geographical variants arises not so much from the subtle nature of the differential characters as from the necessity of first eliminating all other kinds of variation. Thus, while it is often difficult or even impossible to refer a given specimen to any particular form, a *series* of specimens from any one locality may readily be placed, their collective distinctive characters being thus brought into prominence. Good series of specimens are quite necessary in reaching positive conclusions in the study of the Ground Doves, and where the available material has been inadequate some questions have arisen regarding the status of certain forms. As in numerous parallel cases, intergradation between the various forms is often much in evidence, and must be taken into account in attempting to define their respective characters and ranges. In the recognition of geographical races the endeavor has been to follow a consistent and conservative middle course, basing all diagnoses on evident average differences between typical specimens. The following key is intended more as a tabular exposition of the salient characters and relationships of the forms, however, than as a practical aid in the identification of specimens.

KEY TO THE SPECIES AND SUBSPECIES OF *CHÆMEPELIA*.

Based on Adult Males.

- A. Sides of the tarsus naked. (*Chæmepelia*.)
- a. Breast squamate. (*C. passerina*.)
 - b. Larger, wing averaging over 85 mm.
 - c. Above plain grayish brown; below deeper vinaceous.

C. passerina passerina.
 - c¹. Above drab gray; below paler vinaceous.

C. passerina pallescens.
 - c². Above dull brownish olive; below intermediate vinaceous.

C. passerina neglecta.

⁴ But I do not regard this as an argument against the non-emendation of names.

b¹. Smaller, wing averaging less than 85 mm.

c. Above suffused with olive-brown.

d. Larger, wing averaging 83 mm. . . . *C. passerina socorroënsis*.

d¹. Smaller, wing averaging 76 mm. . . . *C. passerina parvula*.

c¹. Above more grayish.

d. Crown and nape suffused with vinaceous, almost concolor with the back. *C. passerina nana*.

d¹. Crown and nape suffused with plumbeous, contrasting with the back.

e. Plumbeous color and squamation of crown and nape obsolescent.

f. Larger, wing averaging 84.5 mm.; coloration brighter.
C. passerina quitensis.

f¹. Smaller, wing averaging 79 mm.; coloration darker.
C. passerina griseola.

e¹. Plumbeous color and squamation of crown and nape evident.

f. Vinaceous areas tinged with lavender-gray.

g. Under tail-coverts extensively white; base of bill yellow. *C. passerina albivitta*.

g¹. Under tail-coverts merely whitish or grayish; base of bill olive or olive-brown.

C. passerina antillarum.

f¹. Vinaceous areas usually without any lavender-gray tinge.

g. Larger, wing averaging 80 mm. or more, tail 56 mm. or more.

h. Basal half or two-thirds of bill crimson.

C. passerina trochila.

h¹. Basal half or two-thirds of bill orange or yellow.

i. Darker. *C. passerina jamaicensis*.

i¹. Paler. *C. passerina insularis*.

h². Bill black, sometimes with a little red at the base.

i. Darker, more brownish olive above.

C. passerina aflavida.

i¹. Paler, more grayish olive above.

C. passerina bahamensis.

g¹. Smaller, wing averaging 78.5 mm.; tail 52 mm.

C. passerina exigua.

a¹. Breast plain. (*C. minuta*.)

b. Paler. *C. minuta minuta*.

b¹. Darker. *C. minuta elæodes*.

A¹. Sides of the tarsus with a narrow line of feathers. (*Talpacotia*.)

a. Remiges black or blackish, with no rufous.

b. Above vinaceous gray. *C. buckleyi*.

- b*¹. Above vinaceous chestnut.....*C. talpacoti*.
*a*¹. Remiges with more or less rufous. (*C. rufipennis*.)
b. Darker.....*C. rufipennis rufipennis*.
*b*¹. Paler.....*C. rufipennis eluta*.

Chæmepelia passerina (Linnæus).

Under this head are placed such references to this species as are of uncertain, indefinite, or general application. Some of the latter class, however, appear also under the various subspecies involved.

"Ortolan" DE ROCHEFORT, Histoire naturelle et morale des Iles antilles de l'Amerique, 1658, 153 (Antilles).

"Columbus minimus . . ." KLEIN, Historiæ Avium Prodomus, 1750, 120, No. 124, part (references).

Columba passerina LINNÆUS, Syst. Nat., ed. 10, I, 1758, 165, excl. syn. part (diag.; "America inter tropicos"; ex Sloane, Catesby, Ray, and Willughby); ed. 12, I, 1766, 285 (ex auctoribus eisdem, atque Brisson).—SCOPOLI, Annus I. Historico-Naturalis, 1769, 126, No. 183 (diag.; "in Americæ torridæ rupibus et arbustis").—FORSTER, Cat. Animals N. Am., 1771, 11.—MÜLLER, Natursystem, II, 1773, 512 (descr.; geog. distr.).—JACQUIN, Beyträge, 1784, 32 (diag.; habits).—GMELIN, Syst. Nat., I, ii, 1789, 787, excl. syn. part (diag.; "in Americæ calidioribus ad Carolinam usque"; ex Jacquin, Ray, Brisson, Buffon, Willughby, Catesby, Sloane, Brown, Latham, and Pennant).—LATHAM, Ind. Orn., II, 1790, 611 (diag.; syn.).—BONNATERRE, Tabl. Enc. et Méth., I, 1792, 252 (descr.; habits; "l'Amérique").—LICHTENSTEIN, Cat. Rerum Nat. Rar., 1793, 40 (South America).—TURTON, Gen. Syst. Nat., I, 1806, 478 (diag., etc.).—TEMMINCK, Cat. Syst. Cab. Orn., 1807, 144 (syn.).—TEMMINCK, in TEMMINCK and KNIP, Pigeons, I, 1808-II, Colombi-gallines, 24, pls. 13-14 (South America; Caribbean Islands; Porto Rico; San Domingo; descr. and general account).—LATHAM, Syst. Orn., 1809, 274 (diag.; syn.).—WILSON, Am. Orn., VI, 1812, 15, part ("West Indies").—TEMMINCK, Hist. Nat. Gén. Pigeons et Gallinacés, I, 1813, 425 (geog. distr.; descr.; general account), 496 (diag.; syn.).—ORD, in Guthrie's Geography, Am. ed. 2, 1815, 317, (340) (North and South Carolina; Louisiana; Florida; Mexico; West Indies; habits).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 401 (geog. distr.; general account).—VIEILLOT, Gal. Oiseaux, I, 1825, 333, pl. 196 (syn.; descr.; geog. distr.; habits).—DESMAREST, Dict. Sci. Nat., XL, 1826, 308 (descr.; geog. distr.; habits).—WAGLER, Syst. Avium, 1827, [260], *Columba*, sp. 88 (United States and Caribbean Islands; descr.; syn.).—LESSON, Man. d'Orn., II, 1828, 162 (given by Swainson as one of the types of his genus *Chæmepelia*).—BONAPARTE, Ann. Lyc. Nat. Hist. N. Y., II, 1828, 120 (diag.; geog. distr.).—LESSON, Traité d'Orn., 1831(?), 474 (references).—SELBY, Jardine's Naturalist's Library, Birds, IX, 1835, 202, in text.—OKEN, Allgemeine Naturgeschichte, VII, 1837, 294 (descr.; references; geog. distr.; habits, ex Wilson).—[RIVOLI?], Catalogue de la magnifique Collection d'Oiseaux, 1846, 30 (America).—KAUP, Das Thierrich, II, 1856, 49 (descr.; North America and West Indies).—SUNDEVALL, Öfv. Kongl. Vet.-Akad. Förh., "1869," 1870, 586 (North America;

- crit.).—ALLEN, Bull. Am. Mus. Nat. Hist., XXIII, 1907, 327, in text (type of *Chamepelia* Swainson); XXIV, 1907, 33, in text (type of *Columbina* Spix).—ALLEN, Auk, XXV, 1908, 301, in text (crit.).—BERLEPSCH, Nov. Zoöl., XV, 1908, 295, in synonymy (crit.).—INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE, Smiths. Inst. Publ. No. 2013, 1911, 73, in text (crit.).
- "Turtur parvus americanus" BRISSON, Orn., I, 1760, 113, pl. 9, fig. 1, excl. syn. part ("in variis Americæ locis"; descr.; syn.).
- "Cocotzin" BUFFON, Hist. Nat. Oiseaux, II, 1771, 559, part.—MAUDUYT, Enc. Méth., I, 1780, 598, excl. syn. part (descr.; habits).
- "Ground Turtle" LATHAM, Gen. Syn. Birds, II, ii, 1783, 659 (geog. distr.; descr.; habits).—LATHAM, Suppl. Gen. Syn. Birds, 1787, 200, part (geog. distr.; habits).—LATHAM, Gen. Hist. Birds, VIII, 1823, 91 (geog. distr.; syn.; descr.; habits; Burke Country [= County?], *vide* Abbot).
- "Ground Pigeon" PENNANT, Arctic Zoölogy, II, 1785, 328 (geog. distr.; descr.; habits); ed. 2, II, 1792, 8.
- "Erd-Turteltaube" BECHSTEIN, Johann Latham's allgemeine Uebersicht der Vögel, 1795, 633 (syn.; general account).
- Columbigallina passerina* BOIE, Isis, 1826, 977.—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, 1886, 181 (geog. distr.).—CORY, Auk, IV, 1887, 116 (Bahamas and Antilles; descr.; references).—JORDAN, Man. Vert. N. U. S., ed. 5, 1890, 254 (diag.; geog. distr.).—SHUFELDT, Proc. Zoöl. Soc. London, 1891, 194 (comparative osteology).—BERLEPSCH, Journ. f. Orn., XL, 1892, 102 (geog. distr.).—HARTERT, Ibis, 1893, 305, part ("South America"). SHUFELDT, Journ. Morph., XVII, 1901, 489, footnote (osteology).—BANGS, Auk, XVIII, 1901, 251, in text (crit.).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; syn.; crit.).
- Chamepelia passerina* SWAINSON, Zoöl. Journ., III, 1827, 361 (generic name).—GRAY, List Birds Brit. Mus., Columbæ, 1856, 49 (Jamaica; North America; South America; Mexico; syn.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150 (geog. distr.).
- Columbina passerina* GRAY, List Gen. Birds, 1840, 58.
- Chamepelia passerina* GRAY, List Gen. Birds, ed. 2, 1841, 75 (designated as type of *Chamepelia* Swainson).—GRAY, List Gallinæ Brit. Mus., 1844, 14, part (North America).—GRAY, Gen. Birds, II, 1845, 475.—(?) REICHENBACH, Syn. Avium, Columbariæ, 1847, pl. 256, figs. 1419–20.—HARTLAUB, Isis, XL, 1847, 606 (West Indies).—REICHENBACH, Syst. Avium, Columbariæ, Novit. Suppl., 1851, pl. 266, figs. 2875–8.—LICHTENSTEIN, Nom. Avium Mus. Zoöl. Berol., 1854, 82 (North America; Cuba; Colombia).—BONAPARTE, Consp. Avium, II, 1854, 77 (geog. distr.: "ex America sept. et Antillis; Jamaica, Hispaniola, Florida, Georgia, Carolina, Louisiana, Mexico").—SCLATER, Cat. Vert. Animals in Gardens Zoöl. Soc. London, 1862, 62 ("North America").—GIEBEL, Thes. Orn., I, 1872, 635, excl. ref. to *C. minuta* Linnæus (references).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133 (Mexico; Central and South America, to Brazil).—SOUSA, Mus. Nac. Lisboa, Columba, 1873, 20, part ("Costa Firme").—COUES, Birds Northwest, 1874, 390 (geog. distr.; references).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389, pl. 58, fig. 6 (descr., references, general account).—SCHMIDT, Proc. Zoöl. Soc. London, 1880, 314 (duration of

- life).—SALVIN, Cat. Strickland Coll., 1882, 547, part (North America).—CORY, List Birds W. Indies, 1885, 24 (West Indies).—TRISTRAM, Cat. Coll. Birds, 1889, 39, part ("West India").—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473 (descr.; syn.; geog. distr.; crit.).—SCLATER, List Vert. Animals in Gardens Zool. Soc. London, ed. 9, 1896, 465 ("America").—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101 (descr. eggs).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 250 (syn.; geog. distr.; crit.).—LOWE, Ibis, 1907, 115, in text (crit.).—LOWE, Bull. Brit. Orn. Club, XXI, 1908, 110, in text (crit.).
- Chamaepeleia passerina* REICHENBACH, Avium Syst. Nat., 1850, xxiv.
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part ("Antilles").
- Chamaepeleia passerina* ELLIOT, Stand. Nat. Hist., IV, 1885, 247, in text (southern North America, Mexico, and Central America to Brazil; habits).
- Columbigallina passerina griseola* (not of Spix) HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXII, 1906, 697, part ("Bogotá," Colombia).

Specific characters.—Male: above, including scapulars, tertiaries, and upper tail-coverts, varying from plain drab gray to olive-brown; crown and nape more or less cinereous or plumbeous, usually enclosing a brown area; forehead, sides of head, and entire under parts some shade of vinaceous, palest on the throat and abdomen; feathers of the breast with dusky centers, and those of the breast and head all around with darker margins, giving a squamate appearance; inner wing-coverts and tertiaries marked on the outer webs with irregular spots of glossy metallic steel-blue or violet; wings rufous chestnut, the remiges more or less dusky brown or black at the tips and on the outer webs; under wing-coverts rufous chestnut; tail black, the base more or less grayish, the two middle rectrices resembling the back, and the outermost rectrices externally edged with white toward the tips.

Female: resembles the male in general, but is duller and browner, without the vinaceous color (normally) on the head and underneath,

⁵ It is true that Hernandez (sometimes given as "Fernandez") in 1628 gave an extended account of the "Cocotzin" of Mexico, which was copied almost verbatim by Nieremberg in 1635, the latter author's bird being identified by Willughby with his own "Turtur barbadensis minimus" or "Least Barbados Turtle." A careful reading of Hernandez's description, however, leaves the exact application of his name very uncertain indeed, despite the circumstantial nature of his account. Moreover, Willughby himself seems to have copied from Nieremberg, but the recognizable figure which he gives, together with the definite locality quoted, puts his account on a somewhat better basis.

(It is, however, proper to add that the writer has not been able to consult the 1628 edition of Hernandez in this connection, the description in question being from the 1651 edition of his *Historia Animalium*, page 24. Compare Coues, *Birds of the Colorado Valley*, Bibliographical Appendix, 1878, 570.)

these parts being colored much like the upper surface, while the throat, abdomen, and under tail-coverts generally have more white.

History.—This species came under the notice of naturalists very early, being first mentioned,⁵ so far as I am able to discover, by du Tertre in 1654, under the name "Ortolan." This was with reference to the bird of Martinique, and practically all of the earliest notices we have pertain to various other West Indian localities. It was reported by Catesby from South Carolina in 1731, and by Bancroft from Guiana in 1769. Linnæus, in describing the species under the name *Columba passerina* in 1758, based his account on Sloane, Catesby, Ray, Willughby, and Marcgrave. The "Picui-pinima" of the latter author, however, is clearly a *Scardafella*, and as the Ray references (with one exception) are also based exclusively on Marcgrave's bird Linnæus' species must be taken from Sloane, Catesby, and Willughby, the respective localities represented being Jamaica, South Carolina, and Barbados. As will be shown beyond, South Carolina must be taken as the type locality. Linnæus merely gives "America inter tropicos."

The species figures extensively in the ornithological literature of the next hundred years, being noticed by almost every author and compiler who had occasion to deal with the neotropical avifauna. Spix described the form from Brazil in 1825 under the name *Columbina griseola*, not identifying it with the Linnæan species, and his specific name is the earliest proposed for any of the races (excepting, of course, true *passerina*). Not until 1854, with the publication of Bonaparte's *Conspectus Avium*, was it recognized that the species was an aggregation of geographical races, but as trinomials were then not in vogue, Bonaparte described three additional forms as full species, pointing out their distinctive characters. Since Bonaparte wrote his review of this genus, and more especially since trinomials have come into common use, one form after another has been described, until no less than twenty-two names are now on the list of claimants for recognition as subspecies. Some of these are *nomina nuda*, others are indeterminable, and still others are accompanied by descriptions which make comparisons of the new forms with others to which they are not at all closely related—a most misleading feature, naturally productive of much misapprehension and confusion. Again, some type specimens are actually not typical, being extremes, intergrades, or immature birds of the forms to which

⁵ [See page 520.]

they belong. To those authors who may find their names reduced to synonymy these considerations are respectfully commended.

Geographic variation.—This mainly affects the size, general intensity and shade of coloration of the upper and under parts and wing-coverts, the extent of the plumbeous or cinereous area on the crown and nape, and the color of the bill. As shown by the table of measurements on page 592, the average sexual difference in size is very little. The three forms from continental North America, *C. p. passerina*, *C. p. pallescens*, and *C. p. neglecta*, are the largest, while the form from the interior of Colombia, *C. p. parvula*, is remarkably small, the remaining forms being intermediate in this respect. The exact shade of color varies greatly, as may be seen by comparing two such forms as *C. p. socorroënsis* and *C. p. exigua*. Two forms, *C. p. albivitta* and *C. p. antillarum*, have a peculiar lavender gray cast to the plumage, occasionally obvious also in *C. p. quitensis* and *C. p. aflavida*. There is a tendency in some of the South American forms towards the expansion of the brownish area of the crown and nape, the grayish color becoming obsolete.

It is the matter of the color of the base of the bill in life, however, that has perhaps given the most trouble, owing of course to want of exact information in many cases. No doubt the color varies somewhat with age, as in other species, but after allowing for this there would seem to be four types of coloration occurring, each fairly constant for adult birds of the respective species involved. In *C. p. passerina*, *C. p. albivitta*, and *C. p. jamaicensis*, for example, the basal half or two-thirds of the bill is yellow or orange yellow in life, this color fading to dull yellowish in the dry skin, but leaving the bill conspicuously bicolor in appearance. In *C. p. pallescens*, *C. p. neglecta*, *C. p. quitensis*, and *C. p. trochila* the base of the bill is more or less crimson, which becomes dusky brownish upon drying, giving a much more uniform effect. *C. p. antillarum* is said to have the base of the bill clear olive or olive-brown in life, while in *C. p. bahamensis* it is almost wholly black. We are greatly indebted to Dr. Percy R. Lowe for our present knowledge along this line, especially as regards the various Antillean forms, which otherwise would be much more difficult to discriminate. [As Dr. Lowe points out, even if no other distinctive characters were available, there can be no justification for "lumping" such forms under one name, as Count Salvadori has done.

Phylogeny.—Even in the case of insular forms intergradation with the races occupying adjacent areas is more or less evident, and in the few instances noted beyond, where this is apparently not the case, it is probable that further explorations will bring to light such intermediate examples. We are justified, therefore, in attributing to *C. passerina* a practically continuous and very extensive distribution, stretching from Peru and Brazil northward through Central America and Mexico to southern Texas and Arizona, and through the Antillean chain to the southeastern United States. Being a bird of the open country, there are of course wide forest areas from which it has not been reported, but otherwise the only bar to its spread would seem to be the higher mountain ranges. We may thus account for the wide dispersion of the Brazilian form, *C. p. griseola*, as well as for the fact that there are no less than three distinct races in the Andean region of Colombia, corresponding to three separate physiographic areas. The species as a whole is undoubtedly of South American origin, but which of the existing races is nearest the primitive form is a question.

Were the various races dependent upon a single set of characters for their definition, the tracing of their genetic relationship would possibly be simple enough, but the matter is vastly complicated when varying combinations of several different characters, not correlated with each other, are involved. To illustrate: take the case of three forms which agree in having the base of the bill yellow or orange-yellow—*C. p. passerina*, *C. p. jamaicensis*, and *C. p. albivitta*. This agreement can scarcely be considered indicative of close affinity in view of the present distribution of these forms, which are isolated not only by wide water areas, but also by the interposition of certain other forms quite different in respect to the character in question. Again, the insular race *C. p. socorroënsis* finds its nearest relative, so far as color alone is concerned, in a form from the interior of Colombia, *C. p. parvula*. Aside from this, perhaps the most curious case is that of *C. p. exigua*, a form which has developed on a small island between Porto Rico and Haiti, but differs decidedly from the bird of either island, while at the same time being exactly like the bird of Great Inagua in the Bahama group. This of course may be a case of the re-duplication of characters under similar conditions of environment.

Enough has been said to show the difficulty of arriving at any positive conclusions on this point. The writer's own views, so far as they can be expressed in a linear sequence of names, are represented

in the key on page 516, where a geographical arrangement has been attempted, based on the assumption that *C. p. griseola* is the central form of the species, which spread northward through Central America on the one hand and the Antilles on the other. Inasmuch as contiguous forms usually have certain characters in common, such an arrangement is by no means an unnatural one. As a matter of convenience, as well as because it is the earliest named and best known form, *C. p. passerina* will be first taken up, and its characters and variations studied in some detail as a basis for comparison.

***Chæmepelia passerina passerina* (Linnæus).**

"*Turtur minimus guttatus*" CATESBY, The Natural History of Carolina, etc., I, 1731, 26, pl. 26 ([South] Carolina).

Columba passerina LINNÆUS, Syst. Nat., ed. 10, I, 1758, 165, part (*ex* Catesby; diag.); ed. 12, I, 1766, 285, part (reprint orig. descr.).—FORSTER, Cat. Animals N. Am., 1771, 11.—GMELIN, Syst. Nat., I, ii, 1789, 787, part (diag.; references).—LATHAM, Ind. Orn., II, 1790, 611, part (diag.; syn.).—BARTRAM, Travels, 1791, 290 (Carolina and Florida).—BARTON, Fragments Nat. Hist. Pa., 1799, vi (near Philadelphia, Pa., accidental).—WILSON, Am. Orn., VI, 1812, 15, part, pl. 46, figs. 2-3 (North and South Carolina; Georgia; Florida; sea islands of Carolina and Georgia; upper parts of Cape Fear River; syn.; descr.; habits).—ORD, in Guthrie's Geography, Am. ed. 2, 1815, 317, (340), part (North and South Carolina; Georgia; Louisiana; Florida; habits).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 401, part (Florida; Georgia; South Carolina).—VIEILLOT, Gal. Oiseaux, I, 1825, 333, part, pl. 196 (United States, from Carolina southward).—BONAPARTE, Journ. Acad. Nat. Sci. Philadelphia, IV, 1825, 265 (southern United States; crit.).—DESMAREST, Dict. Sci. Nat., XL, 1826, 308, part (part of American continent).—WAGLER, Syst. Avium, 1827, [260], Columba, sp. 88, part (United States; descr.; syn.).—BONAPARTE, Ann. Lyc. Nat. Hist. N. Y., II, 1828, 120, part (southern United States; diag.).—WILSON and BONAPARTE, Am. Orn., Jameson ed., II, 1831, 304 (geog. distr.; syn.; descr.; habits).—NUTTALL, Manual Orn., I, 1832, 635 (from Virginia southward; habits).—AUDUBON, Orn. Biog., II, 1834, 471, pl. 182 (lower parts of Louisiana to Cape Hatteras; sea islands of Georgia; coast of east Florida; St. Augustine, Florida; Charleston, South Carolina; Sandy I., south of Cape Sable, Florida; descr.; habits); V, 1839, 558 ("rarely met with to the westward of the mouths of the Mississippi").—AUDUBON, Syn. Birds N. Am., 1839, 192 (Florida; Florida Keys; "Louisiana to North Carolina, including Alabama and Georgia"; descr.).—AUDUBON, Birds Am., V, 1842, 19, pl. 283 (reprint of matter in Orn. Biog., *antea*).—DENNY, Proc. Zool. Soc. London, 1847, 38, part (United States, in geog. distr.).—GERHARDT, Naumannia, 1854, 193 (Florida); 1855, 383 (Georgia).

"Ground Turtle" LATHAM, Gen. Syn. Birds, II, ii, 1783, 659, part (Carolina).

"Ground Pigeon" PENNANT, Arctic Zoölogy, II, 1785, 328, part (Carolina).

Goura passerina STEPHENS, Shaw's Gen. Zoöl., XI, i, 1819, 133 (descr.; references; occasional in Carolina and the southern parts of Pennsylvania); XIV, i, 1826, 296.

- Chamæpelia passerina* BONAPARTE, Geog. and Comp. List, 1838, 41 ("southern parts" of America).
- Chamæpelia passerina* HEERMANN, Cat. Oöl. Coll. Acad. Nat. Sci. Philadelphia, 1853, 23 (Georgia).—BONAPARTE, Consp. Avium, II, 1854, 77, part (Florida; Georgia; Carolina; Louisiana).—BONAPARTE, Compt. Rend., XI, 1855, 20, 21 (crit.), 220.—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, footnote (North America; ex Bonaparte).—BAIRD, Report Pacific R. R. Survey, IX, 1858, xlv, part (geog. distr.), 606, part (Washington, D. C.; Liberty County, Georgia; Cape Florida, Indian Key, and Amelia I., Florida; crit.; syn.).—NEWTON, Ibis, 1859, 254, in text (crit.).—[COUES], in Philps' Washington Described, 1861, 27 (Washington, D. C., accidental).—TAYLOR, Ibis, 1862, 129 (Florida).—COUES, Proc. Boston Soc. Nat. Hist., XII, 1868, 121 (South Carolina, mainly coastwise).—STEARNS, Am. Nat., III, 1869, 282, footnote (Fernandina, Florida).—TURNBULL, Birds E. Pa. and N. J., 1869, 43 (Camden, New Jersey, *vide* Krider).—LIBHART, in MOMBERT, An Authentic History of Lancaster Co., Pa., 1869, 512 (Lancaster Co., Pennsylvania, one shot in 1844).—COOPER, Orn. Calif., 1870, 516, part (Florida; habits; geog. distr.).—ALLEN, Bull. Mus. Comp. Zoöl., II, 1871, 342 (east Florida), 393 (faunal range).—COUES, Birds North-west, 1874, 390, part (near Columbia, South Carolina; Washington, D. C.; syn.).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389, part, pl. 58, fig. 6 (eastern United States; references; descr.; crit.; life history).—JOUY, Field and Forest, II, 1877, 179 (District of Columbia, accidental).—JASPER, Birds N. Am., 1878, 122, 174, pl. 78, fig. 3; pl. 114, fig. 33 (habits, etc.).—MAYNARD, Birds E. N. Am., 1879, 340 (South Carolina and Florida; descr.; habits).—BROWN, Bull. Nuttall Orn. Club, IV, 1879, 12 (Montgomery, Alabama, *vide* Jackson).—KRIDER, Field Notes, 1879, 55 (Key West, Florida; New Jersey, November).—RIDGWAY, Proc. U. S. Nat. Mus., III, 1880, 195, part (North America).—RIDGWAY, Bull. 21 U. S. Nat. Mus., 1881, 40, part (North America).—MAYNARD, Birds E. N. Am., 1881, 245 (sea islands of South Carolina to Key West, Florida; descr.; nesting; habits).—COUES, Check List N. Am. Birds, 1882, 92, part.—COUES and PRENTISS, Bull. 26 U. S. Nat. Mus., 1883, 91 (District of Columbia, one instance).—BAILEY, Bull. Nuttall Orn. Club, VIII, 1883, 41 (Georgia; nesting).—ATKINS, Orn. and Oöl., IX, 1884, 81 (Livingston Co., Michigan [error !!]).—COUES, Key N. Am. Birds, ed. 2, 1884, 569, part ("Atlantic to Pacific"; descr.).—PERRY, Young Oölogist, I, 1884, 10, 30 (Savannah, Georgia; nesting).—HASBROUCK, Orn. and Oöl., X, 1885, 42, 79 (Palatka, Florida; habits).—DAVIE, Egg Check List N. Am. Birds, 1885, 37 (descr. eggs).—DAVIE, Nests and Eggs N. Am. Birds, ed. 2, 1886, 113 (nesting).—BROWNE, Orn. and Oöl., XI, 1886, 18 ([Orlando?], Florida).—CAIRNS, Orn. and Oöl., XII, 1887, 6 (Buncombe Co., North Carolina, accidental).—NORRIS, Orn. and Oöl., XII, 1887, 7 (Charleston, South Carolina; nesting; *vide* Wayne).—HOXIE, Orn. and Oöl., XII, 1887, 94, 155 (Frogmore, South Carolina, nesting).—PERRY, Orn. and Oöl., XII, 1887, 102 (Savannah, Georgia, nesting).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Beaufort Co., South Carolina; Tarpon Springs, St. Augustine, Titusville, and Cedar Keys, Florida; crit.).—MAYNARD, Birds E. N. Am., 1895, 245 (sea-islands, South Carolina; Key West, Florida; descr.; habits).—FORBES and ROBINSON, Bull. Liverpool Mus., II,

- 1900, 141, part (Florida).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101, part (descr. eggs).—SALVIN and GODMAN, Biol. Centr.-Am., Avos, III, 1902, 250, part (Florida; crit.).—NICOLL, Ibis, 1904, 590 (Charlotte Harbor, Florida).
- Chamepeleia passerina* (?) GRAY, List Birds Brit. Mus., Columbæ, 1856, 49, part ("North America").—(?) GRAY, Hand-List Birds, II, 1870, 239, part ("North America").—(?) BOUCARD, Cat. Avium, 1876, 34, part ("North America").
- Pyrgitoënas passerina* REICHENBACH, Tauben, 1862, 13, part (general account, *ex* Audubon; excl. ref. Jamaica).
- Chamepeleia passerina* COUES and PRENTISS, Smiths. Report for 1861, 1862, 414 (District of Columbia, accidental).—ELLIOT, Stand. Nat. Hist., IV, 1885, 247, in text, part (southern North America; habits).—MORRISON, Oölogist, V, 1888, 7 (Lake Helen, Florida; nesting).
- Chamepeleia passerina* COUES, Key N. Am. Birds, 1872, 227, part (descr.).—COUES, Check List N. Am. Birds, 1873, 75, part.—MERRIAM, Am. Nat., VIII, 1874, 89 (St. John's River, Florida).—GRINNELL, Bull. Nutt. Orn. Club, III, 1878, 147 (New York City, accidental).
- Chamepeleia passerina* FIROR, Familiar Science and Fancier's Journal, n. s., V, 1878, 86 (Virginia, accidental; Georgia and Florida; descr.; habits).
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- "*Columbigallina purpurea* Maynard" AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, X, 1893, 62 (crit.).—PALMER, Osprey, V, 1901, 148 (Kissimmee Valley, Florida; habits; crit.).
- Chamepelia terrestris* SHARPE, Hand-List Birds, I, 1899, 81 (southeastern United States).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 251, in text (Florida; crit.).—LOWE, Ibis, 1907, 114, 116, 117, in text (crit.); 1908, 110 (Charlotte Harbor, Florida, crit.).
- Columbigallina passerina* var. *purpurea* DUBOIS, Syn. Avium, II, 1902, 763 (southeastern United States).
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Description.—Adult male: above, including scapulars and tertiaries, plain grayish brown or rather dark hair-brown, with rump and upper tail-coverts usually more decidedly grayish (mouse-gray); crown (from a line even with the eyes), occiput, and nape plumbeous, enclosing a dull brownish area of greater or less extent, and each

feather margined with dusky; forehead, sides of head and neck, and entire under parts dull pinkish vinaceous, palest on the throat and the sides of the head, becoming duller, more whitish, on the middle of the abdomen, and passing into dusky on the under tail-coverts, which are usually edged with whitish or vinaceous white; feathers of the breast with partially concealed dusky centers, and those of the head and neck all around with obscure darker margins, giving a decidedly squamate effect; wing-coverts pale gray, more or less strongly shaded with pinkish vinaceous (the inner ones usually entirely of this color), marked on the outer webs with irregular glossy spots of dark metallic violet, which sometimes are arranged to form one or more bars across the coverts; tertiaries also with one or two violet spots on the outer webs; alula black; primary-coverts black with rufous chestnut centers; primaries rufous chestnut, the tips and outer webs more or less extensively black or dusky brown; secondaries dusky on the outer webs and rufous chestnut on the inner, in gradually decreasing amount; axillaries and under wing-coverts rufous chestnut; middle rectrices dark grayish brown, this color decreasing in amount on the lateral rectrices, which are black with dusky tips, the two outermost with the tips and distal portion of the outer webs narrowly white; feet flesh-colored; iris orange red; bill "pale red, inclining to orange, dusky at the tip" (Audubon), "dark greenish horn-color at tip, bright orange along commissure, paler and more yellowish orange about the nostrils" (Worthington).

Female similar, but lacking (normally) all trace of vinaceous: above plain grayish brown, duller and browner than in the male; crown, occiput, and nape dull olive-gray, with a central brownish area; forehead similar but usually much paler; below, including sides of head and neck, light brownish gray, fading into whitish on the throat, chin, and middle of the abdomen; head and neck all around, and the breast, squamate as in the male; under tail-coverts grayish dusky with prominent grayish white tips and margins; wings as in the male, but brown margins and tips of remiges more extensive; wing-coverts pale gray, and spots on inner coverts and tertiaries usually more bronzy in lustre; tail as in the male, and colors of soft parts similar but duller.

Age variation.—The youngest male examined is one from Amelia Island, Florida, October 4, 1906 (No. 17,062, Bishop Collection). In this bird the general coloration resembles that of the female, but all the feathers of the upper parts, including those of the wing-coverts

and tertiaries, but excepting those of the crown and nape, are narrowly tipped with whitish. The middle coverts have a narrow median streak of rusty, while the greater ones are edged with the same. Below the color is as in the adult female, but the squamation of the breast is obsolescent. The tail is not fully grown, and the feathers of the chin, forehead, and tibiae are just sprouting. The wing-spots are indicated on the coverts and tertiaries, but are almost entirely devoid of metallic lustre.

Another bird from the same locality (No. 17,061, Bishop Collection), although taken earlier in the season, seems to indicate that the first winter plumage is acquired by a postjuvinal moult which apparently involves the wing-coverts and body-plumage alone. Unfortunately there are no other specimens available showing this moult, while examples from Danfuskie Island, South Carolina (No. 23,703, Collection Carnegie Museum) and Broto Neck, Georgia (No. 13,907, Bishop Collection), taken as late as November 25 and December 5 respectively, are still practically in juvenal dress. As this species is known to breed in almost every month of the year, however, the time of moulting is evidently not arbitrarily circumscribed. Moreover, it is quite possible that in some cases there is a limited prenuptial moult, involving the feathers of the head and throat, in early spring. Such at least is indicated by certain specimens from Dummitt's and Miami, Florida (Nos. 10,553, 10,555, and 14,116, Collection Museum Comparative Zoölogy), taken between February 7 and 26, which individuals are doubtless immature, judging from their light-tipped greater wing-coverts. At any rate, it is by such a change that the young male becomes indistinguishable from the adult, except sometimes by the rather duller and fewer metallic wing-spots. Probably the birds with the most and brightest spots are the oldest.

A young female (No. 133,134, Collection U. S. National Museum, Anastasia Island, Florida, May 15, 1894), closely resembles the young male first described, but is rather duller and browner below. A female in first nuptial plumage (No. 4,186, Collection Museum Comparative Zoölogy, Indian River, Florida, April 20) is quite uniform above, including the crown, and duller and browner than in fully adult birds, with conspicuous white edgings to the wing-coverts, which have apparently been retained from the juvenal plumage.

Seasonal variation.—No differences are observable in adult males taken in December, January, and May. A November specimen is

somewhat grayer above. Unfortunately midsummer birds are not available, but would probably show some slight fading. Females likewise show no variation according to season.

Geographic variation.—This form seems remarkably constant throughout its range. I can discover no differences between birds from the Florida Keys on the one hand and those from the Suwanee River and Georgia and South Carolina on the other, when specimens of the same age and sex are compared. It would naturally be expected that Louisiana birds would show variation in the direction of *C. p. pallescens*, but all efforts to secure authentic specimens from that State having failed, this question must be left in abeyance.

Individual variation.—This is evident in several respects. The amount of metallic spotting on the wings is perhaps the most variable character, although, as before intimated, it is possible that this is to some extent at least dependent upon age. The amount of dusky brown color on the wings, and especially on the outer primaries and their coverts, is another variable character. Many individuals have the outer webs of the primaries extensively rufous chestnut at the base, showing prominently in the closed wing, while in others this color is scarcely or not apparent, the outer webs being more extensively dusky brown. The under tail-coverts in both sexes, but more particularly in the male, are subject to much variation as regards the amount of paler tipping. Making due allowance for the greasy and more or less discolored condition of many of the specimens, the variation in color of the under parts is remarkably small in adult males, the extremes being represented respectively by No. 2,393, Bishop Collection ("Peninsular Florida," February 26, 1889), which is fully as dark below as *C. p. socorroënsis*, and No. 14,878, Bishop Collection (Amelia Island, Florida, November 21, 1905), which compares favorably with *C. p. pallescens*. The vast majority of specimens, however, fall midway between these two extremes. There is decidedly more variation in the color of the upper parts, numerous examples being practically indistinguishable from *C. p. pallescens* in this respect. The patch of brownish feathers on the occiput, usually well marked, is occasionally merely indicated, the whole crown and nape being practically "solid" plumbeous gray.

Females vary much as do males in general intensity of color, some being quite light, others much darker. Some females (if correctly sexed) assume a decidedly vinaceous tinge beneath, as in the other

sex; this is probably due to exceptional vigor and development. Several specimens also show an extension of the rufous chestnut of the axillaries, ordinarily concealed by the closed wing, over the flanks and sides of the abdomen.

Measurements.—Male: wing, 84–89 (average, 86); tail, 59–65 (62); exposed culmen, 11–12 (11.5); tarsus, 15–17 (16). Female: wing, 85–88 (86.5); tail, 55–63 (60); exposed culmen, 11.5–12 (11.7); tarsus, 15–17.5 (15.8).

Range.—Peninsula of Florida, north regularly (chiefly coastwise) to Charleston, South Carolina, occasionally to North Carolina and westward to Louisiana; accidental in Virginia, Tennessee, Maryland, Pennsylvania, New Jersey, and New York.

Remarks.—The earliest reference pertaining to this form appears to be that of Catesby (1731), whose description and figure formed part of the basis of Linnæus' name *Columba passerina*, the specific designation having probably been suggested by the upturned tail and sparrow-like pose of the bird in Catesby's plate. This author seems to have remained for many years the chief source of information concerning the Ground Dove of this region, as later writers based their accounts on his, sometimes without giving due credit. Wilson was the next author to give an extended notice of the bird, and Audubon's account, published in 1834, still remains the best we have, although since then numerous additional facts have been put on record concerning its nesting and distribution.

It was not until 1887, however, that Mr. Charles J. Maynard pointed out the differences between the bird of eastern North America and that of the Bahamas, but being uncertain to which of these Linnæus' term *passerina* should apply, he proposed the provisional name *Chamæpelia purpurea* for the "larger continental Dove." This name, published in an obscure trade journal, was critically discussed in 1892 by Mr. Frank M. Chapman, who considered it "unavailable from [on] either logical or zoölogical grounds," Mr. Maynard's "remarks being so vaguely worded as to be capable of several interpretations." Having indicated the differences between the bird of Jamaica (which he accepted as the type locality of *Columba passerina* Linnæus) and that of eastern North America, Mr. Chapman accordingly proposed to call the latter by the subspecific name *terrestris*, but like Mr. Maynard he failed to designate a type. This name was presently accepted by the American Ornithologists' Union

Nomenclature Committee, and has been in current use ever since. As late as 1901, however, Mr. William Palmer took exception to this ruling, and pointed out that should Mr. Maynard designate a type his name would in any case have precedence. Meanwhile, however, Mr. Maynard had become convinced that the name *passerina* had been taken primarily from Catesby, so he proceeded to give the Jamaican bird a new name.

A few months before Mr. Chapman's article was published Count Hans von Berlepsch also decided that Jamaica must be considered as the type locality of *Columba passerina*, mainly on the ground that Sloane is the first citation given by Linnæus, and he therefore accepted Maynard's name *purpurea* for the large North American form. Subsequently both Count von Berlepsch and Dr. Ernst Hartert have explicitly given Jamaica as the type locality of *passerina*. Both these and other authors have evidently entirely overlooked Bonaparte's remarks bearing on this point, published in 1855. In his review of this genus he states as follows:

"Quoi qu'il en soit, je laisse exclusivement ce nom de *Ch. passerina*, Sw. ex L., à l'espèce de l'Amérique septentrionale figurée par Catesby, Buffon, Wilson et Audubon; et je donne les noms de *Ch. granatina* Bp., *Ch. albivitta* Bp., et *Ch. trochila* Bp., à trois espèces nouvelles qui ont, comme le vraie *passerina*, la gorge ondulée de couleur obscure."

Inasmuch as Linnæus' diagnosis applies equally well to both the Jamaican and the eastern North American forms, Bonaparte was entirely within his rights in thus restricting the application of the name *passerina*, and as his meaning is perfectly clear and explicit, and his action in this regard anticipates by many years that of Maynard, Berlepsch, and Chapman, it will be necessary to adopt the name *passerina* as the subspecific appellation of the form from eastern North America, accepting South Carolina (*ex* Catesby) as the type locality. Thus any further controversy over the status of the name *purpurea* is happily avoided, and *passerina* is conserved for the best known form.

The Ground Dove is most abundant in peninsular Florida, but extends northward regularly at least as far as Charleston, South Carolina. It is resident throughout the year, but in the northern part of its range is said to be partially migratory. Audubon says that it is a bird of the maritime lowlands, scarcely to be found more than one hundred miles from the coast. He records it from Louisiana,

where, however, it must be very rare, for, although included in the latest list of birds from that State, repeated inquiry has failed to elicit a single authentic specimen. It is therefore very doubtful whether the range of *C. p. passerina* is regularly continuous with that of *C. p. pallescens*. Indeed, it appears to be a rare bird all along the Gulf coast, until the region of the Suwanee River in northern Florida is reached. It has been recorded as a casual or accidental visitor from the mountain region of western North Carolina and eastern Tennessee, and from south-central Virginia, while there are two records from the vicinity of Washington, D. C., New York City, and southeastern Pennsylvania, and one from western New Jersey. The Michigan record by Dr. H. A. Atkins proves to have been erroneous, according to Prof. Walter B. Barrows.

***Chæmepelia passerina pallescens* Baird.**

(?) "Tortore" GEMELLI CARERI, *Giro del Mondo*, VI, 1719, 7 (Acapulco, Mexico).
 (?) "Tourterelle" GEMELLI CARERI, *Voyage du tour du Monde*, VI, 1727, 12 (Acapulco, Mexico).

Columba pusilla (not of Lichtenstein, 1816, 1818, or 1819) LICHTENSTEIN, *Preis-Verz. Mex. Vögel*, 1830, 3 (Mexico; *nomen nudum*).—BONAPARTE, *Compt. Rend.*, XLIII, 1856, 945 (crit.).—CABANIS, *Journ. f. Orn.*, XI, 1863, 58 (reprint original reference).

Columba passerina (not of Linnæus) ROEMER, *Texas* (title), 1849, 461 (New Braunfels, Texas).—STEPHENS, *Incidents of Travel in Yucatan*, 1868, 475 (Yucatan).

Chamæpelia passerina MCCALL, *Proc. Acad. Nat. Sci. Philadelphia*, 1851, 220 (Rio Grande, between Matamoros and Camargo, Tamaulipas).—BONAPARTE, *Consp. Avium*, II, 1854, 77, part (Mazatlan, Mexico; descr.).—BONAPARTE, *Compt. Rend.*, XLIII, 1856, 945 (crit.).—SCLATER, *Proc. Zoöl. Soc. London*, 1857, 205 (San Andres Tuxtla, Vera Cruz).—BAIRD, *Report Pacific R. R. Survey*, IX, 1858, 606, part (Matamoros and Tamaulipas, Mexico; La Paz, Lower California; crit.).—SCLATER, *Proc. Zoöl. Soc. London*, 1859, 369 (Jalapa, Vera Cruz), 391 (Oaxaca).—SCHOTT, *Report Lieut. Michler's Exp. to Isthmus of Darien*, 1861, 247, in text, part (Lower Bravo del Norte [Rio Grande] and off Lower California).—MÜLLER, *Reisen in Mexico*, 1865, 589 (Mexico).—DRESSER, *Ibis*, 1865, 313, in text (Matamoros, Mexico); 1866, 24 (Matamoros, Mexico; Fort Brown and San Antonio, Texas).—COUES, *Proc. Acad. Nat. Sci. Philadelphia*, 1866, 93 (Fort Yuma, Arizona; La Paz, Lower California; crit.).—COOPER, *Orn. Calif.*, 1870, 516, part (Fort Yuma and Fort Mojave, Arizona).—SCLATER and SALVIN, *Nom. Avium Neotrop.*, 1873, 133, part (Mexico).—COUES, *Am. Nat.*, VII, 1873, 323 (Tucson, Arizona, late nesting).—COUES, *Birds Northwest*, 1874, 390, part (southern Arizona; southern California; Cape St. [= San] Lucas, Lower California; references).—BAIRD, BREWER, and RIDGWAY, *Hist. N. Am. Birds*, III, 1875, 389, part (Monterey, California; western United States and

- Mexican references; crit.), 522 (San Francisco and San Gabriel, California, *vide* Cooper).—HENSHAW, Report Expl. W. 100th Meridian, V, 1875, 433 (Camp Lowell, Arizona; southwestern United States references; habits).—HENSHAW, Report Sec. War, II, ii, 1875, 1084 (Camp Lowell, Arizona).—SANCHEZ, An. Mus. Nac. Mexico, I, 1878, 105 (Matamoros, Tamaulipas; Yucatan).—MERRILL, Proc. U. S. Nat. Mus., I, 1878, 158 (Ft. Brown, Texas; nesting).—SENNETT, Bull. U. S. Geol. and Geog. Survey Terr., IV, 1878, 48 (Brownsville and Hidalgo, Texas; descr. eggs); V, 1879, 424 (Lomita, Texas).—RIDGWAY, Proc. U. S. Nat. Mus., III, 1880, 195, part (North America).—RIDGWAY, Bull. 21 U. S. Nat. Mus., 1881, 40, part (North America).—HOFFMAN, Bull. U. S. Geol. and Geog. Survey Terr., VI, 1881, 245 (Nevada?, *ex* Cooper).—HOLTERHOFF, Am. Nat., XV, 1881, 216 (Tucson, Arizona; nesting).—SUMICHRAST, Naturaleza, V, 1881, 231 (Mexico).—COUES, Check List N. Am. Birds, 1882, 92, part.—NEHRLING, Bull. Nutt. Orn. Club, VII, 1882, 175 (Houston, Texas).—BREWSTER, Bull. Nutt. Orn. Club, VIII, 1883, 32 (Tucson, Arizona; crit.).—BELDING, Proc. U. S. Nat. Mus., VI, 1883, 344 (Guaymas, Sonora).—COUES, Key N. Am. Birds, ed. 2, 1884, 569, part ("Atlantic to Pacific").—STEPHENS, Auk, II, 1885, 229 (Pedroquito, Sonora).—HEINE and REICHENOW, Nom. Mus. Hein., Orn., 1886, 283, part (Mexico).—BENNETT, Orn. and Oöl., XII, 1887, 69 (Laredo, Texas).—ROVIROSA, Naturaleza, VII, 1887, 380 (Rio Macuspana, Tabasco; syn.).—SALVIN, Ibis, 1889, 377 (Holbox I., Muges I., and Cozumel I., Yucatan); 1890, 89 (same localities).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Camp Lowell and Tucson, Arizona; Brownsville, Cameron Co., Hidalgo, and Corpus Christi, Texas; "California"; San José del Cabo, La Paz, and Cape San Lucas, Lower California; Matamoros, Sonora, Santa Rosa, Monte Morelas, Hacienda de los Escobas, San Blas, Zapotlan, Chapala, Chilpancingo, Chietla, Tampico, Tamesi, Sota la Marina, Aldama, Sierra Madre above Ciudad Victoria, Epatlan, Chimalpa, Axotla, Coapa, Mexicalcingo, Ixtapalapa, Culhuacan, Coatepec, Vera Cruz, Jalapa, Tehuantepec, Salina Cruz, environs of Mexico, Mazatlan, Tres Marias Is., Mexico; Holbox I., Muges I., Cozumel I., and Peto, Yucatan; Orange Walk, British Honduras).—LAURENCIO, Mem. y Rev. Soc. Cient. "Altonio Alzate," VII, 1894, 221 (Mexico).—HERRERA, Cat. Col. Aves Mus. Nac., 1895, 78 (Mexico).—RUST, Katalog systematischen Vogelsammlung des Provinzial Museums in Hanover, 1897, 77, part (Mexico).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141, part (Brownsville, Texas).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101, part (Texas).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 250, part (descr.; Mexican localities and references; crit.).
- Chamæpelia passerina* GRAY, List Birds Brit. Mus., Columbæ, 1856, 49, part (Mexico).—LAWRENCE, Bull. 4 U. S. Nat. Mus., 1876, 44 (Tehuantepec City, Mexico).
- Chamæpelia* var. *pallescens* BAIRD, Proc. Acad. Nat. Sci. Philadelphia, 1859, 301 (Cape St. [= San] Lucas, Lower California).
- Chamæpelia passerina* var. *pallescens* BAIRD, Proc. Acad. Nat. Sci. Philadelphia, 1859, 305 (Cape St. [= San] Lucas, Lower California; orig. descr.; type in collection U. S. National Museum, *vide* Richmond).—COOPER, Orn. Calif., 1870, 517, (Cape St. [= San] Lucas; descr.).—RIDGWAY, Proc. U. S. Nat. Mus.,

- III, 1880, 235 (ref. orig. descr.).—BREWSTER, Bull. Nutt. Orn. Club, VIII, 1883, 32, footnote (Tucson, Arizona; crit.).
- Pyrgitoënas passerina* REICHENBACH, Tauben, 1862, 162, part (Mexican references).
- Chamaopelia passerina* SCLATER, Proc. Zool. Soc. London, 1864, 178 (Mexico City, or "tierra caliente").
- "Ground Dove" COOPER, Am. Nat., III, 1869, 481 (Fort Mojave, Arizona).—COOPER, Bull. Nutt. Orn. Club, II, 1877, 95 (San Francisco, California).—FINLEY, Bird-Lore, XII, 1910, 262, pl. (Tucson, Arizona).
- Chamaepeleia passerina* COOPER, Proc. California Acad. Sci., IV, 1870, 65 (Colorado Valley).—COUES, Key N. Am. Birds, 1872, 227, part ("Atlantic to Pacific").—COUES, Check List N. Am. Birds, 1873, 75, part (North America).
- Chamaepeleia passerina* var. *pallescens* COUES, Key N. Am. Birds, 1872, 227, part (Cape St. [= San] Lucas, Lower California).—COUES, Check List N. Am. Birds, 1873, 75, part (North America).
- Chamaepelia pallescens* LAWRENCE, Proc. Boston Soc. Nat. Hist., XIV, 1872, 275, part (Tres Marias Is., Mexico; Cape San Lucas, Lower California).—GRAYSON, Proc. Boston Soc. Nat. Hist., XIV, 1872, 300, part (Tres Marias Is. and opposite mainland, Mexico).—SANCHEZ, An. Mus. Nac. Mexico, I, 1878, 105 (Mazatlan and Tres Marias Is., Mexico).—SHARPE, Hand-List Birds, I, 1899, 81, part (Texas to Arizona; Lower California; Mexico).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 252, in text (crit.).—LOWE, Ibis, 1907, 114, 115, 116, 117, in text (Mexico; Texas; Lower California; crit.); 1908, 111 (Tampico, Mexico; geog. distr., excl. Central American references; crit.), 545 (color of bill).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Cape St. [= San] Lucas, Lower California).
- Chamaepelia pallescens* LAWRENCE, Mem. Boston Soc. Nat. Hist., II, 1874, 305, part (Mazatlan and Tres Marias Is., Mexico; habits).
- Chamaepelia passerina pallescens* COUES, Check-List N. Am. Birds, 1882, 92.—BELDING, Proc. U. S. Nat. Mus., V, 1883, 544 (Cape region, Lower California).—COUES, Key N. Am. Birds, 1884, 569 (Cape St. [= San] Lucas, Lower California).—THAYER and BANGS, Condor, IX, 1907, 136 (Santana, Lower California).—SMITH, Condor, XI, 1909, 63 (Cuernavaca, Morelos, Mexico).
- Chamaepelia passerina* ELLIOT, Stand. Nat. Hist., IV, 1885, 247, in text, part (Mexico).
- Columbigallina passerina* RIDGWAY, Proc. U. S. Nat. Mus., VIII, 1885, 581, 583 (Cozumel I., Yucatan).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, 1886, 181, part (Texas; Arizona; Mexico).—SCOTT, Auk, III, 1886, 421 (Tucson, Florence, and Riverside, Pinal Co., Arizona).—RIDGWAY, Man. N. Am. Birds, 1887, 215, part (Texas; New Mexico; Arizona; Lower California).—BECKHAM, Proc. U. S. Nat. Mus., X, 1888, 657 (Medina River, Texas, *vide* Dresser).—COOKE, Bird Migration Miss. Valley, 1888, 110 (Eagle Pass, Texas).—EVERMANN and JENKINS, Orn. and Oöl., 1888, 68 (Magdalena, Mexico).—BELDING, Occ. Papers California Acad. Sci., II, 1890, 24 (San Francisco and San Gabriel, California, *vide* Cooper).—ATTWATER, Auk, IX, 1892, 233 (San Antonio, Texas).
- Columbigallina passerina pallescens* FERRARI-PEREZ, Proc. U. S. Nat. Mus., IX, 1886, 175 (Acatlan and Chietla, Puebla, Mexico).—RIDGWAY, Man. N. Am.

Birds, 1887, 586, part (diag.; geog. distr., excl. Central America).—BECKHAM, Proc. U. S. Nat. Mus., X, 1888, 637 (Bexar Co., Texas).—CHAPMAN, Auk, V, 1888, 395, part (geog. distr., *ex* Ridgway).—BRYANT, Proc. California Acad. Sci., (2), II, 1889, 278 (Comondu and Santa Margarita I., Lower California).—NORRIS, Orn. and Oöl., XIV, 1889, 59 (Santa Cruz Valley, near Tucson, Arizona; nesting).—MAYNARD, Eggs N. Am. Birds, 1890, 54 (geog. distr.; descr. eggs).—TOWNSEND, Proc. U. S. Nat. Mus., XIII, 1890, 137 (Cape St. [= San] Lucas, Lower California).—STONE, Proc. Acad. Nat. Sci. Philadelphia, 1890, 204 (Tekanto and Ticul, Yucatan), 212 (Orizaba, Mexico).—MAYNARD, Eggs N. Am. Birds, 1890, 54, excl. geog. distr. part (descr. eggs).—KEELER, Zoö, I, 1890, 299 (Colorado River, California).—BRYANT, Zoö, II, 1891, 188 (San José del Cabo, Lower California; habits).—RHOADS, Proc. Acad. Nat. Sci. Philadelphia, 1892, 112 (Corpus Christi, Texas), 114 (Tucson, Arizona).—BENDIRE, Life Hist. N. Am. Birds, I, 1892, 150, excl. Central American ref. (general account; Rillitto Creek, near Tucson, Arizona).—HARTERT, Ibis, 1893, 305, in text (Mexico; crit.).—ALLEN, Auk, X, 1893, 134 (faunal distribution).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 2, 1895, 123, part (geog. distr., excl. Central America).—CHAPMAN, Bull. Am. Mus. Nat. Hist., VIII, 1896, 287 (Chichen-Itza, Yucatan).—RIDGWAY, Man. N. Am. Birds, ed. 2, 1896, 591, part (diag.; geog. distr., excl. Central America).—COUES, Auk, XIV, 1897, 215 (crit.).—CHAPMAN, Bull. Am. Mus. Nat. Hist., X, 1898, 36 (Jalapa, Vera Cruz, Mexico).—DAVIE, Nests and Eggs N. Am. Birds, ed. 5, 1898, 189 (nesting).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XVI, 1899, 108.—NELSON, N. Am. Fauna, No. 14, 1899, 37 (María Madre and María Magdalena, Tres Marias Is., Mexico; crit.).—PRICE, Bull. Cooper Orn. Club, I, 1899, 91 (near Yuma, Arizona).—BRENINGER, Condor, III, 1901, 45 (Pima Indian Reservation, Arizona).—BANGS and BRADLEE, Auk, XVIII, 1901, 251, in text (crit.).—BAILEY, Handbook Birds Western U. S., 1902, 143 (descr.; habits).—GRINNELL, Pacific Coast Avifauna, No. 3, 1902, 31 (Monterey, Fort Yuma, San Francisco, San Gabriel, and Pescadero, California; rare and irregular).—BREWSTER, Bull. Mus. Comp. Zoöl., XLI, 1902, 79 (Sierra de la Laguna, La Paz, San José del Cabo, and Cape region in general, Lower California; references; habits).—COUES, Key N. Am. Birds, ed. 5, II, 1903, 716, part (descr., excl. Central American geog. distr.).—STEPHENS, Condor, V, 1903, 77 (Big Sandy Creek and Bill Williams River, Arizona; Ehrenberg, California).—OSGOOD, Condor, V, 1903, 129 (Sulphur Spring, near Wilcox, Cochise Co., Arizona).—CHAPMAN, Color Key N. Am. Birds, 1903, 126 (descr.; range).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XX, 1903, 360 (crit.).—SWARTH, Pacific Coast Avifauna, No. 4, 1904, 5 (Huachuca Mts. and San Pedro River, Arizona).—REED, N. Am. Birds' Eggs, 1904, 150 (nesting).—MILLER, Bull. Am. Mus. Nat. Hist., XXI, 1905, 343 (Escuinapa, Sinaloa, Mexico).—SWARTH, Condor, VII, 1905, 25 (Papago Indian Reservation, Arizona, habits).—BEEBE, Two Bird Lovers in Mexico, 1905, 185, 386 (Barranca Vueltran, Mexico).—BAILEY, Auk, XXIII, 1906, 385 (San Blas, Tepic).—HOWELL, Bull. Biol. Survey, No. 25, 1906, 22 (Texas; food).—THAYER and BANGS, Proc. Biol. Soc. Wash., XIX, 1906, 18 (Opodepe, Sonora).—COLE, Bull. Mus. Comp.

- Zoöl., L, 1906, 117 (Chichen-Itza and San Ignacio, Yucatan).—LAMB, Condor, XII, 1910, 76 (Las Marietas I., Mexico).
- Columbigallina passerina pallescens* LANTZ, Trans. Kansas Acad. Sci., XVI, 1899, 219 (La Paz, Lower California).
- "Mexican Ground Dove" LITTLEJOHN, Bull. Cooper Orn. Club, I, 1899, 73 (Pescadero, California, one record).—BROWN, Auk, XVII, 1900, 33 (southern Arizona).—LAMB, Condor, XII, 1910, 78 (Las Penas, Banderas Bay, Mexico).—WILLARD, Condor, XIV, 1912, 58 (Dos Reales, Arizona; nesting habits).—SLOAN, Bird-Lore, XIV, 1912, 34 (Palacios, Texas).
- Columbigallina passerina* var. *pallescens* DUBOIS, Syn. Avium, II, 1902, 763, part (southwestern United States; Lower California; Mexico; syn.).
- Columbigallina passerina pallascens (lapsus)* KAEDING, Condor, VII, 1905, 111 (San José del Cabo, Lower California).
- Chamepelia passerina pallescens* HOWELL, Bull. Biol. Survey, No. 29, 1907, 31 (Texas; food).—DEARBORN, Field Mus. Orn. Series, I, 1907, 80 (Gualan and Lake Atitlan, Guatemala).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XXVI, 1909, 297 (crit.).—KNOWLTON, Birds of the World, 1909, 432, in text, part (Mexico; habits).—VISHER, Auk, XXVII, 1910, 281 (Tucson, Arizona).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150, part (geog. distr., excl. Central America).—CARRIKER, Ann. Carnegie Mus., VI, 1910, 398, in text (crit.).—WILLARD, Condor, XIV, 1912, 53 (near Tucson, Arizona).—WILLETT, Pacific Coast Avifauna, No. 7, 1912, 44 (San Gabriel, Los Angeles Co., Banning, Riverside Co., and San Pasqual, San Diego Co., California).—GRINNELL, Pacific Coast Avifauna, No. 8, 1912, 13 (California).

Subspecific characters.—Similar to *C. p. passerina*, but averaging decidedly paler, more drab gray, both above and below, this difference obvious in both sexes; maxilla darker at base (in dried skin), dull crimson, brownish red, or purplish black in life.

Measurements.—Male: wing, 83–91 (average, 87); tail, 57–63 (59.5); exposed culmen, 11–12 (11.5); tarsus, 15–16 (15.6). Female: wing, 84–90 (86.5); tail, 57–62 (59); exposed culmen, 11–12 (11.5); tarsus, 15–16 (15.7).

Range.—From British Honduras and northern Guatemala north through Yucatan and Campeche, and northwestward through Mexico (except central plateau region) to southern Texas and southern Arizona; Cape region of Lower California; accidental in southern California.

Remarks.—Two nestlings of this form (Nos. 155,433–4, Collection Biological Survey), from the mountains near San Domingo, Oaxaca, June 18, 1895, are the youngest of any form of the species I have examined. They still show remains of buffy white natal down clinging to the tips of the juvenal feathers. The general color of the

plumage above is vandyke brown, the feathers narrowly edged with buffy; below wood-brown. Even at this early stage the black wing-spots are conspicuous, but of course not glossy. The remiges are dusky brown, edged externally with vandyke brown, like the back.

As already pointed out (page 520, footnote), the "Cocotzin" of Hernandez is not certainly identifiable, although it is apparently the sole basis upon which the Ground Dove was attributed to Mexico by sundry authors up at least to the year 1771, when Buffon cited Gemelli Careri as authority for the occurrence of the species at Acapulco. Specimens from Mexico in the Berlin Museum were called *Columba pusilla* by Lichtenstein in 1830, but no description was given. When Baird wrote his great work on North American birds in 1858 he was unable to find any differences between specimens of the Ground Dove from Florida, Texas, and Lower California, but soon afterwards the receipt of a series from Cape San Lucas collected by John Xantus led him to provisionally bestow a name upon the birds from that locality. No particular type was designated,⁶ so that the sixteen specimens before me, all apparently collected by Xantus, but now the property of several different museums, may be regarded as cotypes. Other and more recent material brings the total number of specimens examined from the Cape region up to sixty-one. They differ very decidedly from the average example of *C. p. passerina* in the respects above pointed out, and, while individual variation is fully as apparent in the present series, and covers the same ground as in *C. p. passerina*, yet the lightest colored *pallescens* is paler than the same condition in *passerina*, and so on. Some of the differential characters given by Baird, as for instance the small size and the paucity of the wing-spots, the length of the tertiaries, and the size of the tarsus, break down upon examination of the series, but on the whole the form is a sufficiently well characterized one, and well worthy of the recognition it has been so tardily accorded.

Males from Maria Madre, Tres Marias Islands, are absolutely indistinguishable from Lower California birds. The single female in the Biological Survey Collection (No. 156,723, Maria Madre, May 3, 1897), however, I am unable to match in an extensive series, as it

⁶ Since the above was written, Dr. Charles W. Richmond has informed me that he has ascertained, from an examination of the original catalogue entry of the Xantus specimens, that No. 13,013 of the U. S. National Museum Collection was beyond much doubt intended by Prof. Baird to be considered as the actual type of his description.

has a decided rusty cinnamon tinge on the forehead and abdomen. The only other female examined from these islands is referable to *C. p. socorroënsis* (see beyond).

Arizona examples seem to vary in shade more than those from Lower California, some few individuals being quite close to *C. p. passerina*, while others agree well with birds from the type locality. Farther south, in Sonora and Sinaloa, the vinaceous shade of the male seems to deepen, a small series from Sonora in the Brewster Collection, and an example from Culiacan, Sinaloa (No. 164,472, Collection Biological Survey), being very close to Florida skins in this respect. On the other hand, I am unable, after comparison of an extensive series, to find any constant differences in color between specimens from Texas and those from Lower California, but the former average somewhat larger in size. Passing southward, we find males from Linares in Nuevo Leon, and Victoria and Tampico in Tamaulipas, a shade darker below, as also are those from the State of Vera Cruz. There is also a corresponding but slight average color-difference in females from the same localities.

Returning to the west coast, we find the few available specimens from Jalisco, Guerrero, Oaxaca, and eastward to Chiapas and Campeche, agreeing in slightly darker general coloration with those from Sinaloa. Yucatan and British Honduras birds, however, are very puzzling, and I believe really constitute a series of intergrades between *C. p. pallescens* on the one hand and *C. p. insularis* and *C. p. neglecta* on the other. Contrary to what might be expected, the vinaceous color is deeper, and the bill seems decidedly paler and more yellowish at the base. These characters are so evident in two adult males and one adult female from Cozumel Island that, were it not for their decidedly larger size, they might readily be referred to *C. p. insularis*, the only color-difference obvious being the less amount of white on the under tail-coverts. Some of the Yucatan skins, however, are closer to the Central American form, *C. p. neglecta*.

Chæmepelia passerina neglecta Carriker.

(?) "Colombicolin de San Carlos" (Centre-Amérique) LESSON, Descr. Mam. et Ois., 1847, 212.

Chamæpelia passerina (not *Columba passerina* Linnæus) (?) SCLATER and SALVIN, Ibis, 1859, 223 (Dueñas, Guatemala; habits).—(?) SALVIN and SCLATER, Ibis, 1860, 45 (Guatemala; nesting).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., IX, 1868, 139 (San José and "Catargo" [= Cartago], Costa Rica); IX, 1869, 207

- (Merida, Yucatan).—FRANTZIUS, Journ. f. Orn., XVII, 1869, 371 (Costa Rica; habits).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133, part (Central America).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389, part (Central American references).—BOUCARD, Proc. Zool. Soc. London, 1878, 43 (San José, Costa Rica).—(?) SALVIN, Cat. Strickland Coll., 1882, 547, part (Guatemala).—ZELEDÓN, Cat. Aves Costa Rica, 1882, 28 (Costa Rica).—NUTTING, Proc. U. S. Nat. Mus., V, 1882, 408 ("La Palma," Gulf of Nicoya, Costa Rica).—RIDGWAY, Proc. U. S. Nat. Mus., V, 1883, 502 (San José, Costa Rica).—NUTTING, Proc. U. S. Nat. Mus., VI, 1883, 378 (San Juan del Sur, Nicaragua); VI,² 1884, 389 (Sucuyá, Nicaragua), 396 (Ometépe I., Nicaragua).—HEINE and REICHENOW, Nom. Mus. Hein., Orn., 1886, 283, part (Costa Rica).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part [?] Panajachel, 5000 ft., [?] Santa María, and [?] Dueñas, Guatemala; San José and Irazú district, Costa Rica).—UNDERWOOD, Ibis, 1896, 447 (Miravalles, etc., Costa Rica).—UNDERWOOD, Avifauna Costarriquena, 1899, 15 (Costa Rica).—(?) OATES, Cat. Birds Brit. Mus., I, 1901, 101, part (Dueñas, Guatemala).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 250, part (Central American localities and references; habits).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Tejas, Costa Rica; syn.).
- Chæmepelia passerina* (?) BOUCARD, Ann. Soc. Linn. Lyon, n. s., XXV, 1878, 24 (Guatemala; habits).—(?) RODRIGUEZ, An. Mus. Nac. Salvador, IV, 1910, 282 (Guatemala).
- Chamæpelia passerina* ELLIOT, Stand. Nat. Hist., IV, 1885, 247, in text, part (Central America).
- Columbigallina passerina* ZELEDÓN, Proc. U. S. Nat. Mus., VIII, 1885, 112 (Costa Rica).—ZELEDÓN, An. Mus. Nac. Costa Rica, I, 1887, 127 (San José, Costa Rica).—CALVO, Apuntamientos Geográficos, Estadísticos e Históricos, 1887, 88 (Costa Rica).—CHERRIE, Auk, VII, 1890, 333 (San José, Costa Rica); IX, 1892, 329 (San José, Costa Rica).
- Columbigallina passerina pallescens* (not *Chamæpelia passerina* var. *pallescens* Baird) RIDGWAY, Man. N. Am. Birds, 1887, 586, part (Central America).—CHAPMAN, Auk, V, 1888, 395, part (Central America; ex Ridgway).—RICHMOND, Proc. U. S. Nat. Mus., XVI, 1893, 523 (San Carlos, Nicaragua).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 2, 1895, 123, part (Central America).—RIDGWAY, Man. N. Am. Birds, ed. 2, 1896, 591, part (Central America).—COUES, Key N. Am. Birds, ed. 5, II, 1903, 716, part (Central America).—RIDGWAY, Condor, VII, 1904, 154 (Pfigres, Costa Rica).
- (?) *Chamæpelia granatina* (not of Bonaparte) TRISTRAM, Cat. Coll. Birds, 1889, 39 (Panama, Bridges [?]).
- (?) *Columbogallina passerina* LANTZ, Trans. Kansas Acad. Sci., XVI, 1899, 219 (Amatitlan, Guatemala).
- Chamæpelia pallescens* SHARPE, Hand-List Birds, I, 1899, 81, part (Central America).
- Columbigallina passerina* var. *pallescens* DUBOIS, Syn. Avium, II, 1902, 763, part (Central America).
- Chæmepelia passerina pallescens* KNOWLTON, Birds of the World, 1909, 432, in

text, part (Central America).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150, part (Central America).

Chamepelia passerina neglecta CARRIKER, Ann. Carnegie Mus., VI, 1910, 398 (Esparta [type locality], Alajuéla, San José, Bagáces, Bebedéro, Cachí, Tenorio, Coralillo, Los Cuádrós de Irazú, and Miravalles, Costa Rica; orig. descr.; type in collection Carnegie Museum; habits; Costa Rican references).

Subspecific characters.—Similar to *C. p. pallescens*, but male of a much deeper vinaceous color below, more as in *C. p. passerina*; above much darker, being dull brownish olive with a faint vinaceous shade. Similar also to *C. p. passerina*, but decidedly browner above; sides of head and neck averaging deeper pinkish vinaceous; wing-coverts more extensively pinkish vinaceous, and bill reddish at the base. Not so deeply or so uniformly brown above, however, as in *C. p. socorroënsis*. The under tail-coverts average darker, with deeper vinaceous edgings, than in *C. p. pallescens*. The female differs in a corresponding manner, being intermediate in general coloration between *C. p. pallescens* and *C. p. socorroënsis*.

Measurements.—Male: wing, 85–89 (average, 87); tail, 53–60 (56); exposed culmen, 11–12 (11.5); tarsus, 16–16.5 (16.1). Female: wing, 84–89 (86); tail, 52–60 (57); exposed culmen, 11–12 (11.7); tarsus, 15–16.5 (15.6).

Range.—Central America, from Panama (?) north to Guatemala; straggling occasionally to Yucatan.

Remarks.—Messrs. Salvin and Godman were the first to call attention to the peculiarities of this form, remarking that a skin from Costa Rica was very similar to the Socorro Island bird. It seems sufficiently distinct from *C. p. pallescens*, with which until recently it has been confounded, to deserve a separate name. When a series is compared the differences stand out prominently, and are fairly constant. Unfortunately only a few specimens from any of the Central American countries except Costa Rica have been available for examination, but I should refer all I have seen to this form, including two from Guatemala and one each from Merida, San Ignacio, and Chichen-Itza in Yucatan. These more northern examples, however, are not typical, indicating that intergradation with *C. p. pallescens* takes place in this region. The specimens in question average duller vinaceous below and slightly paler above than Costa Rican birds.

Curiously enough, the only Panama record for any form of *C. passerina* is a doubtful one, based on a specimen said to have been

collected by Bridges, and identified as *Chamæpelia granatina* by Canon Tristram. None of the recent workers in this field seem to have met with the species, although *C. minuta* is common enough, and very possibly the specimen in question may belong to this latter species.

Iris in both sexes "light yellow with pink tinge" (Underwood), or "pink" (Carriker). Feet "flesh-color" (Carriker and Underwood). Bill in both sexes "dark crimson" (Underwood), "pink with dusky tip," or "purplish blood, with tip black" (Carriker).

***Chamæpelia passerina socorroënsis* (Ridgway).**

Chamæpelia pallescens (not of Baird) LAWRENCE, Proc. Boston Soc. Nat. Hist., XIV, 1872, 275, part (Socorro I.).—GRAYSON, Proc. Boston Soc. Nat. Hist., XIV, 1872, 300, part (Socorro I.).

Chamæpelia pallescens LAWRENCE, Mem. Boston Soc. Nat. Hist., II, 1874, 305, part (Socorro I.).

Columbigallina passerina socorroënsis RIDGWAY, Man. N. Am. Birds, 1887, 586 (Socorro I.; Tres Marias Is. ?; orig. descr.; type in collection U. S. National Museum).—TOWNSEND, Proc. U. S. Nat. Mus., XIII, 1890, 135 (Socorro I.).—ANTHONY, Auk, XV, 1898, 316 (Socorro I.).—KAEDING, Condor, VII, 1905, 111 (Socorro I.).

Chamæpelia passerina (not *Columba passerina* Linnæus) SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Socorro I.).

Chamæpelia socorroënsis SHARPE, Hand-List Birds, I, 1899, 81 (Socorro I.).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 252 (Socorro I.; descr.; references; crit.).—LOWE, Ibis, 1908, 112 (Socorro I., ex Ridgway).

Columbigallina passerina var. *socorroënsis* DUBOIS, Syn. Avium, II, 1902, 764 (Socorro I., ex Ridgway).

Subspecific characters.—Similar to *C. p. neglecta*, but wing shorter, and general coloration darker, the upper parts of the male being decidedly olive-brown, and the flanks pale brown. Female also very much darker and browner than the female of *C. p. neglecta*.

Measurements.—Male: wing, 81–85 (average, 83); tail, 52–58 (56); exposed culmen, 11–12 (11.5); tarsus, 15–16.5 (16). Female: wing, 81–84 (82); tail, 53–59 (56); exposed culmen, 11–12 (11.5); tarsus, 16–17 (16.2).

Range.—Socorro Island, off the west coast of Mexico; accidental on the Tres Marias Islands and the adjacent mainland (?).

Remarks.—This very distinct insular form is characterized by its dark coloration, the upper parts being decidedly brown, deeper than in *C. p. neglecta*, to which otherwise it would seem to be most closely

allied. The vinaceous color of the under parts is about the same as in that form, while the color of the bill (judging from the dried skin) would seem to be also about the same. Females are even browner than males, especially below, and while occasional specimens of *C. p. socorroënsis* and *C. p. neglecta* are very much alike, the average difference is very conspicuous. With *C. p. pallescens*, its nearest mainland representative, the present form requires no comparison, being very different indeed.

Colonel A. J. Grayson, who was the first ornithologist to visit this out-of-the-way island, brought back a few specimens of this form, which were referred to *C. p. pallescens* at the time. In 1887 Mr. Ridgway distinguished them as a different subspecies, and additional specimens have been secured in more recent years by Messrs. Townsend and Anthony. The doubtful assignment of the Tres Marias bird to this form, as given in the original description, seems to have been based on a female example (No. 58,303) in the U. S. National Museum, collected by Grayson, ostensibly on the Tres Marias Islands. It is quite possible that the locality is an error, as the labels may have become mixed, Grayson having collected at both places. However, there can be no doubt as to the identity of this particular specimen, as it agrees perfectly with Socorro Island females, but the form regularly found on the Tres Marias Islands, as elsewhere shown, is *C. p. pallescens*. Another specimen (No. 26,990, Collection U. S. National Museum) from Mazatlan, probably collected by Grayson also, although not so marked, I would refer to this form on account of its dark colors and brownish flanks, although above it more closely resembles *C. p. neglecta*. Possibly this individual is also wrongly labeled. At most the present form can be regarded only as a mere straggler to the Tres Marias Islands and adjacent mainland.

***Chæmepelia passerina parvula* subsp. nov.**

Columbigallina passerina (not *Columba passerina* Linnæus) ROBINSON, Flying Trip to the Tropics, 1895, 154, part (Honda and Guaduas, Colombia).

Type, No. 128,195, Collection U. S. National Museum, adult male; Honda, Colombia, July 14, 1892; Wirt Robinson.

Subspecific characters.—Smallest of the *C. passerina* group, and general coloration very dark. The male is fully as richly colored above and below as *C. p. socorroënsis*, but may be readily distinguished by its decidedly smaller size. The female is slightly paler above than

the female of *C. p. socorroënsis*, while the brown color of the under parts has a faint wash of cinnamon, especially on the breast. In both sexes the pale edgings of the throat and breast are narrower, giving the parts a decidedly more squamate appearance.

Measurements.—Male (two specimens): wing, 75-77 (average, 76); tail, 54-55 (54.5); exposed culmen, 10-10.5 (10.2); tarsus, 15. Female (one specimen): wing, 73; tail, 51; exposed culmen, 11; tarsus, 15.

Range.—Known only from the type locality, Honda, Colombia, and its vicinity, but probably occupying a more or less extensive area in central Colombia.

Remarks.—The above description is based on a single pair of birds in the collection of the U. S. National Museum, which are so very different from any of the other known forms that I have no hesitation in describing them as new. Besides these I have examined one other specimen, collected by Mr. Louis A. Fuertes on a recent trip to Colombia. This example is somewhat different from the type, not being so dark, but the breast is as finely squamate, while the feathers of the nape have decided dark edgings of a sooty plumbeous color. The chin and forehead are almost as pale as in *C. p. albivitta*, and the under tail-coverts also are quite pale. The back is somewhat brownish, and the crown decidedly so, while the wing-coverts are of the same shade of color as the breast. Judging by analogy from the dry skin, the bill was evidently red for the most of the lower half, and the upper mandible wholly dark, except at the extreme base of the commissure. These differences are not more than are fully covered by the usual range of individual variation obtaining in the present species, but additional specimens are of course very desirable.

Although in color this form is most like *C. p. socorroënsis*, its real affinities would appear to be rather with *C. p. griseola*, while the limits of its range, when more fully worked out, will possibly be found to approximate those of the latter. Lieutenant Wirt Robinson tells us that Ground Doves were common at Honda and Guaduas, on the road to Bogotá, and gives the impression that the species was not seen between Barranquilla (on the coast) and Honda. Count von Berlepsch, indeed, has published a record for *Chamæpelis passerina* from Bucaramanga, Colombia, but the measurements appended show that his bird could not possibly belong to the form here described. Should future work determine that the species does not range over the intervening country it would tend to explain the development

through isolation of a peculiar form, such as this, in the interior region.

Chæmepelia passerina nana subsp. nov.

Type, No. 36,138, Collection Carnegie Museum, adult male; Jimenez, Rio Dagua, western Colombia, July 9, 1907; Mervyn G. Palmer.

Subspecific characters.—Male: upper parts of about the same shade as in *C. p. pallescens*, but crown and nape grayish brown like the back, more or less suffused with vinaceous, seldom with any trace of plumbeous, and the squamation obsolescent; vinaceous of under parts and wing-coverts deeper, and size much less. Female (one specimen) decidedly darker and smaller than the same sex of *C. p. pallescens*, with no plumbeous on the crown and nape, and the squamation of these parts indistinct.

Measurements.—Male (seven specimens): wing, 77–80 (average, 78.4); tail, 52–60 (56.6); exposed culmen, 10.5–11.5 (11); tarsus, 15.5–17 (16). Female (one specimen): wing, 74; tail, 55; exposed culmen, 11; tarsus, 16.

Range.—Western Colombia, in the valleys of the upper Rio Cauca and the Rio Dagua.

Remarks.—In its small size this form resembles *C. p. parvula*, but is undoubtedly distinct, being paler and less distinctly squamate, both above and beneath. The vinaceous coloring is very rich, and invades the upper parts to a greater or less extent, while the plumbeous area of the crown and nape is obsolete or reduced to a mere trace. One specimen, indeed, has the forehead vinaceous cinnamon, passing into brown posteriorly.

Curiously enough, as already noted, no form of *C. passerina* seems to have been positively recorded from Panama, nor are there any records from the valley of the Atrato. Until specimens from this latter section in particular are available it is idle to speculate on the affinities of the two small Colombian forms. The situation in Colombia is certainly a very complicated one so far as *C. passerina* is concerned, and should it turn out that the hiatus in its range to the northwestward is real and not apparent there would remain much more to be explained.

The present form is based on eight specimens, all from a comparatively restricted area in western Colombia, near the head of the

Cauca valley and across the cordillera to the westward, in the valley of the Rio Dagua. Its range is probably much more extensive, however, as will doubtless be shown by the explorations now being conducted in western Colombia. To the southward it probably grades into the next form:

Chæmepelia passerina quitensis subsp. nov.

- Columba passerina* (not of Linnæus) MOLINA, Saggio sulla Storia Naturale del Chili, Italian ed. 2, 1810, 217 (northern Chile [?]; descr.).—LESSON, *Traité d'Orn.*, 1831 (?), 474, part (Lima, Ecuador [= Peru]).—LESSON, *Compl. de Buffon, Oiseaux*, VIII, 1837, 12, part (Peru); ed. 2, 1838, 272 (Peru).—TSCHUDI, *Arch. f. Naturg.*, 1844, i, 305 (Peru).—TSCHUDI, *Fauna Peruana*, 1845-6, 45, 275 (Peru).
- "*Columba chamæpelia* Lesson," ABEILLE, *Catalogue des Oiseaux composant la Collection*, 1850, 40 (Peru).
- Chamæpelia granatina* (not of Bonaparte) SCLATER, *Proc. Zool. Soc. London*, 1858, 556 (Riobamba, Ecuador).
- Chamæpelia gravatava* (*lapsus*) ORTON, *Am. Nat.*, V, 1871, 625 (Quito, Ecuador).
- Chamæpelia passerina* VON PELZELN, *Verh. k.-k. zool.-bot. Ges. Wien*, XXVI, 1877, 772 (Ecuador); XXVIII, 1879, 20 (Ecuador; crit.; "*granatina* Bp."); XXIX, 1880, 526 (Ecuador).—TACZANOWSKI and BERLEPSCH, *Proc. Zool. Soc. London*, 1885, 111 (Riobamba, Ecuador).—TACZANOWSKI, *Orn. Perou*, III, 1886, 242, part (Riobamba, Ecuador; Peruvian examples not seen; descr.; syn.; crit.).—SALVADORI, *Cat. Birds Brit. Mus.*, XXI, 1893, 473, part ([?] Sarayacu [?],⁷ Sical, and Quito, Ecuador).—GOODFELLOW, *Avic. Mag.*, VI, 1900, 227 (Quito and Chillo Valley, Ecuador; [?] Colombia; habits; nesting).—SALVADORI and FESTA, *Boll. Mus. Torino*, XV, no. 368, 1900, 35 (La Concepcion, Ibarra, and Tumbaco [near Quito], Ecuador).—GOODFELLOW, *Ibis*, 1902, 227 (Chillo Valley, Ecuador; habits).—MENECAUX, *Mission du Service Géographique de l'armée pour la Mesure d'un Arc de Méridien Equatorial en Amérique du Sud*, IX, i, 1911, B. 7 (Calacali and Tumbaco, Ecuador; Ecuadorean records).
- Columbigallina passerina* ALLEN, *Bull. Am. Mus. Nat. Hist.*, II, 1889, 76 (Quito, Ecuador).—BERLEPSCH, *Journ. f. Orn.*, XL, 1892, 97, part (Ecuador; crit.).
- Columbigallina passerina granatina* HARTERT, *Nov. Zool.*, V, 1898, 503 (Puerto del Chimbo, Ecuador; crit.).
- Columbina griseola* (not of Spix) BRABOURNE and CHUBB, *Birds S. Am.*, I, 1912, 18, part (Ecuador).

Type, No. 36,130, Collection Carnegie Museum, adult male; Zambiza (6 miles northeast of Quito), Ecuador, August 20, 1910; Ludovic Söderström.

Subspecific characters.—Male: similar in general to *C. p. neglecta*, but somewhat smaller and paler, the plumbeous area of the crown

⁷ As has been repeatedly pointed out by Mr. Hellmayr, this locality, appearing on Buckley's specimens, cannot be depended on.

and nape duller, paler, more restricted, and less distinctly squamate. Darker, as well as decidedly larger, than *C. p. nana*, and with the plumbeous area of the crown and nape usually indicated, although much fainter than in any of the other forms, except *C. p. nana* and *C. p. griseola*. Female above more grayish, less brownish, than in *C. p. neglecta*, and slightly paler below, but only to be distinguished from the same sex of *C. p. nana* by its larger size.

Measurements.—Male: wing, 82–88 (average, 84.5); tail, 54–62 (59); exposed culmen, 10.5–11.5 (11); tarsus, 16–17.5 (16.3). Female: wing, 81–86 (83.5); tail, 54–60 (56.5); exposed culmen, 11; tarsus, 16–17 (16.3).

Range.—Western Ecuador and Peru (?), up to an altitude of about ten thousand feet.

Remarks.—With a series of thirty-two skins of the Ecuador bird available its subspecific distinctness is readily apparent. From its neighbor on the north, *C. p. nana*, it is easily distinguishable by its larger size and different coloration, although it is probable that when the intervening region shall have been worked over intergrades will be found. To the eastward it probably passes into *C. p. griseola*. The exact limits of its southern range are at present unknown, none of the Peruvian records above quoted being above suspicion, while its occurrence so far south as Chili, as recorded by Molina, is exceedingly doubtful. With the exception of Taczanowski, none of the authors who have written on the birds of Ecuador or Peru seem to have recognized the peculiarities of the Ground Dove of the region, which is well worthy of subspecific segregation.

Some of the skins show a faint lavender-gray cast, as in *C. p. albivitta*, and the series otherwise exhibits the usual variations. A young bird taken from the nest on April 1, 1911, at Riobamba, is covered with whitish down, borne on the ends of the growing feathers. None of the specimens examined have the colors of the soft parts indicated, but a number of them show a decided indication of red or yellow at the base of the bill in the dried skin.

Chæmepelia passerina griseola (Spix).

"Least Turtle" [BANCROFT], An Essay on the Natural History of Guiana, 1769, 177 (Guiana; descr.).

"Ground Turtle" LATHAM, Gen. Syn. Birds, II, ii, 1783, 659, part (Guiana, *ex* Bancroft).

- "Ground Pigeon" PENNANT, Arctic Zoölogy, II, 1785, 328, part (Brazil, in geog. distr.).
- Columba passerina* (not of Linnæus) VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 401, part (Guiana).—SCHOMBURGK, Reisen in Britisch-Guiana, II, 1848, 490 (sandhills region, British Guiana).—SUNDEVALL, Öfv. Kongl. Vet.-Akad. Förh., "1869," 1870, 586, part (Surinam; crit.).
- Columbina griseola* SPIX, Avium Species Novæ, II, 1825, 58, pl. 75a, fig. 2 ("habitat in sylvis fl. Amazonum"; orig. descr.; type in collection Munich Museum).—HAGMANN, Boll. Mus. Gældi, IV, 1904, 211 (= *Chamapelia minuta* Br. Mus. Cat. [error !]).—HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXII, 1906, 697 (crit.).—ALLEN, Auk, XXV, 1908, 301, 306, in text (crit.).—INTERNATIONAL COMMISSION ON ZOÖLOGICAL NOMENCLATURE, Smiths. Inst. Publ. No. 2013, 1911, 73, in text (crit.).—BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18, part (Brazil; British Guiana).
- Chamapelia passerina* HARTLAUB, Syst. Verz., 1844, 99 (Brazil).—CABANIS, in SCHOMBURGK, Reisen in Britisch-Guiana, III, 1848, 743 (British Guiana; habits).—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296 (geog. distr.).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1867, 591 (Pará, Brazil).—PELZELN, Orn. Bras., 1870, 277 (Borba, S. Joaquim, S. Gabriel, Forte do Rio Branco, and Barra do Rio Negro, Brazil), 450 (Pará, Brazil, ex Wallace), liv (faunal distribution).—LAYARD, Ibis, 1873, 395 (Pará, Brazil; habits).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133, part (Brazil).—SOUSA, Mus. Nac. Lisboa, Columbæ, 1873, 20, part (Surinam).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389, part (Amazons).—ALLEN, Bull. Essex Inst., VIII, 1876, 82 (Santarem, Brazil).—SCLATER, List Vert. Animals in Gardens Zoöl. Soc. London, ed. 8, 1883, 456 (Pernambuco, Brazil).—(?) BOECK, Mitth. d'Orn. Ver. Wien, 1884, 165 (Cochabamba, Bolivia).—TACZANOWSKI, Orn. Perou, III, 1886, 243, part (Cayenne; crit.).—SALVIN, Ibis, 1886, 173 (British Guiana, ex Cabanis).—HARTERT, Kat. Vogelsammlung, 1891, 186 (Brazil?).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 479, part (Borba, Pará, and Pernambuco, Brazil; Quonga and Annai, British Guiana; Paraguay [?]).—GÆLDI, Bol. Mus. Paraëense, I, 1896, 351, 356 (Pará, Brazil).—RUST, Katalog systematischen Vogelsammlung des Provincial Museums in Hanover, 1897, 77, part (Brazil and Surinam).—LLOYD, Timehri, XI, 1897, 3 (Guiana; nesting).—LOAT, Ibis, 1898, 565 (British Guiana; habits).—GÆLDI, Aves do Brazil, II, 1900, 368 (Pará, Brazil).—VON IHERING, Revista Mus. Paulista, IV, 1900, 282 (Brazil; descr. eggs).—GÆLDI and HAGMANN, Bol. Mus. Paraëense, III, 1902, 319 (Pará and Borba, Brazil; [?] Sarayacu [?], Peru*).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141, part (Pará, Brazil).—GÆLDI, Ibis, 1903, 481, 499 (Approaga, Capim River, Pará, Brazil).—HAGMANN, Bol. Mus. Gældi, IV, 1904, 256 (Burmeister's reference), 301 (Pelzeln's reference).—GÆLDI, Album Aves Amazonicas, 1906, pl. 37, fig. 9.—LOWE, Ibis, 1907, 115, in text, part (British Guiana).—SNETHLAGE, Journ. f. Orn., LVI, 1908, 496 (Tapajoz, Brazil).—PENARD, Vogels van Guyana, 1908, 337 (Guiana; descr.; habits).

* Cf. footnote, page 547.

- Pyrgitoënas passerina* REICHENBACH, Tauben, 1862, 162, part (British Guiana, ex Schomburgk; habits).
- Chamaëpelina griseola* PELZELN, Orn. Bras., 1870, 277, footnote, 450, part (Spix's reference).—GIEBEL, Thes. Orn., I, 1872, 634, part (references).
- Chamaëpelina trochila* (not of Bonaparte) SOUSA, Mus. Nac. Lisbona, Columbæ, 1873, 20 (Bahia, Brazil).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Demerara and Surinam).
- Chamaëpelina passerina* ELLIOT, Stand. Nat. Hist., IV, 1885, 247, in text, part (Brazil).—QUELCH, Timehri, V, 1891, 106 (Georgetown, British Guiana).
- Columbigallina passerina* RIKER and CHAPMAN, Auk, VIII, 1891, 162 (Santarem, Brazil; crit.).—BERLEPSCH, Journ. f. Orn., XL, 1892, 97, part (Bahia, Brazil; crit.), 102 (British Guiana and Cayenne).—VON IHERING, Revista Mus. Paulista, VI, 1904, 371 (faunal distribution).
- Columbigallina passerina griseola* HELLMAYR, Abhand. K. Bayer. Akad. Wiss. II Kl., XXII, 1906, 697, part (crit. on type specimen; Pará and Bahia, Brazil).—HELLMAYR, Nov. Zoöl., XIII, 1906, 384 (Prata and Bemfica, Pará, Brazil; crit.).—VON IHERING, Aves do Brazil, 1907, 21, part (Paraguay [?]; Bahia, Pernambuco, Rio Negro, Rio Branco, and Pará, Brazil).—BERLEPSCH, Nov. Zoöl., XV, 1908, 295 (Cayenne and Roche-Marie, French Guiana).
- Columbina passerina griseola* ALLEN, Auk, XXV, 1908, 306, in text (crit.).—ALLEN, Science, n. s., XXXIII, 1911, 337, in text (crit.).—HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXVI, 1912, 96 (Pará references).

Subspecific characters.—Male: most nearly like *C. p. parvula* in general coloration, but decidedly larger, plumbeous area of crown and nape paler and obsolescent, and vinaceous edgings of throat and breast feathers broader. Female very similar in general to the same sex of *C. p. pallescens*, but decidedly smaller, and usually more brownish above. Bill dark throughout in both sexes (in skin).

Measurements.—Male (eight specimens): wing, 76–80 (average, 79); tail, 52–58 (55); exposed culmen, 10–12 (10.7); tarsus, 16–17 (16.3). Female (four specimens); wing, 76–77 (76); tail, 50–52 (51.5); exposed culmen, 10–11 (10.6); tarsus, 16–17 (16.3).

Range.—Guiana and the valley of the Amazon, and around the eastern part of Brazil to Bahia.

Remarks.—The above diagnosis is based on three males and two females from Diamantina and Santarem, Brazil, all in rather poor condition. Three skins from British Guiana are somewhat paler, verging thus toward *C. p. albivitta*, although having dark bills, while one from Surinam is quite typical of the present form. Three out of the four females examined are slightly tinged with vinaceous below.

This form was described by Spix in 1825, under the name *Columbina*

griseola, the only locality assigned being the forests of the Amazon River. Spix's type was a young bird, and largely on this account his name was not recognized as applying to a bird of the *C. passerina* group, Bonaparte identifying it with what is now known as *C. minuta*, and being followed in this erroneous identification by nearly all subsequent writers. In 1887, however, Count von Berlepsch suggested that this was probably an error, and in 1906 Mr. Hellmayr from an examination of Spix's type fully confirmed this conclusion. The case has been very fully discussed by Dr. J. A. Allen, with reference to its bearing on the proper name of the present genus.

The distribution of the present subspecies seems to be as yet imperfectly worked out. It was found by Natterer and other travelers in the Amazon valley, and has been traced around the eastern extremity of Brazil, being reported from several localities on the coast, as far south at least as Bahia. The probabilities are that it is not confined to the coast, but there is a vast area of country in central Brazil for which there are as yet no records. A single record from Cochabamba, Bolivia, which I refer doubtfully to the present form, is the only one for the far interior of the continent which I have found. I have not been able to discover upon what authority Count Salvadori gives it as an inhabitant of Paraguay, as in reply to an inquiry he writes that he does not now remember how he came to that conclusion, although he feels pretty sure that he had reasons at the time for making the statement. Dr. von Ihering also attributes this species to Paraguay, but it is safe to say he was quoting from Count Salvadori. In the third edition of the American Ornithologists' Union *Check List of North American Birds*, 1910, page 150, the range of *Chæmepelia passerina* is given as extending to southern Brazil, but Prof. Wells W. Cooke writes me that this statement was based on a misapprehension as to the position of one of the localities cited by Natterer.

Chæmepelia passerina albivitta Bonaparte.

Chæmepelia passerina (not *Columba passerina* Linnæus) (?) LICHTENSTEIN, Nom. Avium Mus. Zoöl. Berol., 1854, 82, part (Colombia).—(?)SCHOTT, Rept. Lieut. Michler's Exp. to Isthmus of Darien, 1861, 247, in text, part (Tierra Bomba and Bay of Tesco, near Cartagena, Colombia; habits).—WYATT, *Ibis*, 1871, 383 (Santa Marta, Colombia).—BERLEPSCH, Journ. f. Orn., XXXII, 1884, 317 (Bucaramanga, Colombia).—RIDGWAY, Proc. U. S. Nat. Mus., VII, 1884, 177 (Curaçao).—PETERS, Journ. f. Orn., XL, 1892, 113, 115 (Curaçao; habits).—

- SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Venezuela and Trinidad).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141, part (Trinidad; Cumaná, Venezuela).—LOWE, Ibis, 1907, 115, in text, part (Venezuela and Trinidad).
- (?) *Chamæpelia granatina* BONAPARTE, Consp. Avium, II, 1854, 77 ("Bogotá," Columbia; orig. descr.; type formerly in collection Paris Museum, now lost [*vide* Salvadori]).—SCLATER, Proc. Zool. Soc. London, 1855, 163 ("Bogotá," *ex* Bonaparte; crit.).—BONAPARTE, Compt. Rend., XL, 1855, 21, 220 ("Bogotá"; descr.); XLIII, 1856, 945 (crit.).—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, footnote (Bogotá; diag.; *ex* Bonaparte).
- Chamæpelia albivitta* BONAPARTE, Consp. Avium, II, 1854, 77 (Carthagen, Colombia; orig. descr.; type in collection Paris Museum).—BONAPARTE, Compt. Rend., XL, 1855, 21, 220 (Carthagen; descr.).—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296 (Carthagen; diag.; *ex* Bonaparte).—(?) TAYLOR, Ibis, 1864, 94 (Chacachacare I., Trinidad).—(?) FINSCH, Proc. Zool. Soc. London, 1870, 554 (Trinidad, *ex* Taylor).—GIEBEL, Thes. Orn., I, 1872, 632 (references).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 390, in text (Venezuela; crit.).
- (?) "Red Ortolan or Ground Dove" DE VERTEUIL, Trinidad, Its Geography, etc., 1858, 118 (Trinidad).
- Chamæpelia granatina* CASSIN, Proc. Acad. Nat. Sci. Philadelphia, 1860, 195 (Carthagen, Colombia; habits).—CASSIN, Report Lieut. Michler's Exp. to Isthmus of Darien, 1861, 246 (reprint).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 390, in text (New Grenada; crit.).—HEINE and REICHENBACH, Nom. Mus. Hein., Orn., 1886, 283 (Porto [= Puerto] Cabello, Venezuela).
- (?) *Pyrgitoënas granatina* REICHENBACH, Tauben, 1862, 14, 162 ("Bogotá"; descr.; crit.; *ex* Bonaparte).
- Pyrgitoënas albivitta* REICHENBACH, Tauben, 1862, 14 (Carthagen; descr.; *ex* Bonaparte).
- Columba passerina* SUNDEVALL, Öfv. Kongl. Vet.-Akad. Förh., "1869," 1870, 586, part (Venezuela; crit.).
- Chamæpelia albivitta* GRAY, Hand-List Birds, II, 1870, 240 (Carthagen).
- Peristera passerina* MARTIN, Bericht über eine Reise nach Niederländisch Westindien, 1887,—(Curaçao and Bonaire).
- Columbigallina passerina* BERLEPSCH, Journ. f. Orn., XL, 1892, 69, 97, part (Curaçao; crit.), 102, part (Curaçao, Colombia, Venezuela, Trinidad, and Tobago, in geog. distr.).—ALLEN, Bull. Am. Mus. Nat. Hist., IV, 1892, 56 (Carúpano, Venezuela).—HARTERT, Ibis, 1893, 326, in text (Bonaire).—ROBINSON, Flying Trip to the Tropics, 1895, 43, 154, part (Barranquilla, Colombia), 21, 164 (Curaçao).—ROBINSON and RICHMOND, Proc. U. S. Nat. Mus., XVIII, 1896, 659 (Margarita I., Venezuela; crit.), 682 (Guanta, Venezuela), 683 (La Guaira, Venezuela).—PHELPS, Auk, XIV, 1897, 366 (Cumaná, Cumanacoa, and San Antonio, Venezuela).—ROBINSON and RICHMOND, Proc. U. S. Nat. Mus., XXIV, 1901, 167 (La Guaira, Venezuela; nesting).—CLARK, Auk, XIX, 1902, 261 (Margarita I., Venezuela; nesting).
- Columbigallina passerina perpallida* HARTERT, Ibis, 1893, 304 (Aruba; orig. descr.; type in collection Tring Museum; habits), 325 (Curaçao), 334 (Bonaire; habits).

- ROBINSON, Flying Trip to the Tropics, 1895, 166 (Curaçao, *ex Hartert*).—HARTERT, Nov. Zoöl., V, 1898, 503, in text (*crit.*).—BERLEPSCH and HARTERT, Nov. Zoöl., IX, 1902, 119, in text (*crit.*).—HARTERT, Nov. Zoöl., IX, 1902, 305 (Aruba, Curaçao, and Bonaire).—RILEY, Proc. U. S. Nat. Mus., XXIX, 1905, 172, in text (*crit.*).
- Columbigallina passerina pallescens* (not *Chamaepelia passerina* var. *pallescens* Baird) BANGS, Proc. Biol. Soc. Washington, XII, 1898, 132 (Santa Marta, Colombia).
- Chamaepelia perpallida* SHARPE, Hand-List Birds, I, 1899, 82 (Aruba, Bonaire, and Curaçao).—LOWE, Ibis, 1907, 114 (Blanquilla and Margarita Is.; *crit.*); 1908, 114, 115, in text (Curaçao, Aruba, Bonaire, Blanquilla, Margarita, and Los Hermanos Is.; north coast of Venezuela and Colombia?; *crit.*); 1909, 314 (Los Testigos Is.), 322 (Cariaco Peninsula, Venezuela), 327 (Los Hermanos Is.).—LOWE, A Naturalist on the Desert Islands, 1911, 158 (Blanquilla; habits).
- Columbigallina passerina granatina* ALLEN, Bull. Am. Mus. Nat. Hist., XIII, 1900, 128 (Bonda, Colombia).—BERLEPSCH and HARTERT, Nov. Zoöl., IX, 1902, 118 (Atlagracia, Caicara, and Ciudad Bolivar, Venezuela; *crit.*).—ALLEN, Bull. Am. Mus. Nat. Hist., XXI, 1905, 280 (Bonda, Colombia; nesting).
- Columbigallina passerina* var. *granatina* DUBOIS, Syn. Avium, II, 1902, 763, part (*syn.*; *geog. distr.*).
- Columbigallina passerina* var. *perpallida* DUBOIS, Syn. Avium, II, 1902, 764 (Aruba, Bonaire, and Curaçao, *ex Hartert*).
- Columbigallina passerina griseola* (not *Columbina griseola* Spix) VON IHERING, Aves do Brazil, 1907, 21, part (Meridá, Venezuela).
- Chamaepelia passerina perpallida* LOWE, Ibis, 1907, 552 (Curaçao, Bonaire, Aruba, Margarita, Blanquilla, and Los Hermanos Is.; *crit.*).
- Chamaepelia passerina perpallida* CORY, Field Mus. Orn. Series, I, 1909, 198 (Aruba), 205 (Curaçao), 210 (Bonaire), 218 (Orchilla), 220 (Tortuga), 223 (Blanquilla), 227 (Los Hermanos Is.), 230 (Los Testigos Is.), 240 (Margarita I.).
- Chamaepelia passerina granatina* CARRIKER, Ann. Carnegie Mus., VI, 1910, 398, in text (*crit.*).
- Chamaepelia perpallida* LOWE, A Naturalist on the Desert Islands, 1911, 219 (Orquilla).
- Columbigallina perpallida* LOWE, A Naturalist on the Desert Islands, 1911, 159 (Blanquilla).
- "West Indian Ground Dove" LOWE, A Naturalist on the Desert Islands, 1911, 102 (Islands north of Venezuela, except Swan Island).
- Columbina perpallida* BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (Aruba; Bonaire; Curaçao).
- Columbina griseola* (not of Spix) BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18, part (Venezuela).

Subspecific characters.—Male: similar in general to *C. p. pallescens*, but size smaller, vinaceous of under parts with a faint lavender-gray tinge, and the posterior under parts decidedly lighter, the under tail-coverts being almost entirely pure white; bill dull yellowish (except at tip), pale orange-yellow or pale yellow in life. Female much whiter

below and slightly browner above than the same sex of *C. p. pallescens*, the color of the bill as in the male.

Measurements.—Male: wing, 76–82 (average, 80); tail, 50–58 (53); exposed culmen, 10.5–12 (11.2); tarsus, 15–17 (16). Female: wing, 75–81 (79); tail, 51–58 (53.5); bill, 11–12 (11.1); tarsus, 15–16 (15.7).

Range.—Extreme northern Colombia and northern Venezuela, including the Leeward Islands, south to the Orinoco valley.

Remarks.—This form has been involved in much confusion. Bonaparte's name *Chamæpelia granatina*, which has anteriority over *C. albivitta*, has been generally employed to designate not only the Colombian and Venezuelan form of *C. passerina*, but also, until recently, the South American bird in general. That such an application of the name is not justified is practically certain. A translation of Bonaparte's original diagnosis of *Chamæpelia granatina* reads as follows:

"Similar to the preceding [*i. e.*, a specimen of "*passerina*" from Mazatlan, Mexico]; but somewhat paler; beneath whitish, throat-spots dusky, nape scarcely ashy, not vinaceous; wings beneath rufous, not chestnut; wing-spots coppery garnet; most of the lateral rectrices edged with white; feet somewhat weaker."

Substantially the same diagnosis is given by Bonaparte in his paper published the following year. To Dr. Sclater's intimation that *C. granatina* was the female or young of *C. passerina* (as then understood) Bonaparte returned an emphatic denial, claiming that he had both sexes before him. Nevertheless, it seems very probable that Dr. Sclater was right. Bonaparte said that his bird came from Bogotá, but, as is now well known, "Bogotá" skins may have come from any part of Colombia, and the locality assigned is of absolutely no value. Moreover, as shown elsewhere, the Ground Dove of central Colombia belongs to a very distinct form, to which Bonaparte's description cannot apply in any case. Neither will it answer for the form from western Colombia. Unfortunately, as we learn from Count Salvadori, the actual type seems to have disappeared from the Paris Museum, so that we are left without any means of determining to which of the Colombian forms the name applies, and therefore, in accordance with general usage in such cases, it is to be set aside as indeterminate.

The description of *Chamæpelia albivitta* which follows, however, is at once seen to be applicable to the form from the north coast of

Colombia. The type came from Cartagena, and is still extant. I have before me five skins from this locality. As might be expected, they are exactly the same as a series from the Santa Marta district, which may therefore be regarded as typical of this form. As we pass eastward along the coast of Venezuela, however, we find the birds becoming slightly darker below and more brownish above; the basal two-thirds of the bill is less distinctly yellowish, and the plumbeous area of the crown and nape is obsolescent. This tendency is especially well marked in a series of twelve skins from the lower Orinoco valley (Caicara, Ciudad Bolivar, etc.), which are unquestionably intermediates between *C. p. albivitta* and the Brazilian form, *C. p. griseola*, as in all their characters they show an approach to the latter. For the present, however, I refer them to *C. p. albivitta*, to which on the whole they seem nearer. The bill in some of these specimens is marked as being "reddish yellow at the base, tip black" (Carriker), "blackish, ochraceous rufous at base," or "blackish at tip, dusky orange at base" (Cherrie). No specimens from Trinidad have been examined, and, indeed, there seem to be no recent unquestioned records of the occurrence of the species on that island.

After very careful comparison I am quite unable to distinguish a series of specimens from Aruba, Curaçao, Bonaire, and other of the islands to the eastward from a series of Santa Marta skins, there being no differences obvious in either size or color. Dr. Ernst Hartert has described the bird from these islands under the name *Columbigallina passerina perpallida*, which seems to be a pure synonym of *C. p. albivitta*, contrary to what might be expected in view of the development of so many insular forms on the islands in question. Evidently Dr. Hartert could have had no specimens from the north Colombian coast for comparison, or he would not have been led into taking this unnecessary step. The large series of the present form from these islands in the collection of the Field Museum shows the usual range of variation for this species. The palest birds are those from the island of Orchilla, but the rough condition of many of the skins forbids satisfactory comparison.

Chæmepelia passerina antillarum Lowe.

"Lesser Turtle" LIGON, A true and exact History of the Islands of Barbados, 1673, 60 (Barbados).—HUGHES, The Natural History of Barbados, 1750, 70 (descr.; habits).

- "La petite Tourterelle" LIGON, Histoire de l'isle des Barbades, 1674, 101 (Barbados).
- "Turtur barbadensis minimus" WILLUGHBY, Ornithologia, 1676, 135, pl. 36, excl. syn. (Barbados; descr.; habits).—RAY, Syn. Avium, 1713, 62, No. 5 (ex Willughby).
- "Least Barbados Turtle" RAY, Willughby's Ornithology, 1678, 184, pl. 36, excl. syn. (Barbados; descr.; habits).
- Columba passerina* LINNÆUS, Syst. Nat., ed. 10, I, 1758, 165, part (ex Ray and Willughby); ed. 12, I, 1766, 285, part (reprint).—GMELIN, Syst. Nat., I, ii, 1789, 787, part (ex Ray and Willughby).
- Chamæpelina passerina* SCHOMBURGK, History of Barbados, 1848, 681 (Barbados).—SCLATER, Proc. Zool. Soc. London, 1874, 175 (Barbados).—LAWRENCE, Proc. U. S. Nat. Mus., I, 1878, 196 (St. Vincent); I, 1879, 276 (St. George, Grenada; habits), 487, part (St. Vincent; Grenada).—LISTER, Ibis, 1880, 43 (St. Vincent).—CORY, List Birds W. Indies, 1885, 24, part ("Antilles").—FEILDEN, Ibis, 1889, 480, 490 (Barbados; habits).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Grenada; Becqura; Mustique; St. Vincent; Barbados).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101, part (Barbados).—LOWE, Ibis, 1907, 115, in text, part (Grenada; crit.).
- Chamæpelina trochila* (not of Bonaparte) GRAY, List Birds Brit. Mus., Columbæ, 1856, 50 (Barbados).—GRAY, Hand-List Birds, II, 1870, 240 (Barbados).
- Columbigallina passerina* CORY, Ibis, 1886, 472 (Barbados).—WELLS, List Birds Grenada, 1886, 7 (Grenada).—WELLS, Proc. U. S. Nat. Mus., IX, 1887, 625 (Grenada; habits).—CORY, Auk, IV, 1887, 116, part (references).—CORY, Birds W. Indies, 1889, 217, part (references).—BERLEPSCH, Journ. f. Orn., XL, 1892, 97, part (Grenada; crit.), 102, part (Grenada; St. Vincent; Barbados).—CORY, Cat. W. Indian Birds, 1892, 97, part (Bequia; Canonam; Carriacou; Grenada; Barbados).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; crit.).—[WELLS?], Grenada Handbook, 1902, 141 (Grenada).—WELLS, Auk, XIX, 1902, 344 (Carriacou; habits).—[—?], W. Indian Bull., V, 1904, 88 (St. Vincent).—[WELLS?], Grenada Handbook, 1904, 147 (Grenada), 149 (Carriacou).
- Chamæpelina trochila* HARTERT, Ibis, 1893, 305, in text (crit.).
- "Ground Dove" [—?], W. Indian Bull., IV, 1903, 136 (Barbados).
- Columbigallina passerina trochila* RILEY, Smiths. Misc. Coll., Quarterly Issue, XLVII, 1904, 281, part (St. Vincent; Grenada; meas.; crit.).—CLARK, Proc. Boston Soc. Nat. Hist., XXXII, 1905, 262 (Barbados; St. Vincent; Grenada; Grenadines; habits), 302 (Barbados), 303 (St. Vincent), 304 (Grenadines), 306 (Grenada).
- Chamæpelina jamaicensis* (not of Maynard) LOWE, Ibis, 1908, 111, part (Grenada; crit.).
- Chamæpelina antillarum* LOWE, Bull. Brit. Orn. Club, XXI, 1908, 109 (Barbados; Grenada; St. Vincent; orig. descr.; type in collection P. R. Lowe).—LOWE, Ibis, 1909, 306 (Barbados; St. Vincent; Grenada; crit.).
- Subspecific characters.*—Male: most nearly resembling *C. p. albivitta* in the color of the under parts, and having the same peculiar lavender-gray cast, but slightly deeper or darker, the posterior under parts, and particularly the under tail-coverts, with much less white; bill

wholly dark (in skin), clear olive or olive-brown (basally) in life. Above, averaging slightly more grayish than in *C. p. albivitta*, the wing-coverts especially. Female very similar above to *C. p. albivitta*, but very different below, about as in *C. p. neglecta*, but rather paler brown, and breast more conspicuously squamate, by reason of the sharper contrast between the dark centers and paler edgings of the feathers; bill as in the male.

Measurements.—Male: wing, 78–82 (average, 80); tail, 53–58 (56); exposed culmen, 11.5–13 (12); tarsus, 16.5–17.5 (16.8). Female: wing, 76–81 (79); tail, 51–60 (55); exposed culmen, 11.5–12.5 (12); tarsus, 16–17.5 (16.7).

Range.—Southern Lesser Antilles, from Grenada north to St. Vincent and Barbados.

Remarks.—The history of this form dates back at least to 1673, when it was recorded by Ligon from the island of Barbados, under the name "Lesser Turtle." This was doubtless the chief basis for sundry later references pertaining to the "Caribbean Islands." In more recent years it has been reported from the other islands of the southern Lesser Antilles, St. Vincent, Grenada, the Grenadines, etc., but not until 1908 was it recognized as a distinct form. Dr. Percy R. Lowe, who was the original describer, compared it with the bird from the Bermudas, whereas, as a matter of fact, it is much closer to the form from northern South America, being in fact intermediate between that and *C. p. trochila* from the more northern Lesser Antilles. As previously noted, specimens from the eastern part of the range of *C. p. albivitta* grade into *C. p. griseola* to the southward, while to the northward they would seem rather to approach *C. p. antillarum*. Thus, a female from La Guaira, Venezuela (No. 172,865, Collection U. S. National Museum), is practically indistinguishable from the latter, except by its slightly more brownish coloration above and yellowish bill. Examples from the island of Santa Lucia, on the other hand, are distinctly intermediate between the present form and *C. p. trochila*, to which, on the whole, they are better referred. Mr. Austin H. Clark advises me that birds from the more southern islands have been introduced on Santa Lucia and elsewhere within recent years, which of course tends to complicate the question and obscure the differences which naturally exist.

Chæmpelia passerina trochila Bonaparte.

- "Ortolan" DU TERTRE, Histoire Générale des Isles de S. Christophie, de la Guadeloupe, de la Martinique, et autres dans l'Amérique, 1654, 316 (Martinique).—DU TERTRE, Histoire Générale des Antilles habitées par les Français, II, 1667, 254 (Martinique).
- Columba passerina* (not of Linnæus) FAHLBERG, Kongl. Vetensk. Acad. Nya Handlingar, VII, 1786, 253 (St. Bartholomew).—TEMMINCK, in TEMMINCK and KNIP, Pigeons, I, 1808-11, Colombi-gallines, 24, part, pls. 13-14 ("Iles Caraïbes" and Porto Rico).—LEDRU, Voyage aux Iles de Ténériffe, la Trinité, Saint-Thomas, Sainte-Croix et Porto-Ricco, II, 1810, 39 (St. Thomas; St. Croix; Porto Rico).—TEMMINCK, Hist. Nat. Gén. Pigeons et Gallinaces, I, 1813, 425, part ("Iles Caraïbes" and Porto Rico).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI 1818, 401, part (Martinique).—DESMAREST, Dict. Sci. Nat., XL, 1826, 308., part (Porto Rico).—LESSON, Compl. de Buffon, Oiseaux, VIII, 1837, 12, part (Porto Rico).—BRYANT, Proc. Boston Soc. Nat. Hist., X, 1866, 257 (Porto Rico).—BRYANT, Journ. f. Orn., XIV, 1866, 191 (Porto Rico).—SUNDEVALL, Öfv. Kongl. Vet.-Akad. Forh., "1869," 1870, 586, part (St. Bartholomew), 601 (Porto Rico).—GUNDLACH, Journ. f. Orn., XXII, 1874, 308 (Porto Rico, ex Bryant).—LAWRENCE, Proc. U. S. Nat. Mus., I, 1879, 450 (Guadeloupe, *vide* L'Herminier).
- "Ground Dove" ATWOOD, History of the Island of Dominica, 1791, 28 (Dominica, habits).
- Columba passeris (lapsus)* KNOX, A Historical Account of St. Thomas, 1852, 221 (St. Thomas).
- Chamæpelia trochila* BONAPARTE, Consp. Avium, II, 1854, 77 (Martinique; orig. descr.; type in collection Paris Museum).—BONAPARTE, Compt. Rend., XL; 1855, 21, 220 (Martinique; descr.).—NEWTON, Ibis, 1859, 253, part (St. Croix; St. Thomas; crit.; habits), 375 (St. Croix), 377 (St. Thomas).—CASSIN, Proc. Acad. Nat. Sci. Philadelphia, 1860, 378 (St. Thomas).—SCLATER, Ibis, 1862, 289 (Martinique).—SCLATER and SEMPER, Proc. Zoöl. Soc. London, 1872, 653 (Santa Lucia; habits; crit.).
- Chamæpelia trochilia (lapsus)* BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, footnote (Martinique; diag.; ex Bonaparte).
- Pyrgitoënas trochila* REICHENBACH, Tauben, 1862, 14 (Martinique; descr.; ex Bonaparte).
- Chamæpelia trochila* TAYLOR, Ibis, 1864, 171 (Porto Rico; St. Thomas; crit.).
- Chamæpelia trochilea? (lapsus)* SCLATER, Proc. Zoöl. Soc. London, 1871, 266 (Santa Lucia).
- Chamæpelia passerina* BELLO and ESPINOSA, Zoöl. Garten, XII, 1871, 348 (Porto Rico).—GUNDLACH, Journ. f. Orn., XXII, 1874, 313 (Porto Rico).—LAWRENCE, Forest and Stream, IX, 1877, 345 (Dominica).—GUNDLACH, Journ. f. Orn., XXVI, 1878, 161, 186 (Porto Rico).—GUNDLACH, An. Soc. Esp. Hist. Nat., VII, 1878, 349 (Porto Rico; habits; syn.).—LAWRENCE, Proc. U. S. Nat. Mus., I, 1878, 67 (Dominica), 237 (Antigua), 241 (Barbuda); I, 1879, 360 (Martinique), 460 (Guadeloupe; habits), 487, part (Barbuda; Antigua; Guadeloupe; Dominica; Martinique).—ALLEN, Bull. Nuttall Orn. Club, V, 1880, 169 (Santa Lucia).—

- RIDGWAY, Proc. U. S. Nat. Mus., VII, 1884, 172 (St. Thomas).—CORY, List Birds W. Indies, 1885, 24, part ("Antilles").—SCLATER, Proc. Zool. Soc. London, 1889, 326 (Dominica), 395 (Santa Lucia); 1892, 500 (Anguilla).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Santa Lucia; Dominica; Guadeloupe; St. Kitts; Tortola; Anguilla; Virgin Gorda; St. Thomas; Porto Rico).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101, part (St. Croix).—NICOLL, Ibis, 1904, 570 (Roseau Harbor, Dominica; crit.), 572 (Montserrat; crit.), 575, in text, 576 (St. Croix).—LOWE, Ibis, 1907, 116, in text, part (Porto Rico; St. Thomas; St. Croix; St. Kitts; Dominica; crit.).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (St. Thomas).
- Columbigallina passerina* CORY, Ibis, 1886, 474 (Désirade).—CORY, Auk, IV, 1887, 96 (Martinique), 116, part ("Antilles"; references).—CORY, Birds W. Indies, 1889, 217, part ("Antilles"; references).—CORY, Auk, VII, 1890, 374 (Anegada), 375 (Tortola; Virgin Gorda); VIII, 1891, 47 (Antigua), 48 (St. Croix; St. Kitts; Guadeloupe).—BERLEPSCH, Journ. f. Orn., XL, 1892, 102, part (Santa Lucia; Martinique; St. Thomas).—CORY, Cat. Birds W. Indies, 1892, 97, part (Porto Rico; Tortola, Virgin Gorda; Anegada; St. Croix; St. Bartholomew; St. Eustatius; Montserrat; Guadeloupe; Désirade; Dominica; Martinique; Santa Lucia).—VERRILL, Trans. Connecticut Acad. Sci., VIII, 1893, 324, 349 (Dominica).—BOWDISH, Oölogist, XVI, 1900, 72 (Vieques I., Porto Rico).—HARTERT, Nov. Zoöl., IX, 1902, 276, in text (St. Thomas).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; crit.).—BOWDISH, Auk, XIX, 1902, 361, part (San Juan and Aguadillas, Porto Rico; nesting).
- Columbigallina passerina socorrensis?* (*lapsus*) (not of Ridgway) HARTERT, Ibis, 1893, 305, in text (Porto Rico [and St. Thomas]).
- Columbigallina passerina trochila* RILEY, Smiths. Misc. Coll., Quarterly Issue, XLVII, 1904, 281, part (Barbuda; Antigua; St. Bartholomew; St. Kitts; St. Eustatius; Guadeloupe; Dominica; meas.; crit.).—VERRILL, Addition to the Avifauna of Dominica, etc., 1905, [16, 23] (Roseau, Dominica).
- Chamæpelis portoricensis* LOWE, Ibis, 1908, 108 (Guanica, Porto Rico; orig. descr.; type in collection P. R. Lowe), 545, in text (St. Thomas).
- Chamæpelis jamaicensis* (not of Maynard) LOWE, Ibis, 1908, 111, part (St. Thomas; St. Kitts; Dominica; crit.).
- Chamæpelis passerina trochila* CLARK, W. Indian Bull., XI, 1911, 183, (188) (Santa Lucia).

Subspecific characters.—Male: similar to *C. p. antillarum*, but color of upper parts slightly darker and more olivaceous gray; wing-coverts more decidedly vinaceous; forehead and sides of head deeper vinaceous; under parts more cinnamon vinaceous, without any lavender-gray cast; and remiges more extensively rufous chestnut externally, with narrower black edgings. The female also averages rather darker, more olivaceous gray above, and has the remiges more extensively rufous chestnut externally. Basal two-thirds of bill (in both sexes?) crimson in life, dark in dry skin.

Measurements.—Male (eighteen specimens): wing 77–83 (average, 80); tail, 53–63 (57.5); exposed culmen, 10.5–12 (11.1); tarsus, 15–17 (16). Female: wing, 77–85 (80); tail, 51–62 (56); exposed culmen, 11–12.5 (11.3); tarsus, 15–17.5 (15.7).

Range.—Island of Porto Rico, and Lesser Antilles south to Santa Lucia.

Remarks.—That two forms of the Ground Dove inhabit the Lesser Antilles is perfectly apparent upon even a casual comparison of a series from the more southern islands of the group, Grenada, Carriacou, Bequia, etc., with another from Antigua and Barbuda, the general differences being well marked. Unfortunately from Martinique, the type locality of *Chamæpelia trochila* Bonaparte, no adult males are available, but two females examined seem referable to the northern form. Moreover, as previously noted, while birds from Santa Lucia are somewhat intermediate, a series from Dominica is quite obviously closer in general coloration to the Antigua and Barbuda birds. In view of these considerations it seems quite safe to adopt the name *trochila*, based on the bird of the intermediate island of Martinique, for the northern form. It is simply one of the many cases in which, paradoxically speaking, the bird from the type locality is not typical!

The character of the extent of the rufous chestnut on the outer webs of the remiges, to which Mr. Riley has called attention, is one upon which no dependence can be placed so far as *C. p. passerina* is concerned, as previously shown, and this is true also of the other forms so far considered. It is somewhat surprising, therefore, to find that in this particular case it is a fairly constant diagnostic character in both sexes, serving to separate the two Lesser Antillean forms from each other.

This form varies to some extent geographically, but scarcely enough to justify further subdivision. Birds from Dominica, for example, show less vinaceous tinge on the wing-coverts than do those from farther north, the approach of course being to *C. p. antillarum*. On the other hand, St. Thomas examples are rather more brightly colored in this respect. After careful comparison of a good series from Porto Rico I believe they should also be referred to this form, although the males differ in being rather more "solid" vinaceous below—due to the slightly darker tips of the throat and breast feathers—while the wing-coverts average more decidedly vinaceous, and the

rufous chestnut edgings of the remiges are less extensive. Females are quite indistinguishable. Dr. Lowe, in describing the Porto Rican bird, bases his diagnosis mainly upon the color of the bill, which he says is (when perfectly fresh) crimson at the base, "the tip varying from brownish black to black. The crimson colour occupies at least *two-thirds* of the hinder end of the bill, running abruptly up to the black tip." In extending the distribution of this form to include Martinique—a step which, in spite of the range of variation exhibited by birds from the different islands, seems fully justified by the series I have studied, the name *portoricensis* proposed by Dr. Lowe necessarily becomes a synonym of Bonaparte's much earlier appellation. Unless it can be shown that the color of the bill is not correlated with other color-characters, and is constantly different in birds from Porto Rico and St. Thomas as compared with those from the islands to the southward, I can see no way to avoid merging the birds from all these various islands under one head.

Chæmepelia passerina aflavida (Palmer and Riley).

"Turtur parvus americanus" BRISSON, Orn., I, 1760, 113, part ("Insula Dominicopoli").

"Petite Touterelle de St. Dominique" D'AUBENTON, Pl. Enlum., 1770-86, 243, fig. 1.

Columba passerina LINNÆUS, Syst. Nat., ed. 12, I, 1766, 285, part (ex Brisson).—GMELIN, Syst. Nat., I, ii, 1789, 787, part (ex Brisson).—TEMMINCK, in TEMMINCK and KNIP, Pigeons, I, 1808-11, Colombi-gallines, 24, part, pls. 13-14 ("Saint Domingue," *vide* Vieillot).—TEMMINCK, Hist. Nat. Pigeons et Gallinaces, I, 1813, 425, part ("Saint Domingue," *vide* Vieillot).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 401, part (Santo Domingo and Greater Antilles).—VIEILLOT, Gal. Oiseaux, I, 1825, 333, part, pl. 196 (Santo Domingo).—DESMAREST, Dict. Sci. Nat., XL, 1826, 308, part (Santo Domingo).—HEARNE, Proc. Zool. Soc. London, 1835, 110 (Haiti).—RITTER, Reise nach Haiti, 1836, 156 (Haiti).—LESSON, Compl. de Buffon, Oiseaux, VIII, 1837, 12, part (Santo Domingo); ed. 2, 1838, 272.—D'ORBIGNY, in La Sagra's Hist. Nat. Cuba, Oiseaux, III, 1839, 131 (Cuba).—TEMMINCK, Pl. Col. I, Tabl. Méth., 1840, 81.—DENNY, Proc. Zool. Soc. London, 1847, 38, part (Cuba, in geog. distr.).—POEY, Mem. Real. Soc. Econom. Habana, (2), VII, 1848, 104 (Cuba).—LEMBEYE, Aves Isla Cuba, 1850, 132 (Cuba).—POEY, Memorias sobre la Historia Natural de la Isla de Cuba, I, 1851, 427 (Isle of Pines).—THIENEMANN, Journ. f. Orn., V, 1857, 154 (Cuba; descr. eggs).—SAUSSURE, Rev. et Mag. de Zoöl., 1859, 121 (Haiti).—BRYANT, Proc. Boston Soc. Nat. Hist., XI, 1867, 96 (Santo Domingo).—SUNDEVALL, Öfv. Kongl. Vet.-Akad. Förh., "1869," 1870, 586, part (Haiti; crit.).—GUNDLACH, An. Hist. Nat., 1873, 146 (Cuba; habits).

(?) *Chæmepelia hortulana* WÜRTEMBERG, Naumannia, II, ii, 1852, 56 (Haiti; orig. descr.; type probably lost).

- Chamaepelia passerina* LICHTENSTEIN, Nom. Avium Mus. Zoöl. Berol., 1854, 82, part (Cuba).—GUNDLACH, Journ. f. Orn., IV, 1856, 111 (Cuba; descr.; habits).—SALLÉ, Proc. Zoöl. Soc. London, 1857, 236 (Santo Domingo).—BREWER, Proc. Boston Soc. Nat. Hist., VII, 1860, 307 (Cuba, *vide* Gundlach).—GUNDLACH, Journ. f. Orn., IX, 1861, 336 (Cuba).—GUNDLACH, in Poey's Rep. Fis.-Nat. Cuba, 1865-6, 300 (Cuba; habits).—BAIRD, Am. Journ. Sci. and Arts, XLI, 1866, 188, part (Cuba, in geog. distr.).—BAIRD, Ibis, 1867, 276, part (Cuba, in geog. distr.).—PELZELN, Orn. Bras., 1870, 277, footnote, part (Santo Domingo).—GUNDLACH, Journ. f. Orn., XXII, 1874, 296 (Cuba; habits).—GUNDLACH, Contribucion Ornitologia Cubana, 1876, 7, 13, 136 (Cuba; habits; nesting), 279 (syn.).—CORY, Bull. Nuttall Orn. Club, VI, 1881, 154 (Haiti).—TRISTRAM, Ibis, 1884, 168 (Santo Domingo).—CORY, List Birds W. Indies, 1885, 24, part ("Antilles").—CORY, Birds Haiti and San Domingo, 1885, 127, excl. syn. part (Haiti and Santo Domingo).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Port-au-Prince, Haiti; Santo Domingo; San Cristobal, Cuba).—CHRISTY, Ibis, 1897, 335 (La Vega, Santo Domingo; habits; food).—MENE GAUX, Revue Franc. d'Orn., No. 2, 1909, 31 (Figuabas, Cuba).
- Pyrgitoënas passerina* REICHENBACH, Tauben, 1862, 162, part (Santo Domingo, ex Sallé).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Haiti).
- Columbigallina passerina* CORY, Auk, IV, 1887, 116, part ("Antilles"; references).—CORY, Birds W. Indies, 1889, 217, part ("Antilles"; references).—GUNDLACH, Auk, VIII, 1891, 190 (Cuba; abnormal plumage).—CORY, Auk, VIII, 1891, 293, 294 (San Domingo, Cuba).—BERLEPSCH, Journ. f. Orn., XL, 1892, 97, part (Santo Domingo; crit.), 102 (Greater Antilles, part).—CORY, Auk, IX, 1892, 272 (Havana and San Diego de los Baños, Cuba).—CORY, Cat. W. Indian Birds, 1892, 97, part (Cuba; Isle of Pines; Haiti; Santo Domingo).—CHAPMAN, Bull. Am. Mus. Nat. Hist., IV, 1892, 292 (Trinidad, Cuba; crit.).—GUNDLACH, Orn. Cubana, 1893, 164 (Cuba; descr.; habits).—CHERRIE, Field Mus. Orn. Series, I, 1896, 24 (Santo Domingo).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; crit.).
- Columbigallina passerina aflavida* PALMER and RILEY, Proc. Biol. Soc. Wash., XV, 1902, 33 (San Diego de los Baños, Cuba; orig. descr.; type in collection U. S. National Museum).—BANGS and ZAPPEY, Am. Nat., XXXIX, 1905, 197 (Callebtonita, Hospital, Jucaro, and San Juan, Isle of Pines).—READ, Oölogist, XXVIII, 1911, 3, 16 (McKinley, Isle of Pines).
- Columbigallina aflavida* MAYNARD, Cat. Birds W. Indies, Second Appendix, 1903, 35 (Cuba).
- Chamaepelia aflavida* LOWE, Ibis, 1907, 116, in text (crit.).
- Chamaepelia axantha* LOWE, Ibis, 1908, 114 (new name for *aflavida* Palmer and Riley; Havana and Matanzas, Cuba).
- Chamaepelia passerina* MENE GAUX, Bull. Mus. d'Hist. Nat., XV, 1909, 238 (Cuba), "Ground Dove" READ, Oölogist, XXVI, 1909, 57, 58, 75 (Isle of Pines); XXVII, 1910, 5 (Nuevas River, Isle of Pines), 42 (Isle of Pines), 84 ("Las Tres Mountains," Isle of Pines).
- Chamaepelia passerina aflavida* READ, Bird-Lore, XIII, 1911, 44 (McKinley, Isle of Pines); XV, 1913, 45 (Santa Barbara, Isle of Pines).

Subspecific characters.—Intermediate in general coloration between *C. p. antillarum* and *C. p. trochila*, but bill in life different from either, being black except at the extreme base, which is washed with crimson.

Measurements.—Male: wing, 77–86 (average, 81); tail, 55–61 (58); exposed culmen, 10.5–12 (11.2); tarsus, 15–16.5 (15.6). Female: wing, 81–85 (83.5); tail, 54–60 (57); exposed culmen, 11–12 (11.6); tarsus, 15–16 (15.4).

Range.—Cuba (including Isle of Pines) and Haiti; accidental in Jamaica.

Remarks.—The range of variation in this subspecies is considerable, and renders a more definite diagnosis than the above impracticable. In general, however, the vinaceous of the under parts has a slight lavender gray cast, less decided than in *C. p. antillarum*, and there is more vinaceous on the wing-coverts. These differences, however, are only average ones, and are obvious only when a sufficiently large series is compared to eliminate the factor of individual variation. On the other hand, Porto Rican examples of *C. p. trochila* approach the present form rather closely in their characters, but are somewhat darker and more vinaceous. In fact, the three forms under discussion merge into one another to such an extent that their satisfactory discrimination from dry skins is very difficult, and in the case of some particular specimens quite impossible, so subtle are the visible differential characters. To take the other horn of the dilemma, however, and “lump” the Ground Doves from Cuba, Haiti, Porto Rico, and the Lesser Antilles under the oldest name, would be to render their satisfactory collective diagnosis still more difficult, so that, on the whole, after careful consideration of the entire case, I have decided to recognize the three forms as here given, relying for their discrimination mainly on the data given by Dr. Lowe and other careful observers concerning the color of the bill in life, which would seem to be at least fairly constant. In the few instances where the labels give the colors of the soft parts the iris is marked as brown, hazel, light hazel, and yellow, instead of red or pink, as usual in this species.

Careful examination of a series from Haiti and Santo Domingo discloses no differences sufficient to separate them from the Cuban bird, although the usual range of variation is exhibited. Some specimens, indeed, are fully as pale as *C. p. exigua*, but their measurements average larger. In 1852 the Prince von Württemberg referred to a dove from Haiti under the name *Chamæpelia hortulana*, his description

being merely "grösser als *passerina*"—barely sufficient to take his name out of the *nomen nudum* class, and of itself unidentifiable, inasmuch as it leaves reason to believe that his bird may not have been a *Chamæpelia* at all! Were the actual type available, Württemberg's name might be accepted for the present race, but the type would seem to have been lost through the dispersal of his collection.⁹ Accordingly, we are perfectly justified in falling back on *Columbigallina passerina aflavida* of Palmer and Riley (1902), who were the first to definitely point out the distinctive characters of the Cuban bird as compared with that of neighboring regions, although ten years previously Mr. Chapman had called attention to the matter. In 1908 Dr. Lowe, not liking the hybrid name *aflavida*, renamed the form *axantha*.

A single example from Kingston, Jamaica (No. 14,785, Bangs Collection, February 21, 1906), belongs unquestionably to the present form, and was doubtless a straggler from Cuba or Haiti.

Chamæpelia passerina insularis (Ridgway).

- Columbigallina passerina* (not *Columba passerina* Linnæus) CORY, Auk, III, 1886, 502 (Grand Cayman); IV, 1887, 116, part ("Antilles"; reference); VI, 1889, 32 (Cayman Brac).—CORY, Birds W. Indies, 1889, 217, part ("Antilles"; reference).—CORY, Cat. W. Indian Birds, 1892, 97, part (Grand Cayman; Little Cayman; Cayman Brac) 139, part (crit.).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; crit.).
- Columbigallina passerina insularis* RIDGWAY, Proc. U. S. Nat. Mus., X, 1887, 574 (Grand Cayman; orig. descr.; type in collection U. S. National Museum).—CORY, Birds W. Indies, 1889, 297 (Grand Cayman; Cayman Brac; crit.).—BERLEPSCH, Journ. f. Orn., XL, 1892, 98, in text (crit.).—HARTERT, Ibis, 1893, 305, in text (crit.).
- Chamæpelia passerina* SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473, part (Grand Cayman).—NICOLL, Ibis, 1904, 585 (Grand Cayman; crit.).—LOWE, Ibis, 1907, 116, in text, part (Cayman Islands; crit.).
- Chamæpelia insularis* SHARPE, Hand-List Birds, I, 1899, 82 ("Great" Cayman).—LOWE, Ibis, 1908, 113 (Cayman Islands; crit.).
- Columbigallina insularis* MAYNARD, Cat. Birds W. Indies, 1903, 7 (Grand Cayman).
- Chamæpelia passerina insularis* LOWE, Ibis, 1907, 116, in text (Cayman Islands; crit.).
- Chamæpelia jamaicensis* (not of Maynard) LOWE, Ibis, 1908, 111, part (Cayman Islands; crit.); 1909, 341 (Grand Cayman; crit.); 1911, 145 (Cayman Islands; references).

Subspecific characters.—Male: similar to *C. p. aflavida*, but slightly

⁹ I am greatly indebted to Mr. C. E. Hellmayr for his efforts in my behalf to locate the type specimen in question.

less purplish vinaceous below, and bill usually extensively yellowish at base (in skin).

Measurements.—Male (seven specimens): wing, 80–84 (average, 82); tail, 53–60 (57); exposed culmen, 11–12 (11.1); tarsus, 15–16.5 (15.6). Female (four specimens): wing, 78–83 (81); tail, 55–60 (57); exposed culmen, 10–11.5 (11); tarsus, 15.

Range.—Islands of Grand Cayman, Little Cayman, and Cayman Brac, West Indies.

Remarks.—When Mr. Ridgway discriminated this form in 1887 he had no specimens of the Ground Dove from Cuba or Jamaica, and made his comparison with Bahaman birds. The type is a very pale individual—fully as pale above as the average of *C. p. pallescens*—but other specimens are darker. Three of the skins before me have the color of the bill marked as “brown,” “dull red,” and “red” respectively. This fails to substantiate Mr. Ridgway’s guess as to the color of the bill in life, upon which he mainly based his distinction. The character is more or less apparent in the dry skin, however, but is not constant. The bestowal of a name upon the present form has given rise to considerable discussion as to its status. Dr. Lowe has insisted that it must be identical with the Jamaican bird (in which case the latter would have to be called *C. p. insularis*), but in the writer’s judgment it is much closer to the Cuban bird instead, so far at least as general coloration is concerned, females being practically indistinguishable. On the other hand, as remarked under the head of *C. p. pallescens*, some specimens of the latter from Cozumel Island, Yucatan, apparently show a marked approach to *C. p. insularis* in the color of the bill, and at least one specimen from Cozumel (No. 129,614, Collection U. S. National Museum) is fully as small as *C. p. insularis*.

The status of examples from Little Cayman and Cayman Brac is further open to question, and they are ranged here only provisionally. A small series from Cayman Brac is so badly discolored by the preservative as to be entirely unfit for comparison, while a pair from Little Cayman are perhaps nearer the present form. Until more and better material from all three islands is available, however, it will be difficult to come to any more certain conclusion with reference to the characters of *insularis* and its claims to recognition as a distinct subspecies. As might be expected, it is intermediate between *C. p. aflavida* and *C. p. jamaicensis*, and it may eventually be found desirable to unite it with the former.

Chæmpelia passerina jamaicensis (Maynard).

- "Turtur minimus guttatus" SLOANE, Jamaica, II, 1725, 305, pl. 261, fig. 3 (Jamaica; descr.; habits).
- "Ground Dove, Columba 10" BROWNE, Civil and Natural History of Jamaica, 1756, 469 (Jamaica).
- Columba passerina* LINNÆUS, Syst. Nat., ed. 10, I, 1758, 165, part (*ex* Sloane); ed. 12, 1766, 285, part (reprint orig. descr.).—BROWNE, Civil and Natural History of Jamaica, ed. 2, 1789, Index No. III, [30] (Jamaica).—GMELIN, Syst. Nat., I, ii, 1789, 787, part (*ex* Sloane and Browne).—DENNY, Proc. Zool. Soc. London, 1847, 38, part (Jamaica).—PALMER, Osprey, V, 1901, 148, in text (Jamaica; crit.).—BERLEPSCH, Nov. Zööl., XV, 1908, 295, in synonymy (crit.).
- "Ground Turtle" LATHAM, Gen. Syn. Birds, II, ii, 1783, 659, part (Jamaica, *ex* Sloane).
- Chamæpelia passerina* GRAY, List Gallinæ Brit. Mus., 1844, 14, part (Jamaica). GOSSE, Birds Jamaica, 1847, 311 (Spanish Town, Jamaica; habits).—HARTLAUB, Isis, XLI, 1848, 405 (Jamaica, *ex* Gosse).—GOSSE, Naturalist's Sojourn in Jamaica, 1851, 173 (Jamaica).—BONAPARTE, Consp. Avium, II, 1854, 77, part (Jamaica, in geog. distr.).—SCLATER, Proc. Zool. Soc. London, 1861, 80 (Jamaica).—ALBRECHT, Journ. f. Orn., X, 1862, 204 (Jamaica, *fide* Gosse).—MARCH, Proc. Acad. Nat. Sci. Philadelphia, 1863, 302 (Jamaica; habits).—BAIRD, Am. Journ. Sci. and Arts, (2), XLI, 1866, 188, part (Jamaica, in geog. distr.).—BAIRD, Ibis, 1867, 276, part (Jamaica, in geog. distr.).—PELZELN, Orn. Bras., 1870, 277, footnote, part (Jamaica).—BAIRD, BREWER, and RIDGWAY, Hist. N. Am. Birds, II, 1875, 389, part (Jamaica, *ex* March).—NEWTON, Handbook Jamaica, 1881, 114 (Jamaica, *ex* Gosse and March).—CORY, List Birds W. Indies, 1885, 24, part ("Antilles").—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473 (near Spanish Town, Jamaica).—SHARPE, Hand-List Birds, I, 1899, 81 (Jamaica).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141, part (Jamaica).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101, part (Jamaica).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 250, part (Jamaica; crit.).—LOWE, Ibis, 1907, 114, in text, part; 115, in text, part (Jamaica; crit.).—LOWE, Bull. Brit. Orn. Club, XXI, 1908, 110, in text, (crit.).—SCLATER, Hand-book of Jamaica, 1910, 614 (Jamaica).
- Chamæpelia passerina* GRAY, List Birds Brit. Mus., Columbæ, 1856, 49, part (Jamaica).—GRAY, Hand-List Birds, II, 1870, 239, part (Jamaica).—BOUCARD, Cat. Avium, 1876, 34, part (Jamaica).—KNOWLTON, Birds of the World, 1909, 432, in text (Jamaica).
- Chamæpelia trochila* (not of Bonaparte) NEWTON, Ibis, 1859, 253, part (Jamaica; crit.).
- Pyrgitoënas trochila* REICHENBACH, Tauben, 1862, 162 (Jamaican references).
- Pyrgitoënas passerina* REICHENBACH, Tauben, 1862, 13, part (Jamaica, *fide* Leadbeater).
- Peristera passerina* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Jamaica; syn.).
- Columbigallina passerina* CORY, Auk, IV, 1887, 116, part ("Antilles"; references).—CORY, Birds W. Indies, 1889, 217, part ("Antilles"; references).—CORY,

- Cat. W. Indian Birds, 1892, 97, part, 130, part (Jamaica).—BERLEPSCH, Journ. f. Orn., XL, 1892, 97, footnote, part (Jamaica; crit.).—SCOTT, Auk, IX, 1892, 124 (Jamaica; crit.; habits).—CHAPMAN, Bull. Am. Mus. Nat. Hist., IV, 1892, 292 (Jamaica; crit.).—HARTERT, Ibis, 1893, 304, 305, in text (Jamaica; crit.).—PALMER, Yearbook U. S. Dept. Agric. for 1893, 1894, 94, in text (Jamaica).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XI, 1894, 48, in text (Jamaica).—FIELD, Auk, XI, 1894, 123 (Port Henderson, Jamaica; nesting).—DUBOIS, Syn. Avium, II, 1902, 763, part ("Antilles"; crit.).—PALMER and RILEY, Proc. Biol. Soc. Washington, XV, 1902, 34, in text (Jamaica; crit.).
- Columbigallina jamaicensis* MAYNARD, Appendix to Catalogue Birds W. Indies, "1899," 1900, 34 (Jamaica; orig. descr.; types "in the Bryant Collection").—MAYNARD, Catalogue Birds W. Indies, 1903, 7 (Jamaica).
- Chamaepelia jamaicensis* LOWE, Bull. Brit. Orn. Club, XXI, 1908, 110, in text (crit.).—LOWE, Ibis, 1908, 111, part (Jamaica; crit.).
- Chamaepelia passerina passerina* AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150 ("extralimital" [= Jamaica]).

Subspecific characters.—Male: similar in general to *C. p. aflavida*, but bill extensively yellow at base (in skin), in life varying from bright orange to yellow; vinaceous of under parts decidedly richer, almost brick-red; upper parts averaging slightly more brownish, and plumbeous area of crown and nape much duller, darker, and more restricted. Female indistinguishable from the same sex of *C. p. aflavida* except by the differently colored bill, which is yellow basally.

Measurements.—Male: wing, 80-85 (average, 82); tail, 53-59 (56); exposed culmen, 10.5-12 (11); tarsus, 14-16 (15.5). Female: wing, 79-85 (82); tail, 52-58 (56); exposed culmen, 10-12 (11.3); tarsus, 15-16 (15.5).

Range.—Island of Jamaica.

Remarks.—In its general intensity of coloration and the richness of the vinaceous color below this very distinct form somewhat suggests the far-removed *C. p. socorroënsis*, but in the latter there is comparatively very little vinaceous tinge to the wing-coverts, which is a prominent feature in the present form. The upper parts, too, are generally much grayer, less brownish, than in *C. p. socorroënsis*, while the bill is of course differently colored. The female is more grayish, less brownish above, than in the Socorro form, and generally paler below, with whiter under tail-coverts, and with the bill also differently colored. Compared with *C. p. passerina*, the Jamaican bird is smaller, and the general coloration is richer, and has a ruddy cast. Apparently, however, the color of the bill is about the same in both. The series before me shows considerable variation, apparently of

a purely individual nature, a few specimens being decidedly paler below than the average, with a slight lavender gray tinge as in *C. p. aflavida*, but the series as a whole is sufficiently distinct from any other form.

As early as 1725 Sloane gave a very fair account, accompanied by a figure, of the Jamaican Ground Dove, and his description was the first to be cited by Linnæus under the name *Columba passerina*. Mainly on this account Count von Berlepsch proposed to restrict the name to the Jamaican subspecies, and in this he was followed by Mr. Chapman. Mr. Maynard, however, arrived at a different conclusion, and proceeded to give a new name to the Jamaican bird, which name must now be accepted, inasmuch as Bonaparte, as far back as 1855, restricted the application of Linnæus' name to the form from eastern North America, as has been already pointed out. Mr. Maynard, however, compares the bird of Jamaica with that of the Bahamas, saying that the former is lighter in shade, whereas it is actually the reverse.

Chæmepelia passerina bahamensis Maynard.

- Chæmepelia passerina* (not *Columba passerina* Linnæus) JARDINE, Jardine's Contr. Orn., 1849, 79 (Bermuda).—HURDIS, Jardine's Contr. Orn., 1850, 6 (Bermuda).—REID, Bull. 25 U. S. Nat. Mus., 1884, 225, excl. syn. and geog. distr. (Bermuda; habits).
- Columba passerina* BLAND, Ann. Report Smiths. Inst. for 1858, 1859, 287 (Bermuda).—JONES, Naturalist in Bermuda, 1859, 36, 70 (Bermuda; habits).—MARTENS, Journ. f. Orn., VII, 1859, 216 (Bermuda, ex Jones).—GODET, Bermuda, 1860, 194 (Bermuda; habits).
- Chæmepelia passerina* BRYANT, Proc. Boston Soc. Nat. Hist., VII, 1859, 120 (Bahama Is.).—ALBRECHT, Journ. f. Orn., IX, 1861, 55 (Bahama Is., ex Bryant).—BAIRD, Am. Journ. Sci. and Arts, XLI, 1866, 188, part (Bahama Is., in geog. distr.), 342, 344 (Bermuda).—BAIRD, Ibis, 1867, 276, part (Bahama Is., in geog. distr.), 287, 289 (Bermuda).—WALLACE, Geog. Distr. Animals, II, 1876, 135 (Bermuda).—CORY, Birds Bahama Is., 1880, 139, part (Miraporvos Is.; Bahama Is. in general; habits).—CORY, List Birds W. Indies, 1885, 24, part (Bahama Is.).—JENNINGS, Johns Hopkins University Circulars, VII, No. 63, 1888, 39 (New Providence; Abaco).—TRISTRAM, Cat. Coll. Birds, 1889, 39, part (Bermuda).—CORY, Birds Bahama Is., ed. 2, 1890, inserted page (Bahama Is.; crit.).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 473 (Bermuda).—OATES, Cat. Birds' Eggs Brit. Mus., I, 1901, 101 (Bermuda).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141, part (Bermuda).—BONHOTE, Auk, XX, 1903, 177 (Bird Rock, Bahama Is.).
- Chæmepelia passerina* CORY, Birds Bahama Is., 1880, 228, part ("Bahamas in general").

- "Ground Dove" IVES, *The Isle of Summer, or Nassau and the Bahamas*, 1880, 257 (Bahama Is.).—BONHOTE, *Avic. Mag.*, n. s., I, 1903, 24 (northern Bahama Is.).
—CHAPMAN, *Camps and Cruises of an Ornithologist*, 1908, 152 (Bahama Is.).
- Columbigallina passerina* MILLS, *Canadian Record Science*, II, 1887, 352 (Green Turtle Cay, Abaco).—CORY, *Auk*, IV, 1887, 116, part (Bahama Is.; references).
—CORY, *Birds W. Indies*, 1889, 217, part (Bahama Is.; references).—NORTHROP, *Auk*, VIII, 1891, 76 (Andros; New Providence; habits).—CORY, *Auk*, VIII, 1891, 294 (New Providence), 295 (Berry Is.), 296 (Bimini Is.), 297 (Caicos Is.), 298 (Abaco).—CHAPMAN, *Am. Nat.*, XXV, 1891, 530 (Bahama Is.; faunal distribution).—CORY, *Auk*, IX, 1892, 48 (Maraguana).—CORY, *Cat. W. Indian Birds*, 1892, 97, part (Great Bahama; Abaco; Biminis; Berry Is.; Eleuthera; New Providence; Andros; Cat I.; Concepcion I.; Watlings I.; Rum Cay; Green Cay; Acklin I.; Plana Cays; Maraguana; North Caicos; Grand Caicos; East Caicos).—NUTTING, *Bull. Laboratory State University of Iowa*, III, 1894, 40 (Egg Island), 203 (Eleuthera).—PRENTISS, *Auk*, XIII, 1896, 239 (Bermuda; habits).—BONHOTE, *Ibis*, 1899, 517 (Nassau, New Providence); 1903, 299 (Nassau, New Providence; Little Abaco; habits; crit.).
- Chamæpelia bahamensis* MAYNARD, *American Exchange and Mart*, III, 1887, 33 (Bahama Islands; orig. descr.; type not specified), 69 (corrected reprint orig. descr.).—CHAPMAN, *Bull. Am. Mus. Nat. Hist.*, IV, 1892, 292, in text (crit.).—MAYNARD, *Birds E. N. Am.*, 1895, 252 (Nassau, New Providence; Bahama Is. in general; Enterprise, Florida?; descr.; crit.; habits).—SHARPE, *Hand-List Birds*, I, 1899, 81 (Bahama Is.).—PALMER, *Osprey*, V, 1901, 148 (reprint orig. descr.).—LOWE, *Ibis*, 1908, 112, 545, in text (Bahama Is.; crit.).
- Columbigallina passerina bahamensis* RIDGWAY, *Man. N. Am. Birds*, 1887, 586, part (diag.; Bahama Is.).—RIDGWAY, *Proc. U. S. Nat. Mus.*, X, 1887, 574, in text (crit.).—RIDGWAY, *Auk*, VIII, 1891, 334 (Abaco), 336 (Eleuthera), 337 (Cat I.; Watlings I.), 338 (Rum Cay), 339 (Green Cay; Concepcion I.).—SCOTT, *Auk*, IX, 1892, 124, in text (crit.).—VERRILL (A. H.), *Osprey*, V, 1901, 85 (Bermuda; crit.).—VERRILL (A. E.), *Osprey*, V, 1901, 174, in text (Bermuda; crit.).—VERRILL (A. H.), *Am. Journ. Sci.*, (4), XII, 1901, 64 (Bermuda).—PALMER and RILEY, *Proc. Biol. Soc. Wash.*, XV, 1902, 34, in text (Bahama Is.; crit.).—ALLEN, *Auk*, XXII, 1905, 123, 133 (Great Bahama; Abaco; Elbow Cay; Great Guana Cay; Moraine Cay; Stranger Cay; Great Sale Cay; habits).—RILEY, *Auk*, XXII, 1905, 354 (New Providence; Eleuthera; Cat I.; Watlings I.; Long I.; Abaco).—RILEY, *Proc. U. S. Nat. Mus.*, XXIX, 1905, 172, in text (crit.).—RILEY, in SHATTUCK, *The Bahama Islands*, 1905, 352, 362 (Great Bahama; Abaco; Little Abaco; Biminis; Berry Is.; New Providence; Andros; Green Cay; Eleuthera; Current I.; Cat I.; Concepcion I.; Rum Cay; Watlings I.; Long I.; Acklin I.; Plana Cays; Bird Rock).
- Columbigallina bahamensis* CORY, *Birds W. Indies*, 1889, 297, in text (Bahama Is.; crit.).—BANGS, *Auk*, XVII, 1900, 286 (Nassau, New Providence; Current I.).—MAYNARD, *Cat. Birds W. Indies*, 1903, 7 (Bahama Is.).
- Columbigallina bermudiana* BANGS and BRADLEE, *Auk*, XVIII, 1901, 250 (Hamilton, Bermuda; orig. descr.; type now in collection Museum Comparative Zoölogy).—VERRILL, *Osprey*, V, 1901, 174, in text (Bermuda; crit.).

- Columbigallina passerina* var. *bahamensis* DUBOIS, Syn. Avium, II, 1902, 764 (Bahama Is., ex Maynard).
- Columbigallina passerina* var. *bermudiana* DUBOIS, Syn. Avium, II, 1902, 764 (Bermuda, ex Bangs and Bradlee).
- Columbigallina passerina bermudiana* AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XIX, 1902, 318 (Bermuda).—CHAPMAN, Color Key N. Am. Birds, 1903, 126, 268 (Bermuda; descr.).—BOWDITCH, Am. Nat., XXXVIII, 1904, 557 (Bermuda; habits).—REED, N. Am. Birds' Eggs, 1904, 150 (nesting).
- Chamaepelia bermudiana* LOWE, Bull. Brit. Orn. Club, XXI, 1908, 109, in text (crit.).—LOWE, Ibis, 1908, 113, 545, in text (Bermuda; crit.).
- Chamaepelia passerina bermudiana* AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Auk, XXVI, 1909, 297 (crit.).—AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, Check List N. Am. Birds, ed. 3, 1910, 150 (Bermuda).—CHAPMAN, Handbook Birds E. N. Am., 1912, 285 (reprint orig. descr.).
- Chamaepelia passerina bahamensis* TODD, Ann. Carnegie Mus., VII, 1911, 391 (faunal distribution), 416 (Blue Hills, New Providence; crit.).—WORTHINGTON, Ann. Carnegie Mus., VII, 1911, 450 (New Providence; The Bight and Port Howe, Cat I; Watlings I.; Andros; Abaco; habits).

Subspecific characters.—Male and female: very similar to *C. p. aflavida*, but slightly paler above and below, with more whitish on the abdomen and under tail-coverts, and bill with less red at the base, often entirely black.

Measurements.—Male: wing, 79–84 (average, 81.5); tail, 53–60 (56); exposed culmen, 10–12 (10.8); tarsus, 15–16 (15.6). Female: wing, 81–84 (82); tail, 53–59 (56.5); exposed culmen, 10.5–12 (11); tarsus, 15–16 (15.4).

Range.—Bahama Islands (except Great [and Little?] Inagua) and Bermuda.

Remarks.—This is a rather unsatisfactory and poorly differentiated form. It was described by Mr. Charles J. Maynard as differing from the continental form (*C. p. passerina*) in smaller size and paler coloration, and in having the bill constantly wholly black. It is, of course, very different in these respects from *C. p. passerina*, but its distinctness from the Cuban bird is open to question. Exception has been taken to the constancy of the alleged character of the color of the bill, apparently justified even from an examination of skins alone. Specimens from the type locality, New Providence, are fairly constant in this respect, but an equal series from Rum Cay, besides being somewhat paler throughout—verging thus towards *C. p. exigua*—show a differently colored bill in the skin, and the probabilities are that in life this difference is accentuated. Moreover, in a specimen from Eleuthera (No. 48,065, Collection Philadelphia Academy of

Natural Sciences) the bill is marked as "dull red." Dr. Percy R. Lowe records that in birds shot in the Bahamas (precise locality not stated) in April, 1908, "there is a distinct crimson cast at the base of the bill similar to [that in] specimens from Cuba." It will be seen, therefore, that the name *bahamensis*, if restricted to the bird of this group of islands, rests on a very slender basis indeed. The discovery that two distinct forms occur in the Bahamas still further complicates the question of their relationships.

Females as well as males vary considerably in color, and some specimens are absolutely indistinguishable from Cuban birds, but as a series they average paler.

The Bermuda bird has been described by Mr. Bangs as distinct, but after extended and careful comparison of the type series and a few additional specimens I find myself entirely unable to appreciate the alleged diagnostic characters, nor can I discover any others which would justify the retention of the name. There is certainly no constant difference in general size or color, while the bill is no smaller than in some specimens from the Bahamas. Although this member is described as wholly black, Dr. Percy R. Lowe says that when fresh "the edges of the mandibles have a very narrow line of faint crimson, all the rest of the bill being black." There is thus no great difference in this respect from the bird of the Bahamas, and, indeed, Mr. A. E. Verrill intimates that the Ground Dove was introduced into Bermuda from that source! Dr. Lowe, it is true, considers that *C. p.* "*bermudiana*" is a readily recognizable form, but the material before me certainly does not permit of any such conclusion. In the writer's judgment there are two alternatives: either to unite the Bahaman and Cuban birds, or to unite the Bahaman and Bermudan, and the latter course seems the more logical and desirable to follow.

Some of the Bermuda skins are more or less stained with rusty below, doubtless from iron-impregnated soil.

Mr. Maynard claims to have seen specimens of this race from Florida, but I have little doubt that his records were based on exceptionally small and pale birds of the resident Florida form.

***Chæmepelia passerina exigua* (Riley).**

Columbigallina passerina (not *Columba passerina* Linnæus) CORY, Cat. W. Indian Birds, 1892, 97, part (Great Inagua; Mona I.).—BOWDISH, Auk, XIX, 1902, 361, part (Mona I.; nesting).

Columbigallina passerina exigua RILEY, Proc. U. S. Nat. Mus., XXIX, 1905, 171 (Mona I.; orig. descr.; type in collection U. S. National Museum).

Chamaepelia exigua LOWE, Ibis, 1908, 115 (crit.).

Chamaepelia passerina exigua TODD, Ann. Carnegie Mus., VII, 1911, 391, 392 (faunal distribution), 417 (Alfred Sound and Mathewtown, Great Inagua; crit.).—WORTHINGTON, Ann. Carnegie Mus., VII, 1911, 403, 450 (Great Inagua).

Subspecific characters.—Male and female: similar to *C. p. bahamensis*, and bill (in skin) wholly dark as in typical examples of that form, but general coloration paler throughout, and size smaller.

Measurements.—Male: wing, 76–82 (average, 78.5); tail, 51–55 (52); exposed culmen, 10.5–11.5 (10.8); tarsus, 14.5–15.5 (15). Female: wing, 77–83 (78.5); tail, 51–58 (53); exposed culmen, 10–11 (10.7); tarsus, 14.5–15.5 (15).

Range.—Mona Island (off Porto Rico), and Great Inagua, Bahama Islands.

Remarks.—In view of the subtle and more or less inconstant characters applying to the other Antillean forms, it is a surprise to find a form occurring right in their midst, so to speak, which is sharply differentiated—as distinctions in this species go—from its neighbors on either side. It was described by Mr. J. H. Riley originally from Mona Island, lying between Porto Rico and Haiti, where we would naturally expect to find intergrades between the two imperfectly segregated forms *C. p. trochila* and *C. p. aflavida*, but instead we get a bird which is quite distinct from either. This would be extraordinary enough it would seem, but it is doubly surprising to find that a series of Ground Doves from the island of Great Inagua, the most southern of the Bahaman group, should prove to belong to the same small, pale race. How can such an anomalous distribution be explained?

This is decidedly the palest of all the forms of this species, being even paler and grayer above than *C. p. pallescens*. There is not so much white on the posterior under parts, however, as in *C. p. albivitta*; this is especially true of the females, but it scarcely needs comparison with that subspecies, the sharply bicolored bill and lavender-grayish tinged under parts of which find no counterpart in *C. p. exigua*. As previously noted, some specimens from Haiti are as pale as the Mona and Great Inagua birds, which may be of some significance, but I am inclined to think that the real affinities of the latter are rather with *C. p. bahamensis*. As remarked under the head of that form, a series from Rum Cay is somewhat paler than New Providence birds, indicating an approach to the present form. Un-

fortunately the color of the bill in life of the present bird is not recorded. The series examined shows substantial agreement between the specimens from Mona and those from Great Inagua, although the latter are in fresher plumage, and consequently average a little longer in length of wing. There is very little tinge of pinkish vinaceous on the wing-coverts in this form.

A single female example from the Caicos Islands (exact locality not stated) is to be referred to *C. p. bahamensis*, so that it seems probable that *C. p. exigua* is confined in the Bahamas to Great (and Little?) Inagua.

Chæmepelia minuta minuta (Linnæus).

"*Turtur parvus fuscus americanus*" BRISSON, Orn., I, 1760, 116, excl. syn., pl. 8, fig. 2 (Santo Domingo [error!]; descr.).

Columba minuta LINNÆUS, Syst. Nat., ed. 12, I, 1766, 285 (ex Brisson; diag.).—MÜLLER, Natursystem, II, 1773, 512 (descr.; geog. distr.).—GMELIN, Syst. Nat., I, ii, 1789, 788 (Santo Domingo [error!]; ex Brisson; diag.).—LATHAM, Ind. Orn., II, 1790, 612 (diag.; syn.).—BONNATERRE, Tabl. Enc. et Méth., I, 1792, 253 (Santo Domingo [error!]; descr.; habits).—TURTON, Gen. Syst. Nat., I, 1806, 479 (diag., etc.).—TEMMINCK, Cat. Syst. Cab. Orn., 1807, 144 (syn.).—TEMMINCK, in TEMMINCK and KNIP, Pigeons, I, 1808-11, Colombi-gallines, 28, pl. 16 (French Guiana; Paraguay; Caribbean Islands [?]; Porto Rico [error!]; Santo Domingo [error!]; descr.; general account, ex Azara).—LATHAM, Syst. Orn., 1809, 274 (diag.).—TEMMINCK, Hist. Nat. Gén. Pigeons et Gallinaces, I, 1813, 432 (French Guiana; Paraguay; Porto Rico [error!]; Santo Domingo [error!]; descr.; geog. distr.), 498 (diag.; syn.).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 404 (Paraguay; Guiana; Porto Rico [error!]; Santo Domingo [error!]; descr.).—DESMAREST, Dict. Sci. Nat., XL, 1826, 309 (Guiana; Paraguay; descr.).—WAGLER, Syst. Avium, 1827, [260], Columba, sp. 89, part (Brazil; Guiana; Paraguay; Caribbean Is. [error!]; descr.).—LESSON, Traité d'Orn., 1831 (?), 474 (Brazil).—SELBY, Jardine's Naturalist's Library, Birds, IX, 1835, 202, in text.—LESSON, Compl. de Buffon, Oiseaux, VIII, 1837, 12 (Brazil; Paraguay; ed. 2, VIII, 1838, 272.—(?) TEMMINCK, Pl. Col. I, Tabl. Méth., 1840, 81 (D'Aubenton's figure).—THIENEMANN, Einhundert Tafeln colorirter Abbildungen von Vögeleiern, 1845 (?), 57, pl. 11, fig. 2 (Buenos Aires, Argentina; descr. eggs).—[RIVOLI?], Catalogue de la magnifique Collection d'Oiseaux, 1846, 29 (Brazil).—DENNY, Proc. Zool. Soc. London, 1847, 39 (geog. distr.; Jamaica and Cuba [error!]).—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, footnote (Guiana; crit.).—ALLEN, Auk, XXV, 1908, 302, in text (crit.).—ALLEN, Science, n. s., XXXIII, 1911, 337, in text (crit.).

(?) "Petite Tourterelle de la Martinique" D'AUBENTON, Pl. Enlum., 243, 1770-86, fig. 2 (locality an error!).

"Passerine Turtle, var. A." LATHAM, Gen. Syn. Birds, II, ii, 1783, 660 (Santo Domingo [error!]; descr.; syn.).—LATHAM, Gen. Hist. Birds, VIII, 1823, 93 (Santo Domingo [error!]; warmer parts of America; Paraguay; syn.; descr.).

- "Cocotzin de Surinam" HOLLANDRE, Abrégé d'Hist. Nat., II, 1790, 222 (descr.).
- Columba grisea* BONNATERRE, Tabl. Enc. et Méth., I, 1792, 252 (Cayenne, ex Hollande; descr.).
- "Sperlings-Turteltaube" BECHSTEIN, Johann Latham's allgemeine Uebersicht der Vögel, 1795, 634 (syn.; general account).
- "Paloma de la enana" AZARA, Apuntamientos, III, 1805, 25 (Paraguay; meas.; descr.).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 383 (crit.).
- "Pigeon nain" AZARA, Voyages dans l'Amérique Meridionale, IV, 1809, 137 (Paraguay; meas.; descr.).
- Goura minuta* STEPHENS, Shaw's Gen. Zoöl., XI, i, 1819, 137 ("warmer parts of America"; syn.; descr.); XIV, i, 1826, 296.—RANZANI, Elementi Ornitologica, I, 1823, 218, part (ex Temminck).
- Chamæpelia minuta* GRAY, List Gallinæ Brit. Mus., 1844, 15, excl. syn. part (South America).—GRAY, Gen. Birds, II, 1845, 475, excl. syn. part.—HARTLAUB, Ind. Azara's Apuntamientos, 1847, 21, excl. syn. part ("Paloma enana" Azara).—HEERMANN, Cat. Oöl. Coll. Acad. Nat. Sci. Philadelphia, 1853, 23 (Brazil).—BONAPARTE, Consp. Avium, II, 1854, 77, 78, in synonymy (= *C. passerina* juv. [error!]).—BONAPARTE, Compt. Rend., XL, 1855, 20 (= *C. passerina* juv. [error!]), 22 (Peale's record).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 481, part (Trinidad; "Martinique?" [error]; Rio Yuruani, 2700 feet, Quonga, and Annai, British Guiana; Pernambuco, Bahia, and Chapada, Brazil; Xeberos and Lima, Peru; descr.; syn.).—SHARPE, Hand-List Birds, I, 1899, 82, part (Guiana; Brazil; Peru).—VON IHERING, Rev. Mus. Paulista, IV, 1900, 282 (Brazil; descr. eggs).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141 (Brazil).—VON IHERING, Rev. Mus. Paulista, V, 1902, 285, excl. geog. distr. part (Piracicaba and Bahia, Brazil; Brazilian references), 326 (São Paulo).—GÆLDI and HAGMANN, Bol. Mus. Paraëense, III, 1902, 319 (Xeberos, Peru).—HAGMANN, Bol. Mus. Gœldi, IV, 1904, 256 (Burmeister's reference), 301 (Pelzeln's reference).—NICOLL, Ibis, 1904, 40 (Bahia, etc., Brazil).—PENARD, Vogels van Guyana, 1908, 339 (Guiana; descr.; habits).
- Chamæpelia minuta* PEALE, U. S. Expl. Exp., VIII, Mam. and Orn., 1848, 207 (Callao, Peru; habits).
- Peristera chalcostigma* REICHENBACH, Syn. Avium, Columbariæ, Novit. Suppl., 1851, pl. 245b, figs. 3533-4.
- Chamæpelia pumila* LICHTENSTEIN, Nom. Avium Mus. Zoöl. Berol., 1854, 83 (Brazil; *nomen nudum*).—BONAPARTE, Compt. Rend., XL, 1855, 21, in text.
- Chamæpelia griseola* (not *Columbina griseola* Spix) BONAPARTE, Consp. Avium, II, 1854, 78, excl. syn. part (Guiana; Brazil; Paraguay; Cumaná, Venezuela; descr.; syn.).—BONAPARTE, Compt. Rend., XL, 1855, 21 (Brazil; Paraguay; crit.), 220.—(?) BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, excl. syn. part (Brazil; Paraguay; descr.; syn.).—REINHART, Vid. Med. Nat. For. Kjöbenhavn, 1870, 56 (Paraguay; Brazilian campos region?).—(?) PELZELN, Orn. Bras., 1870, 450, part (Burmeister's reference).—GIEBEL, Thes. Orn., I, 1872, 634, part (references).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133, part (Brazil; Amazonia).—SOUSA, Mus. Nac. Lisboa, Columbæ, 1873, 21 (Bahia and Rio de Janeiro, Brazil).—BAIRD, BREWSTER, and RIDGWAY, Hist. N. Am. Birds, III, 1875, 389, excl. syn. part (diag.).—SCLATER and SALVIN,

- Proc. Zoöl. Soc. London, 1876, 17 (Maranura, Peru).—FORBES, Ibis, 1881, 357 (Recife [= Pernambuco] and Parahyba, Brazil).—SALVIN, Cat. Birds Strickland Coll., 1882, 547.—TACZANOWSKI, Orn. Perou, III, 1886, 244, excl. syn. part (Xevéros, Lima, and Maranura, Peru; descr.; syn.). Tables, 518.—HEINE and REICHENOW, Nom. Mus. Hein., Orn., 1886, 283 (Brazil).—SALVIN, Ibis, 1886, 173 (Rio Yuruani, Roraima, 3500 feet, British Guiana).—TRISTRAM, Cat. Coll. Birds, 1889, 39 (Brazil).—HARTERT, Kat. Vogelsammlung, 1891, 187 (South America).—(?) HAGMANN, Bol. Mus. Gældi, IV, 1904, 256 (Burmeister's reference).
- Chamæpelia amazilia* BONAPARTE, Consp. Avium, II, 1854, 78 (Peru; orig. descr.; type in collection Paris Museum).—BONAPARTE, Compt. Rend., XL, 1855, 21 (Peru; crit.), 220.—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 296, footnote (Brazil; diag.; ex Bonaparte).—CASSIN, U. S. Expl. Exped., Birds, 1858, 279, 446 (Peru; crit.).—SCLATER, Proc. Zoöl. Soc. London, 1866, 100 (Lima, Peru; habits).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1867, 753 (Xeberos, Peru).—PELZELN, Orn. Bras., 1870, 277 (Marambicu, Ytarare, Cuyabá, Engenho do Cap. Gama, Matto Grosso, Brazil; crit.), 450, liv (faunal distribution).—GIEBEL, Thes. Orn., I, 1872, 632, part (references).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1873, 306 (Xeberos, Peru).—TACZANOWSKI, Proc. Zoöl. Soc. London, 1874, 555 (Lima, Peru).—HAGMANN, Bol. Mus. Gældi, IV, 1904, 301 (Pelzeln's reference).
- Chamæpelia rachidialis* SCHIFF, MS., in Frankfort Museum (*vide* Bonaparte, Consp. Avium, II, 1854, 78; Bonaparte, Compt. Rend., XL, 1855, 21; and Hartert, Kat. Vogelsammlung, 1891, 187, note).
- Chamæpelia passerina* (not *Columba passerina* Linnæus) BONAPARTE, Consp. Avium, II, 1854, 77, 78, part (*Columba minuta* Linnæus).—BONAPARTE, Compt. Rend., XL, 1855, 20, part (*C. minuta* Linnæus).—GIEBEL, Thes. Orn., I, 1872, 635, part (*C. minuta* Linnæus).
- Chamæpelia griseola* GRAY, List Birds Brit. Mus., Columbæ, 1856, 50, excl. syn. part (South America; Brazil).—GRAY, Hand-List Birds, II, 1870, 240 (Brazil).—BOUCARD, Cat. Avium, 1876, 34 (Brazil).—ERNST, Primer Anuario Estadístico (Caracas), 1877, 310 (Caracas and Tocome, Venezuela).
- Chamæpelia amazilia* GRAY, List Birds Brit. Mus., Columbæ, 1856, 50, part (Peru).—GRAY, Hand-List Birds, II, 1870, 240 (Peru; Brazil; [?] New Granada).
- Pyrgitoënas amazilia* REICHENBACH, Tauben, 1862, 15 (descr., ex Bonaparte; Peale's record).
- Pyrgitoënas griseola* REICHENBACH, Tauben, 1862, 15, excl. syn. part (Paraguay; Brazil; Guiana; Cumaná, Venezuela; descr.; references).
- Goura griseola* SCHLEGEL, De Dierent., 1864, 208.
- Peristera griseola* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part (Peru; syn.).
- Columbigallina griseola* BERLEPSCH, Journ. f. Orn., XXXV, 1887, 34 (Pilcomayo, Paraguay; Bahia, Brazil; crit.), 124 (Paraguay).—BERLEPSCH and STOLZMANN, Proc. Zoöl. Soc. London, 1892, 394, 408 (Lima, Peru).—ALLEN, Bull. Am. Mus. Nat. Hist., V, 1893, 149 (Matto Grosso, Brazil).
- Chamæpelia griseola* QUELCH, Timehri, V, 1891, 106 (Georgetown, British Guiana).—(?) TESCHEMAKER, Avic. Mag., VI, 1908, 257 (South America; habits in captivity).

Columbigallina minuta DUBOIS, Syn. Avium, II, 1902, 764, part (South America).—BERLEPSCH and HARTERT, Nov. Zoöl., IX, 1902, 119 (Ciudad Bolivar, Venezuela; Cayenne fixed as type locality).—VON IHERING, Rev. Mus. Paulista, VI, 1904, 341 (Paraguay), 371 (faunal distribution).—BERLEPSCH and STOLZMANN, Ornith., XIII, 1906, 100 (Santa Ana, Peru; Roraima, British Guiana; Bahia, Brazil; meas.; crit.).—VON IHERING, Aves do Brazil, 1907, 22, excl. geog. distr. part (Estado de São Paulo, Piracicaba, Victoria, Botucatu, and Bahia, Brazil).—BERLEPSCH, Nov. Zoöl., XV, 1908, 295 (Cayenne, ex Holandre, fixed as type locality).

Columbina grisea BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (geog. distr., excl. Colombia part).

Description.—Adult male: above grayish brown, slightly glossy, shading into cinereous on the hindneck, upper tail-coverts, and wing-coverts, the latter tinged with purplish vinaceous, and the inner ones, together with the tertiaries, marked on the outer webs with irregular spots of glossy dark steel-blue; crown posteriorly grayish brown like the back, anteriorly cinereous, palest on the forehead; lores, sides of head, and under parts generally pale dull vinaceous, deepest on the breast, and fading to nearly white on the chin and under tail-coverts; remiges mostly rufous chestnut, with the tips and more or less of the outer webs dusky brown or black, this area increasing in extent on the inner secondaries; primary-coverts also rufous chestnut, tipped and edged with dusky; under wing-coverts and axillaries rufous chestnut; tail black, the middle rectrices ashy brown, the others cinereous at the base, the outermost edged externally and tipped with white; "bill brown; iris violet red; feet flesh-color" (Taczanowski).

Female: above plain olive-brown, the forehead, sides of head, and nape sometimes with a faint grayish wash; wing-coverts like the back, but paler, the inner ones and tertiaries with irregular spots of glossy dark steel-blue as in the male; wings and tail also as in the male, but duller and more brownish; breast and sides pale wood-brown, sometimes with a faint vinaceous tinge, the throat paler, nearly white, and the abdomen and under tail-coverts also much paler, white or nearly so.

The juvenal dress (illustrated by No. 45,266, Collection American Museum of Natural History, Bahia, Brazil) resembles that of the adult female, but the feathers of the breast and upper parts generally are edged and tipped with paler color, giving a faintly squamate appearance; there is much fulvous suffusion on the breast, sides, crown, and wings; and the wing-spots are merely indicated.

Measurements.—Male: wing, 74-80 (average, 76); tail, 50-56 (52); exposed culmen, 10-11.5 (10.5); tarsus, 15-16 (15.2). Female (six

specimens): wing, 74-80 (77.5); tail, 50-56 (53); exposed culmen, 10-11 (10.5); tarsus, 15-16 (15.1).

Range.—South America, except higher parts, from Paraguay and Peru northward, excluding western Colombia. (No record for Bolivia.)

Remarks.—Some variation is indicated, but the series available is insufficient to determine whether it has any geographical significance. A male from Chapada, Matto Grosso, Brazil (No. 58,646, Collection American Museum of Natural History), is more pinkish vinaceous below and rather darker above than the average, but another specimen from the same locality is not different. A skin from Lima, Peru (No. 159,772, Collection U. S. National Museum), on the other hand, is decidedly paler, and it is quite possible that a larger series might show that the bird from west of the Andes is subspecifically separable, although Messrs. Berlepsch and Stolzmann state that specimens from Santa Ana in the Province of La Convencion, Peru, are little different from skins from Roraima and Bahia. The few Colombian examples I have seen, however, are clearly referable to the darker colored Central American form about to be described.

The synonymy of this species is even more involved than is that of *C. passerina*, and I do not flatter myself that I have fully succeeded in clearing up the confusion, owing to the impossibility in so many cases of consulting the actual specimens upon which the various records were based. Brisson was apparently the first author to notice the species, and although his figure is poor, his description is explicit and evidently made at first-hand, as indicated by the two asterisks preceding the name. He quotes references to Willughby and Hernandez as belonging here—erroneously it would now seem—but in any case the sole basis of the species is his description, which Linnæus cited exclusively in establishing his name *Columba minuta*. Brisson said that his bird came from Santo Domingo, which was an error into which numerous subsequent authors fell as regards this species, which is now known to be confined to the continent. Some authors even went so far as to ascribe the species to certain of the other West Indian Islands.

Columba grisea of Bonnaterre, 1792, was the next name applied to the species, being based on the "Cocotzin de Surinam" of Holandre, and Messrs. Berlepsch and Hartert have accordingly substituted Cayenne as the type locality for the species, admittedly on the basis

of this author. *Peristera chalcostigma* Reichenbach, 1851, is a name based on two very poor figures, while *Chamæpelvia pumila* Lichtenstein, 1854, and *Chamæpelvia rachidialis* Schiff are *nomina nuda*.

Temminck and some of the authors who followed him seem to have correctly identified Linnæus' *Columba minuta*, but in 1854 Bonaparte, "who is responsible for much that is unfortunate in ornithological nomenclature," fell into the grave error of identifying it as the young of *C. passerina*. At the same time he committed another blunder by taking *Columbina griseola* Spix, which is actually a form of *C. passerina*, as the earliest name for the present species—"a wholly erroneous proceeding, by which he supplanted the well-founded *minuta* Linn. by a wholly new *griseola* Bonap. (nec Spix). * * * Yet Bonaparte was followed in this false step by most later ornithologists." Not only that, but he re-described the species under the name *Chamæpelvia amazilia*, based on a specimen from Peru obtained by the Castelnau expedition. Judging from the description this is based on an individual variation of *C. minuta*, but in case the Peruvian bird should prove worthy of separation the name will of course be available. With two names for the same species in use, one of them really belonging to an entirely distinct bird, and neither of them correct, the resultant confusion in the literature is exhibited in the table of synonymy appearing above.

***Chamæpelvia minuta elæodes* subsp. nov.**

- Chamæpelvia minuta* (?) REICHENBACH, Syn. Avium, Columbariæ, 1847, pl. 256, figs. 1422-3.—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 481, part (Atoyac, Vera Cruz; Retalhuleu, Guatemala; Panama; Bogotá, Colombia).—SHARPE, Hand-List Birds, I, 1899, 82, part (Mexico to Panama; Colombia).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 252, excl. South American references (Mexico; Guatemala; Panama; Mexican and Central American references; descr.; crit.).
- Chamæpelvia amazilia* (not of Bonaparte) GRAY, List Birds Brit. Mus., Columbæ, 1856, 50, part (New Granada).
- Chamæpelvia amazilia* SCLATER, Proc. Zoöl. Soc. London, 1856, 30 (Bogotá, Colombia).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1864, 370 (Panama, ex Lawrence).—GRAY, Hand-List Birds, II, 1870, 240, part (New Granada).—(?) WYATT, Ibis, 1871, 383 (Ocaña and Herradura, Colombia).—(?) BERLEPSCH, Journ. f. Orn., XXXII, 1884, 319 (Ocaña and Herradura, Colombia, ex Wyatt).
- Chamæpelvia granatina* (not of Bonaparte) LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., VII, 1862, 333 (Panama Railroad, Pacific side [original specimens examined]).
- Peristera griseola* (not *Columbina griseola* Spix) SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 135, part ("Terre ferme"; Guatemala; syn.).

- Chamæpelia griseola* SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133, part (Colombia to Panama).
- Columbigallina minuta* DUBOIS, Syn. Avium, II, 1902, 764, part (southern Mexico and Central America).—THAYER and BANGS, Bull. Mus. Comp. Zool., XLVI, 1906, 214 (Savanna of Panama).
- Chamæpelia minuta* BANGS, Auk, XXIV, 1907, 288, 292 (Paso Real, Costa Rica; geog. distr.).
- Chamæpelia minuta* DEARBORN, Field Mus. Orn. Series, I, 1907, 80 (Los Amates, Guatemala).—CARRIKER, Ann. Carnegie Mus., VI, 1910, 399 (Buenos Aires, Costa Rica; geog. distr.; habits).
- Chamæpelia minuta* RODRIGUEZ, An. Mus. Nac. Salvador, IV, 1910, 282 (Guatemala).

Type, No. 29,061, Collection Carnegie Museum, adult male; Buenos Aires, Costa Rica, August 29, 1907; M. A. Carriker, Jr.

Subspecific characters.—Similar in general to *C. minuta minuta* (Linnæus), but decidedly darker throughout in coloration, the male more purplish vinaceous below and on the wings; upper parts dark olive-brown; gray area of crown and nape darker, almost slate-gray; under tail-coverts with much less white. Female also much darker than the same sex of *C. m. minuta*, more olivaceous above, and deeper brownish (broccoli brown) below; the under tail-coverts edged with tawny brown or dull buffy, instead of white. Even in juvenal plumage this form averages darker. "Iris pink [in both sexes]; bill dirty olive" or "dark olive-horn; feet flesh-color." (M. A. Carriker, Jr.)

Measurements.—Male: wing, 71-78 (average, 74); tail, 48-55 (50.5); exposed culmen, 10-11 (10.6); tarsus, 15-16 (15.6). Female: wing, 71-79 (74); tail, 47-52 (50); exposed culmen, 10-11 (10.7); tarsus, 15-16 (15.4).

Range.—From west-central Colombia ("Bogotá") north through Panama to southwestern Costa Rica; reappearing in Guatemala, and thence extending into British Honduras and through southeastern Mexico to central Vera Cruz. (No records for Nicaragua, Honduras, or Salvador.)

Remarks.—Some females are much deeper brown below than others; the difference seems to be purely individual, however. Two females from Mexico differ in having the under tail-coverts much paler, nearly white. If No. 28,944, Collection Carnegie Museum (Buenos Aires, Costa Rica, August 21, 1907), is correctly sexed, it indicates that females occasionally approach males in being tinged below with vinaceous, as in other species of this genus. Both sexes in fresh plumage are glossed above with dark olive-green. In juvenal

dress this gloss is lacking, the contour feathers are edged and tipped with paler, and there is much rusty and buffy edging to the feathers of the wings, while the spots on the latter are obsolescent and not glossy. As in *C. passerina*, there is much individual variation affecting the amount of rufous chestnut on the primaries externally, and the extent of the brown area on the crown. The latter is occasionally obsolete, the entire crown being dark plumbeous or slate-gray. The greater coverts and inner secondaries are frequently more or less edged with white externally, particularly in females; this may possibly indicate immaturity.

This darker form of *C. minuta* includes all the Mexican and Central American specimens, as well as those seen from Colombia, as far south as "Bogotá." The characters upon which it is based are more marked and constant than those differentiating *C. rufipennis rufipennis* from *C. r. eluta*, and it is odd that the form should have been so long unrecognized. It would appear to be most numerous in Panama, where it takes the place of *C. passerina neglecta*. Whether the gap in its range to the northward of Costa Rica is real or only apparent is an interesting question; if the former, it is quite possible that the Mexican bird may prove to be subspecifically separable.

Chæmepelia buckleyi Sclater and Salvin.

Chamæpelia buckleyi SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1877, 21 (Santa Rita, Ecuador; types in collection British Museum; crit.).—BERLEPSCH and TACZANOWSKI, Proc. Zoöl. Soc. London, 1883, 537, 575 (Yaguachi and Guayaquil, Ecuador).—TACZANOWSKI and BERLEPSCH, Proc. Zoöl. Soc. London, 1885, III (Yaguachi, Ecuador), 122 (Guayaquil, Ecuador; Tumbes, Peru).—TACZANOWSKI, Orn. Perou, III, 1886, 245 (Lechugal, Peru; descr.; syn.), Tables, 518.—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 484, pl. 10, fig. 1 (Santa Rita, Ecuador; descr.; syn.).—SHARPE, Hand-List Birds, I, 1899, 82 (Ecuador; Peru).—SALVADORI and FESTA, Boll. Mus. Torino, XV, no. 368, 1900, 35 (Babahoyo, Vinces, and Balzar, Ecuador).

Columbigallina buckleyi DUBOIS, Syn. Avium, II, 1902, 764 (Ecuador; Peru; syn.).

Columbina buckleyi BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (western Ecuador).

Description.—Adult male: "upper parts vinous grey; forehead, sides of the head, and underparts vinous, paler (almost white) on the forehead and throat, somewhat greyer on the abdomen and under tail-coverts; velvety black spots on the outer webs on some of the upper wing-coverts, of the scapulars, and of the inner secondaries or tertials; bastard wing, primary-coverts, and quills (with the exception of the

inner secondaries) brown-black; under wing-coverts and axillaries black; quills below dark grey; longer upper tail-coverts and upper surface of the tail grey, the lateral feathers black at the tips, the outer ones almost entirely black, edged with white at the tips and part of the outer webs: 'bill yellowish brown; feet yellow; iris carmine, with an inner ring brownish' (*Taczanowski*)."

Female "pale brown above instead of vinous grey; the dark spots on the wings as in the male; middle of the throat white; rest of the underparts very pale buffy brown, almost white on the abdomen; under tail-coverts dusky grey with broad whitish edges; greater upper wing-coverts edged with white; tail as in the male, only the grey part with a slight brown wash."

Measurements.—Male: wing, 89; tail, 69; exposed culmen, 12.7; tarsus, 18. Female (one specimen): wing, 91; tail, 67; exposed culmen, 13; tarsus, 17.

Range.—Western Ecuador, west of the Andes, south into extreme northwestern Peru.

Remarks.—Of this species I have been able to examine but one specimen (No. 55,002, Collection U. S. National Museum, Guayaquil, Ecuador), a female in not very good condition, and am accordingly obliged to reproduce Count Salvadori's very full description, converting his measurements for the male into millimeters. Structurally this species is close to *C. talpacoti*, possessing a narrow line of feathers on the outer side of the tarsus, but in general coloration it suggests *C. minuta*, differing, however, in its larger size, plain dusky remiges, and blackish under wing-coverts—all of which characters it shares with *C. talpacoti*.

It was described by Messrs. Sclater and Salvin in 1877 from a pair of birds taken by Mr. C. Buckley at Santa Rita, Ecuador,¹⁰ and several years later was met with by M. Taczanowski in the neighborhood of Guayaquil, and subsequently traced southward into northwestern Peru. Its known range is thus very restricted, not approaching that of either *C. talpacoti* or *C. rufipennis*. Nothing is on record concerning its habits, and very few specimens have so far found their way into collections.

¹⁰ This locality does not appear on any map to which I have access, but according to Mr. C. E. Hellmayr it is in the Guayaquil district of western Ecuador. Unless confirmed by subsequent work, all of Buckley's localities are open to question.



Chæmepelia talpacoti (Temminck).

- "Paloma de la roxiza" AZARA, Apuntamientos, III, 1805, 20 (Paraguay; descr.; meas.; eggs).
- "Pigeon rougeâtre" AZARA, Voyages dans l'Amérique Meridionale, IV, 1809, 134 (Paraguay; descr.; meas.; habits).
- Columba talpacoti* TEMMINCK, in TEMMINCK and KNIP, Pigeons, I, 1808-11, Colombi-gallines, 22, pl. 12 (South America; orig. descr.; type in collection Paris Museum).—TEMMINCK, Hist. Nat. Gén. Pigeons et Gallinaces, I, 1813, 421 (descr.; geog. distr.), 496 (syn.).—VIEILLOT, Nouv. Dict. d'Hist. Nat., XXVI, 1818, 385 (descr.).—VIEILLOT, Tabl. Enc. et Méth., I, 1820, 385 (descr.; crit.).—SCHREIBERS, Isis, VII, 1823, 714 (Brazil).—LICHTENSTEIN, Verz. Doubletten Zoöl. Mus., 1823, 66 (= "Pigeon rougeâtre" of Azara).—WAGLER, Syst. Avium, 1827, [259], Columba, sp. 86 (descr.; syn.).—DESMAREST, Dict. Sci. Nat., XL, 1826, 308 (South America; descr.).—LESSON, Traité d'Orn., 1831 (?), 474 (Brazil; ex Latham and Temminck).—WIED, Beiträge Naturg. von Brasilien, IV, ii, 1833, 465 (Brazil, descr.).—LESSON, Compl. de Buffon, Oiseaux, VIII, 1837, 12 (Brazil and Paraguay; descr.); ed. 2, VIII, 1838, 273.—NITZSCH, Syst. Pterylographie, 1840, 157 (wing-characters).—TSCHUDI, Arch. f. Naturg., 1844, i, 305 (Peru).—TSCHUDI, Fauna Peruana, Aves, 1845-6, 45, 270 (Peru).—THIENEMANN, Einhundert Tafeln colorirter Abbildungen von Vögeleiern, 1845 (?), 57, pl. 11, fig. 3 (Brazil; descr. eggs).—[RIVOLI?], Catalogue de la magnifique Collection d'Oiseaux, 1846, 30 (Brazil).—SCHOMBURGK, Reisen in Britisch-Guiana, II, 1848, 490 (sandhill region, British Guiana).—ABEILLE, Catalogue des Oiseaux composant la Collection, 1850, 41 (Brazil).—EULER, Journ. f. Orn., XV, 1867, 189, 190, 196, 198 (Brazil; nesting).—HAGMANN, Bol. Mus. Gældi, IV, 1904, 227 (Wied's reference).
- Goura talpacoti* STEPHENS, Shaw's Gen. Zoöl., XI, i, 1819, 136 (descr.; ex Temminck; "inhabits the middle parts of America"); XIV, i, 1826, 296.
- (?) *Columba minuta* (not of Linnaeus?) WIED, Reise nach Brasilien, II, 1821, 341 (Cachoeirinha I.).
- "Talpacoti Pigeon" LATHAM, Gen. Hist. Birds, VIII, 1823, 93 (South America; descr.; syn.).
- Columbina cabocolo* SPIX, Avium Species Novæ, II, 1825, 58, pl. 75a, fig. 1 (Brazil; orig. descr.; type formerly in Munich Museum).—HAGMANN, Bol. Mus. Gældi, IV, 1904, 211 (Spix's reference).—HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXII, 1906, 697 (crit.).—ALLEN, Auk, XXV, 1908, 301 (crit.).
- Chæmepelia talpicoti (lapsus)* SELBY, Jardine's Naturalist's Library, Birds, IX, 1835, 200, pl. 22 (descr.; habits).
- Chæmepelia cinnamomina* SWAINSON, Class. Birds, II, 1837, 349 (ex Spix).
- Columbina talpacoti* GOULD, in DARWIN, Voyage of the Beagle, Zoölogy, III, 1841, 116 (Rio Janeiro).—HELLMAYR, Nov. Zoöl., XVII, 1910, 416 (Calama and Maruins, Rio Madeira, Brazil).—HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXVI, 1912, 80 (Peixe-Boi, Pará, Brazil; Cayenne; Minas and Rio Madeira, Brazil), 96 (Pará references), 122 (Mexiana I., Brazil, ex Hagmann).—BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (geog. distr.).
- Chæmepelia talpacoti* HARTLAUB, Syst. Verz., 1844, 99 (Brazil).—GRAY, List Gallinæ

Brit. Mus., 1844, 14 (South America; syn.).—REICHENBACH, Syn. Avium, Columbariæ, 1847, pl. 256, fig. 1424.—HARTLAUB, Ind. Azara's Apuntamientos, 1847, 20 ("Paloma roxiza" Azara).—CABANIS, in SCHOMBURGK, Reisen in Britisch-Guiana, III, 1848, 744 (Demerara, British Guiana; habits).—REICHENBACH, Syn. Avium, Columbariæ, Novit. Suppl., 1851, pl. 253b, fig. 3379.—LICHTENSTEIN, Nom. Avium Mus. Zool. Berol., 1854, 83 (Brazil).—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 297 (Rio Janeiro, Brazil; descr.; syn.).—EULER, Journ. f. Orn., XV, 1867, 417 (Brazil; nesting).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1867, 591 (Rio Tocantins, Lower Amazon, Brazil).—PELZELN, Orn. Bras., 1870, 277 (Pombarola, Picuypeon, Rio Janeiro, Sapitiba, Ypanema, Tejuco, S. Vicente, Forte do Rio Branco, Pará, Brazil; nesting), 450 (Brazilian localities), liv (faunal distr.).—REINHART, Vid. Med. Nat. For. Kjöbenhavn, 1870, 56 (Lagoa Santa, Brazil; campos region generally; habits).—HAMILTON, Ibis, 1871, 309 (São Paulo Province, Brazil; habits).—GIEBEL, Thes. Orn., I, 1872, 636, excl. syn. part (references).—LAYARD, Ibis, 1873, 396 (Nazaré, Pará, Brazil; food).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133 (Brazil; Paraguay; Bolivia).—GARROD, Proc. Zool. Soc. London, 1873, 468 (carotid arteries), 639 (ambiens muscle); 1874, 250 (number of rectrices).—BERLEPSCH, Journ. f. Orn., XXII, 1874, 247 (Santa Catharina Province, Brazil; descr.; references).—ALLEN, Bull. Essex Inst., VIII, 1876, 82 (Santarem and Rhemes, Brazil).—SCLATER and SALVIN, Proc. Zool. Soc. London, 1877, 22, in text (Bolivia; crit.).—SCHMIDT, Proc. Zool. Soc. London, 1880, 314 (duration of life).—FORBES, Ibis, 1881, 357 (Pernambuco, Parahyba, etc., Brazil).—WHITE, Proc. Zool. Soc. London, 1882, 626 (Oran (Salta) and Concepción (Misiones), Argentina; habits).—SALVIN, Cat. Birds Strickland Coll., 1882, 547 (Brazil).—SCLATER, List Vert. Animals in Gardens Zool. Soc. London, ed. 8, 1883, 457.—BERLEPSCH and VON IHERING, Zeitschrift d. ges. Orn., 1885, 176 (Taquara; Picade Tocana; Arroio grande, Province Rio Grande do Sul; Bahia, Brazil).—TACZANOWSKI, Orn. Perou, III, 1886, 246 (forests of eastern Peru; Amable Maria and Guajango; descr.; syn.), Tables, 518.—SALVIN, Ibis, 1886, 174 (British Guiana, *ex* Cabanis).—TRISTRAM, Cat. Coll. Birds, 1889, 39 (Brazil; South America).—SCLATER and HUDSON, Argentine Orn., II, 1889, 144 (descr.; northern frontier of Argentina).—HARTERT, Kat. Vogelsammlung, 1891, 187 (South America).—KERR, Ibis, 1892, 147 (lower Pilcomayo River, Paraguay).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 485 (Quonga, Annai, Demerara, and Cayenne, Guiana; Ceara, Pará, Pernambuco, Nova Friburgo, São Paulo, Bahia, Rio [Janeiro], Raião, and Chapada, Brazil; Bolivia; descr.; syn.).—KOENIGSWALD, Journ. f. Orn., XLIV, 1896, 391 (São Paulo, Brazil; Brazil generally; Bolivia; Paraguay).—SCLATER, List Vert. Animals in Gardens Zool. Soc. London, ed. 9, 1896, 465 (South America).—GÆLDI, Bol. Mus. Paraense, I, 1896, 351 (Rio Tocantins, Brazil), 356 (Pará, Brazil, *ex* Layard).—LLOYD, Timehri, XI, 1897, 4 (Guiana).—SALVADORI, Boll. Mus. Torino, XII, no. 292, 1897, 33 (Caiza, Bolivia [or Argentina?]).—GÆLDI, Ibis, 1897, 164 (Lago Grande do Amapa, "South Guiana" [= north Brazil]).—PINDER, Rev. Mus. Paulista, II, 1897, 165 (São Sebastião and Villa Bella, Brazil).—RUST, Katalog systematischen Vogelsammlung des Provincial Museums in Hanover, 1897, 77 (South America).—VON IHERING, Rev. Mus. Paulista, III,

- 1898, 400 (São Sebastião, São Paulo; Brazilian references).—HOLMBERG, Segundo Censo de la Republica Argentina, I, 1898, 553 (Brazil; Bolivia; Paraguay; Oran, Misiones, and Chaco, Argentina; descr.).—NEHRKORN, Katalog der Eiersammlung, 1899, 184 (Paraguay; eggs).—SHARPE, Hand-List Birds, I, 1899, 82 (Venezuela [?]; Guiana; Brazil; Peru; Bolivia).—SALVADORI, Boll. Mus. Torino, XV, no. 378, 1900, 14 (Urucum, Brazil).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141 (Brazil; Bolivia).—EULER, Rev. Mus. Paulista, IV, 1900, 98, 142, 143, 144, 147 (Cantagallo, Brazil; nesting).—VON IHERING, Rev. Mus. Paulista, IV, 1900, 163 (Cantagallo and Nova Friburgo, Brazil), 282 (Brazil; nesting).—GÆLDI, Aves do Brazil, II, 1900, 379 (Rio Janeiro, Brazil; descr.; habits; nesting).—KERR, Ibis, 1901, 234 (Waikthlating-mayalwa, Paraguay).—GÆLDI, Bol. Mus. Paraëense, III, 1901, 230 (southern Guiana).—LILLO, An. Mus. Nac. Buenos Aires, (3), I, 1902, 217 (Rio Salí, Tucuman, Argentina).—VON IHERING, Rev. Mus. Paulista, V, 1902, 326 (São Paulo, Brazil).—GÆLDI and HAGMANN, Bol. Mus. Paraëense, III, 1902, 319 (Pará, Brazil).—NICOLL, Ibis, 1904, 40 (Bahia, etc., Brazil).—BRUCH, Rev. Mus. La Plata, XI, 1904, 249 (Cerrillos, Salta, Argentina).—HAGMANN, Bol. Mus. Gældi, IV, 1904, 211 (Spix's reference), 227 (Wied's reference), 257 (Burmeister's reference), 301 (Pelzeln's reference).—HAGMANN, Zoöl. Jahrb. Jena, Abth. f. Syst., XXVI, 1907, 42 (Island of Mexiana, mouth of Amazon River).—PENARD, Vogels van Guyana, 1908, 340 (Guiana; descr.; habits).—SNETHLAGE, Journ. f. Orn., LVI, 1908, 496 (Tapajoz, Brazil), 516 (Goyana, Brazil), 538 (Alcobaca, [Rio?] Tocantins, Brazil).—HARTERT and VENTURI, Nov. Zoöl., XVI, 1909, 263 (Oran (Salta), Concepción (Misiones), Barracas al Sud, and Posadas (Misiones), Argentina).—CHUBB, Ibis, 1910, 62 (Sapucay, Paraguay; descr. eggs; plumage; habits).
- Chamaepelia talpacoti* (lapsus) GRAY, Gen. Birds, II, 1845, 475.—HEERMANN, Cat. Oél. Coll. Acad. Nat. Sci. Philadelphia, 1853, 23 (Brazil).
- Talpacotia cinnamomea* BONAPARTE, Consp. Avium, II, 1854, 79 (Brazil; Paraguay; Bolivia; descr.; ex Swainson).—BONAPARTE, Compt. Rend., XL, 1855, 22, 220 (Brazil; Paraguay; Bolivia).—BONAPARTE, Icon. Pigeons, 1857, in text to pl. 121 (crit.).—SOUSA, Mus. Nac. Lisboa, Columbæ, 1873, 21 (South America; Surinam; Brazil).
- Talpacotia godina* BONAPARTE, Consp. Avium, II, 1854, 79 (Brazil; Bolivia; orig. descr.; type in Paris Museum).—BONAPARTE, Compt. Rend., XL, 1855, 22 ("du nord-ouest de l'Amérique méridionale et peut-être même de l'Amérique centrale" [error!]; descr.).—GRAY, Hand-List Birds, II, 1870, 240 (Brazil; Bolivia).—SOUSA, Mus. Nac. Lisboa, Columbæ, 1873, 21 (South America; Surinam).—TACZANOWSKI, Proc. Zoöl. Soc. London, 1874, 555 (Amable-Maria, Peru); 1879, 243 (Guajango, Peru).
- Talpacotia godini* (lapsus) BONAPARTE, Compt. Rend., XL, 1855, 220.
- Chamaepelia talpacoti* GRAY, List Birds Brit. Mus., Columbæ, 1856, 50 (Brazil; Pará; Bolivia; syn.).—BOUCARD, Cat. Avium, 1876, 34 (Brazil; Pará; Bolivia).
- Chamaepelia rufipennis* (not of Bonaparte) GRAY, List Birds Brit. Mus., Columbæ, 1856, 51, part (Cayenne [fide Salvadori]).
- Talpacotia gadinaë* (lapsus) BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 297 (Ecuador or Central America [error!]; diag.; ex Bonaparte).

- Chamaepelea godina* REICHENBACH, Tauben, 1862, 16 (ex Bonaparte).
Chamaepelea cinnamomina REICHENBACH, Tauben, 1862, 15 (Paraguay; Bolivia; Rio Janeiro, Cabo Frio, and Espiritu Santo, Brazil; descr.; references; ex Wied).
Goura cinnamomea SCHLEGEL, De Dierent., 1864, 208 (Guiana; Brazil; descr.).
Chamaepelia godina PELZELN, Orn. Bras., 1870, 450 (Brazil; ex Bonaparte).—GIEBEL, Thes. Orn., I, 1872, 634 (references).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1877, 22; in text (crit.).
Talpacotia talpacoti GRAY, Hand-List Birds, II, 1870, 240 (Brazil; Pará; Bolivia).
Peristera talpacoti SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 136 (Cayenne and Surinam, Guiana; Bolivia; Paraguay; Brazil).
Leptopelia talpacoti HEINE and REICHENOW, Nom. Mus. Hein., Orn., 1886, 283 (Brazil).
Columbigallina talpacoti BERLEPSCH, Journ. f. Orn., XXXV, 1887, 124 (Paraguay; ex Azara).—ALLEN, Bull. Am. Mus. Nat. Hist., II, 1889, 105 (Lower Beni [River?], Bolivia).—RIKER and CHAPMAN, Auk, VIII, 1891, 162 (Santarem, Brazil).—ALLEN, Bull. Am. Mus. Nat. Hist., V, 1893, 149 (Matto Grosso, Brazil).—BERLEPSCH and STOLZMANN, Proc. Zoöl. Soc. London, 1902, ii, 44 (La Merced and Chanchamayo, Peru).—DUBOIS, Syn. Avium, II, 1902, 764 (Guiana; Venezuela [?]; Peru; Bolivia; Brazil; Paraguay; syn.).—VON IHERING, Rev. Mus. Paulista, VI, 1904, 341 (Paraguay), 371 (faunal distribution).—HELLMAYR, Nov. Zoöl., XIII, 1906, 47, in text (Surinam).—HELLMAYR, Abhand. K. Bayer. Akad. Wiss., II Kl., XXII, 1906, 697 (crit. on Spix's type; Bahia).—VON IHERING, Aves do Brazil, 1907, 22 (Estado de São Paulo; Ypiranga, S. Sebastião e San José do Rio Pardo, Zaboticabal, Brazil; geog. distr.).—BERLEPSCH, Nov. Zoöl., XV, 1908, 295 (Cayenne).—DABBENE, An. Mus. Nac. Buenos Aires, XVIII, 1910, 193 (Argentina references and distribution).
Chamaepelia talpacoti DALGLEISH, Proc. Royal Phys. Soc. Edinburgh, X, 1888-89, 86 (Paraguay; geog. distr.; nesting).
Camaepelea talpacoti VON IHERING, Anuario do Estado do Rio Grande do Sul, 1900, 146 (Mundo Novo, Rio Grande do Sul, Brazil).

Description.—Adult male: above, including wing-coverts, tertiaries, and two middle rectrices, rich vinaceous chestnut or cinnamon vinous; below similar but slightly paler, fading to nearly white on the chin; crown and occiput dull plumbeous, becoming much paler and sometimes tinged with vinous on the forehead; primary-coverts and remiges deep brown or black, the latter sometimes narrowly margined externally with pale cinnamon; inner wing-coverts, scapulars, and tertiaries marked on the outer webs with irregular spots of black or dark steel-blue; axillaries and under wing-coverts black; rectrices (except middle pair as aforesaid) deep brown or black, usually more or less edged and tipped with cinnamon vinous, and the inner ones generally more or less extensively cinnamon vinous toward the base; iris red or rosy; bill dull green, dusky at tip; feet flesh-color.

Female similar in general, but decidedly duller and paler; above

olive-brown, more or less tinged with cinnamon vinous, especially on the rump and upper tail-coverts; crown with little or no plumbeous tinge; wings and tail as in the male, but duller and with paler, sometimes nearly white, edgings; below dull brownish, more or less decidedly vinous-tinged, and the middle of the abdomen, under tail-coverts, and outer rectrices (externally) often more or less whitish; "iris brown with fine silver ring" (H. H. Smith, on label).

In juvenal dress (not seen by the writer) the species is said to lack the black spots on the wings (*vide* Burmeister).

Measurements.—Male: wing, 86–91 (average, 89); tail, 62–70 (66); exposed culmen, 11–12.5 (12); tarsus, 16–17.5 (17). Female (four specimens): wing, 84–90 (87); tail, 60–64 (61); exposed culmen, 12–12.5 (12.1); tarsus, 16–17 (16).

Range.—South America, east of the Andes, from northern Argentina and Paraguay north through Bolivia and Brazil to eastern Peru and French Guiana.

Remarks.—This Dove was first noticed by Azara in 1805, under the vernacular name "Paloma de la Roxiza," and three years later was formally described by Temminck and figured by Madame Knip in their great work on the Pigeons, wherein it appears as *Columba talpacoti*, the type being still preserved in the Paris Museum. In 1825 it was re-described by Spix as *Columbina cabocolo*, which is the basis of Swainson's name *Chamæpelina cinnamomina*, applied in 1837. Bonaparte overlooked or ignored Temminck's name, and called the species *Talpacotia cinnamomea*, after Swainson, and described the female as another species, *Talpacotia godina*. The synonymy is thus somewhat confused.

C. talpacoti seems to be quite constant in characters throughout its extensive range. It has been attributed to Venezuela, but this is almost certainly an error, at least so far as specimens and published records for that country are concerned, which pertain to *C. rufipennis* instead.

Chamæpelina rufipennis rufipennis (Bonaparte).

Chamæpelina talpicoti (*lapsus*) (not *Columba talpacoti* Temminck) JARDINE, Ann. and Mag. Nat. Hist., (2), XX, 1847, 374 (Tobago).

Talpacotia rufipennis BONAPARTE, Consp. Avium, II, 1854, 79 (Carthagenæ, Columbia; orig. descr.; type in collection Paris Museum?).—BONAPARTE, Compt. Rend., XL, 1855, 22 (Carthagenæ, Colombia; diag.), 220.—BURMEISTER, Syst. Ueber. Thiere Bras., Vögel, II, 1856, 297 (Colombia; diag.;

ex Bonaparte).—BONAPARTE, Icon. Pigeons, 1857, pl. 121 and text (Colombia; crit.).—GRAY, Hand-List Birds, II, 1870, 240 (Trinidad; Cayenne; Colombia).—SOUSA, Mus. Nac. Lisboa, Columbæ, 1873, 21 (Carthagenæ, Colombia; references).

Chamæpelia rufipennis GRAY, List Birds Brit. Mus., Columbæ, 1856, 51, part (Trinidad; west coast of America; Colombia).—BOUCARD, Cat. Avium, 1876, 34 (Trinidad; Colombia).—ERNST, Primer Anuario Estadístico (Caracas), 1877, 310 (San Esteban, Venezuela).—DEARBORN, Field Mus. Orn. Series, I, 1907, 80 (Los Amates and San José, Guatemala).

Chamæpelia rufipennis SCLATER, Proc. Zoöl. Soc. London, 1857, 19 (Bogotá, Colombia).

Chamæpelia rufipennis SCLATER, Proc. Zoöl. Soc. London, 1858, 359 (Comayagua, Honduras).—MOORE, Proc. Zoöl. Soc. London, 1859, 61 (San Pedro, Honduras; Peten, Guatemala).—SCLATER and SALVIN, Ibis, 1859, 223 (Comayagua, Honduras).—TAYLOR, Ibis, 1860, 227 (Comayagua, Honduras).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1864, 370 (Lion Hill, Panama; crit.).—SALVIN, Proc. Zoöl. Soc. London, 1867, 159 (David, Panama).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1868, 629 (San Esteban, Venezuela).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., IX, 1868, 139 (San José, Costa Rica).—FRANTZIUS, Journ. f. Orn., XVII, 1869, 372 (Orosí, Costa Rica).—SALVIN, Proc. Zoöl. Soc. London, 1870, 217 (Chitra, Calobre, Bugabá, and Mina de Chorchá, Panama).—WYATT, Ibis, 1871, 383 (Ocaña, Bucaramanga, and Magdalena Valley, Colombia).—GIEBEL, Thes. Orn., I, 1872, 635 (references).—SCLATER and SALVIN, Nom. Avium Neotrop., 1873, 133 (Venezuela; Colombia; Central America to Guatemala).—BOUCARD, Proc. Zoöl. Soc. London, 1878, 43 (Puntarenas, Costa Rica).—SCLATER and SALVIN, Proc. Zoöl. Soc. London, 1879, 544 (Medellin, Colombia; nesting).—SALVIN and GODMAN, Ibis, 1880, 178 (Santa Marta, Colombia).—ZELEDÓN, Cat. Aves Costa Rica, 1882, 28 (Costa Rica).—BERLEPSCH, Journ. f. Orn., XXXII, 1884, 317 (Bucaramanga, Colombia).—TRISTRAM, Cat. Coll. Birds, 1889, 39 (Tobago).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 487, part (British Honduras; El Paraiso, Dueñas, and Retalhuleu, Guatemala; La Libertad, Salvador; Chinandega and Matagalpa, Nicaragua; Costa Rica; Bugabá, Mina de Chorchá, Chitra, Lion Hill, and Chepo, Panama; Santa Marta, Medellín, and Bogotá, Colombia; San Esteban, Venezuela; Trinidad?; descr.; syn.).—UNDERWOOD, Avifauna Costarriquena, 1899, 15 (Costa Rica).—SALVADORI and FESTA, Boll. Mus. Torino, XIV, no. 339, 1899, 9 (Punta de Sabana, Panama).—SHARPE, Hand-List Birds, I, 1899, 82, part (Central America; Colombia; Venezuela).—DALMAS, Mém. Soc. Zoöl. France, XIII, 1900, 144 (Tobago).—FORBES and ROBINSON, Bull. Liverpool Mus., II, 1900, 141 (Cumaná, Venezuela; Tobago).—SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 253, part (Central American localities and references; descr.; crit.).—PENARD, Vogels van Guyana, 1908, 340 (Guiana; descr.; habits; crit.).

Chamaepelia rufipennis LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., VII, 1861, 301 (Panama R. R.).

Chamaepeleia rufipennis REICHENBACH, Tauben, 1862, 16 (Carthagenæ, ex Bonaparte), 163 (Central American references).

- Chamaepelia talpacoti* (not *Columba talpacoti* Temminck) HARTLAUB, Isis, XLI, 1848, 407 (Tobago; ex Jardine).—TAYLOR, Ibis, 1864, 94 (Ciudad Bolivar, Venezuela).
- Chamaepelia rufipennis* LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., VIII, 1865, 178 (David, Panama).—LEOTAUD, Oiseaux Trinidad, 1866, 366 (Trinidad; descr.; habits).
- Peristera rufipennis* SCHLEGEL, Mus. Pays-Bas, Columbæ, IV, 1873, 136 (Guatemala; Colombia; Caracas, Venezuela; Guiana).
- Chamaepelia talpacoti rufipennis* NUTTING, Proc. U. S. Nat. Mus., V, 1882, 408 ("La Palma," Gulf of Nicoya, Costa Rica; habits).
- Leptopelia rufipennis* HEINE and REICHENOW, Nom. Mus. Hein., Orn., 1886, 282 (Costa Rica; Caracas, Venezuela).
- Columbigallina rufipennis* ZELEDÓN, Proc. U. S. Nat. Mus., VIII, 1885, 112 (Costa Rica).—ZELEDÓN, An. Mus. Nac. Costa Rica, I, 1887, 127 (Las Trojas, Costa Rica).—RIDGWAY, Man. N. Am. Birds, 1887, 215, part (diag.).—RIDGWAY, Proc. U. S. Nat. Mus., X, 1888, 584 (Truxillo, Honduras).—CHERRIE, Expl. Zool. en Costa Rica, 1891-2, 1893, 53 (Brunka, Terraba Valley, Costa Rica).—CORY, Auk, X, 1893, 220 (Tobago).—CHAPMAN, Bull. Am. Mus. Nat. Hist., VI, 1894, 74 ("Indian Walk rest-house," Trinidad; song).—ROBINSON, Flying Trip to the Tropics, 1895, 117, 154 (Barranquilla and Honda, Colombia).—ROBINSON and RICHMOND, Proc. U. S. Nat. Mus., XVIII, 1896, 651, 660 (El Valle, Margarita I., Venezuela).—PHELPS, Auk, XIV, 1897, 366 (Cumanacoa and San Antonio, Venezuela).—BANGS, Proc. Biol. Soc. Wash., XII, 1898, 132 (Santa Marta, Colombia).—ALLEN, Bull. Am. Mus. Nat. Hist., XIII, 1900, 128 (Bonda, Masinga Vieja, and Cienaga, Colombia).—BANGS, Proc. N. Eng. Zool. Club, II, 1900, 15 (Loma del Leon, Panama).—BANGS, Auk, XVIII, 1901, 25 (San Miguel I., Panama), 257 (crit.), 358 (Divalá, Panama).—DUBOIS, Syn. Avium, II, 1902, 764, part (Mexico to Panama; Colombia; Venezuela; Guiana; syn.).—BERLEPSCH and HARTERT, Nov. Zoöl., IX, 1902, 119 (Altagracia, Caicara, Ciudad Bolivar, and La Union, Venezuela).—CLARK, Auk, XIX, 1902, 261 (El Valle, Margarita I., Venezuela).—RIDGWAY, Condor, VII, 1905, 154 (Pígres, Costa Rica).—ALLEN, Bull. Am. Mus. Nat. Hist., XXI, 1905, 280 (Bonda, Colombia; nesting).—HELLMAYR, Nov. Zoöl., XIII, 1906, 47 (Caparo R. and Seelet, Trinidad; Cumaná, Venezuela; Tobago; Bogotá, Colombia; crit.).
- Columbigallina rufipennis rufipennis* BANGS, Bull. Mus. Comp. Zoöl., XXXIX, 1903, 142 (Ceiba, Honduras).—THAYER and BANGS, Bull. Mus. Comp. Zoöl., XLVI, 1905, 148 (San Miguel and Saboga Is., Panama; crit.).
- Chamaepelia rufipennis rufipennis* BANGS, Auk, XXIV, 1907, 292 (Boruca, Pózo del Rio Grande, and Barranca [de Puntarenas], Costa Rica).
- Columbina rufipennis* CHERRIE, Sci. Bull. Mus. Brooklyn Inst., I, 1908, 370 (Pointe Gourde and Carenage, Trinidad).—BRABOURNE and CHUBB, Birds S. Am., I, 1912, 18 (Colombia; Venezuela; Guiana).
- Chamaepelia rufipennis rufipennis* CARRIKER, Ann. Carnegie Mus., VI, 1910, 399 (Pígres, Puntarenas, Cachí, Miravalles, El Pózo, Boruca, and Buenos Aires, Costa Rica; Costa Rican references; habits).
- Chamaepelia rufipennis (lapsus)* RODRIGUEZ, An. Mus. Nac. Salvador, IV, 1910, 282 (Guatemala).

Description.—Similar to *C. talpacoti*, but wings extensively rufous. Adult male: above, including wing-coverts, tertiaries, and two middle rectrices, rich vinaceous chestnut or cinnamon vinous; below similar but paler, fading to nearly white on the chin; crown dull plumbeous, becoming much paler and sometimes tinged with vinous on the forehead; remiges rufous chestnut, tipped with brown, and the secondaries also often clouded with brown; primary-coverts rufous chestnut with black tips; inner wing-coverts, scapulars, and tertiaries marked on the outer webs with irregular spots of glossy black; axillaries and inner under wing-coverts black; outer under wing-coverts rufous chestnut; rectrices (except middle pair as aforesaid) black, the outer pair tipped and edged externally with vinaceous chestnut, the pair next to the middle often also extensively of this color; iris red or pink; bill dull olive or drab, dusky at tip; feet flesh-color.

Female similar, but decidedly duller and paler: above olive-brown, usually more or less tinged with vinaceous chestnut, especially posteriorly; wings and tail as in the male, but the former with the outer webs of the remiges more or less extensively brown; outer web of outer rectrices paler, white or whitish; below pale brownish, with more or less of a vinous tinge, the throat white or nearly so, and the under tail-coverts edged with white or vinaceous cinnamon.

Immature birds (*i. e.*, those in first winter or first nuptial dress) may be distinguished by their generally duller coloration, and by the greater extent of the brown area on the wings, the inner secondaries being largely brown. In juvenal plumage the young bird closely resembles the female, but the feathers of the back, scapulars, wing-coverts, and anterior under parts are narrowly tipped with buffy, giving a squamate appearance, and the black spots on the wings and scapulars lack gloss.

The sexual differences in this species correspond to those of *C. talpacoti*, while females average more brown on the wings than males. If the sexing of certain specimens can be trusted, it would appear that some females approximate the males in general intensity of color. Three females from the Pearl Islands, Bay of Panama, agree in being much browner below than the average of specimens from other localities—a fact which may be of some significance as indicating the existence of an insular form, although no difference in the males is evident.¹¹

¹¹ It would seem that Messrs. Thayer and Bangs could not have compared their

Measurements.—Male: wing, 85-90 (average, 88); tail, 60-70 (64); exposed culmen, 11.5-13 (12.5); tarsus, 16-17.5 (17). Female: wing, 83-89 (86); tail, 57-68 (62); exposed culmen, 12-13.5 (12.3); tarsus, 16-17 (16.5).

Range.—Northern South America, from Guiana, the valley of the Orinoco, and central Colombia north through Central America to Guatemala; a straggler in Yucatan and Vera Cruz, Mexico.

Remarks.—Curiously enough, this very distinct species appears not to have come to the notice of ornithologists until 1847, when Jardine recorded it from the island of Tobago, but wrongly identified it with *C. talpacoti*. In 1854 Bonaparte described it as distinct, his type coming from Carthagena, Colombia, since which time the numerous references from northern South America and Central America are an indication of how common a bird it is in those regions. There is not the slightest indication that it intergrades with *C. talpacoti*, and indeed it is very doubtful if their respective ranges overlap. Mr. E. C. Taylor's record of *C. talpacoti* for Ciudad Bolivar, Venezuela, like Jardine's earlier one for Tobago, unquestionably pertains to *C. rufipennis*. All Guiana skins seen, on the other hand, belong to *C. talpacoti*. Messrs. F. P. and A. P. Penard, it is true, give both species as inhabiting Guiana, but place nearly all their biographical matter under *C. rufipennis*, although an examination of the text leaves the impression that they were really uncertain of the propriety of so doing.

***Chamæpelía rufipennis eluta* (Bangs).**

Chamæpelía rufipennis (not *Talpacotia rufipennis* Bonaparte) SCLATER, Proc. Zool. Soc. London, 1859, 369 (Jalapa, Mexico).—LAWRENCE, Ann. Lyc. Nat. Hist. N. Y., IX, 1869, 207 (Merida, Yucatan).—SANCHEZ, An. Mus. Nac. Mexico, I, 1878, 105 (Yucatan).—BOUCARD, Proc. Zool. Soc. London, 1883, 459 (Yucatan).—SALVIN, Ibis, 1889, 378, and 1890, 89 (Cozumel I., Yucatan).—SALVADORI, Cat. Birds Brit. Mus., XXI, 1893, 487, part (Atoyac, Huatusco, Playa Vicente, Teapa, Santiago, Tierra Colorada, Acapulco, Tonala, Putla, Izalam, Peto, Buctzotz, and Cozumel I., Mexico; Mexican references).—LAURENCIO, Mem. y Rev. Soc. Cient. "Altonio Alzate," VII, 1894, 221 ("region caliente del E. de Veracruz").—SHARPE, Hand-List Birds, I, 1899, 82, part (Mexico).—

series of females from these islands very carefully, as they comment on the absence of any characters peculiar to the island birds. Should additional material show that their peculiarities are constant and worthy of recognition in nomenclature, I would propose for them the name *Chamæpelía rufipennis nesophila*, with No. 14,322, Collection E. A. and O. Bangs (now in the Museum of Comparative Zoölogy) as type.

SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 253, part (Mexican localities and references; crit.).

Talpacotia rufipennis MÜLLER, Reisen in Mexico, III, 1865, 589 (Mexico).

Chamepelia rufipennis SUMICHRAST, Naturaleza, V, 1881, 231 ("tierra caliente" of Vera Cruz, Potrero, and Omealca, Mexico).

Columbigallina rufipennis RIDGWAY, Proc. U. S. Nat. Mus., VIII, 1885, 581, 583 (Cozumel I., Yucatan).—RIDGWAY, Man. N. Am. Birds, 1887, 215, part (Mexican localities).—STONE, Proc. Acad. Nat. Sci. Philadelphia, 1890, 204 (Tekanto, Yucatan).—CHAPMAN, Bull. Am. Mus. Nat. Hist., VIII, 1896, 287 (Chichen-Itza, Yucatan; habits).—DUBOIS, Syn. Avium, II, 1902, 764, part (Mexico; syn.).—COLE, Bull. Mus. Comp. Zoöl., L, 1906, 117 (Chichen-Itza, Yucatan; nesting; food).

Columbigallina rufipennis eluta BANGS, Auk, XVIII, 1901, 258 (Escuinapa and Los Robles, Sinaloa, Mexico; orig. descr.; type in collection Museum Comparative Zoölogy).—MILLER, Bull. Am. Mus. Nat. Hist., XXI, 1905, 343 (Escuinapa, Sinaloa, Mexico).

Chamepelia rufipennis eluta SALVIN and GODMAN, Biol. Centr.-Am., Aves, III, 1902, 254, in text (crit.).

Subspecific characters.—Similar to *C. rufipennis rufipennis*, but general color of male decidedly paler, less rufescent, more brownish. Female also averaging less rufescent, particularly on the rump and upper tail-coverts.

Measurements.—Male: wing, 85-92 (average, 88); tail, 59-70 (65); exposed culmen, 11-13 (12.2); tarsus, 15-17.5 (17). Female: wing, 82-88 (86); tail, 57-66 (62); exposed culmen, 11.5-13 (12.1); tarsus, 16-17 (16.5).

Range.—"Tierra caliente" of Mexico, north to central Vera Cruz and southern Sinaloa.

Remarks.—This form was described from southern Sinaloa, in the extreme northwestern part of its range. A series from this region is appreciably different from another series from the Santa Marta region of Colombia, close to the type locality (Cartagena) of *C. r. rufipennis*, in the respects above pointed out. There is, however, a wide range of variation in both forms, dependent partly upon age—younger birds being duller—but partly apparently of a purely individual nature. However, after allowing for all this, there still seems sufficient difference between the two series to justify subspecific separation. Moreover, with a fairly large series of specimens at my command I find it quite impossible to distinguish the bird of eastern and southern Mexico from that of western Mexico by any constant characters, and I am therefore obliged to assign practically all specimens of the former to the present form. An occasional specimen,

however (as for instance Nos. 15,268, Field Museum of Natural History, Achotal, Vera Cruz, 37,053, Field Museum of Natural History, Yucatan, 38,277, U. S. National Museum, Orizaba, Vera Cruz, and 106,321, U. S. National Museum, Yucatan), is absolutely indistinguishable from typical *rufipennis*, but the Mexican series as a whole is obviously different. Guatemala birds seem referable to the southern form, as well as those from Honduras and Nicaragua, while specimens from Costa Rica and Panama are exactly like those from Colombia. On the other hand, some of the southern birds are almost pale enough to be referred to *C. r. eluta*; they are, however, apparently all immature birds. Everything considered, this is probably as good a subspecies as many others which have been admitted to recognition.

TABLE OF AVERAGE MEASUREMENTS.

Species.	Males.				Females.			
	Wing.	Tail.	Bill.	Tars.	Wing.	Tail.	Bill.	Tars.
<i>C. passerina passerina</i>	86	62	11.5	16	86.5	60	11.7	15.8
“ “ <i>pallescens</i>	87	59.5	11.5	15.6	86.5	59	11.5	15.7
“ “ <i>neglecta</i>	87	56	11.5	16.1	86	57	11.7	15.6
“ “ <i>socorroënsis</i>	83	56	11.5	16	82	56	11.5	16.2
“ “ <i>parvula</i>	76	54.5	10.2	15	73	51	11	15
“ “ <i>nana</i>	78.4	56.6	11	16	74	55	11	16
“ “ <i>quitensis</i>	84.5	59	11	16.3	83.5	56.5	11	16.3
“ “ <i>griseola</i>	79	55	10.7	16.3	76	51.5	10.6	16.3
“ “ <i>albirilla</i>	80	53	11.2	16	79	53.5	11.1	15.7
“ “ <i>antillarum</i>	80	56	12	16.8	79	55	12	16.7
“ “ <i>trochila</i>	80	57.5	11.1	16	80	56	11.3	15.7
“ “ <i>jamaicensis</i>	82	56	11	15.5	82	56	11.3	15.5
“ “ <i>insularis</i>	82	57	11.1	15.6	81	57	11	15
“ “ <i>afllavida</i>	81	58	11.2	15.6	83.5	57	11.6	15.4
“ “ <i>bahamensis</i>	81.5	56	10.8	15.6	82	56.5	11	15.4
“ “ <i>exigua</i>	78.5	52	10.8	15	78.5	53	10.7	15
<i>C. minuta minuta</i>	76	52	10.5	15.2	77.5	53	10.5	15.1
“ “ <i>elaodes</i>	74	50.5	10.6	15.6	74	50	10.7	15.4
<i>C. buckleyi</i>	89	69	12.7	18	91	67	13	17
<i>C. talpacoti</i>	89	66	12	17	87	61	12.1	16
<i>C. rufipennis rufipennis</i>	88	64	12.5	17	86	62	12.3	16.5
“ “ <i>eluta</i>	88	65	12.2	17	86	62	12.1	16.5

LIST OF SPECIMENS EXAMINED.—Continued.

Species and Locality.	Field Mus.	Dwight Coll.	Fleming Coll.	Brewster Coll.	Brooklyn Inst.	Biol. Survey.	Philat. Acad.	Carnegie Mus.	Bishop Coll.	Mus. Comp. Zool.	Amer. Mus.	U. S. Nat. Mus.
<i>C. passerina pallescens</i> :—												
Tamaulipas: Matamoros									10			1
Tampico	2					1		4				
San Fernando									1			
Camargo						1						
Jaumave						2						
"Rio Pilon"											1	
Not specified												1
Nuevo Leon: Linares						1						
Monterey							2	1				
Saddle Mountains											1	
Allende											1	
Vera Cruz: Mirador						1						1
Orizaba												2
Jalapa												2
Sonora: Alamos				2		1						
Hermosillo						1						
Guaymas				1								
Bacoachi				1								
Sinaloa: Culiacan						2						
Mazatlan												2
Escuinapa												2
Southern Sinaloa												2
Tepic: San Blas		2										
Maria Madre Island						8						1
Jalisco: La Barca								3				
Guerrero: Iguala	9											
Dos Arroyos						1						
Oaxaca: Tehuantepec						2						1
Mountains near Santo Domingo						2						
Chiapas: Comitán						3						
Tuxtla Gutierrez						1						
Campeche: Campeche						1						
Yucatan: Temax												1
Chichen-Itza										1	1	
Ticul							1					
Tekanto							1					
Cozumel Island												4
Not specified	1									2		3
British Honduras: Toledo											1	
Manatee Lagoon								4				
Manatee District											1	
Guatemala: Gualan	2											
Lake Atitlan	2											
<i>C. passerina neglecta</i> :—												
Yucatan: Mérida												1
Chichen-Itza										1	1	

LIST OF SPECIMENS EXAMINED.—Continued.

Species and Locality.	Field Mus.	Dwight Coll.	Fleming Coll.	Brewster Coll.	Brooklyn Inst.	Biol. Survey.	Phila. Acad.	Carnegie Mus.	Bishop Coll.	Mus. Comp. Zool.	Amer. Mus.	U. S. Nat. Mus.
<i>C. passerino neglecta</i> :—												
Guatemala: Dueñas												I
Toyabaj, Guitché												I
Honduras: Mouth of Roman River											9	
Southern boundary, 180 mi. from Pacific coast										I		
Nicaragua: Sucuyá												I
Ometepe												I
San Rafael del Norte											4	
Matagalpa												I
Costa Rica: Pígres												I
San José	I	I					2			5	6	9
Los Cuadros de Irazú										2		
Coralillo										I		
Tenorio											I	
Alajuela												2
Miravalles								I				
Esparta								2				
Not specified										I		I
<i>C. passerina socorroënsis</i> :—												
Mexico: Socorro Island								10				12
Tres Marias Islands												I
Mazatlan												I
<i>C. passerina parvula</i> :—												
Colombia: Honda											I	2
<i>C. passerina nana</i> :—												
Colombia: Jimenez								3		I		
Atuncela										I		
Palmira, 3500 feet											I	
Oaldas, 2000 feet												2
<i>C. passerina quitensis</i> :—												
Ecuador: Cumbaya (near Quito)							12					I
Riobamba							5					I
Chambo, Chimborazo							1					
Quito			2									I
Zambiza (near Quito)							2	8				
<i>C. passerina griseola</i> :—												
Guiana: Demerara												I
Georgetown	2											
Surinam							I					
Brazil: Santarem										I		I
Diamantina												4
Rhomes Plantation										I		
Amazon River										I		

LIST OF SPECIMENS EXAMINED.—Continued.

Species and Locality.	Field Mus.	Dwight Coll.	Fleming Coll.	Brewster Coll.	Brooklyn Inst.	Biol. Survey.	Phila. Acad.	Carnegie Mus.	Bishop Coll.	Mus. Comp. Zool.	Amer. Mus.	U. S. Nat. Mus.
<i>C. passerina antillarum</i> :—												
Barbados: Bathsheba			2							9		
Martin's Bay										1		
Turner's Hole										1		
Belle Plain	3											
<i>C. passerina trochila</i> :—												
Santa Lucia	6									12		
Martinique	2											1
Dominica: Roseau Dea								4				
Not specified		1									2	2
Guadeloupe	1											2
Désirade	5											
Antigua	2											9
Barbuda		5										8
St. Bartholomew	1											1
St. Christopher (St. Kitts)	6											1
St. Eustatius												2
St. Croix	1											
Saba												1
Anegada	1											1
Tortola	5											
Virgin Gorda	12											
St. Thomas							1				2	6
St. John												1
Porto Rico: San Juan												2
Cayey						1						
El Yunque												1
Martin Peña						1						
Luquillo												2
Mameyes						2						
Anasco												1
Rio Piedras						4						
Loiza								2				
Fajardo								4				
Guayama								7				
Santa Isabel								2				
Utua								4				
Manati						3						
Salinas						1						
Guanica					15							
Yauco					4							
Gabuscoa					7							
Culebra					7							
Vieques					8							
Not specified	4						1				1	3

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<i>C. passerina jamaicensis</i> :—												
Jamaica: Lucca.....							1					
Priestman's River.....	2									20	11	
Hope Gardens.....												2
Trelawney.....							1					
Port Antonio.....										3		
Spanish Town.....									2	1	2	
Kingston.....										6		
<i>C. passerina insularis</i> :—												
Grand Cayman.....	21						4					5
Little Cayman.....	2											
Cayman Brac.....	11										1	
<i>C. passerina aflavida</i> :—												
Santo Domingo: Catare.....	3											
Honduras.....	9											
Sanchez.....										1		
San Cristobal.....	10											
La Vega.....	3									3		
Maniel.....	24											
Fuerte Resoli.....	1											
Santo Domingo.....	8											
Puerta Plata.....	7											
Not specified.....							3					
Haiti: Jacmel.....	2											
Lecoup.....	2											
Port-au-Prince.....												2
Cuba: Holguin.....										5		
San Diego de los Baños.....	1											4
Remedios.....										2		
Pinar del Rio.....												1
La Catchina (near Tagua).....												1
Monte Verde.....												1
Guanajay.....												2
Guama.....												6
Trinidad.....											5	
Santiago de Cuba.....							2					
Guantanamo Bay.....												3
El Cobre.....												1
Not specified.....										2	2	5
Isle of Pines: Jucaro.....												1
Hospital.....										3		
Nueva Gerona, etc.....							14					5
San Juan.....												1
Callebonita.....										2		
Jamaica: Kingston.....												1
Not specified.....	7									1		

LIST OF SPECIMENS EXAMINED.—Continued.

Species and Locality.	Field Mus.	Dwight Coll.	Fleming Coll.	Brewster Coll.	Brooklyn Inst.	Biol. Survey.	Phila. Acad.	Carnegie Mus.	Bishop Coll.	Mus. Comp. Zool.	Amer. Mus.	U. S. Nat. Mus.
<i>C. passerina bahamensis</i> :—												
Great Bahama	2											
Abaco	2											3
Green Cay												2
Andros	5											2
New Providence: Nassau	4		2							20	2	
Blue Hills								6				
Not specified											1	3
Eleuthera	6						1					5
Current Island									1			
Cat Island												2
Watlings Island												3
Bird Rock	1											
Maraguana	1											
Great Guana Cay											1	
Great Sale Cay											1	
Concepcion Island												1
Rum Cay												14
Caicos Islands	1											
"Bahama Islands"												1
Bermudas: Hamilton											4	
Not specified							2				1	1
<i>C. passerina exigua</i> :—												
Great Inagua: Mathewtown								8				
Alfred Sound								1				
Not specified	21		2									
Mona Island	15											3
<i>C. minuta minuta</i> :—												
Brazil: Bahia												5
Chapada, Matto Grosso												1
Not specified												1
Guiana: Georgetown	3											
Surinam							1					
Venezuela: Ciudad Bolivar								1				
Peru: Lima												2
Callao												1
Not specified								1				
<i>C. minuta elæodes</i> :—												
Colombia: Bogotá												1
Not specified												2
Panama: Corozal							1					
Panama										4		2
Gatun						3						
Panama Railroad												2
Río Indio (near Gatun)							1					

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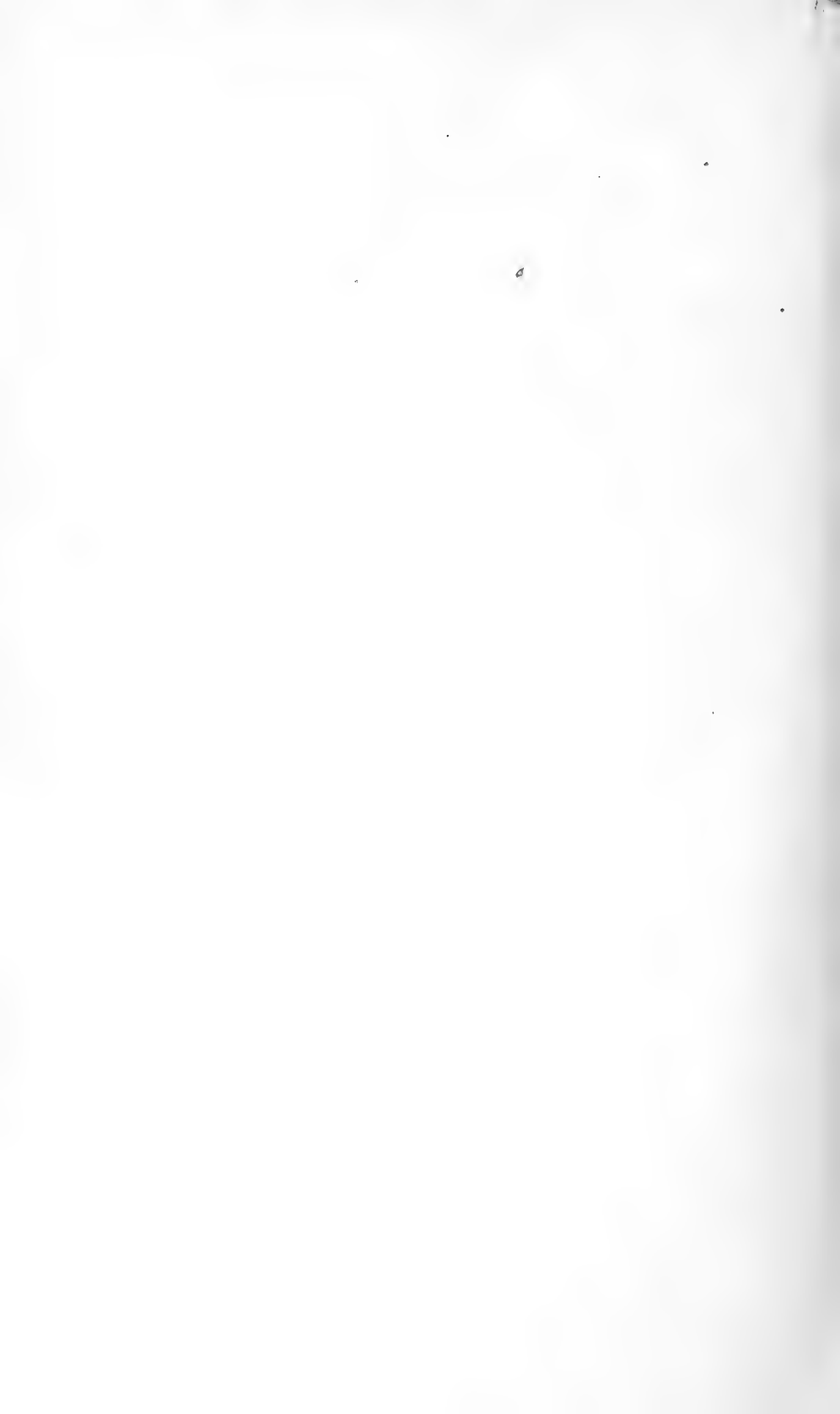
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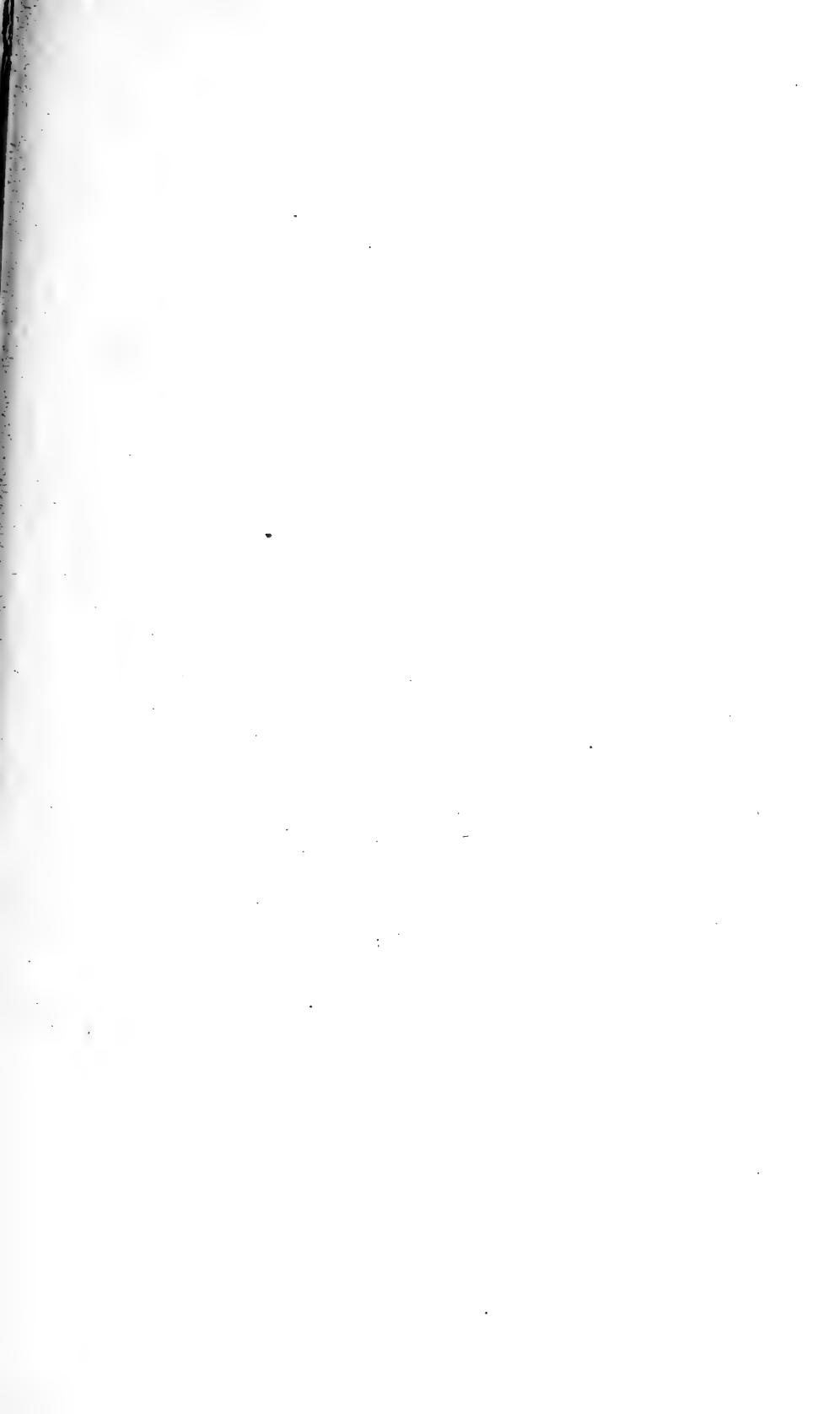
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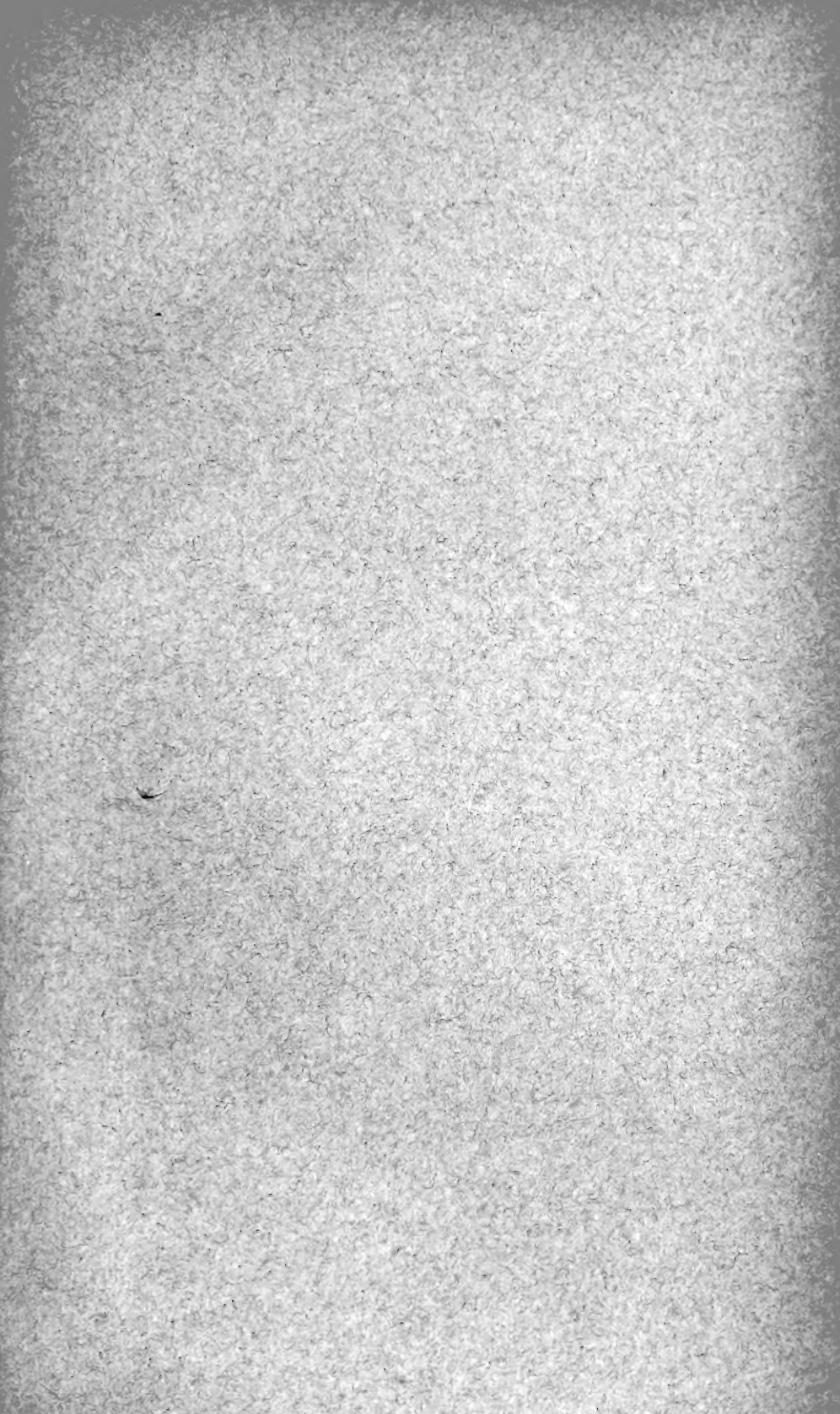
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