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The present volume is the ninety-fifth of this series.

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ALEXANDER WETMORE,
Secretary, Smithsonian Institution.

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NEW AMERICAN CYNIPIDS FROM GALLS

By LEWIS H. WELD

TWENTY-FIVE new species of American cynipids (Hymenoptera: Cynipidae) are described herein, together with a few notes on synonymy. One of the new species is an inquiline; the rest are gallmakers. Two of the latter are described from single reared specimens, but the galls are figured. One is from an unknown gall but is described from a large series of collected specimens, and paratypes are deposited in several institutions. Types of all are in the United States National Museum.

Genus SAPHONECRUS Dalla Torre and Kieffer

SAPHONECRUS FAVANUS, new species

Female.—Head (except black vertex), antennae, most of mesopleura, legs and basal region of abdomen reddish, other parts black. Head from above massive, broader than thorax, occiput concave, coriaceous with scattered punctures; from in front broader than high, with radiating striae about mouth, malar space 0.7 eye. Antennae 13-segmented, lengths as (scape) 12:6:15:12:11:11:10:10:10:10:10:10:22(6). Pronotum and mesonotum beautifully coriaceous, with scattered punctures bearing short appressed hairs. Parapsidal grooves percurrent. Anterior parallel and lateral lines depressed. Scutellum with a shallow sculptured groove at base, septum broad. Carinae on propodeum parallel. Abdomen longer than head plus thorax, collar striate, tergites II and III fused and covering the rest, its posterior third punctate, length to height to width as 38:25:17,

ventral valves protruding, ventral spine short. Wing pubescent, almost nonciliate, radial cell open, three times as long as broad, areolet present but not distinct. With width of the head used as a base, the length of mesonotum ratio is 1.0; antenna 2.0; wing 2.7. Length 2.5–3.65 mm. Average of 17 specimens 3.18 mm.

Male.—More infuscated. Antennae 15-segmented, segments 2–5 as 5:15 (slightly bent):10:11 and the last two as 9:10. Length of big tergite to height as 22:19, with only a small median dorsal group of punctures posteriorly. Length 2.05–2.85 mm. Average of 13 specimens 2.46 mm.

Types.—U. S. N. M. No. 56370: Type female, allotype, and six paratypes. Paratypes in American Museum of Natural History, Chicago Museum of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Biology.—Guests in the galls of *Dryocosmus favus* Beutenmueller. Emerged in September and October from galls collected the previous October and from which the makers had emerged the previous winter.

Habitat.—The type and allotype were selected from a series from galls collected at Washington, D. C. Paratype locality, Ironton, Mo.

Genus CEROPTRES Hartig

CEROPTRES CONFERTUS (McCracken and Egbert)

Periclistus confertus McCracken and Egbert, Stanford Univ. Biol. Ser., vol. 3, No. 1, p. 62, 1922.

The types of this species go in *Ceroptres* and differ from the other described American species in being reddish brown instead of black.

Genus NEUROTERUS Hartig

NEUROTERUS ARGENTATUS, new species

Female.—Black; antennae, coxae, femora, and tibiae brown, trochanters and tarsi almost white. Head finely coriaceous, face sparsely pubescent, malar space 0.3 eye with a groove, cheeks not broadened behind eyes. Antennae 13-segmented, lengths as (scape) 25:24(12):25(5):20:17:17:16:16:17:17:16:16:17(10). Mesonotum smooth, bare, without grooves. Mesopleura and sides of pronotum coriaceous. Wing clear, pubescence short, margin ciliate, veins brown, first abscissa of radius faintly angulate, areolet reaching one-fourth way and cubitus quite to basal, second cross vein at angle of 60° with basal. Tarsal claws weak, simple. Abdomen as long as thorax, as high as long. Ventral spine six times as long as broad in side view. With width of head used as a base, the length of mesonotum ratio is 1.0; antenna 2.0; wing 3.9; ovipositor 1.9. Range in length of 81 specimens 0.8–1.1 mm. Average 0.98 mm.

Types.—U.S.N.M. No. 56371: Type and seven paratypes. Paratypes in Chicago and American Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus gambelii*.

Gall (pl. 2, fig. 16).—Ellipsoidal, dark colored, 1.2 by 0.9 mm. by 0.6 mm. high, firmly attached to underside of leaf in numbers close to main veins. Each is covered, except in center where there is a slight papilla, with radiating straight silvery single-celled hairs about 0.5 mm. long. Exit hole near one end.

Habitat.—The type material was collected by Mrs. N. W. Capron in Oak Creek Canyon, Ariz., in November 1937 when adults were then emerging. Galls were seen at Grand Canyon also. Similar galls were collected on *Q. subturbinella* at Camp Creek and Mayer, Ariz.

NEUROTERUS CLAVENSIS, new species

Female.—Black; region around mouth, base of antennae, trochanters, knees and tarsi yellowish. Head coriaceous; from above transverse, as broad as thorax, occiput concave; from in front interocular area square, malar space 0.3 eye with groove, cheeks broadened behind eyes, antennae 13-segmented, lengths as (scape) 11(5):6:13(2):9:8:8:8:8:7:7:7:6:8. Mesoscutum as broad as long, without grooves, microcoriaceous as are scutellum, sides of pronotum, and mesopleurae. Wing pubescent and ciliate (except on proximal half of front margin), first abscissa of radius strongly angulate and clouded, areolet reaching one-fifth way to and cubitus reaching basal below middle, a faint cloud in first cubital cell and below the break in median. Abdomen collapsed, second tergite reaching about one-third way back. Ventral spine in side view scarcely longer than broad, sheaths upturned. Tarsal claws simple. With width of the head used as a base, the length of mesonotum ratio is 1.1, antenna 2.2, wing 3.7, ovipositor 3.5. Length 1.3–2.15 mm. Average of 28 specimens 1.75 mm.

Types.—U.S.N.M. No. 56372: Type and three paratypes from Flagstaff, Ariz. Other paratypes are from Prescott, Ariz., and from Las Vegas, N. Mex. Paratypes in the Chicago and American Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus gambelii*.

Gall (pl. 2, fig. 21).—Resembles the white-oak club gall externally but with a different internal structure, having a compact nest of cells on one side imbedded in brownish corky tissue.

Habitat.—Galls at Flagstaff, Ariz., contained adults on April 10 and flies emerged May 11–23 (Hopk. U. S. 15626°). Galls from Prescott, Ariz., gave adults on same dates. Galls were seen at Grand Canyon and Williams, Ariz., and in New Mexico at Tijeras and Fierro and in Colorado at Colorado Springs.

Genus TRICHOTERAS Ashmead

TRICHOTERAS FRONDEUM, new species

Female.—Brown with silvery pubescence, only the upper mesopleura and most of abdomen bare. Head coriaceous, from above transverse, broader than thorax, cheeks broadened behind eyes, occiput straight; from in front interocular area 1.28 times as broad as high, malar space 0.44 eye without groove, antenna 12-segmented, lengths as (scape) 15(5):7:14(4):14:12:10:9:8:7:6:5:11(5.5), last six with rhinaria. Mesoscutum broader than long, coriaceous, parapsidal grooves percurrent, very distinct. Scutellum longer than broad, granulate, with two shining, smooth, shallow pits at base. Area between carinae on propodeum narrower above. Mesopleura largely shining, smooth, pubescent below. Wing reduced, just reaching the tip of abdomen, pubescent, ciliate, veins brown, areolet not formed, cubitus not reaching basal. Abdomen longer than head plus thorax, longer than high, lengths of the tongue-shaped tergites as 20:6:5. Ventral spine in side view six times as long as broad, shorter than hind metatarsus. Claws with a strong tooth. With width of the head used as a base, the length of mesonotum ratio is 1.05, antenna 2.1, wing 2.2. Length 2.15–2.5 mm. Described from four specimens (one lacks head).

Types.—U.S.N.M. No. 56373: Type. Paratype in California Academy of Sciences.

Host.—*Quercus chrysolepis*.

Gall (pl. 1, fig. 6).—A transformed lateral bud, the outer brown bud scales surrounding a mass of thinner, narrower bracts. At the base in the center is a single, ovoid, thin-walled cell, 3.0 by 1.7 mm. at whose base and apex is a circle and tuft of straight, single-celled, slender white hairs 1.5 mm. long.

Habitat.—The types (dead) were cut out of galls collected at Idyllwild, Calif., on September 21, 1922. The characteristic galls have been seen on Mount Wilson, in the San Bernardino Mountains, in Sequoia National Park, at Kyburz, Los Gatos, and Shasta in California, and at Canyonville, Oreg. A similar gall on *Quercus wilcoxii* was noted in the Santa Catalina, Chiricahua, and Huachuca Mountains in Arizona.

Genus *PHYLLOTERAS* Ashmead*PHYLLOTERAS SIGMA*, new species

Female.—Antlike, black. Head finely coriaceous, face pubescent; from above massive, length to width to width of thorax as 19:31:19, occiput concave, slightly broadened behind eyes; from in front higher than broad, interocular area broader than high, malar space 0.5 eye without groove; antennae 13-segmented, lengths as (scape) 9:5:11:10:9:8:7:7:6:6:5:5:5:10. Sides of pronotum coriaceous. Mesonotum flattened, faintly coriaceous; mesoscutum wider than long, without distinct grooves; scutellum with a transverse groove at base. Wingless. Middle and hind coxae elongated. Hind tibia shorter than tarsus. Hind metatarsus as long as the three following. Claws with a weak tooth. Propodeum in profile continues the curvature of the thorax. Abdomen longer than head plus thorax as 73:45, its height to width as 52:23, lengths of tergites along dorsal curvature as 22:13:12:17:17:7, ventral spine five times as long as broad in side view, ventral valves protruding horizontally, ovipositor hooked at tip. With width of head used as a base, the length of mesonotum ratio is 0.55, antenna 3.1. Length of two specimens 1.7 and 2.05 mm.

Differs from *rubina* Gillette in having a narrower, nearly bare thorax without evident parapsidal grooves.

Types.—U.S.N.M. No. 56374: Type. Paratype in Weld collection.

Host.—*Quercus alba*.

Gall (pl. 2, fig. 22).—Sessile on underside of leaf near edge in the fall. Fusiform, flattened, the ends slightly curved in reverse directions, up to 4 mm. long by 2 mm. wide, with the larval cell in a depression in the center. It starts to develop late in June. Rare.

Habitat.—East Falls Church, Va., is the type locality. From galls collected October 22, 1940, a living adult was found in out-of-door breeding cage on March 7, 1942. Galls have been seen at Vienna, Va., and Cabin John, Md.; at Ithaca, Manorville (Crosby), and Nyack (Zabriskie), N. Y., and at Washington, D. C. (Pergande). Bassett collected galls in Connecticut.

Genus *LIODORA* Foerster*LIODORA VISCIDA*, new species

Female.—Pale yellow, ocellar area and flagellum brown. Head smooth, shining; from above transverse, not so broad as thorax, cheeks not broadened behind eyes; from in front interocular area as broad as high, malar space 0.28 eye without groove or striae, antennae 14-segmented, lengths as (scape) 10:6:14:11:10:10:9:8:7:7:7:6:6:9. Sides of pronotum pubescent, shining. Mesoscutum highly polished, smooth, almost bare, parapsidal grooves deep, smooth, percurrent,

anterior parallel and lateral lines not evident, no median. Disk of scutellum smooth back of the two deep, smooth pits, reticulate behind, margined at sides and behind. Carinae on propodeum converging above. Mesopleura bare, smooth. Wing subhyaline, pubescence and cilia dark, veins brown, heavy, first abscissa of radius arcuate, clouded anteriorly, one-eighth as long as second which is nearly straight, areolet reaching one-fifth way to basal, cubitus nearly from basal to margin. Tarsal claws toothed. Abdomen about as long as head plus thorax, longer than high, lengths of tergites along dorsal curvature as 40:18:17:14:7:6, pubescent patches on sides of II at base. Ventral spine seven times as long as broad in side view, shorter than hind metatarsus. With width of the head used as a base, the length of mesonotum ratio is 1.3, antenna 2.8, wing 4.3, ovipositor 2.5. Length of five specimens 1.6–2.15 mm. Average 2.05 mm. Runs in the Ashmead 1903 key to *Liodora*. Differs from genotype in its light color, larger areolet, longer radial cell, smoother disk, and bent carinae. Hardly to be distinguished from *sessilis* Weld whose gall is quite different in structure.

Types.—U.S.N.M. No. 56375: Type. Paratypes in the American and Chicago Museums of Natural History and the California Academy of Sciences.

Host.—*Quercus oblongifolia*.

Gall (pl. 1, fig. 3).—A spangle-gall sessile on veins on underside of leaf late in fall, 2–4 mm. in diameter, fleshy, pinkish, covered with stellate hairs on its sticky surface, the edge inrolled, the larval cell basal and eccentric. One to four on a leaf.

Habitat.—Mrs. N. W. Capron collected galls containing white pupae on January 21, 1935, at Nogales, Ariz. Adults emerged on February 21, 22, and 27.

LIODORA APIARIUM, new species

Female.—Black; mandibles and knees brown. Head finely coriaceous; from above transverse, almost as broad as thorax, occiput concave, cheeks broadened behind eyes; from in front broader than high, interocular area broader than high, malar space 0.28 eye without striae, face pubescent below antennae. Antennae 14-segmented, lengths as (scape) 13:6:17:14:13:12:10:9:8:7:7:7:6:7, last eight with rhinaria. Sides of pronotum pubescent, striate in part. Mesoscutum mostly bare, smooth, shining, grooves deep, narrow, percurrent, anterior and parallel lines not evident, no median. Disk of scutellum smooth, pubescent, margined, with two shallow, smooth pits at base. Mesopleura mostly bare, smooth, shining. Hind tibia longer than tarsus; claws toothed. Wing pubescent and ciliate, veins brown, first abscissa of radius angulate, radial cell elongated, areolet reaching one-sixth way to basal, cubitus almost reaching basal. Ca-

rinae on propodeum diverging below, enclosed area bare, smooth, shining. Abdomen longer than head plus thorax, length to height to width as 63:55:35; lengths of tergites along dorsal curvature as 28:15:14:11:10:5, ventral valves protruding obliquely, ventral spine seven times as long as broad in side view, pubescent below, shorter than hind metatarsus. Using width of head as a base the length of mesonotum ratio is 1.36; antenna 2.4; ovipositor 4.9; wing 4.6. Range in length of 21 specimens 1.7–2.6 mm. Average 2.2 mm. Differs from the described species of the genus in having the cheeks broadened behind the eyes.

Types.—U.S.N.M. No. 56376: Type and five paratypes. Paratypes in the American and Chicago Museums, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus alba*.

Gall.—Solitary, sessile, on underside of leaf close to edge in October, shaped like an old-fashioned straw beehive, white or pinkish, measuring up to 4.6 mm. broad by 4.0 mm. high. Inside is a large cavity with a transverse larval cell at very base. During the winter on the ground the outer fleshy layer shrivels and the gall becomes more cylindrical (pl. 1, fig. 9). Not common.

Habitat.—The type is from a series of 16 that were found alive in out-of-door breeding cage on March 7, 1942, from galls collected at East Falls Church, Va., in October 1940. In galls collected at Vienna, Va., in October 1938 living adults were found the next October and one emerged on February 12, 1940, and others had emerged and died in the cage by April 15. Galls have been seen at Bluemont and Rosslyn, Va., Cabin John, Md., and Washington, D. C.

Genus TRIGONASPIS Hartig

TRIGONASPIS PULCHELLA (Beutenmueller)

Dryophanta pulchella BEUTENMUELLER, Ent. News, vol. 22, p. 357, 1911.

Described from two specimens of which the one from Catalina Island Beutenmueller considered as the type. Both go in *Trigonaspis*.

Genus ANDRICUS Hartig

ANDRICUS BRACTEATUS, new species

Female.—Light reddish brown. Head from above transverse, not so broad as thorax, cheeks broadened behind eyes, occiput concave; from in front broader than high, malar space one-third eye without striae, interocular area 1.2 times as broad as high, antenna 14-segmented, lengths as (scape) 16:9:24(5):21:20:17:16:11:10:10:9:8:

7:11(5). Thorax uniformly but not densely pubescent. Sides of pronotum faintly striate near hind margin. Mesoscutum granulate, the punctures of the appressed pubescence very fine, anterior parallel and lateral lines bare, broad, smooth, no median. Foveae smooth, deep, separated by a distinct septum, disk rugose, broader than long. Carinae on propodeum parallel. Mesopleura not rugose. Wing pubescent and ciliate, veins brown, first abscissa of radius slightly clouded and angled, second slightly enlarged at margin of wing, proximal end of areolet faint. Tarsal claws toothed, hind femur with a slight lobe on lower side forming a flange on outer side near apex. Abdomen slightly longer than head plus thorax, length to height to width 35:29:25; lengths of tergites along dorsal curvature as 26:7:2:1:1:3, last four sometimes not visible in side view. Ventral spine 6-7 times as long as broad in side view, shorter than hind metatarsus. With width of head used as a base, the length of mesonotum ratio is 1.4, antenna 2.4, wing 4.3, ovipositor 2.6. Length 2.1-3.5 mm. Average of 12 specimens 2.91 mm.

Types.—U.S.N.M. No. 56377: Type and four paratypes. Paratypes in California Academy of Sciences and Chicago and American Museums of Natural History.

Gall (pl. 2, fig. 11).—A terminal bud gall, globular, up to 8.4 mm. in diameter, more or less covered with leafy bracts, which are green when young, becoming tan. Occurs in fall. Monothalamous, with a thick cavernous wall.

Host and habitat.—The type is selected from a series from galls collected by Mrs. N. W. Capron on November 1, 1935, at Young, Ariz., on an undetermined oak, the adults emerging some time before April 1936. Two paratypes are from galls on *Quercus oblongifolia*, which she sent from Nogales on February 4, 1935, then containing living adults. Two others are from Wolf Creek Camp, 10 miles from Prescott, Ariz. One is from a gall the writer collected in the Santa Rita Mountains, Ariz., on December 7, 1921, on *Q. diversicolor* containing a living adult and one from a gall from the Huachuca Mountains on the same host. These galls were seen on *Q. arizonica* also at Oracle and on *Q. toumeyi* at Patagonia, Ariz.

ANDRICUS COORTUS, new species

Female.—Black, with more or less red on mandibles, legs, and ventral abdomen, especially on specimens cut out of the galls in November. Head coriaceous; from above transverse, cheeks broadened behind eyes; from in front malar space 0.4 eye, striate, antennae 13-segmented, segments as (scape) 15:9:14:14:11:11:10:9:8:8:8:7:15. Sides of pronotum pubescent, with faint striae. Mesoscutum covered with short appressed hairs, which do not hide the coriaceous sculpture,

parapsidal grooves deep, narrow, smooth, percurrent, anterior and lateral lines smooth, no median. Disk of scutellum finely rugose, pubescent, with two smooth oblique pits at base. Mesopleura mostly bare, shining, with faint striae. Carinae on propodeum straight, parallel. Wing pubescent and ciliate, veins brown, first abscissa of radius arcuate, areolet reaching one-sixth way to basal. Tarsal claws with a tooth. Abdomen longer than head plus thorax, lengths of tergites along dorsal curvature as 52:18:7:5:1:7, exposed parts of tergites smooth, II with pubescent patches on sides at base, ventral spine in side view seven times as long as broad, shorter than hind metatarsus. With the width of the head used as a base, the length of mesonotum ratio is 1.3, antenna 2.3, wing 4.2. Length 1.9-2.35 mm. Average of 20 specimens 2.17 mm.

Types.—U.S.N.M. No. 56378: Type and three paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Gall (pl. 1, fig. 5).—A bud gall in the fall consisting of 1 to 7 elongated, vertical, parallel cells each with a dense, thick, dark-colored wall, the whole forming an elongated or rounded mass projecting above the bud scales, the surface not smooth, covered with short pubescence.

Hosts.—*Quercus douglasii* and *Q. dumosa*.

Habitat.—The type is from a series of seven living adults cut out of galls on *Quercus douglasii* at Colfax, Calif., on November 18, 1935. Four paratypes are from same host at Ukiah, Calif., cut out February 2, 1940, and six from Lakeport; one is from *Q. dumosa* at Banning, Calif.

ANDRICUS COSTATUS, new species

Female.—Head dorsally, base of antennae, sides of pronotum, median area of mesoscutum, disk of scutellum and legs reddish brown, rest of body almost black. Head coriaceous; from above transverse, occiput only slightly concave; from in front broader than high, cheeks broadened behind eyes, interocular area broader than high, malar space 0.4 eye and faintly striate, antennae 14-segmented, lengths as (scape) 14:6:11:11:10:9:8:8:8:7:7:6:6:9, the last conical. Sides of pronotum bulging. Mesoscutum microcoriaceous, shining, almost bare, parapsidal grooves deep, narrow, percurrent, anterior and lateral lines obscure, no median. Disk of scutellum circular, rugose; pits narrow, deep, smooth. Carinae on propodeum straight, parallel, enclosed area smooth, broader than high. Mesopleura bare, shining, smooth in large part. Wing pubescent and ciliate, veins brown, not clouded, first abscissa of radius angled, areolet reaching one-seventh way to basal, cubitus almost reaching basal, a faint cloud in first cubital cell. Claws

toothed. Abdomen shining, bare except on tergites VII and sides of II, length to height to width as 26:23:21, lengths of tergites along dorsal curvature as 51:19:14:9:8:11. Ventral spine tapering, as long as hind metatarsus. With width of head used as a base, the length of mesonotum ratio is 1.3, antenna 4.1, wing 4.4. Length 2.55 mm.

Type.—U.S.N.M. No. 56379: Holotype.

Host.—An undetermined oak.

Gall (pl. 2, fig. 17).—A depressed ribbed sphere produced in July on the side of acorn cup of several species of white oaks in the Southwest. The gall measures 3.0 mm. in diameter, the ribbed structure showing best on underside when detached.

Habitat.—The single adult emerged on April 5, 1942, from a gall collected on an undetermined oak by Mrs. N. W. Capron in July 1940 at Indian Creek, near Prescott, Ariz. Similar galls have been seen by the writer on *Q. fendleri* at Trinidad, Colo., and Shoemaker, N. Mex.; on *Q. subturbinella* at Tijeras, N. Mex., and on *Q. gambelii* at Flagstaff, Ariz.

ANDRICUS FLAVOHIRTUS Beutenmueller

Andricus flavohirtus BEUTENMUELLER, Insector Inscitiae Menstruus, vol. 1, p. 124, 1913.

In Proc. U. S. Nat. Mus., vol. 68, art. 10, p. 91, 1926, I erroneously transferred this species to *Callirhytis*. An examination of the holotype now in the National Museum shows that the claws are toothed, and the species should be retained in *Andricus*.

ANDRICUS FORMOSALIS, new species

Female.—Black; front and middle tibiae, all tarsi, and antenna beyond scape yellowish. Head from above transverse, not quite so broad as thorax, vertex granulate, cheeks broadened behind eyes, occiput concave; from in front higher than broad, malar space one-third eye, radiating ridges about mouth, antennae 14-segmented, lengths as (scape) 12(5):7:10(3):9:8:8:7:7:6(5):6:6:5.5:5.5:8(4). Pronotum medially smooth, sides rugose with parallel ridges at posterior margin. Mesoscutum bare, coriaceous, more or less rugose behind, parapsidal grooves percurrent but deeper, broader, smoother, and margined behind, median short, becoming an almost percurrent streak, anterior parallel and lateral lines distinct, depressed. Disk of scutellum rugose, pits deep, smooth, triangular, widely separated. Carinae on propodeum straight, included area rugose. Mesopleura entirely covered with parallel ridges. Tarsal claws weak, toothed. Wing hyaline, nonciliate, pubescence short, veins yellowish, first abscissa of radius arcuate, radial cell slightly open at base and apex, areolet reaching about one-fifth way to basal, cubitus reaching basal. Abdomen (somewhat swollen in degreasing)

longer than head plus thorax, length to height to width as 35:34:27; lengths of tergites along dorsal curvature as 19:8:7:7:5:5, small pubescent areas on sides of II, a few hairs on VII, hind margin of II and exposed areas of rest beautifully and closely punctate. Ventral spine in side view 4 times as long as broad. With width of head used as a base, the length of mesonotum ratio is 1.3, antenna 1.6, wing 3.2. Length 2.55–3.3 mm. Average of six specimens 2.86 mm.

Andricus formosus (Bassett), which produces a somewhat similar gall on various eastern red oaks, differs in having 15-segmented antennae, the mesopleura more finely sculptured, a percurrent median groove, and a red abdomen with tergite II relatively longer.

Types.—U.S.N.M. No. 56380: Type and one paratype. Paratypes in California Academy of Sciences and Chicago and American Museums of Natural History.

Gall (pl. 2, fig. 13).—Ovoid, 8 by 5 mm., whitish with a velvety surface when young, a button-shaped mass of pubescence at apex. Produced in clusters of 3–5 on the previous year's growth early in spring, dropping to the ground early in July. A cross section of a mature gall shows a larval cavity in the center, 2 mm. in diameter, the thick surrounding wall cellular and traversed by 11–13 rather large canals.

Host.—*Quercus emoryi*.

Habitat.—The type material was collected at Wolf Creek Camp near Prescott, Ariz., July 13, 1935, by Mrs. N. W. Capron. Living adults were cut out of the galls on April 15, 1936. She also sent old galls from Young, Ariz., and clusters just starting to develop on February 4 from Nogales. The writer collected these galls at Oracle, Nogales, Patagonia, and in the Huachuca Mountains, Ariz.

ANDRICUS NIGRIDIVS, new name

Callirhytis nigra FULLAWAY, Ann. Ent. Soc. Amer., vol. 4, p. 362, 1911.

Diplolepis operta WELD, Proc. U. S. Nat. Mus., vol. 68, art. 10, p. 29, 1926.

Not *Andricus luteicornis* var. *niger* TAVARES, Broteria, vol. 1, p. 10, 1902.

Not *Andricus niger* TAVARES, Broteria, ser. zool., vol. 14, No. 2, pp. 84–87, 1916.

C. nigra was described as from a twig swelling on *Quercus lobata* and being thought to have simple claws was placed in *Callirhytis*. The unique type at Stanford University examined in 1935 has the claws toothed and was found to agree with paratypes of *Diplolepis operta* Weld, which came from galls inside the buds of *Q. lobata*. The type gall at Stanford is a twig swelling, which also bears a large bud with an exit hole in the side, and the type fly evidently came from a gall inside the bud rather than from the twig swelling. As the name *niger* was preoccupied in *Andricus* by Tavares in 1902, the new name *nigrivus* is here proposed for *nigra* Fullaway.

ANDRICUS FURNESSULUS, new species

Female.—Reddish brown, with black markings on thorax and dorsal abdomen. Head from above transverse, finely rugose, not quite so broad as thorax, cheeks broadened behind eyes; from in front broader than high, malar space one-third eye with radiating ridges, antennae 14-segmented, lengths as (scape) 13(6):8:20(4):16:13:13:12:12:10:9:8:7:7:14(5). Sides of pronotum pubescent, with parallel ridges. Mesoscutum very finely rugose, coarser posteriorly, anterior parallel and lateral line areas black, parapsidal grooves percurrent but deeper, smooth, and wider posteriorly, no median. Foveae narrow, shining, oblique, disk coarsely rugose. Carinae on propodeum arcuate. Mesopleura pubescent, entirely covered with parallel ridges. Tarsal claws toothed. Wing hyaline, pubescent, ciliate, veins brown, first abscissa of radius slightly clouded, radial cell slightly open at base, tip of radius slightly bent at margin, areolet reaching one-fifth way to basal, cubitus reaching basal. Abdomen nearly as long as head plus thorax, length to height to width as 30:23:21, lengths of tergites along dorsal margin as 24:7, tergite II entirely aciculate, III finely rugose with confluent punctures, ventral spine in side view about three times as long as broad. Using width of head as a base the length of mesonotum ratio is 1.4, antenna 2.5, wing 3.8, ovipositor 3.0. Length 2.65–3.15 mm. Average of 20 specimens 2.86 mm.

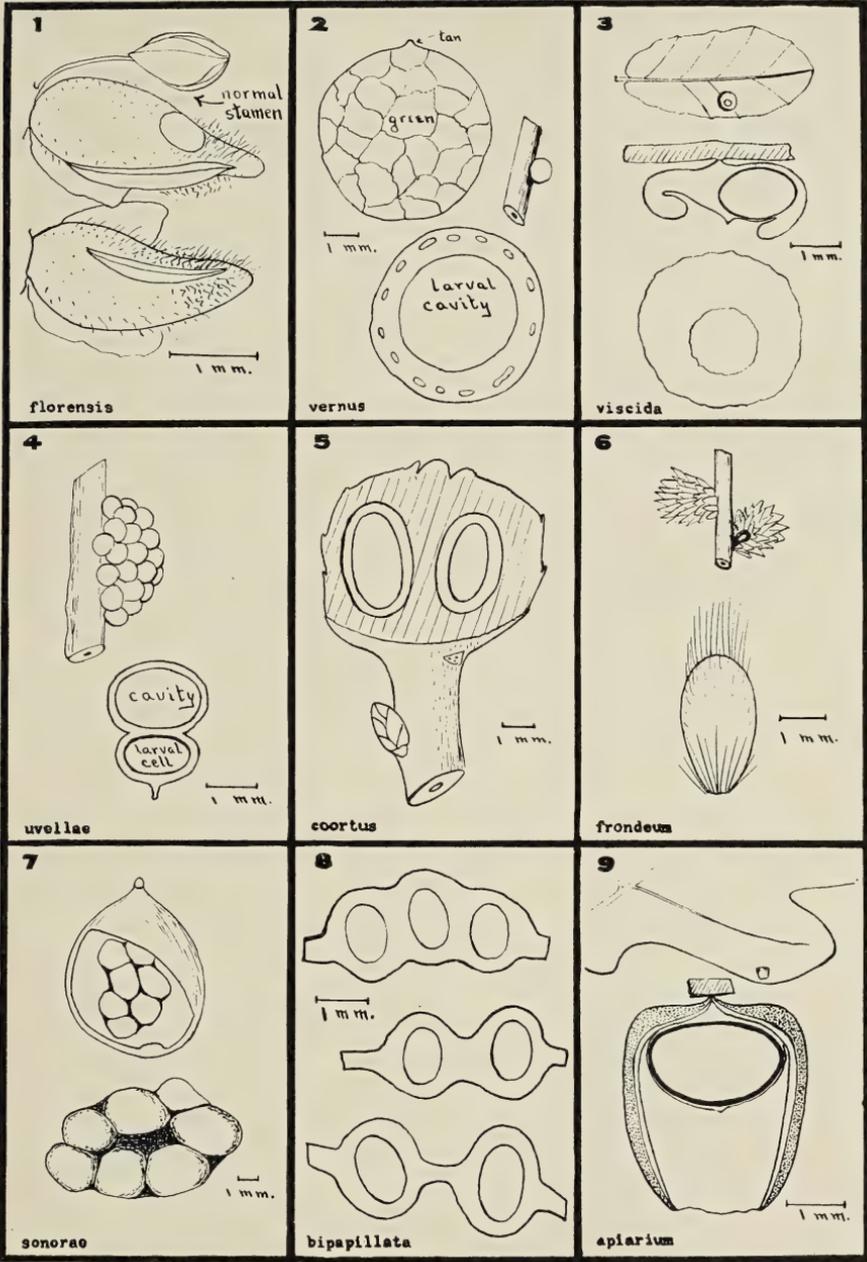
Related to *Andricus furnessae* (Wéld) from a similar but larger gall in Michoacan, Mexico, but differing in its smaller size, parti-colored thorax without median groove, and in the aciculate second tergite.

Types.—U.S.N.M. No. 56381: Type and four paratypes. Paratypes in the California Academy of Sciences and the Chicago and American Museums of Natural History.

Gall (pl. 2, fig. 10).—A woolly mass partly or entirely encircling small twigs, measuring up to 30 by 25 mm., pure white or rosy when young, consisting of a large number of separate biconical cells attached at a common point, each covered with long hairs. These measure about about 7 by 5 mm., shorter and broader than in *furnessae*.

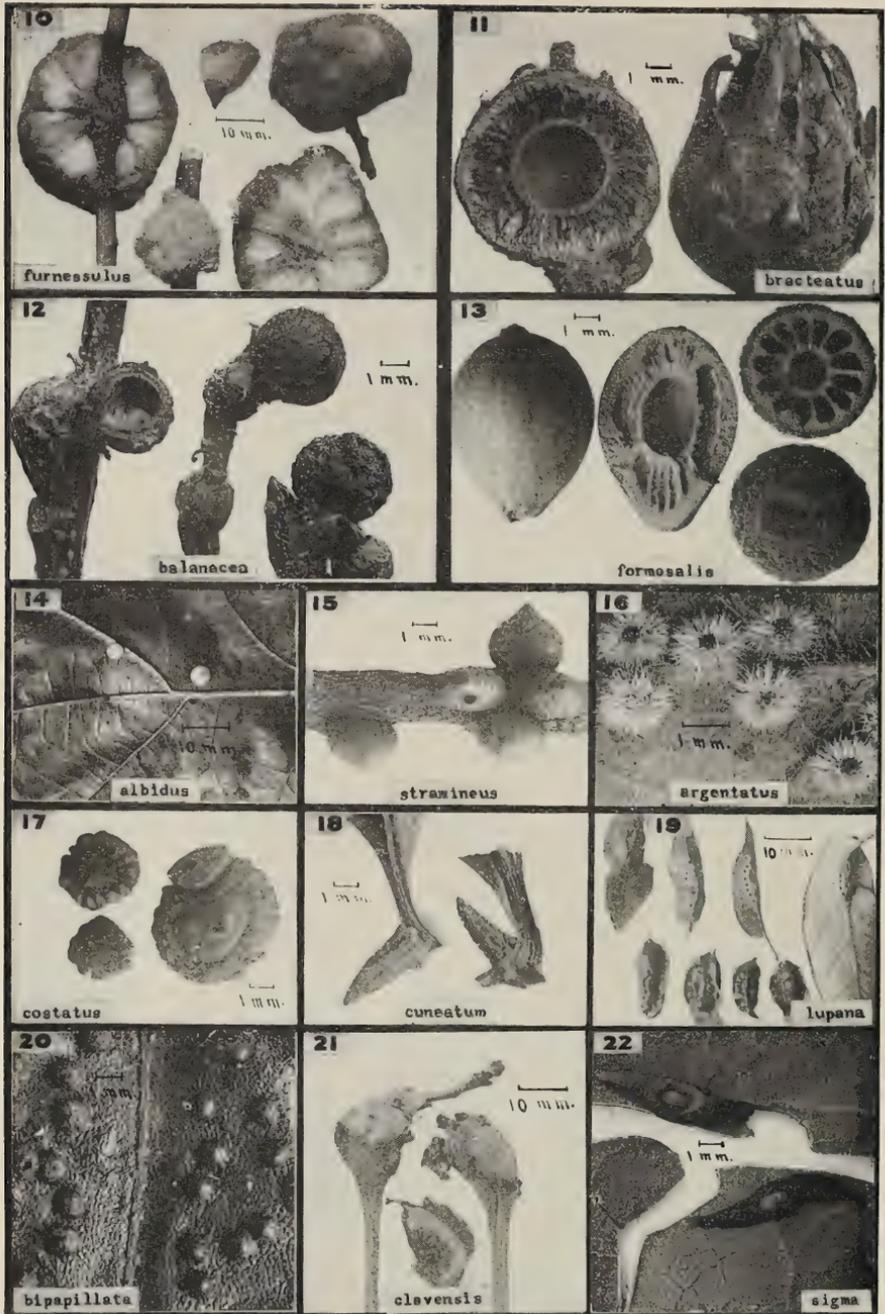
Host.—*Quercus oblongifolia*.

Habitat.—The type is selected from a series from a gall sent from Nogales, Ariz., by Mrs. N. W. Capron on February 4, 1935. Paratypes also are from a gall sent by Ed Jacot from Bear Canyon in the Huachuca Mountains, Ariz., March 30, 1919, the adults emerging May 10–28. The writer collected galls at Nogales and Patagonia, Ariz., and in the Santa Rita Mountains.



GALLS OF NEW AMERICAN CYNIPIDAE

- 1, *Callirhytis florensis* on *Quercus marilandica*; 2, *Andricus vernus* on *Q. garryana*; 3, *Liodora viscida* on *Q. oblongifolia*; 4, *Callirhytis uvellae* on *Q. wislizenii*; 5, *Andricus coortus* on *Q. douglasii*; 6, *Trichoteras frondeum* on *Q. chrysolepis*; 7, *Callirhytis sonorae* on *Q. emoryi*; 8, *Callirhytis bipapillata* on *Q. ilicifolia*; 9, *Liodora apiarium* on *Q. alba*.



GALLS OF NEW AMERICAN CYNIPIDAE

- 10, *Andricus furnessulus* on *Quercus oblongifolia*; 11, *Andricus bracteatus* on *Q.* sp.; 12, *Callirhytis balanacea* on *Q. palustris*; 13, *Andricus formosalis* on *Q. emoryi*; 14, *Dryocosmus albidus* on *Q. coccinea*; 15, *Andricus stramineus* on *Q. oblongifolia*; 16, *Neuroterus argentatus* on *Q. gambelii*; 17, *Andricus costatus* on *Q.* sp.; 18, *Zopheroteris cuneatum* on *Q. alba*; 19, *Callirhytis lupana* on *Q. emoryi*; 20, *Callirhytis bipapillata* on *Q. ilicifolia*; 21, *Neuroterus clavensis* on *Q. gambelii*; 22, *Phylloteras sigma* on *Q. alba*.

ANDRICUS STRAMINEUS, new species

Female.—Uniform light amber or with infuscations on thorax and occiput. Head granulate; from above transverse, cheeks broadened behind eyes, occiput not concave; from in front interocular area higher than broad, malar space one-fourth eye, faint striae about mouth, antennae 15-segmented, filiform, segments as (scape) 16:8:23 (4.5):21:17:16:14:12:10:9:9:8:8:7:13 (5). Sides of pronotum bulging in front of tegulae, pubescent. Mesoscutum coriaceous, shining, with short appressed pubescence without evident punctures, parapsidal grooves narrow, deep, smooth, percurrent; disk of scutellum coriaceous back of the narrow, smooth, oblique pits, rugose behind, pubescent. Carinae on propodeum straight and parallel. Mesopleura in part with faint striae. Wing pubescent and ciliate, veins brown, first abscissa of radius angulate, areolet reaching one-fifth and cubitus three-fourths way to basal. Claws with a strong tooth. Abdomen longer than head plus thorax, as high as long, lengths of tergites along dorsal curvature as 47:18:8:15:9:12, II with pubescent areas on sides at base, III and IV punctate. Ventral spine in side view three times as long as broad, from below triangular. Sheaths projecting at tip. Ovipositor stout, straight at tip. With the width of the head used as a base, the length of mesonotum ratio is 1.3; antenna 2.6, wing 3.6. Lengths of the four specimens 2.1, 2.5, 2.8, and 2.95 mm.

Types.—U.S.N.M. No. 56382: Type. Paratypes in the Chicago Museum of Natural History and the California Academy of Sciences.

Gall (pl. 2, fig. 15).—A tan-colored, bare, smooth, ellipsoidal gall, bursting out of the bark along the internodes of small twigs, drawn out to a blunt point at apex, 2 by 3 mm. by 3 mm. high, single or in small groups in fall. Contains a single larval cell with a wall 0.2 mm. thick.

Host.—*Quercus oblongifolia*.

Habitat.—Mrs. N. W. Capron collected galls containing pupae on February 4, 1935, at Nogales, Ariz. One adult was cut out of the gall on February 14 and three emerged on March 5. She collected galls also at Young, Ariz., on an undetermined oak. Galls have been seen at Patagonia, Ariz.

ANDRICUS VERNUS, new species

Female.—Red; head and tips of antennae and of ventral valves darker. Head from above transverse, as broad as thorax, cheeks broadened behind eyes, occiput concave; from in front broader than high, malar space 0.5 eye with radiating ridges from corners of clypeus, face pubescent, punctured, front coriaceous, antennae 13-segmented, lengths as (scape) 15(8):9:20(5):19:16:14:11:10:9:9:9:9:16(6).

Pronotum medially bare, sides pubescent, punctate with low parallel ridges near hind margin. Mesoscutum very finely coriaceous, uniformly but sparsely pubescent from scattered punctures, parapsidal grooves percurrent, smooth, deep, broader behind, no median; pits of scutellum deep, smooth, separated by a distinct septum, disk rugose, richly pubescent. Carinae of propodeum bowed outward below, parallel above. Mesopleura smooth, polished and bare above, pubescent below. Wing pubescent, ciliate, veins brown, first abscissa of radius faintly angled, areolet reaching one-fifth way to basal. Tarsal claws with a tooth. Abdomen as long as head plus thorax, length to height to width as 37:29:23; lengths of tergites along dorsal curvature as 21:6:3:1, a few hairs on VII, usual pubescent patches on sides of II, exposed parts of others bare, smooth. Ventral spine slender, in side view 10 times as long as broad, as long as hind metatarsus; ventral valves projecting obliquely upward. With the width of the head used as a base, the length of mesonotum ratio is 1.3; antenna 2.3; wing 3.75; ovipositor 3.3. Length 2.3-3.4 mm. Average of 41 specimens 2.92 mm.

Types.—U.S.N.M. No. 56383: Type and 10 paratypes. Paratypes in the California Academy of Sciences and the American and Chicago Museums of Natural History.

Host.—*Quercus garryana*.

Gall (pl. 1, fig. 2).—A smooth, globular, green axillary bud gall, 4-5 mm. in diameter, with a very slight nipple at apex early in spring as new leaves are developing. When detached showing a small whitish sunken scar. After dropping the thin outer fleshy layer becomes wrinkled and soon weathers away, leaving a smooth, slightly elongated, light tan cell whose wall is 0.6-0.7 mm. thick, not brittle, containing about 15 small longitudinal passages.

Habitat.—Galls were collected on May 23, 1922, at Fort Jones, Calif., and sent to Washington under Hopkins U. S. No. 15640^a. The nutritive layer was then used up and the larvae full grown. Adults emerged on April 27, 1923, April 21, 1924, and April 3, 1925. These galls were seen on this host at Yreka and Scott Bar, Calif., and at Siskiyou, Oreg. Similar galls were seen on *Quercus dumosa* at Lakeport, Bartlett Springs, and Ukiah, Calif.

Genus ZOPHEROTERAS Ashmead

ZOPHEROTERAS CUNEATUM, new species

Agamic female.—Light brown; ocellar area, front, and a transverse band on each tergite darker. Face granulate, front coriaceous; head from above transverse, cheeks slightly broadened behind eyes, occiput concave; from in front broader than high, facial area broader than

high, malar space 0.4 eye with groove, a faint ridge on front from between antennae, antennae 13-segmented, lengths as (scape) 13:6:18:15:12:11:9:9:8:8:7:7:11. Sides of pronotum bulging. Mesoscutum shining and coriaceous between the distinct parapsidal grooves. Distal part of scutellum rugose, pubescent, not broader than groove at base, overhanging metanotum behind. Mesopleura smooth and shining. Wings wanting. Hind tibia and its tarsus about equal. Claws simple. Carinae on propodeum not distinct. Abdomen longer than head plus thorax, all tergites visible, ventral spine slender, about 20 times as long as broad in side view, longer than hind metatarsus. With width of the head used as a base, the length of mesonotum ratio is 0.7; antenna 2.8. Length 2.55 mm.

Differs from described species in the longer ventral spine and in having 13-segmented antennae.

Type—U.S.N.M. No. 56384; Holotype.

Gall (pl. 2, fig. 18).—Conical, red, 3.0–4.4 mm. long by 1.5 mm. broad at base, attached to the very base of the petiole in fall just as the leaves are turning. On young trees or sprouts from stumps. Rare.

Host.—*Quercus alba*.

Habitat.—On October 17, 1938, the living adult was cut out of a gall collected just a year previously at East Falls Church, Va. Galls have been seen at Ironton, Mo., and at Hot Springs and Texarkana, Ark.

Genus DRYOCOSMUS Giraud

DRYOCOSMUS ALBIDUS, new species

Agamic female.—Black; scape, mandibles, and legs beyond coxae brownish. Head coriaceous, dull; from above transverse, not quite as broad as thorax, cheeks broadened behind eyes, occiput concave; from in front malar space one-fourth eye without groove or ridges, antennae 14-segmented, lengths as (scape) 12:7:24:18:10:9:8:8:7:7:7:7:6:9. Sides of pronotum pubescent, with parallel ridges. Mesoscutum shining, smooth except for microcoriaceous sculpture along the percurrent grooves, bare except for a few scattered hairs. Pits of scutellum large, shallow, shining, separated by a thin septum; disk coriaceous back of septum, rugose peripherally, overhanging metanotum behind. Mesopleura largely bare, coriaceous with a few faint striae. Wing hyaline, pubescent and ciliate, veins brown, first abscissa of radius angulate, areolet reaching one-sixth way to basal, cubitus almost reaching basal. Tarsal claws simple. Carinae on propodeum parallel. Abdomen longer than head plus thorax, not gibbous below petiole, length to height to width as 39:29:23; lengths of tergites along dorsal curvature as (petiole) 2:51:24:32:30:19:6, all shining although IV–VI have fine punctures and II and VII have scattered hairs on

sides; sheaths projecting, ventral spine 8 times as long as broad in side view, shorter than hind metatarsus. With width of head used as a base, the length of mesonotum ratio is 1.3; antenna 2.2; wing 4.4; ovipositor 5.9. Length 2.15–3.65 mm. Average of 20 specimens 2.8 mm.

Types.—U.S.N.M. No. 56385: Type and four paratypes. Paratypes in American and Chicago Museums of Natural History, Museum of Comparative Zoology, and Academy of Natural Sciences of Philadelphia.

Hosts.—*Quercus coccinea*, *Q. velutina*.

Gall (pl. 2, fig. 14).—A depressed sphere, fleshy, bare, smooth, pure white or pinkish on one side, measuring up to 5 mm. in diameter by 3.8 mm. high. On underside of leaf in October. Not common. Similar in external appearance to *Biorhiza rubina* Gillette on white oaks but with a different internal structure, the larval cell and nutritive layer being central instead of basal.

Habitat.—The type is from galls collected on *Q. coccinea* in October 1933 at East Falls Church, Va., adults emerging on March 20, 1935. Five paratypes are from galls on the same host collected at Vienna, Va. (Hunter), in October 1940, adults emerging on March 23, 1942, and March 31, 1943. Other paratypes are from galls on *Q. velutina* collected at East Falls Church in October 1940 and at Black Mountain, N. C., in 1941, and the adults emerged March 23, 1942, and March 31, 1943. Galls on this oak have been seen at Evanston and Glencoe, Ill., and at Burdett, N. Y.

Genus CALLIRHYTIS Foerster

CALLIRHYTIS BALANACEA, new species

Agamic female.—Reddish brown, with eyes, clypeus, lateral and anterior parallel lines, foveae, propodeum, mesosternum, and dorsal abdomen black. Mesonotum covered with short, appressed pubescence. Venation distinct, wing surface covered with short, dark pubescence, margin nonciliate, areolet lacking. Mesoscutum uniformly granulate, grooves narrow, deep, obsolete anteriorly, median wanting. Scutellum finely rugose on a coriaceous background, disk high-arched. Antennae 14- or 15-segmented, first five segments as 23:10:25:21:15, the fourth not stouter than third. With the width of head used as a base, the length of mesonotum ratio is 1.4, antenna 2.2, ovipositor 3.1, wing 3.5. Length of 104 specimens 3.0–4.5 mm. Average 3.64 mm. Mode 3.6 mm.

Closely related to *C. patiens* (Bassett), which is smaller and has a flatter disk and smaller foveae; also to *C. balanopsis* Weld, which has a flatter disk and smaller foveae, less stout hind femora, a short median groove, and the fourth segment of antenna stouter than third.

Types.—U.S.N.M. No. 56386: Type and 18 paratypes. Paratypes in American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus palustris*.

Gall.—A pip gall produced late in fall beside small acorns of the current season. Almost spherical, up to 6.3 mm. in diameter, smooth, bare, green with a small black papilla at apex, secreting honeydew. Full grown and dropping off during October after which a thin, fleshy, outside layer soon turns black, wrinkles (pl. 2, fig. 12), and dries down on the hard inner shell, 3.5 by 4.0 mm., within which is a thick nutritive layer containing the larval cavity.

Biology.—Galls were collected in October 1930. During October 1931 most of the larvae transformed into adults, which remained within the galls on the ground during the winter and emerged March 26 to April 2, 1932. A few larvae hung over and adults emerged on April 1, 1933. From galls collected in October 1931 adults emerged March 14–28, 1933. October 1935 galls gave adults on March 28, 1937. On March 20 and April 1, 1940, adults emerged from galls collected in October 1938. One was captured at Mount Vernon, Va., on March 21, 1915, by W. L. McAtee.

Habitat.—The type material was collected from two trees at East Falls Church, Va. Galls were seen at Waterford and Bluemont, Va., and at Poplar Bluff, Mo. William Beutenmueller collected galls in Woodlawn Cemetery, New York City, but failed to rear adults.

CALLIRHYTIS BIPAPILLATA, new species

Female.—Body dark brown, antennae and legs lighter. Head, sides of pronotum, and mesopleura coarsely coriaceous. Antennae 11-segmented, lengths as (scape) 18:15(9):20(6):17:14:15:16:17:13:-13:38(13). Malar groove present. Parapsidal grooves very short, no median. Foveae small, deep, well separated, disk as broad as long. No distinct carinae on propodeum. Surface of wing short-pubescent, margin at first sight nonciliate but under magnification of $\times 65$ there are short cilia on hind margin, veins beyond second cross vein pale, no areolet. Abdomen as high as long, lengths of tergites on dorsal curvature as 22:8:6:7:4:3, ventral spine in side view slightly over twice as long as broad, ovipositor exerted and very long. With width of head used as a base, the length of mesonotum ratio is 1.0, antenna 1.8, ovipositor 12.4, wing 3.5. Length of 50 specimens 0.85–1.45 mm. Average 1.15 mm.

Male.—Sculptured like female, legs and antennae almost colorless. Antennae 15-segmented, ratio 3.15. Wing ratio 3.6, margin distinctly

long-ciliate. Length of 50 specimens 0.75–1.15 mm. Average 0.88 mm.

Types.—U.S.N.M. No. 56387: Type female, allotype, 13 male and 13 female paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus ilicifolia*.

Gall (pl. 1, fig. 8; pl. 2, fig. 20).—Leaf parenchyma galls, not detachable, not confluent, on several leaves derived from the same leaf bud and as many as 200 or 300 on a leaf. Individual galls are ellipsoidal, 1.2 mm. high, projecting equally on upper and lower surfaces of the leaf, 0.8–0.9 mm. in diameter, bare above, pubescent below. Exit hole on upper surface.

Habitat.—Type material was collected on July 5, 1930, and June 27, 1933, at elevation of 2,000 feet on the trail to Signal Knob at north end of Three Top Mountain southeast of Strasburg, Va. Adults issued June 30–July 8. Galls were seen also 3 miles northwest of Vienna, Va. Prof. C. R. Crosby collected old galls at Riverhead, N. Y., in September 1913.

CALLIRHYTIS ELECTREA, new species

Female.—Amber, only tips of mandibles and of antennae darker. Head from above transverse, occiput concave, cheeks broadened behind eyes; from in front broader than high, interocular area reticulate, malar space 0.3 eye, striate; antennae 14-segmented, lengths as (scape) 15(7) : 8 : 15(5) : 12 : 11 : 11 : 10 : 10 : 9(6) : 8 : 8 : 8 : 8 : 12(5). Pronotum, mesonotum, and propodeum reticulate. Parapsidal grooves more distinct posteriorly, no median. Pits distinct, not quite smooth. Mesopleura coriaceous above and below a few striae. Tarsal claws weak, simple. Wing pubescent and ciliate, veins brown, first abscissa of radius arcuate, areolet reaching one fifth way to basal. Abdomen shorter than head plus thorax, length to height to width as 27 : 27 : 18, lengths of tergites along dorsal curvature as 63 : 21 : 17 : 14 : 7 : 6, exposed areas bare, smooth. Ventral spine in side view three times as long as broad. With the width of the head used as a base, the length of mesonotum ratio is 1.18, antenna 2.1, wing 3.6, ovipositor 1.5. Length of 14 specimens 2.2–2.8 mm. Average 2.44 mm. Differs from all known species of this genus bred from galls of this sort in acorns by having the wings ciliate.

Types.—U.S.N.M. No. 56397: Type and two paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, and Academy of Natural Sciences of Philadelphia.

Host.—*Quercus montana*, rock chestnut oak.

Gall.—A group of a few hard, stony, cells inside full-grown acorns in the fall, lying close to the wall in depressions in normal cotyledons, usually at or above the center of the acorn.

Habitat.—The type is from a series bred from acorns collected in October 1934 on the Blue Ridge, 5 miles north of Bluemont, Va., adults emerging on May 8, 1937. Two paratypes are from galls collected on Marshall Peak near Washington, Va. Others are from galls collected at East Falls Church, Va., in October 1930, the adults emerging on April 20, 30, 1934. From two of these lots of collected acorns the emergence of an undescribed black species in small numbers suggests that there are two species infesting the acorns of this oak.

CALLIRHYTIS FLORENSIS, new species

Female.—Uniform light yellowish brown. Head, sides of prothorax, mesoscutum, and mesopleura beautifully coriaceous; disk rugose. Antennae 13-segmented, the first five segments as 12:6:14:12:9, the last two as 5:7. Parapsidal grooves percurrent, median short. Wing short-pubescent, nonciliate, veins beyond second cross vein colorless, areolet absent. Carinae on propodeum sharply bent. Abdomen almost as long as head plus thorax, tergites II and III forming the dorsal margin, their lengths as 41:5, their hind margins impunctate. Ventral valves not conspicuous. Ventral spine in side view about twice as long as broad. Using width of head as a base the length of mesonotum ratio is 1.16, antenna 2.55, ovipositor 2.5, wing 3.5. Length of 45 specimens 1.35–1.65 mm. Average 1.45 mm. Closely related to *C. clarkei* Bassett, which differs from it in having 12-segmented antennae and the mesopleura not entirely coriaceous.

Male.—Head, thorax, abdomen, scape, coxae, hind femora, and tibiae black; rest of antenna, mandibles, fore and middle femora and tibiae, and all tarsi yellowish. Sculptured like the female. Antennae 15-segmented, lengths of first five as 12:6:16:13:11; last two as 8:9. Ratio 2.9. Wing with short cilia on posterior margin, ratio 3.2. Length of 50 specimens 1.15–1.5 mm. Average 1.35 mm.

Type.—U.S.N.M. No. 56388: Type female, allotype, 13 female and 13 male paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus marilandica*.

Gall (pl. 1, fig. 1).—Scattered about among the stamens in a shortened catkin; conical, slightly curved, blunt at apex, 2.2 mm. long by 1.0 mm. in diameter, of same color as the anthers but with longi-

tudinal purple streaks, the surface sparsely covered with tangled hairs. Exit hole 0.6 mm. in diameter near apex.

Habitat.—The type material was collected at East Falls Church, Va., from a *Q. marilandica* on May 10, 1931. Adults of both sexes emerged May 18 to 25, the largest number coming out on May 20. In the fall of 1932 nearly every acorn on this tree had a gall of *Callirhytis balanaspis* Weld, and the galls gathered on the ground in October produced adults that emerged on April 9, 1934.

CALLIRHYTIS JUVENCA, new species

Female.—Black; mandibles, knees, and ventral abdomen brown. Head from above transverse, vertex bare, shining, occiput pubescent, not concave; from in front broader than high, cheeks broadened behind the eyes, malar space coriaceous, 0.6 eye, frons shining, pubescent, antennae 13-segmented, lengths as (scape) 13:7:15:12:10:9:8:7:6:6:6:6:13. Pronotum pubescent. Mesoscutum with scattered fine setigerous punctures on a microcoriaceous surface, parapsidal grooves narrow, obliterated anteriorly. Disk of scutellum rugose, pits separated by a septum. Carinae of propodeum almost straight and parallel. Mesopleura largely bare, shining. Wing pubescent and ciliate, veins brown, first abscissa of radius heaviest, arcuate, areolet reaching one-eighth way to basal. Tarsal claws simple. Abdomen longer than head plus thorax, lengths of tergites along dorsal curvature as 20:6:4:4:3:1, exposed parts of III–VII finely punctate, II with pubescent patches on sides at base. Ventral spine slender, tapering, about 7 times as long as broad in side view. With width of head used as a base, the length of mesonotum ratio is 1.2, antenna 2.4, wing 4.4, ovipositor 5.0. Length 2.5–3.3 mm. Average of 20 specimens 2.89 mm.

Types.—U.S.N.M. No. 56389: Types and three paratypes. Paratypes in the Chicago and American Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—An undetermined oak.

Gall.—A midrib cluster on underside of leaf in fall similar to gall of *C. lustrans* (Beutenmueller), but smaller, mottled white and greenish with often a pinkish tinge when fresh, with a scar at apex.

Habitat.—The type locality is Young, Ariz., where Mrs. N. W. Capron collected galls on an undetermined oak November 1, 1935. Four flies emerged on March 20, 15 more by March 24, and one more by April 3, 1937. Agreeing with these is an adult taken ovipositing on *Quercus gambelii* at Williams, Ariz., on April 11, 1918.

CALLIRHYTIS LUPANA, new species

Female.—Head, pronotum, mesoscutum, and front legs reddish brown, rest of body darker. Head from above transverse, as broad as thorax, vertex coriaceous, cheeks broadened behind eyes, occiput concave; from in front broader than high, malar space one-third eye, radiating ridges from corners of clypeus, face granulate, antennae 13-segmented, lengths as (scape) 7 (4) : 5 : 8(2) : 7 : 7 : 6 : 6 : 5 : 5 : 5 : 5 : 5 : 10(4). Sides of pronotum finely rugose. Mesoscutum bare, coriaceous, slightly rugose behind, parapsidal grooves percurrent, sculptured, anterior parallel lines smooth, distinct. Scutellar groove with fine longitudinal ridges, disk distinctly rugose, margined behind. Median area of propodeum with several longitudinal ridges. Mesopleura bare, faintly striate anteriorly. Wing hyaline, pubescence short, brown, margin nonciliate (under high power very short cilia on hind margin), veins brownish, first abscissa of radius arcuate, not clouded, radial cell slightly open at base and apex, areolet reaching one-eighth way to basal, cubitus reaching basal. Tarsal claws weak, simple. Abdomen about equal to head plus thorax, length to height to width as 67 : 63 : 42; lengths of tergites along dorsal margin as 30 : 11 : 12 : 7 : 5, sides of II almost bare, a few hairs on VII, exposed parts of III–VI coriaceous. Ventral spine 3 times as long as broad in side view. Ovipositor very long. With width of the head used as a base, the length of mesonotum ratio is 1.0, antenna 1.6, wing 3.4. Length 1.35–1.9 mm. Average of 17 specimens 1.70 mm.

Male.—Uniform dark brown, antennae and legs lighter, antennae 15-segmented. Mesonotum coriaceous. Wing pubescent and ciliate. Abdomen half as long as head plus thorax. Length 1.15–1.3 mm. Average of five specimens 1.23 mm.

Callirhytis flora Weld, producing a similar gall on *Q. wislizenii*, is distinguished by its larger size, relatively longer antennae, heavier cross veins, larger areolet, and disk not margined behind.

Types.—U.S.N.M. No. 56390: Type female, allotype, and four female paratypes. Paratypes in the Chicago and American Museums of Natural History and the California Academy of Sciences.

Host.—*Quercus emoryi*.

Gall (pl. 2, fig. 19).—A rather abrupt fusiform polythalamous enlargement on the underside of the midrib, stunting the development of the leaf. June.

Habitat.—The type material was collected on June 28, 1935, at Wolf Creek Camp, 10 miles from Prescott, Ariz., by Mrs. N. W. Capron. Adults were then emerging. She later sent empty galls from Cherry, Young, and Nogales, Ariz. A similar gall occurs on *Q. hypoleuca* at Patagonia, Ariz.

CALLIRHYTIS PERRUGOSA, new species

Female.—Head and thorax yellowish brown, abdomen reddish brown. Entire head and thorax almost uniformly rugose but not so coarsely so as in *Amphibolips*. Head as broad as thorax, interocular space broader than high, cheeks strongly broadened behind eyes, occiput from above concave. Antennae 14-segmented, lengths as (scape) 20(9):10:20(6):14:12:11:10:10:9:9:9:8:7:8. Parapsidal grooves scarcely visible in the sculpture, median slightly visible. Scutellum longer than broad, foveae deep, sculptured, septum broad. Area between carinae on propodeum rugose. Wing with yellowish tinge, margin not ciliate, surface short-pubescent, veins yellowish brown, areolet reaching one-eighth way to basal. Abdomen with triangular pubescent patches on sides at base, longer than high, lengths of first two tergites as 27:6. Ventral spine in side view three times as long as broad. With width of head used as a base, the length of mesonotum ratio is 1.36; antenna 2.1; ovipositor 1.9; wing 3.5. Length of 89 measured specimens 3.3–5.1 mm. Average 4.1 mm.

Related to the species in this genus reared from root galls but differing from them all in the very rugose mesonotum in which parapsidal grooves are not distinct even in part.

Types.—U. S. M. M. No. 56391: Type and seven paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus alba*.

Habitat.—The type is selected from a series of over 50 specimens collected at East Falls Church, Va., in seven different years at dates from April 13 to May 3. They were taken while ovipositing in the topmost buds of 3–6-foot saplings or strong sprouts from stumps of white oak, but attempts to determine the resulting gall have so far failed and so have attempts to find the gall from which these flies must have just emerged. Paratypes are from Washington, D. C., Great Falls, Md., Malaga, N. J., and Castle Rock and State College (May 7), Pa.

CALLIRHYTIS SONORAE, new species

Female.—Black, with reddish brown on base of antenna and on more or less of head, mesonotum and side of pronotum. Head coriaceous; from above transverse, as broad as thorax, occiput concave, cheeks distinctly broadened behind eyes; from in front broader than high, interocular area 1.3 times as broad as high, malar space 0.4 eye with distinct groove. Antennae 13-segmented, lengths as (scape) 18:7(5.5):14(4.5):11:10:10:9:8.5:8:8:7:7:14(5). A few par-

allel ridges on sides of pronotum. Mesonotum bare, coriaceous, slightly rugose in low relief posteriorly between grooves. The latter percurrent, broader behind. Anterior and lateral lines distinct, narrow. A faint trace of a median behind. Mesopleura bare, coriaceous. Scutellum rugose, the sculptured transverse groove at base with but an indistinct septum, disk margined behind. Carinae on propodeum parallel. Wing hyaline, veins pale, cross veins not clouded, pubescence short, margin nonciliate. Abdomen about equal to head plus thorax, all tergites visible on dorsal curvature and each with a broad coriaceous band posteriorly, base of II bare, ventral spine not projecting beyond lobes of hypopygium. Tarsal claws simple. Using the width of the head as a base the length of mesonotum ratio is 1.2, antenna 1.7, wing 3.4, ovipositor 2.2. Range in length of 150 specimens 1.85–3.0 mm. Average 2.29 mm. Closely related to *C. lupana* of present paper, a sexual generation from a midrib swelling on same host, emerging late in June.

Types.—U.S.N.M. No. 56392: Type and 45 paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Host.—*Quercus emoryi*.

Gall (pl. 1, fig. 7).—A flattened brown mass of 3–10 cells inside the acorn beside the much-reduced cotyledons, the number of cells evident on the surface. Masses measure up to 10 mm. long.

Habitat.—The type is selected from a series bred from acorns from Santa Ana, Sonora, Mexico, taken from baggage at quarantine at Nogales, Ariz., on September 28, 1935 (No. 10348). Adults issued on April 10, 1937, April 2, 1938, April 3, 10, 15, 1939, April 7, 17, 1940, April 7, 12, 1941, April 12, 15, 1942, and April 16, 1943. Paratypes are from Hermosillo, Magdalena, and other points in the state of Sonora. Earliest emergence was March 10. Galls from Cusion, Cuchuta, Esqueda, Guaymas, Fronteras, and Nogales (all in Sonora) have been found in "bellotas" in the personal baggage of Mexicans crossing the border. Over 60 lots have been intercepted, mostly at Nogales, Ariz., a few at Naco and Douglas, Ariz., and a few at El Paso and Ysleta, Tex.

CALLIRHYTIS UVELLAE, new species

Female.—Reddish brown, legs and antennae yellow. Head transverse, broader than thorax, shagreened; from above not broadened behind eyes; from in front malar space about one-fourth eye without groove or striae, antenna 14-segmented, segments as (scape) 11 (6) : 6 : 16 (3) : 12 : 10 : 10 : 9 : 9 : 8.5 : 8 : 7 : 7 : 7 : 9 (4.5). Mesoscutum longer than broad, bare, microcoriaceous, parapsidal grooves percurrent, an-

terior and lateral lines obscure, no median. Scutellum longer than broad, disk rugose, with two distinct round pits at base. Carinae on propodeum arcuate. Mesopleura striate above with a polished area below. Tarsal claws weak, simple. Wing pubescent and ciliate, veins brown, first abscissa of radius arcuate, slightly clouded, areolet reaching one-ninth way to basal, cubitus reaching basal. Abdomen as high as long, all tergites visible dorsally, II longest, smooth and bare on sides at base, its hind margin oblique. Ventral spine three times as long as broad in side view. With the width of the head used as a base, the length of mesonotum ratio is 1.4; antenna 2.8; ovipositor 1.6; wing 4.4. Length 1.3–2.1 mm. Average of 20 specimens 1.95 mm.

Male.—Similar to female in color; antenna filiform, 15-segmented, malar space one-seventh eye; abdomen small, with a distinct pedicel. Length 1.6–2.0 mm. Average of four 1.8 mm.

Types.—U.S.N.M. No. 56393: Type female, allotype, and four female paratypes. Paratypes in the American and Chicago Museums of Natural History, Museum of Comparative Zoology, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Gall (pl. 1, fig. 4).—Two-chambered, fleshy, reddish, 2.0 mm. in diameter, from bud on side of twigs in spring, single or usually in small clusters. The larva occupies the basal cavity. After the adults emerge the walls of the upper shrivel.

Host.—*Quercus wislizenii*.

Habitat.—The type series was reared from galls collected at Lakeport and Ukiah, Calif., on May 10 and 12, 1922, when the galls contained pupae. Adults issued a few days later and were found dead in the box on May 26. Galls were seen at Upper Lake and at Santa Rosa, Calif. Similar galls were seen on *Q. agrifolia* at Santa Anita, Santa Barbara, Newhall, Fillmore, and Ojai, Calif.

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A COLLECTION OF BIRDS FROM NORTHERN GUANACASTE
COSTA RICA

By ALEXANDER WETMORE

IN THE fall of 1940, when opportunity came for me to visit Costa Rica and to study the birds of the northwestern Province of that country, a plan of many years' standing was fulfilled. The U. S. National Museum, as a result of the early work of Juan Cooper, William Gabb, Anastasio Alfaro, and José Zeledón, and the assistance of the last named to Robert Ridgway, had received many specimens of birds from the Republic, but among the numerous localities from which these came the Province of Guanacaste was almost wholly unrepresented. Only a few specimens, received by gift or in exchange, had come from that area. As my time was limited it was necessary for me to concentrate on one area in the northern part of the Province. Here my investigations centered on the capital town Liberia and extended inland to the Volcán Rincón de la Vieja.

In the arrangements for these studies, and during my most pleasant stay in Costa Rica, I was indebted to many friends. On my arrival I was received with every courtesy as the guest of the Government, and I have the happiest of memories of all those with whom I had association. Among these I must mention especially Licenciado Don Luis Demetrio Tinoco, Ministro de Educación, and Licenciado Don Alberto Echandi, Ministro de Relaciones Exteriores. My friend Dr. Juvenal Valerio Rodríguez, then Director of the Museo Nacional in San José, met me on my arrival in Puerto Limón and assisted me in every way throughout the period of my work. To Señor Don Juan Muñoz, Governor of the Province of Guanacaste, and to General

Gregorio Aguilar Sibaja, Comandante de la Plaza in Liberia, I wish to express my sincere appreciation for their courtesy and assistance in furthering my studies in the field. In San José, Modesto Martínez was most kind to me. Carlos Aguilar, at that time in charge of the zoological collections in the Museo Nacional, worked as my assistant during the entire period of my stay in Guanacaste. One of the pleasant memories of my travels in Latin America is my stay in Liberia and at the hospitable Hacienda Santa María. Always was I among companions who were interested in helping me and in making me feel completely at home in their attractive and friendly land.

ITINERARY

Early in the morning of October 12, 1940, I landed in Puerto Limón from the United Fruit Co.'s steamship *Jamaica*, where through the courtesy of the government officials the formalities of entry into the country were quickly completed, and I was greeted in courteous and friendly fashion as the guest of the Government of Costa Rica. Accompanied by Dr. Juvenal Valerio Rodríguez, Director of the Museo Nacional, who had come to meet me, and with other officials who had arrived on the same ship, I boarded a special train which carried us up the beautiful valley of the Río Reventazón to the highlands of the Meseta Central, and finally to the capital city of San José. A week here passed rapidly and pleasantly, occupied in meeting scientists of the country, in visits to government offices, and in work at the Museo Nacional on its interesting and valuable collections. On October 16, in company with Rómulo Valerio Rodríguez and Alfonso Segura Paguaga, I went in a car furnished by the government to San Ramón, continuing from there to examine a vertebrate fossil deposit located along the Quebrada Ramírez on the Finca Piedades of Don Gabriel Barrantes.

On the morning of October 19, in company with Dr. Valerio and Carlos Aguilar of the Museo Nacional, I left San José, by Taca plane for Guanacaste. At the take-off the wind was blowing and the air was cold, but a half hour later we came down into the long, narrow landing field at Puntarenas on the Gulf of Nicoya into true tropical heat. Beyond, after a half-hour pause, the plane traveled high above mangrove swamps bordering the gulf to the mouth of the Río Tempisque, crossed the wide delta of that river, and continued over the Nicoya Peninsula. Here sharp ridges covered with scrub and low forest rose a thousand feet or more, with small, level valleys lying between.

After a brief stop in Santa Cruz we returned to the southeast over hilly country to Nicoya and then continued north again above the town of Filadelfia to Paso Tempisque. As at the two previous stops, the airfield was long, rather narrow, and grown with grass, with

a small structure at one end consisting of a sheet-iron roof supported on posts and a square, locked room built under one corner. A group of saddle horses crowded in the shade behind the building while the riders walked out to the plane.

This was on the valley floor of the Río Tempisque where it was hot in spite of the early hour. From the air I had an excellent view of the winding course of the river bordered with trees, and of the lowlands adjacent, which were marshy in places. Occasional white herons appeared, and once a little flock of jaçanas. Inland we passed a rather abrupt escarpment that bounded a plain extending toward the distant mountains, and almost immediately I saw the town of Liberia, capital of Guanacaste. About the town the land appeared rather level, with an open growth of brush and trees. Far to the west I could see the Pacific Ocean, while to the east, nearer at hand, rose the mountains, with Volcán Rincón de la Vieja nearby and Volcán Miravalles directly east but at a greater distance.

The airport, reached at half past 9, was at the edge of town and was larger than the others seen. Truly, air travel has been a wonderful service for this region, accessible otherwise only by slow overland journeys requiring several days.

Guanacaste is a land completely apart from the elevated, thickly populated tableland of central Costa Rica. Roads are primitive, so that travel for a good part of the year is by oxcart and horse. Only during the dry season are the carreteras passable for trucks, and only then through skillful driving. The land in the main is held in great haciendas, with cattle raising as the principal industry. Along the valley of the Río Tempisque, and in limited areas elsewhere, as near Liberia, there are small farms where corn, rice, and beans are grown. Over vast sections one sees only scrub forest and pastureland traversed by cattle trails, with houses at long intervals.

In Liberia, known as the Ciudad Blanca because of the white sand of its streets and its white-walled houses, Dr. Valerio left me, and with Aguilar I began at once field studies of the bird life of the region.

The Río Liberia (pl. 5, fig. 1), which passes through the edge of town, is here narrow and rather swift, with clear water. A forest of fair-sized trees lined its banks below town, with occasional stands of larger growth. Also I found open country with small lakes and ponds. Away from the stream the land was cultivated in places, and elsewhere was in pastures (pl. 3, fig. 1) dotted with groves or stands of rather dense scrub. Small quebradas with fairly level, sandy or stony bottoms draining into the river were common. To the east the river ran between hills, forested for a short distance, and then barren and dry, dotted with stunted oaks, and covered with sparse grass, an arid, almost desert region, where birds and other forms of life were rare.

Five miles to the northwest the Río Colorado (pl. 3, fig. 2) joined with the Río Blanco to form a larger stream than the Liberia that dropped rapidly over a stony bed, with quieter stretches at intervals in which we swam to refresh our bodies from the heat. Here there were forested areas and pastures as at Liberia (pl. 4, fig. 1).

The elevation at the airport was 96 meters above sea level. The end of the rainy season was near and many days were continuously clear. Storms came mainly in afternoon and at night, and only occasionally was the morning cloudy. In early morning as the sun rose the air was delightfully cool, but on most days before noon heat drove the birds to cover. Usually there was a breeze in the afternoon, but at this season the frequent rains kept down the dust that later I was told blew in clouds across the land.

On November 4, by invitation of Bert De Langton, Aguilar and I rode inland to the Hacienda Santa María located on the southern and southwestern slopes of the Volcán Rincón de la Vieja (pl. 4, fig. 2). The trail, after crossing the Río Liberia, led over dry-soiled, rolling ridges covered with low, scrubby trees. Deeper valleys carried branches of the river bordered by forest. The region was one without human habitation. Presently, as the elevation increased, some of the ridges carried more vegetation, and beyond the land was covered with grass, in places 2 or 3 feet high, interspersed with thickets and groves of good-sized trees. We continued past a deserted estancia house called Las Delicias and found at this increased elevation that the air had become cool and invigorating. Finally we reached a high, open slope and saw the hacienda house located a mile away across rolling pastures at the edge of the mountain forest (pl. 6, fig. 2). The property had been acquired only recently by Mr. De Langton, and for several years no stock had been run here except for the few head used by the caretaker. In consequence grass grew waist high in places, and there were few open trails away from the house. Deer, peccaries, and other game abounded; we saw fresh jaguar tracks daily; there were occasional signs of mountain lions; and tapirs and interesting birds were common.

The main cone of Rincón de la Vieja appeared bare in the main, and I was told that there were openings where gases and steam escaped. From the main mountain there extended to the southeast the Cerro Santa María (pl. 4, fig. 2; pl. 6, fig. 1) covered with heavy forest that grew down to the hacienda house at an elevation of 750 meters. Above a small coffee plantation back of the house there was a steep pitch over a shoulder of the mountain that led to a high heavily wooded flat known as Papal at 900 meters. Beyond this a series of ridges led up the mountain to the summit of the Cerro, which I estimated to be about 975 meters in elevation. The entire



1. Guanacaste trees in pasturelands near Liberia, Costa Rica. October 19, 1940.



2. Río Colorado, northwest of Liberia, Costa Rica. October 20, 1940.



1. Near the Río Colorado, northwest of Liberia, Costa Rica. October 20, 1940.



2. The Volcán Rincón de la Vieja from the airport at Liberia, Costa Rica, the barren volcano being the highest point, with the wooded Cerro Santa María adjacent at the right October 21, 1940.



1. The Río Liberia below Liberia, Costa Rica. October 22, 1940.



2. Open grassland on the southern base of the slopes of Volcán Rincón de la Vieja. November 4, 1940.



1. Looking across pasturelands to the forested slopes of Cerro Santa María. November 6 1940.



2. The Hacienda Santa María, with the wooded slopes above obscured by mist. November 16, 1940.

mountain was heavily forested so that I marked the old, obscure trail along the ridges, making it possible to work in here without difficulty on days when the mountain slopes were hidden in fog and mist.

From the house a reasonably good trail led around to the east to a broad, fairly level area known as Los Cuadros, where there were old plantations and overgrown clearings in a fine forest in which the larger trees rose to a height of 60 meters. Below the forest the land was rolling, with the ridges and slopes in pasture (pl. 5, fig. 2), while depressions and gullies were filled with brush and stands of oaks and other trees. This was excellent bird country, but a little lower down, where the forest was again continuous for some distance, there was a dense undergrowth of bamboo that was silent and lifeless and extremely difficult to penetrate. The head of the Río Liberia swings into a deep, wooded valley at the north of the house, with tributaries of clear water flowing toward it at frequent intervals. Los Cuadros marked the divide with the Caribbean slope, and here water ran toward the east. When I climbed to open slopes on the mountain shoulders that from below appeared covered with smooth turf I found often that they were waist high in dense grass and tough bushes and almost impassable. In the forest there was necessity for much use of the machete. The undergrowth was always wet and the slopes often slippery.

The bird life here was interesting and abundant, and after long trips afield it was most agreeable to work at the hacienda in the cool, pleasant afternoons, with macaws flying about, a house wren singing, and howler monkeys roaring in the distance. Don Fernando Siles, manager of the hacienda, and his wife were most kind to me in every way, and it was with definite regret that on November 16 I saw my outfit loaded on pack mules for the journey back to Liberia. I had 2 more days in the field here, and then on November 19 Aguilar and I returned by plane to San José. On November 23, accompanied by Dr. Valerio and Aguilar, I descended again by rail to Puerto Limón, to sail at 6 in the evening on the United Fruit Line steamer *Veragua*.

LIFE ZONES AND DISTRIBUTION

Since the period of work in Guanacaste was short, my investigations were in the nature of a reconnaissance that permitted only partial view of the region. I have therefore restricted the extent of the present discussion of distributional data. The area about Liberia lies in the arid division of the Lower Tropical Zone, this extending inland over the lower slopes of the mountain through the area draining into the Pacific. Birds were common here and in good variety, though the species are definitely fewer than in corresponding areas

in the humid section bordering the Gulf of Mexico. The region was marked by areas of scrub, open or dense, by pasturelands broken by thickets and groves, and by tracts of forest along the streams and in poorly drained areas. Below Liberia there were scattered marshes and shallow lagoons. Whether part of the pasturelands had originally been in savanna it was difficult to say, but there were extensive savanna areas toward the mountains.

It is hardly proper to attempt to list completely the characteristic birds of the arid Lower Tropical Zone from the small amount of field work on which this report is based. Instead I shall point out some of the interesting facts in distribution that have been evident.

As characteristic birds of the arid division I may mention such forms as *Scardafella inca*, *Eumomota superciliosa australis*, *Myiarchus nuttingi nuttingi*, *Camptostoma imberbe*, *Polioptila plumbea bairdi*, *Icterus sclateri sclateri*, and *Aimophila rufescens hypaethrus*. It was curious that near Liberia I found no species of the family Formicariidae; though I was certain that some form of *Thamnophilus* must occur, apparently it is found in very limited numbers.

At the Hacienda Santa María on the lower slopes of the Cerro Santa María there was rather abrupt transition to the humid Lower Tropical Zone in the great forests that extended over the mountain and reached to the east over the broad, fairly level area at Los Cuadros. As remarked above, this was the watershed between the Atlantic and the Pacific drainages. Here I obtained *Xiphorhynchus triangularis punctigulus*, *Sclerurus albigularis canigularis*, *Phaenostictus mcleannani saturatus*, *Lophotriccus pileatus luteiventris*, and *Lanio leucothorax leucothorax*.

In two instances I secured different forms of the same species at Liberia and on the Cerro Santa María. In the arid division I obtained *Piaya cayana stirtoni* and *Hylophilus decurtatus pallidus*, while in the humid Lower Tropical area I found *P. c. thermophila* and *H. d. decurtatus*.

As one travels across the rather barren area of poor soil with low, scrubby oaks and scattered herbaceous vegetation toward the mountains the land rises, and there is a sudden transition at about 300 meters elevation to a greener, more fertile region, beginning a short distance below the old, outlying ranch house at Las Delicias. The open slopes in November 1940 were covered with an abundance of green grass, and in the heavier woodland there appeared a dense undergrowth of a small bamboo. Above, the slopes were more open, covered with excellent pasturage, groves being found mainly in the hollows. The growth here was influenced by the rains, mists, and fogs that sweep across from the Atlantic side, and the area nearer the Hacienda Santa María must be considered a part of the humid section

of the zone. The handsome, crested magpie-jay (*Calocitta formosa pompata*) of the arid section, however, ranged across the open lands to the wooded area, occurring thus at the very head of the Caribbean drainage. In these upland savannas I found the grasshopper sparrow and also the meadowlark.

In the heavy forests above 1,000 meters on the Cerro Santa María there was weak indication among the birds of humid Upper Tropical Zone elements, the belt often termed the Subtropical Zone. Trees were tall, and at 1,200 meters I found tree ferns. The toucanet *Aulocorhynchus caeruleogularis* lived here, descending to feed as low as the coffee plantation back of the hacienda, but belonging properly in the higher mountain forests. Other species indicative of the higher zone elements are *Rhynchochylus brevirostris brevirostris*, *Turdus plebejus plebejus*, and *Catharus mexicanus fumosus*. The race of *Myioborus miniatus* found here, and also *Basileuterus culicivorus culicivorus*, *Henicorhina leucosticta tropaea*, and *Xenops minutus ridgwayi*, are less certainly characteristic of the higher zone since they range also into the upper portions of the Lower Tropical Zone. The summit of the mountain usually was covered with clouds that hung in the tree tops, leaving the undergrowth below free, and was beset with winds that seemed cold and harsh, partly because in work in these higher regions my clothing was always soaked with water from the dripping leaves and branches. Birds were more abundant on the lower parts of the forested slopes than in the wet undergrowth across the summit.

I did not reach the somewhat higher reaches of the main peak of Volcán Rincón de la Vieja, but from the views that I had of the west face the slopes were not forested, being covered with grass and herbaceous vegetation, with indication of brush. Possibly this western face may belong in the arid division of the Upper Tropical Zone, but this was not certain.

NOTES ON MIGRATION

The valley of the Río Tempisque and its tributaries seems to form one of the definite highways for northern migrants that travel to and through southern Central America. My stay was during the time of the fall migration, when migrants of a number of species were passing regularly, while others seemed more or less settled on their winter range. Among these travelers from the north sharp-shinned, broad-winged, marsh, and sparrow hawks were found in small numbers. Spotted sandpipers ranged along the Río Liberia, the lesser yellowlegs appeared casually, and in the uplands I saw one Wilson's snipe. A killdeer frequented the horse corral at the Hacienda Santa María.

The western mourning dove appeared on October 27, and on November 1 fully 100 were seen near the Río Colorado. The Texas

nighthawk was recorded in Liberia on October 22 and was seen daily over the Plaza and the pastures adjacent to town until my departure. The ruby-throated hummingbird was common in certain areas. Among the flycatchers it was interesting to find the northern and southern races of the crested flycatcher in the same region and to obtain the yellow-bellied flycatcher. The wood pewees were still more intriguing, and at Liberia I shot specimens of the eastern, western, and Mexican forms, ranging together and not to be distinguished except in the hand. The scissor-tailed flycatcher appeared on October 24 and was found at times in flocks. In evening many came from the open country to sleep in the shade trees of Liberia.

The barn swallow was another common species in the open areas, often in flocks. Bullock's and Baltimore orioles were found together. In the woods and groves I collected yellow-throated and Philadelphia vireos and a fair variety of northern wood warblers, as well as the eastern summer tanager, the rose-breasted grosbeak, and the indigo and western painted buntings.

ANNOTATED LIST OF BIRDS

Family FREGATIDAE

FREGATA MAGNIFICENS Mathews: Man-o'-war-bird

Fregata minor magnificens MATHEWS, Austr. Avian Rec., vol. 2, 1914, p. 120 (Barrington Island, Galápagos Islands).

On October 18 I saw several man-o'-war-birds soaring over the harbor at Puntarenas.

Family ARDEIDAE

ARDEA HERODIAS Linnaeus: Great Blue Heron

Ardea Herodias LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 143 (Hudson Bay).

On November 2 I saw one great blue heron at the lagoon on the Finca América, below Liberia.

CASMERODIUS ALBUS EGRETTE (Gmelin): American Egret

Ardea Egretta GMELIN, Systema naturae, vol. 1, pt. 2, 1789, p. 629 (Cayenne).

These herons were found at lagoons near Liberia on October 30 and 31 and November 2.

FLORIDA CAERULEA (Linnaeus): Little Blue Heron

Ardea caerulea LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 143 (South Carolina).

The little blue heron was recorded near Liberia, October 31 and November 18.

BUTORIDES VIRESCENS (Linnaeus)

Ardea virescens LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 144 (South Carolina).

Green herons were seen near Liberia on October 21 and 31, but were not taken.

Family ANATIDAE

DENDROCYGNA AUTUMNALIS (Linnaeus)

Anas autumnalis LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 127 (America).

On November 1 I flushed two of these tree-ducks from a wet meadow at the Río Colorado northwest of Liberia.

CAIRINA MOSCHATA (Linnaeus)

Anas moschata LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 124 (Brazil).

Below Liberia on November 2 a dozen of these ducks rose from a small lagoon near the Finca America. About 2 o'clock in the morning of November 18, during a full moon, I was aroused from sleep by the calls of a flock that circled over the village.

Family CATHARTIDAE

CORAGYPS ATRATUS (Meyer)

Vultur atratus MEYER, *Zool. Annal.*, vol. 1, 1794, p. 290 (St. Johns River, Fla.).

The black vulture was a common species, seen usually about houses. I observed them often also soaring high in the air. At Liberia one came occasionally into the patio of the house where I lived, searching for scraps of meat. There was always a flock near the village slaughterhouse. One day as I watched a group gathered at carrion I heard several uttering hissing, growling calls, such as I have recorded occasionally elsewhere. There was no question that these were adult birds. This species differs decidedly in this matter of voice from the turkey vulture, which is vocal when immature but when adult is mute, except for the hissing of air expelled from its body when excited.

At the Hacienda Santa María there was a flock of 30 or 40 around the corral, and individuals were seen regularly soaring over the pastures. They never entered the uninhabited, forested area.

CATHARTES AURA (Linnaeus)

Vultur Aura LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 86 (Vera Cruz, Veracruz, México).

The turkey vulture was a bird of daily record both at Liberia and on the Hacienda Santa María, and it ranged even through the semi-desert area above Liberia toward the mountains. On October 28 I

saw one immature bird with dark head but fully grown. In the mountains one or two were constantly in sight over the meadows.

Family ACCIPITRIDAE

ACCIPITER STRIATUS VELOX (Wilson): Sharp-shinned Hawk

Falco velox WILSON, American ornithology, vol. 5, 1812, p. 116, pl. 45, fig. 1 (Philadelphia, Pa.).

A female sharp-shin was taken near Liberia on October 28, and another bird was seen at the Hacienda Santa María on November 8. Carriker in his "Birds of Costa Rica" records it only from the plateau region.

BUTEO PLATYPTERUS PLATYPTERUS (Vieillot): Broad-winged Hawk

Sparvius platypterus VIEILLOT, Tableau Encycl. Méth., vol. 3, 1823, p. 1273 (Philadelphia, Pa.).

Near Liberia on October 24 I shot a male and saw another of these hawks on November 18. At the Hacienda Santa María I killed one on November 12 and gave it to Aguilar. The birds were found at the edge of forest and were quite fat.

BUTEO MAGNIROSTRIS ARGUTUS (Peters and Griscom)

Rupornis magnirostris arguta PETERS and GRISCOM, Proc. New England Zool. Club, vol. 11, Aug. 30, 1929, p. 46 (Almirante, Panamá).

These small hawks were common near Liberia where I prepared a male as a specimen on October 19. On the Hacienda Santa María they were found through the groves bordering the pastures and along the edge of the forest. The species is one that does not range in heavily forested areas. As always, these birds were tame, coming quickly to me at any imitation of a wounded or excited bird and calling querulously as I passed through their haunts. The specimen taken is from near the northern limits of this race in northwestern Costa Rica.

BUTEO NITIDA MICRUS (Miller and Griscom)

Asturina nitida micrus MILLER and GRISCOM, Amer. Mus. Nov., No. 25, Dec. 9, 1921, p. 4 (4 miles northeast of Chinandega, Nicaragua).

On October 19 along the Río Liberia below Liberia one of these hawks came dashing in as I imitated the cry of a small bird in pain and alighted a few feet overhead, sending an iguana that had been resting there scurrying through the branches to a more secure spot. Another was seen here on October 22. The specimen taken, a female, has the wing 264 mm., agreeing in size and color with *micrus* from farther north and showing no approach to the smaller *B. n. costaricensis* of southwestern Costa Rica.

There is no apparent reason to dispute van Rossem's statement¹ that these hawks, known usually as *Asturina*, cannot be separated from *Buteo*.

CIRCUS CYANEUS HUDSONIUS (Linnaeus): Marsh Hawk

Falco hudsonius LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 128 (Hudson Bay).

The marsh hawk was fairly common over the open pasturelands both at Liberia and on the lower mountain slopes inland. As I watched their quartering over these hunting grounds I sometimes wondered how far they had traveled in actual miles in arriving at this far southern point. I recorded the first one on October 30 at Liberia, and saw others there November 3 and 16. At the Hacienda Santa María I noted single birds on November 6, 8, 12, and 13.

Family FALCONIDAE

POLYBORUS CHERIWAY AUDUBONII Cassin

Polyborus Audubonii CASSIN, Proc. Acad. Nat. Sci. Philadelphia, Aug. 7, 1865, p. 2 (Florida).

The caracara, called locally *carga huesos*, was fairly common about Liberia, being recorded on October 18, 22, 26 and November 2.

HERPETOTHERES CACHINNANS CACHINNANS (Linnaeus)

Falco cachinnans LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 90 (Surinam).

Near Liberia these handsome hawks were noted at intervals near the river below the town, while on the Hacienda Santa María they were found occasionally where woodlands bordered open country. At times they were seen soaring overhead, when the long tail and short wings gave them a curious and very characteristic outline. More often their presence was indicated by their strange calls, exhilarating in tone to me both from the sound and from the memories that they always bring of the primitive regions where I have heard them during expeditions of other years. A female taken near Liberia, November 2, rested quietly in the top of a tree over a roadway, calling so softly that I thought at first that it was at a distance, though in reality it was directly overhead. The wing in this specimen measures 260 mm., while in color it is slightly darker above than examples from southern Mexico, being also slightly more buffy below.

This fine falcon naturally has attracted much attention as collections containing examples of it have come to hand, with the result that currently four to six subspecies have been recognized.

Since there have been some uncertainties regarding the limits of the proposed forms, I have taken advantage of opportunity to review the series in the U. S. National Museum and in the American Mu-

¹ Bull. Mus. Comp. Zool., vol. 77, 1934, p. 429.

seum of Natural History. In all, 84 skins have been examined, these being from localities well distributed throughout the range of the species.

Male and female in *Herpetotheres cachinnans* are alike in size and in color and marking, and individual variation, both in measurement and in coloration, is greater than has been supposed. Birds in the first year have the feathers of the dorsum and wing coverts margined with light, bright brown, but otherwise appear like adults. The number of light cross bars on the tail varies from four to five, with considerable variation in width; in some individuals the bars become divided into oval spots. The amount of dark streaking on the crown is highly variable, as is the extent of spotting on the under wing coverts. In some birds there is a deep buffy tinge in the ordinarily white markings of head and under surface, a variation which may appear anywhere in the range of the species, being intensified in regions of heavy rainfall. There is no question that during the rainy season this color may be produced or intensified by stain acquired from wet vegetation and from the ground during feeding. Conversely, birds from drier areas, or those taken during the dry season, are cleaner and therefore whiter.

Tail measurements are uncertain because of excessive wear. This is particularly the case where the birds have been feeding over burned areas, a common habit; apparently they often come down to places where the ashes are still so hot as actually to char the ends of the tail feathers.

With these facts understood the series examined may be separated into three geographic races, as outlined in the following paragraphs:

Herpetotheres cachinnans chapmani Bangs and Penard:

Herpetotheres cachinnans chapmani BANGS and PENARD, Bull. Mus. Comp. Zoöl., vol. 62, 1918, p. 37 (Santa Lucía, Río Hondo, Quintana Roo, México).

Generally similar to *H. c. cachinnans* but averaging more grayish brown above; the light margins on the dorsal feathering of the immature dress brighter, lighter brown, being brighter in color than in *queribundus*.

Range: The tropical areas of México and Guatemala, probably also British Honduras, possibly into northern Honduras and El Salvador.

Birds from northwestern México, judged from the relatively few specimens that have come from that area, have been supposed to average a little larger than from elsewhere in the north, but are equaled by individual birds from many other localities, so much that the race *excubitor*, described recently by van Rossem² cannot be separated.

² *Herpetotheres cachinnans excubitor* van Rossem, Trans. San Diego Soc. Nat. Hist., vol. 9, Nov. 21, 1938, p. 10 (Volcán de Colima, southern Jalisco).

Van Rossem gives the wing of 10 specimens of his *excubitor* from northwestern México as 280 to 302 mm., and the tail as 235 to 250 mm., and of 10 *chapmani* from eastern México and Central America as, wing 255 to 275 mm. and tail 200 to 230 mm. In material that I have examined these figures do not hold. For example, there is one bird from Palmul, Quintana Roo, with the wing 281 and the tail 200, one from Tres Zapotes, Veracruz, with these measurements 292 and 214 mm., and one from Paso Nuevo, Veracruz, 289 and 232 mm., as well as one from Progreso, eastern Guatemala, with the wing 307 and the tail 230 mm. These are mingled in the same regions with specimens of more ordinary dimension. Difference in size definitely cannot be correlated with geographic range, as the wing in birds from Veracruz and Tabasco in eastern México varies from 255 to 292 mm., and from Yucatán and Quintana Roo from 268 to 281. There does not seem to be any particular difference therefore for birds of western México. Color differences also are variable. It appears that only one race can be recognized in México.

Herpetotheres cachinnans cachinnans (Linnaeus):

Falco cachinnans LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 90 (Surinam).

Darker, blacker above; immature with light margins on dorsal feathers darker, more chestnut-brown.

Range: From Honduras (possibly from El Salvador) south through Central America to Perú and the Amazon Valley in Brazil.

Various specimens from Honduras south to Panamá appear somewhat intermediate toward the more northern form, but on the whole birds from this area average very closely similar to a good series from Surinam.

The buffy cast of the light areas of head and breast common in this hawk is intensified in birds from the western parts of Ecuador and Colombia, but this is too inconstant to warrant recognition of a separate race *fulvescens*,³ which some have suggested recently might be extended well north into Central America. This fact has been previously indicated by Peters.⁴

I have examined two specimens of the supposed race *maestus*,⁵ proposed on the basis of paler color, but this difference appears due to the skins being cleaner than the average as they come from a drier area, so that they also must be placed with *cachinnans*.

The wing in six birds from Surinam, the type locality, varies from 258 to 279 mm. A series from the entire range in South America runs from 247 to 286 mm., and one from Central America from 256 to 294.

³ *Herpetotheres cachinnans fulvescens* Chapman, *Bull. Amer. Mus. Nat. Hist.*, vol. 34, 1915, p. 638 (Alto Bonito, 1,500 feet, west slope of western Andes, Antioquia, Colombia).

⁴ Check-list of birds of the world, vol. 1, 1931, p. 276.

⁵ *Herpetotheres cachinnans maestus* Bangs and Noble, *Auk*, 1918, p. 444 (Bellavista, Perú).

In two skins from Parida Island on the Pacific coast of western Panamá one measures 276 and one 290 mm., while three from nearby Gubernador Island range from 256 to 272. The great variation in size in this bird is evident from these figures.

Herpetotheres cachinnans queribundus Bangs and Penard:

Herpetotheres cachinnans queribundus BANGS and PENARD, Bull. Mus. Comp. Zoöl., vol. 63, 1919, p. 23 (Pernambuco, Brazil).

Similar to *cachinnans*, but more grayish brown above; similar also to *chapmani*, but more grayish above; light areas averaging whiter, with less buff than in the other two races.

Range: Eastern Brazil and eastern Bolivia south to the Territory of Chaco and Corrientes, northern Argentina.

The southern form has the wing about as in the typical form in Brazilian examples, but in the southern part of its range averages larger. Birds from Brazil have the wing 266 to 273 mm., one from Bolivia measures 263 mm., and skins from Paraguay and Argentina vary from 289 to 299 mm. The "type" locality through the chance of the original description has been set in a region where approach to *cachinnans* begins, as I consider that larger size and paler color are the characters of this race. These have their maximum development farther south.

MICRASTUR RUFICOLLIS INTERSTES Bangs

Micrastur interstes BANGS, Auk, 1907, p. 289 (La Estrella de Cartago, Costa Rica).

On November 14 in the heavy forest of Cerro Santa María I shot a male of this hawk as it came flying in to rest on a low perch and peer about while I was trying to decoy some small birds. This individual had the tail in molt.

FALCO SPARVERIUS SPARVERIUS Linnaeus: Northern Sparrow Hawk

Falco sparverius LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 90 (South Carolina).

In open fields around Liberia, and in the pasturelands of the Hacienda Santa María, the sparrow hawk was common from October 18 until my departure. One was seen near San Ramón on October 16. From this it appears to be an early arrival from the north in fall. It is called *chameleón* by the country people. The two taken are of the typical form.

Family PHASIANIDAE

ODONTOPHORUS ERYTHROPS MELANOTIS Salvin

Odontophorus melanotis SALVIN, Proc. Zool. Soc. London, 1864 (Feb. 1865), p. 586 (Tucurrique, Costa Rica).

On my first day afield at the Hacienda Santa María in the dense forest above the house I encountered a small flock of these wood-quail

on a steep slope and shot two, one from the forest floor and another from a branch 10 feet from the ground to which it had flown. The first rolled and tumbled until it fell far below where I could not find it. The second proved to be a young bird less than half grown. I encountered a few others here subsequently in heavy forest but in the dense undergrowth did not get a shot at them.

Family CHARADRIIDAE

OXYECHUS VOCIFERUS VOCIFERUS (Linnaeus): Killdeer

Charadrius vociferus LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 150 (South Carolina).

At the Hacienda Santa María I saw a killdeer in the corral near the house on November 6 and recorded one or two subsequently on November 7, 8, 10, and 11.

Family SCOLOPACIDAE

CAPELLA DELICATA (Ord): Wilson's Snipe

Scolopax delicata ORD, in reprint of Wilson's "American Ornithology," vol. 9, 1825, p. CCXVIII (Pennsylvania).

On November 11 at the Hacienda Santa María, following a heavy rain, I flushed a Wilson's snipe in a narrow trail leading through the high grass of a pasture.

ACTITIS MACULARIA (Linnaeus): Spotted Sandpiper

Tringa macularia LINNAEUS, *Systema naturae*, ed. 12, vol. 1, 1766, p. 249 (Pennsylvania).

Near Liberia from October 19 to November 17 I recorded this species regularly on the Río Liberia and the Río Colorado.

TOTANUS FLAVIPES (Gmelin): Lesser Yellowlegs

Scolopax flavipes GMELIN, *Systema naturae*, vol. 1, pt. 2, 1789, p. 659 (New York).

One lesser yellowlegs was seen at a roadside pool near Liberia on October 20.

Family COLUMBIDAE

ZENAIIDURA MACROURA MARGINELLA (Woodhouse): Western Mourning Dove

Ectopistes marginellus WOODHOUSE, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 6, May-June (Aug. 20), 1852, p. 104 (Cross Timbers, north fork of Canadian River, Okla.).

Near Liberia two mourning doves were seen October 27 in pasturelands south of town, and another was recorded October 30. On November 1 I found 100 or more in small flocks scattered over open meadows near the Río Colorado and shot one. Others were seen on November 2 and 3.

The specimen taken, a male, belongs to the western subspecies as indicated by the paler brown of the tertials, back, and rump, when compared with eastern birds. While many western birds are paler below also some have the breast and foreneck as dark as some of the eastern race.

ZENAIDA ASIATICA ASIATICA (Linnaeus): Eastern White-winged Dove

Columba asiatica LINNAEUS, *Systema naturae*, ed 10, vol. 1, 1758, p. 163 (Jamaica).

Near Liberia white-winged doves were found in small numbers near areas of small, cultivated fields. I shot a female here on October 31.

There is considerable variation in depth of color in birds of this species so that in the small series from Costa Rica at hand I cannot distinguish the race *australis* that Peters has described⁶ from the western part of that country. I have at hand specimens from Veracruz, México, and elsewhere that are just as dark as those from the Pacific slope of Costa Rica.

SCARDAFELLA INCA (Lesson): Inca Dove

Chamaepelia inca LESSON, *Oeuvres complètes de Buffon*, vol. 20, 1847, p. 211 (México).

In the vicinity of Liberia the Inca dove was fairly common so that two or three or more were noted nearly every day that I was afield. Their monotonous *coo-coó* is rendered by the country man as *San Juan, San Juan*, which gives this species its local name. One taken on October 19 had developing ovaries. A male was shot on October 29.

These two birds, when compared with specimens from Nicaragua northward, are definitely paler below, the pinkish vinaceous breast being lighter and the abdomen clearer white. The species is here at its extreme southern limit and may be represented by a distinct form, a matter to be checked carefully with more material.

COLUMBIGALLINA PASSERINA NEGLECTA (Carriker)

Chaemepelia passerina neglecta CARRIKER, *Ann. Carnegie Mus.*, vol. 6, 1910, pp. 390 and 398 (Esparta, Costa Rica).

In the vicinity of Liberia these doves were common, being seen daily during work in that area. Toward the mountains to the eastward they continued to a little below Las Delicias but were not recorded higher. Three were taken on October 20, 27, and 29.

CLARAVIS PRETIOSA (Ferrari-Perez)

Peristera pretiosa FERRARI-PEREZ, *Proc. U. S. Nat. Mus.*, vol. 9, 1886, p. 175 (Brazil).

A male of this ground dove was taken on October 27 in an area of wooded pastures south of Liberia, and two more of the same sex were seen here October 30.

⁶ *Melopelia asiatica australis* Peters, *Auk*, 1913, p. 372 (Cerro Santa María, Costa Rica).

LEPTOTILA VERREAUXI VERREAUXI Bonaparte

Leptotila verreauxi BONAPARTE, Compt. Rend. Acad. Sci. Paris, vol. 40, 1855, p. 99 (Colombia).

A male of this pigeon was taken near Liberia on October 28, 1940, and the birds were seen regularly in this region. At the Río Colorado I observed one resting in the sun in early morning in a tall tree top fully 100 feet above the ground. When startled it pitched at once into cover below. In an extended acquaintance with various races of this pigeon I have never before seen one in such a situation as the species is normally found near the ground. Two seen at the Hacienda Santa María on November 9 seemed darker in color, but of this I was not certain as I did not shoot one.

OREOPELEIA MONTANA (Linnaeus): Ruddy Quail-dove

Columba montana LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 163. (Jamaica).

On November 15 I shot a female in an open thicket surrounded by pastureland below the house on Hacienda Santa María.

Family PSITTACIDAE**ARA MACAO (Linnaeus)**

Psittacus Macao LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 96 (South America).

One of the delights experienced at the Hacienda Santa María was the sight each day of these great macaws—not one alone but a dozen, or a hundred, according to where my work took me. As I rode out in early morning across the undulating pastures pairs or little flocks came past me, fairly glowing with color in the morning sun. And in the vast forests I heard their raucous calls in many places. They came daily to wild fruit trees in the little coffee plantation back of the house, and as I prepared specimens each afternoon, if the weather was clear, I could often see the flash of their brilliant plumage in the trees a hundred yards away. Occasionally when something startled them, 40 or 50 would sweep out around the house with strident calls. The birds were molested little and so were tame. On November 9 when I took one for a specimen I had only to walk out into the coffee plantation directly to where macaws were feeding without attempt at concealment. At the shot the companion birds did not trouble to leave the tree.

The macaw here is known as the *lapa*. In evening those from near the house left before sunset, most of them flying around the slopes to the east but a few going directly out over the lowlands to the southwest. Near Liberia on November 2 three passed over high in the air coming from the direction of Nicoya and traveling toward the Volcán Rincón de la Vieja, so that I believed that they flew

across into the mountains of the Nicoya Peninsula. As they pass near at hand their colors flash and the long tail feathers undulate in the wind. In distant flight they travel high in a direct line with steadily moving wing beat when the long, streaming tail gives them a curious outline. As I left the hacienda early on the morning of November 16 a flock of 40 or 50, a brilliant group, came circling low over my head, a farewell to please the heart of any naturalist.

Although *Ara ambigua ambigua* is recorded only from eastern Costa Rica it is certain that it occurs on Rincón de la Vieja. A *lapa verde*, or green macaw, was well known there, and one came with the red ones to the house occasionally. I did not see it personally, but it was reported to me so that I was certain of its presence. High on the mountain I heard macaw notes that seemed somewhat different from those ordinarily heard from *Ara macao*. I thought that they came from the green birds, but among the steep slopes and the great trees I did not succeed in approaching the birds responsible for these calls.

PYRILIA HAEMATOTIS HAEMATOTIS (Sclater and Salvin)

Pionus haematotis haematotis SCLATER and SALVIN, Proc. Zool. Soc. London, Aug. 1860, p. 300 (Vera Paz, Guatemala).

Soon after daylight on November 12 Carlos Aguilar called me to see some small parrots in the coffee plantation at the Hacienda Santa María. Among the dim, shadowed branches presently I made out two resting close together, and after securing them a chattered call drew attention to another. These three were the only ones seen.

While Peters ⁷ has placed this species in the genus *Pionopsitta* of Bonaparte, *haematotis* differs definitely from the type of that genus, *P. pileata*, in slender, compressed bill, and much shorter tail and so it is logical to follow Ridgway ⁸ and segregate it in a separate group, *Pyrilia*. The decidedly swollen bill in *pileata* is especially striking. The downs in *haematotis* are heavily developed and show among the contour feathers.

ARATINGA CANICULARIS CANICULARIS (Linnaeus)

Psittacus canicularis LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 98 (northwestern Costa Rica).

Near Liberia these parakeets, known as the *chocoyo*, were so common that they were seen daily. At the end of October screeching flocks flew about the brush-grown pastures at the Río Colorado, while later they were found in larger numbers along the Río Liberia. November 3, I recorded one flock of 200, and Carlos Aguilar saw an even larger band near town one evening. Specimens were taken on October 20 and 28.

⁷ Check-list of birds of the world, vol. 3, 1937, p. 211.

⁸ U. S. Nat. Mus. Bull. 50, pt. 7, 1916, p. 203.

BROTOGERIS JUGULARIS JUGULARIS (P. L. S. Müller)

Psittacus jugularis P. L. S. MÜLLER, Natursystem, Suppl., 1776, p. 80 (Bonda, Santa Marta, Colombia).

At the Hacienda Santa María I found a pair of these parakeets at an old woodpecker hole in a dead palm and preserved the male. Others were seen here on November 7 and 13. The flight of these birds is swift and darting and resembles that of one of the fast-flying bats like *Tadarida*.

AMAZONA ALBIFRONS NANA W. DeW. Miller

Amazona albifrons nana W. DEWITT MILLER, Bull. Amer. Mus. Nat. Hist., vol. 21, 1905, p. 349 (Calotmul, Yucatán).

Near Liberia these parrots were so common that they were seen daily in morning and evening passage across the sky, and occasionally I found small flocks feeding in the forest. I identified them in flight by size and by the red in the wing, aided occasionally by a glimpse of the white forehead as they passed. At sunset on the evening of November 16 a flock of 200 flew over the town in scattered formation. Two were taken on October 24. A few were recorded in the open country below the house at the Hacienda Santa María on November 12 and 15.

In the two taken the wing in the male measures 158 mm., and in the female 156 mm.

AMAZONA OCHROCEPHALA AURO-PALLIATA (Lesson)

Psittacus (amazona) auro-palliatatus LESSON, Rev. Zool., ser. 2, vol. 4, May 1842, p. 135 (Realejo, Nicaragua).

Near Liberia these parrots were common, being seen most frequently in the morning and evening flights. Occasionally I found small flocks resting in the early morning sun or feeding in forest trees that were in fruit. A female was shot from the top of a tall guanacaste tree on October 30. They were common in captivity, being kept with wings clipped, sometimes on a perch, and sometimes in a small tree beside the door. Although they often called as their wild brethren flew screeching overhead they did not appear interested in them otherwise.

Family CUCULIDAE**PIAYA CAYANA STIRTONI van Rossem**

Piaya cayana stirtoni VAN ROSSEM, Trans. San Diego Soc. Nat. Hist., vol. 6, Sept. 30, 1930, p. 209 (Mount Cacagatique, El Salvador).

The squirrel-cuckoo was fairly common near Liberia along the Río Liberia and the Río Colorado. Specimens were preserved on October 26 and November 17.

The present species is most interesting in the variations that it exhibits in different sections of its vast range. On the Pacific slope of

Central America and México these birds are definitely paler in color than those on the Atlantic side, the eastern birds, *thermophila*, marked by darker hues both above and below, being fairly uniform from Tamaulipas south to Panamá. Those from the Pacific side, while always paler, are more variable, so that three forms are at present recognized, the palest being *extima* in southern Sonora and northern Sinaloa. Another race, *mexicana*, is found in western and southwestern México, while *stirtoni* is described from El Salvador. The only break on the west side seems to be in Guatemala where Griscom has recorded an extensive series from the Pacific slope as the darker-colored *thermophila*. The specimens from Liberia, while slightly darker than *stirtoni* from farther north, are to be identified as that race, which in this slightly intermediate type extends down through Pigres and San Mateo on the Pacific slope of Costa Rica to David and Boquete in northwestern Panamá, according to specimens in the U. S. National Museum. The latter localities mark a considerable extension of the previously reported range.

PIAYA CAYANA THERMOPHILA P. L. Sclater

Piaya thermophila P. L. SCLATER, Proc. Zool. Soc. London, 1859, p. 368 (Jalapa, Veracruz, México).

On the southern and southeastern slopes of Volcán Rincón de la Vieja squirrel-cuckoos were fairly common, specimens being taken on November 5 and 11. As the sun appeared after rain one morning I saw one preening its feathers in the very top of a tall dead tree at the edge of a clearing.

The two listed from the Hacienda Santa María, one taken above the house at the edge of the Pacific side of the divide, and the other two miles or more farther east near Los Cuadros at the head of the Atlantic drainage, are both distinctly darker than those obtained at Liberia and, while intermediate, belong definitely with *thermophila*, which is darker colored than *stirtoni*. This section therefore is on the line of union between these two races.

CROTOPHAGA SULCIROSTRIS SULCIROSTRIS Swainson

Crotophaga sulcirostris SWAINSON, Phil. Mag., new ser., vol. 1, 1827, p. 440 (Temascaltepec, México).

Near Liberia the groove-billed ani was common through pasturelands and fields where it was seen daily. I shot one for a specimen on November 3. At the airports in Santa Cruz and Tempisque as our plane came in to a landing I saw little flocks flying hastily to one side. The ordinary name for this species in Costa Rica is *tico*, in Guanacaste modified usually to *tinco*. More rarely I heard them called *zopilotillo*, from their habit of resting with wings spread in the sun like a little zopilote.

MOROCOCCYX ERYTHROPYGA ERYTHROPYGA (Lesson)

Coccyzus erythropyga LESSON, Rev. Zool., vol. 5, July 1842, p. 210 (San Carlos, Centre Amérique=La Unión, El Salvador).⁹

Near Liberia these curious cuckoos were fairly common in the dense growth of old fields and the thickets adjacent, though only by chance did I come across them. Specimens were taken on October 22 and 28. I found them on the ground, either in grass or in partly overgrown paths, but seldom saw them in the dense cover until they flushed. Sometimes they flew rapidly and expertly for 70 or 80 yards before dropping down again into cover, but more often they alighted in the edge of a thicket under shelter to remain quiet until finally they dropped down and disappeared. I had the feeling that I overlooked many of them near at hand in the dense cover. On the Hacienda Santa María I saw them at the borders of the pastures at about 1,800 feet, and also near Las Delicias. A male had the soft parts colored as follows: Mandible and lower half of maxilla honey yellow; upper half of maxilla down to nostril dusky neutral gray; edge of eyelids and space in front of eye light yellow; line immediately behind gape and extensive bare area behind and above eye clear, light blue; tarsus and toes light reddish brown; claws fuscous; iris dull brown.

Family TYTONIDAE

TYTO ALBA GUATEMALAE (Ridgway)

Strix flammea var. *Guatemalae* RIDGWAY, Bull. Essex Inst., vol. 5, 1873, p. 200 (Chinandega, Nicaragua).

During my stay in Liberia I heard or saw barn owls nearly every evening around the church or in the plaza in front of it. On October 30 and subsequently the chatter of young came from some concealment in the church walls. One or two birds that I saw flying in early evening appeared quite dark colored on the breast.

Family STRIGIDAE

OTUS COOPERI (Ridgway)

Scops cooperi RIDGWAY, Proc. U. S. Nat. Mus., vol. 1, Aug. 15, 1878, p. 116 (Santa Ana, Costa Rica).

At the Hacienda Santa María on November 12 I shot a male of this screech owl that flushed from a tangle of vines in a small grove at an elevation of 1,800 feet.

The bristle-grown toes mark this species from its relatives.

⁹See van Rossem, Publ. Field Mus. Nat. Hist., zool. ser., vol. 23, 1938, pp. 19, 218.

Family CAPRIMULGIDAE

NYCTIDROMUS ALBICOLLIS INTERCEDENS Griscom

Nyctidromus albicollis intercedens GRISCOM, Amer. Mus. Nov., No. 379, Oct. 17, 1929, p. 8 (Tela, Honduras).

Four cuiejos were taken near Liberia on October 22 and 30 and November 1 and 2. Peters¹⁰ has placed *intercedens* as a synonym of typical *albicollis*, but after examination of a good series I feel that it is distinct, with a range from southern Chiapas (Finca Esperanza) to Panamá and northern Colombia. In examining *Nyctidromus* it is necessary always to recall that there are two color phases, one rufescent and the other grayish. With this borne in mind those birds that I have distinguished as *intercedens* while agreeing with *albicollis* in size are definitely lighter in color. They are darker and slightly smaller than *yucatanensis*.

The cuiejo was common in woodlands near Liberia as well as in the groves that filled hollows in the pasture lands below the house at Hacienda Santa María. I saw them regularly and no doubt they were more abundant than my observations indicated. According to country superstition the bill and bones dried and finely ground and put in any fluid that is drunk make a potent love charm.

CHORDEILES ACUTIPENNIS TEXENSIS Lawrence: Texas Nighthawk

Chordeiles texensis LAWRENCE, Ann. Lyc. Nat. Hist. New York, vol. 6, Dec. 1857, p. 167 (Ringgold Barracks near Rio Grande City, Tex.).

Half a dozen of these nighthawks circled over the church and the adjacent park on the evening of October 22, and I noted the birds regularly here until my departure. Their numbers varied somewhat and at times hundreds were present. The town people knew them by the name of *gavilán*.

Occasionally I saw one during the day in the country resting along a tree limb, and I shot two females in such situations on October 24 and November 18. With a wing measurement of 175 mm. both of these birds belong evidently with the northern, migrant race. The Central American nighthawk, *C. a. micromeris*, which is distinguished by smaller size, was undoubtedly present, as I observed occasional birds that appeared smaller than the others, but I obtained no specimens.

Family TROCHILIDAE

ARCHILOCHUS COLUBRIS (Linnaeus): Ruby-throated Hummingbird

Trochilus Colubris LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 120 (South Carolina).

The rubythroat was common about flowers in an area where thickets and woodland were intermingled with pastures to the south

¹⁰ Check-list of birds of the world, vol. 4, 1940, p. 193.

of Liberia. I shot two here on October 27 and two more on October 31. Three of these are young males with a few metallic red feathers appearing on the throat.

FLORISUGA MELLIVORA MELLIVORA (Linnaeus)

Trochilus mellivorus LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 121 (Guiana).

On October 26 near Liberia I secured a male of this hummingbird, not quite adult, from a shaded perch along a roadway at the border of a bush-grown field.

CHLOROSTILBON CANIVETHI SALVINI (Cabanis and Heine)

Chlorolampis Salvini CABANIS and HEINE, *Museum Heineanum*, pt. 3, 1860, p. 48 (Costa Rica).

Near Liberia I secured specimens of this hummer on October 21, 22, and 31 at the edge of heavy woodland. They were quick, alert, and difficult to shoot. On the Hacienda Santa María I found them occasionally in the coffee plantation near the house, or in the groves of gallery forest below, taking a male November 13. A female taken on October 21 was laying.

While I have followed current usage in listing *salvini* as a race of *canivethi* it appears to me that the shorter-tailed forms, including *salvini*, may be specifically distinct from the more northern ones, *canivethi*, *auriceps*, and *forficatus*, the latter having decidedly longer, more deeply forked tails, with the elongated feathers appearing narrower.

ANTHRACOTHORAX PREVOSTII GRACILIROSTRIS Ridgway

Anthracothorax prevosti gracilirostris RIDGWAY, *Proc. Biol. Soc. Washington*, vol. 23, Apr. 19, 1910, p. 55 (Bolsón, Costa Rica).

The only slender-billed mango seen was a female shot on October 30, 1940, at the edge of heavy woodland near Liberia.

AMAZILIA RUTILA RUTILA (Delattre)

Ornismya rutila DELATTRE, *Echo du Monde Savant*, ser. 2, vol. 7, No. 45, June 15, 1843, col. 1069 (Acapulco, Guerrero, México).

The cinnamon hummingbird was fairly common near Liberia through groves adjoining cultivated fields. Two males taken on October 28 are decidedly greener above than any others in the National Museum collection, owing apparently to fresher plumage.

HYLOCHARIS ELICIAE (Bourcier and Mulsant)

Trochilus eliciae BOURCIER and MULSANT, *Ann. Sci. Phys. Nat. Lyon*, vol. 9, 1846, p. 314 (type locality not known).

Near Liberia Elicia's golden-tailed hummingbird was more common than other hummers at this season. Those taken include a female

from the Río Colorado, October 20, and three males nearer the town on October 22 and 26. They were found in shaded places where the ground was open and water not far distant. Many sections of woodland along the Río Liberia were favorable to them, and I found them also along the steep-walled quebradas inland. At the Río Colorado there was one place that was especially favored, a deep, wide quebrada with sandy floor where the trees met overhead and there were pools of water along the channel. While resting in this cool, pleasant place I was sure to hear the low humming made by the wings of this bird, but in the obscure light it was difficult sometimes to see them on the dead twigs on which they perched. The pinkish base of the bill was the most prominent marking in life.

ANTHOSCENUS CONSTANTII CONSTANTII (Delattre)

Ornismya Constantii DELATTRE, Echo du Monde Savant, ser. 2, vol. 7, No. 45, June 15, 1843, col. 1069 (Bolsón, Costa Rica).

In small numbers these hummingbirds were found at the borders of heavy woodland or along brush-lined roadways near Liberia. I collected males on October 28 and 30.

Griscom¹¹ reports that the type of *constantii*, now in the American Museum of Natural History, while marked "Guatemala" is typical in color of the bird found in Costa Rica. As the bird of Guatemala is the paler race *A. c. leocadiae*, he proposes Bolsón, Costa Rica, as the type locality for *constantii*.

Family TROGONIDAE

TROGON ELEGANS AUSTRALIS Griscom

Trogon elegans australis GRISCOM, Proc. New England Zool. Club, vol. 12, Apr. 3, 1930, p. 3 (Bagaces, Guanacaste, Costa Rica).

The two trogons of this race taken were secured near Liberia on November 1 and 2. They were found in heavy woods and were especially common along the Río Colorado.

TROGON MELANOCEPHALUS ILLAETABILIS Bangs

Trogon melanocephalus illaetabilis BANGS, Proc. Biol. Soc. Washington, vol. 22, Mar. 10, 1909, p. 30 (Bolsón, Costa Rica).

The slaty-headed trogon, taken on October 27 and 29, was a common species near Liberia, being found in groves scattered through pastures, as well as in heavy woodland. The loud call, beginning as a cooing note, and at the end becoming so rapid that it terminates in

¹¹ Bull. Amer. Mus. Nat. Hist., vol. 64, 1932, pp. 210-211.

a rattle, is like that of the northern subspecies which I have heard in Mexico. The birds were alert and active, especially when I encountered them in more open localities. The trogons are known here as *viuda*.

Family ALCEDINIDAE

CHLOROCERYLE AMAZONA MEXICANA Brodkorb

Chloroceryle amazona mexicana BRODKORB, Auk, 1940, p. 543 (Barra de Cahuacán, Chiapas).

Near Liberia these kingfishers were seen in small numbers along the Río Liberia and Río Colorado, and once one was observed at a temporary pool of water formed by recent rains. A female was taken on October 22. This specimen has the white mark in front of the eye indistinct, and a wing measurement of 135 mm. On comparing a fair series found in the National Museum I find that the characters pointed out by Brodkorb in describing this race, while slight, seem to hold, except that the tail measurement in birds from South America and in those from México and Central America is about the same. The development of the white streak in front of the eye is highly variable but has its maximum extent in South American birds. It may, however, be absent in specimens from that area. Following are measurements from our series:

C. a. amazona:

Males (10 specimens), wing 122–132, tail 69.7–79.6.

Females (13 specimens), wing 125–137, tail 72.5–82.3.

C. a. mexicana:

Males (11 specimens), wing 129–140, tail 70.8–77.6.

Females (12 specimens), wing 132–142, tail 74.4–78.8.

It will be noted that though the smallest birds come from South America there is a definite overlap. Birds from Colombia are intermediate but seem to me closer to true *amazona*, which apparently should cover all specimens north to Panamá.

CHLOROCERYLE AMERICANA ISTHMICA (Goldman)

Ceryle americana isthmica GOLDMAN, Smithsonian Misc. Coll., vol. 56, No. 27, Dec. 1, 1911, p. 1 (Río Indio, near Gatun, Canal Zone).

Two females of the green kingfisher were taken near Liberia, one over a sluggish channel near the Río Colorado November 1, and one along the Río Liberia November 3.

These birds, with wing measurements of 80.3 and 81.6 mm., belong with the Panamanian race, being marked by a reduction of the white markings on the wings.

CHLOROCERYLE AENEA STICTOPTERA (Ridgway)

Ceryle superciliosa stictoptera RIDGWAY, Proc. Biol. Soc. Washington, vol. 2, Apr. 10, 1884, p. 95 (Sisal, Yucatán).

The only one seen, a female, was taken near the Río Colorado, November 1. This mite of a kingfisher rested on a twig over a forest pool along a small, sluggish stream, jerking its tail with all the mannerisms of its larger relations.

This specimen agrees with birds from México in having the white markings on the secondaries extensive, and it is to be placed with the northern race. It is interesting to record this fact since two in the National Museum taken at Bebedero, near the mouth of the Río Tempisque, by Alfaro on January 23 and by Underwood on February 20 in 1890, have these light markings on the wing so reduced that they are to be identified with the typical race *aenea*. Both forms then are found in western Costa Rica, the dividing line between them being somewhere between the Río Colorado north of Liberia and the lower section of the Tempisque.

Family MOMOTIDAE

MOMOTUS LESSONII LESSONII Lesson

Momotus Lessonii LESSON, Rev. Zool., vol. 5, June 1842, p. 174 (Realejo, Nicaragua).

A male of this motmot was shot on November 14 in the coffee plantation back of the house at the Hacienda Santa María. It rested on a branch with the tail swinging, pendulumlike, from side to side. No others were recorded, but it is supposed that the birds were found regularly in the forested region to the east and northeast.

EUMOMOTA SUPERCILIOSA AUSTRALIS Bangs

Eumomota superciliaris australis BANGS, Proc. Biol. Soc. Washington, vol. 19, July 30, 1906, p. 104 (Bebedero, Guanacaste, Costa Rica).

Near Liberia these motmots were common in the open woodlands bordering the river, in trees along the dry quebradas inland, and in groves and thickets spread through the pastures south of town, all these being areas in which earthen banks provided places for nest holes. The note, a low *hoo-hoot*, in tone is lower and softer than the call of the larger *Momotus lessonii lessonii*. Skins were prepared on October 21, 27, and 30 and November 18.

This form evidently extends into southern Nicaragua, as there is a specimen in the National Museum from Sucuyá, near Rivas, collected by Nutting. Birds from farther north (Managua and Chinandega) belong to *E. s. apiastur*.

HYLOMANES MOMOTULA OBSCURUS Nelson

Hylomanes momotula obscurus NELSON, Smithsonian Misc. Coll., vol. 56, No. 22, Sept. 7, 1911, p. 1 (Cerro Brujo, Canal Zone).

Two males of this motmot were taken in heavy forest on the slopes of Cerro Santa María. On November 10 at 900 meters elevation one rested on a low perch among bushes 3 or 4 feet above the forest floor where arching trees made a heavy canopy overhead though the space below was open. As the bird turned its head, in spite of the dim light, I noted a distinct flash of color from the blue superciliary stripe and the light mark below the eye. On November 11, in a similar situation at a lower elevation above the section known as Los Cuadros, I secured another from a perch 6 feet from the ground.

After examination of a small series of these birds the only character that I discern to distinguish a southern form is that, when laid out in geographic order, birds from northwestern Costa Rica and Panamá have the abdomen duller, while in those from Honduras northward into southeastern México this area is definitely whitish.

Family RAMPHASTIDAE

AULACORHYNCHUS CAERULEOGULARIS (Gould)

Aulacorhamphus caeruleogularis GOULD, Zoologist, Apr. 1853, p. 3861 (Veragua, Panamá).

Two of these toucanets were seen November 14 near the Hacienda Santa María, one near the house and the other at 800 meters elevation in the forest above.

PTEROGLOSSUS TORQUATUS TORQUATUS (Gmelin)

Ramphastos torquatus GMELIN, Systema naturae, vol. 1, pt. 1, 1788, p. 354 (Central America).

Near Liberia I shot one of two seen on October 22. Above the Hacienda Santa María on November 10, as a flock of macaws passing overhead threw a shadow over the forest, one of these toucans came down precipitately through the branches to hide beneath limbs near at hand where I secured it. Apparently some predatory hawk was about. This species is known here as the *feliz*.

RAMPHASTOS SULFURATUS BREVICARINATUS Gould

Ramphastos brevicarinatus GOULD, A monograph of the Ramphastidae, ed. 2, 1854, pl. 3 and text (Panamá).

Though by chance I took no specimens, these toucans were common on the Hacienda Santa María. On November 9, when rain had fallen during the night on the mountain and continued during the forenoon, I saw two flocks, each of 15 or more birds, that had come down out of the clouds that enveloped the mountain to feed on berries at the

borders of the thickets scattered through the rolling pasturelands below the forest. It was highly amusing to watch them hopping awkwardly around, as we passed only 40 or 50 feet away. On November 11 after another rain I saw two flocks perched in the open in small groves in the pastures.

Family PICIDAE

PHLOEOCEASTES GUATEMALENSIS GUATEMALENSIS (Hartlaub)

Picus guatemalensis HARTLAUB, Rev. Zool., vol. 7, 1844, p. 214 (Guatemala).

On October 24 I shot a pair from dead trees in a new clearing in the forest along the river above Liberia. October 30 I watched another pair working at a nest hole 40 feet from the ground in a dead tree standing in a bushy pasture. The female was inside working, while the male clambered up and down the trunk occasionally looking in at her. On November 7 I recorded one below the house at the Hacienda Santa María in a wooded ravine leading through the pastures.

Recently Dickey and van Rossem¹² have stated that the ivory-billed woodpeckers of this group from Costa Rica and Panamá are separable from typical *guatemalensis* by a yellowish or buffy suffusion on the ventral surface. After comparison of a good series from Costa Rica, including the two fresh specimens that I secured at Liberia, with an equally good lot from Guatemala and Honduras, I find that the alleged difference does not hold, birds being whitish or yellowish in cast without regard to their occurrence in the geographic regions stipulated. I believe that the supposed variation may be due in part to adventitious stain, and so it would occur at random.

CEOPHLOEUS LINEATUS SIMILIS (Lesson)

Picus similis LESSON, Oeuvres complètes de Buffon, vol. 20, Apr. 1847, p. 204 (San Carlos, El Salvador).

Above the town of Liberia I shot a male of this species on October 25 in the same forest clearing where I had taken *Phloeoceastes guatemalensis guatemalensis* on the previous day. So similar are these two woodpeckers that, in fact, I killed this bird by a snap shot under the impression that it was *Phloeoceastes*, not realizing its true identity until it was in the hand. On October 27 I saw a pair working over fence posts and small trees in a region of partly wooded pastures south of town. They were alert but tame, jerking the head constantly and throwing the crest erect, and occasionally giving a rattling call faintly suggestive of the note of the pileated woodpecker of the United States. The following day I noted a pair in dead trees scattered through cultivated fields. These birds are much easier to skin than *Phloeoceastes*.

¹² Publ. Field Mus. Nat. Hist., zool. ser., vol. 23, 1938, p. 320.

I have followed present usage in calling this specimen *similis* but feel that the species is one in need of revision when more material becomes available.

CENTURUS HOFFMANNII Cabanis

Centurus Hoffmannii CABANIS, Journ. für Orn., 1862, p. 322 (Costa Rica).

Near Liberia Hoffmann's woodpecker was a common species through regions of groves in fields and pastures and was observed daily. In fact, the first bird that I obtained as a specimen on the expedition was of this species when, with Dr. Juvenal Valerio Rodríguez, Director of the Museo Nacional, I shot one at the Río Liberia near town on October 19. Others were taken here on October 21 and 22. At the Hacienda Santa María a few were found near the house in the coffee plantation and in the trees of the pastures nearby. Two were taken on November 10 and 14. I saw them feeding on the juice of ripe oranges and sometimes noted that one bird claimed as feeding territory one or two orange trees, attempting to keep others away.

This woodpecker in color and markings is closely similar to *Centurus aurifrons aurifrons* and the related *C. a. polygrammus* and *C. a. frontalis* but differs from these in relative proportion of tail to wing, the tail being appreciably shorter. While evidently of the same group, *hoffmannii* on this basis is to be regarded as specifically distinct. It may be noted also that it is smaller, the wing measurement in the largest *hoffmannii* being slightly shorter than in the smallest of the *aurifrons* group that I have examined. I believe that *hoffmannii* and those races of *aurifrons* that are generally similar in bold color pattern of the dorsal surface, and otherwise resemble one another in coloration, are near the primitive stock from which these woodpeckers have come.

Family DENDROCOLAPTIDAE

DENDROCINCLA HOMOCHROA ACEDESTA Oberholser

Dendrocinclá homochroa acedesta OBERHOLSER, Proc. Acad. Nat. Sci. Philadelphia, Apr. 1904, p. 462 (Chiriquí, Panamá).

Four of these woodhewers were taken near the Hacienda Santa María November 10 and 12 as they climbed over tree trunks near the ground in company with a little band of other birds that were gathered over a moving line of ants. They were quiet and were found only by careful watching, though their ochre-brown color caught the eye as they moved behind branches. On the back of the neck the feathering is interrupted by a distinct apterium that leaves much of this area bare. The head is large, while the slender neck has the skin closely applied, so that in preparing them as specimens I had to split the skin over the back of the head to pull through the skull.

SITTASOMUS GRISEICAPILLUS SYLVIOIDES Lafresnaye

Sittasomus sylvioides LAFRESNAYE, Rev. Mag. Zool., 1850, p. 590 (State of Veracruz, México).

A male taken on November 8 in heavy forest at Los Cuadros on the Hacienda Santa María was the only *Sittasomus* seen.

This bird and all others in the National Museum from Tenorio and Bolsón in Guanacaste all are slightly paler than examples from Guatemala and México, apparently showing intergradation toward race *levis* of western Panamá.

XIPHORHYNCHUS FLAVIGASTER EBURNEIROSTRIS (Des Murs)

Dryocopus eburneirostris DES MURS, Iconographie ornithologique, livr. 9, July 1847, pl. 52, with text (Realejo, Nicaragua).

The only one of these woodhewers seen was a female taken on November 8 in heavy forest near the Hacienda Santa María. This bird is very dark in tone, but is matched by occasional specimens from México. It measures as follows: Wing 103.8, tail 78.7, culmen from base 38.4, tarsus 24.2 mm., being thus decidedly smaller than *X. f. ultimus* Bangs and Griscom¹³ from the southern end of the Nicoya Peninsula.

XIPHORHYNCHUS TRIANGULARIS PUNCTIGULUS (Ridgway)

Dendroornis punctigula RIDGWAY, Proc. U. S. Nat. Mus., vol. 11, Sept. 20, 1889, p. 544 (Naranjo, Costa Rica).

These woodhewers were found in the heavy forest of the Hacienda Santa María from the old plantation at Los Cuadros to the summit of Cerro Santa María. Usually they were in company with little groups of other forest-loving birds. They were quiet in habits and no doubt were often overlooked as they climbed over the tree trunks. Four specimens were taken on November 5, 6, and 14.

The National Museum has a considerable series of *punctigulus* from various localities. The four from the slopes of Rincón de la Vieja appear distinctly more yellowish green both above and below, with the spots on the under surface yellower when compared with specimens that we have had for years. I am inclined to believe that this difference may be due to post-mortem fading in the older specimens, since a series taken at La Vijagua in 1908 by C. F. Underwood resembles the other older birds, though this locality is not far to the south from where I collected in 1940.

DENDROCOLAPTES CERTHIA SANCTI-THOMAE (Lafresnaye)

Dendrocops Sancti-Thomae LAFRESNAYE, Rev. Mag. Zool., 1852, p. 466 (Santo Tomás, near Omoa, Honduras).

Near Liberia in a tract of heavy forest on low ground on October 30

¹³ *Xiphorhynchus flavigaster ultimus* Bangs and Griscom, Proc. New England Zool. Club, vol. 13, Nov. 7, 1932, p. 48 (Ojo Ancho, Nicoya, Costa Rica).

I secured three of these woodhewers. Attention was drawn to them by their chattering calls as they clambered over the tree trunks. On the Hacienda Santa María I secured three more on November 6, 8, and 9, also in stands of heavy forest. One was accompanying a flock of other forest birds.

These six specimens have heavy black bars below and are strongly marked, showing no approach to *D. c. hesperius* Bangs of southwestern Costa Rica, in which the barrings are slightly narrower, and are duller black. There are specimens of *hesperius* in the National Museum from Pigres, Paso Real, and Pozo del Río Grande.

Family FURNARIIDAE

XENOPS MINUTUS RIDGWAYI Hartert and Goodson

Xenops genibarbis ridgwayi HARTERT and GOODSON, Nov. Zool., vol. 24, Aug. 31, 1917, p. 417 (Tocoumé, Panamá).

The two taken were shot in the forest near the Hacienda Santa María on November 6 and 8 as they climbed over masses of vines, a common habit with these ovenbirds. Always the light malar streak is a prominent mark that catches the eye.

There is one skin in the National Museum taken by Juan Cooper in May 1874, in Talamanca, that has the tail definitely longer than any other that I have seen. The wing also is long and the feet appear large, suggesting that there may be a local race of limited range in that area. Measurements of this bird (U. S. N. M. No. 68292) are as follows: Wing 67, tail 53.2, culmen from base 14.2, tarsus 15.1 mm.

SCLERURUS ALBIGULARIS CANIGULARIS Ridgway

Sclerurus canigularis RIDGWAY, Proc. U. S. Nat. Mus., vol. 11, Sept. 20, 1889, p. 542 (Turrialba, Costa Rica).

On November 14 I shot a male of this ovenbird near the summit of the mountain above the Hacienda Santa María. The bird, dark in color and heavy in body, decoyed in dense undergrowth in heavy forest.

Family FORMICARIIDAE

PHAENOSTICTUS MCLEANNANI SATURATUS (Richmond)

Phlegopsis saturatus RICHMOND, Proc. U. S. Nat. Mus., vol. 18, Aug. 12, 1896, p. 625 (Río Escondido, 50 miles from Bluefields, Nicaragua).

Near the old plantations at Los Cuadros on the Hacienda Santa María these antbirds were fairly common but were so shy that I secured only two males with some difficulty on November 8 and 9. They frequented dense undergrowth in heavy forest, and as I approached slipped quietly away ahead of me. The call is a clear

whistle of varied tone, an erratic scale that is easily mimicked. They replied to my imitation time after time, and occasionally flew up from the ground to cling for an instant to some low branch, offering the only opportunity for a shot. In the obscure light of their jungle haunt, they appeared uniformly dark in color, so that in the hand it was a pleasant surprise to see the variegated pattern of the plumage and the brilliant blue of the bare skin of the side of the head. This was one of the strangest of the interesting inhabitants of this grand forest.

HYLOPHYLAX NAEVIODES CAPNITIS (Bangs)

Hypocnemis naevioides capnitis BANGS, Proc. Biol. Soc. Washington, vol. 19, July 30, 1906, p. 107 (Volcán Miravalles, Costa Rica).

On the slopes of Volcán Rincón de la Vieja this was one of the commonest of the birds that gathered over the moving ant armies in the forests. It was found from Los Cuadros to the summit of Cerro Santa María, usually in little parties. On my first encounter the chattering, insistent note with which this antbird greets intruders was a mystery for several minutes, as it was difficult to decide whether it came from the tree tops or from the undergrowth, until finally I caught sight of the bird near the ground. Ordinarily they worked along a foot or so above the ant columns, moving actively and uttering their chattering calls. Specimens were secured on November 5, 8, 9, and 11.

MYRMOTHERULA SCHISTICOLOR SCHISTICOLOR (Lawrence)

Formicivora schisticolor LAWRENCE, Ann. Lyc. Nat. Hist. New York, vol. 8, 1865, p. 173 (Turrialba, Costa Rica).

The only one of these antbirds seen was shot on November 8 in undergrowth at the edge of an old clearing at Los Cuadros on the Hacienda Santa María.

DYSITHAMNUS MENTALIS SEPTENTRIONALIS Ridgway

Dysithamnus mentalis septentrionalis RIDGWAY, Proc. Biol. Soc. Washington, vol. 21, Oct. 20, 1908, p. 193 (Choctum, Vera Paz, Guatemala).

In the heavy forest on the Hacienda Santa María these small birds were fairly common. In spite of their stocky little bodies they are active in movement through the undergrowth and the lower tree tops. They formed a regular part of the little groups of forest birds that moved in scattered parties in company through the trees, like migrant warblers in fall in the North. Though active they were often shy. On November 5 I encountered several groups on the high shoulder of the mountain back of the hacienda in the section known as Papal and

collected two. Another was shot on November 6 at Los Cuadros, and on November 14 I secured another at the summit of the mountain.

The three specimens preserved as skins, a male and two females, are in fresh plumage and are decidedly yellower than the rest of our series, the male agreeing with Ridgway's statement on the immature male in having the abdomen distinctly yellow.

DYSITHAMNUS STRIATICEPS Lawrence

Dysithamnus striaticeps LAWRENCE, Ann. Lyc. Nat. Hist. New York, vol. 8, May 1865, p. 130 (Angostura, Costa Rica).

My only specimen of this stocky, heavy-bodied little antbird was taken in low forest trees on the Hacienda Santa María on November 8. This was at Los Cuadros, which lies on the divide between the Pacific and the Caribbean slopes.

Family COTINGIDAE

ATTLA SPADICEUS CITREOPYGUS (Bonaparte)

Dasycephala citreopyga BONAPARTE, Compt. Rend. Acad. Sci. Paris, vol. 38, 1854, p. 657 (Nicaragua).

On November 8 near the Hacienda Santa María I shot one of these chatters from a high tree top in heavy forest. The bird was moving among the branches like a tanager.

TITYRA SEMIFASCIATA PERSONATA Jardine and Selby

Tityra personata JARDINE and SELBY, Illustrations of ornithology, vol. 1, pt. 2, June 1827, pl. 24 (Real del Monte, Hidalgo).

On October 26 I shot a pair of these birds at the edge of the line of forest bordering the river below Liberia and on October 30 noted another in heavy woodland farther west. They were uncommon at this season.

It has been unexpected to find that the two specimens are representative of the northern subspecies, which has not been reported previously from Costa Rica. The male bird, with a wing 125.2 mm. in length, is darker gray above than *costaricensis*, found elsewhere in the Republic, agreeing with specimens from southeastern México. The female (with wing in molt so that it may not be measured) likewise agrees with skins from Veracruz, being paler than *costaricensis*. Specimens from farther south at Pigrés are true *costaricensis*. The connection between *personata* of Guanacaste and of El Salvador and central and northern Honduras may be restricted to a narrow band along the Pacific coast, as skins from Managua, Nicaragua, are *costaricensis* and specimens from Ometepe Island in Lake Nicaragua while somewhat intermediate are nearer *costaricensis*.

Family PIPRIDAE

CORAPIPO LEUCORRHOA ALTERA Hellmayr

Corapipo leucorrhoea altera HELLMAYR, Bull. Brit. Orn. Club, vol. 16, May 8, 1906, p. 84 (Carrillo, Costa Rica).

The only one of these manakins seen was a female shot in the undergrowth in the heavy forest at Los Cuadros on November 6. This resembles a series from eastern Costa Rica.

CHIROXIPHIA LINEARIS FASTUOSA (Lesson)

Pipra fastuosa LESSON, Rev. Zool., vol. 5, June 1842, p. 174 (Realejo, Nicaragua).

The long-tailed manakin, called *toledo* in imitation of its musical note, was common from the region below Liberia to the jungles at 2,000 feet elevation on the Hacienda Santa María. In the lowlands they were found in brushy pastures, or in the woodlands along the streams, where they kept under cover but mewed and whistled so constantly that it was not difficult to follow them, though they were very hard to see. They were often in the dense top foliage of small trees 15 or 20 feet from the ground. Near Liberia the males had molted the long tail feathers, while higher these feathers were partly grown. The five secured were taken at Liberia on October 20 and 23 and November 1 and on the Hacienda Santa María on November 7.

Family TYRANNIDAE

MUSCIVORA FORFICATA (Gmelin): Scissor-tailed Flycatcher

Muscivora forficata GMELIN, Systema naturae, vol. 1, pt. 2, 1789, p. 931 (México).

The first one of these flycatchers was recorded at Liberia on October 24, and several were seen two days later. On October 28 many were recorded amid dead stubs standing in cultivated fields, and along the roads, and two were taken. Apparently they were then arriving in southward migration. On October 30 they were common, and on November 1 I shot another near the Río Colorado. On November 3 another wave of migrants arrived. On November 6 I saw several in the open pastures at the Hacienda Santa María. Near Liberia they were fairly common on November 17 toward the Río Colorado, and on November 18 at sunrise a band of 40 or 50 came flying out past me from the town, and many were seen in the country.

TYRANNUS MELANCHOLICUS CHLORONOTUS Berlepsch

Tyrannus chloronotus BERLEPSCH, Ornith., vol. 14, 1907, p. 474 (Temax, Yucatán).

This kingbird is one of the common birds of open country, ranging inland into the pastures below the house at Hacienda Santa María, where I secured birds on November 8 and 11. Specimens were taken near Liberia on October 24, 27, and 31 and November 2 and 18.

MYIODYNASTES MACULATUS DIFFICILIS Zimmer

Myiodynastes maculatus difficilis ZIMMER, Amer. Mus. Nov., No. 963, Nov. 18, 1937, p. 9 (Bebedero, Costa Rica).

On October 30 I shot a female of this flycatcher at the border of a heavy stand of forest below Liberia. This form has a wider range in Costa Rica than is generally understood, since we have one specimen taken by José Zeledón at Bonilla, April 5, 1905, and another secured by Anastasio Alfaro at Alajuela, April 21, 1889.

MEGARYNCHUS PITANGUA MEXICANUS (Lafresnaye)

Saurophagus mexicanus LAFRESNAYE, Rev. Mag. Zool., 1851, p. 473 (México).

These interesting flycatchers were common in open woodland along the Río Liberia and the Río Colorado, where I secured specimens on October 28 and November 1 and 3. At the Hacienda Santa María I recorded a pair in the coffee plantation near the house on November 14 and collected the female. In life the similarity of this species to the Derby flycatcher is so striking that the two may be confused. The resemblance is mainly in size and color pattern as the notes are quite distinct. *Megarynchus* has a curious rattling call given in a higher tone than the notes of the other species. It is also more liable to be found in forest than the other.

Skins from the southern part of the range in Costa Rica and from Nicaragua appear somewhat deeper and richer colored than specimens from México.

MYIOZETETES SIMILIS TEXENSIS (Giraud)

Muscicapa texensis GIRAUD, A description of sixteen new species of North American birds, 1841 (p. 57), pl. 1 ("Texas").

At the Hacienda Santa María these flycatchers came in pairs into trees about the house, where I took specimens on November 9 and 14. They fed at the ripe oranges opened by orioles and woodpeckers. I heard them utter an explosive chattering song of harsh notes.

The three specimens secured are like those from farther north in Central America.

PITANGUS SULPHURATUS GUATIMALENSIS (Lafresnaye)

Saurophagus Guatimalensis LAFRESNAYE, Rev. Mag. Zool., 1852, p. 462 (Guatemala).

Near Liberia where these flycatchers were common I secured specimens on October 27 and November 17. They were seen regularly in the town, and it was my impression that some came in each night to roost in the great fig trees of the park, for at sunrise I frequently found a dozen or more calling there. At the Hacienda Santa María they were scattered through the open pastures below the house.

The two Guanacaste specimens while dark, as is typical of *guatemalensis*, are slightly grayer, less brownish above than the average from eastern Costa Rica, Nicaragua, and Honduras.

MYIARCHUS CRINITUS CRINITUS (Linnaeus): Southern Crested Flycatcher

Turdus crinitus LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 170 (South Carolina).

Three of the crested flycatchers taken at Liberia are representative of the southern form, with larger bill and darker dorsal coloration. On October 23 I shot one from an open tree at the edge of a pasture near the Río Colorado. On October 26 and November 2 others were obtained near Liberia in bushy fields and at the border of woodland.

MYIARCHUS CRINITUS BOREUS Bangs: Northern Crested Flycatcher

Myiarchus crinitus boreus BANGS, *Auk*, Apr. 1898, p. 179 (Scituate, Mass.).

On November 3 I secured a male in woods along the Río Liberia below Liberia. Apparently this race comes regularly to Guanacaste, as we have another taken by Underwood at Bebedero on February 12, 1890.

MYIARCHUS NUTTINGI NUTTINGI Ridgway

Myiarchus nuttingi RIDGWAY, *Proc. U. S. Nat. Mus.*, vol. 5, Sept. 16, 1882, p. 394 (La Palma de Nicoya, Costa Rica).

Near Liberia I secured specimens of Nutting's flycatcher on October 28, 29, and 31 and November 2, finding them in brushy areas. They seemed to be common and were quite noisy. In life they appeared identical in most instances with *Myiarchus tyrannulus brachyurus*, which ranged with them, and in the short space of time of my field work I was never certain of them until I had them in the hand, though with greater familiarity it is probable that the two could be distinguished in life in most instances. The smaller bulk of the present bird, with the wing measuring under 90 mm., serves to distinguish it, as does the decidedly smaller bill when compared with *brachyurus*.

MYIARCHUS TYRANNULUS BRACHYURUS Ridgway

Myiarchus brachyurus RIDGWAY, *Manual of North American birds*, Sept. 1887, p. 334 (Ometepe, Nicaragua).

Near Liberia these flycatchers were common, and between October 23 and November 17 I secured nine specimens. On November 9 I shot one in the coffee plantation near the house at Hacienda Santa María. They were found in open woods and in the brushy borders of heavy forest and were active and noisy.

Van Rossem¹⁴ has found intergradation between this form and *Myiarchus tyrannulus nelsoni* in El Salvador, which affords satisfactory allocation of a bird whose previous status has been a little uncertain. He records it as confined to mangrove swamps in the

¹⁴ *Publ. Field Mus. Nat. Hist.*, zool. ser., vol. 23, 1938, pp. 367-368.

breeding season in El Salvador, which will be an interesting point to check in studies in Guanacaste.

MYIARCHUS TUBERCULIFER NIGRICAPILLUS Cabanis

Myiarchus nigricapillus CABANIS, Journ. für Orn., 1861, p. 250 (Bonilla, Costa Rica).

At the Hacienda Santa María I shot three males of this flycatcher on November 5, 10, and 14. The birds were found scattered singly through the coffee plantation immediately back of the house and at the edge of the forest. The call is a whistled *whee* sometimes slightly trilled.

The three taken are clearly representative of the dark-headed *nigricapillus*, which ranges through eastern and central Costa Rica, here entering the edge of Guanacaste through the influence of the heavy forest on the slopes of Volcán Rincón de la Vieja.

EMPIDONAX FLAVIVENTRIS (W. M. Baird and S. F. Baird): Yellow-bellied Flycatcher

Tyrannula flaviventris W. M. BAIRD and S. F. BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 1, Sept. 18, 1843, p. 283 (Carlisle, Pa.).

Near the Río Colorado, northwest of Liberia, I secured two on October 20. One of these is in molt on the body and is decidedly brighter yellow than the other.

MYIOCHANES VIRENS (Linnaeus): Eastern Wood Pewee

Muscicapa virens LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 327 (South Carolina).

On October 20 near Liberia, I shot one in an open-limbed tree growing at the edge of a pasture. The bird was eating a yellow butterfly.

MYIOCHANES RICHARDSONII RICHARDSONII (Swainson): Western Wood Pewee

Tyrannula richardsonii SWAINSON, Fauna Boreali-Americana, vol. 2, 1831 (1832), p. 146, pl. 46, lower fig. (Cumberland House, Saskatchewan).

A female taken on October 30 comes from Liberia. The wing measures 82.8 mm. and the tail 64.7 mm.

MYIOCHANES RICHARDSONII SORDIDULUS (Sclater)

Contopus sordidulus P. L. SCLATER, Proc. Zool. Soc. London, May 1859, p. 43 (Orizaba, Veracruz).

As four of the six wood pewees taken at Liberia late in October are this form, the Mexican wood pewee would appear to be the commonest of the three kinds that are present here as migrants. They were found along open trails in the woods bordering streams, or on open perches in clearings. On one occasion while I was storm-bound by a heavy rain with shelter in an old hut one hawked steadily for insects from an exposed perch unmindful of the downpour. Meas-

urements of the four taken are as follows: One male, October 25, wing 82.5, tail 58.8 mm.; three females, October 22 and 24, wing 78.3, 80.5, 80.5, tail 57.2, 60.4, 61.3 mm. The race is marked from the typical form by darker color above, and by shorter tail. The birds seen were silent.

MYIOBIUS SULPHUREIPYGIUS AUREATUS Bangs

Myiobius xanthopygus aureatus BANGS, Proc. New England Zoöl. Club, vol. 4, Mar. 19, 1908, p. 27 (Divala, Chiriquí, Panamá).

In the section called Los Cuadros on the Hacienda Santa María I shot two females of this flycatcher on November 6. They were found in heavy forest, where they sought low perches from which to watch for insects. In mannerisms they were much like *Empidonax*.

ONYCHORHYNCHUS MEXICANUS FRATERCULUS Bangs

Onychorhynchus mexicanus fraterculus BANGS, Proc. New England Zoöl. Club, vol. 3, Mar. 31, 1902, p. 86 (Santa Marta, Colombia).

The only one of these flycatchers seen was a male taken in a shaded thicket south of Liberia October 31. The region was one of pastures interspersed with little thickets and groves of trees.

PLATYRINCHUS CANCROMINUS Sclater and Salvin

Platyrhynchus cancrominus SCLATER and SALVIN, Proc. Zool. Soc. London, 1860, p. 299 (Choctum, Vera Paz, Guatemala).

My only specimen of this flycatcher is a male taken low down in heavy brush where there was dense shadow in a damp spot on the Río Blanco, just above its junction with the Río Colorado, northwest of Liberia. This bird does not differ as far as I can see from a series from Guatemala and México.

TOLMOMYIAS SULPHURESCENS CINEREICEPS (P. L. Sclater)

Cyclorhynchus cinereiceps P. L. SCLATER, Ibis, 1859, p. 443 (State of Oaxaca, México).

In the vicinity of Liberia, both along the Río Liberia and in the brushy pastures to the south, as well as at the Río Colorado, these flycatchers were so common that I secured a series of 10 between October 23 and November 18. They were found in heavy forest, low thickets, or scattered groves of brush in pature lands, where they moved slowly through the smaller branches, reminding me of vireos in their manner of peering about. At this season they were silent. The iris is yellowish white and the mouth lining dark neutral gray. Several of those taken were molting.

RHYNCHOCYCLUS BREVIROSTRIS BREVIROSTRIS (Cabanis)

Cyclorhynchus brevirostris CABANIS, Arch. für Naturg., vol. 13, 1847, p. 249 (Jalapa, Veracruz, México).

On November 5 I shot a male of the short-billed flycatcher on the

forested mountain back of the house at Hacienda Santa María, in the region called Papal. The bird was moving through the lower branches of the trees.

ONCOSTOMA CINEREIGULARE (P. L. Sclater)

Todirostrum cinereigulare P. L. SCLATER, Proc. Zool. Soc. London, 1856 (Jan. 26, 1857), p. 295 (Córdoba, Veracruz).

On November 2 near Liberia I shot one of these flycatchers in heavy woodland where it was in company with other little forest birds.

LOPHOTRICCUS PILEATUS LUTEIVENTRIS Taczanowski

Lophotriccus squamicristatus luteiventris TACZANOWSKI, Ornithologie de Pérou, vol. 2, 1884, p. 231 (Chiriquí, Panamá).

At the Hacienda Santa María I shot one of these flycatchers in undergrowth near the border of dense forest as it moved slowly about perching quietly. On November 9 I secured another from a moving flock of little forest birds.

Family HIRUNDINIDAE

HIRUNDO RUSTICA ERYTHROGASTER Boddaert: Barn Swallow

Hirundo erythrogaster BODDAERT, Table des planches enluminées, 1783, p. 45 (Cayenne).

The barn swallow was seen commonly around Liberia from October 18 to November 3 and on November 18, flying over open pastures, especially at the airport. Their numbers fluctuated somewhat, and they were evidently in southward migration. As they were scattered widely it was difficult to obtain a true picture of their numbers, particularly in view of their habit of coursing over extended areas while feeding. On October 23, after a heavy rain, I found about a hundred gathered on telephone wires near the Río Colorado, and near Liberia on the same day I recorded two additional groups of 20 to 25 each. Toward the end of October they decreased in abundance briefly but were common again on November 3, and on my return from the mountains I saw many on November 18. Seven skins obtained on October 23 include adult and immature birds of both sexes.

Elsewhere in Costa Rica I recorded several near San Ramón on October 16, a flock of several hundred at the airport in Puntarenas on November 19, many at the airport in San José on November 20, and several near Cartago on November 23.

Family CORVIDAE

CALOCITTA FORMOSA POMPATA Bangs

Calocitta formosa pompata BANGS, Proc. New England Zool. Club, vol. 4, Mar. 13, 1914, p. 102 (Bolsón, Guanacaste, Costa Rica).

The magpie-jay is one of the most attractive birds that I found in

the region of my work in Guanacaste. It is, as others have said, typically a bird of the arid Tropical Zone, ranging near Liberia through the brushy pastures and at the borders of woodland along the streams and found in the groves and thickets across the slopes below the heavy forest on the Hacienda Santa María. At this period of the year they were in flocks of half a dozen to ten or more birds that remained in fairly close company. In the lowland area about Liberia, where there is a fairly uniform covering of brush, their interesting flock behavior was hidden and obscure, but at Santa María, where the thickets and groves were isolated by broad areas of pasture, this was easily evident. Each band had its definite range, and I could count each day on finding the groups in certain circumscribed localities.

While these birds resemble magpies in form because of the long, graduated tail, they are definitely jays in action. It was regular habit for them to fly out of the upper branches of low trees, swing down in a long curve that carried them just above the ground, and then, with a flash of white from the partly spread tail, rise to a perch behind cover in another tree. In the new location it was sometimes difficult to obtain another glimpse of them as often they hopped and flew farther away behind cover. At other times, particularly when near traveled trails, they were tame and confiding, resting motionless among leaves only a few feet distant where I could admire their pleasing shades of light blue, white, and black, the recurved plumes of the jaunty crest, and the long graduated tail that was held at varying angles according to the mood or the movements of the bird. As I called to them among the oak groves of the highlands they often came flying overhead with jaylike scolding notes, sometimes two or three perching near together, almost touching wings, to peer down in search of the source of the sound that intrigued them. As their interest increased they uttered whistled calls and croaking sounds and moved about alertly. Near Liberia a small boa moving through the grass called down a flock with much uproar into branches near the ground, and they were often vociferous at other disturbances.

The six taken were secured near Liberia on October 21 and at the Hacienda Santa María on November 11.

From the material in the National Museum the four races that have been described seem evident on basis of color. The size differences alleged are not apparent, though this may be due to the fact that a number of the specimens at hand are of unknown sex. Following is a brief summary of the forms:

Calocitta formosa formosa (Swainson):

Pica formosa SWAINSON, Phil. Mag., new ser., vol. 1, June 1827, p. 437 (Temascáltepec, México, México).

Duller, more grayish blue above, with more or less black below the eye and on the malar region.

Colima and Puebla to eastern Oaxaca (Tehuantepec and Juchitan), México.

Calocitta formosa azurea Nelson:

Calocitta formosa azurea NELSON, Auk, 1897, p. 55 (Huehuetan, Chiapas, México).

Darkest of all the races, being darker, brighter blue above, with the sides of the head white, except for the dark auricular spot.

From extreme eastern Oaxaca (Tapaná) and Chiapas, across the Pacific slope of Guatemala.

One bird from Tapaná in eastern Oaxaca, near the border of Chiapas, is intermediate, having the side of the head as in *azurea*, but being only slightly darker above than *formosa*.

Calocitta formosa impudens van Rossem:

Calocitta formosa impudens VAN ROSSEM, Proc. Biol. Soc. Washington, vol. 54, Dec. 8, 1914, p. 172 (Pine Peaks, Volcán de Conchagua, El Salvador).

Decidedly paler, grayer above, but brighter blue than *formosa*; the sides of the head white as in *azurea*, but decidedly lighter blue above.

El Salvador, north into the arid valleys of the Caribbean slope in Guatemala.

Calocitta formosa pompata Bangs:

Calocitta formosa pompata BANGS, Proc. New England Zoöl. Club, vol. 4, Mar. 13, 1914, p. 102 (Bolsón, Guanacaste, Costa Rica).

Somewhat darker above than *impudens*, but decidedly lighter than *azurea*, with the sides of the head as in the latter form.

Western Nicaragua and Guanacaste, Costa Rica.

A specimen from Chinandega in northwestern Nicaragua is somewhat intermediate but is nearer *pompata* than *impudens*. I have not seen specimens from Honduras and am uncertain as to whether they are *impudens* or *pompata*.

Family TROGLODYTIDAE

HELEODYTES RUFINUCHA CAPISTRATA (Lesson)

Picolaptes capistrata LESSON, Rev. Zool., vol. 5, 1842, p. 174 (Realejo, Nicaragua).

In the region about Liberia these wrens were common, this being one of the species that I encountered daily in the field. They range in small bands, sometimes near the ground in undergrowth, and again high in the trees. They are alert and active and come to attention through their movements and through their croaking calls. The nests are domed structures as large as a football, made of sticks, and placed near the end of a branch. Though this was not the nesting season they were adding sticks to them, so that I supposed they were using them as sleeping quarters. Inland I observed their nests

from the trail above Las Delicias but did not find them at the Hacienda Santa María.

THRYOPHILUS MODESTUS MODESTUS (Cabanis)

Thryothorus modestus CABANIS, Journ. für Orn., 1860 (May 30, 1861), p. 409 (San José, Costa Rica).

On November 15 I collected three of these interesting wrens at the Hacienda Santa María, an adult female and two immature birds, all in rather ragged condition due to partial molt. They ranged in tangled growth in the thickets and groves scattered through the pastures below the house and did not enter the forest. The chattering note is suggestive of that of *Thryophilus pleurostictus ravus* that I found common at Liberia. The song also is similar, but was not so loud or so clear in tone.

THRYOPHILUS PLEUROSTICTUS RAVUS Ridgway

Thryophilus pleurostictus ravus RIDGWAY, Proc. Biol. Soc. Washington, vol. 16, Nov. 30, 1903, p. 167 (San Juan del Sur, Nicaragua).

This wren, like others of its kind called the *salta espinuela*, was common in the vicinity of Liberia in thickets or in undergrowth along the trails in heavy woodland. The song, heard frequently, is clear and musical, suggestive of that of related species. The call note is a chipping sound that to ears attuned to northern bird calls suggests a warbler or a sparrow rather than a wren. The birds at this season were in partial or complete molt. Specimens were secured on October 19, 24, and 25 and November 18.

In the color of the dorsal surface this series is uniformly duller, less reddish brown than birds from western Nicaragua, including specimens from the type locality. Apparently the difference is due to their condition of fresh, newly grown feathering, since San Juan del Sur, the type locality in Nicaragua, is not far away.

THRYOPHILUS THORACICUS (Salvin)

Thryothorus thoracicus SALVIN, Proc. Zool. Soc. London, 1864 (Feb. 1865), p. 580 (Tucurrique, Costa Rica).

These wrens were found about deadfalls in heavy forest, mainly in the region of Los Cuadros on the Hacienda Santa María. Their clear songs were heard frequently, but the birds were secretive and because of their dull colors were difficult to see in the dim light of these woodlands. One was shot on November 6.

Hellmayr¹⁵ includes *Thryophilus leucopogon* of Salvadori and Festa as a geographic race of *thoracicus* on the basis that the juvenile *thoracicus* has only indistinct streaking on the lower surface. In view of the distinctness of the color pattern of the adults, *thoracicus* being

¹⁵ Publ. Field Mus. Nat. Hist., zool. ser., vol. 13, pt. 7, Nov. 15, 1934, pp. 175-176.

heavily streaked on the breast and sides while *leucopogon* is plain brown, it appears that this contention is doubtful and that it must have other support before it can be accepted.

TROGLODYTES MUSCULUS INTERMEDIUS Cabanis

Troglodytes intermedius CABANIS, Journ. für Orn., 1860, p. 407 (San José, Costa Rica).

The house wren was not common in the area worked at this season. On November 4 I heard one singing in early morning in the town of Liberia. At the Hacienda Santa María a male lived secretly around the house throughout my stay, taking care to keep out of reach of the collecting gun and finally, on the morning of my departure, coming out to chatter familiarly at me as I mounted my mule for the ride down to the lowlands.

HENICORHINA LEUCOSTICTA TROPAEA Bangs and Peters

Henicorhina leucosticta tropaea BANGS and PETERS, Bull. Mus. Comp. Zoöl., vol. 67, Jan. 1927, p. 480 (La Vijagua, Costa Rica).

The wood wren was a common species in the heavy forests on the Hacienda Santa María, and between November 5 and 14 I secured ten skins. The birds were recorded regularly in the dense woodland at Los Cuadros and were commoner on the higher slopes of the mountain, especially on the wooded plateau called Papal, immediately above the house. They were found in pairs about the numerous deadfalls, where they skulked and chattered in the manner common to wrens. On occasion I heard them giving clear ringing songs. It was not at all difficult to call them out into sight as they had much curiosity about strange sounds.

The series taken is quite uniform in its agreement with the characters of this race.

Family TURDIDAE

TURDUS PLEBEJUS PLEBEJUS Cabanis

Turdus plebejus CABANIS, Journ. für Orn., Sept. 1860 (Jan. 1861), p. 323 (Costa Rica).

On the Hacienda Santa María these dark-colored robins were fairly common in the heavy forest on the mountain slope back of the house. Sometimes I heard their calls, a robinlike *pup pup pup*, and occasionally I saw one fly. On one occasion half a dozen feeding in scattered company on the forest floor flushed and went into the tree tops where they remained hidden and motionless until alarmed by a shot. They were so shy that it was difficult to judge accurately their abundance. I took specimens on November 5 and 10, and on November 14 I saw one at the top of the mountain. In another place¹⁶ I have expressed

¹⁶ Proc. U. S. Nat. Mus., vol. 89, Mar. 26, 1941, p. 564.

the opinion that *plebejus* should be considered a species distinct from *ignobilis* of South America until there is evidence of closer connection.

HYLOCICHLA USTULATA SWAINSONI (Tschudi): Eastern Olive-backed Thrush

Turdus Swainsoni TSCHUDI, Fauna Peruana, Aves, 1845, p. 28 (Carleton House, lat. 53° N., on the banks of the Saskatchewan River).

On November 12 I shot an immature male, evidently a bird in southward migration, at the edge of a stand of forest above the house at Hacienda Santa María.

CATHARUS MEXICANUS FUMOSUS Ridgway

Catharus fumosus RIDGWAY, Proc. U. S. Nat. Mus., vol. 10, Aug. 6, 1888, p. 505 (Costa Rica).

In the heavy forest near the Hacienda Santa María these small thrushes were fairly common but were so difficult to see that usually I had barely a glimpse of them. They ranged near or on the ground in dense shadows and ordinarily managed to slip away when barely seen. On November 11 I secured one on the mountain slope back of the house. They are thrushlike in action but impressed me as somewhat different from *Hylocichla*.

The type specimen of this race was taken by Zeledón and has no locality other than Costa Rica. It is probable that it came from one of the mountains near San José.

Family SYLVIIDAE

POLIOPTILA PLUMBEA BAIRDI Ridgway

Polioptila bairdi RIDGWAY, Proc. Biol. Soc. Washington, vol. 16, Sept. 30, 1903, p. 110 (San Juan del Sur, Nicaragua).

In brushy areas near Liberia I collected four males and one female on October 31 and November 2 and 3 and saw a few others. Their mannerisms were typical of gnatcatchers as a group, all being jaunty little birds that often are overlooked because of their small size.

The four males from Liberia all show the white line in the lores which, as van Rossem¹⁷ has found, marks the winter plumage. This white loreal line I have observed also in *Polioptila plumbea plumbiceps* Lawrence that I took at the same season of the year at Ocumare de la Costa in northern Venezuela,¹⁸ but at the time I did not recognize that it was a seasonal character and that in the breeding season the lores were black. Hellmayr's conclusion that these gnatcatchers are all geographic races of *Polioptila plumbea* seems reasonable.

¹⁷ Auk, 1931, pp. 34-36, figs. 4, 5.

¹⁸ Proc. U. S. Nat. Mus., vol. 87, 1939, p. 242.

RAMPHOCAENUS RUFIVENTRIS RUFIVENTRIS (Bonaparte)

Scolopacinus rufiventris BONAPARTE, Proc. Zool. Soc. London, 1837 (June 14, 1838), p. 119 (San José de Guatemala, Guatemala).

In a thicket near the river below Liberia on November 18 I heard trilled, chattering notes, and after watching for several minutes finally collected a male of this bird.

Family VIREONIDAE**VIREO FLAVIFRONS Vieillot: Yellow-throated Vireo**

Vireo flavifrons VIEILLOT, Histoire naturelle des oiseaux de l'Amérique septentrionale, vol. 1, 1807 (1808), p. 85, pl. 54 (eastern United States).

Near Liberia I noted two on October 25 in woodland along the river and collected an adult male. November 17 I shot another adult male on the Río Colorado. November 10 I saw one in the shade trees over the coffee at Hacienda Santa María.

VIREO FLAVOVIRIDIS FLAVOVIRIDIS (Cassin)

Vireosylvia flavoviridis CASSIN, Proc. Acad. Nat. Sci. Philadelphia, vol. 5, 1851, p. 152 (Panamá and San Juan de Nicaragua, Nicaragua).

The only one of these vireos recorded was a male taken in brush near the Río Colorado north of Liberia on October 23, 1940. This bird had the iris dull hair brown. The specimen has the brighter color marking the typical subspecies. The supposed southern race *insulanus* in my opinion is not separable. Further, I consider this group as specifically distinct from *Vireo olivaceus*.

VIREO PHILADELPHICUS (Cassin): Philadelphia Vireo

Vireosylvia philadelphia CASSIN, Proc. Acad. Nat. Sci. Philadelphia, vol. 5, June 30, 1851, p. 153, pl. 10, fig. 2 (Philadelphia, Pa.).

At the Hacienda Santa María on November 14 I shot two from a scattered flock of small birds moving through the shade trees in the coffee plantation above the house. On the Río Colorado near Liberia on November 17 I collected another from a small flock all apparently of this species. All three specimens are females, two adult and one immature. It is always interesting to see the Philadelphia vireo, and I found it doubly so here in its southern wintering range.

HYLOPHILUS OCHRACEICEPS OCHRACEICEPS P. L. Sclater

Hylophilus ochraceiceps P. L. SCLATER, Proc. Zool. Soc. London, 1859 (Feb. 1860), p. 375 (Playa Vicente, Oaxaca).

An adult male and an immature female of this vireo were taken on November 8, 1940, from a flock of little forest birds in the lower levels of the trees at Los Cuadros on Hacienda Santa María. On the three occasions on which I have seen this bird in life in Guatemala, in Veracruz, and here, I have each time taken a pair, these being the only

two seen, which suggests that this is another species in which male and female remain associated throughout the year.

While these are listed as the typical form they appear definitely paler than specimens from Veracruz. With more material I believe that the southern race named *pallidipectus* by Ridgway will prove separable.

HYLOPHILUS DECURTATUS DECURTATUS (Bonaparte)

Sylvicola decurtata BONAPARTE, Proc. Zool. Soc. London, 1837 (June 1838), p. 118 (Guatemala).

On November 6 and again on November 8 in the section called Los Cuadros on the Hacienda Santa María I shot one of these little vireos from a chattering flock in the tops of the lower forest trees. One was seen on November 10.

The two taken are definitely duller than specimens of this species from near Liberia and agree with those from eastern Costa Rica to Guatemala. They were secured at the head of the Caribbean drainage on the mountain, and are another indication of the Caribbean influence on the avifauna of this region.

It may be noted that Griscom¹⁹ has recorded this race from north-western Costa Rica.

HYLOPHILUS DECURTATUS PALLIDUS (Dickey and van Rossem)

Pachysylvia decurtata pallida DICKEY and VAN ROSSEM, Proc. Biol. Soc. Washington, vol. 40, Jan. 8, 1927, p. 4 (Puerto del Triunfo, Departamento Usulután, El Salvador).

Near Liberia I found these vireos in small flocks in woodland along the Río Liberia and the Río Colorado and in the larger groves through the pastureland to the south of town. Specimens were taken on October 26 and 31 and November 1 and 2.

The eight birds obtained are definitely brighter, more yellowish green above, lighter gray on the crown, lighter more yellowish green on the sides and under tail coverts, and whiter on the breast and fore-neck than specimens from eastern Costa Rica to Guatemala, in which they agree with *pallidus* described originally from El Salvador, and known later from western Nicaragua. They represent an extension of range for this bird. Further material should be obtained to determine whether *pallidus* ranges farther to the south in the Nicoya Peninsula. Two birds collected by Ridgway at Pigres near the mouth of the Río Grande de Tárcoles, on the Gulf of Nicoya south of Punta-arenas, belong with typical *decurtatus*, though showing some influence of the darker headed *pusillus* of western Panamá.

The races of this species are to be recognized on color and not on size. It may be noted that *Hylophilus minor*, and its race *darienensis* of eastern Panamá, are specifically distinct and are not races of

¹⁹ Bull. Amer. Mus. Nat. Hist., vol. 64, 1932 p. 320.

decurtatus as listed by Hellmayr²⁰ for they have the crown green, while in *decurtatus* it is gray. In the National Museum there is one skin of the green-crowned *H. m. darienensis* from Gatún, a locality where the gray-crowned *H. d. pusillus* is common.

Family COMPSOTHTYPIDAE

MNIOTILTA VARIA (Linnaeus): Black and White Warbler

Motacilla varia LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 333 (Hispaniola).

In the coffee plantation near the house at Hacienda Santa María I shot one on November 12 and saw another on November 14.

VERMIVORA PEREGRINA (Wilson): Tennessee Warbler

Sylvia peregrina WILSON, American ornithology, vol. 3, 1811, p. 83, pl. 25, fig. 2 (banks of the Cumberland River in Tennessee).

Near Liberia this bird was common both in forests and in brush-grown pastures. Four specimens were taken on October 25 and 30 and November 2 and 18. They were often found in little groups in bushes near the ground at the border of pasture lands.

DENDROICA PETECHIA AESTIVA (Gmelin): Eastern Yellow Warbler

Motacilla aestiva GMELIN, Systema naturae, vol. 1, pt. 2, 1789, p. 996 (Canada).

Yellow warblers were common around Liberia, five specimens being taken on October 20, 22, 23, and 25. All these are the typical form. I saw several on November 18, but as none were taken I have no check on the subspecies present at that date. Several forms should occur in this region.

DENDROICA PENNSYLVANICA (Linnaeus): Chestnut-sided Warbler

Motacilla pensylvanica LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 333 (Philadelphia, Pa.).

On November 8 I shot an immature female from a treetop at the edge of heavy forest near the Hacienda Santa María.

SEIURUS AUROCAPILLUS (Linnaeus): Ovenbird

Motacilla aurocapilla LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 334 (at sea, about 30 miles off Hispaniola).

At the Hacienda Santa María on November 5 I saw two and shot an immature male. Another secured on November 12 was prepared by Aguilar for the Museo Nacional in San José.

OPORORNIS FORMOSUS (Wilson): Kentucky Warbler

Sylvia formosa WILSON, American ornithology, vol. 3, 1811, p. 85, pl. 25, fig. 3 (Kentucky).

²⁰ Publ. Field Mus. Nat. Hist., zool. ser., vol. 13, pt. 8, 1935, p. 185.

On November 6 I shot an adult female near the ground in heavy forest at Los Cuadros on the Hacienda Santa María.

CHAMAETHLYPIS POLIOCEPHALA ICTEROTIS (Ridgway)

Geothlypis caninucha icterotis RIDGWAY, Proc. U. S. Nat. Mus., vol. 11, Sept. 20, 1889, p. 539 (Costa Rica).

Near Liberia I shot two of these ground-chats on October 26 and November 18 in brush-grown fields where there was much high grass. At the Hacienda Santa María I found them in grass and weeds bordering thickets on the rolling slopes below the house. Specimens were taken here on November 7 and 15. The birds were completing the molt at this time and were secretive and hard to find.

Review of available material leaves no doubt in my mind that *icterotis* is a valid form and one to be recognized. In breeding dress it is distinctly different from *C. p. caninucha* in being duller green above, and paler yellow with the yellow more extensive. The flanks are lighter brown. In fresh fall plumage it is definitely browner above. It is similar to *C. p. palpebralis* in extent of yellow below but has the flanks deeper brown and the dorsal surface greener.

From available material it appears that the following races of this species should be recognized:

Chamaethlypis poliocephala ralphi (Ridgway):

Geothlypis poliocephala ralphi RIDGWAY, Proc. U. S. Nat. Mus., vol. 16, Feb. 5, 1894, p. 692 (Brownsville, Tex.).

The palest of all the races; compared with *C. p. poliocephala* sides and flanks lighter brown, yellow of breast paler, and abdomen much whiter.

Lower Rio Grande Valley in Texas south into northeastern México.

The present extent of the range of this species in México is uncertain. A good series at hand from Brownsville leaves no question as to its validity as a distinct form, though currently it has been placed in the synonymy of *poliocephala*.

Chamaethlypis poliocephala poliocephala (Baird):

Geothlypis poliocephala BAIRD, Review of American birds, Apr. 1865, pp. 220, 225 (Mazatlán, Sinaloa).

Compared with *ralphi* breast and foreneck deeper yellow, the color more extensive; flanks and sides darker brown.

Northern and central México, from Sinaloa to Morelos and Michoacán.

Brodkorb has separated birds from Morelos and Michoacán under the name *pontilis*²¹ on the basis of supposed larger size. The few

²¹ *Chamaethlypis poliocephala pontilis* Brodkorb, Journ. Washington Acad. Sci., vol. 33, Feb. 15, 1943, p. 33 (Puente de Ixtla, Morelos).

specimens that I have seen make it desirable to check this with more material.

Chamaethlypis poliocephala palpebralis (Ridgway):

Geothlypis (*Chamaethlypis*) *palpebralis* RIDGWAY, Manual of North American birds, 1887, pp. 526, 592 (Mirador, Veracruz).

Yellow of lower surface deeper and more extended distally than in *poliocephala*.

Central Veracruz through northern Chiapas to eastern Guatemala.

While the birds found in Campeche and Yucatán are assigned to this race, the few specimens that I have seen have the yellow below as extensive as in *caninucha*, though above they are paler greenish like *palpebralis*. They probably represent a distinct form, a matter to be decided with more material.

Chamaethlypis poliocephala caninucha (Ridgway):

Geothlypis poliocephala var. *caninucha* RIDGWAY, Amer. Journ. Sci. Arts, Dec. 1872, p. 459 (Retalhuleu, Guatemala).

Similar to *palpebralis* but brighter green above; yellow on lower surface more extensive, covering the abdomen.

Southern Chiapas through western Guatemala, Honduras, and eastern Nicaragua.

The lack of white on the eyelids alleged in early writings as a character in this form is not stable, as white is present in some specimens, though usually in reduced amount where found.

This form may range to extreme northeastern Costa Rica.

Chamaethlypis poliocephala icterotis (Ridgway):

Geothlypis caninucha icterotis RIDGWAY, Proc. U. S. Nat. Mus., vol. 11, Sept. 20, 1889, p. 539 (Costa Rica).

Similar to *caninucha* but somewhat duller above; yellow below a little paler, somewhat less extensive; flanks lighter brown; fall plumage definitely browner above.

Western Nicaragua to central Costa Rica.

In this race the yellow below is about as extensive as in *palpebralis*. It is distinguished from that race by having the dorsal surface brighter green, and the flanks darker brown. We have one specimen from Managua, Nicaragua, that belongs here.

Chamaethlypis poliocephala ridgwayi Griscom:

Chamaethlypis poliocephala ridgwayi GRISCOM, Proc. New England Zoöl. Club, vol. 12, Apr. 3, 1930, p. 7 (Boruca, Costa Rica).

Similar to *caninucha* but deeper yellow below; greener above; slightly smaller in size.

Southwestern Costa Rica (Térraba Valley) and western Panamá (Boquete, Volcán de Chiriquí).

WILSONIA PUSILLA PILEOLATA (Pallas): Northern Pileolated Warbler

Motacilla pileolata PALLAS, Zoographia Rosso-Asiatica, vol. 1, 1811, p. 497 (Kodiak Island, Alaska).

On November 9 I shot a male of this race in the coffee plantation near the house at the Hacienda Santa María. Other warblers of this group were seen at Puerto Limón on October 12 and at San José on October 15. Subspecific identity for these sight records is uncertain.

MYIOBORUS MINIATUS COMPTUS, new subspecies

Characters.—Similar to *Myioborus miniatus aurantiacus* (Baird)²² but definitely darker, more orange on breast and abdomen; chestnut crown patch slightly darker.

Description.—Type, U. S. N. M. No. 361729, male, from 900 meters elevation on Cerro Santa María, a spur of Volcán Rincón de la Vieja, above the Hacienda Santa María, taken November 14, 1940, by Alexander Wetmore, original No. 10958.

Central crown patch bay; crown otherwise dull black; hindneck, back, scapulars, wing coverts, tertials, and rump dark neutral gray; primaries and secondaries dull black, the latter edged with dark neutral gray; upper tail coverts black; tail black with white tips on outer feathers, broad on first two, reduced on third, and disappearing on fourth and fifth; sides of head and side of breast dark neutral gray; throat and upper breast dull black with a wash of dusky neutral gray; center of breast ochraceous-orange becoming cadmium orange on lower breast, sides and abdomen; under tail coverts white; outer under wing coverts deep neutral gray, others white. Bill black; tarsus and toes brownish black (from dried skin).

Measurements.—Males (8 specimens), wing 61.8–65.9 (63.7), tail 55.6–60.4 (58.8), culmen from base 11.7–12.7 (12.2), tarsus²³ 17.9–19.5 (18.7) mm.

Females (4 specimens), wing 56.3–63.6 (59.1), tail 50.0–58.8 (54.4), culmen from base²⁴ 11.6–12.2 (12.0), tarsus 17.4–18.4 (17.9) mm.

Range.—Mountains of northern Costa Rica including the Cordillera Central and the Cordillera de Guanacaste (specimens examined from Volcán Rincón de la Vieja, Tenorio, Barranca, Coliblanco, Grecia, Cartago, and Guayabo).

Remarks.—When Outram Bangs described *acceptus*²⁵ as the race of *Myioborus* from western Panamá he compared it with what he supposed were specimens of Baird's *aurantiacus* from Costa Rica, noting that his birds from Chiriquí were yellower, less orange below. In studying the skins that I secured in the mountains of Guanacaste it was at once evident that there are two races of this species in Costa

²² *Setophaga aurantiaca* Baird, Review of American birds, May 1865, p. 261 (Dota, Costa Rica).

²³ Seven specimens.

²⁴ Three specimens.

²⁵ *Myioborus aurantiacus acceptus* Bangs, Proc. New England Zool. Club, vol. 4, Mar. 19, 1908, p. 30 (Boquete, 4,000 feet elevation, Volcán de Chiriquí).

Rica. From the mountains included in the Cordillera de Talamanca in the southern half of the country down into western Panamá the birds are distinctly paler, more yellow below. Baird's type of *aurantiacus* from Dota, and a series secured by Zeledón and Ridgway from Santa María de Dota, Lagunaria and Copey, are of this lighter yellow group. Specimens from Chiriquí are identical with them, and so *acceptus* of Bangs becomes a synonym of *aurantiacus*.

To the north of the depression through which the railroad line crosses through Siquirres on the route from Puerto Limón to San José, and from there descends toward Puntarenas on the west coast, through the mountains of the Cordillera Central and the Cordillera de Guanacaste, these warblers are darker, more orange below. J. L. Peters writes me that Bangs apparently had available skins from Tenorio and Cerro Santa María when he described *acceptus*, so that actually he was comparing his birds from Chiriquí with the form that I have here named *comptus*. Specimens from above Cartago and Grecia are somewhat intermediate, but are nearer *comptus*.

These warblers were found in the heavy forest of the Cerro Santa María above the Hacienda ranging from about 900 meters elevation to the summit. They were seen in the lower branches of the trees, or in the undergrowth near the forest floor, and were rather shy. The two taken I shot on November 10 and 14.

BASILEUTERUS CULICIVORUS CULICIVORUS (Lichtenstein)

Sylvia culicivora LICHTENSTEIN, Preis-Verzeichniss Säugethiere, Vögel . . . in Mexico, 1830, p. 2 (Jalapa, Veracruz).

At the Hacienda Santa María these warblers were fairly common in heavy forest. I took specimens on November 5, 7, 8, and 9, finding the birds usually in dense cover among the lower branches of the trees, where they moved actively and scolded at me.

The five skins agree with examples from Guatemala to southern México, as do three others in the National Museum from Guanacaste, the latter having been taken by C. F. Underwood at Tenorio on January 28 and February 7 and 10, 1910. As other writers have noted, specimens from northern and central Costa Rica are intermediate between *culicivorus* and *godmani*, being placed with the latter. Two skins from Guayabo are identical with specimens from Chiriquí, being decidedly more yellow green above than a series from farther west.

BASILEUTERUS DELATRII DELATRII Bonaparte

Basileuterus delatrii BONAPARTE, Compt. Rend. Acad. Sci. Paris, vol. 38, 1854, p. 383 (Nicaragua).

October 25 while following the Río Liberia above the town of Liberia I secured three of these active warblers in tangled growth near

the ground. Later, on November 12, on the Hacienda Santa María I found them common in the woodlands and thickets scattered through the pastures below the house. Their chipping calls brought them to attention in the fairly dense growths near the ground that were their haunt.

While the race *mesochrysus* is recorded from southwestern Costa Rica the series represents the typical race.

Family ICTERIDAE

ICTERUS GALBULA (Linnaeus): Baltimore Oriole

Coracias Galbula LINNAEUS, *Systema naturae*, ed. 10, vol. 1, 1758, p. 108 (Virginia).

The four specimens taken include two males and two females from Liberia, October 26, and from Hacienda Santa María, November 10 and 14. The birds were common from the day of my arrival, and at Liberia they were seen frequently in the town. Numbers came at sunset from the adjacent country to roost in the village trees where they mingled with *Icterus sclateri sclateri*. October 29 I observed at least 50 of the two species flying singly or in groups past the hotel. On the mountain I found them in orange trees near the Hacienda house where they were eating the fruit opened by woodpeckers. At Liberia they were present on November 18 on my last day afield.

ICTERUS BULLOCKII (Swainson): Bullock's Oriole

Xanthornus Bullockii SWAINSON, *Phil. Mag.*, new ser., vol. 1, June 1827, p. 436 (Real del Monte, Hidalgo, Mexico).

A female taken at Liberia on November 1, 1940, has the abdomen more yellowish than the average of *bullockii* but otherwise exhibits the coloration of that bird, except that two scapular feathers on the left side have the outer webs dark at the centers as is regularly the case in *Icterus galbula*. The specimen measures as follows: Wing 87.3, tail 66.3, culmen from base 19.7, tarsus 13.3 mm. It is the farthest south at which this bird has been recorded as far as I am aware.

The slightly abnormal markings described are of interest in connection with the account by Sutton²⁶ of orioles from western Oklahoma that display markings variously intermediate between the Baltimore and Bullock's oriole.

ICTERUS SCLATERI SCLATERI Cassin

Icterus Sclateri CASSIN, *Proc. Acad. Nat. Sci. Philadelphia*, Apr. 1867, p. 49 (Nicaragua).

These beautiful orioles were found in the wooded areas along the Río Liberia, where I shot males on October 26, 28, and 29. The Baltimore oriole ranges with them at this season, the two having similar habits.

²⁶ *Auk*, 1938, pp. 1-6, pl. 1.

STURNELLA MAGNA ALTICOLA Nelson

Sturnella magna alticola NELSON, Auk, 1900, p. 266 (Ocuilapa, Chiapas, México).

On the grassy slopes below the forest on the Hacienda Santa María meadowlarks were fairly common from November 4 to 16. The pastures had not been grazed for several years so that the grass was high. In consequence most of the meadowlarks seen flushed before animals as we rode across these open areas. Flight and other mannerisms were typical of meadowlarks everywhere, and the song and call notes are like those of the bird of the eastern United States. An adult male taken on November 11 is in full fall plumage.

Family THRAUPIDAE

TANAGRA AFFINIS AFFINIS Lesson

Tanagra (Euphonia) affinis LESSON, Rev. Zool., ser. 2, vol. 4, 1842, p. 175 (Realejo, Nicaragua).

Near Liberia this tanager was a common bird, so that between October 23 and November 2 I collected seven specimens. They were found among groves in the pastures and in the trees bordering streams, and were observed often resting in the sun in the tops of dead trees in early morning when the air was cool. As they flew overhead I noted a flash of color from the partly concealed white in the wing feathers. The note seemed higher pitched and less clearly whistled than in related species. All taken had eaten mistletoe berries. A male shot on October 28 was definitely immature judged from the stage of ossification in the skull, yet it was in full color and had the testes one-half developed.

Brodkorb has described a race²⁷ of this tanager from Chiapas that I have not seen.

PIRANGA RUBRA RUBRA (Linnaeus): Summer Tanager

Fringilla rubra LINNAEUS, Systema naturae, ed. 10, vol. 1, 1758, p. 181 (South Carolina).

Near Liberia on October 24 I shot a beautiful male in full plumage as it fed on drupes with a little group of *Tyrannus melancholicus chloronotus* in brush bordering the airport, and on November 17 I took an adult female at the Río Colorado. Others were noted on October 28 and 31, and at the Hacienda Santa María on November 8. I saw one near Cartago on November 23. The birds give the familiar call note regularly, making their identification easy.

HABIA RUBICA ALFAROANA (Ridgway)

Phoenicotheraupis alfaroana RIDGWAY, Proc. Biol. Soc. Washington, vol. 18, Oct. 17, 1905, p. 212 (Miravalles, Guanacaste, Costa Rica).

²⁷ *Tanagra affinis esperanzae* Brodkorb, Occ. Pap. Mus. Zool. Univ. Michigan, No. 369, Apr. 11, 1938, p. 5 (Finca Esperanza, Chiapas).

November 6 I saw several small bands of these tanagers ranging with chattering calls through undergrowth in the heavy forest at Los Cuadros. The only one taken was a male still in the immature dress, which is like that of the female. In this stage it exhibits the lighter coloration of the lower surface that marks the female when compared with *vinacea*. The skull in this individual appeared fully ossified, as in a completely adult bird.

LANIO LEUCOTHORAX LEUCOTHORAX Salvin

Lanio leucothorax SALVIN, Proc. Zool. Soc. London, 1864 (Feb. 1865), p. 581 (Tucurriqui, Costa Rica).

The only one of these tanagers seen was a female taken from a traveling flock of forest birds in bushy growth at Los Cuadros on the Hacienda Santa María on November 6. This is one of the species of the Atlantic slope, here at its most western limit.

EUCOMETIS PENICILLATA SPODOCEPHALA (Bonaparte)

Chlorospingus spodocephalus BONAPARTE, Compt. Rend. Acad. Sci. Paris, vol. 37, 1853 (1854), p. 922 (Nicaragua).

In the forests of the Hacienda Santa María these interesting tanagers apparently were fairly common. On November 12 I shot three from a little group in a thicket overgrown with bamboo, where they were following a moving column of ants, hunting through the bushes above the insects. While not particularly wild they kept behind cover. Chattering calls came constantly from them. On November 15 I secured one near the house and saw another.

Three of these specimens show faintly indicated darker streakings on the upper part of the breast, thus indicating a slight approach to *E. p. stictothorax* of farther south. They are, however, to be placed with *spodocephala*.

Family FRINGILLIDAE

HEDYMELES LUDOVICIANUS (Linnaeus): Rose-breasted Grosbeak

Loxia ludoviciana LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 306 (Louisiana).

On October 24, near Liberia, I shot an adult male in full winter plumage. Another of these birds called from the trees over the coffee plantation at the Hacienda Santa María on November 10.

PASSERINA CYANEA (Linnaeus): Indigo Bunting

Tanagra cyanea LINNAEUS, Systema naturae, ed. 12, vol. 1, 1766, p. 315 (South Carolina).

Two birds in immature plumage were taken in brush-grown fields near Liberia on October 26 and 28.

PASSERINA CIRIS PALLIDIOR Mearns: Western Painted Bunting

Passerina ciris pallidior MEARN'S, Proc. Biol. Soc. Washington, vol. 24, Oct. 31, 1911, p. 217 (Fort Clark, Kinney County, Tex.).

I shot an adult female on November 18 in bushes near the Río Liberia.

ARREMONOPS RUFIVIRGATUS SUPERCILIOSUS (Salvin)

Embernagra superciliosa SALVIN, Proc. Zool. Soc. London, 1864, p. 582 (Bebedero, Costa Rica).

On October 19 I shot one of these sparrows in a thicket near the Río Liberia below town, and on November 18 in this same area secured a pair. The birds moved quietly about under cover, resembling in their mannerisms others of the genus.

The three specimens are just completing the molt. They have the lateral lines bordering the crown definitely darker and blacker than a small series seen from farther south from La Palma, Coyolar, Santo Domingo, and San Gerónimo, so that possibly the birds from northern Guanacaste may prove to be a different form. I have not examined specimens from Bebedero, the type locality.

AMMODRAMUS SAVANNARUM BIMACULATUS Swainson

Ammodramus bimaculatus SWAINSON, Phil. Mag., new ser., vol. 1, June 1827, p. 435 (Temascáltepec, México, México).

In the open grasslands of the Hacienda Santa María the grasshopper sparrow was fairly common, though, as always, shy and rather difficult to secure. The three taken, secured on November 6, 13, and 15, were shot on the wing as they flushed before me as I walked, or rode on a steady horse, through the pastures. These birds were in full fall plumage.

The specimens secured are dark, having black and very dark brown predominating above, with the median crown stripe dark buff and the breast band and flanks also very dark buff. The brown and the buff especially are darker than in fall birds of *Ammodramus s. pratensis* of the eastern United States. The relationships of the Central American and Mexican birds are not entirely certain, and it is probable that when sufficient material is available it will be found that there are more than the two forms *bimaculatus* and *cracens* recognized at present.

AIMOPHILA RUFICAUDA RUFICAUDA (Bonaparte)

Chondestes ruficauda BONAPARTE, Compt. Rend. Acad. Sci. Paris, vol. 37, 1853, p. 918 (Nicaragua).

This strong, robust finch was common in the region about Liberia during the entire period of my observations there, so that I prepared eight skins and several skeletons on October 20, 22, 26, 27, and 30 and November 1 and 3. The birds were found near the ground in the brushy, tangled growths of pastures and old fields. I recorded them

mainly not far from the water. On October 20 I shot an adult male in breeding condition, and occasionally I recorded other single birds that may have been nesting. Most, however, were gathered in little bands that sometimes included a dozen individuals, evidently post-breeding-season gatherings as they included young of the year. While I could call them up from the ground to low perches, they remained under cover and were so shy that they soon disappeared and could not be found again. The long tail is moved even more actively than that of a cardinal. At this season they were silent.

AIMOPHILA RUFESCENS HYPAETHRUS Bangs

Aimophila rufescens hypaethrus BANGS, Proc. Biol. Soc. Washington, vol. 22, Mar. 10, 1909, p. 37 (Cerro Santa María, Guanacaste, Costa Rica).

On the Hacienda Santa María these large sparrows were scattered through little thickets growing in the pastures. They flushed from the grass at the border of the bushes and went at once into dense cover, where I seldom saw them except so near at hand that I could not shoot them without destroying them. Possibly their shyness was due to the season, as they were evidently molting. I located one place near the trail leading to Los Cuadros where I could always find one or two, and here, after search each time that I passed, I finally secured an adult male in worn plumage on November 11.

They suggest towhees (*Pipilo* or *Oberholseria*) somewhat in appearance because of their size and form and are not unlike those birds in habits. In November they were silent.

This was a species of the upland grasslands, while *Aimophila ruficauda ruficauda* ranged lower down on the level lands near Liberia.



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STUDIES IN NEOTROPICAL MALLOPHAGA (III)

[TINAMIDAE No. 2]

By M. A. CARRIKER, Jr.

SINCE the publication in 1936 of my first report on the Mallophaga of the tinamous, I have acquired much additional material of this interesting group, not only of the same species treated in that report but also of many additional ones, some from the same hosts and others from hosts on which no Mallophaga had previously been recorded. Several other workers on Mallophaga have, in the meantime, described additional species and reexamined old types, with the result that much further light has been shed on little-known genera and species, making it necessary now to revise many of the conclusions reached in my first report.

For the present paper I have very carefully worked over all my old material in connection with the new, taking into consideration the critical notes published by other authors, many of which I heartily endorse while with others I am forced to disagree. These matters will be fully considered under the pertinent genera and species.

The large quantity of material I have assembled and studied has enabled me to arrive at some tentative conclusions that I am convinced further work will corroborate. Miss Clay (1937) has suggested that some of the genera erected by me in 1936 may prove to be unnecessary and that additional species may be found which will form connecting links between certain genera. However, I am not prepared to take this view. On the contrary, the more I study this fascinating family of Mallophaga the more I am convinced that we are dealing with a large number of genera composed of species and subspecies very closely

related. Many of these genera are monotypic, that is, they consist of but a single species, which, in turn, is split up into many subspecies, which differ very slightly among themselves.

It seems plausible that many genera that at one time may have contained numerous species have now been reduced to but a few or a single species, more persistent than the others and less plastic. Undoubtedly the avian family Tinamidae is very old and probably was much larger in some prehistoric age than it is today, only certain types having persisted, so that in this way many intermediate species and even genera have disappeared.

Another fact that stands out very forcibly is that some genera of Mallophaga are restricted to certain genera of hosts. Most conspicuous in this respect is the group infesting the tinamous whose habitat is the grasslands of southern South America and the high altitudes of the Andes. These are the genera *Tinamotis*, *Nothoprocta*, *Nothura*, and *Rhynchotus*. It is only natural that in the tinamous, which harbor such a large number of highly diversified and specialized genera of Mallophaga, the two distinct divisions of the host family should have strikingly different types of mallophagan parasites, and a glance at the host list bears out this fact. Only two genera of Mallophaga, *Strongylocotes* and *Heptapsogaster*, have so far been recorded from both groups of the tinamous, but I am not at all convinced that any of the species concerned are properly allocated generically. *Strongylocotes lipogonus* is a very aberrant type and might well be separated from the rest of the genus, while *Heptapsogaster dilatatus* (Piaget) is undoubtedly a *Rhynchothura*, although previously placed by me in *Heptapsogaster*. As for *Heptapsogaster tessellatus*, from *Nothoprocta*, I was doubtful about its allocation in 1936, and said so at the time, and am more so at present, but I am not yet prepared to place it in *Rhynchothura*.

Miss Clay (1937, p. 140) has described *Heptapsogaster testudo* from *Nothura maculosa peruviana*, but its allocation in *Heptapsogaster* is clearly an error, since it is a typical *Rhynchothura*, a genus confined to *Rhynchotus*, *Nothoprocta*, *Nothura*, and *Tinamotis*, while *Heptapsogaster* is found almost exclusively on *Crypturellus*, a woodland-inhabiting genus of tinamous.

The following genera of Mallophaga have thus far been taken only on the savanna-, or puna-, inhabiting forms of tinamous: *Tinamicola*, *Rhynchothura*, *Docophorocotes*, *Cuclotocephalus*, *Lamprocorpus*, and *Tinamotaecola*. The only species of Amblycera certainly known to infest the tinamous have been taken on two genera of this group of hosts—*Menacanthus arctifasciatus* (Piaget) on *Rhynchotus* and *M. nothoproctae*, new species, on *Nothoprocta*.

All the remaining genera, except one, now known to be parasitic on the grassland-inhabiting tinamous belong to the family Heptapsogastriidae, those belonging to the Philopteridae being restricted to the woodland group of tinamous (*Pseudolipeurus*, an offshoot of the old genus *Lipeurus*, and *Pseudophilopterus*, most likely derived from *Philopterus* or its progenitor). However, a new genus is described in this paper (*Tinamotaecola*) from *Tinamotis* which is a philopteroid and seems to bear the same relation to *Degeeriella* that *Pseudophilopterus* bears to *Philopterus*.

Our knowledge of the Mallophaga from the grassland tinamous is much less extensive than of the woodland-inhabiting forms, but the evidence now in hand seems quite conclusive that all, or nearly all, the genera of lice infesting them are peculiar to that group of hosts. I have yet to find any trace of the "scent" gland on any species of Mallophaga infesting the grassland tinamous, while many of the species now placed under *Heptapsogaster* and allied genera possess them. I should not yet say that the presence or absence of scent glands should be taken as a generic character, but certainly these organs deserve closer attention.

I agree with Miss Clay (1937, p. 135) in her suggestion that perhaps some of the species now placed by me under *Heptapsogaster* (such as *platycephalus* and *petersi*) should be removed from that genus, but I do not agree with her suggestion of placing them under *Megapeostus*. I think that any revision of this kind should await additional material and further study.

In a friendly spirit I might make more or less the same criticism of Miss Clay's arrangement of the species and genera in her splendid report on the Mallophaga of the gallinaceous birds. Her genus *Oxylipeurus* is, to my way of thinking, entirely too unwieldy and seems to contain species not congeneric. This genus contains species from both Old and New World gallinaceous birds and from such distantly related avian families as Phasianidae, Cracidae, and Perdidae. There are many superficial resemblances between some of the parasites from these three families, but there are more *actual* differences between some of them than there are between some of the *genera* of their hosts.

I fully realize the inadequacy of my 1936 report on the lice of the tinamous and know that certain changes in my original classification are inevitable, but I do not think that these changes should be made without ample material to justify them. Quite a number of corrections and changes have already been made by myself and also by other workers, some of which I heartily endorse; others I cannot accept, because my own perhaps more ample material does not corroborate them. My hope is that in the present report I may have added con-

siderably to our knowledge of this difficult but fascinating group of insects and laid a secure foundation for future work.

A most regrettable error was made in my 1936 report regarding the measurements given there. *All* measurements given are *too small*, owing to an error made in calibrating the eye-piece micrometer with the stage micrometer, which consisted of 1.1 mm. instead of 1 mm. as I had supposed. All these published measurements may be corrected by multiplying each by the constant 1.084. In the present report, as well as the first, all measurements were made by means of the eye-piece micrometer. All measurements used are in millimeters, and all drawings were made by me.

I take this opportunity of expressing my thanks to Dr. Alexander Wetmore, director of the U. S. National Museum, for his permission to study all the Mallophaga collected while engaged in ornithological explorations for that institution in Mexico and Colombia, and for his assistance and encouragement during the preparation of this report, as well as that given me by Dr. E. A. Chapin, curator of insects in the same institution. I also extend my appreciation to Dr. G. H. E. Hopkins for his generous cooperation and helpful criticisms from time to time, especially in having fresh material compared with the old types of Piaget and others, thereby establishing certain identifications beyond question.

Suborder AMBLYCERA Kellogg

Family MENOPONIDAE Mjöberg

Genus MENACANTHUS Neumann

MENACANTHUS NOTHOPROCTAE, new species

FIGURE 1, a-c

Types.—Male and female, adults, from *Nothoprocta cinerascens*, collected by the author at Villa Montes, El Chaco, Bolivia, November 6, 1936; in collection of author.

Diagnosis.—Closely related to *M. arctifasciatus* (Piaget), taken on *Rhynchotus r. rufescens* and *R. rufescens maculicollis*, the female differing chiefly from that species in the size and proportions of the body segments, shape of head, different shape of last abdominal segment, and its chaetotaxy, as well as the chaetotaxy in general of the abdomen, the present species having the hairs, both dorsal and ventral, shorter and fewer.

The male of *M. arctifasciatus* not having been taken by either Piaget or myself, no comparison can be made of the genitalia, which will no doubt prove to be distinct.

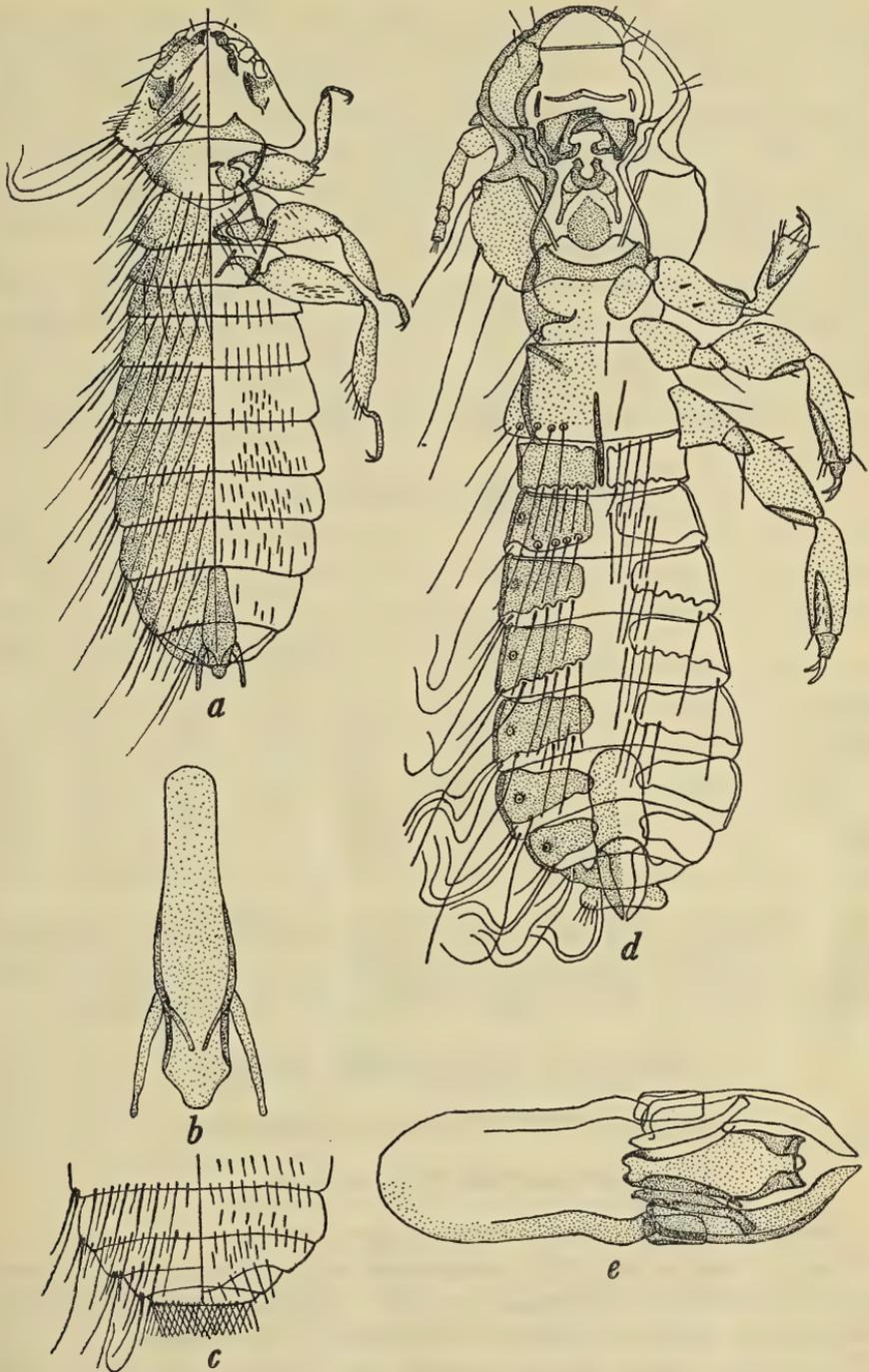


FIGURE 1.—MENACANTHUS AND TINAMOTAECOLA

a-c, *Menacanthus nothoproctae*, new species: *a*, Male; *b*, male genitalia; *c*, tip of female abdomen.

d, e, *Tinamotaecola andinae*, new genus and species: *d*, Male; *e*, male genitalia.

In the female of both *arctifasciatus* and *nothoproctae* there is a decided horizontal slit on the side of the head slightly behind the tip of the antennae. This slit is more pronounced in *arctifasciatus*, while in the male of *nothoproctae* it is completely closed, there being but a trace of it visible. The male genitalia are simple, consisting of a basal plate, semimovable paramers, and rigid endomeres, the paramers being attached on the *side* of the basal plate, while the latter extends nearly to the tips of the former.

The discovery of another species of *Menacanthus* on another genus of Tinamidae creates a puzzling situation. They are the only species of Amblycera known to be parasitic on this family of birds, so that they are undoubtedly of much more recent acquisition than the multitude of complex genera and species of Ischnocera found so abundantly on them.

MEASUREMENTS OF MENACANTHUS

Structure	<i>M. nothoproctae</i>				<i>M. arctifasciatus</i>	
	Male		Female		Female	
	Length	Width	Length	Width	Length	Width
Body.....	1.76	-----	1.82	-----	2.01	-----
Head.....	0.33	0.50	0.37	0.53	0.35	0.55
Prothorax.....	0.21	0.37	0.26	0.42	0.23	0.40
Mesothorax.....	0.17	0.44	0.23	0.51	0.17	0.50
Metathorax.....	0.09	0.47	0.11	0.58	0.13	0.56
Abdomen.....	1.06	0.58	1.11	0.82	1.33	0.83
Genitalia.....	0.32	0.08	-----	-----	-----	-----

In *nothoproctae* the paratergal plates are more heavily pigmented than the tergites, while in *arctifasciatus* the two are more or less of the same pigmentation but are separated by a narrow hyaline space.

Suborder ISCHNOCERA Kellogg

Family PHILOPTERIDAE Burmeister

TINAMOTAECOLA, new genus

Genotype.—*Tinamotaecola andinae*, new species.

Head circumfasciate, with pronounced antennal fossae and concave occiput; small fixed trabeculae; antennae simple, similar in the sexes, with second segment the longest and the last three subequal.

Transverse clypeal suture present, but fused at the sides; clear postantennal suture running diagonally backward from base of antennal bands to sides of occiput; narrow clypeal band completely

encircling the *frons*; internal clypeal bands running from base of antennal bands to front of head; occipital bands continuous from base of antennal bands to sides of occiput.

Thorax small, the combined segments much smaller than the head. Prothorax quadrilateral; pterothorax with mesothorax indicated, but the two segments completely fused; sides slightly divergent and posterior margin flatly convex, with numerous, very long, pustulated hairs set submarginally.

Abdomen elongated, widest at segments V and VI, similarly shaped in the two sexes, and composed of *nine segments*, with segment IX very small; tergal plates widely separated medially; paratergal plates very narrow and fused to tergites; sternal plates apparently absent.

Male genitalia well developed, basal plate longer than paramers; paramers heavy; dorsal endomeral plate large, with small penis attached; slender ventral endomeral plates on each side of base of dorsal sclerite. Legs stout but not excessively long, with tibiae and femora about equal; trochanters well developed; the second and third pairs of coxae unusually large, articulated near sides of thorax, and with more than half of segment *outside* of body.

The genus superficially resembles some of the circumfasciate forms of *Degeeriella*, but the head structure seems to be unique, while the genital armature is of an entirely different type, as well as the structure of the abdominal sclerites. It probably bears a relationship to the *Degeeriella* group similar to that which *Pseudophilopterus* bears to *Philopterus* and *Pseudolipeurus* to *Esthiopterum*.

This is the third known genus of Philopteridae whose true host is unquestionably a species of Tinamidae. It has been clearly proved that the true host of *Lipeurus rhynchoti* Carriker is a species of Cracidae and that *Cuclotogaster laticarpus* Carriker is the ordinary chicken louse, *Cuclotogaster heterographus* (Giebel).¹ I doubt very much whether the true host of *Esthiopterum tataupa* Carriker is *Crypturellus tataupa*, and so the only Philopteridae left whose true hosts are unquestionably species of the Tinamidae are *Pseudolipeurus*, *Pseudophilopterus*, and *Tinamotaecola*.

TINAMOTAECOLA ANDINAE, new species

FIGURE 1, *d, e*

Types—Male and female, adults, from *Tinamotis pentlandi*, collected by the author at Chocaya, Bolivia, June 18, 1936; in collection of the author.

Description of male.—Front of head circular, with a slight protu-

¹ Carriker, M. A., Jr., *Lloydia*, vol. 3, No. 4, p. 298, Dec. 1940.

berance on the median portion, where the clypeal band is slightly submarginal (not shown in figure) and has the inner margin crenulated. The arrangement of the clypeal, antennal, and occipital bands is somewhat complicated and can best be understood by consulting the figure. The mandibles are large but not thickened and are set but slightly forward of the middle of the head; the left mandible is toothed and the right sharply pointed; pharyngeal sclerite and gland large; gular plate small and but slightly chitinized; eye prominent and set with an extremely long, strong hair (very unusual). Temples flatly rounded, with two large, pustulated hairs and one small; occipital margin deeply reëntering, but occiput flatly convex.

Prothorax one-fourth covered by head, sides strongly convex, posterior margin nearly straight, and with one long hair inside the prominent spiracle.

Pterothorax about equal in length to prothorax, with sides slightly divergent and sinuate; four submarginal hairs on each side of posterior margin, the three inner ones pustulated. Abdomen rather slender, widening gradually to segment V and with tip bluntly rounded, except for the slightly protruding segment IX. The tergal plates are irregularly shaped, widely separated medially, and from one another in segments III to VIII; paratergal plates narrow, without reëntrant heads, and strongly chitinized. Segment I with four long dorsal hairs on each side of posterior margin of tergite; segment II with one hair at angle and four long hairs on posterior margin of tergal sclerite; segment III with one short and two long hairs in posterior angle and four dorsal hairs on tergites; segment IV with two hairs in angle and five on posterior margin of tergite; segment V with three hairs at angle, three at margin, and two on surface of tergite; segment VI with three hairs at angle and one on margin of tergal plate; segments VII and VIII with three hairs in angle; segment IX with two long and four short hairs on each side of posterior margin. The hairs on the ventral surface are shown on the right side of figure, those on dorsal surface at the left.

Legs as under generic description; claws medium, somewhat blunt at tips. A few short bristles on femora and tibiae and a longish hair on second and third trochanter; all femora and tibiae more or less excavated on underside in posterior portion.

Female very similar to male, except in larger size, but with the antennae of the same length; chaetotaxy quite similar, but tergal plates less irregularly shaped and with the two plates fused medially on segment VIII.

MEASUREMENTS OF TINAMOTAECOLA ANDINAE

Structure	Male		Female	
	Length	Width	Length	Width
Body	1.86		2.17	
Head	0.59	0.48	0.63	0.53
Prothorax	0.22	0.30	0.22	0.30
Pterothorax	0.22	0.39	0.26	0.37
Abdomen	1.00	0.50	1.28	0.61
Antennae	0.26	0.05	0.26	0.06
Basal plate	0.26	0.13		
Paramers	0.18	0.14		
Endomeral plate	0.15	0.07		

Genus PSEUDOLIPEURUS Carriker

PSEUDOLIPEURUS LONGIPES (Piaget)

Lipeurus longipes PIAGET, Les Pédiculines, p. 329, pl. 28, fig. 3, 1880. (Host: *Tinamus obsoletus*=*Crypturellus o. obsoletus*, Brazil.)

Dr. Hopkins has recently received from Brazil specimens of *P. longipes* taken on *Crypturellus o. obsoletus*, which, when compared with Piaget's types, proved to be identical with them but different from the specimens taken by me on *C. obsoletus punensis*, and which I had redescribed as *P. longipes* (Carriker, 1936, p. 72, pl. 3, figs. 2, 2a, 2b). Dr. Hopkins has transmitted his findings regarding the two forms, making my specimens from *C. o. punensis* the types of a new subspecies (p. 93). He has communicated to me the differences between the two forms, so that I am now able to define clearly the status of the series of specimens of *P. longipes* taken in Mexico on *Tinamus major percautus*, *Crypturellus b. boucardi*, and *C. cinnamomeus sallaei*.

According to Dr. Hopkins, true *longipes* differs from the parasites described by me from *C. obsoletus punensis* as follows:

"The chitinous bars which strengthen the basal plate converge distally distinctly more strongly in Piaget's form; the paramers are decidedly stouter and more strongly bent than in the material from *punensis*, but the most striking difference is that the endomeral plate (of the same type in both forms) is proportionately very much shorter in the material from *C. o. punensis* than in true *longipes*; in the former it is little more than twice as long as broad and occupies slightly more than half (seven-thirteenths) of the longitudinal space between the paramers, whereas in true *longipes* it is rather more than three times as long as broad and occupies nearly three-quarters (nine-thirteenths) of this space. In the form from *C. o. punensis* the female is considerably larger than the male, while the head is decidedly wider in the female than in the male. Neither of these characters holds good

in true *longipes*, the sexes being practically of the same size and with the same width of head."

MEASUREMENTS OF PSEUDOLIPEURUS LONGIPES

Structure	Seven males from <i>C. b. boucardi</i> (Mexico)		One male from <i>C. c. sallaei</i> (Mexico)		One male from <i>T. m. percautus</i> (Mexico)	
	Length	Width	Length	Width	Length	Width
Body.....	2.15-2.25	-----	2.15	-----	2.28	-----
Head.....	0.51-0.53	0.37-0.38	0.49	0.37	0.53	0.38
Thorax.....	0.51-0.54	0.35-0.38	0.52	0.26	0.53	0.27
Abdomen.....	1.28-1.34	0.41-0.45	1.28	0.39	1.34	0.45
Antennae.....	0.36-0.39	-----	0.38	-----	0.39	-----
Paramers.....	0.191-0.20	-----	0.20	-----	0.194	-----
Paramers at base.....	-----	0.10-0.107	-----	-----	-----	0.117
Endomeres.....	0.135-0.143	0.053-0.056	0.138	0.051	0.138	0.061

Structure	One male from <i>C. o. obsoletus</i> (Brazil) (after Piaget)		Two specimens from <i>C. o. punensis</i> (Bolivia)			
	Length	Width	Male		Female	
			Length	Width	Length	Width
Body.....	1.90	-----	1.95	-----	2.06	-----
Head.....	0.44	0.33	0.48	0.335	0.53	0.42
Thorax.....	0.40	0.33	0.45	0.305	0.47	0.41
Abdomen.....	1.01	0.38	1.17	0.30	1.25	0.48
Antennae.....	0.28	-----	0.31	-----	0.34	-----
Paramers.....	-----	-----	0.191	0.11	-----	-----
Endomeres.....	-----	-----	0.138	0.059	-----	-----

From the foregoing measurements it is obvious that the specimens from *C. o. punensis* do not fall within the extremes of the measurements of any of the Mexican material, while the genitalia differ in shape, although to no great extent in measurements, except for the width at base of paramers.

The paramers are, however, thin toward the base and much thickened and rounded at the tips (circular), while in the Mexican material they are not only thicker at the base, but also thicker in the median portion and are bent more sharply toward the rapidly tapering tips, while the contour of the outer margin (on the bent apical portion) is concave, not convex, as in the specimens from *C. o. punensis*.

We have, therefore, in the Mexican material, a genital armature which, in its longitudinal proportions, resembles that of the specimens from *C. o. punensis*, while the shape of the paramers is that of *P. l. longipes* (Piaget); the body measurements are much greater and of different proportions than either *P. l. longipes* or the specimens from *C. o. punensis*, but with the female larger than the male and with the

temples wider in the female than in the male, precisely as in the specimens from *C. o. punensis*.

The parasites from *C. b. boucardi* are therefore entitled to subspecific rank, and the single male taken on *C. cinnamomeus sallaei* must go along with them, since practically all of its body measurements are within the extremes given for the material from *boucardi*, while the genital armature is even closer.

Had there been the slightest possibility of straggling, I would say that *C. cinnamomeus sallaei* is not the true host of this single male, but since the specimen of *C. c. sallaei* was shot prior to the taking of any birds of *C. b. boucardi*, all thought of straggling is eliminated. The single male taken on *Tinamus major percautus* also obviously belongs to that host and is very close to the specimens from *C. b. boucardi*, especially in its body measurements, all of them except two falling within the extremes for the *boucardi* material. However, the genital armature is not the same, and this, after all, is the safest character to use in this group. In addition, the shape of the last abdominal segments differs, and so it seems advisable to give this specimen subspecific rank.

We therefore have the following arrangement of the races of *P. longipes* and their respective hosts:

PSEUDOLIPEURUS LONGIPES LONGIPES (Piaget)

Lipeurus longipes PIAGET, Les Pédiculines, p. 329, pl. 28, fig. 3, 1880. (Host: *Tinamus obsoletus*=*Crypturellus o. obsoletus*, Brazil.)

PSEUDOLIPEURUS LONGIPES SIMILIS, new subspecies

FIGURE 2, b

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

Differs from *P. l. longipes* and *P. l. carrikeri* in much smaller size and in size and proportion of the male genitalia and also from *P. l. longipes* in sexual dimorphism (see previous discussion).

A single male of this race was also taken on *Crypturellus cinnamomeus sallaei*, shot at Tres Zapotes, Veracruz, Mexico, on March 27, 1940.

PSEUDOLIPEURUS LONGIPES ROBUSTUS, new subspecies

FIGURE 2, a

Type.—Male, adult, the only specimen, taken on *Tinamus major percautus*, collected on Cerro Tuxtla, Veracruz, Mexico, by the author on March 23, 1940; in U. S. National Museum.

Very similar to *P. l. similis* in size and appearance, but differs from it as follows: Basal plate and genital armature considerably wider, with endomerale plate larger and of different shape (see fig.), and with paramers thicker toward their tips and less tapering; posterior pair of femora and tibiae longer, but middle pair shorter.

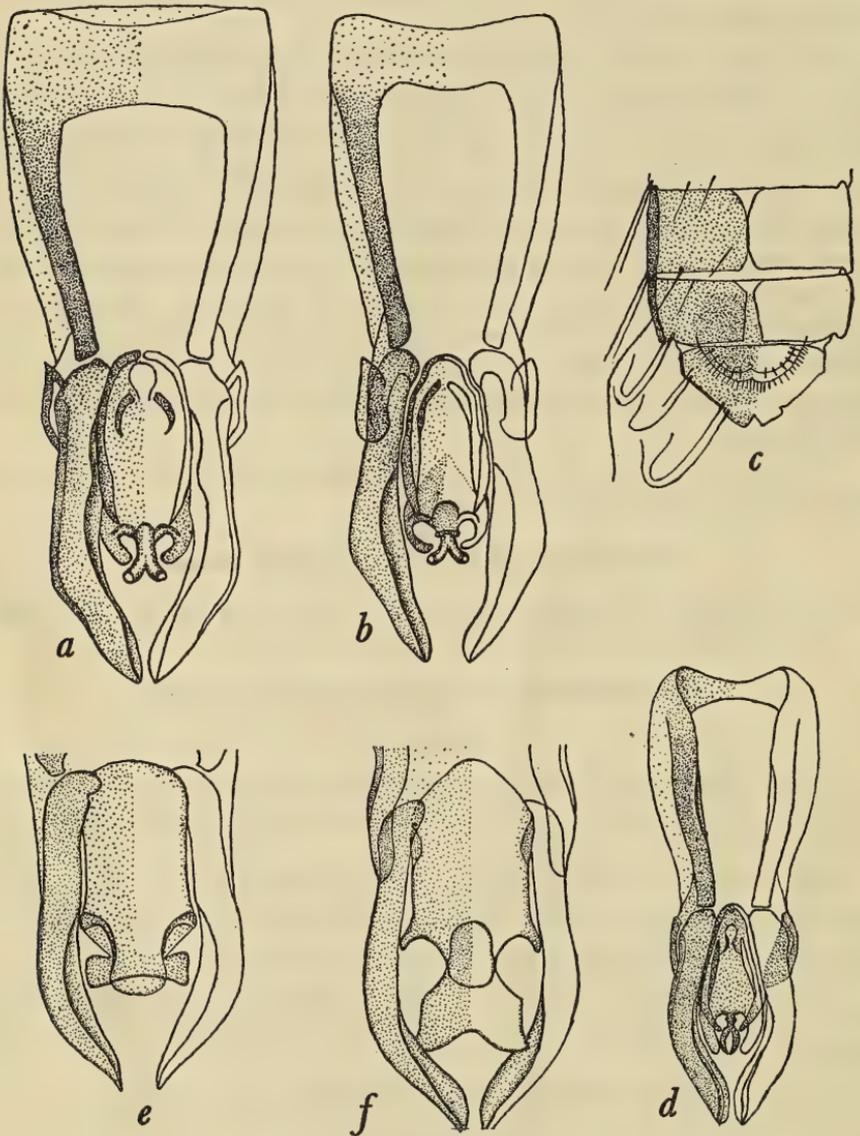


FIGURE 2.—PSEUDOLIPEURUS

- a*, *Pseudoliipeurus longipes robustus*, new subspecies: Male genitalia.
b, *P. l. similis*, new subspecies: Male genitalia.
c, d, *P. l. garleppi*, new subspecies: *c*, Female abdomen; *d*, male genitalia.
e, *P. tinami tinami* (Carriker): Male genitalia.
f, *P. t. serratae*, new subspecies: Male genitalia.

PSEUDOLIPEURUS LONGIPES GARLEPPI, new subspecies

FIGURE 2, c, d

Types—Male and female, adults, from *Crypturellus garleppi affinis*, collected at Todos Santos, Río Chaparé, Bolivia, by the author on August 11, 1937; in collection of author.

Diagnosis.—This race is very close to *P. l. carrikeri*, from *Crypturellus obsoletus punensis*, in body structure but differs rather strongly in the shape and proportions of the genital armature. The female is considerably larger than the male, but the head is no wider at the temples. The measurements as compared with those given by Piaget for *longipes* show: Length considerably more (2.08 against 1.90); head 0.44 by 0.33 against 0.49 by 0.35; thorax longer, but same width; abdomen longer and narrower; antennae longer (0.32 against 0.28).

Compared with *P. l. carrikeri* we have: Size much larger in both sexes, with cephalic index quite different (male, 1.04 against 1.43; female, 1.33 against 1.26); abdomen longer and wider, but thorax nearly the same. The proportions of the male genitalia are very close, but all component parts are of different shape (paramers 0.195 by 0.11 against 0.191 by 0.11; endomeral plate 0.14 by 0.065 against 0.138 by 0.059).

MEASUREMENTS OF PSEUDOLIPEURUS LONGIPES GARLEPPI

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.08	-----	2.45	-----
Head.....	0.49	0.35	0.52	0.39
Prothorax.....	0.18	0.25	0.205	0.24
Pterothorax.....	0.32	0.33	0.32	0.37
Abdomen.....	1.28	0.32	1.47	0.40
Third femur.....	0.48	0.11	0.456	0.12
Antennae.....	0.32	0.046	0.35	0.043
Basal plate.....	0.22	0.12	-----	-----
Paramers.....	0.195	0.11	-----	-----
Endomeres.....	0.14	0.065	-----	-----

PSEUDOLIPEURUS LONGIPES CARRIKERI Hopkins, new subspecies

FIGURE 4, d

Pseudolipeurus longipes CARRIKER, Lice of the tinamous, p. 72, pl. 3, figs. 2-2b, 1936 (not Piaget). (Host: *Crypturellus obsoletus punensis*.)

The following description of this race is from the manuscript prepared by Dr. G. H. E. Hopkins and kindly sent to me for incorporation in the present review of the group:

"Piaget (1880, p. 329, pl. 28, fig. 3) describes and figures *Lipeurus longipes* from a male found on a skin of *Tinamus obsoletus* in the

Leyden Museum. Carriker (1936, p. 72, pl. 3, fig. 2) redescribes what he took to be the same form from *Crypturellus obsoletus punensis* from Peru and Bolivia, though noting that Piaget's type was probably from the Brazilian form of the host (*C. o. obsoletus*) and might prove slightly different; he placed the species in his new genus *Pseudolipeurus*. Clay (1937, p. 133) compared Piaget's type with Carriker's figure and found that in the type the hyaline frontal margin is bilobed, whereas Carriker's figure shows it entire. She was unable to decide whether the difference should be considered subspecific owing to the absence of adequate material.

"Recently I received from Prof. Plaumann a collection of Mallophaga taken on *Crypturellus o. obsoletus* (Temminck) in south Brazil, which included a good series of *Pseudolipeurus longipes* (Piaget). All these specimens have the frontal margin bilobed as in Piaget's type and Miss Clay kindly compared one of the males with Piaget's type and found it to be identical. Meanwhile Mr. Carriker has most kindly sent me two males and two females comprising the whole of the material from which he redescribed the species, except the single male from Calabatea, Bolivia, which is no longer in his possession. In all these specimens the hyaline frontal margin is practically straight, but in all of them it has a somewhat folded and collapsed appearance, and so I am unable to satisfy myself that the apparent absence of the two lobes is genuine. But there are other differences between the two forms, some of which appear to be constant, which convince me that they are subspecifically distinct.

"The most important difference is in the form of the male genitalia: The chitinous bars which strengthen the basal plate converge distally more strongly than in Piaget's form and the paramers are decidedly stouter and more strongly bent than in the material from *C. o. punensis*, but the most striking difference is that the endomerale plate (of the same type in both forms) is proportionally very much shorter in the material from *C. o. punensis* than in true *longipes*; in the former it is little more than twice as long as broad and occupies slightly more than half (seven-thirteenths) of the longitudinal space between the paramers, whereas in true *longipes* it is rather more than three times as long as broad and occupies three-quarters (nine-thirteenths) of this space. Carriker has drawn attention (1936, p. 72) to the fact that in his form the head is decidedly narrower in the male than in the female, and that the female is much longer than the male. Neither of these observations is true of *longipes*, in which the sexes are almost exactly the same size and the cervical index is 1.33 in both sexes. The two pairs from *C. o. punensis* are by no means uniform in either of these respects, and I am not convinced that we are not dealing with three subspecies instead of two, but in

the absence of more material it is safer to consider the two pairs from this host to be of one form; in each pair the head is narrower in the male than in the female, and the female is much the larger insect. In the pair from Bolivia the cervical index is 1.5 in the male and 1.3 in the female, and the total length is 1.95 mm. in the male and 2.03 in the female. In the Peruvian pair the cervical index is 1.3 in the male and 1.25 in the female, and the total length is 2.20 in the male and 2.61 in the female. In true *longipes* the cervical index is 1.33 in both sexes and the difference in total length is trivial (male 2.37; female 2.47).

"I have much pleasure in naming Mr. Carriker's form *Pseudolipeurus longipes carrikeri*. The holotype male and allotype female (on one slide) are from *Crypturellus obsoletus punensis* (Chubb), Sandillani, Dept. La Paz, Bolivia, November 25, 1934, and have been returned to Mr. Carriker. The pair of paratypes which Mr. Carriker has very generously permitted me to retain are from the same host, La Oroya, Peru, June 6 and 12, 1931. All specimens were collected by Mr. Carriker.

"The fact that my males from *C. o. obsoletus* agree perfectly with Piaget's type strongly supports the suggestion that the type of *Pseudolipeurus l. longipes* (Piaget) came from the nominate form of the host."

Remarks.—Dr. Hopkins notes that his measurements are not the same as published by me for the specimens under discussion and suggests that they were made from the projection of the image of the specimen, with a rule obtained by projecting a stage micrometer at the same distance from the projector and tracing the image on paper. However, I wish to take this opportunity of stating that *all* the measurements published by me in 1936 were made directly from the insect by means of an eyepiece micrometer calibrated to the magnification used. The error he mentions in the measurements, or rather the difference, was due to a mistake made by me in the calibration of my eyepiece micrometer; *all* the measurements given in my "Lice of the Tinamous," 1936, present the same error. A true correction may be obtained by multiplying all the measurements by the constant 1.084.

PSEUDOLIPEURUS TAOI PERUVIANUS, new subspecies

Type.—Female, adult, from *Tinamus tao kleei*, collected by the author at La Pampa, Peru, July 5, 1931; in collection of author.

This race is based on a single female (the type), which was previously identified as *P. taoi* Carriker. A careful study of the additional material from *T. t. tao*, collected in Colombia, together with the single female from *T. tao kleei*, shows that the Peruvian insect is not the same and deserves subspecific rank.

Unfortunately no male was taken, but the characters shown by the female, although not strikingly different, seem to be of subspecific value.

The measurements are considerably greater in all respects, while the cephalic index remains the same; the head is wider at the base of the trabeculae and at the *frons* (in proportion to the width at the temples); the sides of the prothorax and the occipital margin of the head are more emarginate; the tergal plates are wider, being but slightly separated medially, while in *taoi* they are separated by a hyaline space two-thirds the width of the paratergal plates; the paratergals are much narrower (half the width); the last abdominal segment is much wider at its anterior end, with sides more converging, while the chaetotaxy of this segment is some different.

MEASUREMENTS OF TWO RACES OF PSEUDOLIPEURUS TAOI

Structure	<i>taoi</i> (females)		<i>peruvianus</i> (female)	
	Length	Width	Length	Width
Body.....	1.80-1.94		2.10	
Head {trabeculae.....	0.46-0.51	-0.27 0.38-0.43	0.53	0.30 0.44
{temples.....				
Prothorax.....	...-0.18	0.24-0.25	0.22	0.29
Pterothorax.....	0.25-0.28	0.33-0.37	0.32	0.41
Abdomen.....	1.08-1.17	0.37-0.44	1.26	0.49
Antennae.....	0.31-0.32	...-0.043	0.36	0.045

PSEUDOLIPEURUS TINAMI TINAMI (Carriker)

FIGURE 2, e

Lipeurus longipes tinami CARRIKER, Univ. Nebraska Stud., vol. 3, No. 2, p. 146, pl. 3, fig. 3, 1903. (Host: *Tinamus robustus*=*T. major castaneiceps*, from Pozo Azul, Costa Rica.)

Esthiopterum tinami (Carriker) HARRISON, The genera and species of Mallophaga, p. 143, 1916.

Pseudolipeurus tinami (Carriker) CARRIKER, Lice of the tinamous, p. 69, pl. 2, figs. 2, 2a, 1936.

Numerous males and females were taken on *Tinamus major percautus* collected on Cerro Tuxtla and at Tres Zapotes, Veracruz, Mexico, by the author in 1940.

The Mexican specimens are very close to the types from Costa Rica, but there are certain slight differences as follows: Total length in both sexes slightly greater; head of male some longer (0.48 against 0.52) but not wider; in the female it is both longer and wider; prothorax in both sexes the same length, but slightly narrower; pterothorax almost same in male, larger in female; abdomen longer in both sexes, scarcely wider in male but considerably wider in female; the antennae

slightly shorter and thicker in both sexes; hyaline frontal margin bilobed in both forms but wider in Mexican specimens.

If we consider the wide range of individual variation present in this genus, these differences do not seem to be of sufficient extent or importance to warrant the separation of the Mexican parasites. I have found other species of Mallophaga to be the same on both *Tinamus major castaneiceps* and *T. m. percautus*.

PSEUDOLIPEURUS TINAMI SERRATAE, new subspecies

FIGURE 2, f

Type.—Male, adult, from *Tinamus s. serratus*, collected by the author at Todos Santos, Río Chaparé, Bolivia, September 9, 1937; in collection of author.

Diagnosis.—In general appearance very close to *P. t. tinami* but slightly smaller in all body dimensions (see table of measurements) except the genitalia, which are actually larger (paramers, 0.16 by 0.097 against 0.14 by 0.09; endomerale plate, 0.14 long against 0.11).

The temples are less rounded, running almost straight back from the eye to the rounded posterior angle, and not uniformly curving as in *tinami*. The most striking differences between *serratae* and *tinami* are the shape of the endomerale plate and the longer, slenderer paramers, with thicker ends (see figures). The genital armature in this genus furnishes excellent characters for the separation of species and subspecies.

MEASUREMENTS OF THE TYPE (MALE) OF PSEUDOLIPEURUS TINAMI SERRATAE

Structure	Length	Width
Body.....	1.74	
Head {frons.....		0.26
{temples.....	0.46	0.39
Prothorax.....	0.18	0.24
Pterothorax {front.....	0.27	0.29
{rear.....		
Abdomen.....	1.02	0.32
Antennae.....	0.38	0.045
Paramers.....	0.16	0.097
Endomerale plate.....	0.14	

This race of *tinami* differs more from the nominate form than does *P. t. ruficeps*, especially in the shape of the temples and the endomerale plate. *Tinamus major* and its races are very closely related to the *T. serratus* group, so much so that there has been uncertainty as to which group the Colombian bird, *T. s. ruficeps*, should be allocated, some authors having placed it under *major*. The close relationship

between the *Pseudolipeurus* parasites of these two avian species corroborates this fact and would lead one to believe that *ruficeps* might well be conspecific with *major* rather than with *serratus*, or that *major* and *serratus* were also conspecific. Three males, including the type, were taken, but no females.

PSEUDOLIPEURUS TINAMI RUFICEPS, new subspecies

FIGURE 3, a-c

Types.—Male and female, adults, from *Tinamus serratus ruficeps*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; types in U. S. National Museum.

Diagnosis.—General shape of head and body and male genital armature similar to those of *P. t. tinami*, differing in proportions only.

In the male the total length is less, the head is slightly shorter but considerably narrower; the prothorax of same length but much narrower; pterothorax also much narrower; the antennae as well as the third femur slightly smaller; the basal plate longer and narrower, and the paramers longer and slenderer apically; the endomerale plate, basal plate, and paramers are of slightly different shape.

The female is also smaller than the female of *tinami*, but the proportions are not the same as in the male (see table of measurements). Two males and two females (including the types) were taken. Another individual of this host failed to yield parasites of the species.

MEASUREMENTS OF PSEUDOLIPEURUS TINAMI RUFICEPS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.74		1.80	
Head.....	0.466	0.357	0.487	0.395
Prothorax.....	0.19	0.227	0.174	0.25
Pterothorax.....	0.26	0.305	0.25	0.35
Abdomen.....	0.98	0.303	1.05	0.32
Antennae (segment 1).....	0.11	0.045	0.053	0.04
Antennae (segment 2).....	0.087	0.03	0.097	0.02
Basal plate.....	0.195	0.087		
Paramers.....	0.15	0.09		
Third femur.....	0.41	0.11	0.39	0.11
Antennae (total).....	0.347		0.32	

PSEUDOLIPEURUS SANCTAE-MARTAE, new species

FIGURE 3, d-g

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; in U. S. National Museum.

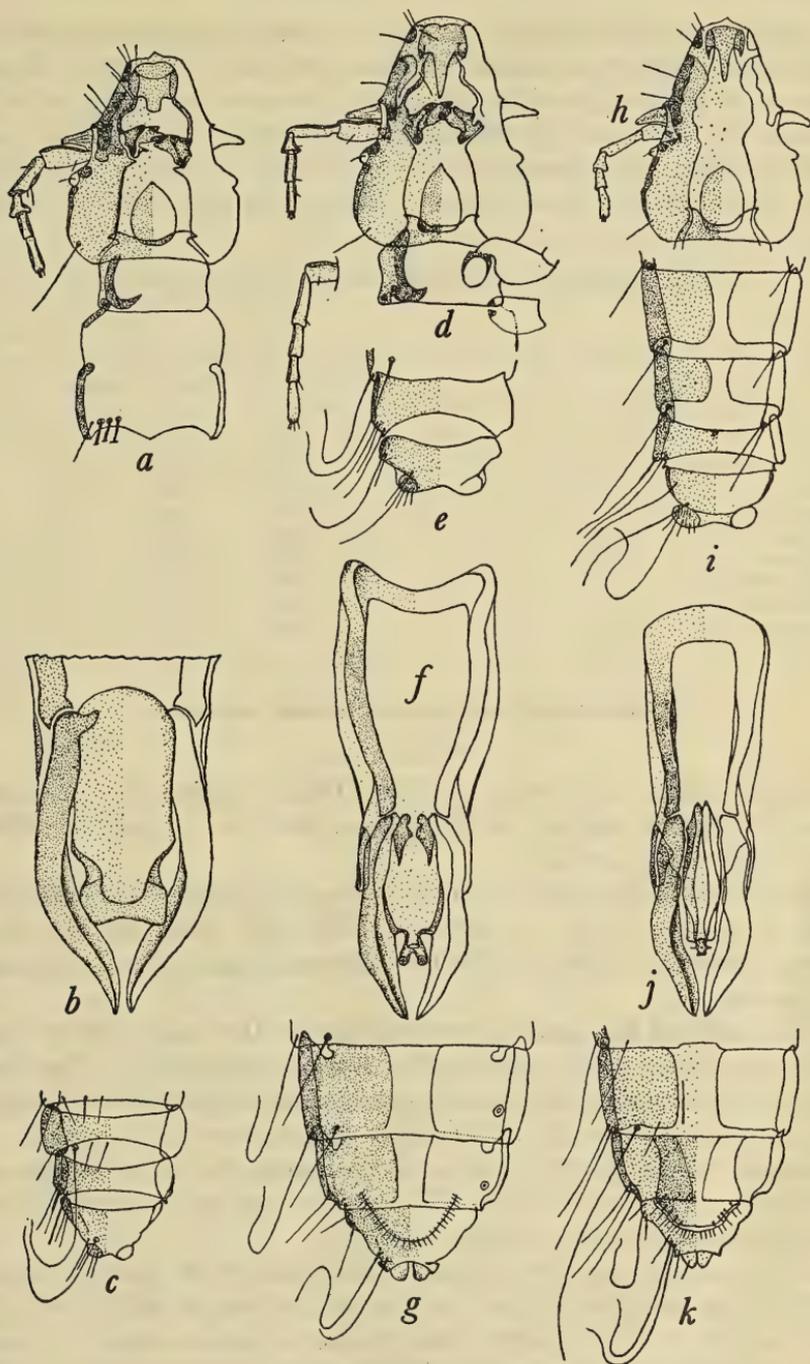


FIGURE 3.—PSEUDOLIPEURUS

a-c, *Pseudolipeurus tinami ruficeps*, new subspecies: *a*, Male head and thorax; *b*, male genitalia; *c*, tip of female abdomen.

d-g, *P. sanctae-martae*, new species: *d*, Male head and thorax; *e*, female antennae and tip of male abdomen; *f*, male genitalia; *g*, tip of female abdomen.

h-k, *P. tataupicola*, new species: *h*, Male head; *i*, tip of male abdomen; *j*, male genitalia; *k*, tip of female abdomen.

Diagnosis.—Nearest to *P. longipes* (Piaget) in general shape of head and clypeal signature, but the antennae are quite different. In *longipes* there is almost no dimorphism in the antennae, while in the new species they are strongly dimorphic; the tip of the abdomen in the male strongly resembles that of *P. subsimilis*, while the male genital armature is nearest to the type of *longipes*, but very different as to detail.

MEASUREMENTS OF PSEUDOLIPEURUS SANCTAE-MARTAE

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.10		2.41	
Head.....	0.50	0.37	0.53	0.41
Prothorax.....	0.18	0.24	0.19	0.28
Pterothorax.....	0.33	0.36	0.37	0.41
Abdomen.....	1.28	0.35	1.50	0.51
Antennae.....	0.36	0.04	0.36	0.04
Third femur.....	0.52	0.13	0.50	0.14
Basal plate.....	0.25	0.13		
Paramers.....	0.20	0.11		

PSEUDOLIPEURUS TATAUPICOLA, new species

FIGURE 3, h-k

Types.—Male and female, adults, from *Crypturellus t. tataupa*, collected by the author at Río Lipeo, Bolivia, August 9, 1938; in collection of the author.

Diagnosis.—This species, while having characters in common with several others, seems to differ considerably from all the known forms, just as its host is radically different from the other species of the genus.

The shape of the head is between that of the long, slender-headed *longipes* and the short, wide head of *tinami* and *grandis*. The chaetotaxy of the last four abdominal segments in the male differs radically from that of the female and from the other species of the genus. The structure of the pleural plates in the male also is rather unusual, especially in segments III to VI, the posterior portion being incised on the dorsal surface (see fig.).

The antennae are very slightly dimorphic, with the first segment in the male practically equal to that of the female and shorter than the *trabeculae*. The genital plate in the female resembles, in shape, that of *genitalis* and *grandis*, with the double fringe of setae around the posterior margin very close to *grandis*. The clypeal signature, while resembling several other forms of the genus, is slightly different from all, as is also the shape of the gular plate.

The male genital armature is, however, the most striking of the distinctive characters of the species. The basal plate is nearest to that of *longipes*, yet not the same, while the massive paramers are more or less of the same type as in *grandis*, *sanctae-martae*, and *subsimitis*, but the endomerale plate is unique for this genus in the structure of its posterior portion. The pair of "claspers" found in *grandis* and *longipes* is entirely absent, as well as the bifurcated penis of *longipes* and *sanctae-martae*, that organ being furnished with a row of spines near the tip.

MEASUREMENTS OF PSEUDOLIPEURUS TATAUPICOLA

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.97		2.20	
Head.....	0.46	0.33	0.49	0.36
Prothorax.....	0.16	0.20	0.17	0.23
Pterothorax.....	0.27	0.30	0.29	0.30
Abdomen.....	1.30	0.33	1.43	0.42
Antennae.....	0.28	0.03	0.27	0.04
Third femur.....	0.38	0.097	0.40	0.097
Basal plate.....	0.20	0.11		
Paramers.....	0.20	0.10		

PSEUDOLIPEURUS GRANDIS Carriker

FIGURE 4, a-c

Pseudolipeurus grandis CARRIKER, Lice of the tinamous, p. 73, pl. 3, figs. 1, 1a, 1936. (Host: *Nothocercus nigrocapillus*.)

This species was described from a single female taken on *N. n. nigrocapillus* from Sandillani, Bolivia. In 1941 five females and a male of this species were taken from *Nothocercus bonaparti*, in the Sierra Perijá of Colombia. The five females are almost identical with the type of *grandis*, there being but insignificant differences in measurements, and so until the male can be examined from the type host (*N. nigrocapillus*) I prefer to use the name *P. grandis* for these specimens from *N. bonaparti*.

Should the male from *N. n. nigrocapillus* prove to be different from the male here figured (from *N. bonaparti*), then the specimens from the latter host will have to be named, but I doubt very much whether they will prove to be even subspecifically different.

Diagnosis of male.—In this species there is an unusual discrepancy in size between the sexes, not only in the length and width of the abdomen but also in all the body segments. The cephalic index in the female is slightly less than in the male, the temples being wider. There

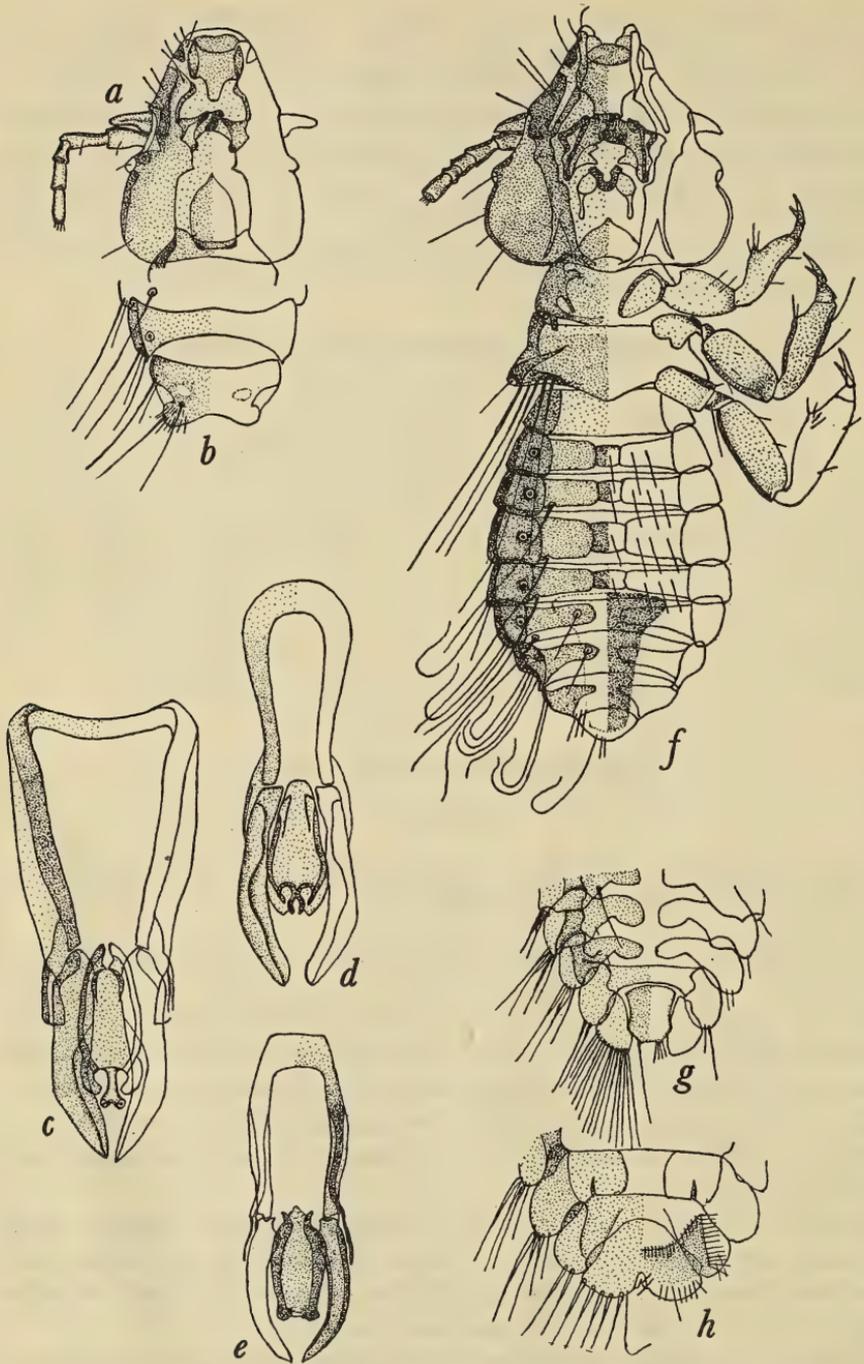


FIGURE 4.—PSEUDOLIPEURUS, PSEUDOPHILOPTERUS, AND STRONGYLOCOTES

- a-c.* *Pseudolipeurus grandis* Carriker: *a*, Male head; *b*, tip of male abdomen; *c*, male genitalia.
d. *P. longipes carrikeri* Hopkins, new subspecies: Male genitalia.
e, f. *Pseudophilopterus hirsutus similis*, new subspecies: *e*, Male genitalia; *f*, body of male.
g, h. *Strongylocotes subconiceps perijae*, new subspecies: *g*, Tip of male abdomen; *h*, tip of female abdomen.

is a slight dimorphism in the antennae, the first segment in the male being much larger than in the female (about equal to the second), while the third is slightly conical in shape and attached somewhat latterly to the second.

In this species, like others of the genus, the tergal plates are widely separated medially in the female, while in the male they are united, but not fused. The male genitalia have the endomerale plate and penis resembling those of *longipes*, but the basal plate is similar to that of *genitalis* and *subsimilis*. Flaps extend from each side of the basal plate downward along the sides of the paramers, giving added lateral support. The paramers are heavy and pointed, also resembling those of *genitalis*; the penis is bifurcated, and has lateral protecting flaps attached to the end of the endomerale plate.

MEASUREMENTS OF PSEUDOLIPEURUS GRANDIS

Structure	From <i>Nothocercus bonaparti</i> (Colombia)				Type female from <i>N. nigrocapillus</i> (Bolivia) (corrected)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	2.15	-----	2.93	-----	2.92	-----
Head.....	0.50	0.37	0.66	0.50	0.63	0.49
Prothorax.....	0.19	0.25	0.26	0.33	0.24	0.31
Pterothorax.....	0.34	0.37	0.44	0.57	0.41	0.49
Abdomen.....	1.30	0.38	1.76	0.65	1.78	0.58
Third femur.....	0.52	0.13	0.62	0.15	0.56	0.13
Antennae.....	0.37	0.046	0.46	0.053	0.41	-----
Basal plate.....	0.25	0.18	-----	-----	-----	-----
Paramers.....	0.21	0.11	-----	-----	-----	-----

Genus PSEUDOPHILOPTERUS Carriker

PSEUDOPHILOPTERUS HIRSUTUS SIMILIS, new subspecies

FIGURE 4, e, f

Types.—Male and female, adults, from *Crypturellus cinnamomeus sallaei*, collected by the author at Tres Zapotes, Veracruz, Mexico, March 27, 1940; in U. S. National Museum.

Diagnosis.—Male: The general shape of the head is similar to that of *hirsutus*, with broadly rounded temples and convex occiput, but the preantennary area has the sides more deeply concave and the frons wider. The antennae are shorter and thicker in both sexes; the trabeculae are longer, and the hairs on the preantennary area are much longer, as in *P. hirsutus obsoletus*.

The prothorax is short, as in *hirsutus*, but with the strongly convex sides more convergent anteriorly. The pterothorax is wider, more

angulated on the posterior margin, and more constricted laterally in anterior portion. The abdomen is more oval in shape, more broadly rounded posteriorly, with the last segment shorter and wider. The pleural and tergal plates are similar, but the former are more deeply pigmented and the darker markings are reduced to a *single* band along the lateral margin.

The general chaetotaxy is similar, but the hairs are longer throughout, while there is an additional long, pustulated hair at the inner edge of pleurite IV, on the posterior margin of the sclerite, similar to those on segments V and VI in *hirsutus*. The pigmented bands along the sides of the second and third pairs of femora are much narrower, and the femora are more swollen (less parallel-sided). The genitalia are similar to those of *P. h. obsoletus*, rather than of *hirsutus*.

The female is much like the male in most respects but is slightly larger, and, unlike *hirsutus*, the abdomen is similar in shape to the male, not long and slender. There are heavy, long, pustulated hairs at the inner, posterior corner of pleurites II and III, which are absent in the male.

MEASUREMENTS OF PSEUDOPHILOPTERUS HIRSUTUS

Structure	<i>hirsutus</i>				<i>similis</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.35		1.49		1.36		1.54	
Head.....	0.50	0.47	0.50	0.51	0.52	0.50	0.52	0.53
Prothorax.....	0.14	0.26	0.16	0.27	0.17	0.29	0.15	0.326
Pterothorax.....	0.12	0.32	0.13	0.31	0.13	0.41	0.14	0.41
Abdomen.....	0.69	0.38	0.95	0.44	0.67	0.49	0.79	0.52
Antennae.....	0.25		0.26		0.24		0.22	
Paramers.....	0.133	0.107			0.14	0.108		
Endomerale plate.....	0.087	0.066			0.097	0.053		
Basal plate.....	0.23	0.117			0.17	0.09		

Family HEPTAPSOGASTRIDAE Carriker

Subfamily STRONGYLOCOTINAE Carriker

Genus STRONGYLOCOTES Taschenberg

STRONGYLOCOTES COMPLANATUS INTERMEDIUS, new subspecies

Strongylocotes complanatus complanatus (Piaget) CARRIKER, Lice of the tinamous, p. 84, pl. 6, figs. 2-2b, 1936.

Types.—Male and female, adults, from *Crypturellus obsoletus ochraceiventris*, collected by the author at Eneñas, Dept. Junín, Peru, March 12, 1930; in collection of the author.

Specimens of *Strongylocotes complanatus* from *Crypturellus obsoletus punensis* and *C. o. ochraceiventris* were considered by Carriker (1936) to be the same. Since then I have secured additional material from *C. o. punensis* and also, through the courtesy of Dr. Hopkins, authentic specimens of *S. c. complanatus* (Piaget) from *Crypturellus o. obsoletus*, collected at Novo Teutonia, Brazil.

A careful study of all this material has resulted in the discovery not only that the specimens of *S. complanatus* from *C. obsoletus punensis* and *C. o. ochraceiventris* are very different from true *complanatus*, but also that those from *C. obsoletus punensis* are different from both of the others.

The parasites from *C. o. ochraceiventris* are without a name and are described below as *Strongylocotes complanatus intermedius*. However, there is a name available for those taken on *C. obsoletus punensis*, since the species described by Carriker (1936, p. 80) as *Nirmocotes nirmoides* from *C. obsoletus punensis* has proved to be the immature of *Strongylocotes*, and a description of the adult follows that of *S. c. intermedius*.

Diagnosis of S. c. intermedius.—The head of the male in true *complanatus* is longer and narrower at the temples; the sides of the thorax are quite straight (not slightly concave) and have a pronounced "tooth" at the anterolateral angle; the mesothorax seems to be the same, but the metathoracic apron has the sides more convex and the posterior margin slightly concave. The abdomen is longer and is narrower at the third and fourth segments, while the abrupt narrowing of the fifth segment is much less pronounced, so that in this character *intermedius* is intermediate between true *complanatus* and *S. c. interruptus* Carriker. The pair of "segments" lying alongside the last abdominal segment are also of different shape, having the posterior margin more oblique (less transverse), while the whole segment is differently shaped. The wide, deeply pigmented, longitudinal band along the inner edge of the pleural plates, so noticeable in the male of *intermedius*, is entirely absent in the male of *complanatus*, although present in the female (as in *S. pellucidifrons*, new species). In the male of *complanatus* a darker band is present along the outer edge of the pleural plates, while the remaining area is unicolored, but in the female the reverse is true. In *intermedius* the male has both the marginal and inner bands, while in the female only the submarginal one is present.

There is a slight difference in the shape of the paramers, those of *complanatus* being uniformly convex on the outer margin, while in *intermedius* they are concave medially, then curving together at the tips.

In *complanatus* there is a marked difference between the sexes in the shape of the head. The male has the front much flattened, while in

the female it is narrower and decidedly rounded. The temples are very little wider in the female but much more angulated, the posterior half of the sides being much more flattened. In *intermedius* the front is equal in the sexes, but the temples are more flattened posteriorly in the female. There is also a decided difference in the shape and chaetotaxy of the last abdominal segment in the female. Each side of the posterior margin is much more rounded, almost circular in shape, while the *thickened* hairs along the margin are fewer and much shorter, but the fine, intermediate hairs are still *finer* and shorter. The sides of this segment in *complanatus* are also much more rounded and the anterior end less pointed. The remaining abdominal chaetotaxy is the same.

MEASUREMENTS OF STRONGYLOCOTES COMPLANATUS

Structure	<i>complanatus</i>				<i>intermedius</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.67		2.89		2.95		3.23	
Head.....	0.74	0.69	0.77	0.66	0.84	0.69	0.87	0.70
Prothorax.....	0.34	0.51	0.35	0.51	0.36	0.54	0.39	0.54
Mesothorax.....	0.48	0.76	0.54	0.76	0.52	0.83	0.52	0.79
Metathorax.....	0.27	0.50	0.28	0.50	0.24	0.55	0.28	0.56
Abdomen.....	1.43	1.27	1.65	1.29	1.60	1.10	1.82	1.28
Antennae.....	0.50		0.45		0.50		0.46	

STRONGYLOCOTES COMPLANATUS NIRMROIDES (Carriker)

Nirmocotes nirmoides CARRIKER, Lice of the tinamous, p. 80, pl. 4, fig. 3, 1936.
(Host: *Crypturellus obsoletus punensis*.)

Diagnosis of lectotype.—The preantennal portion of the head is longer in the female and shorter in the male than in *intermedius*, with the same width at frons in both sexes of both races, but wider at the base in the female of *nirmoides*; in the male the anterior angles of the prothorax are rounded, with the lateral notch obsolete, while in the female they are angulated as in *both sexes* of *intermedius*, but in *intermedius* the lateral notch is present in both sexes. The sides of the prothorax in *nirmoides* are less emarginate and more divergent, the difference in width between the anterior and posterior margins being 0.065 mm. in *nirmoides* and 0.033 mm. in *intermedius*.

The terminal segments of the abdomen in the male (that is, the last median segment and the ones on each side of it) are differently shaped, while there is a much abrupter narrowing of the abdomen at segment V, more nearly approximating *S. c. interruptus* in this character, although in all other respects it is nearer to *intermedius*.

The male genitalia seem to be identical in the two subspecies. The total length in both sexes is greater in *intermedius*; the head is much shorter but of the same width at the temples (0.76 by 0.69 against 0.84 by 0.69); the abdomen in both sexes is shorter but not wider.

As compared with *S. c. complanatus*, the total length is somewhat greater, with head about the same in the male but considerably longer in the female. However, the shape of the abdomen in the male separates at a glance the race of *complanatus*, there being no trace of the abrupt narrowing of the abdomen at segment V, while the shape of the terminal segments is quite different. In regard to the abrupt narrowing of the abdomen at segment V in the males of these races of *complanatus*, we have the extreme of this character in *interruptus*, to a less degree in *nirmoides*, still less in *intermedius*, and none at all in *complanatus*.

MEASUREMENTS OF STRONGYLOCOTES COMPLANATUS NIRMOIDES

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.70	-----	3.08	-----
Head {at trabeculae.....	-----	0.22	-----	0.24
Head {temples.....	0.76	0.69	0.81	0.70
Prothorax.....	0.37	0.53	0.37	0.54
Mesothorax.....	0.52	0.80	0.57	0.84
Metathoracic apron.....	0.26	0.52	0.29	0.60
Abdomen.....	1.50	1.28	1.70	1.35
Antennae.....	0.456	0.065	0.456	0.065
Preantennal region.....	0.20	{ 0.24 } { 0.48 }	0.25	{ 0.24 } { 0.52 }

STRONGYLOCOTES COMPLANATUS INTERRUPTUS Carriker

Strongylocotes complanatus interruptus CARRIKER, Lice of the tinamous, p. 85, pl. 7, figs. 1, 1a, 1936. (Host: *Crypturellus atrocapillus*.)

Further ornithological collecting in Bolivia by the author revealed the fact that the host of this louse, collected at Chiñiri, Bolivia, was wrongly identified. It proved to be *Crypturellus garleppi affinis*, several additional specimens of which were later taken on the Chaparé River, from which additional series of parasites were taken that proved to be identical with the type series of *S. c. interruptus*.

STRONGYLOCOTES COMPLANATUS BOUCARDI, new subspecies

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

This race of *complanatus* is close to *interruptus*, having abdominal

segment V abruptly narrower than IV, a character that renders it easily recognizable and that is shared (to the same extent) only by *S. c. interruptus*.

Male: Differs from *interruptus* in having the lines of the sides of the head and temples all slightly convex, while in *interruptus* they are perfectly straight. The aborted segments alongside the last abdominal one are of different shape, less rounded on the posterior margin and less protuberant. The chaetotaxy and the double, longitudinal bands across pleurites I to IV seem to be about the same. Both races have the head narrower at the temples in the female, as well as the *frons* more rounded. In the female of *interruptus* the mesothorax has the sides more divergent, extending farther from the sides of the abdomen, which is also true of the male in a lesser degree.

The whole basal plate is narrower, while the paramers are wider across their bases and slightly longer, and the endomerale plate is wider. The whole insect averages longer and wider, having the measurements of the various segments equal to or greater than the maximum for the series of *interruptus*. This race is not particularly well marked, but the differences, while slight, are constant. In view of the considerable individual variation in measurements in this group, care must be taken in basing subspecific differences on size *alone*, and then only when there is a sufficient series to determine individual variation.

MEASUREMENTS OF STRONGYLOCOTES COMPLANATUS

Structure	<i>boucardi</i>				<i>interruptus</i>			
	Male		Female		Males		Females	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.93		3.08		2.54-2.76		2.88-3.04	
Head.....	0.78	0.69	0.81	0.67	0.73-0.78	0.59-0.55	0.76-0.79	0.59-0.65
Prothorax.....	0.35	0.56	0.39	0.57	0.33-0.40	0.48-0.54	0.35-0.43	0.54-0.54
Mesothorax.....	0.56	0.84	0.59	0.79	0.50-0.54	0.65-0.79	0.50-0.56	0.72-0.85
Metathoracic apron.....	0.29	0.56	0.29	0.56	0.26-0.30	0.50-0.54	0.28-0.30	0.54-0.58
Abdomen.....	1.60	1.37	1.75	1.28	1.35-1.45	1.00-1.18	1.61-1.66	1.18-1.26
Antennae.....	0.52	0.065	0.46	0.065	0.45-0.50		0.41-0.48	

STRONGYLOCOTES COMPLANATUS FIMBRIATUS Clay

Strongylocotes complanatus fimbriatus CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 156, pl. 4, fig. 3. (Hosts: *Crypturellus c. cinnamomeus*, Nicaragua; and *C. cinnamomeus mexicanus*, Mexico.)

This race is represented by three adult females and four juvenals. They were taken on *Crypturellus cinnamomeus sallaei*, collected by the author at Tres Zapotes, Veracruz, Mexico, on March 27, 1940.

It is of the type of *S. c. interruptus*, agreeing closely in size with

that race and with *S. c. boucardi*, except that the head and thorax are narrower (in the female). The shape of the head in the female is different from all other known races of *complanatus*. The lines of the head are much less divergent from the front to the eye, the comparative width of the frons being a little greater and the width at the eye much less, while the temples project abruptly from the posterior edge of the eye, then slope rapidly inward to the narrow occiput.

In the other races we have an almost straight line from the sides of the frons back to the widest point of the temples, then an abrupt convergence to the sides of the occiput. The clypeal band, which completely encircles the front of the head beyond the trabeculae, is considerably narrower than in the other races; so also is the median projection from this band, while all the other bands of the head are of the same width as in the other races. The shape and markings of the abdomen are very similar to those of *boucardi*, except the last segment, which is smaller (0.39 by 0.63 against 0.41 by 0.55 mm.), while its chaetotaxy is entirely different. In *boucardi* the posterior margin has a sparse series of about eight strong, longish hairs on each side, with probably 20 shorter, fine hairs intermixed with them. In *interruptus* the stout hairs number about six and are thicker and a bit shorter, while the fine hairs are shorter and finer. In *fimbriatus* there are about 12 of the long, strong hairs, with a correspondingly greater number of the fine ones, which, however, are much longer and thicker than in the other two races. The posterior margin of the last segment is also more transverse in outline (less curving on each side), with the extreme lateral portions curving abruptly forward.

MEASUREMENTS OF FEMALE SPECIMEN OF STRONGYLOCOTES COMPLANATUS FIMBRIATUS

Structure	Length	Width
Body.....	2.93	
Head.....	0.78	0.61
Prothorax.....	0.37	0.52
Mesothorax.....	0.56	0.72
Metathorax.....	0.30	0.54
Abdomen.....	1.71	1.24
Antennae.....	0.43	

STRONGYLOCOTES COMPLANATUS SETIFER Hopkins

Goniodes setosus PIAGET, Les Pédiculines, p. 263, pl. 21, fig. 9, 1880. (Host: *Crypturellus* [*Tinamus*] *variegatus*.)

Strongylocotes lipogonus setosus (Piaget) CARRIKER, Lice of the tinamous, p. 92, 1936.

Strongylocotes setifer HOPKINS, Ann. Mag. Nat. Hist., ser. 11, vol. 9, p. 116, 1942. Nom. nov. for *setosus* Piaget, preoccupied.

It is now a well-established fact that the lice described by the author under the genus *Nirmocotes* are nothing more than the juvenals of various species of *Strongylocotes*, and taking this into consideration a further careful study of Piaget's description and figure of *Goniodes setosus* leads me to believe that it is an immature specimen of a race of *Strongylocotes complanatus*, probably the same or very close to *S. complanatus variegatus* Carriker (1936, p. 86) described from *Crypturellus variegatus salvini*. No form of *Strongylocotes* has as yet been recorded by modern authors from Piaget's host of *setosus* (*Crypturellus v. variegatus*), which may very likely prove to be different subspecifically from *S. c. variegatus* Carriker, and so it is possibly better to keep the two forms separate until fresh material can be examined from *C. v. variegatus*. Should these prove to be the same as *S. c. variegatus* Carriker, then that name becomes a synonym of *S. c. setosus* (Piaget).

One of the principal characters that led me to believe that the type of *setosus* was an immature of *complanatus* is the shape of the metathoracic apron, which is typical of all species of *Strongylocotes* having a *median projection on the clypeal band*, while no known species of *Strongylocotes* lacking this projection has the metathoracic apron of the shape shown in Piaget's figure of *setosus*. The absence of the median projection on the clypeal band (in Piaget's figure) has no significance, since this projection is always absent in *all* young of the genus, while the shape of the tip of the abdomen also differs radically in the young. The above arguments, taken in connection with the fact that a race of *complanatus* has been taken on a closely related subspecies of the host of *setosus*, seem to be conclusive evidence.

STRONGYLOCOTES SUBCONICEPS SUBCONICEPS Carriker

Strongylocotes subconiceps CARRIKER, Lice of the tinamou, p. 90, pl. 8, figs. 1, 1a, 1936. (Host: *Crypturellus soui inconspicuus*, Bolivia.)

A series of 21 adults of both sexes and immature were taken on three individuals of *Crypturellus soui meserythrus* at Tres Zapotes and Cerro Tuxtla, Veracruz, Mexico.

This series is very uniform *inter se* and extremely close to the type series of *subconiceps* in all respects. The peculiar truncate-conical shape of the head, the narrow, scarcely protruding mesothorax, and the curious apical segments of the abdomen in the male combine to make this species easily recognizable. The taking of this form on the Mexican host *C. s. meserythrus* makes the fifth race of *C. soui* on which I have found it, a very unusual record for any mallophagan parasite of the tinamou, all of which would seem to offer strong proof of the very close relationship between the races

of *soui* and also to lend support to the supposition that they are all of comparatively recent origin.

STRONGYLOCOTES SUBCONICEPS PERIJAE, new subspecies

FIGURE 4, g, h

Types.—Male and female, adults, from *Crypturellus soui* (*mustelinus* (?)), collected by the author of Tierra Nueva, Sierra Perijá, Colombia, July 8, 1941; in the U. S. National Museum.

Diagnosis.—An immature male of *perijae* has the genitalia fully developed but not fully chitinized, nor are the bodily markings clearly outlined. The median projection on the clypeal band is entirely absent, yet the metathoracic apron is already outlined. This young male is still smaller than the single adult male taken.

The three females are almost identical in size and vary but little in this respect from typical *subconiceps*. In *subconiceps* the females are much smaller than the males (a very unusual situation), while in *perijae* the sexes are very closely matched in size, some measurements being greater in the male, others in the female. In *perijae* the frons is wider and more convex; the last segments of the abdomen in the male differ considerably in shape, as well as in chaetotaxy (see figure). There seems to be no difference in the shape of the apical segments in the female, but the ventral fringe of setae are much finer and shorter in *perijae* (see fig.).

MEASUREMENTS OF STRONGYLOCOTES SUBCONICEPS

Structure	<i>subconiceps</i>				<i>perijae</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	3.15		2.82		3.00		2.69	
Head.....	0.86		0.76		0.74		0.75	
Base of trabeculae.....		0.26		0.24		0.26		0.25
Temples.....		0.70		0.76		0.59		0.57
Prothorax.....	0.46	0.64	0.40	0.47	0.39	0.50	0.38	0.49
Pterothorax.....	0.60	0.83	0.48	0.60	0.48	0.67	0.50	0.68
Metathoracic apron.....	0.30	0.54	0.28	0.43	0.25	0.45	0.28	0.46
Abdomen.....	1.83	1.10	1.50	1.11	1.38	0.92	1.50	1.06
Antennae.....	0.43	0.073	0.40		0.39	0.053	0.37	0.045
Paramers.....	0.13	0.075			0.13	0.087		
Endomeral plate.....	0.087	0.043						

STRONGYLOCOTES SPINOSUS (Piaget)

Goniodes spinosus PIAGET, Les Pédiculines, p. 261, pl. 21, fig. 7, 1880. (Host: *Nothocercus* [*Tinamus*] *julius*.)

Strongylocotes spinosus (Piaget) TASCHEBERG, Die Mallophagen, p. 57, 1882.

Under the discussion of this species published by the author in 1936 ("Lice of the Tinamous," p. 88) it was stated that two females taken

on *Nothocercus nigrocapillus* at Huacapistana, Peru, belonged to it, and a figure was published (pl. 7, fig. 4). At the same time the species *S. subspinosus* Carriker was described from the same host collected at Sandillani, Bolivia. A careful study of this material, in connection with an adequate series of a *Strongylocotes* taken on *Nothocercus bonaparti*, leads me to revise my former treatment of this group.

Unquestionably the two females taken on *N. nigrocapillus*, at Huacapistana, Peru, cannot be called *spinosus* (Piaget), and it is equally certain that they are not *subspinosus* Carriker, although they are conspecific with both. A review of all the material of *Strongylocotes* taken on the different species of *Nothocercus* shows that they are all conspecific with *S. spinosus* (Piaget) but represent various well-marked subspecies.

The specimen of *Nothocercus* shot at Huacapistana (central Peru) is an intermediate between typical *nigrocapillus* of Bolivia and *N. nigrocapillus cadwaladeri* of north Peru, closer, perhaps, to the latter, which would readily account for the differences between the parasites on the central Peru and Bolivian hosts.

The figure of *S. subspinosus* published in "The Lice of the Tinamous" (pl. 8, fig. 2) is misleading in numerous details, especially in the pterothorax, the chaetotaxy of the abdomen, and the abdominal plates, especially in the first segment and the metathoracic apron.

It is now clearly evident that not only the types of *subspinosus* but the entire type series have the posterior angle of the pterothorax either doubled under or crumpled in a manner that completely distorts the shape of that segment. In reality the pterothorax is of the same shape as that of *spinosus* (the principal character on which the specific distinction was based), a fact amply proved by the series from *Nothocercus bonaparti*, some of which also have the angles doubled under while others are of the normal shape. All these forms of *Strongylocotes* from the avian genus *Nothocercus* have the same general shape of head, thorax, and abdomen, especially the terminal segments, in both sexes, all splendid characters for separating the species of this genus, and so it would seem a more rational proceeding to make them all conspecific, and subspecies of *spinosus*.

The following arrangement of the various known forms of the *spinosus* group is therefore proposed:

STRONGYLOCOTES SPINOSUS SPINOSUS (Piaget)

Goniodes spinosus PIAGET, Les Pédiculines, p. 261, pl. 21, fig. 7, 1880. (Host: *Nothocercus [Tinamus] julius*.)

This race is known at present only from the figure and description of the female as given by Piaget and Taschenberg, which, so far as

they go, are very good but hardly sufficient for the separation of closely related subspecies. Until fresh material from that host can be examined we must take for granted (by analogy) that the parasite from this host is different from those taken on the other species of *Nothocercus*.

STRONGYLOCOTES SPINOSUS SUBSPINOSUS Carriker

FIGURE 5, a-c

Strongylocotes spinosus subspinosus CARRIKER, Lice of the tinamous, p. 89, pl. 8, figs 2, 2a, 1936 (also male genitalia without number). (Host: *Nothocercus n. nigrocapillus*.)

The status of this form has been fully discussed above. Since corrected figures are herewith given, no further description is necessary.

STRONGYLOCOTES SPINOSUS PERUVIANUS, new subspecies

Strongylocotes spinosus (Piaget), CARRIKER, Lice of the tinamous, p. 88, pl. 7, fig. 4, 1936. (Host: *Nothocercus nigrocapillus* (near) *cadwaladeri*.)

The original description and figure of the female, as cited above, are ample for the determination of this race. They are of the two females previously identified as *S. spinosus* (Piaget).

STRONGYLOCOTES SPINOSUS BONAPARTI, new subspecies

FIGURE 5, d

Types.—Male and female, adults from *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, July 16, 1941; in U. S. National Museum.

Diagnosis.—This race is close to *subspinosus*, the differences being slight but constant. The male genitalia differ but slightly, the basal plate being somewhat narrower at its distal end, so that the paramers are set more closely together; the paramers are slightly longer, heavier at base but slender apically; there are also slight differences in the structure of the endomerale plate.

In *subspinosus* both sexes have one long hair attached on the posterior margin of abdominal segment I, at the inner point of the paratergal plate. The succeeding segments, back to V, have a very short, slender hair at this same place. In *bonaparti* the male has a long, strong hair (longer than width of succeeding segment) in segments I to IV, while on V it is half the length. In the female there is a long hair *only* on segment I, while the hairs on the succeeding segments are so small as to be almost invisible. There are other minor differences in the abdominal chaetotaxy of the female, especially of the spines and fine hairs on the genital plate.

The clypeal band in both sexes is considerably narrower around the *frons*, in front of the break in this band. The anterior angles of

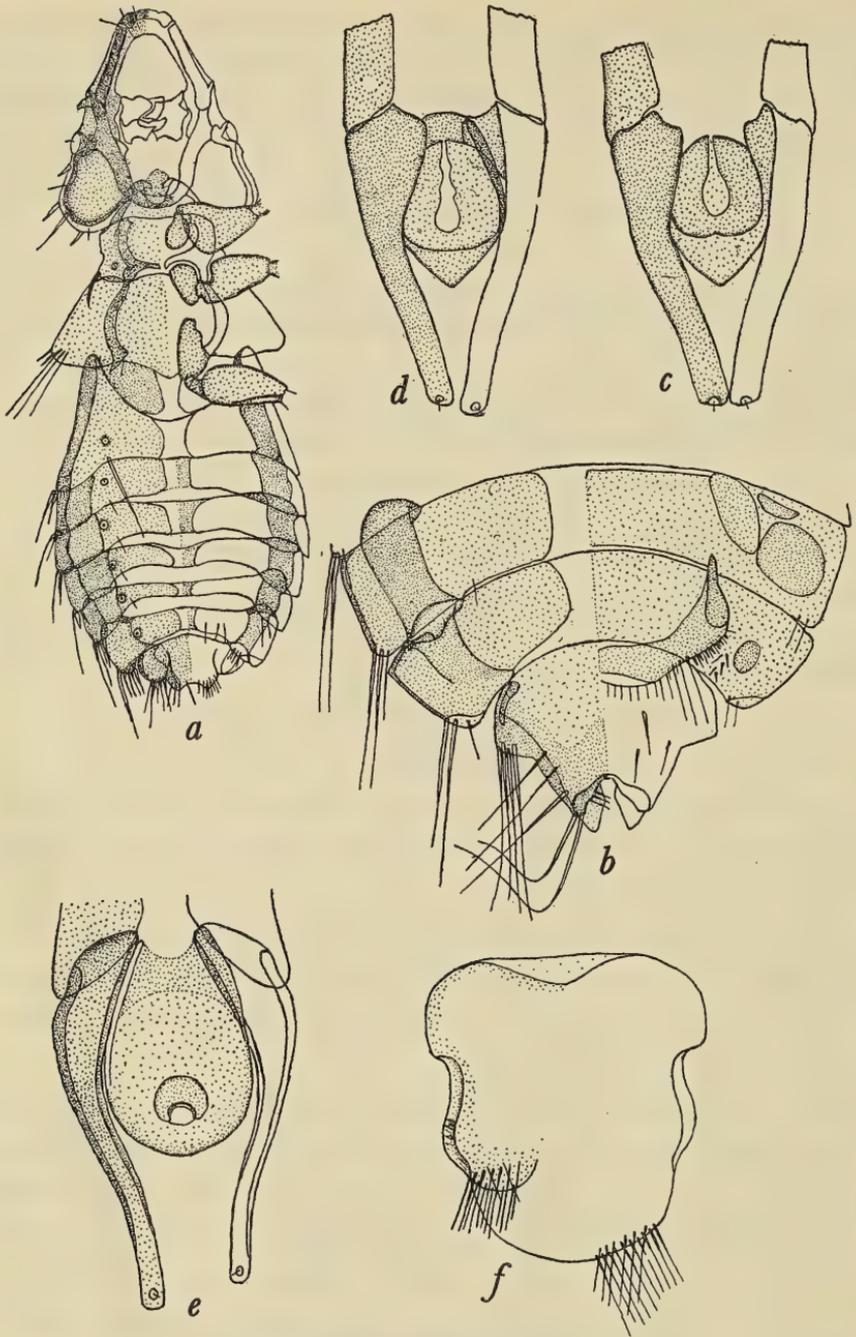


FIGURE 5.—STRONGYLOCOTES

a-c, *Strongylocotes spinosus subspinosus* Carriker: *a*, Body of male; *b*, tip of female abdomen; *c*, male genitalia.

d, *S. s. bonaparti*, new subspecies: Male genitalia.

e, f, *S. angulocapitis taoi*, new subspecies: *e*, Male genitalia; *f*, male abdominal segment VII.

the prothorax are more rounded and the lateral notch is absent, while the sides of the pterothorax are much more convex.

MEASUREMENTS OF STRONGYLOCOTES SPINOSUS

Structure	<i>bonaparti</i>				<i>subspinus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.85		3.17		2.79		2.95	
Head { at trabeculae.....	0.90	0.53	0.94	0.54	0.91	0.52	0.89	0.52
{ at temples.....		0.83		0.87		0.83		0.78
Prothorax.....	0.40	0.56	0.43	0.59	0.38	0.54	0.39	0.54
Pterothorax.....	0.41	0.91	0.47	1.00	0.43	1.00	0.43	1.00
Metathoracic apron.....	0.24	0.59	0.25	0.61	0.25	0.54	0.24	0.56
Abdomen.....	1.54	1.06	1.78	1.13	1.47	1.12	1.69	1.06
Antennae.....	0.456	0.078	0.48	0.075	0.50	0.087	0.456	0.075
Paramers.....	0.15	0.09			0.135	0.10		
Endomerale plate.....	0.09	0.05			0.087	0.05		

STRONGYLOCOTES ANGULOCAPITIS Carriker

Strongylocotes angulocapitis CARRIKER, Lice of the tinamous. p. 89, pl. 8, fig. 3, 1936. (Host: *Tinamus s. serratus*.)

This species was described from one juvenal and two adult females, from two different individuals of the same species of host. Two females from *Tinamus t. tao*, collected at La Cumbre de Valencia, Venezuela, were identified as being the same.

The two females from Venezuela have unaccountably disappeared, but the following additional material of *S. angulocapitis* was obtained at a later date: One male and two females from the type host, *Tinamus s. serratus*, collected at Río Chaparé, Bolivia; three males and three females from *Tinamus t. tao*, taken at Sierra Perijá, Colombia; one male and one female from *Tinamus tao weddelli*, collected at Palmar, Dept. Cochabamba, Bolivia; and three males and four females from *Tinamus major ruficeps*, from Sierra Perijá, Colombia.

The male of *S. angulocapitis*, hitherto unknown, is herewith described and figured. The shape of the last abdominal segments and the markings of the whole abdomen are so unique that the species (outside of the unusual shape of the head) may be recognized at a glance.

The parasites taken on *T. t. tao* prove to be subspecifically distinct, as well as those from *T. tao weddelli* and the series from *T. major ruficeps*.

In the figure of the male the second segment of the antennae is shown as being considerably thicker than the same segment in the female. I have since discovered that this was caused by the position of the

antennae in the mounted specimen. Apparently this second segment (and to some extent the third) is not cylindrical, but *flattened*, its width differing according to the side shown. The figure of the male shows clearly the chaetotaxy of the abdomen, and so a detailed description of same seems superfluous. We have the following subspecies of *angulocapitis*:

STRONGYLOCOTES ANGULOCAPITIS ANGULOCAPITIS Carriker

FIGURE 6, a-d

Of all the races this is the smallest in all dimensions; the paramers are equal to those of *S. a. taoi* (described below) but shorter than the other two races (also described below); the endomerale plate is *longer* than all the other races except *ruficeps*; pterothorax scarcely wider than abdomen in the male; the only race in which the female has the pterothorax *wider* than in the male; hairs on abdomen long and coarse; terminal segment in the male small (see fig.); pterothorax with posterior angle rounded and shorter.

STRONGYLOCOTES ANGULOCAPITIS TAOI, new subspecies

FIGURE 5, e, f

Types.—Male and female, adults, from *Tinamus t. tao*, collected at Tierra Nueva, Sierra Perijá, Colombia, by the author on July 8, 1941; in U. S. National Museum.

Diagnosis.—The width of head at the trabeculae is equal to that of *angulocapitis* but is wider at the temples and longer; in the female the head is wider at the trabeculae and narrower at the temples than in *angulocapitis* and in the male of *taoi*; the pterothorax is much wider than the abdomen in the male; the pterothorax of the female is narrower than that of the male; the abdominal hairs are fewer and shorter; the terminal segment in the male is large; the posterior angle of the pterothorax is sharp and longer posteriorly.

STRONGYLOCOTES ANGULOCAPITIS WEDDELLI, new subspecies

FIGURE 6, e, f

Types.—Male and female, adults, from *Tinamus tao weddelli*, collected by the author at Palmar, Dept. Cochabamba, Bolivia, July 12, 1927; in collection of the author.

Diagnosis.—The head is the same width at the trabeculae in both sexes but much narrower at the temples in the female; pterothorax wider than in *angulocapitis* and *ruficeps* but narrower than in *taoi*; the pterothorax of the female is narrower than that of the male; hairs

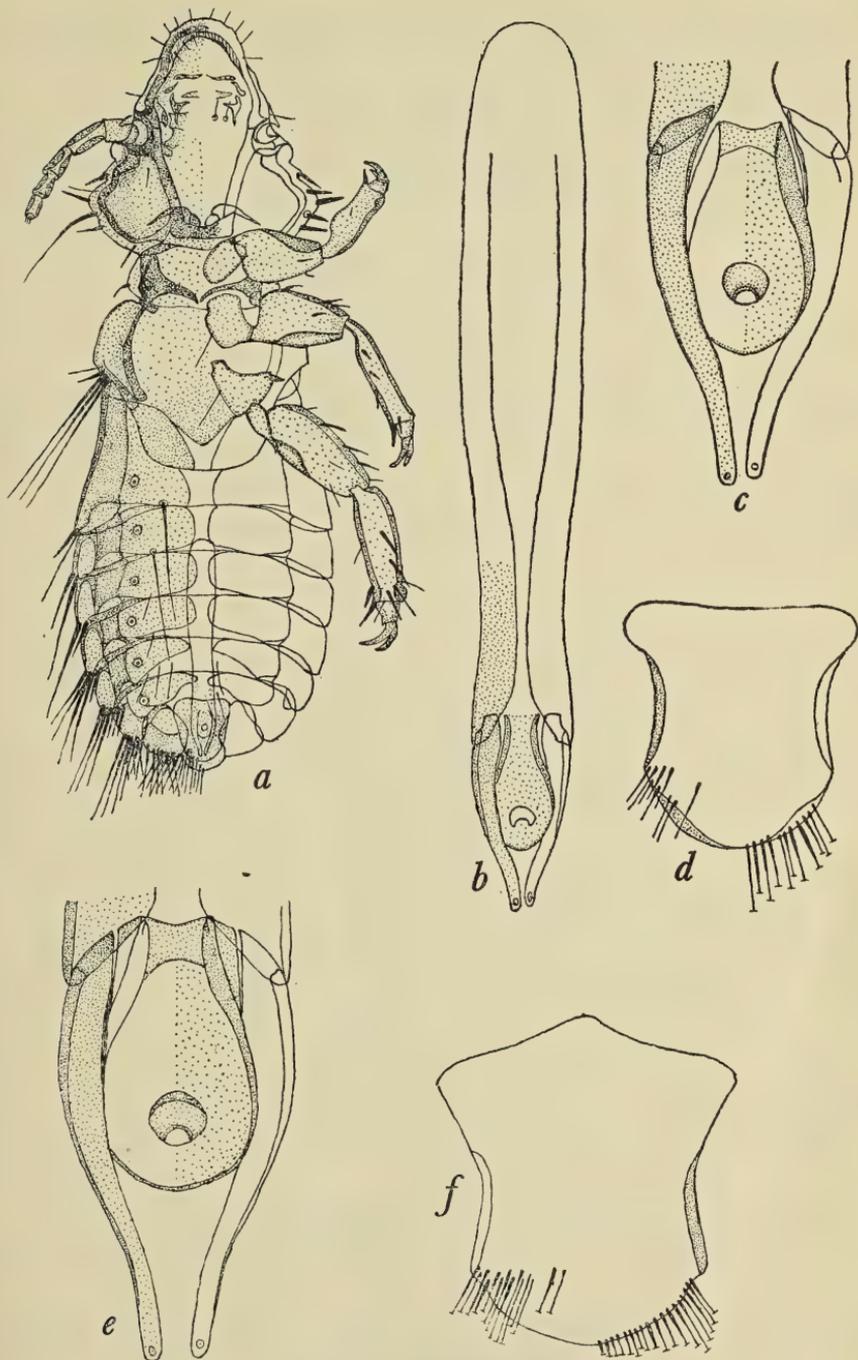


FIGURE 6.—STRONGYLOCOTES

a-d, *Strongylocotes angulocapitis angulocapitis* Carriker: *a*, Body of male; *b*, male genitalia; *c*, male genitalia (enlarged); *d*, male abdominal segment VII.

e, f, *S. a. weddelli*, new subspecies: *e*, Male genitalia; *f*, male abdominal segment VII.

on abdomen of medium length and number; the terminal segment in male is large; the posterior angle of the pterothorax *short* and *sharp*.

MEASUREMENTS OF STRONGYLOCOTES ANGULOCAPITIS

Structure	<i>angulocapitis</i>				<i>taoi</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body	2.97		3.25		3.21		3.47	
Head {trabeculae	0.95	0.54	0.95	0.56	1.03	0.54	1.00	0.58
{temples		0.90		0.84		0.98		0.92
Prothorax	0.40	0.58	0.41	0.58	0.46	0.65	0.45	0.65
Pterothorax	0.58	0.84	0.63	0.89	0.68	0.99	0.69	0.91
Metathoracic apron	0.29	0.60	0.32	0.63	0.38	0.71	0.37	0.67
Abdomen	1.56	1.04	1.73	1.13	1.60	1.09	1.89	1.30
Antennae	0.57	0.09	0.56	0.087	0.63	0.09	0.61	0.087
Basal plate	0.74	0.09			0.79	0.11		
Paramers	0.16	0.09			0.16	0.118		
Endomeral plate	0.13	0.053			0.097	0.068		
Structure	<i>weddelli</i> ¹				<i>ruficeps</i>			
Body	3.38		3.44		3.18		3.36	
Head {trabeculae	1.07	0.58	1.01	0.58	0.97	0.55	0.95	0.56
{temples		1.06		0.96		0.96		0.87
Prothorax	0.49	0.67	0.46	0.64	0.46	0.63	0.45	0.63
Pterothorax	0.67	0.97		0.91	0.67	0.94	0.71	0.91
Metathoracic apron	0.35	0.71		0.71	0.30	0.78	0.30	0.69
Abdomen	1.76	1.19	1.91	1.25	1.66	1.11	1.84	1.30
Antennae	0.67	0.097	0.63	0.087	0.64	0.09	0.52	0.085
Basal plate	0.91	0.13			0.87	0.10		
Paramers	0.18	0.11			0.195	0.097		
Endomeral plate	0.11	0.075						
Measurement	Last abdominal segment in males							
	<i>angulo-</i> <i>capitis</i>	<i>taoi</i>	<i>weddelli</i>	<i>ruficeps</i>				
Length		0.28	0.35	0.326	0.29			
Width at anterior end		0.23	0.29	0.29	0.28			
Width at posterior end		0.17	0.24	0.217	0.24			

¹ The female of *weddelli* is probably slightly immature.

STRONGYLOCOTES ANGULOCAPITIS RUFICEPS, new subspecies

FIGURE 7, d, e

Types.—Male and female, adults, from *Tinamus major ruficeps*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; in U. S. National Museum.

Diagnosis.—This race is nearest in size to *angulocapitis*; the head at the trabeculae is equal in width in both sexes but much narrower at

the temples in the female; the pterothorax is but little wider than the abdomen in the male, and the same segment is narrower in the female than in the male; the terminal segment is smaller, being the same length as in *angulocapitis*, but considerably wider; the hairs are short and fine at tip of abdomen, longer along the sides and slender; the pterothorax is longer posteriorly, the angle rounded, but less so than in *angulocapitis* (see fig.).

STRONGYLOCOTES PELLUCIDIFRONS, new species

FIGURE 7, a-c

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

This species presents a combination of the characters of *S. angulocapitis* Carriker and *S. spinosus* (Piaget), having the shape of the head, prothorax, and last abdominal segment in the female similar to the former, with the mesothorax of the latter. The only other known species of the genus that have the last abdominal segment, in both sexes, similar to the present one are *lipogonus*, *wernecki*,² and *complanatus* (also the female in *angulocapitis*), while the only ones with a similar-shaped head (and lacking the median spur on the clypeal band) are *spinosus*, *subspinosus*, *wernecki*, and *angulocapitis*. All the species possessing this type of head have the metathoracic apron *circular* on the posterior margin, while all the others have it straight, or nearly so (slightly concave in *lipogonus*). Perhaps the most unique character possessed by this species, and not found in any other of the genus, is the hyaline border around the front of the head, beginning about halfway between the trabeculae and the frons. This hyaline border is slightly wider at the sides, where it measures 0.03 mm. It was from this character that the species received its name.

The genital armature is of the same type as *complanatus* but differs in having the basal plate constricted apically and in having the paramers curving *outwardly* toward their tips, instead of *inwardly*, as in *complanatus*.

A detailed description of the male is unnecessary since all essential characters are clearly delineated in the accompany figures, while the last two abdominal segments of the female are also figured. The heavy, deeply pigmented, longitudinal bands across the pleural plates in the female are similar to those in *angulocapitis*. In addition, the

² *Strongylocotes wernecki* Guimarães and Lane, from *Tinamus solitarius*, is very close to *S. pellucidifrons* but lacks entirely the hyaline border around the front of the head. *S. latithorax* Kéler, from *Tinamus solitarius*, is a synonym of *S. wernecki*, the latter having priority over the former by a year.

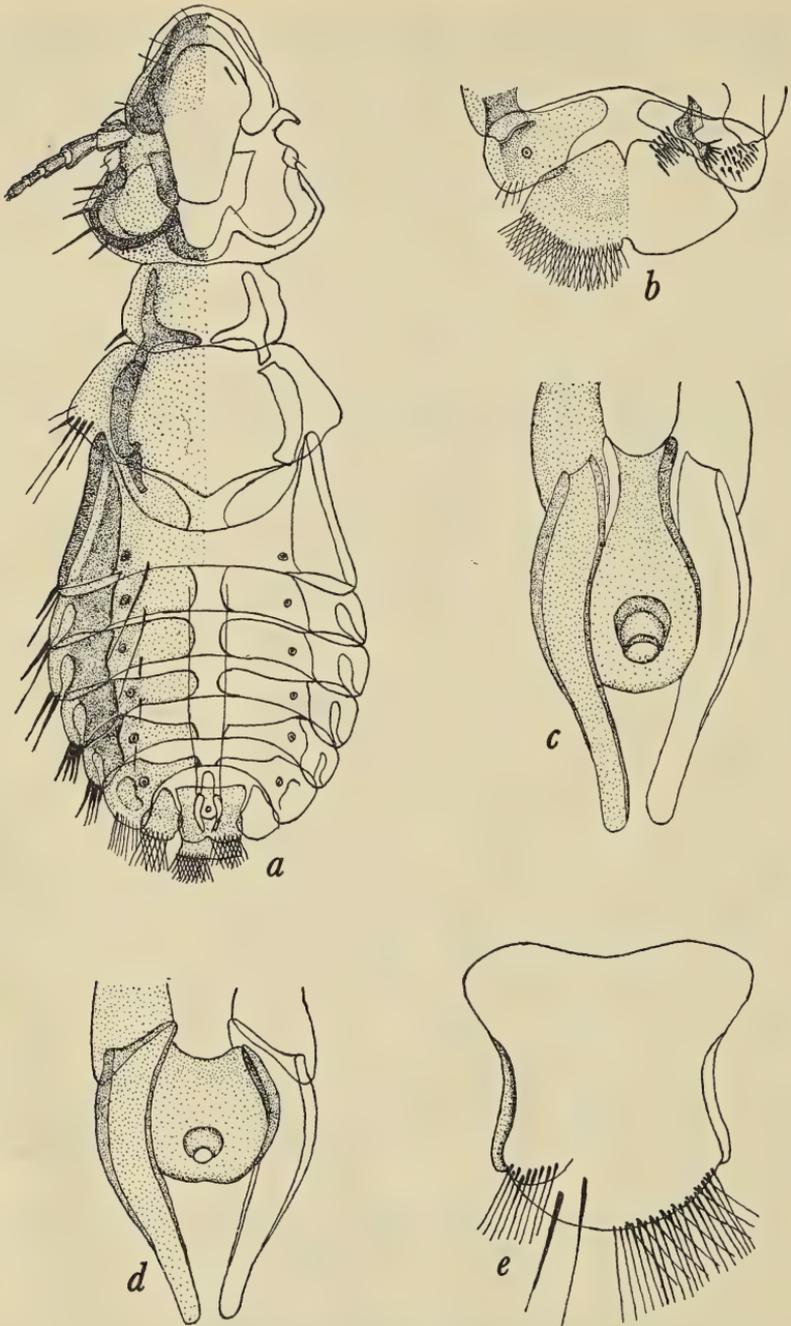


FIGURE 7.—STRONGYLOCOTES

a-c, *Strongylocotes pellucidifrons*, new species: *a*, Body of male; *b*, tip of female abdomen; *c*, male genitalia.

d, e, *S. angulocapitis ruficeps*, new subspecies: *d*, Male genitalia; *e*, male abdominal segment VII.

female has the head and all the thoracic segments actually narrower than in the male, although all are slightly longer. The abdomen is both longer and wider in the female.

MEASUREMENTS OF STRONGYLOCOTES PELLUCIDIFRONS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	3.21		3.56	
Head.....	1.00	0.93	1.00	0.89
Prothorax.....	0.37	0.70	0.39	0.65
Mesothorax.....	0.63	1.05	0.65	1.02
Metathoracic apron.....	0.28	0.68	0.32	0.67
Abdomen.....	1.67	1.19	1.90	1.39
Antennae.....	0.58	0.087	0.57	0.087

STRONGYLOCOTES LIPOGONUS LIPOGONUS (Nitzsch)

Goniodes lipogonus NITZSCH, in Giebel, Zeitschr. für Ges. Naturw., vol. 28, p. 388, 1866. (Host: *Rhynchotus r. rufescens*.)

A reexamination of the material treated in "The Lice of the Tinamous," 1936, together with additional material from *Rhynchotus rufescens maculicollis*, shows that the parasites from the two host subspecies are not the same. The specimens from *R. r. maculicollis* differ from true *lipogonus* in the size and proportions of the head, the male genitalia (see table of measurements), and in the chaetotaxy of the abdomen. It seems best, therefore, to give the insects from *R. r. maculicollis* subspecific rank (since I consider *R. r. rufescens* to be the host of *S. l. lipogonus*), and they may be called:

STRONGYLOCOTES LIPOGONUS ALTICOLA, new subspecies

Types.—Male and female, adults, from *Rhynchotus rufescens maculicollis*, collected by the author at Sandillani, Dept. La Paz, Bolivia, December 11, 1934; in collection of author.

Diagnosis.—In *S. l. alticola* the head of the male is smaller in all proportions than that of true *lipogonus*, although the frons is wider in proportion to the width at the trabeculae and temples. In the genital armature we have the paramers of *alticola* very much shorter and narrower, as well as the endomeral plate, although the latter is considerably wider in proportion to its length. In the female there are 10 strong hairs on each side of the posterior margin of the last abdominal segment, while in *lipogonus* there are but 7 hairs; in the lateral angles of segments IV and V there are one weak and two strong hairs in *alticola*, and but one strong and one weak hair in *lipogonus*, while on segment VI there are one weak and three strong hairs in *alticola*

and but two strong ones in *lipogonus*. There are other minor characters, but the above are sufficient for the easy recognition of the new race.

MEASUREMENTS OF MALES OF STRONGYLOCOTES LIPOGONUS

Structure	<i>lipogonus</i>		<i>alticola</i>	
	Length	Width	Length	Width
Head { at frons.....	0.94	0.30	0.89	0.28
at trabeculae.....		0.73		0.66
at temples.....		0.965		0.87
Paramers.....	0.174	0.087	0.14	0.067
Endomeral plate.....	0.13	0.053	0.097	0.043

Subfamily PHYSCONELLINAE Carriker

Genus PHYSCONELLA Paine

PHYSCONELLA KELLOGGI KELLOGGI (Paine)

Ancistrocephalus kelloggi PAINE, Psyche, vol. 20, p. 158, fig. 1, 1913.

Physconella kelloggi PAINE, Psyche, vol. 21, p. 23, 1914.

Physconella k. kelloggi (Paine) CARRIKER, Lice of the tinamous, p. 94, 1936.
(True host: *Crypturellus soui panamensis*.)

In 1936 I gave no reference to the figure, which is pl. 9, fig. 1, female; while under *P. k. subsimilis* (p. 95) the reference to the figure should read pl. 9, fig. 1a (male genitalia), which is the only figure given for the race.

PHYSCONELLA KELLOGGI SUBSIMILIS Carriker

Physconella kelloggi subsimilis CARRIKER, Lice of the tinamous, p. 95, pl. 9, fig. 1a (male genitalia), 1936. (Host: *Crypturellus soui inconspicuus*.)

A single female on *C. s. mustelinus* at Tierra Nueva, Sierra Perijá, Colombia, is so very close to this form that there are no tenable grounds for its separation. While the two hosts are widely separated geographically, they are nevertheless very closely related, and it is not strange to find that both hosts harbor exactly the same kind of parasite. As corroborative proof of this we have *Strongylocotes s. subconiceps* found on five races of *Crypturellus soui*.

A male and a female taken on *Crypturellus soui meserythrus*, Cerro Tuxtla, Mexico, may also be referred to this subspecies. The measurements are exceedingly close, the only appreciable differences being the lengths of the abdomen and pterothorax. The former may vary owing to pressure in mounting, while the latter is difficult to determine, since the end of the mesometathoracic suture is not always clearly visible. The genital armature is also very close as to measurements and shape, as are the abdominal hooks. This form has the

hooks very similar to those of *P. h. hamata* (see Carriker, 1936, pl. 9, fig. 2).³

MEASUREMENTS OF *PHYSCONELLA KELLOGGI* SUBSIMILIS

Structure	From Bolivia				From Mexico			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	0.933	-----	1.00	-----	0.933	-----	1.02	-----
Head.....	0.25	0.326	0.25	0.347	0.239	0.328	0.260	0.347
Prothorax.....	0.108	0.27	0.108	0.281	0.110	0.280	0.118	0.280
Mesothorax } Metathorax }	0.174	0.369	0.238	0.358	0.15	0.347	0.174	0.370
Abdomen.....	0.564	0.694	0.596	0.748	0.574	0.660	0.640	0.738

PHYSCONELLA NOTHOCERCAE Carriker

Physconella nothocercae CARRIKER, Lice of the tinamous, p. 97, pl. 10, figs. 1, 1a, 1936. (Host: *Nothocercus nigrocapillus nigrocapillus*.)

Three females of this species were taken on *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, on July 16, 1941.

These specimens could not be compared directly with the type of *P. nothocercae* but were compared with two females that were taken on another specimen of *Nothocercus nigrocapillus* collected at Huacapistana, Peru, and that were discussed under the description of the species. The measurements are all very close to those of the type and to the two Huacapistana females, while there are no other apparent differences. The male of this species is still unknown.

MEASUREMENTS OF FEMALES OF *PHYSCONELLA NOTHOCERCAE*

Structure	Type		Specimen from <i>Nothocercus nigrocapillus</i> (Peru)		Specimen from <i>N. bonaparti</i> (Colombia)	
	Length	Width	Length	Width	Length	Width
Body.....	1.12	-----	1.16	-----	1.07	-----
Head { frons..... } temples..... }	0.28	0.38	0.28	{ 0.305 } 0.38 }	0.28	{ 0.30 } 0.37 }
Prothorax.....	0.13	0.27	0.14	0.29	0.13	0.28
Pterothorax.....	0.22	0.336	0.18	0.37	0.17	0.37
Abdomen.....	0.68	0.68	0.705	0.76	0.66	0.74
Antennae.....	0.25	-----	0.27	0.043	0.26	0.043
Frontal hooks.....	-----	-----	0.087	-----	0.09	-----
Seventh abdominal segment.....	-----	-----	-----	0.337	-----	0.347

³ In the explanation of the plates in "The Lice of the Tinamous," pl. 9, fig. 1, is given as the female of *P. kelloggi subsimilis*, which is an error, this figure illustrating the female of *P. k. kelloggi*, taken on *Crypturellus soui nigriceps* (as given in the text). Figure 1a on the same plate represents the male genitalia of *P. k. subsimilis*, while figs. 2 and 2a are correctly given as of *P. h. hamata*.

Genus MEGAGINUS Carriker

MEGAGINUS EMARGINATUS EMARGINATUS Carriker

Megaginus emarginatus emarginatus CARRIKER, Lice of the tinamous, p. 98, pl. 10, figs. 3-3c, 1936. (Host: *Crypturellus obsoletus punensis*.)

A male and a female taken on *Crypturellus t. tataupa*, Río Lipeo, Bolivia, are extremely close to this species. They are slightly smaller in some dimensions but not in all, while the male genitalia are precisely the same in shape and measurements of their component parts. Most of the discrepancies in measurements might easily fall within the range of individual variation. It is rather unusual to find the same parasite on two hosts so different from each other.

Two males and a female were taken by the author at Samaipata, Bolivia, on *Crypturellus obsoletus crucis*, a recently described race. These three specimens of *Megaginus* are almost identical with others from the type host (*C. o. punensis*), only slight differences, all within the range of individual variation, being present.

MEASUREMENTS OF MEGAGINUS EMARGINATUS EMARGINATUS

Structure	Types (corrected)				Specimens from Río Lipeo, Bolivia			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.19		1.25		1.085		1.19	
Head.....	0.43	0.585	0.44	0.585	0.40	0.586	0.40	0.608
Prothorax.....	0.102	0.30	0.108	0.308	0.108	0.30	0.12	0.31
Pterothorax.....	0.216	0.40	0.227	0.42	0.19	0.40	0.217	0.42
Abdomen.....	0.617	0.617	0.68	0.617	0.56	0.59	0.64	0.61
Antennae.....	0.206		0.195		0.195	0.043	0.195	0.04
Basal plate.....	0.25	0.07			0.28	0.08		
Paramers.....	0.12	0.065			0.12	0.065		

MEGAGINUS EMARGINATUS LATACLYPEUS, new subspecies

FIGURE 8, a

Type.—Female, adult, from *Crypturellus soui meserythrus*, collected by the author at Tres Zapotes, Veracruz, Mexico, on February 26, 1940; in U. S. National Museum.

When compared with females of *M. e. emarginatus* we find that this new race is considerably smaller in all dimensions except the length of the prothorax, which is actually longer but not quite so wide. All the remaining measurements are consistently smaller except the front of the head. The head is of different shape and proportions, the front being wider, with the frontal emargination shallower and the sides of the front more rounded and expanded; the emarginations on each side of the occiput are less deep; the

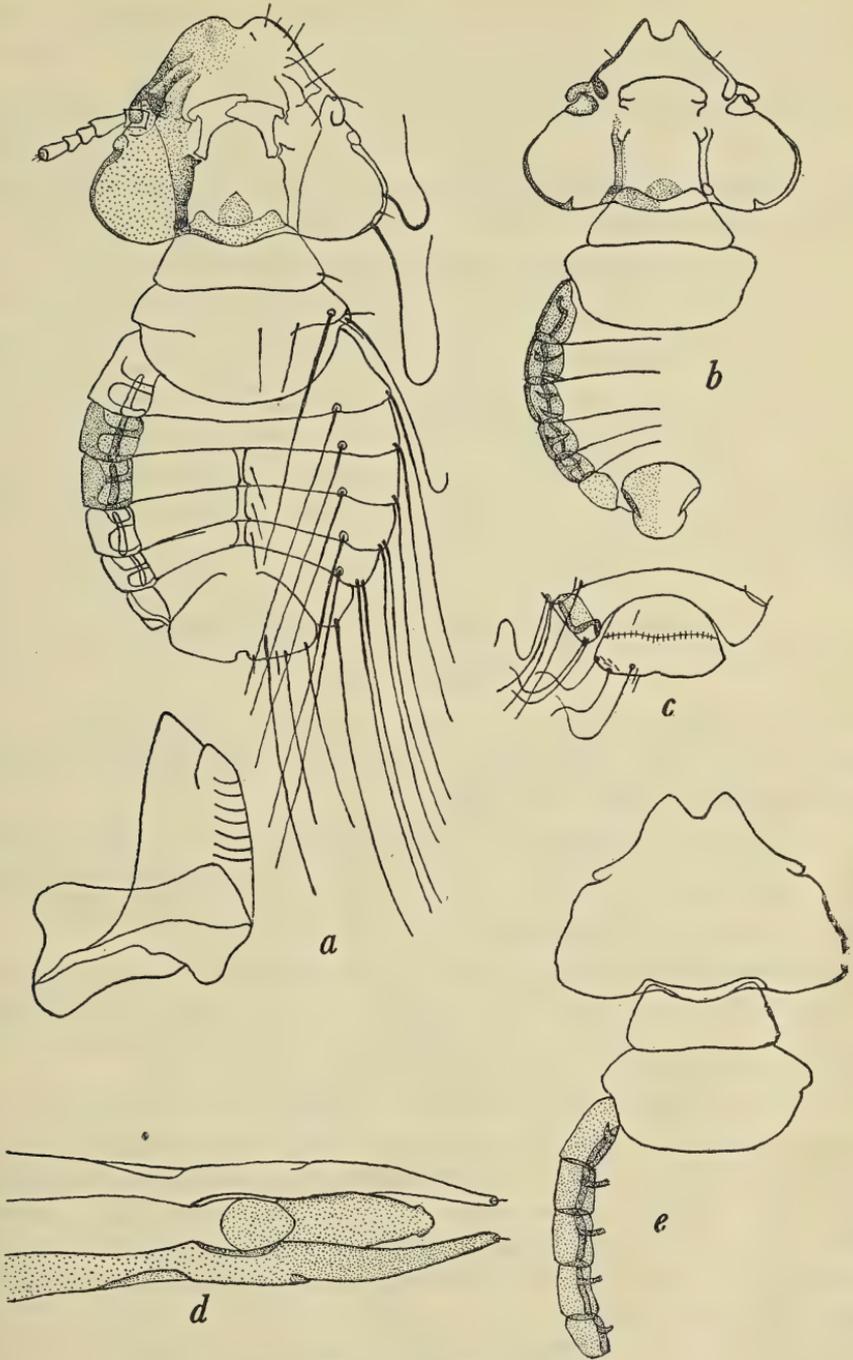


FIGURE 8.—MEGAGINUS

- a*, *Megaginus emarginatus lataclypeus*, new subspecies: Female with enlarged mandible.
b-d, *M. e. excavatus*, new subspecies: *b*, Body of male; *c*, tip of female abdomen; *d*, male genitalia.
e, *M. e. dissimilis*, new subspecies: Body of female.

prothorax is wider anteriorly, and the pterothorax extends farther laterally from the sides of the abdomen; the last abdominal segment is more rounded posteriorly and less protuberant.

The chaetotaxy and the markings of the abdominal pleurites seem to be about the same. It is unfortunate that no male is available, since the genitalia would undoubtedly present distinguishing characters. Three additional females were taken on the same bird.

MEASUREMENTS OF MEGAGINUS EMARGINATUS

Structure	<i>lataclypeus</i> (female, type)		<i>emarginatus</i> (female)	
	Length	Width	Length	Width
Body.....	1.08		1.26	
Head.....	0.39	0.51	0.444	0.585
Prothorax.....	0.118	0.28	0.108	0.309
Pterothorax.....	0.202	0.38	0.222	0.423
Abdomen.....	0.57	0.54	0.68	0.618

MEGAGINUS EMARGINATUS EXCAVATUS, new subspecies

FIGURE 8, b-d

Types.—Male and female, adults, from *Crypturellus soui inconspicuus*, collected by the author at Santa Ana, Río Coroico, Bolivia, July 30, 1934; in collection of author.

The series of 4 males and 12 females, from which these types were selected, was tentatively placed under *M. e. emarginatus* (Carriker, 1936, p. 100), but a more careful study of them reveals differences much too great to be disregarded.

Diagnosis.—More closely related to *emarginatus* than to *quadri-thorax*, having the shape of the prothorax and the pattern of markings on pleural plates similar to the former but differing radically from both in the shape of the head and the frontal emargination.

The head is wider and shorter, with clypeus narrower; the frontal emargination wider and twice the depth, while the bipartite tips of the frons are more pointed. It resembles *M. e. sordidus* in shape of head, although the new form has the head even wider, but it differs from *sordidus* in the narrower clypeus, with tips of frons more pointed, and in deeper and wider emargination, as well as in the markings of the pleural plates.

It differs from *M. e. lataclypeus* in the same way as from the other races of *emarginatus*, viz: in the much narrower clypeus, pointed frons, and deep frontal emargination; in fact, there is no other form of the genus possessing this type of clypeus and clypeal emargination (table of measurements follows *dissimilis*).

MEGAGINUS EMARGINATUS DISSIMILIS, new subspecies

FIGURE 8, e

Type.—Female, adult, from *Crypturellus soui nigriceps*, collected by the author at Tamborapa, northern Peru, July 14, 1933; in collection of author.

Diagnosis.—The type and one female paratype have some of the characters of *excavatus* but differ strikingly in others. The markings on the pleural plates are quite different, there being no band along the lateral margin of these sclerites, while the longitudinal band is nearer to the inner margin of the plates, and the median transverse band begins at the *outer edge of longitudinal band* and extends some distance *inside* of the sclerite, into the tergal plate. The first and the sixth paratergal plates are without markings except for a very faint longitudinal bar along inner edge of sclerite on first segment.

The clypeal emargination is even larger than in *excavatus* and of different shape, being less rounded on the posterior portion, while the preantennal area of the head has the lateral margins decidedly *concave*, and the whole head is differently shaped.

Unfortunately no males are available for study, but the above characters seem to be sufficient to warrant the separation of this form from all the other races.

The measurements of *dissimilis* are almost exactly the same as in the female of *excavatus*, except that the abdomen is wider (0.63 against 0.58 mm.), while the clypeal emargination is 0.06 by 0.087 against 0.043 by 0.065. In both *emarginatus* and *lataclypeus* the emargination is 0.021 by 0.053 mm.

MEASUREMENTS OF MEGAGINUS EMARGINATUS

Structure	<i>excavatus</i>				<i>dissimilis</i> (female)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body	1.05		1.19		1.23	
Head	0.375	0.55	0.39	0.59	0.40	0.586
Prothorax	0.11	0.29	0.13	0.30	0.12	0.305
Pterothorax	0.195	0.38	0.23	0.41	0.23	0.42
Abdomen	0.54	0.54	0.68	0.58	0.67	0.63
Antennae	0.18	0.03				
Basal plate	0.195	0.055				
Paramers	0.097	0.053				
Clypeal emargination	0.043	0.065			0.06	0.087

Genus CUCLOTOCEPHALUS Carriker

Cuclotocephalus CARRIKER, Lice on the tinamous, p. 101, 1936. (Genotype: *C. extraneus* Carriker.)

This genus was erected solely on the characters of the female, the

male being unknown. Since that time I have taken the male, not only on the host of the genotype but also on other species of *Nothoprocta*, but as yet it has not been taken on any other genus.

The additional generic characters that it is necessary to add to the original description are as follows: Antennae dimorphic, the first segment being lengthened and swollen, the second longer than in the female, while the third has a slight hook on the inner side at the distal end; male genitalia simple, resembling very much those of *Megaginus* (see fig.); the female is considerably larger than the male.

The new material of this genus presents a most interesting fact concerning the distribution of the two species originally described as belonging to it, viz: *C. extraneus* and *C. secundus*. At the time of describing them I was uncertain as to whether the two forms were conspecific, but the new material proves conclusively that the two are *distinct species*, since I have taken *both species* on the *same individual host*. Very few cases among the tinamous are now known where two closely related species of the same genus of parasite are found together. One instance is found where two species of *Rhynchothura* have been taken on the same host, and another is the remarkable distribution of *Heptapsogaster mandibularis*, *H. temporalis*, and *H. inexpectata*.

CUCLOTOCEPHALUS EXTRANEUS Carriker

Cuclotocephalus extraneus CARRIKER, Lice of the tinamous, p. 101, pl. 6, figs. 1, 1a, 1936.⁴ (Host: *Nothoprocta branickii*.)

No more specimens of this species have been taken on the type host since 1936, but I now have a large series of both sexes from *Nothoprocta p. pentlandi*, taken at Choros, Bolivia, and one male from same host taken at Oploca, Bolivia, which bird host is the *type host* for *C. secundus*; also another female from *Nothoprocta ornata* subsp., Incachaca, Bolivia.

The above series presents clear-cut characters for the easy separation of *extraneus* and *secundus*, which are as follows: *C. extraneus* may be distinguished by its large size, much wider head, and the type of paratergal plates, which are well outlined on the inner side (in *secundus* they are completely fused with the tergites and the line of suture invisible); much more deeply chitinized, and with a darker-colored band along the outer margin, which is twice as wide as in *secundus*.

The specimens of this species taken on *N. p. pentlandi* prove to be subspecifically distinct from typical *extraneus* and are described below.

⁴The published figure of *extraneus* does not give a true conception of the markings of the paratergal plates.

CUCLOTOCEPHALUS EXTRANEUS SIMILIS, new subspecies

FIGURE 9, a, c

Types.—Male and female, adults, from *Nothoprocta p. pentlandi*, collected by the author at Choros, Dept. Cochabamba, Bolivia, on January 10, 1937; in collection of the author.

There is very little difference in size between *extraneus* and *similis*, the former being slightly larger in all dimensions, with the abdomen much wider (0.80 against 0.64 mm.); the markings of the paratergal plates are decidedly different (see fig.). In *extraneus* they are wider and have the greater part deeply colored, with this more heavily chitinized portion *concave on the inner side*, with the top and bottom portions reaching to the inner side of the sclerite. In *similis* the paratergal plates are narrower, and have the deeply colored portion reduced to a narrow band along the outer margin of the sclerite. A character not mentioned in the original description of *extraneus*, and present also in *similis*, is the tessellated dorsal surface of the pterothorax and abdomen more noticeable on the paratergal plates. The chaetotaxy of the abdomen is essentially the same in the two races, except that the prominent dorsal hairs are *shorter* and *slenderer*.

MEASUREMENTS OF CUCLOTOCEPHALUS EXTRANEUS

Structure	<i>extraneus</i> (type, female)		<i>similis</i>			
			Male		Female	
	Length	Width	Length	Width	Length	Width
Body.....	1.97		1.53		1.90	
Head.....	0.52	0.53	0.44	0.43	0.50	0.49
Prothorax.....	0.19	0.325	0.174	0.26	0.17	0.29
Pterothorax.....	0.34	0.42	0.29	0.347	0.326	0.395
Abdomen.....	1.22	0.80	0.88	0.58	1.19	0.64
Antennae.....	0.227		0.24	0.045	0.217	0.04
Basal plate.....	0.195	0.075				
Paramers.....	0.195	0.097				
Endomeral plate.....	0.105	0.06				

The male genitalia are quite simple, consisting of a short basal plate, scarcely, if any, longer than the paramers, not so wide, and poorly chitinized; the paramers are thicker at their bases, tapering slightly to their tips, which are bent inward. The dorsal endomeral plate overlaps the inner edge of the paramers for most of its length, is slightly more than half the length of the paramers, and has the posterior end bluntly pointed; the ventral endomeres are reduced to a pair of short, narrow bars on each side of the dorsal endomere; penis absent.

Eight males and five females (including the types) were taken on the type host at Oploca, Bolivia, and a single female on *Nothoprocta* from Incachaca. This female is not quite typical, but until more material is available for study it seems best to place it here.

CUCLOTOCEPHALUS EXTRANEUS ORNATUS, new subspecies

FIGURE 9, b, i

Types.—Male and female, adults, from *Nothoprocta o. ornata*, collected by the author at Callipampa, Bolivia, on June 4, 1936; in collection of author.

Diagnosis.—The head has the front elliptical, instead of uniformly rounded; occiput more deeply emarginate; sides of prothorax more convex and not divergent; pterothorax wider at lateral angles (extending farther beyond sides of abdomen) and its sides more convex.

Whole abdomen much slenderer, the last abdominal segment in the female is of the same shape as in typical *extraneus*, except the anterior end is less conical; the chaetotaxy of the entire body seems to be practically the same as in *extraneus*. The paratergal plates are the same as in *similis*. Region of temples, thorax, paratergal plates and narrow area inside them have the dorsal integument rugose, as in *similis*. There is less dimorphism in the antennae than in *similis*; the basal plate is wider, paramers longer and much narrower. There are some striking discrepancies in the measurements, the abdomen of the female of *ornatus* being narrower than that of the male, while in *similis* it is the reverse; the prothorax and pterothorax of the two sexes are practically the same size in *ornatus*, but in *similis* they differ decidedly; the head is decidedly wider than long in *ornatus*, while in *similis* it is the reverse. The female as compared with *extraneus* is smaller in all dimensions, with the head proportionally wider and the abdomen very much narrower.

MEASUREMENTS OF CUCLOTOCEPHALUS EXTRANEUS ORNATUS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.58	-----	1.71	-----
Head.....	0.43	0.456	0.477	0.50
Prothorax.....	0.15	0.26	0.15	0.26
Pterothorax.....	0.28	0.35	0.27	0.35
Abdomen.....	0.96	0.52	1.07	0.46
Antennae.....	0.25	0.05	0.217	0.04
Basal plate.....	0.20	0.087	-----	-----
Paramers.....	0.205	0.095	-----	-----
Endomeral plate.....	0.11	0.043	-----	-----

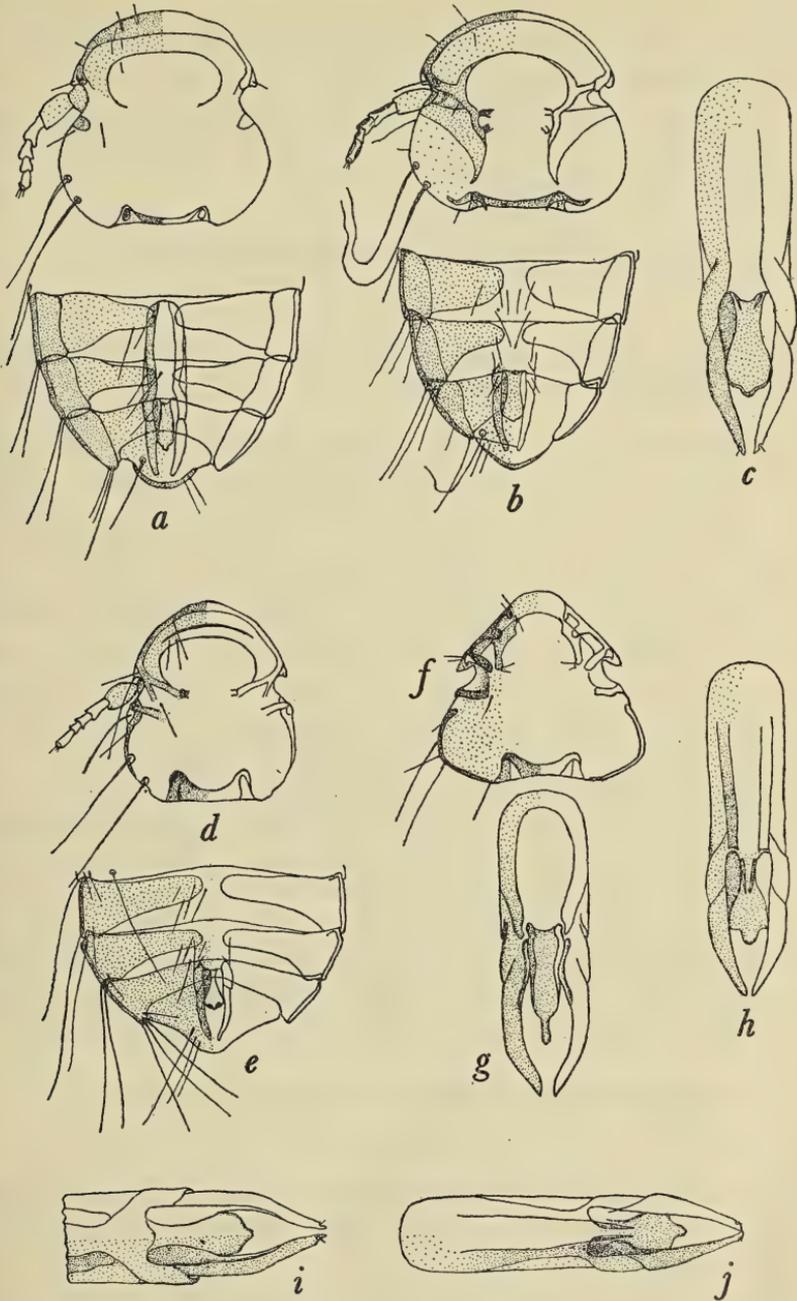


FIGURE 9.—CUCLOTOCEPHALUS AND NOTHOCOTUS

- a, c, Cuclotocephalus extraneus similis*, new subspecies: *a*, Male head and tip of abdomen; *c*, male genitalia.
- b, i, C. e. ornatus*, new subspecies: *b*, Male head and tip of abdomen; *i*, male genitalia.
- d, e, j, C. secundus secundus* Carriker: *d*, Male head; *e*, tip of male abdomen; *j*, male genitalia.
- f, g, Nothocotus parvithorax parvithorax* Carriker: *f*, Male head; *g*, male genitalia.
- h, Cuclotocephalus secundus incachacae*, new subspecies: Male genitalia.

The single female of *extraneus* taken on *Nothoprocta ornata* subsp., Incachaca, is very close in all respects to *similis*, the size and proportions being almost identical, with nothing outside the range of individual variation. The head is, however, exactly as wide as long, while in *similis* it is slightly longer than wide (0.50 by 0.49 mm.). This specimen I have placed under *C. e. similis*.

CUCLOTOCEPHALUS SECUNDUS SECUNDUS Carriker

FIGURES 9, d, e, j

Cuclotocephalus secundus CARRIKER, Lice of the tinamous, p. 102, pl. 11, fig. 2, 1936.
(Host: *Nothoprocta p. pentlandi*.)

The differences between this species and *extraneus* have been fully explained under *extraneus*. The species was described from a single female. I now have additional material of this species as follows: Six males and four females from *Nothoprocta p. pentlandi* (the type host) taken at Oploca and Padilla, Bolivia; three males and two females from *Nothoprocta ornata* subsp., taken at Incachaca, Bolivia.

The four females from Oploca and Padilla seem to be identical with the type, while the specimens from Incachaca are slightly different, presenting discrepancies in size and proportion of abdomen and pterothorax, as well as in all three parts of the male genitalia.

The male, hitherto unknown, may be diagnosed as follows: Very similar to the female except for size, dimorphism in the antennae, and different shape of seventh abdominal segment. The antennae are exactly like those of the male in *extraneus* (see description under genus). Abdominal segment VI is as wide as in the female, but VII is very small and rounded posteriorly; the general shape of the abdomen is very similar in the sexes, except that in the male it is much smaller, but of similar proportions (see table of measurements).

CUCLOTOCEPHALUS SECUNDUS INCACHACAE, new subspecies

FIGURE 9, h

Types.—Male and female, adults, from *Nothoprocta ornata* subsp., collected by the author at Incachaca, Dept. Cochabamba, Bolivia, in June 1930; in collection of author.

Diagnosis.—The abdomen of the male is longer and narrower than in *secundus* (0.98 by 0.63 against 0.93 by 0.67 mm.); the pterothorax in the female is wider (0.39 against 0.336 mm.); the basal plate in the male is shorter and wider (0.195 by 0.075 against 0.12 by .0084 mm.); paramers are shorter and narrower (0.108 by 0.075 against 0.12 by 0.084 mm.); endomerale plate longer but of same width (0.097

against 0.087 by 0.043 mm.). The slight differences in the body measurements of the males are unimportant.

MEASUREMENTS OF CUCLOTOCEPHALUS SECUNDUS

Structure	<i>secundus</i>				<i>incachacae</i>			
	Male (cotype)		Female (type)		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.40	-----	1.69	-----	1.45	-----	1.69	-----
Head.....	0.41	0.37	0.455	0.42	0.42	0.38	0.456	0.42
Prothorax.....	0.15	0.24	0.15	0.26	0.13	0.26	0.155	0.28
Pterothorax.....	0.26	0.303	0.27	0.336	0.25	0.33	0.29	0.39
Abdomen.....	0.81	0.56	0.93	0.67	0.82	0.54	0.98	0.63
Antennae.....	0.205	0.045	0.195	-----	0.20	0.05	0.17	0.033
Basal plate.....	0.22	0.065	-----	-----	0.195	0.075	-----	-----
Paramers.....	0.12	0.084	-----	-----	0.108	0.075	-----	-----
Endomeral plate.....	0.087	0.043	-----	-----	0.097	0.043	-----	-----

Genus NOTHOCOTUS Carriker

NOTHOCOTUS PARVITHORAX PARVITHORAX Carriker

FIGURE 9, f, g

Nothocotus parvithorax CARRIKER, Lice of the tinamous, p. 104, pl. 11, figs. 3-3b, 1936. (Host: *Nothocercus bonaparti*.)

This species was described from one male and two females. The types are not available for comparison with the series of specimens taken on the type host, collected in the Sierra Perijá, Colombia, in 1941, but a female paratype is still in my collection.

This series is exceedingly uniform *inter se* and does not agree in all respects with the figures of the types of *parvithorax*, nor does the female paratype agree with the published figure. The temples are *not* angulated in either sex, but rounded, almost exactly the shape of the temples in *N. p. subsimilis*. The other difference is in the shape of the paramers, which have the tips bent inward somewhat as in *subsimilis*, but the bent portion is not concave, nor are the tips tapering as in *subsimilis*. An error was probably made in preparing the published drawings of the types, since all the other details of the genital armature in the Colombian insects are as figured for the species.

New figures are herewith given of the head and genital armature of the Colombian insect. Their measurements are very close to those of the types, and until the types can be compared with the Colombian series it seems best to identify them as *N. p. parvithorax*. In view of the more extensive knowledge acquired of this group of Mallophaga, it seems best to make *N. subsimilis* a subspecies of *parvithorax*.

Outside of the dimorphism in the antennae of *parvithorax*, the heads of the two sexes are almost identical, the only difference being slightly greater width at the temples in the female (0.466 against 0.434 mm.); the markings and chaetotaxy are identical, as well as the shape of the temples (see figure of male head).

Subfamily HEPTAPSOGASTRINAE Carriker

Genus RHOPALOCERAS Taschenberg

RHOPALOCERAS ONISCUS (Nitzsch)

Goniodes oniscus NITZSCH, in Giebel, Zeitschr. für Ges. Naturw., vol. 28, p. 388 (female), 1866. (Host: *Tinamus tao*.)

Goniodes aliceps NITZSCH, in Giebel, *ibid.*, p. 389 (male). (Host: *Crypturus macrourus*.⁵)

A fine series of this species was taken on the type host at Tierra Nueva, Sierra Perijá, Colombia, on July 19, 1941. They agree in all respects with the specimen taken on *Tinamus t. tao* in Venezuela, from which the species was redescribed (Carriker, 1936, p. 107).

RHOPALOCERAS GENITALIS GENITALIS Carriker

Rhopaloceras genitalis genitalis CARRIKER, Lice of the tinamous, p. 110, pl. 15, figs. 2-2c, 1936 (Host: *Tinamus serratus ruficeps*.)

Additional specimens of this species were taken on the type host, col-

⁵ Kéler (1938, p. 325) suggests that the name *Crypturus macrourus* was a mistake for *Dendrotya macrourus* and that the specimens were stragglers. Dr. Hopkins was inclined to accept this theory, but I was rather doubtful, even if the two birds had been together in a zoological garden, while in their wild state it would have been utterly impossible, since the birds are not found in the same region at all. However, according to Dr. Hopkins (1940, p. 419) Kéler compared a paratype of *Rhopaloceras genitalis simplex* Carriker (sent to Hopkins by the author) with the type of *Goniodes aliceps* Nitzsch and found them "absolutely identical with Nitzsch's type." This seemed to leave little doubt that the true host of *R. aliceps* (Nitzsch) was *Tinamus major castaneiceps* of Costa Rica, or else some closely related subspecies of *T. major*, and that *R. genitalis simplex* Carriker was a pure synonym of *R. aliceps* (Nitzsch).

Recently I received the following comment from Dr. Hopkins, bearing on the identity and status of *Goniodes aliceps* Nitzsch:

"In the previous note on this species (Hopkins, 1940, pp. 418-421) I discussed the identity of *R. genitalis simplex* Carriker and placed the form in the synonymy of *R. aliceps* (Nitzsch). My reason for this step was that Dr. Kéler, after comparing my male paratype of *simplex* with the male type of *aliceps*, informed me that they were 'absolutely identical,' except for differences in the shape of the temporal lobes which are apparently due to the accidents of mounting.

"L. R. Guimarães has now kindly sent me a copy of Kéler's most recent remarks on *Rhopaloceras* (Kéler, 1939, p. 233), contained in a paper which I had not seen because of war conditions. These remarks compel me to alter my opinion entirely.

"Kéler now synonymizes *Rhopaloceras aliceps* (Nitzsch) with *R. oniscus* (Nitzsch) and states that the penis of the solitary male in the Nitzsch collection (i. e., the type of *aliceps*) is damaged to such a degree as to render impossible a proper comparison with specimens which Carriker described as *oniscus*. He now states that *oniscus* and *genitalis* are specifically distinct.

"In view of the fact that the genitalia of the type of *aliceps* are in such a damaged condition, I am forced to withdraw my statement that *R. g. simplex* is a synonym."

Thus it appears, after much controversy, that the status of *R. oniscus*, *R. aliceps*, *R. g. genitalis*, and *R. g. simplex* now definitely remains the same as placed by me in my first treatment of the group (Carriker, 1936).

lected by the author in the Sierra Perijá of Colombia, which agree in every way with the type material.

Five females taken on *Tinamus s. serratus*, collected by the author at Todos Santos, Río Chaparé, Bolivia, agree so closely with the female type of *genitalis* that they must be classed with that species.

RHOPALOCERAS BREVITEMPORALIS Carriker

Rhopaloceras brevitemporale CARRIKER, Lice of the tinamous, p. 112, pl. 13, figs. 1-1e, 1936. (Host: *Crypturellus obsoletus punensis*.)

An additional series of this species was taken on *Crypturellus obsoletus crucis* by the author at Samaipata, Bolivia, November 2, 1937. These specimens apparently agree in all particulars with the type series from *C. o. punensis*. It would seem, from a study of the mallophagan parasites taken on *C. o. crucis*, that this new race of tinamou is a rather poor one, especially since it was based on a single specimen, probably nothing more than a very old, richly colored male bird.

RHOPALOCERAS RUDIMENTARIUS Carriker

Rhopaloceras rudimentarium CARRIKER, Lice of the tinamous, p. 113, pl. 14, figs. 1-1c, 1936. (Host: *Crypturellus soui nigriceps*.)

A series of 11 males and females from three individuals of *Crypturellus soui meserythrus* collected by the author at Tres Zapotes and Cerro Tuxtla, Veracruz, Mexico, between February and May 1940, agree with the type series of *rudimentarium* in every particular. The male and female genitalia and the number of teeth in the combs of the various abdominal segments are identical.

Three males and three females were also taken on *Crypturellus soui (mastelinus ?)*, collected by the author at Airoca, Sierra Perijá, Colombia, April 7, 1942, which cannot be separated from the typical specimens. This makes the seventh race of *Crypturellus soui* on which this species of *Rhopaloceras* has been taken by the author, in addition to two races of *C. undulatus*.

The Mexican series is, perhaps, more nearly identical with the types than some of the others, but they all run exceedingly close. In such a widespread genus as *Rhopaloceras*, containing so many species, it is very significant that the various races of *Crypturellus soui* are exceedingly close in their relationships. This same fact was noted under *Strongylocotes subconiceps*.

RHOPALOCERAS PENNATICEPS (Paine and Mann)

Goniodes pennaticeps PAINE and MANN, Psyche, vol. 20, p. 16, fig. 3, 1913. (Host: *Anthus lutescens*=*Crypturellus t. tataupa*.)

Rhopaloceras pennaticeps (Paine and Mann) CARRIKER, Lice of the tinamous, p. 114, 1936. (Host: *Crypturellus t. tataupa*.)

An additional pair was taken on the type host, collected by the author at Río Lipeo, southern Bolivia, and another pair on the same

host at Samaipata, Bolivia, November 4, 1937. They agree exactly with the original insects from which the species was redescribed by the author.

RHOPALOCERAS HETEROGENITALIS HETEROGENITALIS, new species

FIGURE 10, a, b, e

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, on March 28, 1940; in U. S. National Museum.

This species differs from all the other known forms of the genus in the type of the male genital armature. There is no other that it seems to resemble as to the paramers, although the endomeres are somewhat after the type of *brevitemporalis*, to which it is nearest in size and the female genitalia, but it is still considerably larger than that species. The shape of the head is quite close to that of *R. laticeps abbreviatus*, but the thorax and genitalia are very different.

The number of teeth in the abdominal combs varies greatly, both among individuals and between the right and left sides. The accompanying figure shows clearly the shape and structure of the head and thorax and the antennae of both sexes, as well as the last abdominal segment and genital apparatus of the female, while an enlarged figure of the unique male genital armature is given.

MEASUREMENTS OF RHOPALOCERAS HETEROGENITALIS HETEROGENITALIS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.71		3.51	
Head.....	0.93	1.43	0.98	1.52
Prothorax.....	0.32	0.87	0.32	0.90
Mesothorax.....	0.28	1.01	0.31	1.06
Metathorax.....	0.19	1.15	0.17	1.16
Abdomen.....	1.41	1.21	1.95	1.26
Antennae.....	0.52	0.095	0.45	0.075
Paramers.....	0.097	0.04		
Endomeres.....	0.205	0.03		

NUMBER OF TEETH IN ABDOMINAL COMBS

Male		Female	
Left	Right	Left	Right
12	15	17	16
12	12	14	13
10	12	13	12
10	8	11	11
5	3	5	7

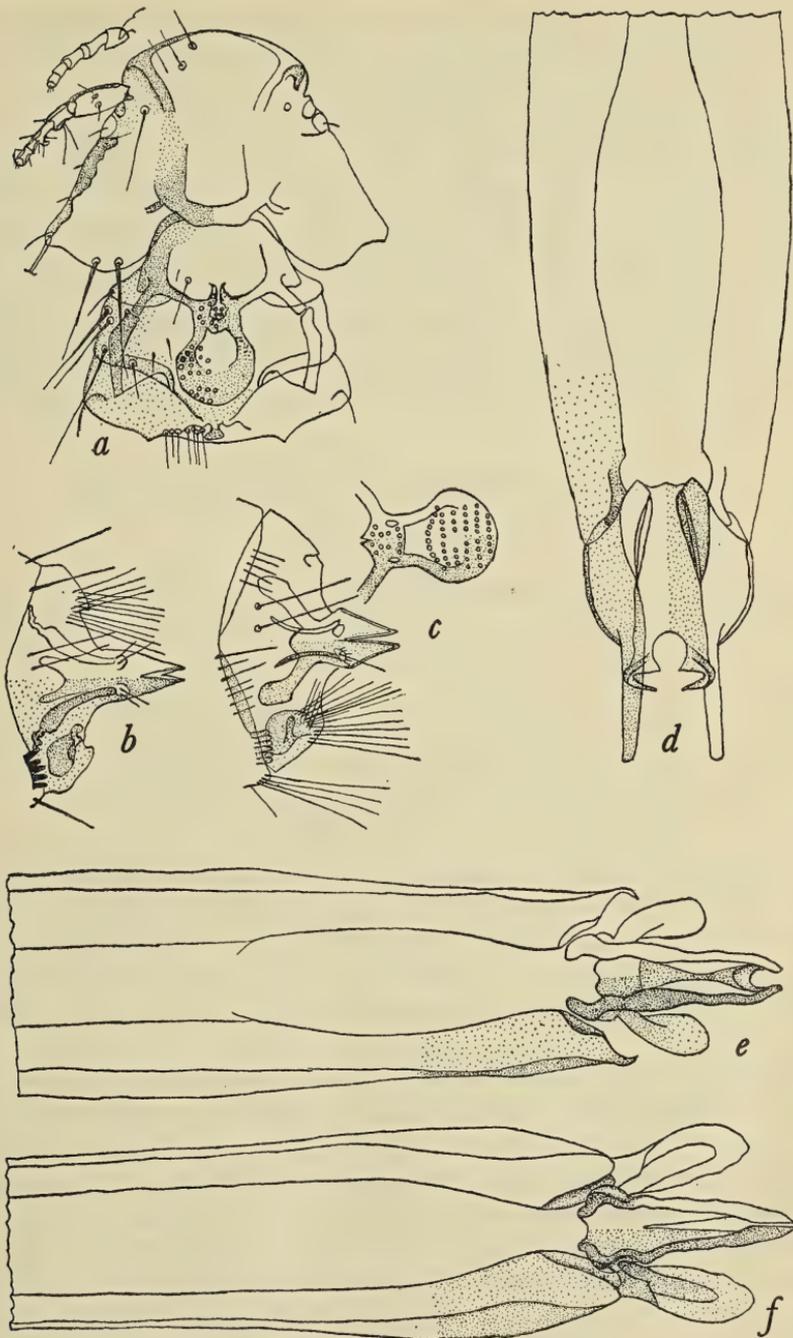


FIGURE 10.—RHOPALOCERAS

- a, b, e, Rhopaloceras heterogenitalis heterogenitalis*, new species: *a*, Male head and thorax; *b*, tip of female abdomen; *e*, male genitalia.
c, f, R. h. spatulata, new subspecies: *c*, Tip of female abdomen and mesosternal plate; *f*, male genitalia.
d, R. laticeps bonaparti, new subspecies: Male genitalia.

The elongated-oval, thin flaps at each side are unquestionably the paramers and are almost unpigmented except toward the thickened basal portion. The endomeral plates are clearly connected basally, and *apparently* near the tips, and may be covered by a membrane both above and below, thus forming a kind of tube, although there is not a great deal of visible evidence to corroborate this theory. The irregular outline of the endomeres is also a most unusual character. There is nothing unusual about the abdominal structure, other than the apical segment in the female, which is figured. The chaetotaxy is very similiar to that of *brevitemporalis*, as is also the shape of the last abdominal segment in the male. The number of teeth given for the abdominal combs was taken from the types and does not represent the average.

RHOPALOCERAS HETEROGENITALIS SPATULATA, new subspecies

FIGURE 10, c, f

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; in U. S. National Museum.

Diagnosis.—Very closely related in all respects to *R. h. heterogenitalis*, from the Mexican host *Crypturellus b. boucardi*. The head, with the exception of the male antennae, is practically the same shape as in *heterogenitalis*, but a trifle *smaller* in the male and *larger* in the female; the antenna is longer in the male and shorter in the female, and with fewer hairs in the male; the prothorax is the same size in the male, the mesothorax longer, but the same width, while the metathorax is both shorter and narrower (these measurements for length are the exposed lateral margins). There are also discrepancies in the size and proportions of the thoracic segments in the female (see table of measurements).

The paramers are much longer but very little wider (0.13 by 0.053 against 0.097 by 0.04); the endomeres are about the same length but more than twice the width; the mesothoracic sternal plate is of a decidedly different shape and chaetotaxy (see figure). The number of teeth in the abdominal combs is also very variable, as in *heterogenitalis*, although they average nearly the same. The presence of *heterogenitalis* on *C. b. boucardi* and of a closely related subspecies of it on *C. idoneus* seems to be rather conclusive proof that *C. idoneus* may be conspecific with *C. boucardi*, and not *C. cinnamomeus*, as given by Peters.

MEASUREMENTS OF RHOPALOCERAS HETEROGENITALIS SPATULATA

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.70		3.58	
Head {frons.....	0.90	0.74	1.06	0.78
{temples.....		1.39		1.60
Prothorax.....	0.32	0.87	0.37	0.97
Mesothorax.....	0.32	1.00	0.39	1.13
Metathorax.....	0.15	1.07	0.17	1.26
Abdomen.....	1.30	1.19	1.97	1.41
Antennae.....	0.59	0.09	0.41	0.087
Paramers.....	0.13	0.053		
Endomeres.....	0.217	0.075		

NUMBER OF TEETH IN ABDOMINAL COMBS

Male		Female	
Left	Right	Left	Right
14	15	19	16
13	13	13	15
12	10	13	13
6	9	12	12
5	4	7	6

RHOPALOCERAS LATICEPS BONAPARTI, new subspecies

FIGURE 10, d

Types.—Male and female, adults, from *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, in July 1941; in U. S. National Museum.

Diagnosis.—This race does not differ strikingly from *R. l. abbreviatus*. The shape, markings, and chaetotaxy of the head and body segments are very similar, although *bonaparti* is slenderer; the sternal thoracic plate is of the same shape, but the hairs attached to it are longer, as are the hairs at the posterolateral angles of the abdomen.

The male genital armature, while of the same type, differs markedly as to proportions and detail, but the genital apparatus of the female is practically identical with that of *abbreviatus*, the differences being too small to be worthy of illustration. The measurements of the male as compared with Piaget's for *laticeps* show the length to be more in all segments except the abdomen, which is less (this length is not always reliable), while the head and thorax are very much wider in *bonaparti*. As compared with *R. l. abbreviatus*, there are

numerous differences in size, and especially proportion, *bonaparti* averaging slenderer throughout. The number of teeth in the abdominal combs of the male falls within the extremes for *abbreviatus*, some having one more than the maximum and others one less than the minimum. In the female they average fewer in number in practically all the combs.

MEASUREMENTS OF RHOPALOCERAS LATICEPS BONAPARTI

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	3.08		4.17	
Head.....	1.08	1.58	1.28	1.97
Prothorax.....	0.33	1.02	0.44	1.17
Mesothorax.....	0.37	1.15	0.41	1.34
Metathorax.....	0.19	1.24	0.22	1.58
Abdomen.....	1.39	1.34	2.17	1.58
Antennae.....	0.70	0.115	0.45	0.097
Paramers.....	0.24	0.16		
Endomeres.....	0.22	0.11		

NUMBER OF TEETH IN ABDOMINAL COMBS

Male		Female	
Left	Right	Left	Right
17	16	17	16
14	13	16	15
11	12	16	15
9	10	11	11
4	4	5	5

RHOPALOCERAS species(?)

A single male of this genus was taken on *Crypturellus garleppi affinis*, collected by the author at Todos Santos, Río Chaparé, Bolivia. The specimen is in poor condition and has the genital armature mutilated, and so it is impossible to describe or figure it accurately, although it seems to be an undescribed form.

Genus HEPTAPSOGASTER Carriker

HEPTAPSOGASTER MANDIBULARIS Carriker

FIGURE 11, a

Heptapsogaster mandibularis CARRIKER, Lice of the tinamous, p. 116, pl. 16, figs. 2-2b, 1936. (Host: *Crypturellus t. tataupa*.)

The original description and figures given for this species are full and correct, with exceptions that follow and that now prove

to be of unusual importance in separating the species of this particular section of the genus.

The genital armature was poorly described, owing to the fact that the single male (the type) was in poor condition, with the genitalia impossible to distinguish clearly or properly interpret. I have since secured two fine males from the type host, collected at Samaipata, Bolivia, which have been carefully compared with the type. These two specimens are a trifle larger, but otherwise identical with the type, and a correct delineation of the genitalia has been prepared from one of them. The original figure was fairly correct (Carriker, 1936, pl. 16, fig. 2b) as to the basal plate, and paramers, but the drawing of the endomeral plate was very misleading.

One character of the endomeral plate is not always visible, that is, the sac that fills the space between the two lateral prongs and that extends distally a varying distance beyond them, according to the different subspecies. In some of the races of *mandibularis* there are no strengthening bars of chitin within this sac, while in others they are present, while its walls are so thin and transparent that they are often very difficult to differentiate.

The presence in the Mexican material of two races of *mandibularis*, two of *H. temporalis*, and the undescribed species *inexpectata*, has made necessary a complete revision of the *mandibularis-temporalis* group. The second error in the description of *H. mandibularis* was the incorrect description of the chaetotaxy of the abdominal pleurites, which now proves to be of vital importance, especially the presence or absence of certain short, thickened spines. In the male we have the following: Pleurite I has no hairs or spines (this enumeration does not include the hairs at the posterolateral angle of the pleurite); II and III have one spine and one hair; IV and V have three hairs. This arrangement of hairs and spines is one of the essential characters for the separation of all races of *H. mandibularis* from all races of both *H. temporalis* and *H. inexpectata*.

The males of both *H. mandibularis* and *H. inexpectata* have the crescent-shaped "scent gland" on the fifth abdominal pleurite, while *H. temporalis* has the flower-shaped glands on segments IV and V. The females of these three species are separated on the chaetotaxy of the abdominal pleurites and tergites and the character of the last abdominal segment. We have the following known races of *H. mandibularis*:

HEPTAPSOGASTER MANDIBULARIS MODESTAE, new subspecies

FIGURE 11, b, c

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

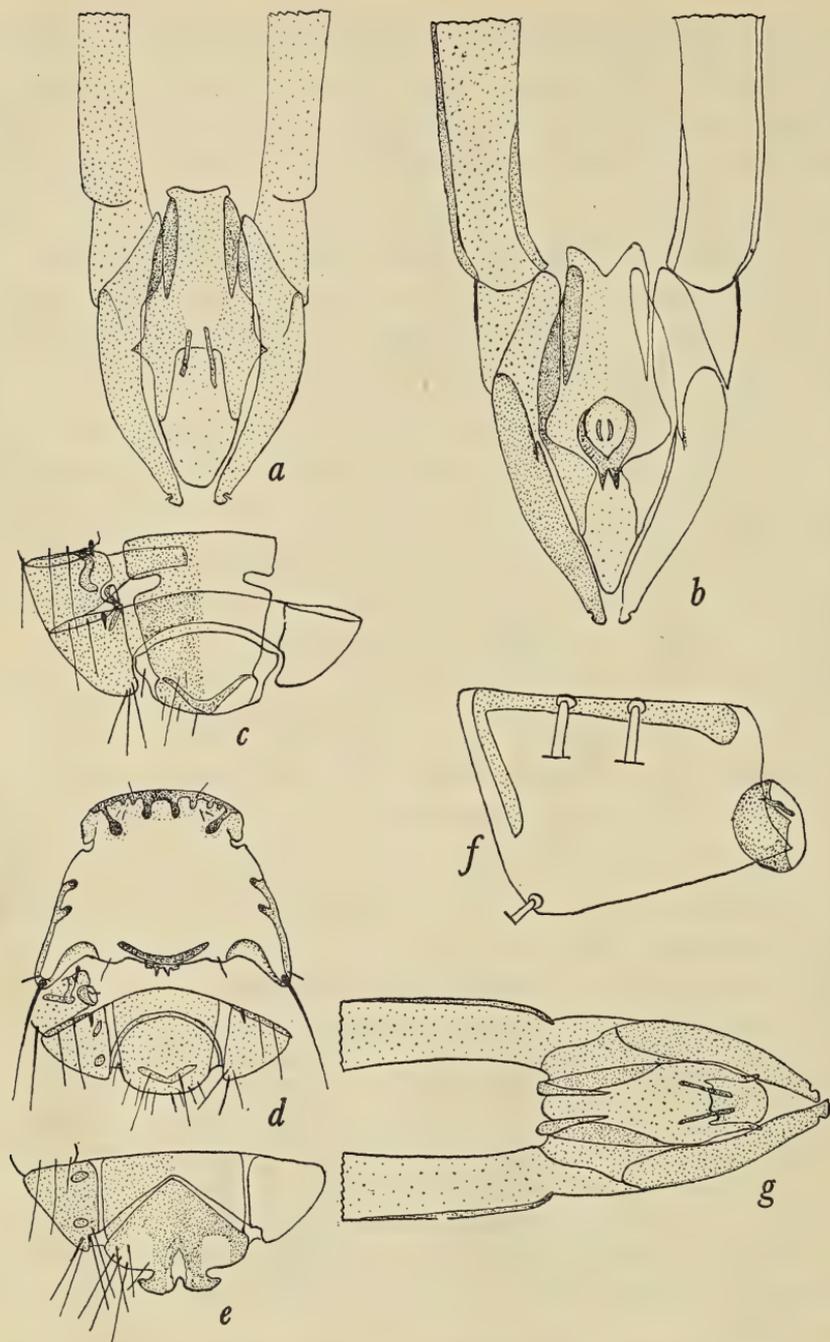


FIGURE 11.—HEPTAPSOGASTER

- a*, *Heptapsogaster mandibularis mandibularis* Carriker: Male genitalia.
b, *c*, *H. m. modestae*, new subspecies: *b*, Male genitalia; *c*, abdomen of female.
d–*g*, *H. m. tapicollae*, new subspecies: *d*, Male head and tip of abdomen; *e*, tip of female abdomen; *f*, scent gland; *g*, male genitalia.

This subspecies differs from the nominate form and from the one that follows chiefly in its much larger size and the male genitalia. The "scent" gland is small (that of *mandibularis* is smallest of all the races known), is of a simple crescent shape, and lies within the deeply incised margin of pleurite V, like *mandibularis*. There is a slight difference in the shape of the last abdominal segment of the male. The female seems to be impossible to separate from the female of *mandibularis*, except in size and proportions.

MEASUREMENTS OF HEPTAPSOGASTER MANDIBULARIS

Structure	<i>mandibularis</i> (types)				<i>modestae</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.13		1.29		1.48		1.61	
Head.....	0.357	0.44	0.39	0.45	0.42	0.57	0.42	0.61
Prothorax.....	0.124	0.24	0.13	0.26	0.15	0.305	0.16	0.33
Mesothorax.....	0.12	0.43	0.13	0.45	0.15	0.58	0.16	0.61
Metathorax.....	0.086	0.42	0.097	0.43	0.11	0.55	0.16	0.57
Abdomen.....	0.62	0.51	0.74	0.57	0.71	0.68	0.96	0.76
Antennae (first segment in male).....	0.075	0.053	0.195		0.11	0.087	0.203	
Paramers.....	0.09	0.08			0.11	0.097		

HEPTAPSOGASTER MANDIBULARIS TAPICOLLAE, new subspecies

FIGURE 11, d-g

Types.—Male and female, adults, from *Crypturellus soui meserythrus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, May 8, 1940; in U. S. National Museum.

The male differs from *mandibularis* and *modestae* in having the temples much less divergent, and from *modestae* in smaller size. Unlike *mandibularis*, abdominal segment VII is deeply imbedded within VI, and is also of different shape.

The genital armature is nearer to that of *mandibularis*, except that the endomerale plate is much wider, with longer prongs and sac. The female seems to be impossible to separate except by measurement, although the temples are much less divergent. The "scent" gland in the male is of the same general shape as the previous two races but much larger, extending into pleurite VI, while sclerite V is *not incised* to receive it, as in *mandibularis* and *modestae*, but it lies just under the inner edge of the plate, with seemingly a short duct leading from it to the surface (see figure).

MEASUREMENTS OF HEPTAPSOGASTER MANDIBULARIS TAPICOLLAE

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.11		1.37	
Head.....	0.35	0.46	0.40	0.49
Prothorax.....	0.13	0.24	0.13	0.28
Mesothorax.....	0.13	0.44	0.13	0.53
Metathorax.....	0.09	0.46	0.12	0.45
Abdomen.....	0.57	0.54	0.70	0.61
Antennae (first segment in male).....	0.09	0.055	0.174	
Paramers.....	0.08	0.075		

HEPTAPSOGASTER MANDIBULARIS NOCTIVAGI Clay

Heptapsogaster stultus noctivagus CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 138, fig. 2d. (Hosts: *Crypturellus n. noctivagus*, Brazil, and *C. noctivagus dissimilis*, British Guiana.)

The fact that the chaetotaxy given for the male of this race agrees with that given by Miss Clay for the male of *H. stultus* proves beyond doubt that the male is a race of *mandibularis* and not of *inexpectata* (equals *stultus* of Clay) (see notes under *H. mandibularis stultus* Clay), while her statement that the seventh abdominal segment in the female is that of *H. mandibularis* Carriker proves that the female belongs also to a race of *mandibularis*, since all known races of *inexpectata* have a similar seventh abdominal segment, as do all races of *mandibularis* and *temporalis*.

The description of the chaetotaxy of the female agrees with that of the female of *mandibularis*, and not of *inexpectata*, but there is one slight discrepancy between Miss Clay's description and my own observations. She gives for segment III, two hairs and one spine on the pleurite, which should be (according to my description), one hair and two spines. The spine next to the hair on this pleurite is longer than the other spine, and a trifle slenderer, but nevertheless a spine, rather than a hair.

Miss Clay has mentioned also a character in this species that I had never noticed before, that is, the presence of a "scent" gland in the female on the inner edge of pleurite V, which is incised to receive it. Further investigation shows that not only *H. mandibularis* possesses this character, but also *H. inexpectata* and *H. temporalis*, the gland in the latter being of a thickened crescent shape, instead of flowerlike as in the male.

HEPTAPSOGASTER MANDIBULARIS STULTUS Clay

Heptapsogaster stultus stultus CLAY, Proc. Zool. Soc. London., ser. B, 1937, p. 136 (*partim*—♂), fig. 4b, pl. 1, fig. 3. (Host: *Crypturellus o. obsoletus*, Argentina.)

In the description of this species Miss Clay has made a regrettable but quite excusable error in that she has described the male of one species and the female of another. Her male is undoubtedly an undescribed race of *H. mandibularis*, while the female is correctly identified as a new species, being that form mentioned by me under my "remarks" concerning *H. mandibularis*, as the form taken along with *mandibularis*, and for that reason could not be classed as a subspecies of it (*mandibularis*) (Carriker, 1936, p. 118).

The name *stultus*, proposed for these two parasites, must therefore be restricted to the male, it being the first one described, and it therefore becomes *H. mandibularis stultus* Clay. (See descriptions of chaetotaxy under *H. mandibularis* Carriker and *H. inexpectata*, new species, for substantiation of above statement.)

The female of *H. stultus* Clay (1937, p. 136) therefore remains without a name, which is unfortunate, in that the description of this interesting species must rest solely on the female, the male being unknown, at least of the nominate form. I have in my collection, however, males and females of this new form from four different hosts, representing several different races, but unfortunately none from *Crypturellus o. obsoletus*.

I therefore propose for the female of *H. stultus* Clay (1937, p. 136) the name *Heptapsogaster inexpectata*, which will be treated on a subsequent page.

HEPTAPSOGASTER MANDIBULARIS GARLEPPI, new subspecies

FIGURE 12, a-d

Types.—Male and female, adults, from *Crypturellus garleppi affinis*, collected by the author at Todos Santos, Río Chaparé, Bolivia, August 2, 1937; in collection of author.

This race of *mandibularis* has the front flattened, not rounded, as in the nominate form, while the male genitalia differ from all the other races here treated. It falls into the group containing *mandibularis* and *modestae* as regards size but differs from *modestae* in the shape of the endomerai prongs, which are slender, as in *mandibularis*. From *mandibularis* it differs in having longer, less incurved parameres, heavier secondary lateral endomerai plates, and in the absence of strengthening chitin struts in the endomerai sac, this latter being invisible in specimens examined.

The head of the male is perhaps closest in shape to that of *H. m.*

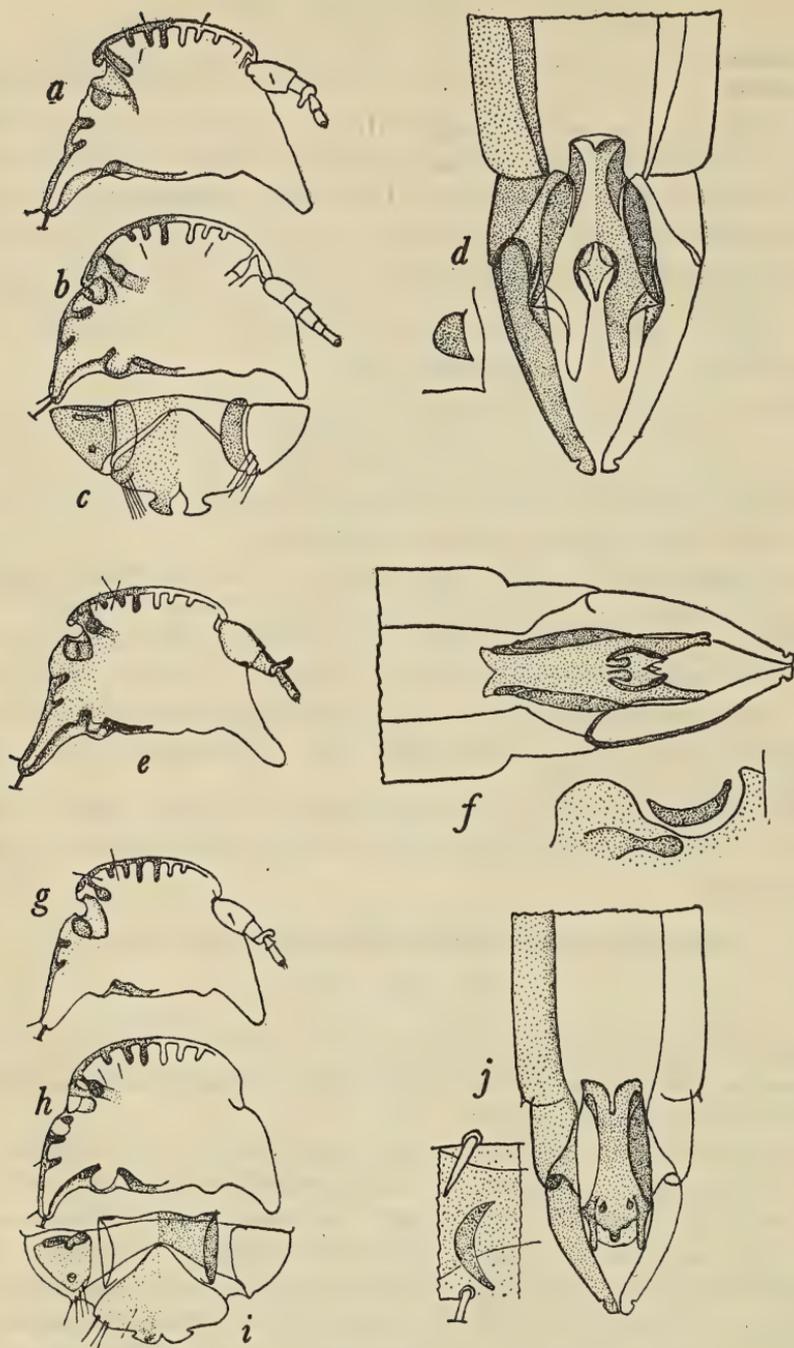


FIGURE 12.—HEPTAPSOGASTER

a-d, *Heptapsogaster mandibularis garleppi*, new subspecies: *a*, Male head; *b*, head of female; *c*, tip of female abdomen; *d*, male genitalia and scent gland.

e, f, *H. m. yapurae*, new subspecies: *e*, Male head; *f*, male genitalia and scent gland.

g-j, *H. m. nigriceps*, new subspecies: *g*, Male head; *h*, female head; *i*, tip of female abdomen; *j*, male genitalia and scent gland.

yapurae, from which it differs in having the general line of the sides of the head straight (but slightly undulating), while in *yapurae* there is a marked convexity just back of the antennal fossae, and the temples are decidedly concave on both outer and inner margins. The scent gland is short and much thickened (see fig.), differing from all the other races.

The measurements of this race are given together with *H. m. yapurae*, which follows.

HEPTAPSOGASTER MANDIBULARIS YAPURAE, new subspecies

FIGURE 12, e, f

Type.—Male, adult, from *Crypturellus undulatus yapura*, collected by the author at Puerto Yessup, Peru, February 19, 1930; in collection of author.

Diagnosis.—This race is represented by a single male, the type. It is distinguished by the wide, flattened front of the head, concave, slender, rather widely divergent temples, and by characters of the male genitalia.

The genitalia are of medium size, narrow at base of paramers, and with wide basal plate; the endomerale plate is also narrow, with slender secondary, lateral plates (more or less superimposed); short, slender, divergent prongs and crescent-shaped internal chitin struts. The scent gland is long and narrow, very similar in this respect to *H. m. nigriceps*.

MEASUREMENTS OF HEPTAPSOGASTER MANDIBULARIS

Structure	<i>garleppi</i>				<i>yapurae</i> (male)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	1.30		1.49		1.41	
Head.....	0.40	0.56	0.42	0.54	0.41	0.564
Prothorax.....	0.14	0.28	0.15	0.31	0.15	0.303
Mesothorax.....	0.15	0.53	0.175	0.55	0.175	0.575
Metathorax.....	0.14	0.51	0.13	0.51	0.13	0.54
Abdomen.....	0.705	0.63	0.86	0.64	0.77	0.67
Antennae.....	0.24	0.065	0.20	0.045	0.25	0.076
Paramers.....	0.12	0.098			0.133	0.09
Endomerale plate.....	0.12	0.075			0.112	0.04

HEPTAPSOGASTER MANDIBULARIS NIGRICEPS, new subspecies

FIGURE 12, g-j

Types.—Male and female, adults, from *Crypturellus soui nigriceps*, collected by the author at Tamborapa, Peru, July 14, 1933; in collection of author.

Diagnosis.—Represented by a single pair, the types. The front of the head is flattened also in this race but is much narrower than either *yapuræ* or *garleppi* and has the sides of front more abruptly curving backward to the trabecular tubercles; the sides of head are quite straight, with temples but slightly divergent, and pointed. The male head is quite similar to that of *H. m. crucis* (see fig.), both as to small size and shape, but differs as to detail. In the female abdominal segment VII has the apical protuberances short and the sides more concave than in the other races, while the genital sclerites are narrow and pointed at both ends. The male genitalia are distinguished by the very short, slender paramers, proportionately large endomeral plate, large secondary lateral endomeral sclerites, and very short, straight, slender apical prongs on endomeral plate. There also seems to be present a short penis (not present in other races), while there are no internal strengthening struts in endomeral plate. The scent gland is long, narrow, and crescent-shaped, as in *yapuræ*.

Measurements are given with those of *H. m. crucis*.

HEPTAPSOGASTER MANDIBULARIS CRUCIS, new subspecies

FIGURE 13, a, b

Type.—Male, adult, from *Crypturellus obsoletus crucis*, collected by the author at Samaipata, Bolivia, November 14, 1937; in collection of author.

Diagnosis.—Represented by a single male, the type. The head is very similar in shape to that of *H. m. nigriceps*, except that the front is less flattened, the sides undulating, and the trabecular tubercles strongly developed (very small in *nigriceps*), almost filling the antennal fossae. The male genitalia are of medium size, with paramers slender, sharply bent inward at tips, and strongly concave. This concavity of the outer edge of the paramers is more marked in *crucis* than in any other known race of *mandibularis*. The endomeral plate is long and wide, two-thirds of which is composed of the apical prongs, which are the longest of any known race and are decidedly *divergent* at their tips. The lateral endomeral sclerites are well developed and *not* superimposed. Scent gland of medium size, slender, and but slightly crescent-shaped.

Remarks.—It would be naturally supposed that this race would be the same as or very close to *H. m. stultus* Clay, from *Crypturellus o. obsoletus* (Argentina), but they are quite different, at least in the male genitalia, *crucis* having the endomeral prongs wider and longer than in any other known race of *mandibularis*. In *H. m. stultus*, the prongs are very slender, parallel-sided, and curving *inward*, not outward. The head also seems to be of slightly different shape.

MEASUREMENTS OF HEPTAPSOGASTER MANDIBULARIS

Structure	<i>nigriceps</i>				<i>crucis</i> (male)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	1.17		1.43		1.13	
Head.....	0.37	0.468	0.39	0.51	0.38	0.50
Prothorax.....	0.13	0.27	0.13	0.303	0.12	0.26
Mesothorax.....	0.175	0.50	0.18	0.53	0.17	0.456
Metathorax.....	0.113	0.47	0.12	0.50	0.12	0.435
Abdomen.....	0.61	0.597	0.81	0.67	0.58	0.55
Antennae.....	0.22	0.055	0.205	0.043	(incomplete)	
Paramers.....	0.09	0.066			0.115	0.094
Endomeral plate.....	0.095	0.038			0.115	0.056

HEPTAPSOGASTER MANDIBULARIS IDONEUS, new subspecies

FIGURE 13, c-f

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; in U. S. National Museum.

Diagnosis.—This is a well-defined race, represented in the collection by a large series of both sexes. The shape of the head somewhat resembles that of *H. m. garleppi*, with long, widely divergent temples and nearly straight (slightly convex) sides. It differs from *garleppi* in the narrower, more convex front, larger trabecular tubercles, shape of the depression at inner side of antennal fossae, and in having sides of temples uniformly, though but slightly, convex, while in *garleppi* they are straight, but undulating.

The head in the female is also much larger than that of *garleppi*, with more *flattened frons*, larger trabecular tubercles, more convex temples, which are much thinner at their tips (see figure). The last abdominal segment in the female is similar in shape to *garleppi*, but the genital sclerites have almost straight, parallel sides, and the anterior end is *truncate*.

The male genitalia rather resemble those of *yapurae* in size and shape of paramers, but the basal plate is narrower. The endomeral plate is longer and more deeply inserted within the basal plate, while the endomeral prongs are much longer and thicker and have a transverse, chitinized plate across their bases, instead of internal, crescent-shaped struts. The scent gland is long and narrowly crescent shaped, as in *nigriceps*.

Remarks.—This race has the head with many features resembling *modestae* (from *C. b. boucardi* of Mexico), but the genital armature is quite different and apparently unique among the races of *mandibularis*.

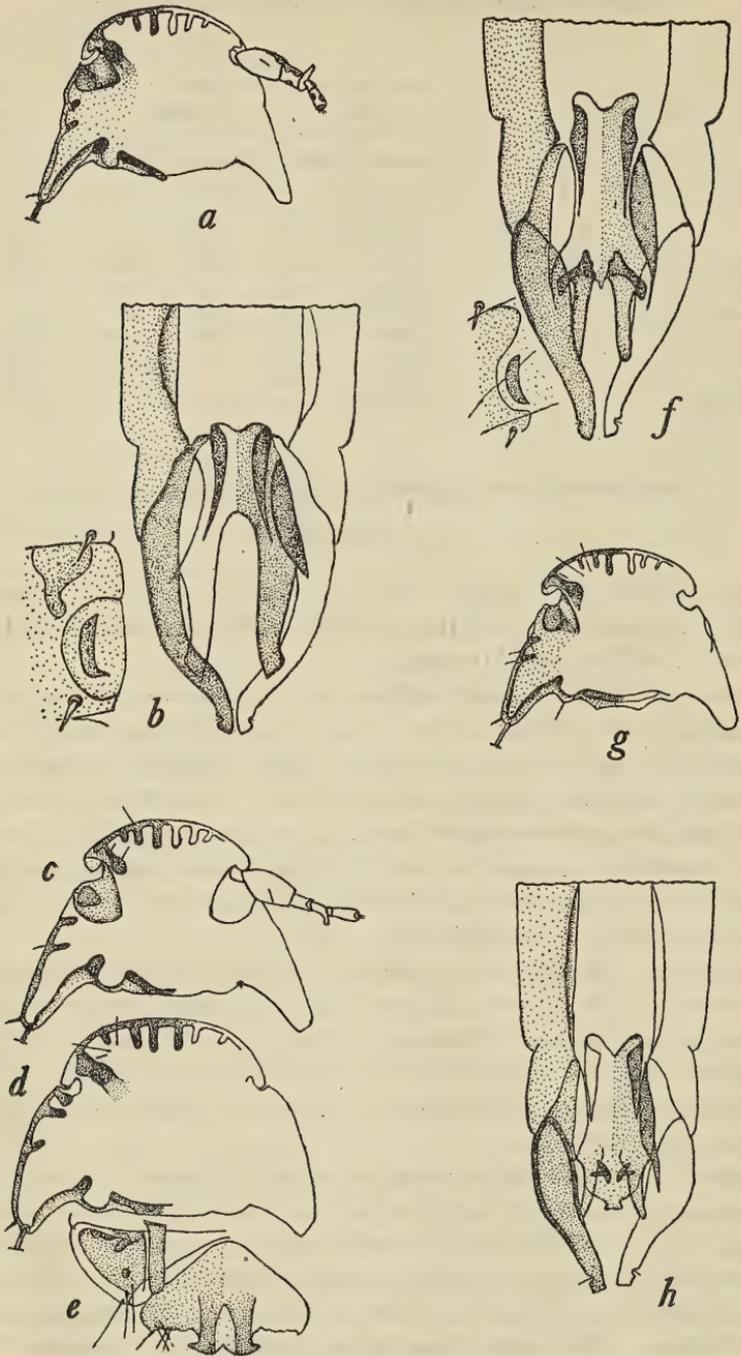


FIGURE 13.—HEPTAPSOGASTER

a, b, *Heptapsogaster mandibularis crucis*, new subspecies: *a*, Male head; *b*, male genitalia and scent gland.

c-f, *H. m. idoneus*, new subspecies: *c*, Male head; *d*, female head; *e*, tip of female abdomen; *f*, male genitalia and scent gland.

g, h, *H. m. motilonensis*, new subspecies: *g*, Male head; *h*, male genitalia.

The female is close to that of *mandibularis*, differing but slightly in shape of temples and length of internal projections from the *frons*.

Measurements are given with those of *H. m. motilonensis*.

HEPTAPSOGASTER MANDIBULARIS MOTILONENSIS, new subspecies

FIGURE 13, *g, h*

Types.—Male and female, adults, from *Crypturellus soui* (*mustelinus* ?), collected by the author at Airoca,⁶ Sierra Perijá, Colombia, April 7, 1942; in U. S. National Museum.

Diagnosis.—Represented by the pair of types and a second female, taken on the same host, at Tierra Nueva, Sierra Perijá, Colombia, in 1941. The head of the male in this race closely resembles that of *H. m. nigriceps* (from *C. soui nigriceps*), except that the frons is some narrower and more convex and the temples are slightly more divergent. The female also has the head close to that of *nigriceps*, but the apical prongs on abdominal segment VII are much longer, as in *idoneus*. The male genitalia resemble superficially those of *yapurae*, except that the paramers are shorter and proportionately wider at their bases. The endomerale plate is very similar, as well as the apical prongs, but there seems to be a small penis present, as in *nigriceps*, while the internal, chitinized struts are different from those of *yapurae*. The scent gland is of the type of *garleppi*, short but less thickened.

MEASUREMENTS OF HEPTAPSOGASTER MANDIBULARIS

Structure	<i>idoneus</i>				<i>motilonensis</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.32	-----	1.60	-----	1.08	-----	1.32	-----
Head.....	0.42	0.56	0.423	0.57	0.348	0.456	0.37	0.50
Prothorax.....	0.15	0.303	0.15	0.326	0.12	0.25	0.13	0.27
Mesothorax.....	0.185	0.575	0.195	0.586	0.174	0.46	0.14	0.50
Metathorax.....	0.13	0.524	0.14	0.55	0.108	0.42	0.12	0.466
Abdomen.....	0.684	0.64	0.92	0.73	0.55	0.52	0.76	0.586
Antennae.....	0.25	0.068	0.20	0.043	0.215	0.055	0.174	0.083
Paramers.....	0.143	0.114	-----	-----	0.102	0.072	-----	-----
Endomerale plate.....	0.123	0.051	-----	-----	0.08	0.04	-----	-----

HEPTAPSOGASTER INEXPECTATA INEXPECTATA, new name

Heptapsogaster stultus stultus CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 136 (partim, ♀), fig. 2c, pl. 1, fig. 4. (Host: *Crypturellus o. obsoletus*, Argentina.)

The descriptions and figures given by Miss Clay for the female of *H. s. stultus* are ample for the recognition of the species, but without

⁶ Airoca is a small hamlet ("rancheria") of the very primitive Motilón Indians, where the author spent a month in 1942, hence the name *motilonensis*.

the male and a figure of the genitalia it will be difficult to separate the other races from it, although the shape of the head and measurements given will be of considerable assistance.

The male of *inexpectata* is superficially very close to that of *H. mandibularis*, both being more or less of the same size, shape, sexual dimorphism, and markings and both with the same type of scent gland on the fifth abdominal pleurite. However, it may be separated from all races of *mandibularis* by the following characters:

The endomerale plate lacks the lateral prongs at its distal end, and the sac that lies between them, these being replaced by a bifurcated projection in the median portion of the transverse, posterior margin, or else a single median projection of varying shape, which may be the penis. A second character present in *all* males of *inexpectata* I have seen is the arrangement of the short, heavy spines on the dorsal surface of the abdomen. There is a spine just *inside* the inner edge of pleurite IV, near its posterior margin; a second spine is just *outside* the inner edge of pleurite III, also near its posterior margin, while a third spine is on the posterior margin of the second tergite, some distance inside the pleurite, so that the three spines are almost on a diagonal line with each other. (Note arrangement of spines under description of *H. mandibularis* and *H. temporalis*.)

The females of *inexpectata* are very similar to those of *H. mandibularis* and *H. temporalis*, except in two characters, by which each of the three may be easily distinguished, viz: the shape of abdominal segment VII and the chaetotaxy of the pleural plates of the abdomen. In *inexpectata* abdominal segment VII protrudes but slightly beyond VI, is almost transverse on its posterior margin (only a slight rounded median projection), but also has a narrow, elongated, median emargination, the entrance to which is practically closed. There are four abdominal spines, all on the posterior margin of the *tergal* plates of segments II to V, the one on V being at the inner edge of the pleurite, with each succeeding spine set farther inward, toward the center of the abdomen, so the four spines form diagonal lines across the abdomen converging toward the thorax.

There are minor characters for separating the races of each species, such as size and proportion of the various body segments, but there are cases where the females of the different races are very difficult to differentiate, and then only by careful measurements and comparison with actual specimens. The figures given will serve better for distinguishing these differences between closely allied forms than pages of lengthy description.

HEPTAPSOGASTER INEXPECTATA TUXTLAE, new subspecies

FIGURE 14, a-d

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

Diagnosis.—A comparison of the figure of the male genitalia of this race with that given by Miss Clay for *H. s. stultus* (= *H. mandibularis stultus*) will show that they are of an entirely different type, at least the endomeral plate.

The male of this race is essentially like the description given above for that of *inexpectata*, and it may be separated from other races of the species by the male genitalia, shape and size of various body segments, and size and shape of the scent gland, which always seems to differ slightly in the different races. The female may be separated from the nominate form by the shape of the head and the antennae. The head is very similar in shape to that of *H. mandibularis noctivagi* Clay, except that the temples are very much narrower and pointed. The shape of the trabecular tubercles is another diagnostic character for the females of *inexpectata* (mentioned by Miss Clay), those of *inexpectata* being truncate on the posterior margin, while in *mandibularis* they are bluntly pointed and longer.

The female of *tuxtlae* is larger in all proportions than that of *inexpectata*, but the differences are not great, except for the head, which is considerably longer and some wider (see measurements), the other measurements not differing more than could be taken care of under individual variation.

MEASUREMENTS OF HEPTAPSOGASTER INEXPECTATA

Structure	<i>tuxtlae</i>				<i>inexpectata</i> (female)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	1.13		1.35		1.30	
Head.....	0.36	0.47	0.38	0.49	0.32	0.47
Prothorax.....	0.13	0.28	0.13	0.30	0.12	0.28
Mesothorax.....	0.13	0.50	0.13	0.51	0.23	0.47
Metathorax.....	0.12	0.50	0.13	0.50		
Abdomen.....	0.58	0.62	0.76	0.64	0.74	
Antennae (first segment).....	0.097	0.055	¹ 0.17			
Paramers.....	0.09	0.075				

¹ Total.

Remarks.—In the males of *H. inexpectata* there are two strong hairs on the occipital margin of the head, one at the edge of the pro-

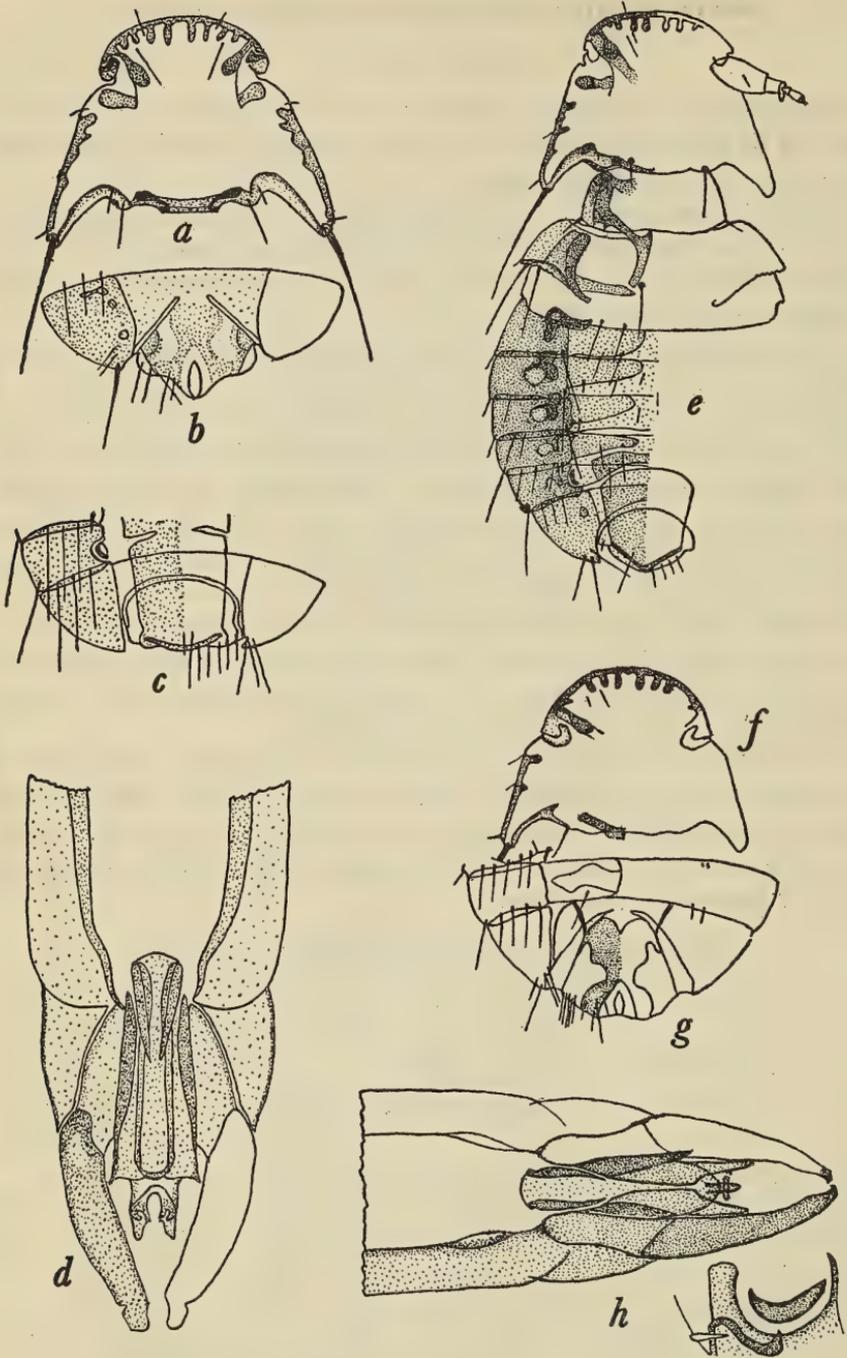


FIGURE 14.—HEPTAPSOGASTER

a-d, *Heptapsogaster inexpectata tuxtlae*, new subspecies: *a*, Male head; *b*, tip of female abdomen; *c*, tip of male abdomen; *d*, male genitalia.

e-h, *H. i. undulata*, new subspecies: *e*, Body of male; *f*, female head; *g*, tip of female abdomen; *h*, male genitalia and scent gland.

thorax and the other on the dorsal surface, inside the occipital band. The female apparently lacks the one on the dorsal surface, while the other is sometimes reduced to a spine.

HEPTAPSOGASTER INEXPECTATA UNDULATA, new subspecies

FIGURE 14, e-h

Types.—Male and female, adults, from *Crypturellus u. undulatus*, collected by the author at Rurrenabaque, Río Beni, Bolivia, September 11, 1934; in collection of author.

Diagnosis.—Represented by the types and a female paratype. Very much smaller in all proportions than *H. i. tuxtlae*, the male with front more flattened, sides of temples straight (instead of convex), with the tip of the last abdominal segment rounded and with the submarginal chitinized band V-shaped instead of flatly crescent-shaped.

In the female the seventh segment is also of a very different shape, as well as the genital plate (see fig.). The male may be recognized at once by the shape of the endomeral plate, the tip of which is elongated oval (not truncated), and with what is apparently a small penis, bearing a median cross bar. The paramers are shorter and slenderer than in *tuxtlae*, much resembling those of *H. i. benii*; in fact, the whole genital armature is much smaller and especially slenderer than in *tuxtlae*. The scent gland is of the conventional type of several races of *H. mandibularis*, of a slender, somewhat crescent shape. A male and four females taken on *C. undulatus yapura*, collected at Puerto Yessup, Peru, seem to be exactly the same; at least the male genital armature is. Measurements are given with those of *H. i. benii*.

HEPTAPSOGASTER INEXPECTATA BENII, new subspecies

FIGURE 15, a-d

Types.—Male and female, adults, from *Crypturellus soui inconspicuus*, collected by the author at Chiñiri, Río Beni, Bolivia, September 3, 1934; in collection of author.

Diagnosis.—Represented by the types and one female paratype. This race is also close to *H. i. tuxtlae*, both in male genital armature and other characters. The scent gland is somewhat different, as well as the shape of the last abdominal segment in the female.

The metathorax is angulated on the posterior margin, with each side straight to the rounded posterolateral angle. In the male the third segment of the antennae is strongly hooked; in the female there are four short spines on abdominal tergites II to V, all inside of the pleural plates, in a line slightly converging anteriorly.

The male genital armature is the smallest of any of the known races of *inexpectata*, being especially narrow, both the basal plate and the

width at base of paramers; the endomerale plate is also shorter than in any of the known races and has the distal end of a different shape (see fig.), there being a bilobed median projection, having a bifurcated tip, which is probably the penis. There are no internal, strengthening, chitinized struts, such as the long U-shaped one in *tuxtlae*. The scent gland is rather similar to *tuxtlae*.

MEASUREMENTS OF HEPTAPSOGASTER INEXPECTATA

Structure	<i>undulata</i>				<i>benii</i>				<i>magdalanae</i>			
	Male		Female		Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
Body	1.07		1.35		1.00		1.20		1.14		1.30	
Head	0.357	0.475	0.38	0.50	0.336	0.42	0.357	0.456	0.38	0.48	0.35	0.477
Prothorax	0.12	0.29	0.14	0.30	0.12	0.25	0.12	0.28	0.13	0.28	0.12	0.285
Mesothorax	0.174	0.52	0.195	0.525	0.16	0.477	0.174	0.51	0.17	0.52	0.195	0.50
Metathorax	0.12	0.51	0.15	0.477	0.097	0.466	0.105	0.50	0.12	0.51	0.12	0.49
Abdomen	0.53	0.62	0.78	0.655	0.48	0.545	0.67	0.61	0.56	0.63	0.73	0.64
Antennae	0.195	0.06	0.174	0.043	0.16	0.045	0.14	0.033	0.22	0.065	0.195	0.028
Paramers	0.087	0.065			0.08	0.055			0.09	0.07		
Endomerale plate	0.095	0.03			0.077	0.03			0.11	0.033		

HEPTAPSOGASTER INEXPECTATA MAGDALENAE, new subspecies

FIGURE 15, e

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at Carraipia, Guajira, Colombia, May 30, 1941; in U. S. National Museum.

Diagnosis.—This race is also very close to *tuxtlae*, from *C. b. boucardi*, except that it is smaller and has the distal end of endomerale plate of a different shape, there being two median protuberances on the truncate tip that bear short prongs. The internal, U-shaped chitinized strut found in *tuxtlae* is absent. The scent gland is similar to that of *undulata*, instead of *tuxtlae*.

HEPTAPSOGASTER TEMPORALIS Carriker

Heptapsogaster temporalis CARRIKER, Lice of the tinamous, p. 118, pl. 16, figs. 1-1b, 1936. (Host: *Crypturellus u. undulatus*.)

Since the publication of my first report on the lice of the tinamous in 1936, much additional material of *H. temporalis* has been examined, which shows that it is widely distributed on the avian genus *Crypturellus* and is often found in company with *H. mandibularis* or *H. inexpectata*, but I have not yet taken the three species on the same indi-

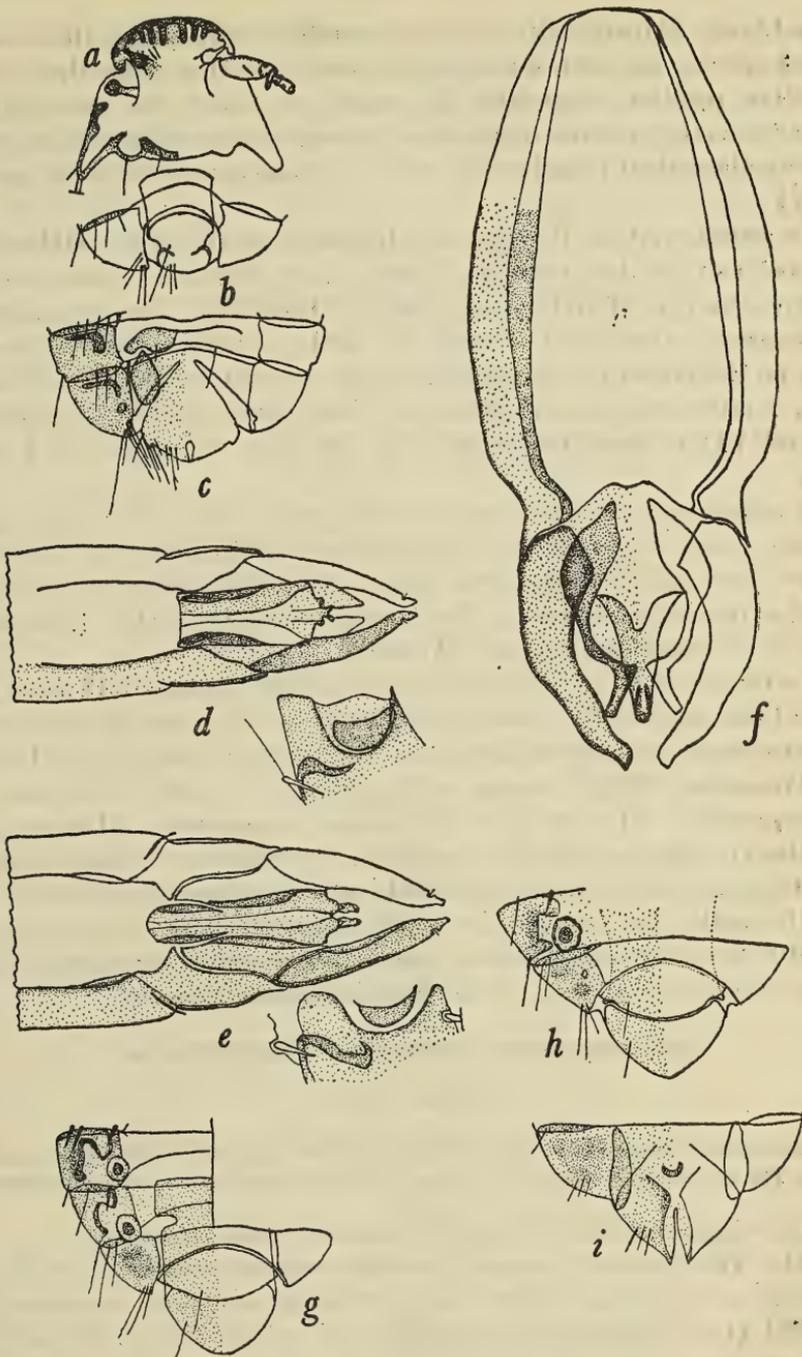


FIGURE 15.—HEPTAPSOGASTER

a-d, *Heptapsogaster inexpectata benii*, new subspecies: a, Male head; b, tip of male abdomen; c, tip of female abdomen; d, male genitalia and scent gland.

e, *H. i. magdalenae*, new subspecies: Male genitalia and scent gland.

f, g, *H. temporalis acutiventris* Clay: f, Male genitalia; g, tip of male abdomen.

h, i, *H. t. boucardi*, new subspecies: h, Tip of male abdomen with scent gland; i, tip of female abdomen.

vidual host. Superficially it much resembles both of the above-mentioned species, but both sexes possess characters that make their identification positive, especially the male, in which the outstanding character is the presence of *two* scent glands of a most unusual appearance on abdominal pleurites IV and V. (Carriker, 1936, p. 53, pl. 12, fig. 3.)

The female may be distinguished by the shape of the last abdominal segment and by the presence of three short, thickened spines on the posterior margin of abdominal pleurites II and III. The last abdominal segment extends far beyond the sixth, is much narrower, is circular on the posterior margin, is slightly pointed at the tip, and has a deep, narrow, median emargination. The suture separating segments VI and VII is fused medially in all the races of *temporalis* I have seen.

An examination of the females of this species shows that, like *mandibularis* and *inexpectata*, all races have a small, somewhat crescent-shaped scent gland at the inner edge of the *first* abdominal pleurite, which is incised to receive it. Its shape is totally unlike the same gland found in the male on segments IV and V.

The female of *H. t. femininus* has abdominal segment VII more like that of the male in *H. t. temporalis*, but it is wider and shorter and is likewise fused medially with segment VI. (My pl. 16, fig. 3, in "Lice of the Tinamous," 1936, is wrong in this respect; it should be the same as in *temporalis*.) The female of *H. t. chinirii* is unknown. However, the females are always difficult to separate, the differences being so slight that they are not always recognizable unless accompanied by their respective males, but they can always be separated from the same sex of *mandibularis* and *inexpectata* by the arrangement of the spines on the pleurites and by the shape of the last abdominal segment.

HEPTAPSOGASTER TEMPORALIS ACUTIVENTRIS Clay

FIGURE 15, *f, g*

Heptapsogaster temporalis acutiventris CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 135, fig. 4a, pl. 1, figs. 1, 2. (Host: *Crypturellus cinnamomeus mexicanus*.)

This subspecies differs from the nominate form as follows:

Male: The front of the head is wider and more flattened, with the whole head shorter and wider; the prothorax has the sides more nearly parallel (less divergent posteriorly); the mesothorax is proportionately wider, extending farther beyond the sides of the abdomen; abdominal segment VII is larger and of quite different shape (see fig.), being elongated posteriorly, with tip bluntly rounded, not emarginate as in *H. t. temporalis*.

The genital armature is decidedly different, as may be seen by the two figures.

Female: Decidedly larger than *temporalis* in all measurements; abdominal segment VII is similar to that of *temporalis*, but slightly longer, while the two oval, genital plates on each side in segment VI are larger. The chaetotaxy and markings of the pleurites are the same, and there seem to be no other distinguishing characters.

The measurements of my specimens do not agree with those given by Miss Clay.

MEASUREMENTS OF HEPTAPSOGASTER TEMPORALIS

Structure	<i>temporalis</i>				<i>acutiventris</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.08		1.24		1.20		1.34	
Head.....	0.347	0.415	0.35	0.44	0.336	0.46	0.338	0.50
Prothorax.....	0.10	0.195	0.108	0.195	0.105	0.205	0.118	0.227
Mesothorax.....	0.16	0.41	0.15	0.42	0.17	0.456	0.174	0.466
Metathorax.....	0.105	0.40	0.09	0.39	0.097	0.42	0.097	0.42
Abdomen.....	0.596	0.50	0.73	0.54	0.81	0.586	0.81	0.586
Antennae.....	0.15		0.16		0.16		0.16	

HEPTAPSOGASTER TEMPORALIS BOUCARDI, new subspecies

FIGURES 15, h, i; 16, a

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 29, 1940; types in U. S. National Museum.

This race is much closer to *acutiventris* than to *temporalis* and differs from the former as follows:

Male: Slightly larger in all measurements, being the largest of the three races *temporalis*, *acutiventris*, and *boucardi*; the scent glands are smaller and less well developed, and are both of same

MEASUREMENTS OF HEPTAPSOGASTER TEMPORALIS BOUCARDI

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.28		1.38	
Head.....	0.347	0.47	0.39	0.51
Prothorax.....	0.118	0.227	0.13	0.127
Mesothorax.....	0.174	0.51	0.18	0.51
Metathorax.....	0.108	0.44	0.118	0.477
Abdomen.....	0.759	0.605	0.825	0.61
Antennae.....	0.195		0.17	

size, while in *acutiventris* those on pleurites V are the larger; abdominal segment VII is practically the same, but the genital armature is different, the paramers being of quite a distinct shape, although the endomerals and basal plates are fairly close (see figures).

Females are almost indistinguishable; the measurements, while mostly a little greater, are no safe criterion, although the mesothorax and metathorax are proportionately wider in *boucardi*.

HEPTAPSOGASTER TEMPORALIS CHIÑIRII Carriker

FIGURE 16, d

Heptapsogaster temporalis chiñirii CARRIKER, Lice of the tinamous, p. 120, pl. 16, fig. 4, 1936. (Host: *Crypturellus atrocapillus*=*C. garleppi affinis*.) (On fig. 16, e, is shown the male scent gland of *H. t. femininus* Carriker.)

This race of *temporalis* was described from three males, the female being unknown. Later additional specimens were secured from the type host, collected at Todos Santos, Río Chaparé, Bolivia, which included four males and three females. These males are like the type series in all respects, except for the tips of the paramers, which, instead of being pointed and slender, seem to be blunt and bent inward. However, they have the appearance of being abnormal, either deformed or injured, although *all* have the genitalia within the abdomen.

The female (hitherto unknown) is extremely close to that of the nominate form, so close, in fact, that it is with difficulty that they can be separated. The last abdominal segment is more acuminate apically and more rounded anteriorly, while the hairs on posterior margin are finer and perhaps shorter.

MEASUREMENTS OF HEPTAPSOGASTER TEMPORALIS

Structure	<i>temporalis</i> (female) (corrected)		<i>chiñirii</i> (female)	
	Length	Width	Length	Width
Body.....	1.25	-----	1.25	
Head.....	0.357	0.46	0.35	0.456
Prothorax.....	0.12	0.21	0.12	0.205
Mesothorax.....	0.16	0.44	0.174	0.456
Metathorax.....	0.10	0.42	0.11	0.39
Abdomen.....	0.73	0.54	0.75	0.55
Antennae.....	0.16	-----	0.155	

Remarks.—The measurements of these two females agree remarkably well; in fact they are closer than is sometimes found between individuals of the same species, from the *same individual host*.

HEPTAPSOGASTER TEMPORALIS NOTHOCERCAE, new subspecies

FIGURE 16, b, c, g

Types.—Male and female, adults, from *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, on July 16, 1941; in U. S. National Museum.

This form is close to *H. t. femininus* in the shape of the last abdominal segment of the female, and in the type of male genitalia, but differs in details. The scent glands are quite different, both as to size and shape.

A single male from *Nothocercus nigrocapillus cadwaladeri*, from Leymebamba, Peru, is so close to these specimens that there seems to be no point in attempting to separate it, the genital armature being almost identical, as well as the scent glands and other details.

The male of *nothocercae* has the metathorax sharply angulated on the abdomen, the point reaching back to the posterior margin of the first abdominal segment.

The measurements for this subspecies are given with those of *H. t. boliviensis*.

HEPTAPSOGASTER TEMPORALIS BOLIVIENSIS, new subspecies

FIGURE 16, f

Type.—Male, adult, from *Crypturellus obsoletus punensis*, collected by the author at Sandillani, Bolivia, November 25, 1934; in collection of author.

This race is distinguished chiefly by the very large scent glands, which cover nearly the whole length of the pleural plate and have a narrow "corolla" and large glandular center. The genital armature is also quite different from any of the known races.

MEASUREMENTS OF HEPTAPSOGASTER TEMPORALIS

Structure	<i>nothocercae</i>				<i>boliviensis</i> (male)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	0.95		1.11		0.94	
Head {	frons.....	0.25				0.26
	temples.....	0.326	0.43	0.347	0.45	0.32
	occiput.....	0.28		0.29	0.29	0.27
Prothorax.....	0.12	0.22	0.13	0.25	0.11	0.23
Mesothorax.....	0.17	0.42	0.174	0.466	0.15	0.42
Metathorax.....	0.13	0.38	0.13	0.41	0.09	0.38
Abdomen.....	0.475	0.435	0.53	0.55	0.477	0.49
Antennae.....	0.205	0.058	0.16	0.032	0.17	0.05
Paramers.....	0.076	0.054			0.087	0.054
Endomeral plate.....	0.074	0.03			0.073	0.032

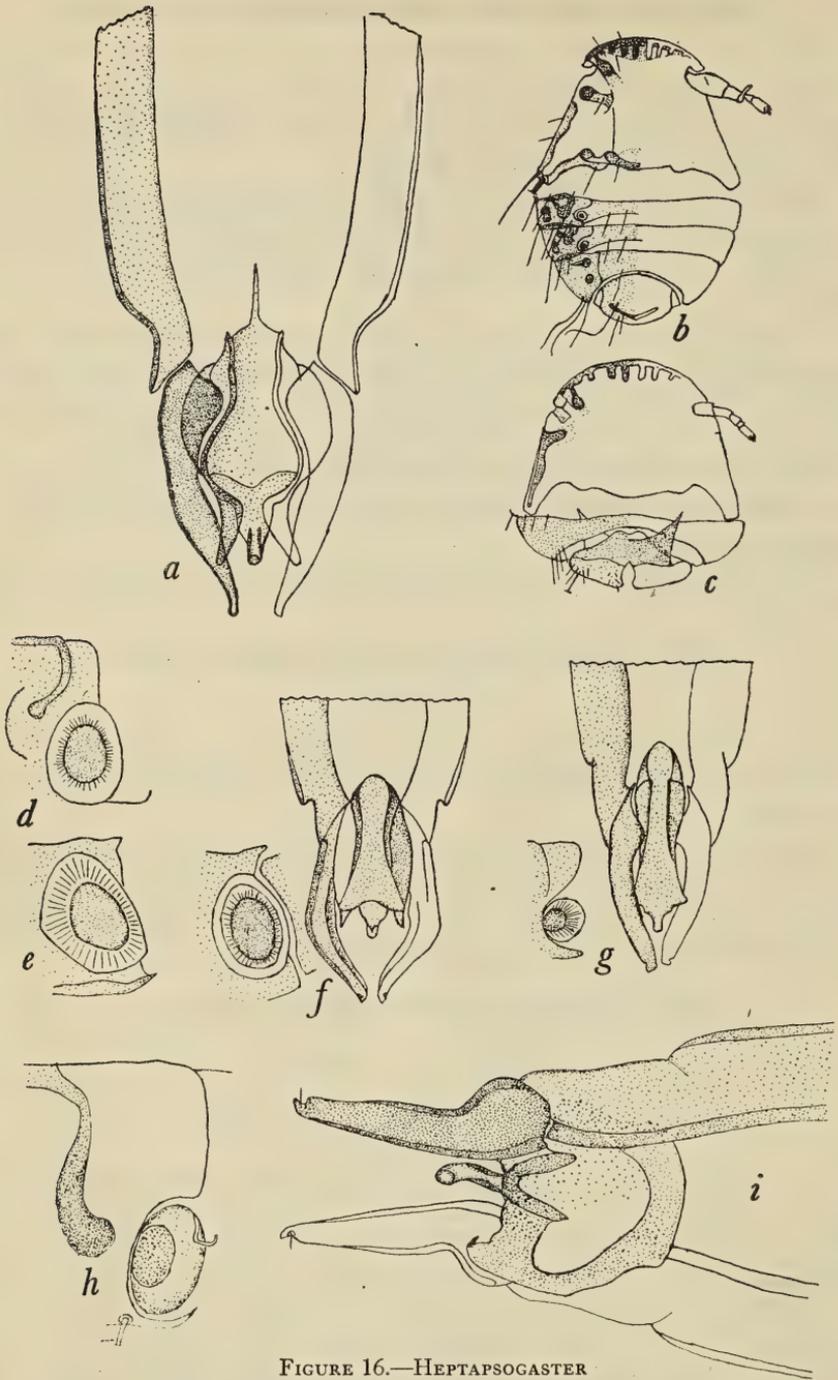


FIGURE 16.—HEPTAPSOGASTER

- a*, *Heptapsogaster temporalis boucardi*, new subspecies: Male genitalia.
b, c, g, *H. t. nothocerae*, new subspecies: *b*, Male head and tip of abdomen; *c*, female head and tip of abdomen; *g*, male genitalia and scent gland.
d, *H. t. chinirii* Carriker: Male scent gland.
e, *H. t. femininus* Carriker: Male scent gland.
f, *H. t. boliviensis*, new subspecies: Male genitalia and scent gland.
h, i, *H. platycephalus platycephalus* Carriker: *h*, Scent gland; *i*, male genitalia.

The female is unknown, the subspecies being described from a single male, the type. The head is practically of the same width as in *nothocerae*, at both frons and temples, but is considerably longer, both at occiput and temples, and with temples proportionately longer and more pointed; the temporal bands are much more crenulated and the internal projections at the frons are somewhat shorter and thicker.

In *H. temporalis* and its races there seem to be *no hairs* whatever on the occipital margin of the head, as in *inexpectata*; however, in *H. t. femininus* there are very small bristles in the same places at which *inexpectata* has long hairs.

HEPTAPSOGASTER PLATYCEPHALUS Carriker

FIGURE 16, h, i

Heptapsogaster platycephalus CARRIKER, Lice of the tinamous, p. 120, pl. 17, figs. 1-1c, 1936. (Host: *Crypturellus soui inconspicuus*.)

I have now been able to examine a large series of specimens of this interesting species taken on five races of *Crypturellus soui*, *C. obsoletus punensis*, and *C. u. undulatus*. In my previous report (1936) I placed all specimens taken up to that time (except those from *C. s. soui*) under the nominate form. Additional material, together with more careful study, shows that some of these must be given subspecific rank, especially those from *C. obsoletus punensis*, of which there is a large series from numerous individual hosts taken in Peru and Bolivia. The whole series is very uniform and presents characters that may not be disregarded. The single male from *Nothocercus nigrocapillus*, previously listed under *platycephalus* has been discarded, since I am convinced that it was not its true host, having become accidentally mixed with that material in some unknown manner.

Specimens from *C. soui ochraceiventris*, *C. s. meserythrus*, and *C. s. mustelinus* are all so very close to the type series that they must remain there, while two males and a female from *C. u. undulatus* are so close that to separate them would savor too much of hair-splitting. The male genitalia in these specimens from *C. u. undulates* are exactly like those of *platycephalus*, except slightly smaller, but of the same proportions, although the paramers may be a trifle slenderer, as well as the endomeral plate, but the body and head measurements are so close to *platycephalus* that practically all the differences easily fall within the range of individual variation. It was previously stated that a scent gland was present on the fifth abdominal segment in the male (Carriker, 1936, p. 123), but no description or figure was given. The fifth pleurite is incised on the posterior portion of the inner margin to receive it. The gland is elongated globular in shape, with a tubular outlet on the inner face (see figure). This gland differs slightly in size and shape in the different races of *platycephalus*.

HEPTAPSOGASTER PLATYCEPHALUS ASYMMETRICUS, new subspecies

FIGURE 17, a, c

Types.—Male and female, adults, from *Crypturellus obsoletus punensis*, collected by the author at Samaipata, Bolivia, November 2, 1937; in collection of author.

Diagnosis.—In general appearance this race is very similar to *H. p. platycephalus*, with the same markings on head and body and same chaetotaxy, having (in the male) one hair and one spine on the posterior margin of pleurite II; the same on III; one spine and two hairs on IV; and three hairs on V. The seventh abdominal segment is not circular on posterior margin but has lateral margins straighter and sinuated, while the chaetotaxy is slightly different (see fig.).

The insect is much larger than *platycephalus* in most body dimensions, except that the male genitalia have the endomeral plate slightly shorter and wider. The proportions of the head are also different, while the prothorax and mesothorax are actually shorter and the metathorax narrower; the abdomen is much longer (1.06 against 0.95) but scarcely wider (0.70 against 0.68). The most striking differences are found in the male genital armature. The paramers are much longer (0.14 against 0.11) and very much slenderer, with the base differently shaped; the single endomeral plate presents a character heretofore not seen by the author. It lies *on top* of the basal plate and paramers (not unusual), but on its left side, at posterior portion, is a curious appendage, joined to the plate at the base of the penis. This character is uniform in all males taken from this host, regardless of locality. I cannot conceive what may be the function of this appendage. In *H. p. soui* the male genitalia are of the same pattern as in *platycephalus*, but the paramers are much shorter and the endomeral plate differently shaped.

HEPTAPSOGASTER TESSELATUS ORNATUS, new subspecies

FIGURE 17, d-f

Types.—Male and female, adults, from *Nothoprocta o. ornata*, collected by the author at Callipampa, Bolivia, June 14, 1936; in collection of author.

Diagnosis.—Nearest to *H. t. truncatus* Carriker, having the male genital armature very similar to that form; the incrassations on the paratergal plates are more pronounced and of a type different from *truncatus*. The head in the male is very much narrower at the temples than in *tesselatus* or *truncatus*, being almost the same shape as in the female of *tesselatus*; the pleural plates are more deeply pigmented, and the prothorax has the sides less convex than in the above-

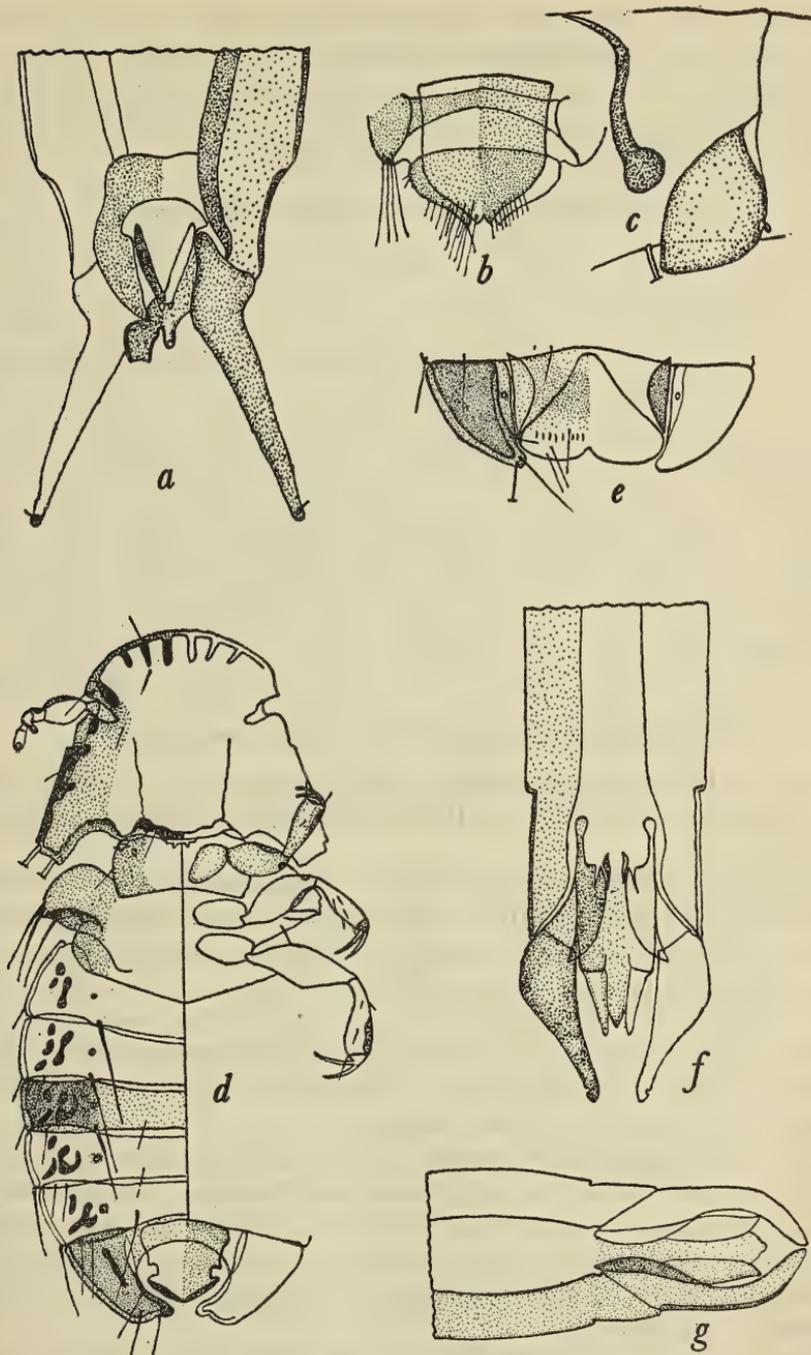


FIGURE 17.—HEPTAPSOGASTER and RHYNCOTHURA

a-c, *Heptapsogaster platycephalus asymmetricus*, new subspecies: *a*, Male genitalia; *b*, tip of female abdomen; *c*, scent gland.

d-f, *H. tessellatus ornatus*, new subspecies: *d*, Body of male; *e*, tip of female abdomen; *f*, male genitalia.

g, *Rhyncothura minuta boliviana*, new subspecies: Male genitalia.

mentioned races; the tergal and paratergal plates are also closely fused, with the suture almost invisible, as in *truncatus*. There is some variation in the markings on the pleural plates, but I think that this may be due to the age of the specimens, the fully adult individuals having the incrassations more fully developed.

MEASUREMENTS OF HEPTAPSOGASTER TESSELATUS

Structure	<i>ornatus</i>				<i>pentlandi</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.49		1.58		1.41		1.58	
Head {frons.....		0.38		0.44		0.355		0.42
{temples.....	0.466	0.59	0.50	0.595	0.41	0.58	0.41	0.62
{occiput.....	0.41		0.44		0.358		0.456	
Prothorax.....	0.12	0.28	0.13	0.30	0.13	0.28	0.135	0.326
Mesothorax.....	0.17	0.586	0.195	0.60	0.20	0.586	0.24	0.63
Metathorax.....	0.15	0.44	0.15	0.456	0.155	0.44	0.17	0.48
Abdomen.....	0.86	0.72	0.92	0.78	0.82	0.716	0.94	0.805
Antennae.....	0.195	0.054	0.174	0.038	0.228	0.054	0.174	0.034
Paramers.....	0.076	0.095			0.087	0.105		
Endomeral plate.....	0.098	0.035			0.108	0.035		

HEPTAPSOGASTER TESSELATUS PENTLANDI, new subspecies

Types.—Male and female, adults, from *Nothoprocta p. pentlandi*, collected by the author at Choros, Bolivia, January 10, 1937; in collection of author.

Diagnosis.—This race is more or less intermediate between *tesselatus* and *ornatus*, having the shape of the head in the male as in the former, but with the genitalia of the latter, although with some differences in proportion, the paramers being slightly longer but of exactly the same width at the thickened basal portion, but they are set much farther apart, and so a pronounced open space remains between each paramer and the endomeral plate. The endomeral plate is of the same width as in *ornatus*, but slightly longer.

The head is considerably smaller in all dimensions than in *ornatus*, except the width at temples, which is almost the same. The prothorax and mesothorax are longer than in *ornatus* but of the same width, while the metathorax is exactly the same; the abdomen is shorter, but of the same width, while the antenna in the male is longer, but first segment of equal width.

There are also considerable discrepancies in the measurements between the female and that of *ornatus* (see table of measurements). The incrassations on the pleural plates are almost identical with those of *ornatus*.

Genus RHYNCOTHURA Carriker

RHYNCOTHURA MINUTA BOLIVIANA, new subspecies

FIGURES 17, *g*; 18, *a*, *b*

Types.—Male and female, adults, from *Nothura maculosa oruro*, collected by the author at Callipampa, Bolivia, May 31, 1936; in collection of author.

Diagnosis.—The male differs from *R. minuta minuta* in shape of head, shape and proportion of thoracic segments, shape of abdomen, and character of abdominal sclerites, as well as in the shape and proportion of the genital armature.

The preantennal area is considerably longer, with frons rounded instead of flatly convex and with margin not crenulated; the sides of the prothorax are straight to the posterior angles, not convex, while both mesothorax and metathorax are of different shape.

The abdomen is slenderer, less rounded, but with chaetotaxy about the same, except that most of the hairs are longer. There is no hyaline space between the tergites and pleurites, these sclerites being closely fused, with the suture very faintly visible, while the tergal plates are broken medially and sternal plates continuous. (The first joint of the antennae of the male, as shown in the figure, is the inside face; the opposite face is much narrower, 0.06 instead of 0.078.)

MEASUREMENTS OF RHYNCOTHURA MINUTA BOLIVIANA

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.21		1.36	
Head { frons.....		0.30		0.33
Head { temples.....	0.39	0.415	0.41	0.436
Head { occiput.....	0.375		0.40	
Prothorax.....	0.09	0.217	0.108	0.23
Mesothorax.....	0.14	0.35	0.15	0.37
Metathorax.....	0.13	0.31	0.11	0.33
Abdomen.....	0.67	0.52	0.80	0.52
Antennae.....	0.195	0.05	0.16	0.033
Paramers.....	0.09	0.06		
Endomeral plate.....	0.087	0.038		

The female is very similar to the male, the head, except for the dimorphic antennae, being similar as to markings and shape, although slightly longer, but of same width at temples. The abdomen is elongated, with segments VI and VII wide, the latter being flatly rounded posteriorly. The pleural plates are narrower and have inner margin clearly outlined. There seems to be a clear space between the sternal plates and the pleurites, while the latter are continuous with the

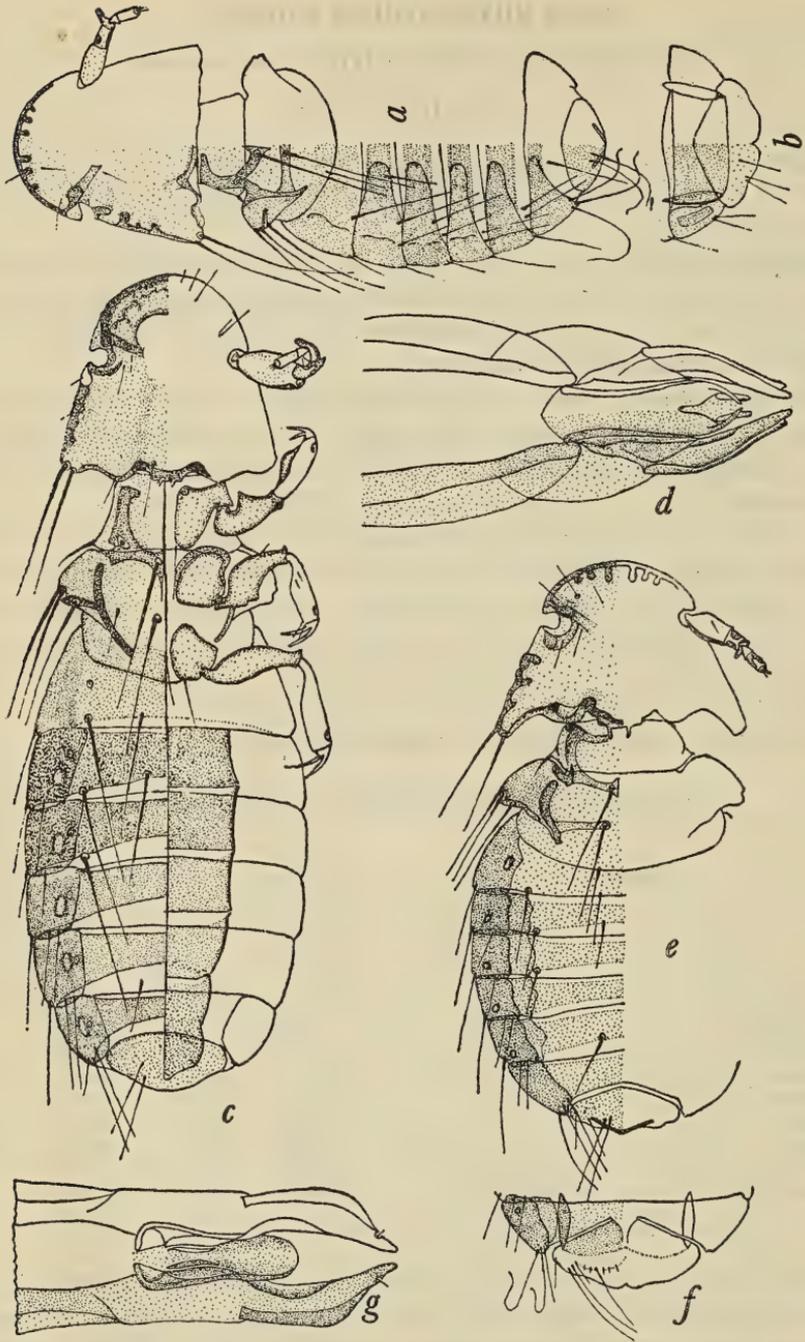


FIGURE 18.—RHYNCOTHURA

- a, b, Rhyncothura minuta boliviana*, new subspecies: *a*, Body of male; *b*, tip of female abdomen.
- c, d, R. heterura*, new species: *c*, Body of male; *d*, male genitalia.
- e-g, R. chacoensis*, new species: *e*, Body of male; *f*, tip of female abdomen; *g*, male genitalia.

tergals. The head of the female is longer than in *minutus*, while there is but slight trace of the dark band along the temporal margins; segments VI and VII of the abdomen are both wider than in *R. m. minuta*, with the latter evenly rounded posteriorly, while the genital plate is of different shape.

RHYNCOTHURA HETERURA, new species

FIGURE 18, c, d

Type.—Male, adult, from *Nothoprocta cinerascens*, collected by the author at Villa Montes, Bolivia, November 6, 1936; in collection of author.

Diagnosis.—This species closely resembles *R. testudo* (Clay), from *Nothura maculosa peruviana*, and may prove to be conspecific with it, but until actual comparison can be made I prefer to keep it as a distinct species. The measurements are exceedingly close, as far as given by Clay, but the prothorax is more divergent, with the sides concave, while the sides of the mesothorax are shorter and strongly rounded (in *testudo*, according to the microphotograph published, the sides of both prothorax and mesothorax are straight). The chaetotaxy of the abdomen seems to be about the same. The genital armature of *heterura* certainly is different from that of *testudo* (according to the figure by Clay), while abdominal segment VII is entire, not bilobed on the dorsal surface as in *testudo*.

The pleural plates are wide and faintly outlined on their inner side but clearly fused with the tergites, which are continuous across the abdomen, and with both sclerites deeply pigmented. The sternal plates are prominent, considerably wider (longitudinally) than the tergites, but are rather widely separated from the paratergals, and with a sharp, deeply pigmented line bordering their outer edges in segments II to VI.

The shape of the coxae and that of the femora in this species are most extraordinary, but it is not possible to tell from the microphotograph of *testudo* whether or not they are the same in that species. The first and second coxae and femora are especially noteworthy, having shapes I have not hitherto seen (see figure). The species is represented by 4 males, the female not having been taken.

Measurements for this species are given under *R. subteres*, which follows.

RHYNCOTHURA SUBTERES, new species

FIGURE 19, a-c

Types.—Male and female, adults, from *Nothoprocta p. pentlandi*, collected by the author at Incachaca, Bolivia, June 1937; in collection of author.

Diagnosis.—This species is undoubtedly close to *R. teres* Clay, from *Nothura maculosa peruviana* and *Nothoprocta p. pericardia*, and may possibly prove to be conspecific with it.

It differs from *teres* in the following particulars: The length of body is less in both sexes, while the head in the male is slightly longer but much narrower, and in the female both slightly *shorter* and *much* narrower; the prothorax is noticeably shorter and narrower in both sexes, while the mesothorax is much narrower and the abdomen shorter.

It is impossible to compare the measurements of the genitalia, since those for *teres* are not given. In *teres* the abdominal tergites are continuous in segments I, VI, and VII and separated in II to V, but in *subteres* they are continuous in *all* abdominal segments, but not strongly chitinized or deeply pigmented, and are so closely fused with the pleurites that the suture is completely lost, while the pigmentation of the latter sclerites is but little deeper than in the tergites. The markings on the pleurites may be seen clearly in the accompanying figure. The chaetotaxy of the abdomen is quite different. In *teres* there are two hairs at posterolateral angle of segment VI, instead of one; there is a longish hair at the inner posterior corner of the pleurites of segments I to V, with two more in the median portion of the posterior margin of pleurite IV; there are two hairs on the median portion of the posterior margin of tergal plates I to V, while on segment VII there are three long and one short hairs on each side of posterior margin (the two long ones submarginal).

MEASUREMENTS OF RHYNCOTHURA

Structure	<i>heterura</i> (male)		<i>subteres</i>			
			Male		Female	
	Length	Width	Length	Width	Length	Width
Body.....	1.68		1.59		2.04	
Head { frons.....		0.366		0.35		0.43
{ temples.....	0.41	0.445	0.48	0.586	0.52	0.56
{ occiput.....	0.42		0.45		0.52	
Prothorax.....	0.15	0.305	0.12	0.305	0.14	0.347
Mesothorax.....	0.15	0.456	0.175	0.51	0.24	0.59
Metathorax.....	0.17	0.37	0.16	0.41	0.195	0.48
Abdomen.....	0.96	0.58	0.90	0.69	1.24	0.84
Antennae.....	0.26	0.082	0.25	0.083	0.217	0.045
Paramers.....	0.065	0.064	0.10	0.08		
Endomerale plate.....	0.073	0.023	0.098	0.043		

As in *teres*, the female of *subteres* is considerably larger than the male in all its dimensions except the filiform antenna, which is shorter. The head is also differently shaped from the male, the post-antennal margins being straight in the male and concave in the fe-

male, and with temples narrower in the female than in the male (just the reverse of *teres*, which is typical of the sexual dimorphism found in this and other groups with temples of this type).

RHYNCOTHURA CHACOENSIS, new species

FIGURE 18, e-g

Types.—Male and female, adults, from *Nothoprocta cinerascens*, collected by the author at Villa Montes, Bolivia, November 6, 1936; in collection of author.

Diagnosis.—In this distinct species we have a type of head similar to that of *Heptapsogaster tessellatus*, with the six internal projections on the frons and the heavy templar incrassations, but there is no sign of the tessellated dorsal surface, the serrated margins of the occiput and mesothorax, or the peculiar structure of abdominal segment VII found in that species, while the type of the genitalia is quite distinct.

The whole insect is small, about the size of *R. minuta*, with the head large and body short and wide. The prothorax is short and wide, with convex, divergent sides and sharp lateral angles with a spine; the structure of the mesometathoracic segments is clearly illustrated in the figure, as well as the chaetotaxy.

The abdomen in both sexes is oval, short, and broad and but little longer than wide (0.69 by 0.63 and 0.70 by 0.62). The structure of the paratergals is somewhat obscure. In the male they seem to be clearly outlined on the inner margins but with another sclerite showing within the pleurites on segments II to VI. This may be a ventral extension of the pleurite, more faintly pigmented than the dorsal portion, and with irregular internal margin. There is a small, more deeply pigmented, round or oval spot on pleurites I to V. These are not the spiracles, which are located in the paler, inner portion of the plate. The tergites are continuous, but narrow and faintly pigmented, and there are no apparent sternites.

The chaetotaxy of the whole body is scanty (see figure). The legs are small, with femora and tibiae short and thick and of about equal length and with some stout, longish spines, but not so many as in *subteres*. The trochanters are also well developed on all three legs, while the claws are long and very slender. The male genitalia are simple in structure, the short, thick paramers, sharply bent inward apically and tapering to their narrow tips; the endomerale plate is deeply inserted within the basal plate and is almost as long as the paramers, with broad, rounded tip, destitute of projections of any kind. Like so many species of this genus, there is a minute bristle set in a small pit on the outer edge of the paramers near their tips.

The head and body of the female are very similar to those of the male, except for the dimorphic antennae; the incrassations along the

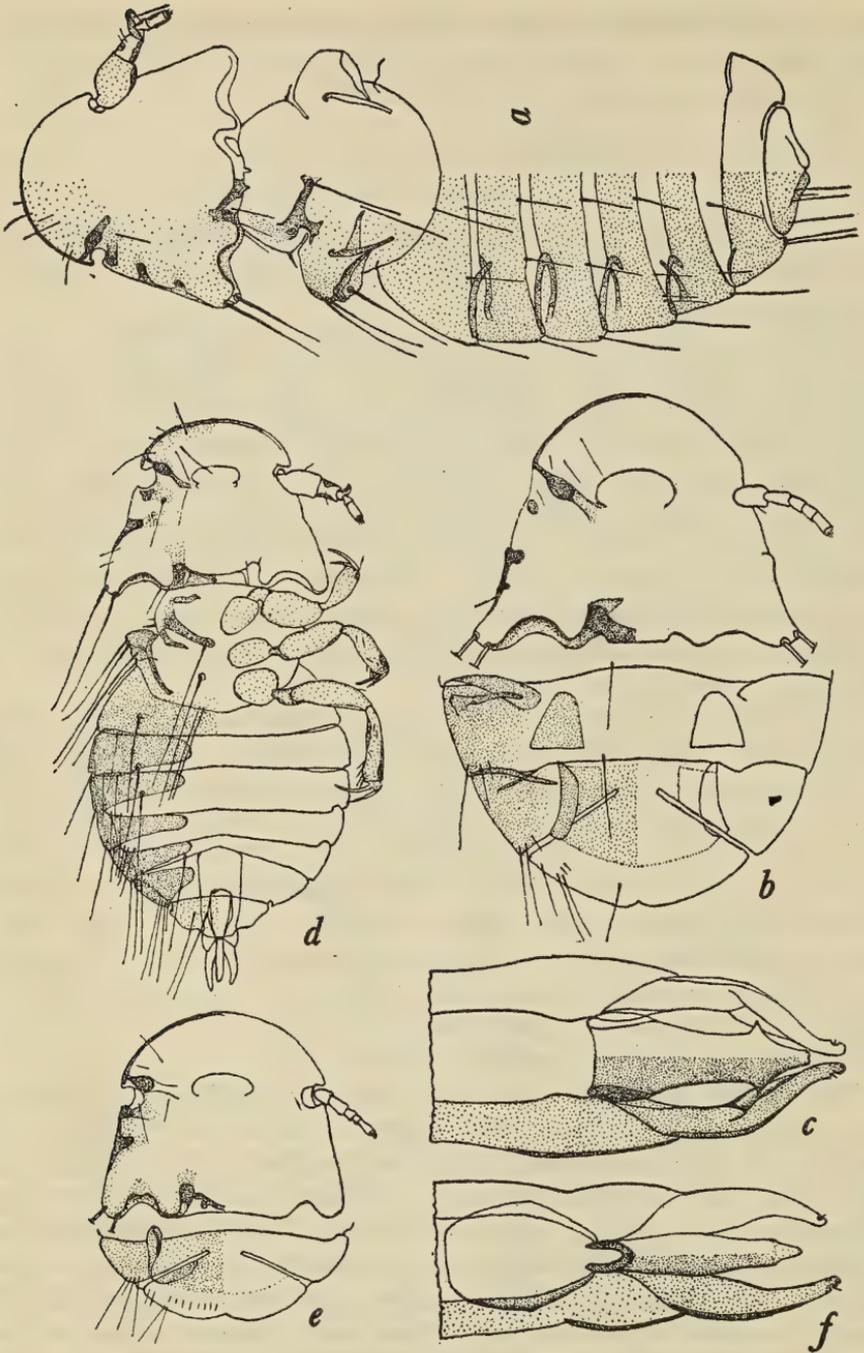


FIGURE 19.—RHYNCOTHURA

a-c, *Rhyncothura subteres*, new species: *a*, Body of male; *b*, head and tip of female abdomen; *c* male genitalia.

d-f, *R. andinae*, new species: *d*, Body of male; *e*, female head and tip of abdomen; *f*, male genitalia.

temples and frons are slightly larger and the templar margins slightly more sinuate; the abdominal sclerites and markings are similar, while the chaetotaxy is exactly the same except on segment VII (see figure). Measurements are given with those of *R. andinae*.

RHYNCOTHURA ANDINAE, new species

FIGURE 19, d-f

Types.—Male and female, adults, from *Tinamotis pentlandi*, collected by the author at Potosí, Bolivia, January 23, 1938; in collection of author.

Diagnosis.—This is the smallest species of the genus now known and decidedly different from all others in many characters. Like *teres* and *subteres* it has no internal projections on the frons and very few markings on the head and thorax and none at all on the abdomen. The head is very large, much larger than the combined thoracic segments, while the abdomen in both sexes is very small. The thoracic structure is also unique. The three segments are very closely fused, even the prothorax and mesothorax, where the suture is extremely difficult to distinguish, especially in the male. The suture between the mesothorax and metathorax is also very short (at sides only) and almost invisible. The sexes are strongly dimorphic, not only in the antennae, but in the shape of the head (see figure).

MEASUREMENTS OF RHYNCOTHURA

Structure	<i>chacoensis</i>				<i>andinae</i>				
	Male		Female		Male		Female		
	Length	Width	Length	Width	Length	Width	Length	Width	
Body	1.20		1.21		1.06		1.26		
Head	frons	0.314		0.347		0.30		0.41	
	temples	0.38	0.53	0.39	0.51	0.36	0.45	0.40	0.49
	occiput	0.365		0.36		0.336		0.40	
Prothorax	0.11	0.30	0.12	0.27	0.11	0.25	0.09	0.25	
Mesothorax	0.18	0.50	0.19	0.49	0.20	0.365	0.215	0.38	
Metathorax	0.13	0.44	0.13	0.39					
Abdomen	0.69	0.63	0.70	0.62	0.57	0.52	0.69	0.55	
Antennae	0.206	0.055	0.16	0.038	0.195	0.06	0.155	0.03	
Paramers	0.078	0.07			0.105	0.055	0.108	0.02	
Endomerale plate	0.076	0.038							

The genital armature of the male is also somewhat unusual in its extreme simplicity, the endomerale plate being long and slender, without lateral thickened bars or rods, and with only a horseshoe-shaped support at its base. The basal plate presents an unusual character, in that the inner margin of the lateral bands seems to be folded back (see fig.). All four males taken show this character.

The chaetotaxy of the whole body is typical of the genus, presenting no unusual features (see fig.). The legs are of normal shape, although the femora are somewhat unusual, the first pair being short and very thick, while the other two pairs are elongated and of rather abnormal shape; the trochanter is large in the first and third legs, small in the second. The tergal plates are widely separated medially and closely fused with the paratergals, while the sternal sclerites are apparently wanting. The abdomen in the female, except for greater length and difference in terminal segment, is the same as in the male.

RHYNCOTHURA TESTUDO (Clay)

Heptapsogaster testudo CLAY, Proc. Zool. Soc. London, ser. B. 1937, p. 140, figs. 2a, 3b, 3c, 4d, pl. 1, fig. 5. (Host: *Nothura maculosa peruviana*, Peru.)

This species is unquestionably not a *Heptapsogaster* but a typical *Rhyncothura*. As stated in the introduction, true *Heptapsogaster* is not found on any of the Tinamidae inhabiting the grasslands (note species of questionable status), while *Rhyncothura* is confined to that group (*Tinamotis*, *Nothoprocta*, *Nothura*, and *Rhynchotes*). Also, the genus *Rhyncothura*, as defined by the author, places no obstacle for the inclusion of *testudo* in it, while *Heptapsogaster* certainly does.

Genus TRICHODOPEOSTUS Carriker

TRICHODOPEOSTUS SPINOSUS PRAEGRACILIS, new subspecies

Types.—Male and female, adults, from *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, July 16, 1941; in U. S. National museum.

Diagnosis.—The characters separating this race from typical *spinosus* are not conspicuous, but are constant, and may be briefly summed up as follows:

The whole insect, as well as most of its component parts, is uniformly smaller; the proportions of the head vary considerably between the races and the sexes of the same race, the length in the male being less, with width at temples less, but at the frons practically the same. In female the length at the occiput is equal, slightly less at the temples, while the width at the temples is *much more*, with the frons the same (frons: 0.54 against 0.55; temples: 0.92 against 0.80). The thoracic segments are both shorter and narrower in both sexes, but there is little difference in width of abdomen (length of abdomen not always a reliable measurement). The antennae in the male are longer and narrower (first segment), and in the female slightly longer but of equal width.

Perhaps the most noticeable difference is in the male genitalia, which have the basal plate longer and narrower (0.44 by 0.11 against 0.38 by

0.12), while the combined paramers are also longer and *much narrower* (0.326 by 0.0162 against 0.38 by 0.0108).

A series of 27 males and 10 females was taken from three individuals of the type host at Tierra Nueva and Monte Elias, Sierra Perijá, Colombia, and one male and two females on the same host from La Cumbre de Valencia, Venezuela. They are very uniform in size, markings, and chaetotaxy, with the exception of the number of spines along the posterior margins of the pleurite, which varies considerably in the two pleurites of the same segment (a case similiar to the number of teeth in the abdominal combs of *Rhopaloceras*), there often being *one* less on the *right* side of the abdomen. It is a curious coincidence that the lesser number of spines should almost invariably be on the right side. It is not a case of a spine having been broken off, since when that happens the place of attachment is always clearly visible. This phenomenon is also present in the series of *T. s. spinosus*.

MEASUREMENTS OF TRICHODOPEOSTUS SPINOSUS

Structure	<i>spinosus</i>				<i>praegracilis</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.71	-----	1.96	-----	1.71	-----	2.05	-----
Head {frons.....	-----	0.54	-----	0.55	-----	0.53	-----	0.54
{temples.....	0.59	0.825	0.63	0.80	0.55	0.77	0.61	0.92
{occiput.....	0.50	-----	0.50	-----	0.477	-----	0.50	-----
Prothorax.....	0.20	0.42	0.206	0.43	0.185	0.41	0.195	0.41
Mesothorax.....	0.25	0.68	0.26	0.69	0.24	0.66	0.25	0.66
Metathorax.....	0.25	0.586	0.25	0.61	0.22	0.56	0.24	0.57
Abdomen.....	0.98	0.80	1.13	0.82	1.00	0.78	1.33	0.79
Antennae.....	0.26	0.095	0.25	0.05	0.29	0.087	0.27	0.05
Basal plate.....	0.38	0.12	-----	-----	0.44	0.11	-----	-----
Paramers.....	0.326	0.0162	-----	-----	0.38	0.0108	-----	-----

HETEROPEOSTUS, new genus

Genotype.—*Rhyncothura carrikeri* Clay.

Diagnosis.—Superficially resembling some species of *Rhyncothura* but differing from that genus in the structure and markings of the abdominal sclerites and especially in the male genitalia, which seem to be of a completely unique type and of generic significance in this family.

Size medium; sexual dimorphism in shape of antennae, head, abdomen, and seventh abdominal segment. First antennal segment in male lengthened and swollen; second segment enlarged to a lesser degree; third with distal end elongated, and the minute fourth at-

tached on the side; fifth normal. Female with antennae filiform, with first, second, and fifth segments subequal, fourth the shortest.

Head large, in female larger than combined thoracic segments; frons flatly rounded to circular; temples expanded laterally, with rounded angles, and extending little if any behind the occiput. Prothorax short and wide; mesothorax and metathorax almost completely fused, the latter overlapping the former at the sides and being almost entirely imbedded within the first abdominal segment. Pharyngeal sclerite and gland well developed.

Abdomen elliptical in female, almost parallel-sided in the male from segment I to IV; tergal plates entire and broadly separated from the paratergals, which are of a most unusual shape (see figure); sternal plates also entire, and extending completely across the abdomen, under the pleural plates; tip of segment VII with large opening for extruding of genitalia, on the dorsal side of which there is a heavily chitinized, circular margin. Legs small, rather stout, with tibiae and femora about equal in length; coxae small, but trochanters well developed; claws long and slender.

Chaetotaxy somewhat sparse, especially on body, but most hairs are long.

Genital armature with basal plate extremely long and wide (resembling *Rhopaloceras*), extending from tip of abdomen to posterior coxae; paramers minute, completely fused to tip of basal plate, and with their tips bent sharply inward. The endomeres seem to consist of a long sac lying on top of a wide, median slit in the basal plate and are attached to the basal plate at the anterior end of the slot. The portion lying over the basal plate is strengthened by a heavily chitinized longitudinal bar on each side, while the portion of the sac which fills the space between the minute paramers is unpigmented, nonchitinized, and with thin membranous walls.

HETEROPEOSTUS CARRIKERI (Clay)

FIGURE 29, c-f

Rhyncothura carrikeri Clay, Proc. Zool. Soc. London, ser. B, 1937, p. 143, fig. 6c, pl. 2, figs. 1, 2. (Host: *Nothoprocta cinerascens*.)

I have a series of 6 males and 13 females of this interesting species, taken on the type host, collected by myself at Villa Montes, Bolivian Chaco, November 6, 1936.

On the same individual host with the above series of *H. carrikeri* were taken two new species of typical *Rhyncothura*. This fact, considered in connection with the strikingly different genitalia and abdominal structure of *H. carrikeri*, has convinced me that *carrikeri* should be placed in a new genus.

I have two males with the genital armature half extruded, both in splendid condition for study. In the drawing published by Miss Clay the paramers are shown as jointed to the basal plate. This is an error, as can be plainly seen in my material, since they are completely fused with the basal plate, the only evidence of point of fusion being the thickening of the margins in the paramers. Her figure of the endomeral sac is also somewhat misleading, since it is distorted, being pulled to the left. In my material there are two males that show this distortion, the remaining being normal, as in the figure herewith presented.

Genus HEPTARTHROGASTER Carriker

HEPTARTHROGASTER MINUTUS (Carriker)

FIGURE 20, *g*

Goniodes minutus CARRIKER, Univ. Nebraska Stud., vol. 3, No. 2, p. 155, pl. 4, figs. 1, 2, 1903. (Host: *Tinamus robustus*=*T. major castaneiceps*.)

Heptarthrogaster minutus (Carriker) CARRIKER, Lice of the tinamous, p. 135, pl. 20, figs. 2-2b, 1936. (Host: *Tinamus major castaneiceps*.)

This genus seems to be rare. Since the publication of the "Lice of the Tinamous," 1936, I have been able to secure the following additional material of this species: Two females from *Tinamus s. serratus*, Bolivia; one male and two females from *T. serratus ruficeps*, Colombia; one male from *Crypturellus garleppi affinis*, Bolivia (which may possibly belong to *T. s. serratus*), and a series of 24 males and females from *Tinamus major percautus*, Mexico. There are certain minute differences between the specimens from *T. s. serratus*, *T. s. ruficeps*, and *T. major castaneiceps* (the type series), but these are so small that it does not seem advisable to separate them, especially in view of the small amount of material available for study. However, the series from *T. major percautus* seems worthy of subspecific rank and is described below.

HEPTARTHROGASTER MINUTUS MEXICANUS, new subspecies

FIGURE 20, *h*

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author at Cerro Tuxtla, Veracruz, Mexico, March 23, 1940; in the U. S. National Museum.

This race agrees rather closely with *H. m. minutus* in many respects. There is a noticeable difference in the shape of the head in the male, as well as in the shape and proportions of the genital armature. They are also slightly larger in all respects, and so it seems advisable to recognize this form.

MEASUREMENTS OF HEPTARTHROGASTER MINUTUS

Structure	<i>minutus</i>				<i>mexicanus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	0.91		1.11		1.08		1.20	
Head.....	0.29	0.36	0.26	0.41	0.30	0.38	0.27	0.43
Prothorax.....	0.14	0.28	0.14	0.30	0.14	0.29	0.14	0.30
Mesothorax.....		0.39		0.40		0.41		0.43
Abdomen.....	0.56	0.53	0.69	0.55	0.59	0.54	0.76	0.58

HEPTARTHROGASTER PARVULUS (Taschenberg)

FIGURE 20, d

Goniodes parvulus TASCHEMBERG. Die Mallophagen, p. 38, pl. 1, figs. 4-4b, 1882.

(Host: *Tinamus robustus*, Costa Rica=*T. major castaneiceps*.)

Heptarthrogaster parvulus (Taschenberg) CARRIKER, Lice of the tinamous, p. 134, pl. 20, figs. 1-1b, 1936. (Host: *Tinamus major castaneiceps*.)

The types of this species were taken on a dried skin of "*Tinamus robustus*," from Costa Rica, according to Taschenberg. At that time the Caribbean and Pacific races of *Tinamus major* had not been separated, and all were known as *T. robustus*, which name is now restricted to the birds from Mexico and Guatemala. Therefore, it is not possible to say (without knowing the exact locality from which Taschenberg's host came) which race of *T. major* is the true host of this parasite, since collecting had been done on both sides of the country by the three Germans von Frantzius, Hoffmann, and Ellendorf, who began working in Costa Rica about 1858, and whose collections went to Berlin. They were notorious for the inaccuracy of the locality data on their skins, many being labeled "San Jose" that obviously could not possibly have come from there, and so we shall probably always be in some doubt about this point.

The only Costa Rican specimens I have seen of this parasite are two females taken on *Tinamus major castaneiceps* from Pozo Azul (on the Pacific side), and their measurements agree very closely with those given by Taschenberg.

Additional material has been secured from the following hosts: *Tinamus serratus ruficeps*, Venezuela and Colombia; *Tinamus major percautus*, Mexico; and *Tinamus t. tao*, Colombia. These specimens have been carefully measured, together with those from *T. s. serratus* and the two females from Costa Rica. This series falls into two groups, the larger specimens coming from *Tinamus t. tao* and *T. major percautus*, the latter being slightly larger than the former; the smallest specimens are from *T. s. ruficeps*, with those from *T. s. ser-*

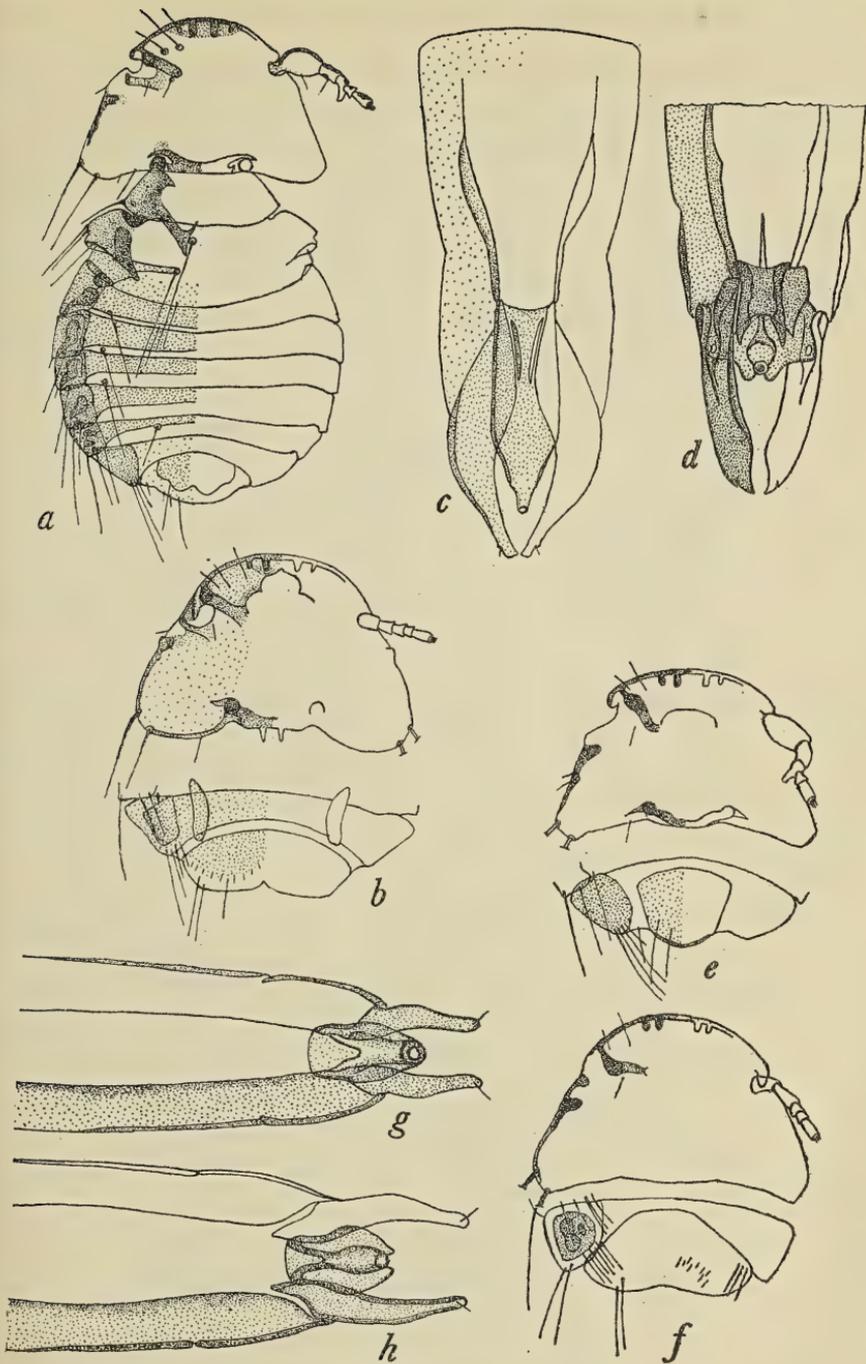


FIGURE 20.—HEPTARTHROGASTER

a-c, *Heptarthrogaster latacephalus*, new species: *a*, Body of male; *b*, female head and tip of abdomen; *c*, male genitalia.

d, *H. parvulus* (Taschenberg): *d*, Male genitalia.

e, f, *H. costaricensis*, new species: *e*, Male head and tip of abdomen; *f*, female head and tip of abdomen.

g, *H. minutus minutus* (Carriker): Male genitalia.

h, *H. m. mexicanus*, new subspecies: Male genitalia.

ratus being but a trifle larger. The typical female from Costa Rica is almost exactly the same size as the females from *T. s. serratus*.

The male genitalia, while presenting certain minute differences, are very uniform as to proportions, with the slight variations in size corresponding to the size of the insect. To attempt to separate these insects into different races of *parvulus* would be pure hair-splitting and serve no useful purpose.

This species and *H. minutus* seem to be among the most stable of the tinamou lice, having remained almost identical while their hosts have undergone considerable differentiation, especially *T. t. tao*.

MEASUREMENTS OF HEPTARTHROGASTER PARVULUS FROM FIVE TINAMOU HOSTS

Structure	From <i>Tinamus major castaneiceps</i> (female)		From <i>T. m. percautus</i>				From <i>T. tao tao</i>			
			Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.18									
Head {frons.....	0.304	0.444	0.326	{ 0.30 0.395 }	0.35	{ 0.36 0.52 }	0.326	{ 0.285 0.37 }	0.345	{ 0.337 0.49 }
temples.....										
Prothorax.....	0.14	0.30	0.145	0.32	0.15	0.33	0.14	0.33	0.15	0.326
Mesothorax.....	0.13	0.444	0.13	0.50	0.12	0.52	0.12	0.475	0.13	0.49
Metathorax.....	0.14	0.40	0.15	0.456	0.15	0.44	0.15	0.42	0.16	0.45
Abdomen.....	0.67	0.54	0.61	0.60	0.73	0.65	0.59	0.565	0.73	0.63
Antennae.....	0.18		0.24	0.065	0.18	0.033	0.217	0.07	0.18	0.033
Paramers.....			0.108	0.067			0.12	0.072		
Endomerale plate.....			0.058	0.04			0.06	0.03		

Structure	From <i>T. serratus serratus</i>				From <i>T. s. ruficeps</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.05		1.19		1.03		1.12	
Head {frons.....	0.30	{ 0.28 0.35 }	0.324	{ 0.33 0.44 }	0.30	{ 0.28 0.38 }	0.326	{ 0.33 0.44 }
temples.....								
Prothorax.....	0.13	0.29	0.14	0.32	0.15	0.326	0.13	0.293
Mesothorax.....	0.108	0.43	0.12	0.44	0.11	0.445	0.108	0.456
Metathorax.....	0.13	0.40	0.14	0.40	0.13	0.40	0.144	0.41
Abdomen.....	0.564	0.53	0.65	0.54	0.51	0.565	0.64	0.57
Antennae.....	0.217	0.06	0.174	0.033	0.206	0.055		
Paramers.....	0.10	0.065			0.098	0.065		
Endomerale plate.....	0.054	0.033			0.05	0.035		

HEPTARTHROGASTER LATACEPHALUS, new species

FIGURE 20, a-c

Types.—Male and female, adults, from *Crypturellus u. undulatus*, collected by the author at Boca Chaparé, Bolivia, August 25, 1937; in collection of author.

Diagnosis.—Very different from the known species of this genus and may be distinguished by the much wider temples in the males, the short, rounded abdomen in both sexes (wider than long in the male), and the style of markings on the paratergal plates.

There are but four internal projections on the antennal band in both sexes (six in *parvulus* and *minutus*); the prothorax is large, much wider than long and with sides more divergent than the other species; the mesometathoracic segments are very similar to those of *parvulus*. The abdomen is almost circular in both sexes, with pleural plates sharply delineated and tergites entire, but separated by pronounced hyaline areas; pleurites I to V with darker, internal incrassations; segment VII rounded anteriorly and posteriorly (angulated anteriorly in all other forms). The chaetotaxy is sparse and similar in the sexes, except that in the female there are two hairs on the posterior margin of pleurites II and III and three on IV and V, while the hairs on the mesosternal and metasternal plates and tergites I to III are slenderer and some shorter.

The male genitalia have the paramers somewhat like those in *minutus*, except for their attachment to the basal plate, while the endomerale plate resembles that of *parvulus*, except for greater length; the basal plate is very short.

The female is considerably larger than the male, with filiform antennae and with well-developed, pointed processes extending backward under the first segment of the antennae, which are attached on the ventral side of the head, the first segment being nearly covered by the dorsal integument. Abdominal segment VII is broad and short, with rounded sides, flattened posterior margin and medium emargination, and with rounded anterior margin (not angulated as in the other species). The genital plates consist of two semicrescent-shaped sclerites lying across each side of tergite VI, extending over V and touching edge of VII. Scent gland entirely absent.

MEASUREMENTS OF HEPTARTHROGASTER LATACEPHALUS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	0.95		1.19	
Head {frons.....	0.326	0.28 0.51	0.38	0.35 0.575
{temples.....				
Prothorax.....	0.11	0.31	0.10	0.35
Mesothorax.....	0.12	0.47	0.15	0.54
Metathorax.....	0.11	0.456	0.15	0.52
Abdomen.....	0.48	0.586	0.67	0.716
Antennae.....	0.22	0.06	0.16	0.032
Paramers.....	0.072	0.072		
Endomerale plate.....	0.098	0.033		

HEPTARTHROGASTER COSTARICENSIS, new species

FIGURE 20, e, f

Types.—Male and female, adults, from *Crypturellus soui modestus*, collected by the author at Guapiles, Costa Rica, on March 10, 1903; in collection of author.

Diagnosis.—Differs from *latacephalus* as follows: Slightly larger in size, head wider at frons in both sexes, while in the female the temples are of same width or slightly less, with length of head also slightly less; posterior margin of temples *straight* in both sexes (not rounded) and in the male the points are more attenuated and less rounded; tubercles at base of antennae in the female are shorter and less pointed; thoracic segments of slightly different proportions. The structure of the abdominal plates is practically the same as in *latacephalus*, but the abdomen in the female is also wider than long (longer than wide in *latacephalus*). The chaetotaxy seems to be very similar in both sexes but differs considerably from that of *latacephalus* (see fig.).

The male genitalia are somewhat different, especially the endomeral plate (see fig.); the paramers are shorter, but of same width, while the endomeral plate is both shorter and narrower, and has the tip broad and truncated, with what seems to be a small penis.

Remarks.—This species is of the general type of *latacephalus*, although the head of the male in some respects resembles that of *parvulus*, except for shape of occipital margin. Species represented by two males and one female, including the types.

The taking of this new type of *Heptarthrogaster* on two species of *Crypturellus* so far removed from each other, both geographically and systematically, presents further proof of the stability of the species of this genus. It is probable that the *minutus* and *parvulus* group are confined to the avian genus *Tinamus* and the *latacephalus* and *costaricensis* group to *Crypturellus*.

MEASUREMENTS OF HEPTARTHROGASTER COSTARICENSIS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.07		1.29	
Head {frons.....	0.35	0.337	0.37	0.38
{temples.....		0.53		0.56
Prothorax.....	0.11	0.35	0.12	0.36
Mesothorax.....	0.14	0.52	0.15	0.56
Metathorax.....	0.13	0.49	0.16	0.53
Abdomen.....	0.57	0.655	0.75	0.78
Antennae.....	0.23	0.065	0.16	0.04
Paramers.....	0.062	0.075	-----	
Endomeral plate.....	0.076	0.025	-----	

HEPTARTHROGASTER GRANDIS Carriker

FIGURE 21, a-d

Heptarthrogaster grandis CARRIKER, Lice of the tinamou, p. 136, pl. 20, fig. 3, 1936. (Host: *Tinamus s. serratus*.)

This species was described from a single female and was placed in *Heptarthrogaster* with some misgivings, since the male was unknown. I now have two males and five females of what seems to all appearances to be the same species but collected on *Tinamus t. tao*, in the Sierra Perijá of Colombia. The measurements of the type (after correction) prove to be extremely close to the females taken on *T. t. tao* (see table of measurements), while I can find no differences in shape of body segments or chaetotaxy in the females.

Under these conditions it seems advisable to label these specimens from *Tinamus t. tao* as *H. grandis* and describe the male as such. If the males from *T. s. serratus* should prove to be distinct from the male here described as *grandis*, then the insects from *Tinamus tao* will be without a name, but I doubt very much if they will prove to be different, since the females are apparently identical.

Description of male: The antennae are strongly dimorphic, the first segment being much lengthened and thickened; the second is short, but thick, while the third has a medium-sized hook at the distal end, much less developed than in either *minutus* or *parvulus*.

There is little difference in the shape of the head in the sexes, the frons being slightly more flattened in the male, with the trabecular tubercles somewhat larger, as well as the internal projections on the frons. There are no differences between the sexes in the markings of the head and thorax, but the prothorax is smaller in the male.

The abdomen is shorter and narrower than that of the female and more ovoid; the pleural plates are wider and lack the small hooks at the inner posterior corner on segments II to V; the shape of the incassations on the pleural plates also differs slightly between the sexes, the hook at the posterior end of the marking being more open and with the end lengthened horizontally in the male.

In the female the sternal plates of the abdomen are continuous across the abdomen but very faintly pigmented, while the tergites are separated from both the pleural plates and from each other medially (the published figure of the female does not show the faintly pigmented sternites).

In the male the tergites are closely joined to the pleural plates and almost touch each other medially but are much more widely separated horizontally by hyaline spaces than in the female. Segments VI and VII are shorter in the male, VI having the tergal plate continuous, while VII is flatly rounded both anteriorly and posteriorly and protrudes but slightly beyond segment VI.

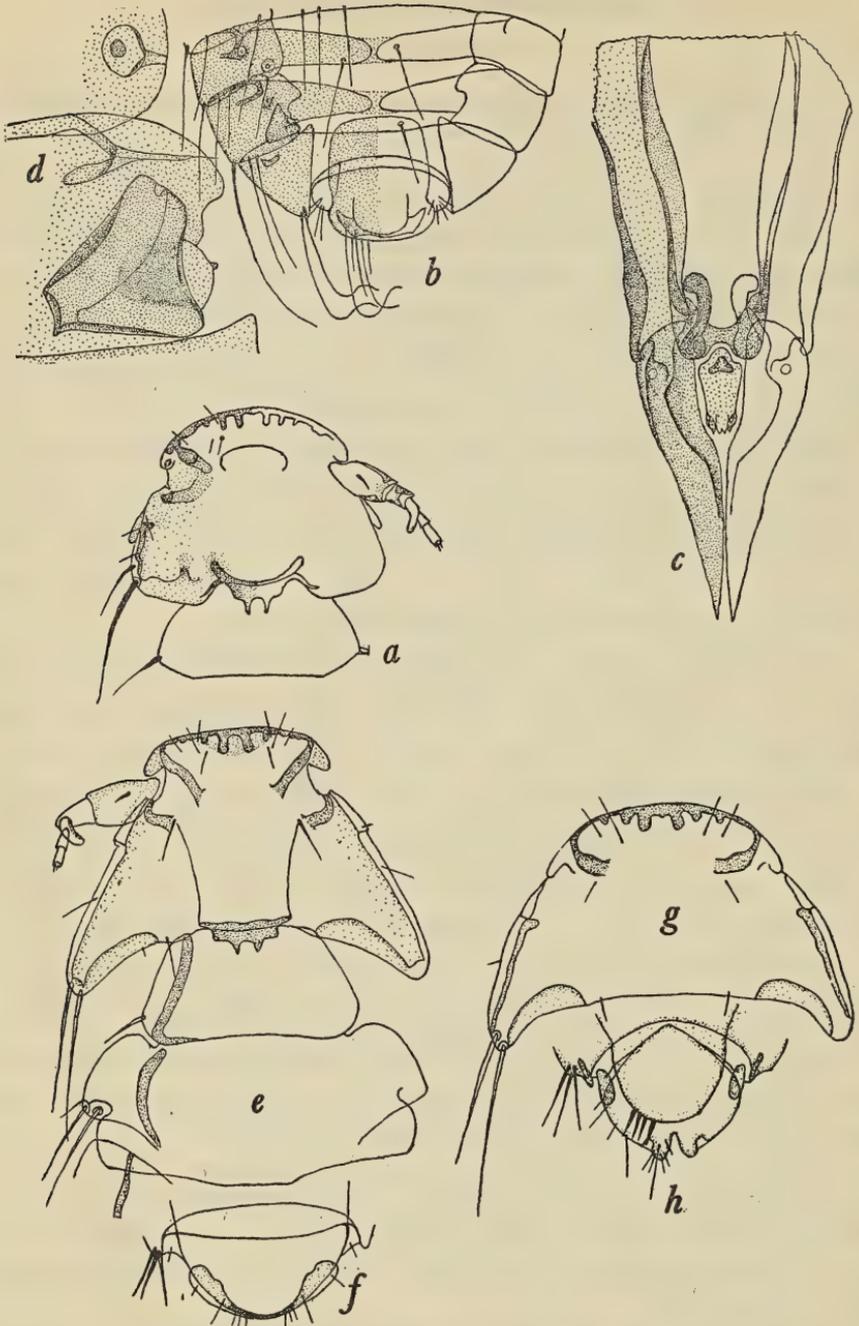


FIGURE 21.—HEPTARTHROGASTER and MEGAPEOSTUS

a-d, *Heptarthrogaster grandis* Carriker: *a*, Male head; *b*, tip of female abdomen; *c*, male genitalia; *d*, scent gland.

e-h, *Megapeostus multiplex multiplex* Clay: *e*, Male head and thorax; *f*, male abdominal segment VII; *g*, female head; *h*, female abdominal segment VII.

The scent glands in this species are unique. On segment IV the gland is small, round, with dark granulated center, and resembles that of *Heptapsogaster temporalis*, while it seems to lie between the dorsal and ventral integument, near the inner, posterior edge of the sclerite, which is *not* incised to receive it. The gland on segment V is entirely different. It is more than half as wide as the pleurite and extends posteriorly slightly under segment VI. Apparently it consists of two parts, a large triangular body attached to the ventral surface of the pleurite and a second part attached to the median portion of the first part and extending nearly over to its inner edge, where the pleurite is incised back to the large triangular body on its posterior portion. The visible portion of this second part of the gland is ovoid, unpigmented, and with a short median outlet, so that it resembles a woman's breast. This is undoubtedly the sac where the substance secreted is stored, while the large, deeply pigmented portion is where it is secreted. The large triangular body has the sides (in part) raised, or folded over, which leads one to assume that it is attached to the ventral surface and not between the two integuments, and apparently does not have its entire surface attached to the pleurite.

The genital armature is of the same general type as *H. minutus*, with small, weak endomeres, but with the paramers longer and with straight tips tapering to a point.

MEASUREMENTS OF HEPTARTHROGASTER GRANDIS FROM TWO TINAMOU HOSTS

Structure	From <i>Tinamus s. serratus</i>		From <i>Tinamus t. tao</i>			
	Female (type) (corrected)		Male		Female	
	Length	Width	Length	Width	Length	Width
Body.....	1.73		1.46		1.78	
Head {frons.....	0.43	0.63	0.40	{ 0.39 0.53 }	0.41	{ 0.46 0.63 }
{temples.....						
Prothorax.....	0.206	0.42	0.18	0.41	0.218	0.456
Mesothorax.....	0.16	0.64	0.16	0.63	0.16	0.67
Metathorax.....	0.227	0.58	0.24	0.586	0.24	0.63
Abdomen.....	1.06	0.82	0.82	0.89	1.07	0.846
Antennae.....	0.25		.29	0.072	0.25	0.045
Paramers.....	0.15	0.076				
Endomeral plate.....	0.087	0.043				

Genus MEGAPEOSTUS Carriker

MEGAPEOSTUS PARVIGENITALIS Carriker

Megapeostus asymmetricus parvigenitalis CARRIKER, Lice of the tinamou, p. 143, pl. 23, fig. 2, 1936. (Host: *Crypturellus atrocapillus*, Bolivia.)

Owing to the discovery of several new species belonging to this unusually interesting genus, additional information has come to light

concerning the characters that separate the species belonging to it. In view of this information it has seemed advisable to give the race *parvigenitalis* full specific rank, as well as the subspecies *M. multiplex secundus* Clay. The host of this species was wrongly identified. It should be *Crypturellus garleppi affinis*.

MEGAPEOSTUS MULTIPLEX MULTIPLEX Clay

FIGURES 21, e-h; 22, a

Megaepostus multiplex multiplex CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 150, figs. 9c, 10a, pl. 3, fig. 2. (Host: *Crypturellus b. boucardi*, Nicaragua.)

The original description and figures given by Miss Clay for this and the following species are not very complete and have been supplemented by further remarks and additional figures.

A series of 38 adults of both sexes was taken on four individuals of the type host, collected by the author on Cerro Tuxtla, Veracruz, Mexico, in March 1940.

The male of *M. multiplex* is very similiar in general appearance to the male of *M. parvigenitalis*, with which it agrees in the absence of hooks on the posterior margin of the metathorax, shape of the head, and in having *four* deeply pigmented, internal projections from the narrow clypeal band, on the front of the head, instead of *two*, as in *asymmetricus*.

In the male the body measurements are all slightly less than in *parvigenitalis*, with the single exception of the width of the abdomen, which is greater. However, the genital armature is quite different. The basal plate is larger than in *parvigenitalis*; the paramers are *equal* in length, but both are bent to the *right*, apically, and are very unequal in shape (see fig.); the endomerale plate with attached penis (?) resembles somewhat that of *parvigenitalis*, except that it is much longer and tapers to a narrow, *bifurcated* tip, each bifurcation being clearly tubular in character. In addition, there is a long, slender hook attached at each side of the basal plate, outside of the paramers, which curves inward and backward under the paramers. These hooks are also asymmetrical.

The female differs from that of *parvigenitalis* in having the temples longer, narrower, and more pointed (like the female of *asymmetricus*), but the head is narrower (proportionately) across the temples than either of these two species, and the temples are less divergent. As to size, the female of *multiplex* presents a most unusual situation. It is not only much smaller than the female of *parvigenitalis* but is also smaller than its own male sex, in every measurement. The last abdominal segment is also differently shaped from either of the described species (*asymmetricus* and *parvigenitalis*).

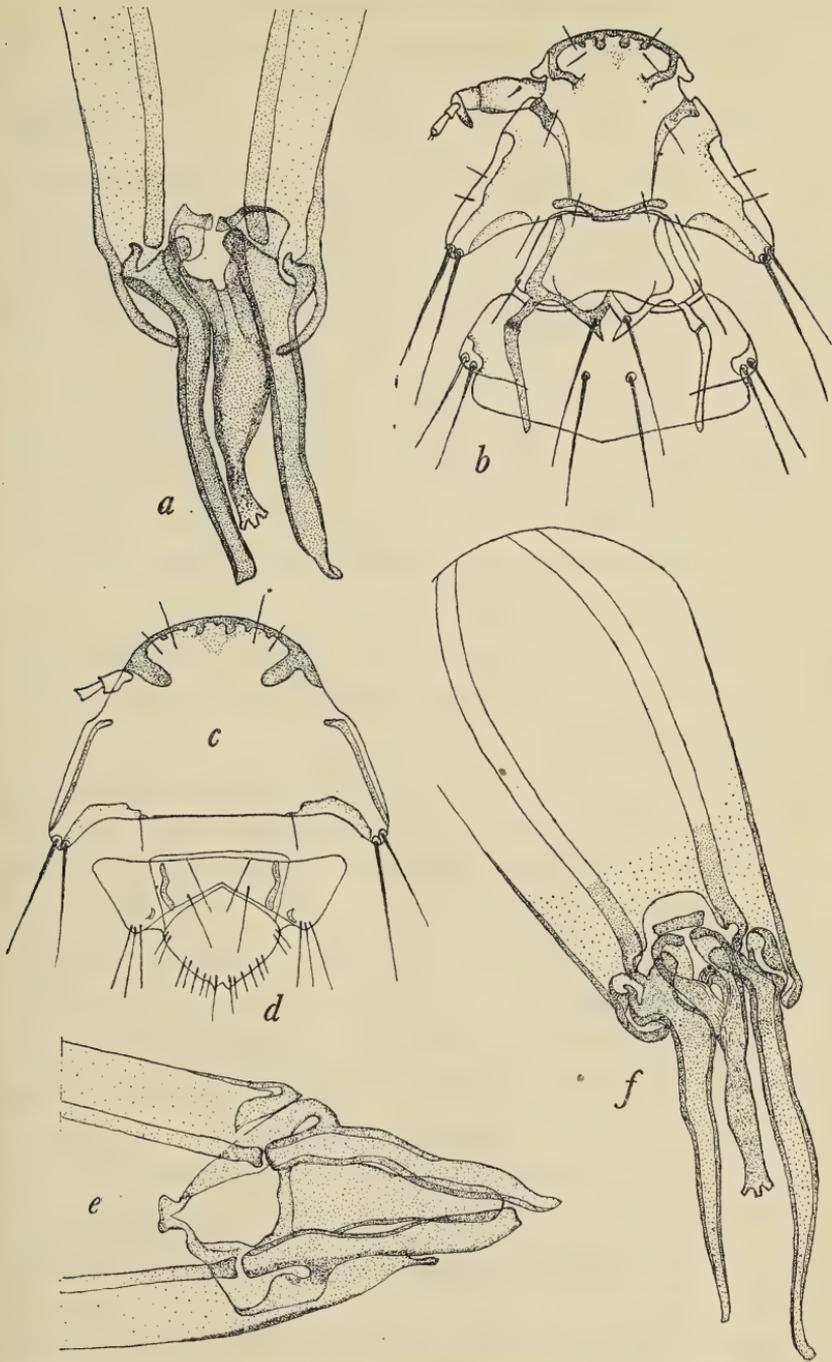


FIGURE 22.—MEGAPEOSTUS

- a*, *Megapeostus multiplex multiplex* Clay: Male genitalia.
b-e, *M. secundus* Clay: *b*, Male head and thorax; *c*, female head; *d*, tip of female abdomen;
e, male genitalia.
f, *M. multiplex idoneus*, new subspecies: Male genitalia.

MEASUREMENTS OF MEGAPEOSTUS

Structure	<i>parvigenitalis</i> (corrected)				<i>m. multiplex</i>			
	Male		Female		Male		Females (average of 5)	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.10	-----	2.40	-----	2.07	-----	1.98	-----
Head.....	0.54	0.835	0.57	0.868	0.51	0.76	0.487	0.75
Prothorax.....	0.27	0.49	0.26	0.44	0.24	0.466	0.22	0.415
Mesothorax.....	0.195	0.76	0.195	0.738	0.18	0.735	0.16	0.68
Metathorax.....	0.217	0.69	0.24	0.68	0.217	0.67	0.21	0.64
Abdomen.....	1.25	0.84	1.35	0.88	1.31	0.81	1.28	0.80
Antennae.....	0.39	0.09	0.26	0.03	0.30	0.09	0.21	0.038
Basal plate.....	0.41	0.25	-----	-----	0.456	0.31	-----	-----
Long paramer.....	0.347	0.04	-----	-----	¹ 0.292	0.028	-----	-----
Short paramer.....	0.26	0.024	-----	-----	² 0.282	0.021	-----	-----
Endomeral plate.....	0.184	0.017	-----	-----	0.217	0.043	-----	-----

¹ Right.² Left.

MEGAPEOSTUS MULTIPLEX IDONEUS, new subspecies

FIGURE 23, a-c

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at Carraipia, La Guajira, Colombia, May 30, 1941; in U. S. National Museum.

Diagnosis.—Differs from *M. m. multiplex* Clay in the following characters: Male with frons more convex, between *multiplex* and *secundus*, and with six instead of four internal projections on the front; the sides of the temples are almost straight (less convex than in *multiplex*); the prothorax is nearer to the shape of *secundus*, as well as the metathorax; abdominal segment VII is also different (see fig.), as well as the shape of the incassations on the pleural plates; the scent gland,⁷ on pleurite V, is strongly developed in both forms, but the pleurite is more deeply incised for its reception in *idoneus*.

The male genitalia are of the same pattern as in *multiplex*, in that they possess the curving braces attached at the base of the basal plate, for the support of the paramers; the endomeral plate is likewise of the same type, with tripartite tip. The longer paramer (the *right*) is of a different pattern, however, being similar in shape to the long *left* paramer in *M. asymmetricus* Carriker, but most of the component parts of the genital armature differ considerably in detail from those of *multiplex*.

The female is very close to that of *multiplex*. The temples are wider

⁷ The scent gland is well developed in all the species of this genus I have seen (*M. asymmetricus*, *M. parvigenitalis*, *M. multiplex*, *M. m. idoneus*, and *M. secundus*) and is of the same type in all the species, with a short tubular outlet at its apex, much resembling a woman's breast. The different species and subspecies present certain slight differences in size, shape, and the incised recess in which it lies.

at their tips, while abdominal segment VII differs both in structure and chaetotaxy (see fig.). The single female of *secundus* I have seen has this segment as shown in the figure, but I am of the opinion that this specimen is slightly immature and that perhaps the fully adult will show differences in structure.

The species is represented in the collection by four males and two females, two pairs from one bird and two males from another.

Miss Clay (1937, p. 151) had a single female of this species, taken from a skin of the type host, which she placed, without remark, under *M. secundus*, the types of which were taken on *Crypturellus cinnamomeus mexicanus*.

This is the third species of Mallophaga taken on the Colombian host *Crypturellus idoneus*, which is very closely related to the parasites from *C. b. boucardi* of Mexico and not to *C. c. cinnamomeus* or *C. cinnamomeus sallaei*. This cumulative evidence seems to show that *C. idoneus* of Colombia is conspecific with *C. boucardi* and not with *C. cinnamomeus*, as given by Peters.

MEASUREMENTS OF MEGAPEOSTUS MULTIPLEX IDONEUS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	2.00		1.95	
Head { frons.....		0.38		0.47
Head { temples.....	0.51	0.79	0.52	0.80
Head { occiput.....	0.44		0.44	
Prothorax.....	0.22	0.45	0.215	0.41
Mesothorax.....	0.18	0.70	0.174	0.67
Metathorax.....	0.18	0.65	0.18	0.63
Abdomen.....	1.22	0.81	1.17	0.78
Antennae.....	0.30	0.10	0.23	0.04
Basal plate.....	0.53	0.326		
Long paramer.....	0.43	0.18		
Short paramer.....	0.37			
Endomeral plate.....	0.30	0.11		

MEGAPEOSTUS SECUNDUS Clay

FIGURE 22, b-e

Megaepostus multiplex secundus CLAY, Proc. Zool. Soc. London, ser. B, 1937, p. 150, figs. 9b, 10b. (Host: *Crypturellus cinnamomeus mexicanus*, Mexico.)

Two males and one female were taken on *Crypturellus cinnamomeus sallaei*, collected by the author at Tres Zapotes, Veracruz, Mexico, on March 27, 1940.

Male: The head is very similar to that of *multiplex* in every particular except that the length from the occiput to the front is slightly less, and from the front to the tips of the temples slightly more, while the temples are narrower. Also, the metathorax is without hooks on

the posterior margin, and the suture separating it from the abdomen is *entire*, as in *multiplex* and *parvigenitalis*, only *asymmetricus* having this suture interrupted medially, as shown in the figure of that species (Carriker, 1936, pl. 28, fig. 1). The abdomen appears to be about the same, including the apical segment.

The measurements, as compared with *multiplex*, are curiously variable. The body is shorter; the head is shorter but wider; the prothorax is both shorter and narrower; the mesothorax of the same length, but considerably narrower; the metathorax both shorter and narrower; and the abdomen shorter but of the same width.

The genital armature is, however, very different from all three of the known species, being asymmetrical to a most surprising degree. The *left* paramer is the shorter, is much constricted medially, then widens apically and ends in a truncated tip. The right paramer is of more or less uniform width, but much twisted, and ends in an out-curving, narrow tip.

The endomeral plate is rather similar in general shape to that of *multiplex*, but less tapering apically, and terminates in a *broadly rounded tip, with no sign of penis or tubular outlet*.

A projection of the basal plate extends backward along the left paramer for two-thirds of its length, ending in a point, while there is attached on the outside of each paramer, near the base, a curiously shaped, elongated flap, which folds back under the distal portion of the basal plate, the two flaps being joined medially. The whole genital apparatus, both for this species and *multiplex*, is among the most unbelievably bizarre and extraordinary that have come under my notice. The single female taken is very similar to that of *multiplex* and, like that species, is slightly smaller than the male in some of but not all its measurements.

MEASUREMENTS OF MEGAPEOSTUS SECUNDUS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	1.93	-----	1.93	-----
Head.....	0.49	0.77	0.51	0.77
Prothorax.....	0.227	0.434	0.217	0.41
Mesothorax.....	0.184	0.69	0.16	0.67
Metathorax.....	0.195	0.64	0.217	0.62
Abdomen.....	1.19	0.80	1.15	0.80
Antennae.....	0.33	0.09	0.227	0.043
Basal plate.....	0.456	0.26	-----	-----
Right paramer.....	0.292	0.033	-----	-----
Left paramer.....	0.26	0.043	-----	-----
Endomeral plate.....	0.25	0.065	-----	-----

Genus DISCOCORPUS Carriker

DISCOCORPUS CEPHALOSUS FURCULUS, new subspecies

FIGURE 23, d-f

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in collection of author.

This form presents a combination of the characters of both *cephalosus* and *microgenitalis*, the head being somewhat similar in shape to the latter, yet different from either, while the genital armature is of the same type as the former.

In the male the body length, as well as the length and breadth of the head, is greater than in *cephalosus*; the prothorax is shorter and wider; the mesothorax is both longer and wider, while the metathorax is shorter and wider; the abdomen is also longer and wider and the antennae longer.

Both paramers and basal plate are longer, but scarcely wider.

In the female of *furculus* the prothorax is shorter, the mesothorax and abdomen the same length, while all the other measurements are greater. The last abdominal segment is considerably wider but about the same length, while the chaetotaxy is very similar.

The genital armature is decidedly the type of *cephalosus*, both as to size and structure of basal plate, paramers, and endomeral plate, differing only in their proportions (see corrected figure of *cephalosus* and of *furculus*). However, the seminal duct is quite different, that of *cephalosus* being a simple tube, with two complete convolutions, and with the distal opening at the end of the endomeral plate. In *furculus* the duct is without convolutions, although there is a thickening of the tube in the middle portion, which may or may not be a sort

MEASUREMENTS OF DISCOCORPUS CEPHALOSUS

Structure	<i>cephalosus</i>				<i>furculus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	0.87		1.04		1.02		1.10	
Head.....	0.26	0.47	0.29	0.50	0.31	0.55	0.32	0.55
Prothorax.....	0.087	0.29	0.092	0.30	0.07	0.326	0.087	0.347
Mesothorax.....	0.087	0.466	0.108	0.46	0.10	0.52	0.108	0.52
Metathorax.....	0.13	0.42	0.13	0.41	0.12	0.50	0.15	0.53
Abdomen.....	0.55	0.65	0.65	0.67	0.57	0.72	0.66	0.75
Antennae.....	0.15		0.16		0.18		0.195	
Paramers.....	0.087	0.07			0.097	0.072		
Basal plate.....	0.17	0.065			0.195	0.065		

of valve, beyond which point the duct becomes smaller, with very thin, almost transparent walls. At the tip of the endomeral plate the duct divides into two branches, which extend a short distance beyond it.

A careful study of the figures accompanying this article, as well as the original description of *cephalosus* and *microgenitalis*, will prove more enlightening than a detailed description. The original drawing for the male genitalia of *cephalosus* proves to be erroneous, and a corrected one is herewith given (fig. 23, *g*).

DISCOCORPUS CEPHALOSUS INTERMEDIUS, new subspecies

FIGURE 23, *h, i*

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at El Bosque, Sierra Perijá, Colombia, on June 14, 1941; in U. S. National Museum.

Diagnosis.—This race is closer to the nominate form than to *furculus*. It differs from *cephalosus* as follows: The preantennal portion of the head is practically the same, as to shape and width, but the temples are less convex laterally, and they extend farther posteriorly on each side of prothorax. There are minute differences in shape, size, and proportions of the various body segments which are too slight to enumerate, the chief distinguishing character of the race being the male genitalia (see fig.), which differ considerably from both *cephalosus* and *furculus*. The endomeral plate is of the type of *cephalosus*, but much wider posteriorly and of distinct shape, while the seminal duct is more like that of *furculus*, except that it is *not* bipartite. The paramers and basal plate also present differences. There is no trace of a scent gland in this genus.

MEASUREMENTS OF DISCOCORPUS CEPHALOSUS INTERMEDIUS

Structure	Male		Female	
	Length	Width	Length	Width
Body.....	0.95		0.97	
Head { frons.....	0.26	0.33	0.26	0.337
{ temples.....				
Prothorax.....	0.08	0.315	0.07	0.30
Mesothorax.....	0.12	0.50	0.13	0.48
Metathorax.....	0.17	0.44	0.15	0.43
Abdomen.....	0.60	0.71	0.59	0.65
Antennae.....	0.15	0.04	0.16	0.03
Basal plate.....	0.205	0.085		
Paramers.....	0.087	0.07		
Endomeral plate.....	0.06	0.03		

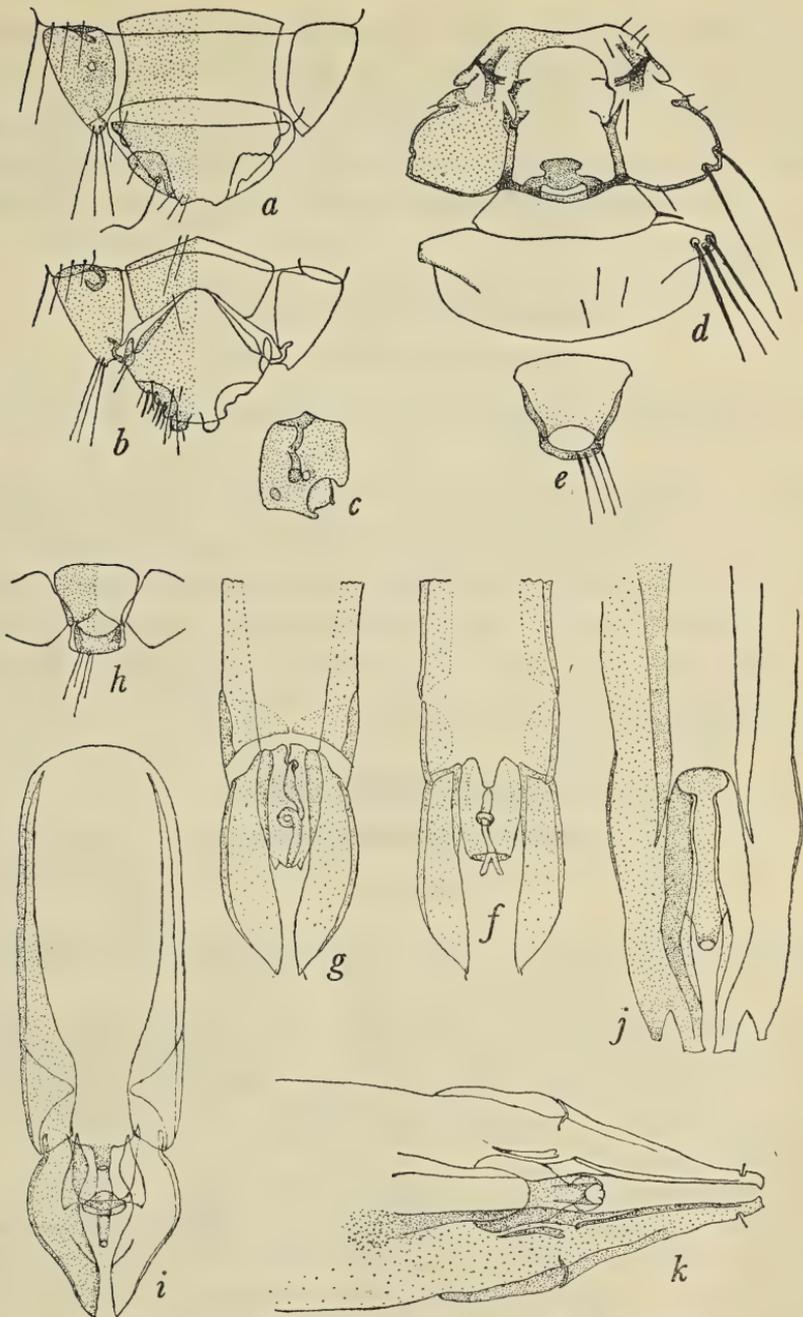


FIGURE 23.—MEGAPEOSTUS, DISCOCORPUS, and HEPTAPSUS

a-c, *Megapeostus multiplex idoneus*, new subspecies: *a*, Tip of male abdomen; *b*, tip of female abdomen; *c*, pleurite V with scent gland.

d-f, *Discocorpus cephalosus furculus*, new subspecies: *d*, Male head and thorax; *e*, male abdominal segment VII; *f*, male genitalia.

g, *D. cephalosus cephalosus* Carriker: Male genitalia.

h, i, *D. c. intermedius*, new subspecies: *h*, Male abdominal segment VII; *i*, male genitalia.

j, *Heptapsus nothocercae* Carriker: Male genitalia.

k, *H. inexpectatus*, new species: Male genitalia.

The female, except for shape of head, seems to be indistinguishable from the female of *cephalosus*. The species is represented by four males and four females, the type series of three pairs from one bird, the other pair from another, taken at Carraipia, La Guajira, Colombia.

Note.—The drawing of *D. cephalosus* published in 1936 (pl. 24, fig. 1) shows the front of the head too convex. There is actually a slight depression in the middle of the *frons*, but much less than in *D. microgenitalis*.

Genus LAMPROCORPUS Carriker

LAMPROCORPUS HIRSUTUS Carriker

Lamprocorpus hirsutus CARRIKER, Lice of the tinamous, p. 150, pl. 25, figs. 1-1e, 1936. (Host: *Nothoprocta branickii*.)

I have a large series of this handsome species taken on several individuals of *Nothoprocta o. ornata*, collected at Callipampa, Inca-chaca, Choros, and Potosí, Bolivia. There seems to be no valid grounds for separating these insects from *hirsutus*, they being extremely similar in all respects, except the single character of more, and more prominent, internal projections on the *frons*. However, since this character, I find, is subject to individual variation, it does not seem sufficient for their separation.

Genus HEPTAPSUS Carriker

HEPTAPSUS NOTHOCERCAE Carriker

FIGURE 23, j

Heptapsus nothocercae CARRIKER, Lice of the tinamous, p. 154, pl. 27, figs. 1-1b, 1936. (Host: *Nothocercus bonaparti*.)

This species was described from two males and one female, all in rather poor condition. I have recently secured fresh material from the type host, taken in northern Colombia. The published figure of the male genitalia is somewhat misleading, and a corrected one is herewith presented.

The chaetotaxy, as shown in the published figure of the male, is very deficient, and we have the following additions: Four short, dorsal hairs on the *frons*, two marginal and two submarginal; two ventral hairs on each side of head just forward of antennal bands; a dorsal hair on each side of base of mandibles; two submarginal hairs on middle of temples instead of one; a long hair on posterior margins of abdominal segments II to V near the small hair shown in the figure; an additional hair on segments IV and V on the posterior margin, inside the lateral angle; two median ventral hairs also on segments III and IV; four dorsal hairs on median portion of posterior margin of

segments I to III. The chaetotaxy of the female is practically the same as in the male, with the exception of segment VII.

I was much surprised to find among these specimens of *Heptapsus* a second species which is larger than *nothocercae* and which has the male genitalia quite different. Both species were taken together on two individuals of the same host. It is described below.

HEPTAPSUS INEXPECTATUS, new species

FIGURE 23, k

Types.—Male and female, adults, from *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, July 12, 1941; in U. S. National Museum.

Diagnosis.—Differs from *H. nothocercae* as follows: Total length considerably more in both sexes (male, 1.32 against 1.18; female, 1.45 against 1.16); the head in the male is longer but very little wider, either at frons or temples, while in the female it is about the same proportion but larger; the thoracic segments are of practically the same length in both sexes but uniformly wider (than in *nothocercae*), while the abdomen is both longer and wider in both sexes. In the female of *nothocercae* the anterior margin of abdominal segment V is slightly concave, and that of VI is straight, while in the new form both V and VI are strongly arched, being pushed forward medially by the longer segment VII. The structure of segment VII in the female is also slightly different (see fig.). The chaetotaxy seems to be about the same in both species.

The most striking difference is in the male genitalia. In *nothocercae* the paramers are so completely fused with the basal plate that they seem to be merely a continuation of it, no trace of suture being visible. In *inexpectatus* the paramers, while strongly fused to the basal plate, nevertheless clearly show the line of suture on the sides, while they are short, straight, and tapering to a narrow, truncated tip (not broad and bifurcated as in *nothocercae*). The endomeral plate is small, poorly chitinized and pigmented, and difficult to differentiate. The species is represented by two males and five females, while in the same lot of specimens were four males and six females of *H. nothocercae*.

Remarks.—These two species (*H. nothocercae* and *H. inexpectatus*) are remarkably alike superficially. The females, except for size and different shape of abdominal segments V and VI, would be impossible to differentiate. The males are even more similar than the females, except for genitalia and proportions of head.

MEASUREMENTS OF HEPTAPSUS

Structure	<i>nothocerae</i>				<i>inexpectatus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1. 18		1. 16		1. 32		1. 45	
Head {frons.....		0. 28		0. 37		0. 295		0. 42
{temples.....	0. 37	0. 53	0. 44	0. 54	0. 456	0. 545	0. 50	0. 62
{occiput.....	0. 29		0. 35		0. 347		0. 37	
Prothorax.....	0. 13	0. 35	0. 14	0. 37	0. 14	0. 38	0. 14	0. 38
Mesothorax.....	0. 11	0. 45	0. 13	0. 48	0. 12	0. 51	0. 14	0. 59
Metathorax.....	0. 11	0. 37	0. 13	0. 41	0. 11	0. 43	0. 13	0. 45
Abdomen.....	0. 65	0. 50	0. 76	0. 57	0. 75	0. 54	0. 87	0. 65
Antennae.....	0. 26	0. 07	0. 195	0. 026	0. 26	0. 075	0. 22	0. 032
Paramers.....	(1)	0. 098			0. 18	0. 108		
Endomeres.....	(1)	(1)			0. 075	0. 043		

1 Paramers are fused to basal plate, suture invisible; structure of endomeral plate very obscure.

Genus PTEROCOTES Ewing

PTEROCOTES ABERRANS MEXICANUS, new subspecies

FIGURE 24, a-c

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 23, 1940; in U. S. National Museum.

The Mexican form of this species is more closely related to *P. a. aberrans* of Costa Rica than to *P. taoi* of Peru, differing from the latter in much larger size, less tapering tip to abdomen, shape of abdominal segment VII, and the genitalia.

MEASUREMENTS OF PTEROCOTES ABERRANS

Structure	<i>aberrans</i> (types)				<i>mexicanus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1. 93		2. 32		2. 00		2. 34	
Head {frons.....		0. 336		0. 52		0. 36		0. 50
{sides.....		0. 30				0. 32		
{temples.....	0. 56	0. 69	0. 61	0. 87	0. 56	0. 66	0. 61	0. 80
{occiput.....	0. 41		0. 45		0. 43		0. 44	
Prothorax.....	0. 24	0. 50	0. 24	0. 53	0. 21	0. 48	0. 23	0. 52
Mesothorax.....	0. 17	0. 65	0. 17	0. 69	0. 15	0. 63	0. 16	0. 67
Metathorax.....	0. 14	0. 54	0. 13	0. 61	0. 13	0. 53	0. 13	0. 58
Abdomen.....	1. 17	0. 68	1. 54	0. 76	1. 23	0. 69	1. 59	0. 76
Basal plate.....	0. 37	0. 20			0. 45	0. 22		
Paramers.....	0. 28	0. 07			0. 35	0. 10		
Endomeral plate.....	0. 29	0. 045			0. 28	0. 045		
Genitalia.....			0. 43	0. 13			0. 43	0. 11
Antennae.....			0. 28	0. 045			0. 29	0. 045
Antennae, first segment.....	0. 24	0. 13			0. 24	0. 135		

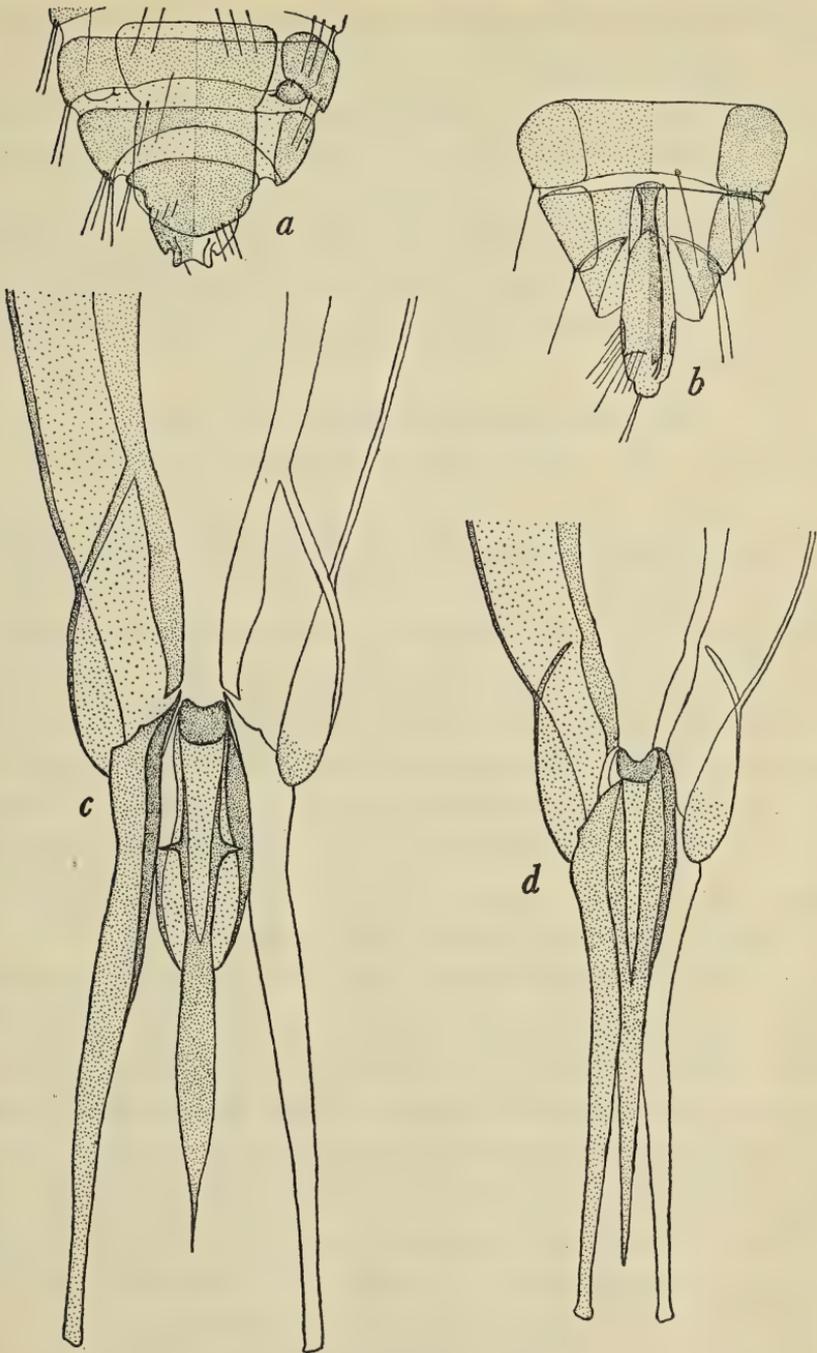


FIGURE 24.—PTEROCOTES

a-c, *Pterocotes aberrans mexicanus*, new subspecies: *a*, Tip of male abdomen; *b*, tip of female abdomen and female genitalia; *c*, male genitalia.
d, *P. a. colombianus*, new subspecies: Male genitalia.

The differences in body measurements between *mexicanus* and *aberrans* are no more than could be covered by individual variation, except the width of the head at temples in the female, which is less (0.07 mm.), and in the size of the genitalia of both sexes, those of the male being considerably larger, and of the female narrower and differently shaped.

The tergal plate of segment VI in the female is continuous, as in *aberrans*, not broken medially as in *taoi*. The scent glands in the male are located on the fifth segment, at the inner, posterior edge of the pleurite. They are globular in shape, with a short tubular outlet, as in *aberrans*.

PTEROCOTES ABERRANS COLOMBIANUS, new subspecies

FIGURE 24, d

Types.—Male and female, adults, from *Tinamus serratus ruficeps*, collected by the author at El Bosque, Sierra Perijá, Colombia, June 14, 1941; in U. S. National Museum.

Diagnosis.—The male of this race is very close to *P. taoi* in size of body segments, but the antennae and genitalia differ considerably. The antennae are longer (0.40 against 0.326); the basal plate longer and wider (0.37 by 0.17 against 0.26 by 0.15); the paramers are longer (0.26 against 0.16); and the endomer plate and penis are twice as long and some wider (0.25 by 0.045 against 0.12 by 0.038). The paramers are straighter and slenderer than in *aberrans* and especially *mexicanus* (like *taoi*) and have the tips slightly enlarged but *not bluntly pointed*. The seventh abdominal segment, as well as the sternal genital plate, is very similar to *mexicanus*.

The female differs considerably from that of *taoi* in body measurements and is also much smaller than either *aberrans* or *mexicanus*; the head is longer at the temples and wider at both frons and temples; all three thoracic segments are both longer and wider; the antennae are shorter, while the genital apparatus is both shorter and narrower.

The female genital apparatus resembles that of *mexicanus* rather than *aberrans*, but there is very little difference between all the races of *aberrans* in the chaetotaxy of this organ. However, in *taoi* the hairs are somewhat shorter and considerably finer, but *all* forms have the two pairs of curving spines at the tip of the ventral lip (the 1936 published figure of *aberrans* is incorrect in this respect).

In *aberrans* the tip of the abdomen is more rounded than in the other races, while in *taoi* it is most acuminate, *mexicanus* and *colombianus* being intermediate and similar. The temples in the female of *colombianus* are the most acuminate, and those of *aberrans* the least (the 1936 figure is also incorrect in this detail).

Specimens taken on *Tinamus s. serratus* are referable to *P. a. aberrans*, as stated previously (Carriker, 1936, p. 157). The only differences worthy of note are the following: The length of head at temples in the male is less in insects from *T. s. serratus*, while the width is about the same, and the length at occiput exactly the same; the width at frons is the same, while at the point posterior to the antennal fossae slightly less in the type of *aberrans*, as well as at the lateral emargination. Practically all other differences in measurements may well be attributed to individual variation.

PTEROCOTES TAOI Carriker

FIGURE 25, a-c

Pterocotes aberrans taoi CARRIKER, Lice of the tinamous, p. 158, pl. 26, figs. 3, 3a, 1936. (Host: *Tinamus tao kleei*.)

Male cotype, from *Tinamus tao weddelli*, collected by the author at Palmar, Dept. Cochabamba, Bolivia, July 12, 1937; in collection of author.

This species was described from a single female. I have since been able to secure specimens of what is apparently this species from the following hosts: *Tinamus tao weddelli*, Palmar, Bolivia, one male; *Tinamus t. tao*, Sierra Perijá, Colombia, one male and 10 females.

The two subspecies of *Tinamus tao* (*kleei* and *weddelli*) are generally considered to be inseparable, so that we may infer that the male *Pterocotes* taken on *T. t. weddelli* is the male of the *Pterocotes* described from a female collected on *T. tao kleei*.

The single male collected on *T. t. tao* has, unfortunately, lost its head, but the measurements of the body segments and the genitalia are very close to those of the male taken on *T. tao weddelli* (male cotype of *P. taoi*). The only appreciable differences are the following: The abdomen is some smaller (not a reliable character); the basal plate is a little longer and the base of the paramers somewhat narrower (0.046 against 0.062); the endomerical plate is a trifle longer and narrower. The females from *T. t. tao* are also very close to the type of *P. taoi*, the only appreciable differences in measurements being the following: Mesothorax longer and wider; abdomen a little smaller, and genitalia considerably narrower (0.065 against 0.11). However, these slight differences do not warrant the separation of the specimens from the three subspecies of *Tinamus tao*, and it seems best to call them all *Pterocotes taoi* Carriker.

The male of *P. taoi* differs from the males of *P. a. aberrans* and *P. a. mexicanus* as follows: Whole body, all body segments, and genital armature very much smaller, with the single exception of the width of the head at the lateral emarginations, which is the same (0.31 against 0.303); the basal plate and paramers are but little more than half

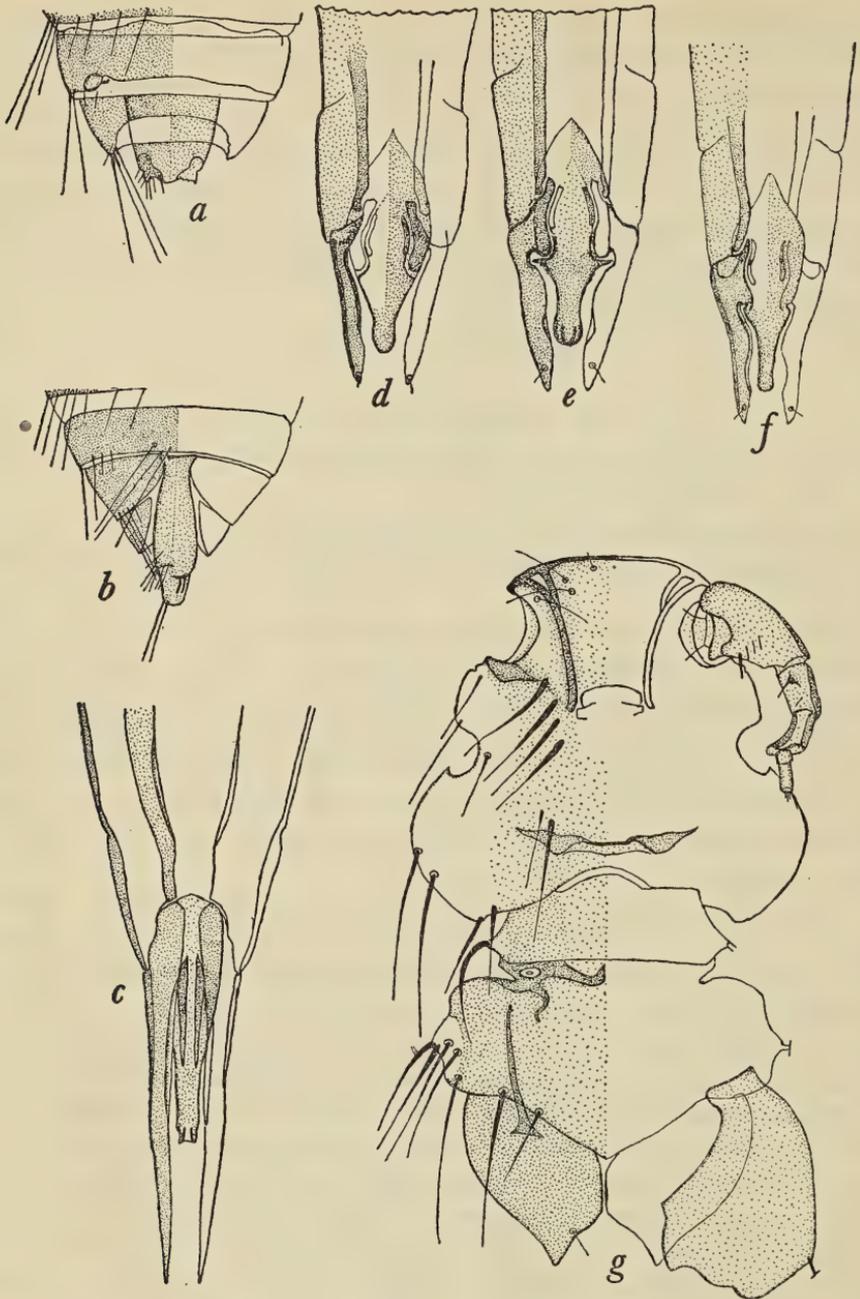


FIGURE 25.—PTEROCOTES, PECTENOSOMA, and HEPTAGONIODES

a-c, *Pterocotes taoi* Carriker: *a*, Tip of male abdomen; *b*, tip of female abdomen and female genitalia; *c*, male genitalia.

d, *Pectenosoma verrucosa inconspicua*, new subspecies: Male genitalia.

e, *P. v. punensis*, new subspecies: Male genitalia.

f, *P. v. nigriceps*, new subspecies: Male genitalia.

g, *Heptagoniodes dimorphus*, new species: Male head and thorax.

the length of those in *aberrans*, the paramers *less* and the endomerale plate *much less* than half the length of those in both *mexicanus* and *aberrans*. The most striking difference is in the endomerale plate, which is not elongated into a slender, needlelike point but is abruptly truncate and extends but little beyond the middle of the paramers. This character, in connection with the small size, has led me to give *taoi* specific rank, since it differs from all other known forms in this respect. The differences between *taoi* and *colombianus* are given under the latter.

MEASUREMENTS OF PTEROCOTES TAOI

Structure	Male (cotype) from <i>Tinamus</i> <i>tao weddelli</i>		Female (type) from <i>T. t. kleei</i>		Male (without head) from <i>T.</i> <i>t. tao</i>		Female from <i>T. t. tao</i>	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.60		1.93				1.77	
{frons.....		0.27		0.39				0.38
{emargination.....		0.31						
{temples.....	0.47	0.65	0.47	0.69			0.47	0.69
{occiput.....	0.37		0.39				0.38	
Prothorax.....	0.195	0.43	0.18	0.43	0.174	0.43	0.174	0.434
Mesothorax.....	0.22	0.57	0.16	0.58	0.225	0.566	0.215	0.59
Metathorax.....	0.15	0.50	0.14	0.48	0.15	0.48	0.15	0.51
Abdomen.....	1.12	0.61	1.28	0.62	0.97	0.555	1.15	0.59
Antennae.....	0.326	0.115	0.25				0.24	0.045
Basal plate.....	0.26	0.15			0.33	0.14		
Paramers.....	0.16	0.062			0.16	0.046		
Endomerale plate.....	0.12	0.038			0.13	0.03		
Genitalia.....			0.39	0.11			0.35	0.065

¹ Tip of penis broken off.

Genus PECTENOSOMA Ewing

PECTENOSOMA VERRUCOSA (Taschenberg)

Gonicotes verrucosus TASCHENBERG, Die Mallophagen, pp. 68, 94, pl. 3, fig. 4, male, 1882. (Host: *Crypturellus variegatus*.)

When my "Lice of the Tinamous," 1936, was published I had seen no material of this species from the type host, but I assumed that a single female from *C. variegatus salvini*, as well as numerous males and females from *C. undulatus yapura*, was the same as Taschenberg's type. My drawing of the female was made from the specimen taken on *C. v. salvini*, while the male genitalia were taken from a specimen off *C. v. yapura*.

Miss Clay (1937, p. 155, fig. 13) subsequently published a note on this species, stating that she had compared specimens of *P. verrucosa* from *C. v. variegatus* with others from *C. variegatus salvini* and found them to be the same, but that those from *C. undulatus yapura* were slightly different. Her figure of the genitalia of true *verrucosa* amply substantiates this statement, so that the figure published by me of the

genitalia of *P. v. verrucosa* is incorrect, and belongs, rather, to the new race described below. In my present treatment of this group, according to the number of papillae present on abdominal tergites III to V, the male of typical *verrucosa* cannot be included, since it has not been seen, although it is of rather more importance than the female in this character. Nevertheless, there is one significant feature present in the female from *C. v. salvini*, viz: the presence of a short third row of smaller papillae above the others, on all three tergites under consideration.

Specimens of *P. verrucosa* were taken on all four forms of tinamous collected on the Mexican expedition. A careful study of all these specimens, together with specimens of *P. v. verrucosa*, *P. v. parva*, *P. v. angusta*, and *P. v. yapurae*, reveals the following facts:

There is considerable individual variation in the number of papillae present on the various body segments, but outside of this individual variation there is a definite variability in the number to be found on the abdominal tergal plates III, IV, and V. Among all the males, that of *parva* invariably has the greatest number, there always being present two to five in both rows on all the segments under discussion, while among the females *verrucosa* has the highest number (five to eight in both rows on all segments) and in addition a third row of smaller papillae above the other two. The males from *Tinamus major percautus* and *Crypturellus soui meserythrus* have no papillae at all on segments IV and V and but one row of three or four on segment III, while in *angusta* there are none on the fifth segment, with one row of two to four on segments III and IV.

The only females that have no papillae on segment V are those from *C. cinnamomeus sallaei* (no male taken) and *T. major percautus*, but both have double rows of four or five each on the other two segments.

There is also a wide range of measurements between the parasites from different hosts, by far the largest being from *Tinamus*, while *parva*, from *C. tataupa*, is the smallest, with those from *C. soui meserythrus* almost as small.

It is unusual to find that the genitalia of all three of the males taken from the different Mexican hosts are practically identical in shape and detail, differing only very slightly in the length of the paramers, while the width at base of paramers and the combined length of endomer-plate and penis are identical in the three, as well as the length of the basal plate.

The genitalia resemble very closely those of *P. v. yapurae* (see Carriker, 1936, pl. 29, fig. 1b). It is thus apparent that the only char-

acters that may be utilized for the separation of some of the forms of this compact group into subspecies are the comparative measurements and the number of papillae on certain of the abdominal segments. With these facts in mind it seems advisable to give subspecific rank to all the different Mexican forms although the single female from *C. cinnamomeus sallaei* is very close to the nominate form in measurements but has the arrangement of papillae different.

Figures of the genitalia of three of the new South American forms are given, while a figure of *yapurae* has already been published, and the three Mexican forms have the genitalia so close to those of *yapurae* that they do not need to be figured. The known races of the species are as follows:

KEY TO THE SUBSPECIES OF PECTENOSOMA VERRUCOSA

- a.¹ Tergites III, IV, and V in female with 3 rows of papillae (upper row smaller)----- verrucosa
- a.² Tergites III, IV, and V in female with never more than 2 rows of papillae and sometimes one of these sclerites in one or both sexes with papillae absent.
- b.¹ Tergite V in female without papillae.
- c.¹ Size smaller (head 0.31 by 0.53 in female; male unknown)___ cinnamomea
- c.² Size larger (head 0.34 by 0.63 in female); tergite V in both sexes without papillae; tergite IV in male also without papillae----- tinami
- b.² Tergite V in female with but 1 row of 2 papillae; male with none in IV and V----- boucardi
- b.³ Tergite V in female always with 2 rows of papillae.
- c.¹ Tergite V in male without papillae; size small; abdomen narrower in female than in male (0.57); antennae 0.18 in both sexes----- angusta
- c.² Tergite V in male always with 1 row of papillae (1 to 5); female always with 2 rows (2 to 5).
- d.¹ Tergites III and IV in male with but a single row of papillae (3 to 5) (a few specimens of *punensis* and *yapurae* will fall into this section, but they usually have two rows); female with 2 rows of 4 to 6.
- e.¹ Size larger (head in male 0.30 to 0.34 by 0.48 to 0.50); tergite V in female with 2 rows of 4 or 5 papillae, or 2 or 3.
- f.¹ Tergites III, IV, and V in male with a single row of 3 papillae; genitalia of different size (see fig.)----- punensis
- f.² Tergite III in male with a single row of 4 papillae, tergite IV with 3, and tergite V with a single row of 1; genitalia differ from those of *punensis* (see fig.)----- nigriceps
- e.² Size smaller (head in male 0.28 by 0.45; antennae 0.15 in male, 0.21 in female); genitalia different (see fig.); tergite V in female with 2 rows of 2 to 4 papillae; in female tergite III has 1 row of 4 to 5; IV has 1 row of 3 to 4; V has 1 row of 2----- meserythra
- d.² Tergite III in male always with 2 rows of papillae, and some specimens tergite IV also----- inconspicua, punensis, yapurae
- c.³ Tergite V in both sexes with 2 short rows of papillae; size very small----- parva

PECTENOSOMA VERRUCOSA VERRUCOSA (Taschenberg)

Citation of original description on page 201. (Host: *Crypturellus v. variegatus*; taken also on *C. variegatus salvini*.)

PECTENOSOMA VERRUCOSA PARVA Carriker

Pectenosoma verrucosa parva CARRIKER, Lice of the tinamous, p. 164, pl. 29, figs. 2, 2a, 1936. (Host: *Crypturellus t. tataupa*, Bolivia.)

PECTENOSOMA VERRUCOSA ANGUSTA Carriker

Pectenosoma verrucosa angusta CARRIKER, Lice of the tinamous, p. 165, pl. 29, fig. 3, 1936. (Host: *Crypturellus garleppi affinis*, Bolivia.)

PECTENOSOMA VERRUCOSA YAPURAE, new subspecies

Pectenosoma verrucosa verrucosa (Taschenberg) CARRIKER, Lice of the tinamous, p. 164 (*partim*), 1936.

Types.—Male and female, adults, from *Crypturellus undulatus yapura*, collected by the author at Puerto Yessup, Peru, February 19, 1930; in collection of author.

Also from *C. u. undulatus*, Bolivia.

PECTENOSOMA VERRUCOSA TINAMI, new subspecies

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 23, 1940; in U. S. National Museum.

PECTENOSOMA VERRUCOSA BOUCARDI, new subspecies

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

PECTENOSOMA VERRUCOSA MESERYTHRA, new subspecies

Types.—Male and female, adults, from *Crypturellus soui meserythrus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, May 8, 1940; in U. S. National Museum.

PECTENOSOMA VERRUCOSA CINNAMOMEA, new subspecies

Type.—Female, adult, from *Crypturellus cinnamomeus sallaei*, collected by the author at Tres Zapotes, Veracruz, Mexico, March 27, 1940; in U. S. National Museum.

PECTENOSOMA VERRUCOSA PUNENSIS, new subspecies

FIGURE 25, e

Types.—Male and female, adults, from *Crypturellus obsoletus punensis*, collected by the author at Sandillani, Bolivia, November 25, 1934; in collection of author.

ARRANGEMENT OF PAPILLAE ON ABDOMINAL TERGITES III, IV, AND V IN SUBSPECIES OF PECTENOSOMA VERRUCOSA

Tergite	<i>verrucosa</i>	<i>parva</i>		<i>inconspicua</i>		<i>punensis</i>		<i>yapurae</i>		<i>nigriceps</i>	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
III.....	{ 3 5 8 }	3	5	2-3	5	2-3	5-6	0-4	5	0	4-5
		5	5	4-5	5-6	4-5	6-7	4-6	6	4	5-6
IV.....	{ 2 6 7 }	2	4	0	4-5	0-2	4-6	0-2	4-6	0	4-5
		4	5	3-4	4-6	4-5	5-6	3-5	5-6	3	4-5
V.....	{ 2 4 6 }	2	3	0	4	0	4-5	0	4-5	0	2-4
		2	4	2-3	4-5	3	4-5	0-3	4-5	1	3-4

Tergite	<i>angusta</i>		<i>tinami</i>		<i>meserythra</i>		<i>boucardi</i>		<i>cinnamomea</i>
	Male	Female	Male	Female	Male	Female	Male	Female	Female
III.....	{ 0	4	0	5	0	4	0	6	4-5
	4	6	4	5	4	5	3	6	5-6
IV.....	{ 3	4	0	4	0	4	0	5	3-4
	3	5	0	5	4	5	0	5	4-5
V.....	{ 0	3	0	0	0	3	0	0	0
	0	4	0	0	2	4	0	2	0

MEASUREMENTS OF PECTENOSOMA VERRUCOSA

Subspecies	Body (length)	Head	Prothorax	Mesothorax	Metathorax	Abdomen	Antennae (length)
<i>yapurae</i> { ♂.....	1.34	0.28 x 0.51	0.14 x 0.30	0.13 x 0.51	0.12 x 0.44	0.71 x 0.72	0.217
{ ♀.....	1.57	0.33 x 0.54	0.14 x 0.33	0.14 x 0.54	0.13 x 0.46	0.89 x 0.82	0.185
<i>cinnamomea</i> ♀.....	1.67	0.31 x 0.53	0.14 x 0.31	0.14 x 0.51	0.13 x 0.42	0.91 x 0.75	0.185
<i>inconspicua</i> { ♂.....	1.20	0.28 x 0.48	0.13 x 0.27	0.13 x 0.46	0.10 x 0.39	0.70 x 0.64	0.16
{ ♀.....	1.38	0.29 x 0.50	0.14 x 0.27	0.13 x 0.47	0.12 x 0.38	0.87 x 0.68	0.15
<i>punensis</i> { ♂.....	1.28	0.33 x 0.48	0.12 x 0.28	0.14 x 0.46	0.12 x 0.39	0.76 x 0.67	0.19
{ ♀.....	1.45	0.35 x 0.51	0.13 x 0.29	0.13 x 0.49	0.13 x 0.43	0.90 x 0.69	0.174
<i>nigriceps</i> { ♂.....	1.27	0.31 x 0.50	0.13 x 0.28	0.13 x 0.49	0.11 x 0.43	0.74 x 0.68	0.17
{ ♀.....	1.50	0.33 x 0.52	0.15 x 0.30	0.13 x 0.50	0.13 x 0.42	0.95 x 0.76	0.16
<i>tinami</i> { ♂.....	1.30	0.30 x 0.52	0.15 x 0.31	0.12 x 0.50	0.10 x 0.43	0.74 x 0.72	0.21
{ ♀.....	1.56	0.34 x 0.63	0.17 x 0.33	0.13 x 0.60	0.13 x 0.48	0.98 x 0.80	0.25
<i>meserythra</i> { ♂.....	1.15	0.28 x 0.45	0.12 x 0.28	0.11 x 0.46	0.12 x 0.39	0.69 x 0.63	0.152
{ ♀.....	1.30	0.30 x 0.48	0.12 x 0.28	0.12 x 0.48	0.13 x 0.41	0.80 x 0.72	0.21
<i>boucardi</i> { ♂.....	1.34	0.30 x 0.51	0.15 x 0.30	0.12 x 0.50	0.14 x 0.42	0.79 x 0.71	0.14
{ ♀.....	1.56	0.33 x 0.56	0.15 x 0.35	0.13 x 0.54	0.15 x 0.47	1.00 x 0.82	0.185
<i>parva</i> { ♂.....	1.10	0.25 x 0.38	0.09 x 0.22	0.09 x 0.37	0.08 x 0.33	0.64 x 0.57	0.14
{ ♀.....	1.18	0.25 x 0.39	0.09 x 0.23	0.09 x 0.38	0.08 x 0.32	0.73 x 0.58	0.13
<i>angusta</i> { ♂.....	0.99	0.28 x 0.48	0.11 x 0.28	0.11 x 0.46	0.13 x 0.40	0.72 x 0.67	0.18
{ ♀.....	1.32	0.31 x 0.44	0.11 x 0.28	0.11 x 0.43	0.09 x 0.37	0.80 x 0.57	0.18
<i>verrucosa</i> { ♂.....	1.27	0.30 x 0.50	(whole thorax = 0.23 x 0.50)			0.74 x 0.69	
{ ♀.....	1.53	0.35 x 0.55	0.14 x 0.31	0.14 x 0.54	0.14 x 0.45	0.94 x 0.78	0.195

PECTENOSOMA VERRUCOSA NIGRICEPS, new subspecies

FIGURE 25, f

Types.—Male and female, adults, from *Crypturellus soui nigriceps*, collected by the author at Tamborapa, Peru, July 14, 1933; in collection of author.

PECTENOSOMA VERRUCOSA INCONSPICUA, new subspecies

FIGURE 25, d

Types.—Male and female, adults, from *Crypturellus soui inconspicuus*, collected by the author at Shapaja, Peru, November 1933; in collection of author.

Genus DOCOPHOROCOTES Carriker

DOCOPHOROCOTES SEXSETOSUS SECUNDUS, new subspecies

FIGURES 26, c, d; 27, a

Types.—Male and female, adults, from *Rhynchotus rufescens maculicollis*, collected by the author at Padilla, Bolivia, January 5, 1938; in collection of author.

MEASUREMENTS OF DOCOPHOROCOTES SEXSETOSUS

Structure	<i>sexsetosus</i>				<i>secundus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.34		1.56		1.15		1.54	
Head {frons.....		0.39		0.39		0.37		0.37
Head {temples.....		0.55		0.564		0.545		0.55
Head {occiput.....	0.43		0.456		0.44		0.467	
Prothorax.....	0.13	0.314	0.14	0.326	0.12	0.314	0.13	0.33
Mesothorax.....	0.15	0.434	0.15	0.445	0.11	0.435	0.12	0.456
Metathorax.....	0.15	0.40	0.174	0.42	0.135	0.39	0.13	0.40
Abdomen.....	0.716	0.685	0.93	0.694	0.67	0.59	0.88	0.60
Antennae.....	0.195	0.048	0.18	0.04	0.205	0.043	0.195	0.04
Basal plate.....	0.25	0.08			0.22	0.077		
Paramers.....	0.09	0.068			0.087	0.065		

Diagnosis.—There is very little difference in size between the nominate form and the new race, although the abdomen of both sexes is shorter and narrower in *secundus*; the preantennal area is of decidedly different shape, the whole frons being uniformly circular, while in *sexsetosus* its sides are slightly *concave*; the width of the head at the base of the more pointed trabeculae is narrower; the internal projections on the frons are of different shape and length (see fig.), as well as the buccal cavity and the internal clypeal bands; the occipital bands

are much less developed and are broken medially, while in *sexsetosus* they are entire. The chaetotaxy of the abdomen is also distinct, there being more hairs on *secundus*, while they are mostly longer and slenderer; the shape of segment VII is also different. The male genitalia, while of the same general pattern as in *sexsetosus*, differ decidedly as to proportions and detail, especially in the basal plate and paramers (see fig.). In the female the genital plate, as well as the posterior margin of segment VII, is differently shaped.

The new race is represented by four males and five females, taken on three individuals of the host, collected at Padilla and Samaipata, Bolivia.

Subfamily ORNICHOLACINAE Carriker

Genus HEPTAGONIODES Carriker

Heptagoniodes CARRIKER, Lice of the tinamous, p. 166, 1936. [Genotype: *H. mirabilis* Carriker=*Heptagoniodes agonus* (Nitzsch).]

This genus was created solely on the characters of the male, the female being unknown at that time, or rather the two sexes were known but not associated with each other; therefore it becomes necessary to amend the generic diagnosis to include the characters of the female.

Sexes strongly dimorphic, not only in the shape of the antennae, but in the shape of the whole head, the female strongly resembling both sexes of *Kelloggia*, especially the female, having the temples expanded laterally and posteriorly, with the front narrow and rounded and with the sides of head straight and strongly divergent; sides of head bifurcated in the female, as in both sexes of *Kelloggia*; antennae of female short and slender, but with first segment considerably swollen and rounded and attached on the *under* side of the head; thoracic segments and abdomen practically the same in both sexes, while the female is but slightly larger than the male.

Note on synonymy.—Now that the true identity of *Goniocotes agonus* Nitzsch has been established, it is possible to clear up the synonymy of the various genera that have become involved with it by previous authors.

Taschenberg erected the subgenus *Lepidophorus* in 1882 and placed in it *Goniocotes agonus* Nitzsch and *L. coniceps*, sp. nov. [= *Hypocrypturellus coniceps* (Taschenberg)]. In 1916 Harrison made the genus *Ornicholax* Carriker a new name for *Lepidophorus* Taschenberg (name preoccupied), which was totally unwarranted, because no species placed in *Ornicholax* was included by Taschenberg under *Lepidophorus*.

In 1936, on page 171 of my "Lice of the Tinamous," I called attention to this fact, and designated *Kelloggia* Carriker, 1903, as the new name for *Lepidophorus*, which also was in error, being contrary to the

International Code. We now find that *Heptagoniodes* Carriker, 1936, is actually the new name for *Lepidophorus* Taschenberg, 1882, it automatically replacing *Lepidophorus* since the two generic concepts and names are isogenotypic through synonymy. Therefore we have the following facts:

Kelloggia Carriker, 1903. Type, *Kelloggia brevipes* Carriker. Monobasic. The type designation of Carriker, 1936, is invalid because the species designated was not originally included in the genus.

Lepidophorus Taschenberg, 1882. No type designated. Two species included, the second not congeneric with the first.

Ornicholax Carriker, 1903. Type, *Ornicholax robustus* Carriker. Monobasic.

Heptagoniodes Carriker, 1936. Type, *Heptagoniodes mirabilis* Carriker. *Heptagoniodes mirabilis* Carriker=*Goniocotes agonus* Nitzsch.

Kelloggia now stands in the clear, with its monobasic type; also *Ornicholax*, with type designated by the author. Since no type was designated for *Lepidophorus*, the first species under it should be so designated, viz: *Goniocotes agonus* Nitzsch. Therefore we have the following:

Kelloggia Carriker. Genotype: *K. brevipes* Carriker.

Ornicholax Carriker. Genotype: *O. robustus* (= *O. alienus robustus* Carriker.)

Heptagoniodes Carriker. Genotype: *Goniocotes agonus* Nitzsch (through synonymy). Syn. *Lepidophorus* Taschenberg. Genotype: *Goniocotes agonus* Nitzsch.³

HEPTAGONIODES AGONUS (Nitzsch)

Goniocotes agonus NITZSCH, in Giebel, Zeitschr. für ges. Naturw., vol. 28, p. 387, 1866. (Host: *Tinamus tao*.)

Lepidophorus agonus (Nitzsch) TASCHENBERG, Die Mallophagen, p. 61, pl. 1, fig. 6 (female), 1882.

Kelloggia agona (Nitzsch) CARRIKER, Lice of the tinamous, p. 175, 1936.

Heptagoniodes mirabilis CARRIKER, Lice of the tinamous, p. 167, pl. 30, figs. 3, 3a (male), 1936. (Host: *Tinamus t. tao*.)

It is now a well-established fact that *Goniocotes agonus* Nitzsch, described from a single female, is the female of *Heptagoniodes mirabilis* Carriker. Dr. Hopkins (1940, p. 420) has presented a very clear and perfectly logical exposition of the case, with which I am thoroughly in accord, while the taking of both sexes of this genus by me in 1937 had already convinced me of this fact. The above-mentioned specimens were taken on *Tinamus tao weddelli*, and the females resemble rather closely Taschenberg's figure of *Goniocotes agonus*, but the males are different from *Heptagoniodes mirabilis* Carriker, taken on *Tinamus t. tao*. The taking of both sexes of *Heptagoniodes* together on the same individual host (a subspecies of *T. tao*) leaves no further room for argument concerning the true relationship between *Goniocotes agonus* Nitzsch and *Heptagoniodes mirabilis* Carriker.

³ I am greatly indebted to Dr. E. A. Chapin, of the U. S. National Museum, for his assistance in untangling the synonymy of the four genera here discussed.

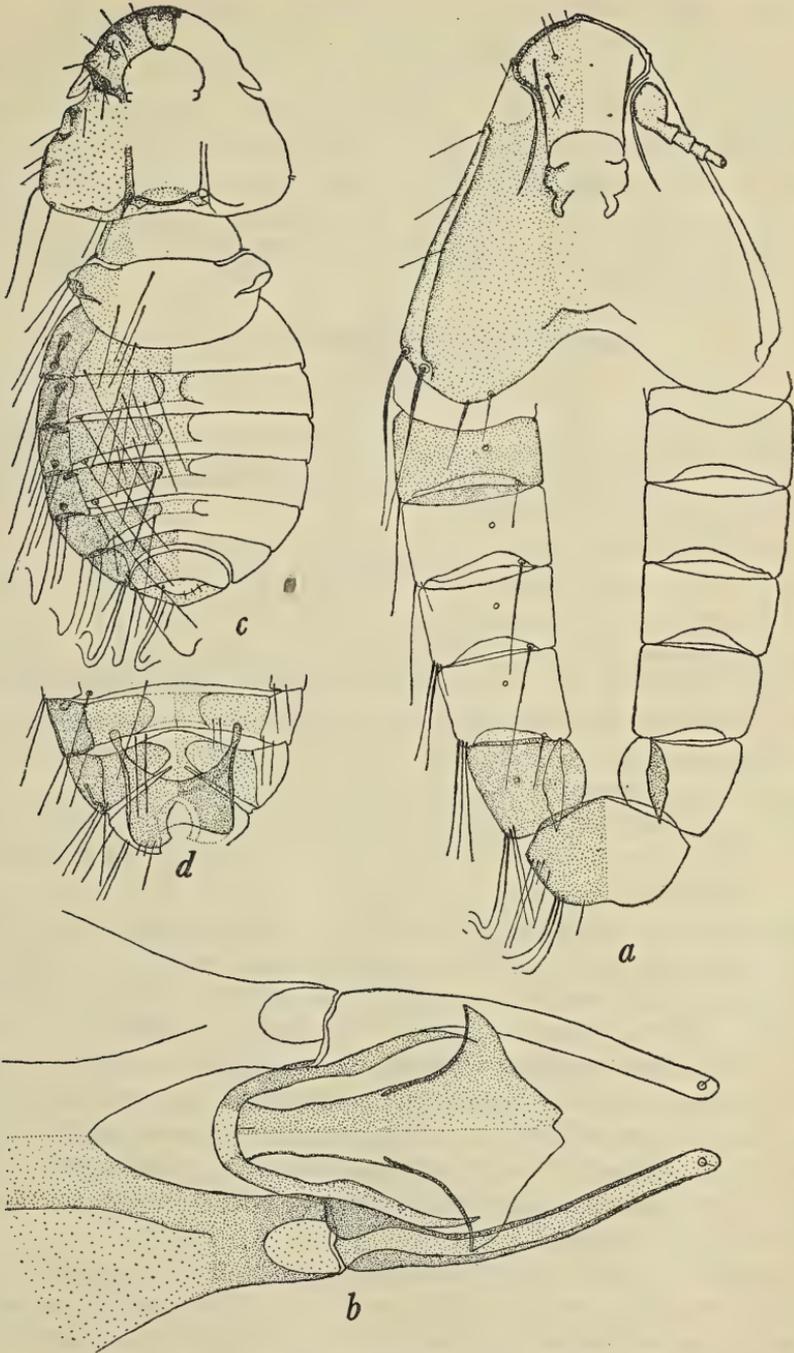


FIGURE 26.—HEPTAGONIODES and DOCOPHOROCOTES

a, b, Heptagoniodes dimorphus, new species: *a*, Female head and abdomen; *b*, male genitalia.
c, d, Docophorocotes sexsetosus secundus, new subspecies: *c*, Body of male; *d*, female abdominal segment VII.

In the published figure of *H. mirabilis* (Carriker, 1936, pl. 30, fig. 3), only one hair is shown at the outer edge of the mandibles, where *four* long, strong hairs are present in *clayi* Guimarães and Lane and *dimorphus*, new species. A reexamination of the type of *mirabilis* shows three small pustules in a line posterior to the single hair shown in the published figure. Undoubtedly the hairs from these pustules have been lost, but they were certainly very much smaller than those in *dimorphus*, probably of the same size as the single hair shown in the figure.

HEPTAGONIODES DIMORPHUS, new species

FIGURES 25, *g*; 26, *a*, *b*

Types.—Male and female, adults, from *Tinamus tao weddelli*, collected by the author at Palmar, Dept. Cochabamba, Bolivia, on July 12, 1937; in collection of author.

Diagnosis.—Male: There is a strong superficial resemblance between the new form and *agonus*, but *dimorphus* is somewhat larger and differs very much in the proportions of the head and thoracic segments, while the abdomen is practically the same, both in structure and measurements. The male genital armature is strikingly different, having the basal plate longer, the paramers nearly twice as long, and the endomeral plate *more* than twice as long, while the latter two are very much narrower and of very different shape.

In some respects *dimorphus* resembles *clayi* Guimarães and Lane,⁹ but the genital armature is quite distinct, as well as the proportions of the head and thorax.

The female of *dimorphus* differs from *clayi* (as figured by Kéler), in the size, proportions of head, and its shape, while the abdomen is much longer and narrower, with apical portion much attenuated. The shape of the head is nearer to Taschenberg's figure of *agonus* than to *clayi*, but the abdomen is very much slenderer, while segment VI of abdomen has the paratergal plates separated medially (there are no tergal or sternal plates in this genus) by a considerable hyaline space, while in Taschenberg's figure of *agonus* they are united.

The new species is represented by two males and four females (including the types).

Remarks.—In the male of *dimorphus* the lateral emarginations of the head resemble very strongly those shown in Piaget's figure of his *H. excavatus*, having a very sharp point at the posterior edge of the emargination.

⁹ There is not the slightest doubt that Kéler (1938, p. 323) has described and figured *H. clayi* as *H. agonus*. The shape of head, chaetotaxy of head, and genital armature are exactly the same, while the specimen figured was taken from the same host as *clayi* (*Tinamus solitarius*). Dr. Hopkins has already called attention to this fact.

MEASUREMENTS OF HEPTAGONIODES

Structure	<i>agonus</i> (male)		<i>dimorphus</i>				
			Male		Female		
	Length	Width	Length	Width	Length	Width	
Body.....	2.32		2.39		2.43		
Head {	frons.....	0.39		0.41		0.29	
	emargination.....	0.48		0.52			
	temples.....	0.67	0.69	0.75	0.80	0.77	0.74
	occiput.....	0.56		0.63		0.64	
Prothorax.....	0.20	0.48	0.174	0.50	0.195	0.57	
Mesothorax.....	0.336	0.63	0.37	0.70	0.36	0.69	
Metathorax.....	0.30	0.52	0.35	0.57	0.347	0.55	
Abdomen.....	1.34	0.89	1.39	0.85	1.45	0.89	
Antennae.....	0.477	0.14	0.50	0.174	0.25	0.068	
Basal plate.....	1.02	0.17	0.86	0.17			
Paramers.....	0.12	0.098	0.20	0.15			
Endomeral plate.....	0.087	0.065	0.18	0.12			

Genus ORNICHOLAX Carriker

ORNICHOLAX ALIENUS (Giebel)

Goniocotes alienus GIEBEL, Zeitschr. für ges. Naturw., vol. 28, p. 389, 1866. (Host: *Crypturus macrourus*.)

Strongylocotes alienus (Giebel) TASCHENBERG, Die Mallophagen, p. 59, 1882.—CARRIKER, Lice of the tinamous, p. 93, 1936.

An examination by Keler of the type of *Goniocotes alienus* Giebel shows it to be an *Ornicholax*, not *Strongylocotes*, as I, having followed Taschenberg, had previously stated.

Kéler has published a figure of the male genitalia of an *Ornicholax* taken on *Tinamus solitarius*, which he says is "exactly like the type" of *alienus*. Then he goes on to say that figures published by Carriker (1936) of the genitalia of *O. robustus* and *O. taoi* are incorrect and that *Ornicholax robustus* Carriker is a synonym of *O. alienus* (Giebel). In the first place, having examined the genitalia of *Ornicholax* from six different species of *Tinamus*, I maintain that if Kéler's figure, which he calls the genitalia of *O. alienus* (Giebel), was drawn from a specimen collected on *Tinamus solitarius* and not the actual type of *alienus*, it is impossible to accept his statement that they are the same. While admitting that there are some errors in my published figures of the genitalia of *O. robustus* and *O. taoi*, I further maintain that Kéler, not having seen my material, had no basis for saying that *robustus* was a synonym of *alienus*. As a matter of fact, the genitalia of *O. a taoi* are much closer to those of *solitarius* Guimarães and Lane than those of *robustus*. In further proof of the unreliability of Kéler's statements we have his report to Miss Clay concerning specimens of *Ornicholax* from *Tinamus major percartus* of Mexico, of which I have an adequate series.

Kéler says: "The type of *alienus* is very similiar to your male from *T. major percautus*, but it differs distinctly in the shape of the prothorax, which in *alienus* type is distinctly trapezoidal, the points lying behind the middle of the sides, as well as in the form of the last segment, which in the type *alienus* is a little longer than wide (336×288 microns)."

The material before me (males from six species of *Tinamus*) shows absolutely *no variation* in the shape of the prothorax. It is true that there is some variation in size, but the general shape is the same, agreeing precisely with the shape of the prothorax of *O. solitarius* of Guimarães and Lane, as shown in the figure published by them. As for the last abdominal segment, all males examined (except that of *O. a. robustus*) have this segment *exactly as long as broad* (ranging from 0.27 to 0.303 mm.). In *O. a. robustus* this segment is very slightly longer than wide (0.297 by 0.285 mm.), but the difference is so slight that it has no value whatever.

Taking the above facts in consideration, I am not prepared to accept Dr. Hopkins's theory (1940, p. 419) that the true host of *O. alienus* (Giebel) is *Tinamus solitarius* or that *Ornicholax solitarius* Guimarães and Lane is a synonym of *O. alienus* (Giebel). I prefer, until additional proof is forthcoming, to recognize *O. solitarius* and to leave *O. alienus* (Giebel) in the category of "host unknown."

Furthermore, Taschenberg (1882, p. 59) distinctly says that he examined the type of *alienus* and found it in several pieces, and for that reason he could not give an exact description of it. If the type was in such poor condition as that in 1882, what must be its condition today, and how would it be possible to say that it was any one of the several closely related known forms, without being able to distinguish very clearly the intricate genital armature, whose complicated structure is very difficult to differentiate under the most favorable conditions?

I have examined a series of *Ornicholax alienus* from the following hosts: *Tinamus major castaneiceps* (host of *O. a. robustus*), Pacific slope of Costa Rica; *T. m. fuscipennis*, Caribbean slope of Costa Rica; *T. m. percautus*, Mexico; *T. s. serratus*, Bolivia; *T. serratus ruficeps*, Colombia; *Tinamus t. tao*, Venezuela and Colombia; *T. tao weddelli*, Bolivia.

Unquestionably *O. a. taoi* (from *Tinamus tao*) is one of the most well marked subspecies of *alienus*. In addition to the male type from Venezuela I have a second male from the same host taken in Colombia, and two females from *T. tao weddelli*. The male from Colombia is extremely close to the type in all particulars, while the two females from *T. t. weddelli* seem also to belong here. The head is not so narrow (proportionately) as in the male, but I find that this is true of

most of the material from other hosts. The measurements are larger than for the male (as would be expected), but the proportions run about the same except in the width of the mesothorax, which is wider, but this is also found to be true in specimens from *T. s. serratus* and *T. m. castaneiceps*. We may therefore safely assume that the two females from *T. t. weddelli* are *Ornicholax alienus taoi*.

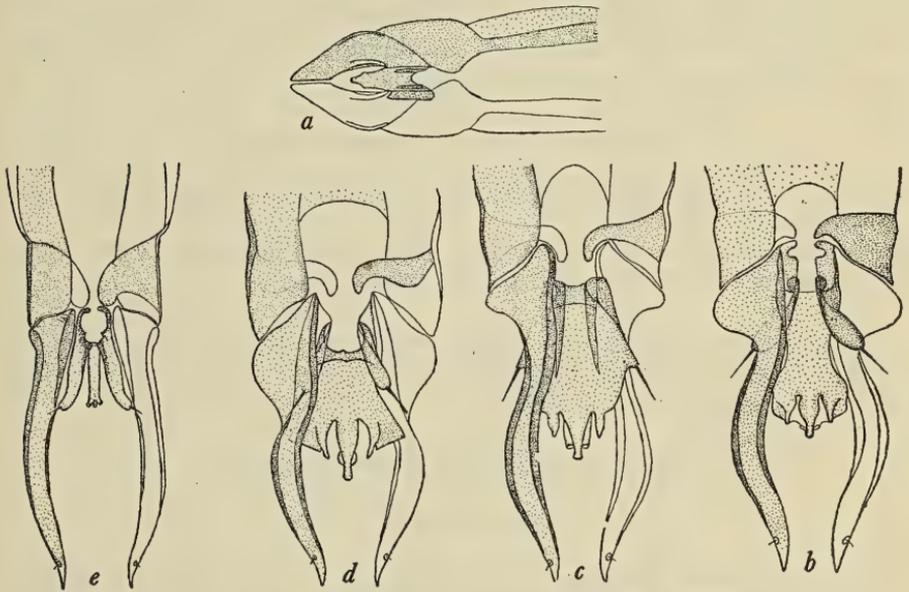


FIGURE 27.—DOCOPHOROCOTES AND ORNICHOLAX

- a*, *Docophorocotes sexsetosus secundus*, new subspecies: Male genitalia.
b, *Ornicholax alienus robustus* Carriker: Male genitalia.
c, *O. a. mexicanus*, new subspecies: Male genitalia.
d, *O. a. boliviensis*, new subspecies: Male genitalia.
e, *O. a. taoi* Carriker: Male genitalia.

The Mexican material from *T. m. percautus* seems to average the largest, while specimens from *T. m. fuscipennis* are the smallest. However, in most cases the proportions run about the same and the differences in size seem to fall within the limits of individual variation for *O. a. robustus*. Nevertheless when we examine the male genital armature we find that there are discrepancies that may not be disregarded. These differences are mostly in the shape of the endomerall plates, but the paramers also differ, so that it seems best to give some of them subspecific rank.

Apparently the genus *Ornicholax* is confined to the avian genus *Tinamus* and, like other genera found on the tinamou, is composed of quite a number of closely related forms, so close, in fact, that all known up to the present time (5 or 6) may be classed as conspecific with *alienus*, although they fall into two groups, viz: *solitarius* (= *alienus*?)

and *taoi* in one group, with *robustus*, *mexicanus*, and *bolivianus* forming the other.

I have not yet discovered a way of separating the females of some of the races, but the males are easily distinguished by the genital armature. *O. solitarius* and *taoi* are easily recognized by their nearly straight paramers, while *alienus* probably also falls into this category. Further study and additional material may show that those forms with the straight paramers should be classed as one species, with the *robustus* group as another. For the present it seems best to classify the known forms of the genus as follows:

ORNICHOLAX ALIENUS ALIENUS (Giebel)

Goniocotes alienus GIEBEL, Zeitschr. für ges. Naturw., vol. 28, p. 389, 1866. (Host: *Crypturus macrourus*.)

Strongylocotes alienus (Giebel) TASCHENBERG, Die Mallophagen, p. 59, 1882.—
CARRIKER, Lice of the tinamous, p. 93, 1936.

It is my opinion that we do not know the true host of this insect, and owing to the poor condition of the type itself we may never be able to identify it with fresh material.

ORNICHOLAX ALIENUS ROBUSTUS Carriker

FIGURE 27, b

Ornicholax robustus CARRIKER, Univ. Nebraska Studies, vol. 3, No. 2, p. 29, pl. 9, figs. 1, 1c, 1903. (Host: *Tinamus robustus*=*T. major castaneiceps*.)

Ornicholax robustus robustus CARRIKER, Lice of the tinamous, p. 171, pl. 30, fig. 2, 1936.

This race has been fully discussed above, so that no further comment is necessary. The figure of the male genitalia published by the author in 1936 is not correct in several details, and a corrected one is herewith presented, which was drawn from the type. The head is wider than long in this race.

Seven males and six females taken on two individuals of *Tinamus serratus ruficeps*, collected by the author in the Sierra Perijá and the Sierra Nevada de Santa Marta, Colombia, are almost identical in size with specimens from *T. major fuscipennis* (= *O. a. mexicanus*) and are also very close in size to *O. a. robustus*, while the males have the genitalia very close to the latter. The distal end of the endomerale plate is the same, as well as the lateral lobe at base of paramers. The only difference seems to be a slightly different structure at the basal portion of the endomerale plate. This small detail, the only discrepancy be-

tween the two lots of insects, is not of sufficient importance to deserve nomenclatural recognition. Therefore the insects from *T. serratus ruficeps* may be classed as *O. a. robustus* Carriker.

ORNICHOLOX ALIENUS MEXICANUS, new subspecies

FIGURE 27, c

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 23, 1940; in U. S. National Museum.

Diagnosis.—This race is perhaps closer to *boliviensis* in type of genital armature than to *robustus*, although the endomeral plate differs markedly. The measurements are also nearer to those of *boliviensis*. Like *robustus*, *mexicanus* has the head wider than long in both sexes (male 0.80 by 0.89; female 0.83 by 0.93). This subspecies is represented by two males and three females, including the types, all from the same individual host.

Five males taken on two individuals of *Tinamus major fuscipennis*, collected by the author on the Río Sicsola, Costa Rica, are somewhat slenderer than the Mexican specimens from *T. m. percautus*, but the genital armature is practically identical in every particular (head 0.79 by 0.836 against 0.80 by 0.89; mesothorax, 0.326 by 0.89 against 0.34 by 0.93; metathorax, 0.337 by 0.59 against 0.32 by 0.63; abdomen, 1.28 by 1.17 against 1.41 by 1.28). These slight differences do not seem to be worthy of recognition, especially since the male genitalia are so nearly alike. Therefore the insects from *T. m. fuscipennis* may be called *O. a. mexicanus*.

ORNICHOLOX ALIENUS BOLIVIENSIS, new subspecies

FIGURE 27, d

Types.—Male and female, adults, from *Tinamus s. serratus*, collected by the author at Santa Ana, Río Coroico, Bolivia, July 26, 1934; in collection of author.

Diagnosis.—This is the only known race that has the head of equal length and breadth, in both sexes (male 0.78 by 0.78; female 0.84 by 0.836). With the exception of *taoi*, which has the head longer than wide, all the other races have it wider than long.

The genitalia are also quite different in detail and proportions. The paramers are shorter and more sharply curved, with the lateral lobes reaching much farther toward their middle. The lateral, spine-bearing lobes of the endomeral plate are short, while the distal end of the plate has *angulated sides*. Represented by six males and two females.

ORNICHOLAX ALIENUS TAOI Carriker

FIGURE 27, e

Ornicholax robustus taoi CARRIKER, Lice of the tinamous, p. 171, pl. 30, figs. 1, 1a, 1936. (Host: *Tinamus t. taoi*.)

This race was described from a single male, collected at Lagunita de Aroa, Venezuela. I have since secured an additional male from the type host, collected in the Sierra Perijá of Colombia. (See discussion of this race in general remarks under *Ornicholax alienus*.)

This is a well-marked race, whose nearest relative seems to be *O. a. solitarius* Guimarães and Lane. It is easily recognized by its small size, head longer than wide (unique in this character, *O. solitarius* having head measurement in male of 0.83 by 0.86), and by the male genitalia. The paramers are slender, only slightly curved, and entirely without the characteristic lateral lobes at their bases. The endomeral plate is extremely reduced in length, with the penis long, without appendages, and apparently with a tripartite tip; the spine-bearing lobes are unusually well developed, but the spine is short (but half the length of the spines in the *O. robustus* group).

ORNICHOLAX ALIENUS SOLITARIUS Guimarães and Lane

Ornicholax solitarius GUIMARÃES and LANE, Rev. Mus. Paulista, vol. 23, p. 3, pl. 1, figs. 1-1b, 1937. (Host: *Tinamus solitarius*.)

This form, like *taoi*, has the genitalia with the paramers almost straight, slender, and lacking the lateral lobes, but differs from *taoi* in structure of the endomeral plate (see fig.). The head in the male is also *wider* than long, the reverse of *taoi*. Unfortunately, the measurements given are not so complete as might be desired.

MEASUREMENTS OF ORNICHOLAX ALIENUS

Structure	<i>robustus</i> (types, from <i>Tinamus major castaneiceps</i>)				<i>mericanus</i> (types, from <i>T. m. percautus</i>)			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.41		2.94		2.47		2.73	
Head.....	0.76	0.84	0.825	0.846	0.80	0.89	0.83	0.93
Prothorax.....	0.21	0.49	0.24	0.52	0.22	0.50	0.24	0.51
Mesothorax.....	0.326	0.87	0.36	0.94	0.34	0.93	0.39	0.95
Metathorax.....	0.30	0.59	0.37	0.63	0.32	0.63	0.37	0.65
Abdomen.....	1.41	1.18	1.62	1.30	1.43	1.28	1.67	1.35
Antennae.....	(?)0.28				0.32		0.28	
Paramers.....	0.205				0.23			
Basal plate.....		0.13				0.13		

MEASUREMENTS OF ORNICHOLAX ALIENUS—Continued

Structure	<i>robustus</i> (from <i>T. serratus ruficeps</i>)				<i>mericanus</i> (male from <i>T. m. fuscipennis</i> , Costa Rica)	
	Male		Female		Length	Width
	Length	Width	Length	Width		
Body.....	2.28		2.52		2.28	
Head.....	0.78	0.836	0.80	0.825	0.79	0.836
Prothorax.....	0.217	0.50	0.217	0.50	0.195	0.50
Mesothorax.....	0.337	0.868	0.33	0.846	0.326	0.89
Metathorax.....	0.337	0.59	0.326	0.61	0.337	0.59
Abdomen.....	1.27	1.21	1.49	1.28	1.28	1.17
Antennae.....	0.31	0.043	0.31	0.045	0.326	0.05
Paramers.....	0.206	0.05			0.20	0.054
Endomeral plate.....	0.11	0.065			0.13	0.043

Structure	<i>boliviensis</i>				<i>taoi</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	2.41		2.69		2.23		2.62	
Head.....	0.78	0.78	0.84	0.836	0.76	0.70	0.84	0.836
Prothorax.....	0.228	0.50	0.23	0.52	0.195	0.49	0.23	0.54
Mesothorax.....	0.32	0.868	0.34	0.92	0.32	0.76	0.34	0.84
Metathorax.....	0.30	0.57	0.347	0.63	0.29	0.54	0.326	0.59
Abdomen.....	1.30	1.17	1.60	1.33	1.21	1.04	1.56	1.17
Antennae.....	0.30	0.05	0.326	0.043	0.26	0.043	0.326	0.043
Paramers.....	0.195	0.087			0.174	0.087		
Endomeral plate.....	0.11	0.065			0.087	0.043		

Genus KELLOGGIA Carriker

KELLOGGIA BREVIPES Carriker

In this species we have another case parallel to that of *Ornicholax alienus*, where the genus is apparently composed of a single species, which in turn is split up into quite a number of closely related subspecies, all found on the different species of the avian genus *Tinamus*, the same as *Ornicholax*.

I have before me a series of *Kelloggia brevipes* taken on the following hosts: *Tinamus major castaneiceps* (the type); *T. major percautus*, *T. m. latifrons*, *T. serratus serratus*, *T. s. ruficeps*, *T. tao tao*, and *T. t. weddelli*. A casual examination of these specimens might lead one to believe that they all represent a single form, but a more careful study reveals an astonishing number of small but constant differences between most of them. There are two reliable indices that may be used for their separation into subspecies—the male genital armature and the shape of the preantennal portion of the head.

There is a slight dimorphism of the sexes in *Kelloggia*, consisting of the shape of the head and abdomen, and the former character is useful in separating the females of the various subspecies. In the above-mentioned series of specimens we have two types of genital armature, or rather of the endomerale plate, one type found in insects from *T. major castaneiceps* (*K. b. brevipes*) and *T. m. percautus* (*K. b. mexicanus*), while the other type is present in the remaining list of hosts cited above.

It is a very curious anomaly that the genitalia of the insects taken on *T. m. latifrons* and *T. serratus ruficeps* are extremely close to those of specimens from *T. tao tao*, one group being almost identical in size and shape, the other of the same shape but somewhat slenderer, but to counteract this similarity we have differences in the shape of the pre-antennal area of the head, as well as body measurements.

When all these characters are considered, it seems best to arrange the various known forms of *Kelloggia* in the following manner:

KELLOGGIA BREVIPES BREVIPES Carriker

FIGURE 28, *g-i*

Kelloggia brevipes CARRIKER, Univ. Nebraska Studies, vol. 3, No. 2, p. 154, pl. 9, fig. 2, 1903 (host: *Tinamus robustus*); Lice of the tinamous, p. 173, pl. 32, figs. 5, 5a, 1936 (host: *Tinamus major castaneiceps*; original designation of host incorrect).

Of all the known races of *Kelloggia brevipes* the nominate form exhibits the greatest sexual dimorphism in the shape of the preantennal portion of the head. In the male the frons is very flat, with the sides almost angulated (see fig.), while in the female it is *circular* and with the clypeal band crenulated at each side, the latter character found only on the female of *K. b. mexicanus*, but combined there with a distinct antennal band (see fig.). The endomerale plate in *brevipes* is also distinctive.

Measurements are given with those of *K. b. mexicanus*.

KELLOGGIA BREVIPES MEXICANUS, new subspecies

FIGURE 28, *j-l*

Types.—Male and female, adults, from *Tinamus major percautus*, collected by the author at Tres Zapotes, Veracruz, Mexico, April 8, 1940; in U. S. National Museum.

Diagnosis.—Nearest to the nominate form in the style of male genital armature, but with preantennal region (especially in male) very different (see fig.).

The frons is circular, not flatly rounded, and much wider, while the antennal bands in both sexes differ in having at their anterior portion a narrow, deeply pigmented section which ends posteriorly in a slender

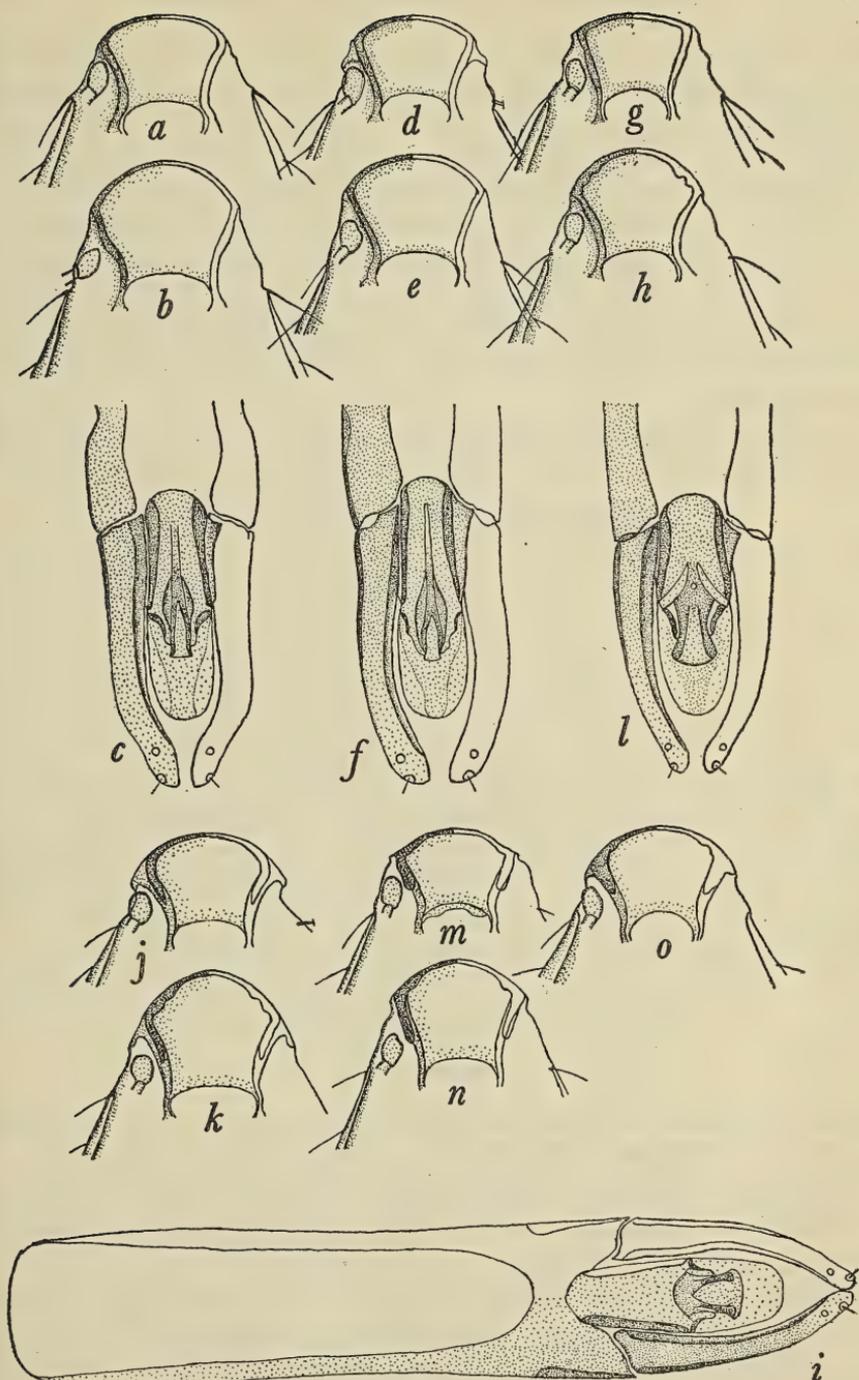


FIGURE 28.—KELLOGGIA

- a-c*, *Kelloggia brevipes taoi*, new subspecies: *a*, Male head; *b*, female head; *c*, male genitalia.
d-f, *K. b. latithorax* Carriker: *d*, Male head; *e*, female head; *f*, male genitalia.
g-i, *K. b. brevipes* Carriker: *g*, Male head; *h*, female head; *i*, male genitalia.
j-l, *K. b. mexicanus*, new subspecies: *j*, Male head; *k*, female head; *l*, male genitalia.
m, n, *K. b. ruficeps*, new subspecies: *m*, Male head; *n*, female head.
o, *K. b. chocoensis*, new subspecies: Male head.

point. The endomerale plate is shorter, has the distal portion narrower and longer, and has the anterior end narrower and with certain differences in detail of structure. The head in the male is longer, at both occiput and temples and very much wider at the temples. In the female the frons is much wider and is elliptical in shape instead of circular, while the length of head at both occiput and temples, as well as the width at temples, varies but little. There is considerable variation in the width of the temples in a series of 16 males, ranging from 0.65 to 0.74 (average, 0.0673). These 16 males were taken on two individual hosts, but both narrow and wide temples were found equally in both series.

In both *brevipes* and *mexicanus* the males have the head wider than long, while in the females the length and width are practically equal.

MEASUREMENTS OF KELLOGGIA BREVIPIES

Structure	<i>brevipes</i> (types)				<i>mexicanus</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.71	-----	2.28	-----	1.79	-----	2.30	-----
Head { frons.....	-----	0.25	-----	0.26	-----	0.30	-----	0.33
{ temples.....	0.575	0.63	0.70	0.71	0.60	0.74	0.735	0.73
{ occiput.....	0.456	-----	0.57	-----	0.50	-----	0.59	-----
Prothorax.....	0.22	0.41	0.227	0.39	0.20	0.37	0.227	0.46
Mesothorax.....	0.28	0.61	0.326	0.67	0.29	0.60	0.31	0.70
Metathorax.....	0.27	0.466	0.30	0.52	0.27	0.46	0.336	0.56
Abdomen.....	1.00	0.88	1.39	1.05	1.01	0.90	1.36	1.13
Paramers.....	0.112	0.071	-----	-----	0.11	0.07	-----	-----
Endomerale plate.....	0.082	0.036	-----	-----	0.08	0.036	-----	-----

KELLOGGIA BREVIPIES LATITHORAX Carriker

FIGURE 28, d-f

Kelloggia latithorax CARRIKER, Lice of the tinamous, p. 174, pl. 32, fig. 6, 1936.

(Host: *Crypturellus nigrocapillus* (?), probably *Tinamus s. serratus*.)

Lectotypes.—Male and female, adults, from *Tinamus s. serratus*, collected by the author at Chiñiri, Río Kaka, Bolivia, September 6, 1934; in collection of author.

Diagnosis.—This race differs from typical *brevipes* and *mexicanus* in smaller size and different shape of the endomerale plate (see figs.). The head is much narrower at the temples in proportion to the width of the frons, while the prothorax is very noticeably shorter and narrower than the male of *brevipes*, but almost the same in the female, while it is much narrower than the female of *mexicanus*.

The genital armature is narrower and longer, with the paramers thicker and more curved apically and with a lateral constriction

basally; in addition, the endomerical plate is of a decidedly different shape apically. In respect to the genital armature, the Mexican specimens are intermediate between the nominate form and the present race, *latithorax*. The shape of the preantennal area in both sexes differs from both *brevipes* and *mexicanus*, the male being intermediate respecting curvature of frons, while in the female the frons is but slightly more circular than in the male, in marked contrast to both *brevipes* and *mexicanus*. The antennal bands are uniform in pigmentation like *brevipes*.

I have recently taken a series of *Kelloggia* on *Tinamus t. tao*, which contains immature specimens. I find that these, as well as another specimen (also immature) from *T. tao weddelli*, correspond very closely to *K. latithorax*. There seems to be little doubt that this is a case parallel to that of *Strongylocotes* and *Nirmocotes*, and that *K. latithorax* is the immature of *K. brevipes latithorax*.

I believe also that the true host of *Kelloggia latithorax* was *Tinamus s. serratus*, and not *Crypturellus nigrocapillus* (= *C. garleppi affinis*), since both birds were taken at Chifñiri, Bolivia, although on different dates, and that in some manner I am not able to explain, the type of *latithorax* became mixed with specimens from *C. garleppi affinis*. There is no absolute proof of this assertion, but I have up to the present time taken *Kelloggia* only on the genus *Tinamus*.

Kéler asserts that *K. latithorax* is the young of *Heptagoniodes*, which I am positive is incorrect. Both *Kelloggia* and *Heptagoniodes* are found on *Tinamus tao*, and the fact that he found a specimen of *latithorax* among *Heptagoniodes* does not prove that it is the young of that genus. I have taken it on two different individuals of *Tinamus tao* on which *Heptagoniodes* was absent but *Kelloggia brevipes* present, which would seem to be ample proof of my assertion. Measurements are given with those of *K. b. taoi*.

KELLOGGIA BREVIPES TAOI, new subspecies

FIGURE 28, a-c

Types.—Male and female, adults, from *Tinamus t. tao*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, July 19, 1941; in U. S. National Museum.

Diagnosis.—In the present race we have the length in both sexes, as well as the width of the abdomen in the male, about as in *K. b. mexicanus*, but in the female the abdomen is much narrower. The width of the frons is more or less the same in the sexes, the same as in the three previous races, but the length at the temples and occiput, as well as the width at the temples, is of decidedly different proportions.

The shape of the preantennal region in the male is nearer to that of *latithorax*, but it is longer; in the female the frons is decidedly circular (neither elliptical nor flatly rounded), much like the male of *mexicanus*; all thoracic segments are longer and wider than in *latithorax*, but of the same proportions.

The male genital armature differs in shape from all the previously treated races. The paramers are widest at their bases, with sides subparallel but concave, and with the tips bent abruptly inward, and also *concave* on their outer margins. The endomeral plate is rather close to that of *latithorax*, but is some shorter and wider at both ends. The basal plate also differs in shape, being rather sharply constricted just back of the distal end, a character absent in the races described above.

MEASUREMENTS OF KELLOGGIA BREVIPES

Structure	<i>latithorax</i>				<i>taoi</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body.....	1.60		2.00		1.78		2.28	
Head { frons.....		0.26		0.28		0.27		0.30
temples.....	0.54	0.60	0.68	0.65	0.64	0.66	0.755	0.67
occiput.....	0.445		0.54		0.52		0.62	
Prothorax.....	0.16	0.35	0.217	0.38	0.206	0.39	0.24	0.41
Mesothorax.....	0.27	0.57	0.30	0.63	0.31	0.65	0.34	0.67
Metathorax.....	0.26	0.44	0.30	0.50	0.30	0.51	0.35	0.55
Abdomen.....	0.96	0.80	1.22	0.92	1.13	0.87	1.41	0.94
Antennae.....					0.23	0.045	0.22	0.045
Paramers.....	0.128	0.066			0.13	0.076		
Endomeral plate.....	0.09	0.036			0.076	0.033		

KELLOGGIA BREVIPES CHOCOENSIS, new subspecies

FIGURE 28, o

Type.—Male, adult, from *Tinamus major latifrons*, collected by the author at Malagita, Río San Juan, Chocó, Colombia, May 11, 1918; in collection of author.

Diagnosis.—This is not a particularly well marked race and is represented by but two males, including the type. It is most nearly related to *K. b. taoi*, from which it differs as follows: The frons is wider and strongly rounded (not flatly rounded); the sides of the head are emarginate at the base of the antennae (as in *mexicanus*), so that the first joint of the antennae extends beyond the margin of the head; the lateral bifurcation is wider, as in *taoi*, but the antennal bands are as in *ruficeps*, but *very wide* at their junction with the clypeal band,

being wider than in any other known race of *brevipes*; the mandibles and buccal cavity are much narrower than in *taoi* or *ruficeps*, being equal only to *brevipes* in this respect. All measurements run very close to those of the male in *taoi*, there being, however, a few discrepancies but nothing outstanding. All measurements of head and thoracic segments are somewhat smaller, except width at temples, which is slightly greater; the abdomen and antennae are also shorter.

The genitalia are narrower at base of paramers than in *taoi*, but otherwise essentially the same in all details. Measurements are given with those of *K. b. ruficeps*.

KELLOGGIA BREVIPES RUFICEPS, new subspecies

FIGURE 28, m, n

Types.—Male and female, adults, from *Tinamus serratus ruficeps*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, July 19, 1941; in U. S. National Museum.

Diagnosis.—This race also is close to *K. b. taoi*. The frons is less flattened and somewhat undulating, this being the only race here described that exhibits this character, while the sides of the preantennal area run straight back in a line with the temples. The lateral bifurcation is much narrower than in *taoi*; the whole insect is uniformly smaller. In the female the shape of the frons is very close to the female of *taoi*, but the antennal bands in both sexes are similar to those of *mexicanus*, having the more deeply pigmented incrustation in their anterior portion, but with *rounded*, not pointed, posterior ends. The head in the male is shorter at the temples and occiput (than in *taoi*) but of the same width at temples and narrower at the frons. In the female the head is of equal length and breadth at the temples,

MEASUREMENTS OF KELLOGGIA BREVIPES

Structure	<i>chocoensis</i> (male)		<i>ruficeps</i>			
			Male		Female	
	Length	Width	Length	Width	Length	Width
Body.....	1.82		1.69		2.01	
Head { frons.....		0.27		0.25		0.27
temples.....	0.62	0.678	0.586	0.66	0.70	0.71
occiput.....	0.51		0.48		0.575	
Prothorax.....	0.206	0.37	0.18	0.37	0.195	0.38
Mesothorax.....	0.30	0.62	0.28	0.586	0.305	0.63
Metathorax.....	0.28	0.467	0.26	0.467	0.29	0.50
Abdomen.....	1.05	0.95	0.97	0.868	1.23	0.97
Antennae.....	0.24	0.04	0.20	0.043	0.20	0.043
Paramers.....	0.12	0.068	0.12	0.065		
Endomeral plate.....	0.066	0.033	0.07	0.033		

but in *taoi* it is much narrower than long (0.755 against 0.67), while in *ruficeps* it is smaller in *all dimensions*.

The genitalia differ from those of *taoi* more in this race than in *chocoensis*, being narrower at base of paramers and having the paramers considerably shorter; the endomerale plate is shorter and slightly narrower, while there is the same constriction of the basal plate as in *taoi*.

Genus AUSTROKELLOGGIA Carriker

AUSTROKELLOGGIA INTERMEDIA Carriker

Austrokelloggia intermedia CARRIKER, Lice of the tinamous, p. 176, pl. 31, figs. 1-1b, 1936. (Host: *Nothocercus n. nigrocapillus*, Bolivia.)

A series of 9 males and 13 females of this interesting species was taken on two individuals of *Nothocercus bonaparti*, collected by the author at Tierra Nueva, Sierra Perijá, Colombia, in July 1941. An exhaustive series of measurements of both sexes shows considerable variation, especially in the head measurements, which run as follows:

Structure	Seven males		Eight females	
	Length	Width	Length	Width
Frons.....		0.31-0.33 (0.326)		0.293-0.33 (0.31)
Temples.....	0.53-0.62 (0.57)	0.61-0.62 (0.613)	0.542-0.586 (0.57)	0.56-0.61 (0.59)
Occiput.....	0.48-0.52 (0.51)		0.49-0.53 (0.52)	

Compared with the measurements of two males and four females of the type series of *intermedia* it is found that all the measurements of *intermedia* fall within the extremes for the series of specimens taken on *N. bonaparti* (as given above).

Apparently there are no differences in the male genitalia, and so we may safely say that specimens of *Austrokelloggia* from *Nothocercus bonaparti* are *A. intermedia* Carriker. It is unusual that not even subspecific differences are found in a species of Mallophaga taken on two different host species of tinamous, although it is not by any means unique.

Genus HYPOCRYPTURELLUS Carriker

Hypocrypturellus CARRIKER, Lloydia, vol. 3, p. 298, 1940. (New name for *Hypocryptus* CARRIKER, Lice of the tinamous, p. 178, 1936, not *Hypocryptus* Förster, Verh. Ver. Rheinlande, vol. 25, p. 198, 1869: Hymenoptera.)

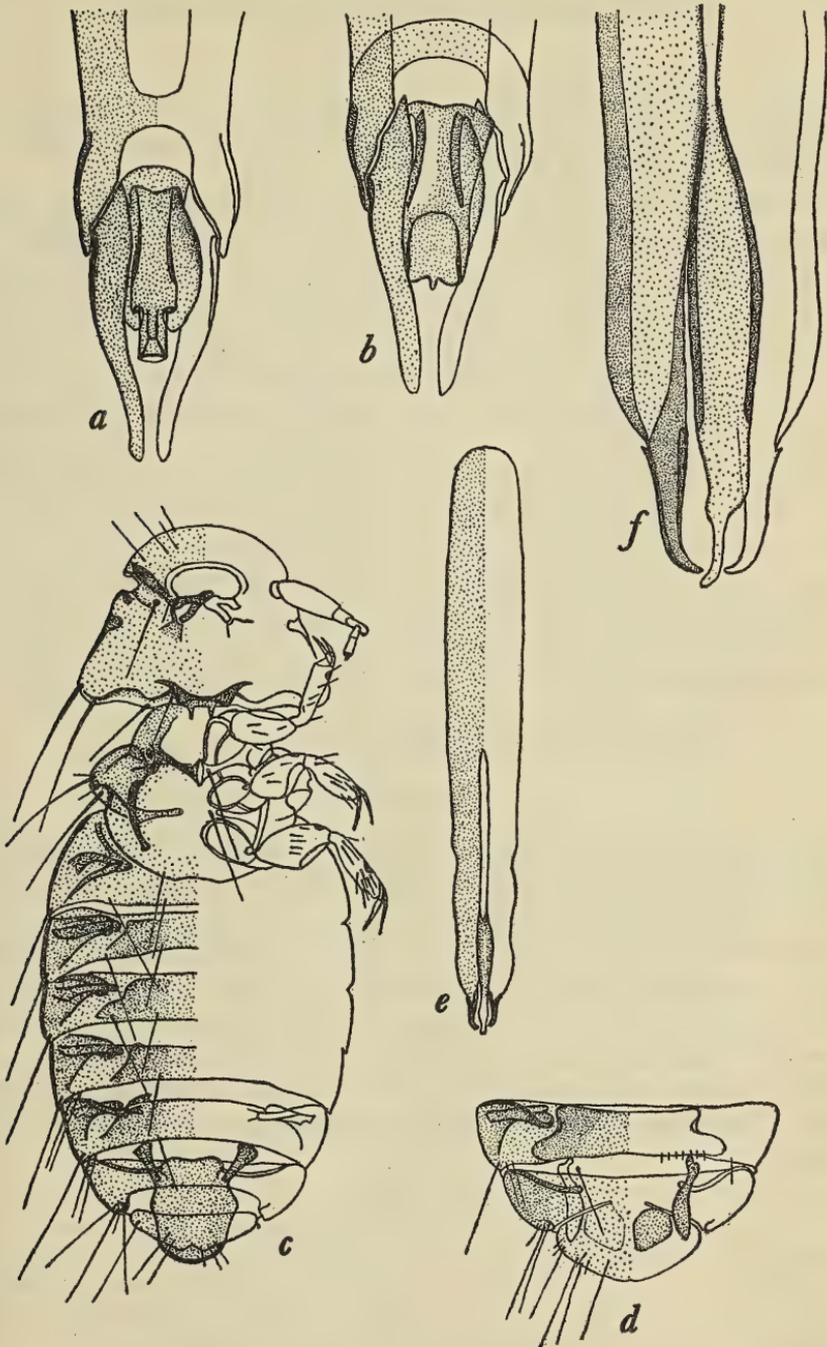


FIGURE 29.—HYPOCRYPTURELLUS and HETEROPEOSTUS

a, *Hypocrypturellus coniceps idoneus*, new subspecies: Male genitalia.

b, *H. c. boucardi*, new subspecies: Male genitalia.

c-f, *Heteropeostus carrikeri* (Clay): *c*, Body of male; *d*, female abdominal segment VII; *e*, male genitalia; *f*, male genitalia (enlarged).

HYPOCRYPTURELLUS CONICEPS IDONEUS, new subspecies

FIGURE 29, a

Types.—Male and female, adults, from *Crypturellus idoneus*, collected by the author at Carraipia, La Guajira, Colombia, May 30, 1941; in U. S. National Museum.

Diagnosis.—Closely related to *H. c. boucardi* of Mexico, from which it differs as follows: Both sexes are slightly smaller in practically all dimensions (see table of measurements); in the female the head is almost the same length at the occiput but considerably shorter at the temples, while the width at the temples is but slightly less, and at the frons proportionately narrower (0.347 against 0.38). The proportions of the head in the male are practically the same, only slightly smaller.

The genital armature is of the same general style, the chief difference being in the endomeral plate. The paramers are some shorter, but slenderer distally and differently shaped basally; the basal plate is narrower at its junction with the paramers and is more deeply constricted just forward of that point. The endomeral plate is very differently shaped in every way, both basally and distally (see figs.) and resembles in several features that of *H. c. undulatus* Carriker.

HYPOCRYPTURELLUS CONICEPS BOUCARDI, new subspecies

FIGURE 29, b

Types.—Male and female, adults, from *Crypturellus b. boucardi*, collected by the author on Cerro Tuxtla, Veracruz, Mexico, March 28, 1940; in U. S. National Museum.

Diagnosis.—This race of *coniceps* has the genital armature more nearly resembling that of *H. c. undulatus* (from *Crypturellus u. undulatus*) than of any other of the known races, from which it differs in larger size, with longer, slenderer, and more curving paramers and slightly longer endomeral plate, which is also of slightly different shape. Measurements of the genital armature in the two races are as follows:

Structure	<i>undulatus</i>		<i>boucardi</i>	
	Length	Width	Length	Width
Basal plate.....		0.071		0.092
Paramers.....	0.102	¹ 0.056	0.151	0.072
Endomeral plate.....	0.066	0.038	0.087	0.041

¹ At base.

MEASUREMENTS OF HYPOCRYPTURELLUS CONICEPS

Structure	<i>idoneus</i>				<i>boucardi</i>			
	Male		Female		Male		Female	
	Length	Width	Length	Width	Length	Width	Length	Width
Body	1.58		1.79		1.65		1.83	
Head { frons		0.35		0.347		0.347		0.38
Head { temples	0.51	0.63	0.54	0.66	0.52	0.65	0.586	0.68
Head { occiput	0.445		0.49		0.45		0.50	
Prothorax	0.15	0.358	0.14	0.36	0.14	0.36	0.155	0.37
Mesothorax	0.195	0.65	0.217	0.66	0.217	0.67	0.217	0.69
Metathorax	0.174	0.39	0.185	0.41	0.195	0.41	0.195	0.43
Abdomen	0.92	0.868	1.05	0.88	0.976	0.89	1.08	0.92
Antennae	0.195		0.195		0.22		0.205	
Basal plate		0.078				0.092		
Paramers	0.135	0.059			0.15	0.072		
Endomeral plate	0.084	0.026			0.087	0.04		

HYPOCRYPTURELLUS CONICEPS subspecies

Three females of this species were taken on *Crypturellus cinnamomeus sallaei*, collected by the author at Tres Zapotes, Veracruz, Mexico, the status of which cannot be satisfactorily determined without the male sex. A careful comparison with the females of all the known races shows that the Mexican specimens may be separated from all of them except *obsoletus*, either on size, proportions, or metathoracic structure. They are so close to *obsoletus* in all these characters that I hesitate to give them a name without having seen the genital armature. When the males are available for study they will doubtless be found to differ as regards genitalia.

LIST OF TINAMOU HOSTS AND THEIR MALLOPHAGAN PARASITES
TREATED IN THIS PAPER

[For a complete host list of the Tinamidae it is necessary to combine the present list with that published in Carriker, 1936, p. 182. The nomenclature here used for the Tinamidae is substantially that of Peters in his "Check-list of Birds of the World," vol. 1, pp. 12-29, 1931.]

Tinamus major castaneiceps Salvadori:

- Pseudolipeurus tinami tinami* (Carriker).
- Rhopaloceras aliceps* (Nitzsch).(?)
- Heptarthrogaster minutus minutus* (Carriker).
- Heptarthrogaster parvulus* (Taschenberg).
- Ornichola alienus robustus* Carriker.
- Kelloggia brevipes brevipes* Carriker.

Tinamus major fuscipennis Salvadori:

- Ornichola alienus mexicanus*, new subspecies.

Tinamus major latifrons Salvadori:

- Kelloggia brevipes chocoensis*, new subspecies.

Tinamus major percautus Van Tyne:

- Pseudolipeurus longipes robustus*, new subspecies.
- Pseudolipeurus tinami tinami* (Carriker).
- Strongylocotes pellucidifrons*, new species.
- Heptarthrogaster minutus mexicanus*, new subspecies.
- Heptarthrogaster parvulus* (Taschenberg).
- Pterocotes aberrans mexicanus*, new subspecies.
- Pectenosoma verrucosa tinami*, new subspecies.
- Ornichola alienus mexicanus*, new subspecies.
- Kelloggia brevipes mexicanus*, new subspecies.

Tinamus serratus ruficeps Selater and Salvin¹:

- Pseudolipeurus tinami ruficeps*, new subspecies.
- Strongylocotes angulocapitis ruficeps*, new subspecies.
- Rhopaloceras genitalis genitalis* Carriker.
- Heptarthrogaster minutus* (Carriker).
- Heptarthrogaster parvulus* (Taschenberg).
- Pterocotes aberrans colombianus*, new subspecies.
- Ornichola alienus robustus* Carriker.
- Kelloggia brevipes ruficeps*, new subspecies.

Tinamus serratus serratus (Spix)¹:

- Pseudolipeurus tinami serratae*, new subspecies.
- Strongylocotes angulocapitis angulocapitis* Carriker.
- Heptarthrogaster minutus* (Carriker).
- Heptarthrogaster parvulus* (Taschenberg).
- Heptarthrogaster grandis* Carriker.
- Ornichola alienus boliviensis*, new subspecies.
- Kelloggia brevipes latithorax* Carriker.

Tinamus solitarius (Vieillot):

- Strongylocotes wernecki* Guimarães and Lane.
- Ornichola alienus solitarius* Guimarães and Lane.

¹ *T. s. ruficeps*, as well as all other races of *T. serratus*, has been placed under *major* by some recent authors, and the relationships of the mallophagan parasites tend to corroborate this change.

Tinamus tao kleei (Tschudi) :*Pseudolipeurus taoi peruvianus*, new subspecies.*Pterocotes taoi* Carriker.**Tinamus tao tao** Temminck :*Strongylocotes angulocapitis taoi*, new subspecies.*Rhopaloceras oniscus* (Nitzsch).*Heptarthrogaster parvulus* (Taschenberg).*Heptarthrogaster grandis* Carriker.*Pterocotes taoi* Carriker.*Heptagoniodes agonus* (Nitzsch).*Ornicholax alienus taoi* Carriker.*Kelloggia brevipes taoi*, new subspecies.**Tinamus tao weddelli** Bonaparte :*Strongylocotes angulocapitis weddelli*, new subspecies.*Pterocotes taoi* Carriker.*Heptagoniodes dimorphus*, new species.**Nothocercus bonaparti** (G. R. Gray) :*Pseudolipeurus grandis* Carriker.*Strongylocotes spinosus bonaparti*, new subspecies.*Physconella nothocercae* Carriker.*Nothocotus parvithorax parvithorax* Carriker.*Rhopaloceras laticeps bonaparti*, new subspecies.*Heptapsogaster temporalis nothocercae*, new subspecies.*Trichodopeostus spinosus praegracilis*, new subspecies.*Heptapsus nothocercae* Carriker.*Heptapsus inexpectatus*, new species.*Austrokelloggia intermedia* Carriker.**Nothocercus julius** (Bonaparte) :*Strongylocotes spinosus spinosus* (Piaget).**Nothocercus nigrocapillus cadwaladeri** Carriker :*Strongylocotes spinosus peruvianus*, new subspecies.*Heptapsogaster temporalis nothocercae*, new subspecies.**Nothocercus nigrocapillus nigrocapillus** (G. R. Gray) :*Pseudolipeurus grandis* Carriker.*Strongylocotes spinosus subspinosus* Carriker.*Physconella nothocercae* Carriker.*Austrokelloggia intermedia* Carriker.**Crypturellus boucardi boucardi** (P. L. Sclater) :*Pseudolipeurus longipes similis*, new subspecies.*Strongylocotes complanatus boucardi*, new subspecies.*Rhopaloceras heterogenitalis heterogenitalis*, new species.*Heptapsogaster mandibularis modestae*, new subspecies.*Heptapsogaster inexpectata tuxtlae*, new subspecies.*Heptapsogaster temporalis boucardi*, new subspecies.*Megapeostus multiplex multiplex* Clay.*Discocorpus cephalosus furculus*, new subspecies.*Pectenosoma verrucosa boucardi*, new subspecies.*Hypocrypturellus coniceps boucardi*, new subspecies.**Crypturellus cinnamomeus cinnamomeus** (Lesson) :*Strongylocotes complanatus fimbriatus* Clay.

Crypturellus cinnamomeus sallaei (Bonaparte)²:

- Pseudolipeurus longipes similis*, new subspecies.
Pseudophilopterus hirsutus similis, new subspecies.
Strongylocotes complanatus fimbriatus Clay.
Heptapsogaster temporalis acutiventris Clay.
Megapeostus secundus Clay.
Pectenosoma verrucosa cinnamomea, new subspecies.
Hypocrypturellus coniceps subsp.

Crypturellus garleppi affinis (Chubb):

- Pseudolipeurus longipes garleppi*, new subspecies.
Strongylocotes complanatus interruptus Carriker.
Rhopaloceras sp.
Heptapsogaster mandibularis garleppi, new subspecies.
Heptapsogaster temporalis chinirii Carriker.
Heptarthrogaster minutus (Carriker).
Megapeostus parvigenitalis Carriker.
Pectenosoma verrucosa angusta Carriker.

Crypturellus idoneus (Todd)³:

- Pseudolipeurus sanctae-martae*, new species.
Rhopaloceras heterogenitalis spatulata, new subspecies.
Heptapsogaster mandibularis idoneus, new subspecies.
Heptapsogaster inexpectata magdalenae, new subspecies.
Megapeostus multiplex idoneus, new subspecies.
Discocorpus cephalosus intermedius, new subspecies.
Hypocrypturellus coniceps idoneus, new subspecies.

Crypturellus noctivagus dissimilis (Salvadori):

- Heptapsogaster mandibularis noctivagi* Clay.

Crypturellus noctivagus noctivagus (Wied):

- Heptapsogaster mandibularis noctivagi* Clay.

Crypturellus obsoletus crucis Bond and de Schauensee:

- Megaginus emarginatus emarginatus* Carriker.
Rhopaloceras brevitemporalis Carriker.
Heptapsogaster mandibularis crucis, new subspecies.

Crypturellus obsoletus obsoletus (Temminck):

- Pseudolipeurus longipes longipes* (Piaget).
Heptapsogaster mandibularis stultus Clay.
Heptapsogaster inexpectata inexpectata, new name.

Crypturellus obsoletus ochraceiventris (Stolzmann):

- Strongylocotes complanatus intermedius*, new subspecies.

Crypturellus obsoletus punensis (Chubb):

- Pseudolipeurus longipes carrikeri* Hopkins, new subspecies.
Strongylocotes complanatus nirmoides (Carriker).
Megaginus emarginatus emarginatus Carriker.
Rhopaloceras brevitemporalis Carriker.
Heptapsogaster temporalis boliviensis, new subspecies.
Heptapsogaster platycephalus asymmetricus, new subspecies.
Pectenosoma verrucosa punensis, new subspecies.

Crypturellus soui inconspicuus Carriker:

- Strongylocotes subconiceps subconiceps* Carriker.
Physconella kelloggi subsimilis Carriker.

² According to Wetmore (Proc. U. S. Nat. Mus., vol. 93, p. 229, 1943) this bird is *C. cinnamomeus sallaei*, not *C. c. cinnamomeus* as given by Peters.

³ I cannot follow Peters in making this form a subspecies of *cinnamomeus*. Its parasites are very close to those from *C. b. boucardi*, but it seems best to keep it as a distinct species.

- Megaginus emarginatus excavatus*, new subspecies.
Heptapsogaster inexpectata benii, new subspecies.
Heptapsogaster platycephalus platycephalus Carriker.
Pectenosoma verrucosa inconspicua, new subspecies.
- Crypturellus soui meserythrus** (P. L. Sclater) :
Strongylocotes subconiceps subconiceps Carriker.
Megaginus emarginatus laticlypeus, new subspecies.
Rhopaloceras rudimentarius Carriker.
Heptapsogaster mandibularis tapicollae, new subspecies
Pectenosoma verrucosa meserythra, new subspecies.
- Crypturellus soui modestus** (Cabanis) :
Heptarthrogaster costaricensis, new species.
- Crypturellus soui mustelinus** (?) (Bangs) (Sierra Perijá, Colombia) :
Strongylocotes subconiceps perijae, new subspecies.
Rhopaloceras rudimentarius Carriker.
Heptapsogaster mandibularis motilonensis, new subspecies.
- Crypturellus soui nigriceps** (Chapman) :
Megaginus emarginatus dissimilis, new subspecies.
Rhopaloceras rudimentarius Carriker.
Heptapsogaster mandibularis nigriceps, new subspecies.
Pectenosoma verrucosa nigriceps, new subspecies.
- Crypturellus soui panamensis** (Carriker) :
Physconella kelloggi kelloggi (Paine).
- Crypturellus tataupa tataupa** (Temminck) :
Pseudolipeurus tataupicola, new species.
Megaginus emarginatus emarginatus Carriker.
Rhopaloceras pennaticeps (Paine and Mann).
Heptapsogaster mandibularis mandibularis Carriker.
Pectenosoma verrucosa parva Carriker.
- Crypturellus undulatus undulatus** (Temminck) :
Heptapsogaster inexpectata undulata, new subspecies.
Heptapsogaster temporalis temporalis Carriker.
Heptarthrogaster laticephalus, new species.
Pectenosoma verrucosa yapurae, new subspecies.
- Crypturellus undulatus yapura** (Spix) :
Heptapsogaster mandibularis yapurae, new subspecies.
Pectenosoma verrucosa yapurae, new subspecies.
- Crypturellus variegatus salvini** (Salvadori) :
Pectenosoma verrucosa verrucosa (Taschenberg).
- Crypturellus variegatus variegatus** (Gmelin) :
Strongylocotes complanatus setifer Hopkins.
Pectenosoma verrucosa verrucosa (Taschenberg).
- Rhynchotus rufescens maculicollis** (G. R. Gray) :
Strongylocotes lipogonus alticola, new subspecies.
Docophorocotes sexsetosus secundus, new subspecies.
- Rhynchotus rufescens rufescens** (Temminck) :
Strongylocotes lipogonus lipogonus (Nitzsch).
- Nothoprocta branickii** Taczanowski :
Cuclocephalus extraneus extraneus Carriker.
Lamprocorpus hirsutus Carriker.
- Nothoprocta cinerascens** (Burmeister) :
Menacanthus nothoproctae, new species.
Rhyncothura heterura, new species.

- Rhynchothura chacoensis*, new species.
Heteropeostus carrikeri (Clay).
Nothoprocta ornata ornata (G. R. Gray) :
Cuclotocephalus extraneus ornatus, new subspecies.
Heptapsogaster tessellatus ornatus, new subspecies.
Lamprocorpus hirsutus Carriker.
Nothoprocta ornata subsp. (Incachaca, Bolivia) :
Cuclotocephalus secundus incachacae, new subspecies.
Nothoprocta pentlandi pentlandi (G. R. Gray) :
Cuclotocephalus extraneus similis, new subspecies.
Cuclotocephalus secundus secundus Carriker.
Heptapsogaster tessellatus pentlandi, new subspecies.
Rhynchothura subteres, new species.
Nothura maculosa oruro Bond and de Schauensee :
Rhynchothura minuta boliviana, new subspecies.
Nothura maculosa peruviana Berlepsch and Stolzmann :
Rhynchothura testudo (Clay).
Tinamotis pentlandi Vigors :
Tinamotaecola andinae, new species.
Rhynchothura andinae, new species.

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NOTE

Opportunity is here taken to correct a few errors that occurred in "Lice of the Tinamous" (Carriker, 1936):

Page 183: Under *Crypturellus atrocapillus*

Heptapsogaster mandibularis subsp. should read *Heptapsogaster temporalis chiniirii*.

Megapeostus asymmetricus microgenitalis should read *Megapeostus asymmetricus parvigenitalis*.

Crypturellus atrocapillus should read *Crypturellus garleppi affinis*. (Also same correction wherever this host name appears.)

Page 186: Text Plate 31, Figure 3

H. tataupa should read *H. genitalis*.

Also, it has been called to my attention by Paul H. Oehser that the generic name *Dimorphia*, proposed by me for a group of Mallophaga infesting the parrots (Lloydia, vol. 3, p. 294, Dec. 1940) is preoccupied in Diptera (Malloch, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 273, 1922). I therefore now propose the name **Epipsittacus** to replace *Dimorphia* Carriker, preoccupied, the genotype being *Epipsittacus mirabilis* (Carriker).



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THE FISHES OF THE FAMILY CHARACINIDAE FROM
VENEZUELA, WITH DESCRIPTIONS OF SEVENTEEN
NEW FORMS

By LEONARD P. SCHULTZ ¹

THIS report on the family Characinidae is the second contribution on the fishes of Venezuela resulting from my expedition to that country to study the fish fauna, mostly of the Maracaibo Basin, in February through May 1942. This work was undertaken at the invitation of Dr. Guillermo Zuloaga, assistant chief of explorations, Standard Oil Co. of Venezuela, now the Creole Petroleum Corporation, and was made possible through the cooperation of the Smithsonian Institution and the Department of State. I was a guest at the camps of the Standard Oil Co. of Venezuela and of the Lago Petroleum Corporation, Lago de Maracaibo, and to the officials of these companies grateful acknowledgment is made for their help and hospitality.

The previous report,² which treated the 12 families of catfishes, or bagre, reported from Venezuela, gave the details of my itinerary and a list of the stations where specimens were collected. These data apply as well to the present paper. The map of the Maracaibo Basin, showing collecting localities visited and other localities recorded, is reproduced on page 367, figure 56.

In all, 8,342 specimens of characins were collected in the Maracaibo Basin and in other Venezuelan localities, and these form the basis of

¹ Drawings of the new fishes reproduced herein were made by Mrs. Aime M. Awl, artist, U. S. National Museum.

² Proc. U. S. Nat. Mus., vol. 94, pp. 173-338, 5 figs., 14 pls., 1944.

this report. Specimens already in the collections of the United States National Museum were also used, and a few others were borrowed for study from the California Academy of Sciences, the American Museum of Natural History, the Chicago Natural History Museum, the Natural History Museum of Stanford University, and from Dr. William Beebe, New York Zoological Society.

There are recorded herein from Venezuela 58 genera and 117 species and subspecies of the Characinidae. These numbers should be considerably increased when adequate and further collecting of fishes is done in the Orinoco River system and in the coastal drainages of Venezuela. Three genera (one from the Orinoco system) and 17 species and subspecies (12 from the Maracaibo Basin and 5 from the Orinoco drainage) are here described as new to science. I was able to collect only in certain restricted regions of the Maracaibo Basin, and there is little doubt that many more new forms will be revealed when further collections are made in that basin.

At present, 29 species of characins are known from the Maracaibo Basin, and only two of these are found in the Orinoco system. One, *Hoplias malabaricus*, appears to be the same form along the coast from the Magdalena system to Brazil; but the other, a *Creagrutus*, may prove to be a distinct subspecies when the series from the Orinoco system are carefully compared with those from the Maracaibo Basin. Several species show close relationships with similar ones in the Magdalena River system. The only species reported from the Maracaibo Basin but not obtained by me is *Piabucina erythrinoides*, and this comes from a locality I did not visit.

Except in a few instances, subfamilies of the Characinidae as used by authors are omitted from the present treatment because they are not well defined.

No attempt will be made to discuss the distribution of the fresh-water fishes of Venezuela until the other groups represented in the collections have been studied.

DEFINITION OF TERMS

Terms used in this report are defined as follows:

Standard length is measured from tip of snout to midbase of caudal fin; *length of head* is the distance from tip of snout to rear end of fleshy operculum; *depth* is greatest depth of body; *snout* is from tip of snout to front of eye; *distance between nostrils* or *nostrils to eye* is measured from edge of nasal openings; *interorbital space* is fleshy distance between eyes; *postorbital length of head* is distance from eye to rear end of fleshy operculum; *caudal peduncle length* is measured from base of last anal ray to midbase of caudal fin; distances involving the *anus* are measured from center of anus.

It appears necessary to explain my methods of counting and recording fin rays both for the characins and for the Nematognathi reported upon previously. The use of small Roman numerals for the simple unbranched soft rays of all fins was not without precedent and was not intended to represent the evolution or homologies of true spines or soft rays but was adopted as a practical means of indicating the fact that the first soft rays are often unbranched, flexible, and nonpungent. Furthermore, I find that the separation of the unbranched from the branched rays, especially for the pectoral fins, is of prime importance in distinguishing genera and species. Many authors have wholly neglected to study the pectoral fin rays, thereby missing a valuable diagnostic character. In characins, counting only the branched or principal rays is not adequate, though most authors agree that it is a sufficient count in American Cyprinidae. I did not observe that the number of unbranched or branched rays of characins or Nematognathi changed with age, as has been noted in certain groups of fishes.

Simple, unbranched soft rays are represented by small Roman numerals and the *branched soft rays* by Arabic numerals thus: iii, 8. Pungent spines are represented by large Roman numerals, although no true spines occur in the Characinidae. In the case of the caudal fin only branched soft rays were counted, and these are sometimes separated in a formula, as 9+8, which indicates 9 rays in dorsal part of caudal fin and 8 in the lower lobe.

I counted all rudimentary rays in the dorsal, anal, pectoral, and pelvic fins and counted as a single ray each that had a separate base. In cases where the last ray was divided at the base, this was counted as one ray. However, many of the genera and species reported upon here did not have the last ray of either dorsal or anal fins divided at the base.

Other terms will be found self-explanatory as the species involved are carefully studied.

Order HETEROGNATHI

Family CHARACINIDAE

The Characinidae belong to the great group of ostariophysan fishes having the Weberian apparatus, which consists of the first four vertebrae modified into a series of bony ossicles that connect the air bladder with the auditory apparatus or ear.

This diverse family of fresh-water fishes, found in both Africa and South America, is most closely related to the Nematognathi, or catfishes, and to the Cyprinidae. The characinids have evolved so many diverse elements and specialized forms in this vast territory that the family cannot be defined by any one character; instead, we

are forced to "content ourselves with a combination of characters" summarized below:

Mouth usually bordered by premaxillaries in the middle and maxillaries on the sides; teeth usually present on the jaws, only rarely on the palatine bones; soft rayed dorsal fin, usually followed by an adipose fin; body covered with scales; head naked; branchiostegal rays 3 to 5; gill arches 4; pseudobranchia lacking or rudimentary and glandular; coracoid sometimes forming a ventral ridge; pelvic rays usually number 10 to 13; the first ray of pectoral, dorsal, and anal rays but rarely ossified and never forming a sharp spine as in the Nematognathi; air bladder always divided into two parts by a constriction, anterior part smallest; usually about 10 to 40 caeca on stomach; intestines short or very long in herbivorous forms.

ARTIFICIAL KEY TO THE GENERA AND TO CERTAIN SUBFAMILIES OF CHARACINIDAE REPORTED FROM VENEZUELA

- 1a. No teeth in either jaw and none on lips; nares close together, separated by a dermal flap; lateral line complete, straight, along midaxis of body; intestine greatly coiled, very long; caudal fin forked; adipose fin present.
- 2a. Caudal lobes densely scaled to near tips; preventral area flat with a median series of scales and blunt lateral keels; postpelvic area with a median keel and two lateral keels converging toward anal, less developed in young----- *Curimatella* Eigenmann and Eigenmann (p. 248)
- 2b. Caudal fin scaled only a short distance out from base; gill membranes joined with each other and with a narrow free fold moderately forward on isthmus; lower jaw oblique, with hard edge; interorbital convex.
- 3a. Roof of mouth with folds of tissue and sometimes with papillae; predorsal plate absent; gill rakers short, numerous; low midventral ridge present from pelvics to anus but not well developed; scales large.
Curimata Walbaum (p. 249)
- 3b. Roof of mouth normal, without dermal folds or papillae; predorsal plate minute, bilobed; no scales in midline except middle third of length in young; gill rakers absent anteriorly, represented by a dermal fold; scales small; midventral ridge from anus to pelvics well developed.
Anodus Agassiz (p. 251)
- 1b. Teeth present in one or both jaws or on the lips.
- 4a. Abdomen keeled, with a median series of sharp-edged bony plates with backward-directed points; body much compressed; anal base oblique, long; dorsal base long; scales small; a naked predorsal line; teeth strong, in one or two series in both jaws, usually with sharp cutting edges (*Serrasalminae*).
- 5a. Teeth in a single series in both jaws; teeth with a strong median cusp and with either a single lateral cusp or a pair, those of upper jaw mostly asymmetrical----- *Serrasalmus* Lacepède (p. 254)
- 5b. Premaxillary teeth in two series; mandibular teeth in a single series; sometimes a pair of conical teeth behind and in contact with symphyseal mandibular teeth; abdomen serrated before and behind pelvics; teeth more or less close-set, either incisorlike or with an oblique cutting edge or molariform; each premaxillary with 5 teeth in the outer and 2 in the inner series; jaws equal or lower jaw a little projecting; conical mandibular teeth present.

- 6a. No predorsal spine.
- 7a. Supplementary scales, if present, small and confined to hinder edges of primary scales; anal fin with a basal sheath of scales and with highest rays anteriorly-----*Colossoma* Eigenmann (p. 255)
- 7b. Numerous supplementary scales which may obscure the primary ones; anal fin densely scaled in at least its basal half and with highest rays posteriorly or of nearly equal length posteriorly and anteriorly-----*Mylossoma* Eigenmann and Kennedy (p. 256)
- 6b. A predorsal spine present; base of adipose fin less than half as long as that of rayed dorsal; dorsal with 22 rays or more; anterior teeth of outer series of premaxillary with an oblique cutting edge, not greatly compressed, generally more or less separated from those of inner series-----*Mylopius* Gill (p. 258)
- 4b. Abdomen rounded or flattish or if keeled the median ridge lacking backward-directed points.
- 8a. Both dorsal and anal origins in last third of standard length, body very elongate, narrow, with a pikelike mouth, belly rounded and having no keel; interorbital space flattish; pointed snout about as long as greatest depth of body; gill membranes extending far forward, free from each other and from isthmus; teeth conical, in a single row in both jaws; caudal fin forked (*Ctenolucinae*).
- 9a. Numerous small, close-set, conical teeth in a single row, hooked backward on premaxillary, and meeting at tip of jaw to form a rounded expansion with somewhat enlarged teeth; 3-3 vomerine teeth opposite constricted portion of premaxillary; front sides of lower jaw with a barbellike flap of skin; anal origin under middle of dorsal base; dorsal origin almost equal distance from pelvic insertion to midcaudal base; last anal ray not filamentous; scales ctenoid.
Ctenolucius Gill (p. 258)
- 9b. Numerous small conical teeth in a single row, hooked backward, meeting at a point or acute angle behind projecting fleshy tip of snout; no vomerine teeth; no flap of skin at front of lower jaw; anal origin behind base of dorsal fin; dorsal origin 6 or 7 times closer to a vertical through pelvic origin than one through midcaudal base; last anal rays filamentous, at least in young; scales probably cycloid-----*Boulengerella* Eigenmann (p. 261)
- 8b. Dorsal or anal origins or both in middle third of standard length; snout not pikelike.
- 10a. Numerous fine, incisorlike teeth on margins of lips, then a curved V-shaped row at front of both jaws; mouth protractile; scales rough; a conspicuous bispinous predorsal plate; a rather strong midventral ridge from pelvics to anus; interorbital convex; gill membranes joined, and narrowly joined to isthmus.
Prochilodus Agassiz (p. 261)
- 10b. No fine teeth on margins of lips.
- 11a. Gill membranes firmly joined to isthmus without a free fold across it and none of teeth canines; lateral line complete, straight; adipose fin present; caudal fin forked.
- 12a. Fourth gill arch dilated behind; anterior side of fifth gill arch with its surface corrugated or plicated; each jaw with about 12 feeble incisorlike teeth in fleshy lips; mouth not protractile, rather small, terminal; gill rakers minute.
Chilodus Müller and Troschel (p. 265)

12b. Fourth gill arch normal.

13a. Nostrils close together and separated only by a dermal flap; 4 teeth with broad cutting edges projecting forward in each side of both jaws; basal two-thirds of caudal lobes scaled; lips reflected with a free margin on both jaws, the lower lip lobed; anal short, without basal sheath of scales.

Leporellus Lütken (p. 265)

13b. Nostrils rather widely separated by an isthmus of skin, the anterior nostril somewhat tubular; predorsal plate absent.

14a. Mouth small, terminal, or inferior, with 4 to 6 teeth on each side of both jaws directed obliquely forward toward middle, these teeth obliquely truncate or lobed; anal short; snout conical; second suborbital not covering more than half of cheek; lips somewhat plicate.

Leporinus Agassiz (p. 267)

14b. Mouth opening vertical or nearly so, narrow and elongate, lower jaw folding upward to close mouth; lower jaw bearing at its tip 2 large, hooked, projecting teeth, sickle-shaped at tips; upper jaw with 3 or 4 spear-shaped teeth on each side directed forward.

Gnathodolus Myers (p. 268)

14c. Mouth small, terminal or oblique, with incisorlike teeth lobed or not in a single series of 8 in each jaw, those at front of lower jaw not directed forward toward middle; lips not plicate.

15a. Middle teeth of lower jaw trifold, with three points; mouth terminal, somewhat oblique (fig. 31, a).

Schizodon Agassiz (p. 268)

15b. Middle teeth of lower jaw incisors with truncate edge; mouth terminal, oblique.....*Laemolyta* Cope (p. 272)

11b. Gill membranes extending far forward and free from isthmus or narrowly joined far forward, sometimes with a free fold across isthmus, or sometimes broadly joined to each other with a wide free fold across isthmus.

16a. Midline of belly with a keel or ridge in front of pelvis; abdominal region sometimes greatly compressed to an edge, or trenchant; anterior and posterior nasal openings close together, separated only by a dermal flap.

17a. Lateral line complete.

18a. Lateral line nearly straight along midaxis of body; mouth large, gape oblique, teeth conical, sharp, long canines present; gill membranes separated, free from isthmus.

19a. Anal fin covered with minute scales nearly to their tips, caudal fin with minute scales basally; scales minute.

20a. Dorsal origin considerably in front of anal origin.

Hydrolycus Müller and Troschel (p. 272)

20b. Dorsal origin behind anal origin and both far behind middle of elongate body; dorsal profile nearly straight, ventral profile curved to under pectorals, then nearly straight; belly much compressed, ventral edge thin.....*Rhaphiodon* Agassiz (p. 273)

19b. Anal base with a sheath of scales consisting of about 2 rows; caudal fin base not with minute scales; anal rays iv, 40 to iv, 49; dorsal origin a little behind anal origin;

- dorsal profile concave at occiput; scales moderate in size, about 58 to 74.—*Gilbertolus* Eigenmann (p. 302)
- 18b. Lateral line decurved, closer to anal base than to mid-axis of body; preventral area trenchant, moderately enlarged; dentary with strong triangular multipointed teeth at front of jaw and small ones at sides; inner row consisting of 2 conical teeth at symphysis; premaxillary with 2 or 3 irregular rows of teeth, second suborbital not covering cheek, adipose fin present; gill membranes separated, free from isthmus.—*Triportheus* Cope (p. 273)
- 17b. Lateral line incomplete.
- 21a. Lateral line deflected to before anal origin; gill membranes narrowly joined and with a narrow free fold across isthmus; preventral area compressed, trenchant, greatly expanded; pectorals large, saillike; body very short and deep (*Gasteropelecinae*).
- 22a. No adipose fin; maxillary with a single tooth.
Carnegiella Eigenmann (p. 275)
- 22b. Adipose fin present, well developed; maxillary with 3 to 5 teeth; premaxillary with a single row of tricuspid teeth; anterior profile straight.—*Thoracocharax* Fowler (p. 275)
- 21b. Lateral line ending near midaxis of body but not deflected to in front of anal; gill membranes free from isthmus without a free fold; preventral area trenchant but not expanded; anal sheath of 2 to 2½ scales; dorsal origin over about the base of fifth or sixth branched anal ray; teeth in a single series in both jaws, tripointed, no canines.—*Paragoniates* Steindachner (pp. 309, 311)
- 16b. Midline of belly not trenchant and without a median keel or ridge in front of pelvics; belly rounded or flattish.
- 23a. First 3 or 4 rays of pectoral fins simple, unbranched, somewhat enlarged; gill membranes free from each other and from isthmus; lateral line complete; only slightly decurved anteriorly; teeth nearly conical or tricuspid, in a single row on premaxillary and a similar row on dentary; an inner row of minute teeth occurring on dentary along inner bases of larger outer row, these visible if lower jaw of specimens is partially dried; adipose fin present; second suborbital not covering cheek.—*Characidium* Reinhardt (p. 276)
- 23b. Only first or second ray of pectoral fin simple; if first two simple, then middle of lower jaw toothless.
- 24a. No teeth on middle of lower jaw, which is hard-edged, but teeth sometimes occurring at sides of jaw; premaxillary teeth spatulate, minutely denticulated; gill membranes broadly joined but with a broad free fold across isthmus; adipose fin present; caudal fin forked; caudal fin lobes with scales about halfway out; pelvics with axillary scale; lateral line complete, straight; mouth subterminal or inferior; teeth in upper jaw usually 2+8+2 (2 teeth on each maxillary); upper lip not free but forming part of the flesh between bases of teeth; pectoral fin rays i, 11 to i, 16; usually 3 teeth on each side of lower jaw (*Parodontinae*).
Parodon Valenciennes (p. 288)

- 24b. No teeth on lower jaw, but upper jaw with a single row of 20 to 30 pluricuspid, incisorlike teeth; gill membranes free from each other and from isthmus; lateral line complete; premaxillary not protractile; eye in a sheath or adipose lid with small circular opening; pelvics inserted under middle of dorsal base and dorsal origin closer to snout than base of caudal fin-----*Hemiodus* Müller (p. 291)
- 24c. Middle of lower jaw with teeth and without hard cartilaginous edge.
- 25a. Teeth in two rows in lower jaw, inner row sometimes represented by a pair of teeth near symphysis or a row of minute teeth; pelvics inserted in front of a vertical line through dorsal origin.
- 26a. Adipose fin present.
- 27a. Teeth on premaxillary in one or two rows, the inner row on dentary formed by a series of minute teeth directed inward.
- 28a. No canines in either jaw; gill membranes free from isthmus but partially united forward with a narrow free fold across it; base of anal fin with a sheath of scales.
- 29a. Teeth tricuspid; premaxillary teeth in one row, those at front similar to outer row of dentary and numbering 9 to 11 on a side; caudal fin scaled two-thirds the way out, only a wide margin scaleless; upper caudal lobe longest; lateral line obsolete.
Fiabucina Valenciennes (p. 291)
- 29b. Teeth conical, short, in two rows in both jaws; maxillary with a single row along its entire edge; maxillary slipping under preorbital and reaching to rear of eye; lateral line complete, a little decurved anteriorly; caudal scaled a little at its midbase.
Salminus Agassiz (p. 293)
- 28b. Both jaws with several canine teeth as follows: 2 pairs on premaxillaries and 4 or 5 pairs on dentaries; no small conical teeth between canines on lower jaw; inner series of teeth of dentary confined to front of jaw; anterior half of upper portion of first gill arch with rough plates instead of elongate gill rakers.
Cynopotamus Valenciennes (p. 295)
- 27b. Teeth tricuspid, in 3 rows on premaxillaries, inner row on dentary formed by a pair of enlarged teeth at symphysis; maxillary long, narrow with a series of teeth along its entire edge; lower jaw included; gill rakers numerous, slender; lateral line complete; dorsal origin in front of that of anal.
Brycon Müller and Troschel (p. 307)
- 26b. Adipose fin absent; top of head flat; no canines; lower jaw longest, mouth oblique, short; dorsal fin behind middle of length of body without tail; anal with a

sheath of scales, middle rays longest; upper caudal lobe longest; nostrils separated by a flap of skin.

- 30a. Anterior edge of maxillary straight or gently convex, the point where maxillary and premaxillary join nearly straight or only slightly concave; maxillary extending obliquely to under front of eye; teeth conical, in 2 series on both jaws and these 2 series widely separated at least on males; gill membranes narrowly united forward with a narrow free fold across isthmus; a few scales occurring at bases of caudal lobes--- *Pyrrhulina Valenciennes* (p. 307)
- 30b. Anterior edge of maxillary sharply convex near its union with premaxillary and this convexity reaching a vertical line through snout tip or nearly so, thus at the point of union of maxillary and premaxillary a deeply concave space occurring; maxillary very short, nearly vertical in position and not reaching front of eye; teeth on premaxillary in a single row; two widely spaced rows of teeth on dentary of males, closer together in females; gill membranes broadly joined with each other and forming a wide free fold across isthmus.

Copeina Fowler (p. 303)

25b. Teeth in a single row in lower jaw.

- 31a. Outer edge of lips with bony protuberances; teeth conical in one irregular row on both jaws but no canines; body compressed; lateral line complete near midaxis of body; adipose fin present; anterior profile concave; pectoral base in a bony notch of cleithrum protected below by a bony elongation; dorsal origin near middle of length and behind the anal origin; anal fin base very long--- *Roeboides* Günther (p. 303)

31b. Outer edges of lips fleshy without bony protuberances.

- 32a. Strong canines present in both jaws; teeth conical; a single row in lower jaw; lateral line straight; mouth large, terminal.

33a. Adipose fin present; body much compressed; profile of head concave; nostrils separated by a valvular flap of skin; caudal fin forked; an outer row of small conical teeth between the 2 canines on each premaxillary, inner row consisting of 2 enlarged conical teeth on each side; middle pair of canines on dentaries fanglike; pectoral shield with shallow notch.

Cyrtcharax Fowler (p. 296)

33b. No adipose fin; body elongate, little compressed; no fontanels; nostrils separated by skin of head so that an isthmus separates anterior and posterior nasal openings; head bony and somewhat depressed; caudal fin rounded; a single row of teeth in upper jaw.

34a. Maxillary with 1 or 2 short canines anteriorly, reaching past rear of eye in adults; walls of air

bladder normal; palatine teeth with an outer enlarged row, then an elongate strip along inside of enlarged row, a short patch of teeth occurring anteriorly, these separately movable from elongate strip; about 20 to 24 scales in a zigzag row around caudal peduncle.

Hoplias Gill (p. 308)

34b. Maxillary without a canine; walls of air bladder cellular; no enlarged row of teeth on palatines; 14 to 16 scales in a zigzag row around caudal peduncle.

35a. Two broad patches of teeth in roof of mouth separated by a narrow edentulous strip; pterygoids with teeth; dorsal and pelvics rounded when spread; opercle with black spot.....**Hoplerythrinus** Gill (p. 309)

35b. Palatines with villiform teeth in a narrow elongate band; pterygoids toothless; dorsal fin angular or pointed, the longest ray next to last; anal and pelvics pointed; rear of opercle without black spot.

Erythrinus Scopoli (p. 309)

32b. No canine teeth in either jaw; nostrils close together separated by a dermal flap; teeth usually 3- to 7-pointed.

36a. Premaxillary with a single row of teeth, sometimes one tooth on each side a little out of line with others.

37a. Dorsal rays about 18; mouth small, with scarcely any gape; maxillary reaching only to anterior border of eye; adipose fin present; body compressed; snout pointed; lateral line incomplete, with 5 or 6 pores; teeth tricuspid in both jaws; scales about 25, with 6 in a transverse series.

Elachocharax Myers (p. 309)

37b. Dorsal rays usually ii, 8 or ii, 9, never more than ii, 10.

38a. Anal origin in front of that of dorsal fin; anal fin with a long base, rather straight; caudal fin forked; mouth small, oblique, lower jaw projecting a little in front of upper; body compressed, thin; distance from tip of snout to rear of maxillary about $1\frac{1}{2}$ in postorbital length of head, about equal to interorbital width, and 2 to $2\frac{1}{2}$ times in distance from tip of snout to occiput; tip of snout to occiput 3 to 5 times in length of anal fin base.

39a. Adipose fin absent; lateral line incomplete with 9 to 16 pores.

Phenagoniates Eigenmann and Wilson (pp. 310, 311)

39b. Adipose fin present; lateral line complete.

Xenagoniates Myers (pp. 310, 312)

38b. Anal origin behind that of dorsal fin.

40a. Lateral line incomplete.

41a. Greatest depth $3\frac{3}{4}$ to 4 times and head 4 in standard length; anal rays iii, 16 or 17; scales 34 to 37, 5 or 6 above, and 3 to $3\frac{1}{2}$ below lateral line; 9 to 11 pores in lateral line; 14 predorsal scales; teeth small, tricuspid; 6 teeth on each premaxillary and 12 to 14 along greater part of each maxillary; about 13 teeth on each dentary; pectorals not reaching pelvics; pelvics inserted a little in advance of dorsal origin; caudal fin brick red, when alive; no black caudal spot.

Aphyocharax Günther (p. 312)

41b. Greatest depth about $2\frac{1}{2}$ to 3 times in standard length; about 6 to 8 pores in lateral line.

42a. Interhaemals not projecting on ventral side of caudal peduncle of males; caudal fin scaled out one-third its length and none of scales saclike or glandular; maxillary with minute teeth along its anterior convex edge; premaxillary row of teeth with third tooth a little out of line; about 7 pores in lateral line; mouth oblique, lower jaw a little longer and, when closed, in front of upper; a black bar across dorsal, one on front of anal fin and pelvic fins; anal rays about iii, 20 or 21.

Pristella Eigenmann (p. 312)

42b. Several or many interhaemals projecting on lower side of caudal peduncle of adult males; no enlarged scales on caudal fin base; about 6 to 8 pores in lateral line; teeth with about 7 points; a few teeth on maxillary.

Cheirodon Girard (p. 313)

40b. Lateral line complete; interhaemals not projecting.

43a. Teeth on premaxillary and on dentary usually 7-pointed and similar in both jaws, distal part of each tooth enlarged, much broader than its base (fig. 41a, b), sides of teeth in dentary not parallel; maxillary with 2 teeth and premaxillary usually with 5 or 6 teeth on each side.

44a. Lower lobe of caudal fin with a dermal sac more or less covered with a few enlarged scales (fig. 41, c).

Saccoderma, new genus (p. 314)

44b. Base of caudal fin "naked," without enlarged scales and without a dermal sac developed, scales of body ending near base of caudal fin as is usual on many species of fishes.

Odontostilbe Cope (p. 318)

43b. [Teeth on premaxillary and on dentary not of same shape (fig. 43) but usually 5-pointed, the two outer points minute and located at lower sides of next inner point of tooth; maxillary with teeth; caudal fin with scales only at base and none enlarged, no dermal sac on lower lobe of caudal fin.

Cheirodontops, new genus (p. 319)

36b. Premaxillary with 2 or 3 rows of teeth, dentary with 1 row.

45a. Origin of dorsal fin considerably behind middle of body and considerably behind a vertical line through anal origin; lower caudal fin rays or fulcra of males free, forming a peculiar spur; caudal fin base without glandular scales; second suborbital covering cheek; 5 teeth in inner row of premaxillary; anal branched rays 25 to 32; middle rays of caudal fin usually blackish; mouth oblique, lower jaw, when closed, in front of tip of snout; lateral line decurved anteriorly; sheath of scales along anal fin base not quite complete, last few lacking. *Gephyrocharax* Eigenmann (p. 322)

45b. Origin of dorsal fin in front of that of anal; lower caudal rays of males not free from other caudal fin rays.

46a. Scales ctenoid with age and always ctenoid on prepelvic area; lateral line complete, a long tube extending out on base of middle caudal membrane, caudal fin base naked; 4, rarely 5, teeth in front row of premaxillary and 5 teeth in inner row, all teeth 3- to 5-pointed; anal rays 38 to 49.

Ctenobrycon Eigenmann (p. 326)

46b. Scales not ctenoid even on prepelvic area.

47a. Premaxillary teeth in 3 rows or if in 2 rows the teeth very irregular, with at least 2 teeth on each side out of line with the others; teeth tricuspoid; lower jaw included, oblique; dorsal origin nearer snout by eye diameter than caudal base, and nearly over pelvic insertion; branched anal rays 8 to 12; caudal fin base naked.

48a. Lateral line incomplete, with only 9 or 10 pores just behind head; teeth arranged as in figure 46.

Creagrutops, new genus (p. 327)

48b. Lateral line complete.

49a. Teeth of upper jaw arranged as shown in figure 48.

Creagrutus Günther (p. 330)

49b. Teeth in upper jaw in 2 irregular rows on premaxillary, 4 large tricuspid teeth in inner row and 3 small teeth in an outer irregular row, the first and third set out and the second set back forming a middle row; maxillary with about 12 tricuspid teeth.

Creagrudite Myers (p. 337)

47b. Premaxillary teeth 2-rowed; branched anal rays about 12 to 45.

50a.³ Caudal fin with the scales extending one-fourth or a greater distance out on rays of that fin, these scales usually small.

51a. Lateral line complete; anal sheath of scales present, at least anteriorly.

52a. Lateral line much decurved in front, not parallel with row of scales below it in front, frequently several odd scales in front between it and the next regular series; depth at least half standard length; pre-ventral area flat with sharply bent scales on sides; profile depressed, over eyes; occipital crest one-third of distance from its base to dorsal; outer series of premaxillary teeth small and of even size, inner row larger, graduated; dentary with larger teeth in front, abruptly minute behind; anal rays 31 to 37.

Tetragonopterus Cuvier (p. 337)

52b. Lateral line little decurved, parallel with row of scales below it.

53a. Second suborbital leaving a naked area between it and lower limb of preopercle; at least 5 teeth in inner row of premaxillary; outer series of premaxillary teeth in a line parallel with inner series, except for one tooth that frequently retreats a little from in line with others; anal rays 18 to 37.

Moenkhausia Eigenmann (p. 338)

53b. Second suborbital in contact with preoperculum below and usually covering cheek; caudal fin base variably scaled or naked; 4 teeth

³ Sections 50a and 50b modified after Eigenmann.

in inner row of premaxillary, one tooth on each side in outer row sometimes out of line; anal rays 15 to 43.

Bryconamericus Eigenmann (p. 338)

- 51b. Lateral line incomplete, of 3 to 18 pores; maxillary teeth if present crowded on upper anterior angle; anal sheath of scales short, incomplete; anal rays 12 to 34.

Hemigrammus Gill (p. 348)

- 50b. Caudal fin naked except at its base, scales on middle of lobes of caudal fin never minute and not extending more than one-fourth way out on longest rays.

- 54a. Lateral line incomplete; about $2\frac{1}{2}$ scales bordering on one side of supraoccipital process; sheath of scales on anal base only along anterior half or less; usually 5 teeth in inner row on premaxillary.

Hyphessobrycon Durbin (p. 349)

- 54b. Lateral line complete.

- 55a. Second suborbital not covering cheek and not in contact with preopercle; about 5 teeth in inner row on premaxillary; premaxillary-maxillary borders usually sharp-angled where they meet; usually 4 scales bordering on one side of supraoccipital process; anal rays 18 to 45.

Astyanax Baird and Girard (p. 353)

- 55b. Second suborbital in contact with lower limb of preopercle; usually 4 teeth in inner series of premaxillary; anal rays 15 to 43; 2 to $2\frac{1}{2}$ scales bordering on one side of supraoccipital process; anal sheath of scales along base of anal rays at least anteriorly.

- 56a. None to 6 teeth crowded at anterior upper portion of maxillary.

Bryconamericus Eigenmann (p. 338)

- 56b. Teeth along greater part or along entire edge of maxillary.

Hemibrycon Günther (p. 361)

Genus **CURIMATELLA** Eigenmann and Eigenmann

Curimatella EIGENMANN and EIGENMANN, Ann. New York Acad. Sci., vol. 4, p. 7, 1889. (Type, *Curimatella lepidurus* Eigenmann and Eigenmann.)

The following key to the species of *Curimatella* reported from Venezuela was prepared from the literature. A further study of

specimens from the Orinoco may reveal that only one species occurs at Ciudad Bolívar.

1a. Scales 32, $5\frac{1}{2}$ above lateral line and 5 to $5\frac{1}{2}$ below it to pelvic bases; caudal base with a large blackish-brown spot.

Curimatella bolivarensis (Steindachner)

1b. Scales 35 to 38, 5 or $5\frac{1}{2}$ above and 5 scales below lateral line; no dark caudal spot.....*Curimatella alburna* (Müller and Troschel)

CURIMATELLA BOLIVARENSIS (Steindachner)

Curimatus bolivarensis STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 47, p. 265, 1910 (Ciudad Bolívar, Venezuela).

CURIMATELLA ALBURNA (Müller and Troschel)

Anodus alburnus MÜLLER and TROSCHER, Horae ichthyologicae, pts. 1, 2, p. 26, pl. 4, fig. 3, 3a, 1845 (Guiana, Lake Amucu).

Curimatus alburnus STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 153, 1879 (Ciudad Bolívar).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Genus CURIMATA Walbaum

Curimata WALBAUM, Artedi's Bibliotheca ichthyologica, vol. 3, ed. 2, p. 80, 1792. (Type, *Salmo marcgravi* Walbaum = *Salmo cyprinoides* Linnaeus.) (Ref. copied.)

KEY TO THE SPECIES OF CURIMATA REPORTED FROM VENEZUELA

1a. Scale rows from anterior edge of gill opening to midbase of caudal fin 51 to 63; second and third rays of dorsal produced, reaching in extreme cases to caudal; roof of mouth with numerous folds of skin; upper gill arches with papillae and with valvelike folds at anterior ends; lower gill arches with backward- and forward-directed rakerlike filaments on anterior halves, forming a grill on floor of mouth and with a few large papillae on posterior halves.....*Curimata schomburgkii* Günther

1b. Scale rows fewer than 50.

2a. Midbase of caudal fin or rear of caudal peduncle with a black spot; anal rays iii, 7 and dorsal ii, 9; scales about 35 or 36, $5\frac{1}{2}$ to 6 above and $4\frac{1}{2}$ to $5\frac{1}{2}$ below lateral line.

3a. A roundish black blotch or spot at midbase of caudal fin and extending a little on caudal peduncle; base of dorsal rays without a black blotch; insertion of pelvics equal distance from tip of snout and midcaudal base; depth of body 3; scales below lateral line to pelvic base $4\frac{1}{2}$.

Curimata spilura Günther

3b. An oblong blackish blotch or spot on midposterior end of caudal peduncle barely extending on base of rays; an elongate black streak basally on middle dorsal rays; insertion of pelvics closer to tip of snout than to midcaudal base by a distance equal to diameter of eye; depth of body $2\frac{1}{2}$; scales below lateral line to pelvic base 5 to $5\frac{1}{2}$.

Curimata argentea Gill

2b. No black blotch at base of caudal fin, scales numbering 39 to 43 from gill opening to midcaudal base, with 6 above and 5 or 6 below lateral line; dorsal rays ii, 9, anal iii, 7, pectoral i, 13 or i, 14; roof of mouth with 5 lengthwise fleshy folds, one along midline enlarged anteriorly, the pair next to midline enlarged posteriorly, and outer pair enlarged anteriorly; rear of mouth at sides below orbit with a patch of dermal papillae; inside of gill cover finely papillate; gill rakers short, pointed, about 19 or 20+30;

a very low keel along midventral line from pelvics to anus; peritoneum dusky to blackish on sides, paler ventrally; body plain darkish above, paler below; in young and half-grown a faint grayish streak occurring along midsides posteriorly----- *Curimata magdalенаe* Steindachner

CURIMATA SCHOMBURGKII Günther

Curimatus schomburgkii GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 291, 1864 (British Guiana).

Curimata schomburgkii FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Pitch Lake at Guanoco, Venezuela).

CURIMATA SPILURA Günther

Curimatus spilurus GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 288, 1864 (Essequibo).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 153, 1879 (Ciudad Bolívar).

Curimata spilura EIGENMANN and ALLEN, Fishes of western South America, p. 292, 1942 (Orinoco).

CURIMATA ARGENTEA Gill

Curimatus argenteus GILL, Ann. Lyc. Nat. Hist. New York, vol. 6, p. 62, 1858 (Trinidad).—EIGENMANN, Indiana Univ. Studies, vol. 7, No. 44, p. 9, 1920 (El Concejo, Río Tiquirito, Maracay, Río Bué, Venezuela).—PEARSE, Univ. Wisconsin Studies, No. 1, p. 21, 1920 (mouth Río Bué, Lago Valencia at Maracay, Venezuela).

Curimata argentea FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Pitch Lake at Guanoco, Venezuela).

CURIMATA MAGDALENAE Steindachner

BOCACHICA

Curimatus magdalенаe STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 39, p. 50, 1878 (Río Magdalena).—MEEK and HILDEBRAND, Publ. Field Mus. Nat. Hist., zool. ser., vol. 10, No. 15, p. 269, 1916 (Lake Maracaibo).—EIGENMANN, Mem. Carnegie Mus., vol. 9, p. 104, pl. 17, fig. 2, 1922 (Encontrados, Estado de Zulia, Maracaibo Basin).

See table 1 for counts made on specimens of *Curimata magdalенаe*. Throughout the extensive range of *C. magdalенаe* local populations, presumably of subspecific rank, undoubtedly occur, but the significance of these and their naming should await a careful analysis of hundreds of examples from many different stream systems. There are about 19 or 20+30 gill rakers on the first gill arch of the form in the Maracaibo Basin.

The following collections were made by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942:

U. S. N. M. No. 121309, 4 specimens, 45 to 92 mm. in standard length, Río Machango at bridge south of Lagunillas, March 16.

U. S. N. M. No. 121312, a specimen 114.5 mm., from the Río San Pedro at the bridge south of Mene Grande, Motatán system, March 20.

U. S. N. M. No. 121308, a specimen 83 mm., from Ciénaga del Guanavana about 10 km. north of Sinamaica, March 11.

U. S. N. M. No. 121310, 14 specimens, 35 to 79 mm., taken in Lago Tulé, about 75 km. west of Maracaibo, Río Socuy drainage, March 1.

U. S. N. M. No. 121314, 2 examples, 104 and 170 mm., obtained in Lake Maracaibo at the mouth of the Río Concha, May 2.

U. S. N. M. No. 121311, 2 specimens, 106 and 109.5 mm., from the Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U. S. N. M. No. 121313, 3 examples, 101.5 to 112 mm., from the Río Apón about 35 km. south of Rosario, February 26.

U. S. N. M. No. 121319, 1 specimen, 194 mm., from the Río de Los Pajaros, 3 km. above Lago Maracaibo, April 30.

U. S. N. M. No. 121315, 29 examples, 86.5 to 133 mm., from the Río San Juan near the bridge south of Mene Grande, Motatán system, March 17 and 20.

U. S. N. M. No. 121316, 16 examples, 108 to 147 mm., taken from a caño ¼ km. west of Sinamaica, March 11.

U. S. N. M. No. 121317, 52 specimens, 42.5 to 132 mm., from the Río Negro below mouth of Río Yasa, March 2.

U. S. N. M. No. 121318, 25 specimens, 55 to 150 mm., from the Río Socuy, 3 km. above mouth, February 24.

TABLE 1.—Counts made on *Curimata magdalenae* from three South American localities

Locality	Number of fin rays						Number of scales								
	Dor-sal	Anal	Pelvic		Pectoral		Rows crossing lateral line					Above	Below		
	ii, 9	iii, 7	i, 7	i, 8	i, 13	i, 14	39	40	41	42	43	44	6	5	6
Truando, Colombia..	3	3	-----	3	-----	6	2	1	-----	-----	-----	-----	3	3	-----
Calamar, Colombia..	3	3	-----	3	6	-----	-----	1	1	-----	1	-----	3	2	1
Maracaibo Basin, Venezuela.....	6	6	1	6	1	8	-----	-----	1	5	1	-----	6	-----	6

Three specimens, F.M.N.H. Nos. 41992–41994, from Lago Maracaibo, W. H. Osgood, 1911, were lent to me for report by the Chicago Natural History Museum.

In specimens about 80 to 100 mm. and sometimes smaller, the midsides of the body have a darkish band posteriorly, with a pale streak running along the lateral line in the middle of this band; in larger specimens the sides are plain in color.

This species is used extensively as food, as it is one of the better flavored fishes in the Maracaibo Basin.

Genus ANODUS Agassiz

Anodus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . ., p. 57, pl. 40, 1829. (Type, *Anodus elongatus* Agassiz.) (Ref. copied.)

ANODUS LATICEPS (Valenciennes)

BOCACHICA

Curimatus laticeps VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 21, pl. 634, 1849 (Lago Maracaibo).—GÜNTHER, *Catalogue*

of the fishes in the British Museum, vol. 5, p. 293, 1864 (Lago Maracaibo).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 43, p. 137, 1882 (Lagoon of Maracaibo).—EIGENMANN and EIGENMANN, Ann. New York Acad. Sci., vol. 4, p. 24, 1889 (Lago Maracaibo).

Anodus laticeps EIGENMANN and ALLEN, Fishes of western South America, p. 300, 1942 (Lago Maracaibo).

See table 2 for certain counts made on this species from the Maracaibo Basin.

The following collections were made by Leonard P. Schultz during 1942, in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121321, 3 specimens, 149 to 152 mm., taken in the Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. 121323, 4 specimens, 128 to 159 mm., from the Río Palmar at the bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121322, specimen, 130 mm., from pool in Río San Ignacio, 20 km. south of Rosario, February 26.

U.S.N.M. No. 121320, 9 specimens, 207 to 255 mm., from the Río Apón about 35 km. south of Rosario, February 26.

TABLE 2.—Counts made on *Anodus laticeps* from the Maracaibo Basin

Number of fin rays									Number of scales in reference to lateral line										
Dorsal	Anal			Pectoral			Pelvic			Rows from gill opening to mid-caudal base						Above		Below	
	ii, 9	ii, 13	ii, 14	i, 15	i, 16	i, 17	i, 8	i, 9	113	114	115	116	117	118	26	27	25	26	27
6	3	4	2	7	1	5	6	1	-----	1	1	1	1	4	1	1	2	1	

Subfamily SERRASALMINAE

KEY⁴ TO THE GENERA AND SPECIES OF SERRASALMINAE REPORTED FROM VENEZUELA⁵

- 1a. Teeth in a single series in both jaws; teeth with a strong median cusp and with either a single lateral cusp or a pair, those of upper jaw mostly asymmetrical (*Serrasalmus*).
- 2a. Head broad, with upper profile straight or convex; length $2\frac{2}{3}$ to 3 in total length (without caudal); snout short, blunt; second suborbital deeper than eye, covering or nearly covering cheek; interorbital width $1\frac{1}{2}$ to $2\frac{1}{4}$ in length of head; lower jaw very heavy; palatines toothless; distance between rayed dorsal and adipose fin 2 to $3\frac{1}{2}$ in base of former; adipose fin not rayed; fewer than 40 ventral serrae; base of rayed dorsal equal to or greater than distance from upper caudal fulcra; anterior profile only moderately arched; base of rayed dorsal $2\frac{2}{3}$ to $2\frac{3}{4}$ in depth of body, 2 to $2\frac{3}{4}$ times distance from adipose fin.-----*Serrasalmus nattereri* (Kner)
- 2b. Head narrower, with upper profile more or less concave above eyes; length $2\frac{2}{3}$ to $3\frac{1}{4}$ in total length (without caudal); lower jaw not very heavy;

⁴ Modified after Norman's review of this subfamily in Proc. Zool. Soc. London for 1928, pp. 781-829, pl. 1, figs. 1-20, 1928.

⁵ *Pygocentrus palometa* Valenciennes, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 296, 1849 (Río Apure, Río Guarico), is not recognizable at present from his description.

interorbital width $2\frac{1}{3}$ to $3\frac{1}{3}$ in length of head; palatines with or without teeth; distance between rayed dorsal and adipose fin 1 to $1\frac{1}{3}$ in base of former.

3a. Palate toothless, sometimes roughened or with a few blunt, rudimentary teeth; second suborbital not or not much deeper than eye, separated from angle of preoperculum by a space equal to $\frac{1}{3}$ to $\frac{1}{2}$ diameter of eye; base of adipose fin $3\frac{2}{3}$ to $4\frac{1}{4}$ in that of rayed dorsal, which is $3\frac{1}{3}$ to $3\frac{1}{2}$ in depth of body; distance between rayed dorsal and adipose about equal to base of former.

4a. Depth about $1\frac{1}{2}$ in standard length, head about $3\frac{1}{2}$; eye $3\frac{2}{3}$ to $3\frac{3}{4}$ in head; origin of dorsal a little nearer base of caudal than end of snout.

Serrasalmus scapularis Günther

4b. Depth about 1½ in the length, head $3\frac{1}{2}$ to $3\frac{1}{2}$; eye about 4 in head; origin of dorsal equidistant from end of snout and base of caudal.

Serrasalmus serrulatus (Valenciennes)

3b. Palate with well-developed teeth.

5a. Second suborbital broad, narrowly separated from preoperculum in adults.

6a. Dorsal with 14 to 19 rays; anal 32 to 37 rays; snout shorter than eye in adults; base of adipose fin $2\frac{3}{4}$ to 4 in that of rayed dorsal; snout blunt; interorbital width $2\frac{1}{3}$ to $2\frac{2}{3}$ in length of head; last simple ray of anal distinctly thicker than first branched ray; caudal fin generally with a black submarginal band.

Serrasalmus spilopleura Kner

6b. Dorsal with 20 rays; anal with 27 rays.

Serrasalmus caribe Valenciennes

5b. Second suborbital rather narrow, separated from angle of preopercle by a space equal to about $\frac{1}{2}$ (or more in young) of eye; depth $1\frac{3}{4}$ in length; head 3; base of anal $2\frac{3}{4}$ in length to base of caudal fin; dorsal rays ii, 14 or 15; anal rays iii, 29 to 31; ventral serrae 22 to 24+10 or 11; base of caudal fin blackish. **Serrasalmus eigenmanni** Norman

1b. Premaxillary teeth in two series; mandibulary teeth in a single series; sometimes a pair of conical teeth behind and in contact with symphyseal mandibulary teeth; abdomen serrated before and behind pelvics; teeth more or less close-set, either incisorlike or with an oblique cutting edge or molariform; each premaxillary with 5 teeth in outer and 2 in inner series; jaws equal or lower, a little projecting; conical mandibulary teeth present.

7a. No predorsal spine.

8a. Supplementary scales, if present, small and confined to hinder edges of primary scales; anal fin with a basal sheath of scales and with highest rays anteriorly (*Colossoma*); gill rakers 15 to 18 on lower half of first arch; 65 to 69 ventral serrae; base of adipose fin 5 to $6\frac{1}{4}$ in that of rayed dorsal, base of dorsal $4\frac{1}{2}$ to $5\frac{1}{2}$ in standard length; adipose fin rayed in adults.

9a. Head a little more than 3 in standard length in adults; breadth of operculum more than one-half length of postorbital part of head; suborbital and opercular bones rather smooth; second suborbital almost entirely covering cheek; about 80 scales from head to caudal base.-----**Colossoma macropomus** (Cuvier)

9b. Head $3\frac{1}{2}$ to nearly 4 in standard length in adults; breadth of operculum less than one-half length of postorbital part of head; suborbital and opercular bones rugose; second suborbital separated from

angle of preoperculum by a wide naked space; depth about 2 to $2\frac{3}{4}$ in total length; origin of dorsal nearer end of snout than base of caudal, slightly behind origin of pelvics; probably about 95 to 110 scales from head to caudal base.-----**Colossoma brachypomus** (Cuvier)

8b. Numerous supplementary scales, which may obscure primary ones; anal fin densely scaled in at least its basal half and with highest rays posteriorly or of nearly equal length posteriorly and anteriorly (*Mylossoma*).

10a. Length of anal base $2\frac{1}{2}$ to $3\frac{1}{2}$ times in standard length; ventral serrae 10 to 13 along midventral line behind base of pelvics then 7 to 10 pairs around vent; branched dorsal rays 14 to 16 and anal with 33 to 36; base of adipose fin $3\frac{1}{2}$ to 6 in that of dorsal.

Mylossoma acanthogaster (Valenciennes)

10b. Length of anal base $1\frac{3}{8}$ to $2\frac{1}{4}$ in standard length.

11a. Ventral serrae 10 to 15 behind root of pelvic fin; a space equal to about one-fourth diameter of eye between last spine and first anal ray; dorsal with 14 to 16 branched rays, anal with 28 to 34; base of adipose fin $3\frac{3}{4}$ to $4\frac{1}{4}$ in that of rayed dorsal.

Mylossoma aureum (Agassiz)

11b. Ventral serrae 18 to 22 behind root of pelvic; last spine very close to first ray of anal; dorsal with 14 or 15 branched rays and anal with 34 to 38; base of adipose fin $2\frac{5}{8}$ to $2\frac{3}{4}$ in that of rayed dorsal.

Mylossoma duriventris (Cuvier)

7b. A predorsal spine present; base of adipose fin less than half as long as that of rayed dorsal; dorsal with 22 rays or more; anterior teeth of outer series of premaxillary with an oblique cutting edge, not greatly compressed, generally more or less separated from those of inner series (*Myloplus*).

12a. Sides of body with more or less distinct round orange spots; margins of anterior part of anal dusky; ventral serrae 28 + 10; dorsal iii or iv, 24 to 28, anal iii or iv, 34 to 37.

Myloplus asterias (Müller and Troschel)

12b. A black vertical bar or blotch on side of body between dorsal and pelvic fins; anal 23 to 25.-----**Myloplus schomburgkii** (Jardine)

Genus SERRASALMUS Lacepède

Serrasalmus LACEPÈDE, Histoire naturelle des poissons, vol. 5, p. 283, 1803. (Type, *Salmo rhombeus* Linnaeus.)

SERRASALMUS NATTERERI (Kner)

CARIBE

Pygocentrus nattereri KNER, Denkschr. Akad. Wiss. Wien, vol. 18, p. 36, pl. 3, fig. 8, 1859.

Serrasalmo nattereri PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (San Fernando de Apure, Venezuela).—RÖHL, Fauna descriptiva de Venezuela, p. 377, fig. 190, 1942 (Orinoco).

Serrasalmo (*Pygocentrus*) *notatus* LÜTKEN, Vid. Medd. Naturh. Foren. Kjøbenhavn, 1874, pts. 12-16, p. 238 (Caracas, Venezuela).

Pygocentrus notatus EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 60, 1891 (Venezuela).

Pygocentrus stigmaterythraeus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 424, 1911 (La Pedrita on Caño Uracoa, Venezuela).

Rooseveltiella stigmaterythraeus EIGENMANN, Ann. Carnegie Mus., vol. 9, p. 245, 1915 (La Pedrita on Caño Uracoa).

SERRASALMUS SCAPULARIS Günther

Serrasalmo scapularis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 368, 1864.—? PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Serrasalmo scapularis NORMAN, Proc. Zool. Soc. London, 1928, pt. 4, p. 792, fig. 8 (Venezuela ? [based on Pellegrin]).

Serrasalmo coccogenis FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 428, 1911 (La Pedrita on Caño Uracoa, Venezuela).

SERRASALMUS SERRULATUS (Valenciennes)

CARIBE

Pygopristis serrulatus VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 300, 1849.

Serrasalmo gymnogenys PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River drainage).

SERRASALMUS SPILOPLEURA Kner

CARIBE

Serrasalmo spilopleura KNER, Denkschr. Akad. Wiss. Wien, vol. 18, p. 43, pl. 5, fig. 11, 1859.

Serrasalmo irritans PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (San Fernando de Apure, Venezuela).

Serrasalmo irritans EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 60, 1891 (Apure).

SERRASALMUS CARIBE Valenciennes

CARIBE

Serrasalmo caribe VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 278, 1849 (Río Orinoco, Río Apure, Llanos de Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 60, 1891 (Orinoco).—NORMAN, Proc. Zool. Soc. London, 1928, pt. 4, p. 803 (Río Orinoco).

SERRASALMUS EIGENMANNI Norman

Serrasalmo eigenmanni NORMAN, Proc. Zool. Soc. London, 1928, pt. 4, p. 804, fig. 16 (Rockstone, British Guiana).

Two specimens, 32 and 33 mm., collected by Dr. William Beebe at Río Caripe, April 23, 1942, were lent to me for identification and report.

Genus COLOSSOMA Eigenmann

Colossoma EIGENMANN, Smithsonian Misc. Coll., vol. 45, p. 148, 1903.—EIGENMANN and KENNEDY, Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 530, 1903. (Type, *Myletes oculus* Cope.)

COLOSSOMA MACROPOMUS (Cuvier)

Myletes macropomus CUVIER, Mem. Mus. Hist. Nat. Paris, vol. 4, p. 453, pl. 21, fig. 3, 1818.—PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 473 (Apure River, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 61, 1891 (Apure).

COLOSSOMA BRACHYPOMUS (Cuvier)

Myletes brachypomus CUVIER, Mem. Mus. Hist. Nat. Paris, vol. 4, p. 452, pl. 22, fig. 1, 1818.

? *Piarctus* (type: *Myeletes brachypomus*) EIGENMANN and ALLEN, Fishes of western South America, p. 247, 1942 (Orinoco Basin to La Plata Basin).

A specimen collected by Dr. William Beebe in the Río Caripe, near Caripito, Venezuela, April 23, 1943, was lent to me for study. I identify it with some uncertainty as *Colossoma brachypomus* because Cuvier (Mem. Mus. Hist. Nat. Paris, vol. 4, p. 452, pl. 22, fig. 1, 1818) and Valenciennes (Histoire naturelle des poissons, vol. 22, p. 199, 1849) do not describe certain characters. This much is certain: It is very close to *macropomus* but disagrees because the second suborbital does not completely cover the cheek. It agrees with *brachypomus* in this respect and for this reason I tentatively identify it as *brachypomus*, but in the event it is a new form, the following description is recorded:

Standard length 185 mm. Greatest depth 1.9, head 3.2, anal fin base 3.7, dorsal fin base 4.8, and greatest postorbital length of head 5.3, all in standard length; adipose base 5 times in dorsal fin base; eye 4 in the head, 2.3 in interorbital space; dorsal profile of head a little concave, snout short, blunt; suborbital and postorbital bones with low ridges; the second suborbital does not cover the cheek by a naked space whose width is about equal to pupil; distance from rear of dorsal fin base to rear of adipose fin base not quite equal to length of dorsal fin base; pelvic fins inserted in advance of a vertical line through dorsal origin; anterior rays of anal longest, the distal margin of anal fin a little concave; longest anal ray (first branched) a little longer than dorsal fin base; origin of dorsal fin a little closer to mid-caudal fin base than to tip of snout; adipose fin not rayed.

The following counts were made: Dorsal rays iii, 14; anal iii, 24; gill rakers on first gill arch 18+18; ventral serrae 38 to pelvics +21 to anus +6 paired ones around anus; pectoral fin rays i, 16-i, 16; pelvic rays i, 7-i, 7; branched caudal rays 17; 10 or 11 scales from rear base of adipose fin to lateral line; scales from pelvic insertions to lateral line 23; number of scales from upper edge of gill opening to midbase of caudal fin 95; basal $\frac{1}{4}$ of anal fin rays covered with small scales as is base of caudal fin.

Genus MYLOSSOMA Eigenmann and Kennedy

Mylossoma EIGENMANN and KENNEDY, Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 530, Sept. 28, 1903 (type, *Myletes albiscopis* Cope).—EIGENMANN, Smithsonian Misc. Coll., vol. 45, p. 148, Dec. 9, 1903 (type, *M. albiscopis* Cope).

MYLOSSOMA ACANTHOGASTER (Valenciennes)

PAMPANO

Myletes acanthogaster VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 209, 1849 (Lagoon of Maracaibo).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 60, 1891 (Lago Maracaibo).

Mylossoma acanthogaster NORMAN, Proc. Zool. Soc. London, 1928, pt. 4, p. 812 (Maracaibo Lagoon, Venezuela).

The following collections were made by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942:

U.S.N.M. No. 121347, 12 examples, 154 to 294 mm. in standard length, from the Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121348, 5 specimens, 104 to 216 mm., Río Palmar at bridge 70 km. southwest of Maracaibo, March 6.

The shape of this species changes remarkably with increase in size, the body becoming more elongate. The relative positions of the insertion of pelvics and origin of dorsal fins are variable. These differences are recorded in table 4. The average length of the anal base and the average of the greatest depths of the body for the following standard lengths were computed as shown in table 3.

TABLE 3.—Variation in *Mylossoma acanthogaster*

Standard lengths (in mm.)	Average length of anal base	Average greatest depth of body	Number of specimens
100-124.....	40.4	69.2	1
125-149.....	38.1	65.0	1
150-174.....	35.5	59.2	3
175-199.....	36.1	54.5	6
200-224.....	34.7	56.2	2
225-249.....	35.2	57.8	2
250-274.....	32.8	53.1	1
275-299.....	32.6	52.4	1

TABLE 4.—Measurements, expressed in hundredths of the standard length, made on *Mylossoma acanthogaster*

Standard length (in mm.)	104	134	154	163	164	177	178	179	182	195	198	201	216	235	237	256	294
Length of anal base.....	40.4	38.1	35.7	35.0	35.9	36.1	37.1	35.8	35.7	35.4	36.3	39.8	29.6	34.9	35.5	32.8	32.6
Greatest depth.....	69.2	65.0	59.0	61.4	57.3	52.5	57.2	58.0	53.8	51.2	54.5	60.2	52.3	58.2	57.4	53.1	52.4
Snout to pelvic insertion....	53.8	56.7	54.5	57.6	54.2	52.5	51.0	54.2	52.8	52.8	51.0	49.8	53.7	52.3	52.3	50.0	50.3
Snout to dorsal origin.....	59.6	59.7	56.5	57.0	56.0	54.2	57.2	56.4	58.2	52.3	56.0	58.7	52.8	57.8	56.5	57.8	58.1

TABLE 5.—Counts made on *Mylossoma acanthogaster*

Number of fin rays											Number of gill rakers on first gill arch						
Dorsal			Anal				Pectoral				Above angle	At angle	Below angle				
iii, 14	iii, 15	iii, 16	iii, 33	iii, 34	iii, 35	iii, 36	i, 14	i, 15	i, 16	i, 17	i, 18	15	16	1	20	21	22
7	1	1	3	2	3	1	1	3	3	-----	3	3	1	4	1	2	1

The following coloration of *acanthogaster* was recorded from live specimens: Plain in color, silvery on sides, darker above and paler below; anal fin brilliant crimson; upper parts of eyes red.

The pampanos frequent the deeper pools of the rivers, and are active fishes. They are used extensively as food and occur occasionally in the Maracaibo market.

MYLOSSOMA AUREUM (Agassiz)

Myletes aureus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . ., p. 74, 1829.

Mylossoma aureum EIGENMANN and ALLEN, *Fishes of western South America*, p. 249, 1942 (Orinoco to Ucayali and La Plata).

MYLOSSOMA DURIVENTRIS (Cuvier)

Myletes duriventris CUVIER, *Mem. Mus. Hist. Paris*, vol. 4, p. 451, pl. 22, fig. 2, 1818.—?PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 473 (Calabozo, Venezuela).—EIGENMANN and EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 61, 1891 (Calabozo).

Mylossoma duriventre EIGENMANN and ALLEN, *Fishes of western South America*, p. 249, 1942 (Orinoco, upper Amazon, La Plata systems).

Genus MYLOPLUS Gill

Myloplus GILL, *Proc. U. S. Nat. Mus.*, vol. 18, p. 214, 1896. (Type, *Myletes asterias* Müller and Troschel.)

MYLOPLUS ASTERIAS (Müller and Troschel)

Myletes asterias MÜLLER and TROSCHERL, *Horae ichthyologicae*, pt. 1, pp. 24, 36, pl. 10, fig. 2, 1845.

? *Myloplus* (type: *Myletes asterias* Müller and Troschel) EIGENMANN and ALLEN, *Fishes of western South America*, p. 251, 1942 (Orinoco and Guianas to Amazons and Paraguay).

MYLOPLUS SCHOMBURGKII (Jardine)

Tetragonopterus schomburgkii JARDINE, in Schomburgk, *The natural history of the fishes of [British] Guiana*, vol. 1, p. 243, pl. 22, 1841 (ref. copied).

Myletes palomet VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 214, 1849 (upper Orinoco).—RÖHL, *Fauna descriptiva de Venezuela*, p. 384, 1942 (Río Apure).

Subfamily CTENOLUCINAE

Genus CTENOLUCIUS Gill

Ctenolucius GILL, *Proc. Acad. Nat. Sci. Philadelphia*, Suppl., vol. 13, p. 8, 1861. [Type, based on U. S. N. M. No. 1658 by Gill from Río Truando, Colombia = *Belonocharax beani* Fowler = *Ctenolucius hujeta beani* (Fowler).]

Luciocharax STEINDACHNER, *Denkschr. Akad. Wiss. Wien*, vol. 39, p. 67, pl. 13, fig. 2, a-b, 1878. (Type, *Luciocharax insculptus* Steindachner, Río Magdalena.)

Belonocharax FOWLER, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 62, p. 464, fig. 51, 1906. (Type, *Belonocharax beani* Fowler, Truando.)

This group of fishes has been reported upon under at least two subfamily names from time to time. Eigenmann (*Repts. Princeton Univ. Exped. Patagonia*, vol. 3, pt. 4, p. 446, 1910; *Mem. Carnegie Mus.*,

vol. 5, p. 411, 1912, and vol. 9, p. 166, 1922) reported upon them under the subfamily name "Hydrocyninae," but that name is not available because *Hydrocynus* Cuvier (Règne animal, vol. 2, p. 167, 1817) was restricted by Cuvier (Mem. Mus. Hist. Nat. Paris, vol. 5, p. 353, 1819) to the African *H. forskali* and spelled *Hydrocyon*. The name *Hydrocynus*, therefore, is not available for any American genus of Characinidae.

The family name Xiphostomidae was used by Regan (Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 13, 1911) and the subfamily name Xiphostominae by Eigenmann and Allen (Fishes of western South America, p. 274, 1942), but both of these names are not available for fishes.

Gregory and Conrad (Zoologica, vol. 23, pt. 4, p. 338, 1938) refer *Luciocharax* to the subfamily Sarcodacinae. It so happens that *Sarcodaces* Günther, 1864, is not so old a name as *Ctenolucius* Gill, 1861, and thus is not available as the basis of the subfamily name in this group, even though Gregory and Conrad may be correct in referring that African genus to the same subfamily as *Ctenolucius* and *Bouleengerella*. No doubt Ctenolucinae is the name that should be used for this group of genera.

It should be added that Cuvier's figure of *Hydrocyon lucius* (Mem. Mus. Nat. Hist. Paris, vol. 5, pl. 1, fig. 3, 1819) shows the jaws the same as in *Ctenolucius*, but the dorsal fin is farther forward than in the genotype.

The forms of *Ctenolucius* in northern South America in the Maracaibo and Magdalena Basins and in the Pacific slope of Panama and Colombia are very closely related, and it is difficult, if not impossible, to separate them on one or two specimens. The males may have a few more pores in the lateral line than the females, but this point needs careful study before a final conclusion can be made. At most, the various species named cannot be more than poorly separated subspecies.

See table 6 for counts made on species of *Ctenolucius* from northern South America.

KEY TO THE SUBSPECIES OF CTENOLUCIUS HUJETA

1a. Scales 45 to 49; scales in a transverse row from dorsal to anus usually 11; scales around caudal peduncle in a zigzag row 16 to 19; pores in lateral line 24 to 31; upper sides of body with more or less evident brown wavy lines between rows of scales (Maracaibo Basin).

Ctenolucius hujeta hujeta (Valenciennes)

1b. Scales 42 to 48; scales in a transverse row from dorsal to anus usually 11; scales around caudal peduncle 16 or 17; pores in lateral line 22 to 26; practically no trace of brown wavy lines along upper sides (Magdalena System).

Ctenolucius hujeta insculptus (Steindachner)

1c. Scales 49 or 50; scales in a transverse row from dorsal to anus usually 11; scales around caudal peduncle 16 or 17; pores in lateral line 25 to 36; upper sides of body with very distinct, lengthwise, brown wavy streaks between rows of scales (Pacific slope of Panama and of Colombia).

Ctenolucius hujeta beani (Fowler)

U.S.N.M. No. 121343, 10 examples, 145 to 185 mm., from the Río San Juan near bridge, Motatán system, March 20.

U.S.N.M. No. 121338, 2 examples, 116 and 230 mm., from Lago Tulé, about 80 km. west of Maracaibo, March 1.

U.S.N.M. No. 121337, a specimen, 237 mm., from the Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

One specimen listed above, U.S.N.M. No. 121335, at 37 mm. in standard length, has a black lateral band, not extending on caudal fin.

After comparing this species with specimens of *Luciocharax insculptus* Steindachner (new genus and new species) from the Magdalena Basin, it was concluded that Myers (*ibid.*, p. 94, 1942) was fully justified in considering Steindachner's species as a synonym of *C. hujeta* Valenciennes.

Genus BOULENGERELLA Eigenmann

Xiphostoma AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . ., pp. 60, 78, 1829. (Type, *Xiphostoma cuvieri* Agassiz, designated by Jordan and Evermann, *Genera of Fishes*, p. 132, 1917.) (Preoccupied by *Xiphostoma* Kirby and Spence, 1828, in Hemiptera.)

Boulengerella EIGENMANN, *Smithsonian Misc. Coll.*, vol. 45, p. 147, 1903. (Type, *Xiphostoma lateristriga* Boulenger.)

BOULENGERELLA CUVIERI (Agassiz)

Xiphostoma cuvieri AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . ., p. 78, pl. 42, 1829 (ref. copied).—PELLEGRIN, *Bull. Mus. Hist. Nat. Paris*, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Genus PROCHILODUS Agassiz

Prochilodus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . ., p. 57, 1829. (Type, *Prochilodus argenteus* Agassiz.) (Ref. copied.)

KEY TO THE SPECIES OF PROCHILODUS REPORTED FROM VENEZUELA⁶

- 1a. Scale rows from upper end of gill opening to midbase of caudal fin 42 to 47; dorsal fin barred with small dark spots but caudal fin plain in color.
- 2a. Branched rays of dorsal 9; anal rays iii, 8, rarely iii, 9; scales 42 or 43; scales above lateral line usually 8, seldom 9; scales below lateral line 6 or 7 (Maracaibo Basin) . . . *Prochilodus reticulatus reticulatus* Valenciennes
- 2b. Branched rays of dorsal 10; anal rays iii, 8 or iii, 9; scales 43 or 44; scales above lateral line 7 or 8; scales below lateral line "8 or 9" (Caracas, Venezuela) *Prochilodus reticulatus asper* Lütken
- 2c. Branched rays of dorsal 9 or 10, usually 9; anal rays iii, 7 or iii, 8, usually iii, 8; scales 44 to 47, usually 45 or 46; scales above lateral line 8 or 9; scales below lateral line 6 or 7.

Prochilodus reticulatus magdalenae Steindachner⁷

⁶ The descriptions of the species of *Prochilodus* reported from the Orinoco system and from Caracas are not adequate. Since no specimens are available to me from those localities, the data used in this key have been taken from the descriptions. Further information is needed to clarify the species already named in the Orinoco Basin.

⁷ *Prochilodus reticulatus magdalenae* Steindachner, *Denkschr. Akad. Wiss. Wien*, vol. 39, p. 78, pl. 12, fig. 1, 1a, 1878 (Río Magdalena) (description on p. 51 of this species leaves off the name *magdalenae*, but the latter is used in the legend for the plate).

- 1b. Scales in lateral line about 53, 10 or 11 above and 10 below to base of pelvics; dorsal rays ii, 9; anal iii, 9; pelvic 10 [?, i, 9] (Orinoco Basin).

Prochilodus laticeps Steindachner

PROCHILODUS RETICULATUS RETICULATUS Valenciennes

BOCACHICA

Prochilodus reticulatus VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 92, 1849 (Lago Maracaibo).—GÜNTHER, *Catalogue of the fishes in the British Museum*, vol. 5, p. 295, 1864 (Lago Maracaibo).

The following specimens were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121324, 31 examples, 125 to 325 mm. in standard length, from the Río Palmar about 100 km. southwest of Maracaibo, near Totuma, February 21.

U.S.N.M. No. 121326, 4 examples, 106 to 113 mm., from a pool of the Río San Ignacio about 20 km. south of Rosario, February 26.

U.S.N.M. No. 121333, 10 specimens, 106 to 224 mm., from the Río Negro below the mouth of the Río Yasa, March 2.

U.S.N.M. No. 121330, 2 specimens, 131 and 158 mm., from Lago Tulé, about 75 km. west of Maracaibo, March 1.

U.S.N.M. No. 121329, 2 examples, 203 and 215 mm., from a caño $\frac{3}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121331, 6 examples, 195 to 345 mm., from the Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121327, a specimen, 176 mm., from the Río Motatán at the bridge, 22 km. north of Motatán, March 17.

U.S.N.M. No. 121328, 9 examples, 64 to 303 mm., from the Río Socuy, 3 km. above mouth, February 24.

U.S.N.M. No. 121322, an example, 200 mm., from the Río Jimelles, 12 km. east of Motatán, Motatán system, March 24.

This species of bocachica reaches the largest size among the three forms occurring in the Maracaibo Basin.

Since this species has never been adequately described or recognized, a description was drawn up: Detailed measurements were made on two specimens, and these data, expressed in hundredths of the standard length, are recorded below, respectively. Standard length in mm. 177 and 113.

Length of head 31.6 and 31.0; length of snout 13.6 and 11.1; distance between fleshy eyelids along horizontal axis 5.20 and 6.64; diameter of orbit 6.78 and 8.14; interorbital space 15.3 and 16.3; postorbital length of head 14.7 and 13.7; least depth of caudal peduncle 12.3 and 12.4; length of caudal peduncle 13.6 and 15.0; distance from eye to nostrils 3.11 and 3.19; snout to dorsal origin 49.2 and 47.8; snout to anal origin 78.5 and 77.2; snout to adipose origin 84.0 and 87.2; snout to pelvic insertion 53.4 and 50.4; snout to pectoral fin 28.3 and 29.3; snout to anus 76.2 and 75.2; length of base of anal fin 12.2 and 12.4; length of dorsal base 17.2 and 19.9; length of longest ray of dorsal fin 23.7 and 28.7; length of longest anal ray 16.7 and

21.0; length of longest pectoral ray 20.9 and 22.2; length of longest pelvic ray 18.6 and 23.8; length of longest caudal fin ray 28.8 and 33.2; length of shortest caudal fin ray 10.7 and 14.2.

The following counts were made, respectively: Dorsal fin rays ii, 9 and ii, 9; anal iii, 8 and iii, 8; pectoral i, 15-i, 15 and i, 14-i, 14; pelvic i, 8-i, 8 and i, 8-i, 8; branched caudal fin rays 9+8=17 and 9+8=17; number of scale rows crossing lateral line from upper end of gill opening to base of midcaudal fin rays 43 and 43; scales from dorsal origin to lateral line 9 and 8; scales from anal origin to lateral line upward and a little forward 7 and 6; scale rows before dorsal fin 16 and 14; scale rows from dorsal base to adipose origin 13 and 13; scales around caudal peduncle in a zigzag row 18 and 18. For additional counts see table 7.

TABLE 7.—Counts made on subspecies of *Prochilodus reticulatus*

Subspecies	Number of fin rays														Number of scales									
	Dorsal		Anal			Pelvic	Pectoral							Rows crossing lateral line					Above lateral line			Below lateral line		
	ii, 9	ii, 10	iii, 7	iii, 8	iii, 9	i, 8	i, 13	i, 14	i, 15	i, 16	i, 17	42	43	44	45	46	47	7	8	9	6	7		
<i>magdalenae</i>	7	2	1	8	---	8	---	4	13	7	2	---	---	1	11	2	1	---	3	4	3	4		
<i>reticulatus</i>	12	---	---	11	1	11	1	11	7	2	---	3	9	---	---	---	---	---	7	1	5	2		
<i>asper</i>	---	1	---	1	1	1	---	1	1	---	---	---	1	1	---	---	---	11	---	---	---	---		

Body compressed, head rounded, profile a little concave at occiput; mouth somewhat protrusible, but premaxillary not strictly protractile, mouth more or less disklike; lips with very numerous small, incisor-like teeth; inside of the outer series of teeth near middle of mouth on upper and lower surfaces of mouth another short series of small incisorlike teeth arranged in a curve, the two curved series meeting posteriorly, this lower series on each side numbering about 10 or 11 and the upper about 18; nasal openings together, the pair not separated by the skin of the head; lower lip with wide frenum; caudal and all other fins without scales except at their bases; gill membranes joined to the isthmus with a narrow free fold; scales rough or ctenoid, more so anteriorly; a low keel from pelvic bases to anus along mid-ventral line; belly rounded to pelvic insertion; lateral line complete; pelvics inserted under fifth to sixth branched dorsal fin rays; anal origin a little in advance of adipose origin; margin of dorsal rounded, the first or second branched dorsal ray longest; anal margin concave, the first branched ray longest and when fin is depressed the first rays of anal extending a little past the last rays; posterior margin of paired fins truncate, then rounded; caudal fin deeply forked, upper lobe a

little longer and more pointed than lower lobe, the latter on adults sometimes a little rounded; pectoral fin reaching within 2 scale rows of pelvic bases and pelvic fins reaching within 2 or 3 scale rows of anus; greatest depth at origin of dorsal fin about 2.6 to 2.9 in the standard length and head 3.0 to 3.6; least depth of caudal peduncle about equal to length of anal base and a little shorter than postorbital length of head; pelvic insertion a little closer to midcaudal fin base than to tip of the snout; rear margin of eye at middle of head length; short predorsal plate bicuspid, with a black fleshy flap the size of a scale covering the points of this plate anteriorly; intestine much coiled; pyloric caeca very small and very numerous, probably a few hundred in number.

Color.—Darker above, paler below, the sides with about 16 vertical bars that are a little wider than the pale interspaces, width of bars about equal to diameter of pupil; these vertical blackish bars breaking up ventrally and anteriorly into a few roundish blotches, all bars distinct up to a length of 150 mm., becoming obsolete on the largest specimens; dorsal fin barred with the black spots at front of dorsal rays; other fins plain grayish in color; peritoneum blackish; the margins of the scales blackish, on some this pigment being more intense dorsally and ventrally, giving the appearance of a wavy blackish line along each row of scales. When alive, the dorsal fin was pinkish and the sides of the body yellowish.

The following differences between the various subspecies are worthy of emphasis: *Prochilodus reticulatus reticulatus* differs from *P. r. magdalenae* in having 42 or 43 scales from the upper end of the gill opening to midbase of caudal instead of 44 to 47, usually 45; the number of pectoral fin rays average fewer too, i, 13 to i, 16, usually i, 14 or i, 15, instead of i, 14 to i, 17, usually i, 15 or i, 16 in *P. r. magdalenae*. The vertical color bars in *P. r. reticulatus* tend to break up into roundish blotches ventrally and anteriorly, while in *P. r. magdalenae* they are unbroken ventrally. Although little is known about *Prochilodus reticulatus asper* from Caracas, Venezuela, *P. r. reticulatus* and *P. r. magdalenae* differ from it in having 9 branched rays in the dorsal instead of 10 and in having 7 or 8 scales above the lateral line instead of 8 or 9.

PROCHILODUS RETICULATUS ASPER Lütken

Prochilodus asper LÜTKEN, Vid. Medd. Naturh. Foren. Kjøbenhavn, 1874, pts. 12-16, p. 226 (Caracas, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 48, 1891 (Caracas).

PROCHILODUS LATICEPS Steindachner

Prochilodus laticeps STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 16, p. 150, 1879 (no locality given); Denkschr. Akad. Wiss. Wien, vol. 41, p. 152, 1879 (Ciudad Bolívar, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 48, 1891 (Orinoco near Ciudad Bolívar).

- ?*Prochilodus brama* (not of Cuvier and Valenciennes) PETERS, Montasb. Akad. Wiss. Berlin, 1877, p. 472 (Calabozo, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 48, 1891 (Calabozo).
- ?*Prochilodus kneri* PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 15, p. 155, 1909 (Orinoco) [new name for *P. insignis* of Kner and of Günther, not Schomburgk].

Genus CHILODUS Müller and Troschel

- Chilodus* MÜLLER and TROSCHER, Horae ichthyologicae, pts. 1, 2, p. 10, pl. 4, fig. 2, 2a, 1845 (Lake Amucu, Guiana). (Type, *Chilodus punctatus* Müller and Troschel.)
- Microdus* KNER, Sitzb. Akad. Wiss. Wien, vol. 30, p. 77, 1858; Denkschr. Akad. Wiss. Wien, vol. 17, p. 149, pl. 3, fig. 5, 1859. (Type, *Microdus labyrinthicus* Kner.)
- Caenotropus* GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 297, 1864 (substitute name for *Chilodus* and *Microdus* said to be preoccupied.)

CHILODUS LABYRINTHICUS (Kner)

- Microdus labyrinthicus* KNER, Denkschr. Akad. Wiss. Wien, vol. 17, p. 149, pl. 3, fig. 5, 1859 (Rio Branco and Barra do Rio Negro.)
- Caenotropus labyrinthicus* STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 153, 1879 (Ciudad Bolívar, Venezuela.)
- Chilodus labyrinthicus* EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 49, 1891 (Orinoco.)

This species has a pale streak along midaxis of body and only iii, 7 anal rays. *Chilodus punctatus* has iii, 10 anal rays and a black lateral streak.

Genus LEPORELLUS Lütken

- Leporellus* LÜTKEN, Overs. Danske Vid. Selsk. Forh., 1874, pp. 129, 141. (Type, *Leporinus pictus* Kner = *Leporellus pictus* Lütken [1875, on Rio das Velhas specimen] = *Leporinus maculifrons* Reinhardt, in Lütken = *Leporellus timbore* Eigenmann.)
- Leporinodus* EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 116, 1922. (Type, *Leporinodus retropinnis* Eigenmann, on Rio Piracicaba specimen.)

There is considerable confusion concerning the specific identity of the species referred to this genus, largely because it is so scarce in museum collections that no investigator has been able to examine all the species at one time. In addition, the descriptions are not adequate. I have attempted to clarify in this discussion certain necessary nomenclatorial changes, as a result of Eigenmann's proposal of the genus *Leporinodus* and his overlooking of the available name for his *Leporellus timbore*.

The following tentative key was prepared mostly from the figures and descriptions of the species referred to this genus as noted in the literature. The genus needs careful revision.

- 1a. Origin of dorsal about equidistant between tip of snout and base of caudal fin;⁸ head spotted above and on sides; predorsal scales with a dark spot at

⁸ It is assumed that Eigenmann (1922, p. 116) meant base of caudal in his statement, "Origin of dorsal about equidistant from snout and caudal. . ."

base; a dark lateral band to end of caudal; light bands above and below it, 2 darker lines along 2 rows of scales below lateral band; dorsal with dark spot from middle of anterior rays to tip of seventh, another along middle of last 5 rays; 3 oblique bands across caudal lobes.

Leporellus retropinnis (Eigenmann) ⁹

1b. Origin of dorsal closer to tip of snout by about length of snout than to base of caudal fin.

2a. Upper sides of body and back with 7 or 8 parallel rows of dark spots, each scale with dark spot including 1 or 2 scale rows below lateral line, then lower sides abruptly pale without spots; dorsal with blackish band across third quarter of its length, distal fourth white; 2 oblique black bars across each caudal lobe and a black streak on midcaudal fin rays; no black lateral band except a faded one on caudal peduncle posteriorly and thence on middle rays of caudal fin; top and sides of head with small black spots.-----**Leporellus vittatus** (Valenciennes)

2b. A distinct blackish band along midaxis from head to tip of midcaudal fin rays, no dark spots on each scale posteriorly on body; a dark stripe along side of back, or back blackish; sometimes each of predorsal scales with a black spot; dorsal fin with a wide black band distally; 2 oblique black bands on each lobe of caudal fin; sides and top of head with spots.

3a. Anal fin with a black band----**Leporellus sexdentatus** (Eigenmann) ¹⁰

3b. Anal fin pale without black band or spot--**Leporellus pictus** (Kner) ¹¹

LEPORELLUS VITTATUS (Valenciennes)

Leporinus vittatus VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 33, 1849 (Amazon).—CASTELNAU, *Animaux nouveaux ou rares l'Amérique du Sud, Poissons*, p. 59, pl. 29, fig. 3, 1855 (Araguay, Province of Goyaz, Brazil).—GÜNTHER, *Catalogue of the fishes in the British Museum*, vol. 5, p. 310, 1864 (Rio Araguay; Irisanga).

⁹ *Leporinodus retropinnis* Eigenmann, *Mem. Carnegie Mus.*, vol. 9, No. 1, p. 116, 1922 (Rio Piracicaba), Brazil.

¹⁰ *Leporinodus sexdentatus* Eigenmann, *Mem. Carnegie Mus.*, vol. 9, No. 1, p. 117, 1922 (Rio Cauca) (new name).

Leporinus vittatus (non Valenciennes) Steindachner, *Denkschr. Akad. Wiss. Wien*, vol. 42, p. 71, 1879 (Rio Cauca, Colombia).

¹¹ It is possible that *L. sexdentatus* and *L. pictus* are not distinct species. These two forms need careful comparison, as Eigenmann apparently lacked specimens of both species. The following nomenclatorial observations and other comments should be carefully considered when this genus is further investigated:

Leporinus pictus Kner, *Denkschr. Akad. Wiss. Wien*, vol. 17, p. 172, pl. 8, fig. 19, 1859 (Irisanga).

Leporellus pictus (Kner) LÜTKEN, *Overs. Danske Vidk. Selsk. Forh.*, 1874, pp. 129, 141 (Rio das Velhas); *Danske Vid. Selsk. Skrift.*, vol. 12, No. 2, pp. 204, xi, 1875 (Rio das Velhas).

Leporinus maculifrons REINHARDT, in Lütken, 1875, *ibid.*, p. 204, is given as a new specific name in case this specimen from the Rio das Velhas, as stated on p. 206 by Lütken, proves to be a distinct species. Reinhardt's *maculifrons* was a manuscript name and apparently unpublished until 1875 by Lütken.

Leporellus timbore Eigenmann, *Mem. Carnegie Mus.*, vol. 9, No. 1, p. 117, 1922 (Rio das Velhas), a new name said by Eigenmann to be a substitute for "*Leporellus pictus* (non *Leporinus pictus* Kner) Lütken and is based on the specimen from the Rio das Velhas."

Leporellus cartledgei Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 93, p. 177, fig. 89, 1941 (Penedo, Rio São Francisco, Pernambuco).

Leporellus vittatus Cope, *Proc. Amer. Philos. Soc.*, vol. 17, p. 690, 1878 (Peruvian Amazon).—Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 58, p. 327, 1906 (Peruvian Amazon);? vol. 66, p. 236, 1914 (Rupununt River, British Guiana).

Lütken (1875, p. 205) describes the color of the Rio das Velhas specimen as follows: Back brownish gray, paler on sides; lower sides brass-yellow in recently caught specimens; belly white; occiput to end of dorsal has a dark stripe along upper sides; a dark lateral band or stripe along midsides continuing out on tail fin; sides of head silvery; upper parts of head grayish with dark spots, these more or less present on back anteriorly at base of each scale but fading posteriorly; dorsal fin with a broad band in distal half of fin; base of caudal fin with two oblique dark stripes. This description agrees with that of Kner's figure of *L. pictus* in essential details.

U. S. N. M. No. 121406, 2 specimens, 123 and 154 mm.—standard length, collected by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., on May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

The following counts are recorded for the two specimens listed above and another, U. S. N. M. No. 100776, from the Río Meta Basin, Colombia, respectively: Dorsal rays ii, 9; ii, 10; ii, 10; anal ii, 8; ii, 8; ii, 8; pectoral i, 15-i, 15; i, 15-i, 15; i, 15-i, 15; pelvic i, 8-i, 8; i, 8-i, 8; i, 8-i, 8. Number of scales along lateral line 41, 42, 42; above lateral line to base of dorsal fin $5\frac{1}{2}$, $5\frac{1}{2}$, 5; below lateral line to pelvic insertion 4, 4, 4. Number of scales in front of dorsal 12, $12\frac{1}{2}$, $13\frac{1}{2}$. Number of gill rakers on first gill arch 16+16. This is the only *Leporellus* so far recorded from Venezuela.

Genus LEPORINUS Agassiz

Leporinus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . . , p. 65, 1829. (Type, *Leporinus novemfasciatus* Agassiz.)

The following species of *Leporinus* have been recorded from Venezuela or the Orinoco system. Since I do not have specimens of these species from the Orinoco system, I cannot work out the relationships with any degree of certainty and no key is attempted.

LEPORINUS FRIDERICI (Bloch)

Salmo friderici BLOCH, *Ichthyologie, ou histoire naturelle* . . . des poissons, vol. 11, p. 75, pl. 378, 1797 (Surinam).

Leporinus friderici EIGENMANN and ALLEN, *Fishes of western South America*, p. 305, 1942 (Venezuela).

Leporinus leschenaultii PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 472 (Venezuela).—EIGENMANN and EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 51, 1891 (Calabozo).

Leporinus leschenaulti PELLEGRIN, *Bull. Mus. Hist. Nat. Paris*, vol. 5, p. 157, 1899 (Apure River, Venezuela).

LEPORINUS STRIATUS Kner

Leporinus striatus KNER, *Denkschr. Akad. Wiss. Wien*, vol. 17, p. 171, pl. 8, fig. 18, 1859 (Irisanga and Caicara in Matto Grosso).—PELLEGRIN, *Bull. Mus. Hist. Nat. Paris*, vol. 5, p. 157, 1899 (Río Apure).

LEPORINUS FASCIATUS (Bloch)

Salmo fasciatus BLOCH, *Ichthyologie, ou histoire naturelle* . . . des poissons, vol. 11, p. 77, pl. 379, 1797 (Surinam).

Leporinus fasciatus PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 472 (Calabozo, Venezuela).—STEINDACHNER, *Denkschr. Akad. Wiss. Wien*, vol. 41, p. 155, 1879 (Ciudad Bolívar).—EIGENMANN and EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 51, 1891 (Orinoco; Calabozo).

LEPORINUS AFFINIS Günther

Leporinus affinis GÜNTHER, *Catalogue of the fishes in the British Museum*, vol. 5, p. 308, 1864 (Para, Río Capin).—STEINDACHNER, *Denkschr. Akad. Wiss.*

Wien, vol. 41, p. 155, 1879 (Ciudad Bolívar).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 51, 1891 (Orinoco).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

LEPORINUS HYPSELONOTUS Günther

Leporinus hypselonotus GÜNTHER, Proc. Zool. Soc. London, 1868, p. 244, pl. 22 (Xeberos).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 44, p. 12, 1882 (Ciudad Bolívar).—EIGENMANN and ALLEN, Fishes of western South America, p. 308, 1942 (Orinoco).

LEPORINUS MÜLLERI Steindachner

Leporinus mülleri STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 44, p. 12, 1882 (Orinoco at Ciudad Bolívar).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 51, 1891 (Orinoco).—EIGENMANN and ALLEN, Fishes of western South America, p. 306, 1942 (Orinoco).

Genus GNATHODOLUS Myers

Gnathodolus MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 108, 1927. (Type, *Gnathodolus bidens* Myers.)

GNATHODOLUS BIDENS Myers

Gnathodolus bidens MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 108, 1927 (Río Cassiquiare, Chemoni [near Bifurcation], Laga Tama-Tama, Bifurcation, Venezuela).

Genus SCHIZODON¹² Agassiz

Schizodon AGASSIZ, in Spix, Selecta genera et species piscium . . . Brasiliam . . . , p. 66, pl. 36, 1829. (Type, *Curimatus fasciatus* Agassiz.) (Ref. copied.)

KEY TO THE SPECIES OF SCHIZODON REPORTED FROM VENEZUELA

1a. Side of body with 4 broad vertical black bars sometimes reduced to a triangular blotch along middles and a black spot at end of lateral line; first vertical black bar occurring above middle of length of pectoral fin, second under dorsal fin, third and fourth between base of dorsal fin and adipose origin; scales usually $4\frac{1}{2}$ to $5\frac{1}{2}+41$ to $44+4$ or 5.

2a. Number of scales between lateral line and origin of dorsal fin $5\frac{1}{2}$; scales from lateral line to anal origin 5; gill rakers about 25 to 30.

Schizodon fasciatum corti, new subspecies

2b. Number of scales between lateral line and origin of dorsal fin $4\frac{1}{2}$; scales from lateral line to anal origin 4; gill rakers on two specimens 21 and 24.

Schizodon fasciatum fasciatum Agassiz

1b. Along midaxis of body a wide black band extending to tips of middle caudal fin rays, this band set off by a pale streak above it and paler color below it; scales $6\frac{1}{2}+44$ to $46+5$*Schizodon isognathus* Kner

¹² The following key will aid in the separation of those genera related to *Schizodon*. *Anostomus* Scopoli, Introductio ad historiam naturalem . . . , p. 451, 1777; Cuvier and Cloquet, Dict. Sci. Nat., ed. 2, p. 2, suppl. p. 69, 1816 (type, *Salmo anostomus* Linnaeus), as yet has not been reported from Venezuela.

1a. Middle teeth of lower jaw trifold, with 3 points (fig. 31, a); mouth terminal, somewhat oblique; lips not plicate.....*Schizodon* Agassiz

1b. Middle teeth of lower jaw incisors with truncate edge (fig. 31, b); mouth terminal, oblique; lips not plicate. *Laemolyta* Cope

1c. Middle teeth of lower jaw bifid with 2 points (fig. 31, c); snout elongate; mouth oblique opening dorsally; lips plicate.....*Anostomus* Scopoli

SCHIZODON FASCIATUM CORTI, new subspecies

CORTI

FIGURES 30, 31, a

Piabuca schizodon VALENCIENNES, in Cuvier and Valenciennes (in part), Histoire naturelle des poissons, vol. 22, p. 112, 1849 (Lago Maracaibo).

✓ *Holotype*.—U. S. N. M. No. 121300, a specimen 258 mm. in standard length, collected by Leonard P. Schultz, February 21, 1942, in the Río Palmar near Totuma, about 100 km. southwest of Maracaibo.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela.

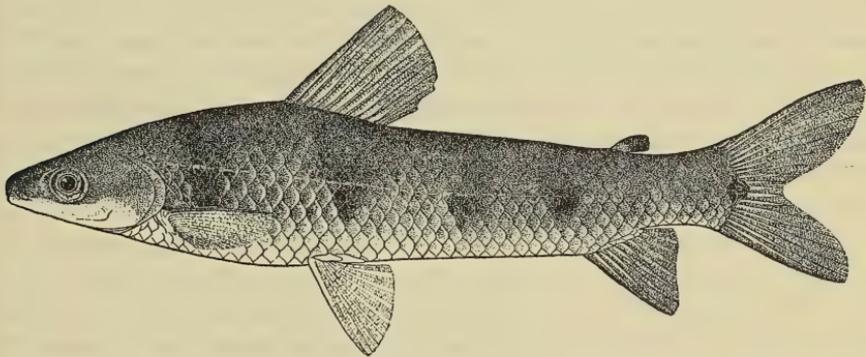


FIGURE 30.—*Schizodon fasciatum corti*, new subspecies: Holotype, U.S.N.M. No. 121300, 258 mm. in standard length.

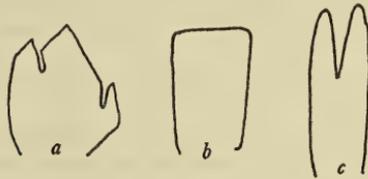


FIGURE 31.—Enlargement of one of middle teeth of lower jaw: *a*, *Schizodon fasciatum corti*, new subspecies; *b*, *Laemolyta varius nitens* (Garman); *c*, *Anostomus anostomus* (Linnaeus).

U.S.N.M. No. 121306, 10 specimens, 166 to 335 mm. in standard length, taken along with the holotype and bearing same data.

✓ U.S.N.M. No. 121307, 15 examples, 131 to 335 mm., February 24, Río Socuy, 3 km. above its mouth.

✓ U.S.N.M. No. 121302, 4 examples, 153 to 230 mm., taken March 6 in the Río Palmar at bridge, 70 km. southwest of Maracaibo.

✓ U.S.N.M. No. 121304, 2 specimens, 280 and 290 mm., taken March 2 in the Río Negro below mouth of Río Yasa.

✓ U.S.N.M. No. 121301, 4 specimens, 146 to 179 mm., obtained March 11 from a caño $\frac{3}{4}$ km. west of Sinamaica.

U.S.N.M. No. 121305, 5 specimens, 232 to 263 mm., collected February 26 from the Río Apón about 35 km. south of Rosario.

✓ U.S.N.M. No. 121303, a specimen, 285 mm., obtained March 17 in the Río Motatán at the bridge, 22 km. north of Motatán.

Description.—Based on the holotype and paratypes. Detailed measurements, expressed in hundredths of the standard length, were made on the holotype and one paratype as recorded below, first for the holotype, then for the paratype in parentheses. Standard length in mm. 258 and 222.

Length of head 23.6 (24.0); greatest depth of body 23.0 (22.8); length of snout 9.00 (9.01); greatest width of head 13.6 (12.6); diameter of eye or between eyelids along anterior-posterior axis 4.38 (4.46); interorbital space 11.4 (11.9); postorbital length of head 12.0 (12.3); eye to posterior nostril 2.67 (2.48); length of caudal peduncle 12.0 (11.9); least depth of caudal peduncle 9.97 (9.65); distance from snout to dorsal origin 41.8 (41.1); snout to anal origin 83.4 (82.0); snout to adipose origin 86.0 (84.7); snout to pectoral insertion 22.2 (23.1); snout to pelvic insertion 45.3 (46.0); length of base of dorsal 14.7 (13.8); length of anal base 8.02 (8.07); longest ray of dorsal fin 21.9 (19.6); longest ray of anal 15.3 (13.9); longest ray of pectorals 15.2 (14.6); longest ray of pelvics 17.1 (16.0); longest ray of caudal fin 25.2 (22.8); shortest caudal fin rays 9.69 (8.10).

The following counts were made on the holotype and paratype, respectively: Dorsal rays ii, 10 (ii, 10); anal ii, 8 (ii, 8); pectoral i, 15-i, 15 (i, 15-i, 15); pelvic i, 8-i, 8 (i, 8-i, 8); scales 42 (43) from upper end of gill opening to base of midcaudal fin rays; scales from dorsal fin origin to lateral line posteriorly downward 5½ (5½); scales from anal origin to lateral line (backward and upward) 5 (5); scales before dorsal fin 13 (13); zigzag scales around caudal peduncle 16 (16); scales from dorsal base to adipose origin 16 (16). For additional counts see table 8.

TABLE 8.—Counts made on subspecies of *Schizodon fasciatum*

Subspecies	Number of fin rays				Number of scales											
	Dorsal	Anal	Pelvic	Pectoral	Lateral line				Above lateral line		Below lateral line		Before dorsal		Dorsal base to adipose origin	
	ii, 10	ii, 8	i, 8	i, 15 i, 16	41	42	43	44	4½	5½	4	5	12	13	15	16
<i>corti</i>	9	9	11	12 3	1	5	2	2	21	21	2	2	5	3	2	
<i>fasciatum</i>	2	2	4	2 2	1	1			2	2	2	2	2	1	1	

Subspecies	Number of gill rakers on first gill arch																					
	Above				At angle	Below						Total										
	10	11	12	13	1	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
<i>corti</i>		1	2	1	4				2		1	1					1	1		1		1
<i>fasciatum</i>	1	1			2	1		1					1			1						

Body elongate, head rounded, body a little compressed, forward part of head a little depressed, interorbital considerably convex; eyes lateral, seen as well from below as from above; anterior and posterior nostrils separated by a small isthmus of skin, the anterior nostril tubular; snout rounded, mouth small, terminal; teeth broad, tricuspid incisors in a single row of 8 in upper and 8 in the lower jaw, none of which is produced forward; premaxillaries not protractile; eye with adipose eyelids wider anteriorly; gill membranes joined to isthmus, no free fold across it; pelvics inserted under the third branched ray of dorsal; anal fin origin a little in front of that of adipose fin; intestinal canal short; about 20 pyloric caeca; anus just in front of anal origin; greatest depth 4 to $4\frac{1}{2}$ and head 4 to $4\frac{1}{2}$ in standard length; diameter of orbit $3\frac{1}{2}$ to $4\frac{1}{2}$, and of eye (between eyelids) $4\frac{1}{8}$ to $6\frac{3}{4}$, interorbital $2\frac{1}{8}$ to $2\frac{1}{8}$, snout $2\frac{3}{4}$ to 3, all in the head; second simple ray of dorsal about equal to first branched rays; first branched rays of anal longest; first branched rays of paired fins longest; posterior margins of dorsal, pectoral and paired fins a little rounded; that of anal a little concave; caudal deeply forked, the upper lobe usually a little longer; gill rakers short; the pectorals reach two-thirds the way to the pelvic insertion and the pelvics one-half the way to the anus; scales large.

Color.—Brownish above, yellowish white below; sides with four broad vertical black bars sometimes reduced to a triangular blotch along midsides and a black spot at end of lateral line; the first vertical black bar on the body occurring above the middle of length of pectoral fin, second under dorsal fin, third and fourth between base of dorsal fin and adipose origin; adipose fin dusky to blackish in color; anal fin dusky as are caudal and dorsal fins; upper parts of head blackish; opercle blackish; peritoneum pale.

Remarks.—This new subspecies may be distinguished from *S. fasciatum fasciatum* by the key on page 268. Figure 31, *b, c*, illustrates the different shapes of the teeth in *Laemolyta* and *Anostomus*.

Named *corti* (=cut) after the common name of this fish in the Maracaibo Basin, as given to me on several occasions, probably referring to its sharp "cutting" teeth.

SCHIZODON FASCIATUM FASCIATUM Agassiz

Schizodon fasciatus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . , p. 66, pl. 36, 1829 (ref. copied).—EIGENMANN and ALLEN, *Fishes of western South America*, p. 303, 1942 (Venezuela to the Amazons and Río Paraguay). *Anostomus fasciatus* GÜNTHER, *Catalogue of the fishes in the British Museum*, vol. 5, p. 304, 1864 (Caracas).—EIGENMANN and EIGENMANN, *Proc. U. S. Nat. Mus.*, vol. 14, p. 50, 1891 (Caracas).

SCHIZODON ISOGNATHUS Kner

Schizodon isognathus KNER, *Denkschr. Akad. Wiss. Wien*, vol. 17, p. 163, pl. 6, fig. 13, 1859 (Río Cujaba). *Anostomus isognathus* PETERS, *Monatsb. Akad. Wiss. Berlin*, 1877, p. 472 (San Fernando de Apure, Venezuela).

Genus **LAEMOLYTA** Cope

Laemolyta COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 23, p. 258, 1872 (type, *Schizodon taeniatus* Kner).—EIGENMANN and ALLEN, Fishes of western South America, p. 302, 1942 (Orinoco).

Schizodontopsis Garman, Bull. Essex Inst., vol. 22, No. 4, p. 18, 1890. (Type, *Schizodon taeniatus* Kner.)

LAEMOLYTA ORINOCENSIS (Steindachner)

Anostomus orinocensis STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 154, pl. 2, fig. 7, 7a, 1879 (Ciudad Bolívar, Venezuela); Anz. Akad. Wiss. Wien, vol. 16, p. 150, 1879.—GARMAN, Bull. Essex Inst., vol. 22, No. 4, p. 20, 1890.

Laemolyta orinocensis EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 50, 1891 (Orinoco).

Genus **HYDROLYCUS** Müller and Troschel

Hydrolycus MÜLLER and TROSCHER, Arch. Naturg., vol. 10, No. 1, p. 93, 1844; Horae ichthyologicae, pt. 1, p. 19, pl. 5, fig. 2, 1848. (Type, *Hydrocyon scomberoides* Cuvier.)

KEY TO THE SPECIES OF **HYDROLYCUS**¹³

1a. Pelvic fin base remote from midline of belly, distance from upper edge of pelvic base to midventral knifelike edge of belly about equal to least depth of caudal peduncle; anal rays 43 to 48 (probably iii, 40 to iii, 45); pectoral almost always i, 17; pelvic i, 8; a black spot at base of lower and upper pectoral fin rays, another on adipose fin; humeral black blotch roundish; distal portion of caudal fin rays pale.

Hydrolycus pectoralis (Günther)¹⁴

1b. Pelvic fin base little above midline of belly, distance from upper edge of pelvic base to midventral ridge (not a thin keel) 2 to 2½ times in least depth of caudal peduncle; anal rays 33 to 35 (probably iii, 31 to iii, 33); pectoral almost always i, 16; pelvic i, 8; no black spot at base of lower pectoral fin rays and no black blotch on inside of base of upper pectoral fin ray; adipose fin with black spot; humeral black blotch elongate; distal half of caudal fin rays blackish, contrasting with pale basally.

Hydrolycus scomberoides (Cuvier)**HYDROLYCUS SCOMBEROIDES** (Cuvier)

PAYARA

Hydrocyon scomberoides CUVIER, Mem. Mus. Hist. Nat. Paris, vol. 5, p. 357, pl. 27, fig. 2, 1819.

Cynodon scombroides PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (Venezuela).—RÖHL, Fauna descriptiva de Venezuela, p. 385, 1942 (Venezuela)

¹³ Since no specimen of the third species, *Hydrolycus copei* Gill, is available for examination, I am unable to place it correctly in the above key. I quote Gill's description from Proc. Acad. Nat. Sci. Philadelphia, vol. 22, p. 93, 1870:

"D. 11. A. 43. The height enters 2¾ times in the length (exclusive of the caudal), the length of the head 3¼; the profile between the nape and convex snout is moderately incurved; the interorbital space is slightly arched, and about equal to the orbit, the snout, and a quarter of the head's length. The maxillary passes considerably behind the vertical of the posterior border of the orbit. The dorsal fin commences above the anus. The pectorals pass for a third of their own length beyond the tip of the ventrals, and the ventrals extend backwards to the third or fourth anal ray.

"The lateral spot is faint, and above the lateral line, just in advance of the vertical of the anus." From the Napo and Marañon Rivers. Known only from the four types.

¹⁴ Based on Günther's original description and three specimens in the United States National Museum, Nos. 5686, 39402, and 94669. Not yet reported from Venezuela.

Counts were made on certain specimens of *Hydrolycus* in the United States National Museum, and these data are recorded in table 9.

The following specimen was collected for me through the courtesy of Dr. Walter Dupouy, director of the Museo de Ciencias Naturales, Caracas:

U. S. N. M. No. 121385, a specimen, 240 mm. in standard length, collected by Eduardo Correa, March 19, 1942, in the Río Paya, a tributary of the Río Guárico.

TABLE 9.—Counts made on species of *Hydrolycus*

Species	Number of fin rays															Dor- sal	Pectoral	Pel- vic
	Anal																	
	iii, 33	iii, 34	iii, 35	iii, 36	iii, 37	iii, 38	iii, 39	iii, 40	iii, 41	iii, 42	iii, 43	iii, 44	iii, 45	iii, 46	ii, 10			
<i>pectoralis</i>	---	---	---	---	---	---	---	---	---	---	1	1	---	1	3	---	6	6
<i>scomberoides</i>	1	---	---	---	---	---	---	---	---	---	---	---	---	---	1	2	---	2

Genus RHAPHIODON Agassiz

Rhaphiodon AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . . , p. 59, 1829. (Type, *Rhaphiodon vulpinus* Agassiz.)

RHAPHIODON VULPINUM Agassiz

“PAYARA”

Rhaphiodon vulpinus AGASSIZ, in Spix, *Selecta genera et species piscium* . . . Brasiliam . . . , p. 59, 1829.

Cynodon vulpinus PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (Calabozo, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 59, 1891 (Calabozo).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Rhaphiodon vulpinum EIGENMANN and ALLEN, *Fishes of western South America*, p. 271, 1942 (Orinoco Basin to La Plata Basin).

Genus TRIPORTHEUS Cope

Triporthus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 23, p. 264, pl. 8, fig. 3; pl. 14, fig. 2, 1872. (Type, *Triporthus albus* Cope.)

*Chalcinus*¹⁵ VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 258, 1849 (preoccupied). (Type, *Chalcinus brachypomus* Valenciennes=*Chalceus angulatus* Agassiz.)

The recent study by Paulo de Miranda Ribeiro (Papeis Avulsos Dept. Zool. Sci. Agr. São Paulo, Brasil, vol. 1, art. 18, pp. 159–174, figs., 1941) of the genus *Chalcinus* did not prove very satisfactory, as in some cases his counts in the key are not in agreement with the descriptions of the species.

¹⁵ According to Myers (Stanford Ichth. Bull., vol. 1, No. 5, p. 170, 1940), *Triporthus* replaces *Chalcinus*.

3a. Scale rows from upper edge of gill opening to base of caudal fin 20; anal rays about iii, 39 to iii, 41; dorsal about iii, 12; pectoral about i, 11; usually 2 or 3 teeth in outer premaxillary row.

Thoracocharax stellatus (Kner)

3b. Scale rows from upper edge of gill opening to base of caudal fin about 29 to 31; anal rays iii, 27 to 33; dorsal usually ii, 9; pectoral usually i, 10 or i, 11; gill rakers usually 4 to 8 + 11 to 15; usually but one tooth in outer premaxillary row.

4a. Below base of each dorsal ray along distal tips of each pterygiophore are short black streaks giving appearance of a black blotch at base of dorsal fin; anal rays usually iii, 29 to iii, 31 (see table) (Magdalena and Maracaibo Basins).

Thoracocharax maculatus magdalenae Eigenmann

4b. Black spot below base of dorsal fin absent or nearly so; anal rays usually iii, 30 to iii, 32 (Pacific slope of Panama and in Río San Juan and Río Atrato in Colombia).

Thoracocharax maculatus maculatus (Steindachner)¹⁶

Genus *CARNEGIELLA* Eigenmann

Carnegiella EIGENMANN, Ann. Carnegie Mus., vol. 6, No. 1, p. 13, 1909. (Type, *Gasteropelecus strigata* Günther.)

CARNEGIELLA MARTHAE Myers

Carnegiella marthae MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 119, 1927 (Caño de Quiribana, near Caicara and opposite Pan de Azucar, and creek into Laguna San Raphael, Caicara, all Venezuela); Stanford Ichth. Bull., vol. 2, No. 4, p. 93, 1942 (Río Orinoco).

Genus *THORACOCCHARAX* Fowler

Thoracocharax FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 58, p. 452, 1906. (Type, *Gasteropelecus stellatus* Kner.)

THORACOCCHARAX STELLATUS (Kner)

Gasteropelecus stellatus KNER, Denkschr. Akad. Wiss. Wien, vol. 18, p. 17, pl. 1, fig. 2, 1859 (Río Cujaba).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Thoracocharax stellatus EIGENMANN and ALLEN, Fishes of western South America, p. 268, 1942 (Orinoco).

THORACOCCHARAX MACULATUS MAGDALENAE Eigenmann

Thoracocharax magdalenae EIGENMANN, Indiana Univ. Bull., vol. 10, No. 8, p. 25, 1912 (Girardot, Colombia).

The following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121423, 66 specimens, 33 to 48 mm. in standard length, taken March 16, in the Río Machango at bridge, south of Lagunillas, Estado de Zulia.

U.S.N.M. No. 121421, 3 examples, 38 to 46 mm., taken February 26, in a stagnant pool of Río San Ignacio, about 20 km. south of Rosario.

U.S.N.M. No. 121422, 14 examples, 12 to 45 mm., March 2, from Río Negro below mouth of Río Yasa.

¹⁶ Not reported from Venezuela.

TABLE 10.—Counts made on subspecies of *Thoracocharax maculatus*

Subspecies	Number of rays in anal fin						
	iii, 27	iii, 28	iii, 29	iii, 30	iii, 31	iii, 32	iii, 33
<i>maculatus</i>		1	4	8	13	10	3
<i>magdalenae</i>	1	2	14	18	8	3	3

Genus CHARACIDIUM Reinhardt

VOLADORITAS

Characidium REINHARDT, Overs. Danske Vid. Selsk. Forh. Kjøbenhavn, 1866, p. 56, pl. 2, fig. 1-2. (Type, *Characidium fasciatum* Reinhardt.)

Chorimycterus COPE, Amer. Nat., vol. 28, p. 67, 1894. (Type, *Chorimycterus tenuis* Cope.)

Nanognathus BOULENGER, Bol. Mus. Zool. Anat. Comp. Univ. Torino, vol. 10, No. 196, p. 3, 1895. (Type, *Nanognathus borelli* Boulenger.)

Poecilosomatops FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 58, p. 323, 1906. (Type, *Characidium etheostoma* Cope.)

Jobertina PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 15, pp. 149, 151, 1909. (Type, *Characidium (Jobertina) interruptum* Pellegrin.)

Upon examination of the fishes of this general relationship from the Maracaibo Basin, I have observed certain features that caused me to ponder for some time over the generic relationships, as well as the validity of certain species, but I do not have available certain critical species that must be studied before the fishes of this genus are properly compared. In the National Museum are two of Lütken's specimens from South America (U. S. N. M. No. 44950) of what I believe is the valid *Characidium fasciatum* Lütken. In coloration and in all respects they agree with his figures. I partially dried the lower jaw of one of these specimens and found a second row of minute teeth projecting inward along the bases of the single row of larger teeth. *Chorimycterus* Cope is described as having two series of teeth in the lower jaw, but Fowler (1906, p. 325) says, "The presence of biserial mandibular teeth is entirely fallacious, as both of the cotypes before me have but a single series in the mandible." I could believe the latter statement if I knew how carefully the cotypes were examined, but I am practically certain that Cope's observations are correct, since these teeth are difficult to observe, especially when only a low-power hand lens is used. When the lower jaw is dried a little, the teeth are obvious.

In substantiation of Cope's observation, I have found that all three species of *Characidium* collected by me have the two series of mandibular teeth and that they are somewhat prominent in the specimens from the Río Chama and the Río Torbes. No doubt all or at least many of the species now referred to the genus *Characidium*

will be found to possess the inner row of minute teeth along the bases of the outer row of larger teeth. I do not consider the number of scales below the lateral line as of generic significance, since I find them to vary from 2 to 5.

The genus *Characidium* may be split into two subgenera, however, on the presence or absence of scales on the breast. This character seems not to have been mentioned or else was overlooked by authors, and I am unable, because of lack of specimens, to determine if any of the generic names already proposed are available. Since *Characidium fasciatum* has a scaly breast, the group of species with scaly breasts and two rows of mandibular teeth must be referred to the genus *Characidium*. It is regretted that I lack material for a revision of this genus.

The following tentative key indicates some of the differences for the species of *Characidium* occurring in northern South America. It was prepared from the study of specimens in the National Museum and others lent by the California Academy of Sciences.

1a. Caudal fin with dark bars or with 1 or 2 oblique dark bands across each lobe.

2a. Caudal, dorsal, anal, and pelvic fins with about 4 dark cross bands; sides of body with about 7 dark bars, these reaching to midventral line posteriorly; breast scaly; dorsal rays iii, 8 or iii, 9; anal iii, 6; pectoral iv, 8 or iv, 9; pelvic ii, 6; scales 34 to 36, $4\frac{1}{2}$ above and 3 below lateral line; 9 scales in front of dorsal; pelvic insertion closer to base of caudal than snout tip-----*Characidium blennioides* Eigenmann

2b. Caudal, dorsal, and pectoral fins barred with spots; 6 or 7 dark bars on body from dorsal to lateral line; dorsal rays iii, 8; anal iii, 5 or 6; pectoral iii, 9; pelvic i, 6; scales 31 or 32, 3 above and 2 below lateral line.

Characidium declivirostre Steindachner

2c. One or two oblique bars across each lobe of caudal fin.

3a. Each lobe of caudal fin with an oblique black bar; dorsal iii, 9; anal iii, 6; pectoral rays iv, 8 or iv, 9; pelvic ii, 6; black lateral band and another black band along back, the two connected by about 7 or 8 black bars; scales 36 or 37, 4 above and $2\frac{1}{2}$ or 3 below lateral line, 9 or 10 scales in front of dorsal; breast scaly. (Adults.)

Characidium laterale Eigenmann¹⁷

3b. Each caudal lobe with two oblique cross bands; dorsal rays iii, 9; anal iii, 6; pectoral iii, 9; pelvic i, 7; scales 35.

Characidium hasemani Steindachner

1b. Caudal fin without blackish cross bands or bars or oblique dark bands.

4a. Sides of body with dark spots or with crescent-shaped dark spots, none being arranged to form definite bars on sides; back with narrow cross bars not continuous on sides; no blackish lateral band along sides; scales 36, 3 or 4 above and 2 or $2\frac{1}{2}$ below lateral line; breast scaly.

5a. Middle of sides with 26 to 30 black spots, one or more out of line; back with 16 cross bars; dorsal rays iii, 9; anal iii, 6; 9 scales in front of

¹⁷ An examination of a cotype specimen of *C. laterale*, Ind. Univ. No. 11673, and 4 cotypes of *C. vintoni*, Ind. Univ. No. 11674, shows ii, 6 pelvic rays and iv, 8 or 9 pectoral. This combination of two and four simple rays in the paired fins is not found in other species that I have examined except in *C. blennioides*, which likewise has ii, 6 pelvic rays and iv, 9 pectoral. It is concluded that *laterale* was based on the young and *vintoni* on the large adults. Thus *C. vintoni* becomes a synonym of *C. laterale*.

dorsal; pelvic insertion equal distance between snout and midcaudal base; 15 or 16 dark spots along lateral line.

Characidium pellucidum Eigenmann

- 5b. Sides with numerous small crescents of brown irregularly arranged; back with about 13 cross bars; dorsal rays iii, 9; anal iii, 5; pelvic insertion closer to tip of snout than midcaudal base.

Characidium pteroides Eigenmann

- 4b. Sides with a wide black band, not crossed with dark bars, through snout to caudal fin base; 2 or 3 more or less obsolete dark bars posteriorly; pectoral rays iv, 8 or 9; pelvic ii, 6; dorsal iii, 9 or 10; anal iii, 6; scales 36, 4 above and $2\frac{1}{2}$ below lateral line; breast scaly. (Young.)

Characidium laterale Eigenmann

- 4c. Sides of body with 7 to 14 blackish vertical bars and black lateral band or streak present or absent, usually vertical bars less distinct on adults, especially during breeding season.

- 6a. Teeth conical without lateral points basally; breast scaly; centers of scales in black bars pale, especially so along back; dorsal rays iii, 8 or 9; anal iii, 6; scales 38, 4 above and 3 below lateral line, 10 scales in front of dorsal; about 10 bars on sides; no dark lateral band; pelvics inserted a little closer to tip of snout than midcaudal base.

Characidium catenatum Eigenmann

- 6b. Teeth with lateral points basally.

- 7a. Breast naked at all ages¹⁸; dorsal rays usually iii, 9; anal iii, 6; pectoral iii, 8 or iii, 9; pelvic insertion almost equidistant between tip of snout and midcaudal base; caudal spot at midbase of caudal fin, in young usual embedded cross bar at base of caudal fin; scales 30 to 33, $3\frac{1}{2}$ above, $2\frac{1}{2}$ or 3 below lateral line; 10 to 12 scales in front of dorsal; pelvic rays usually i, 8, rarely i, 9; 12 or 13 bars on sides becoming obsolete on breeding adults; shoulder spot blackish and prominent; usual black lateral streak represented by a narrow dark line or absent.-----**Characidium voladorita**, new species

- 7b. Breast scaly, probably naked in young.

- 8a. Pectoral rays iii, 7 to iii, 9, very rarely iii, 10; dorsal usually iii, 9; pelvic i, 8.

- 9a. Pectoral rays iii, 7 to iii, 9; anal iii, 6; scales 32 to 36, $3\frac{1}{2}$ to $4\frac{1}{2}$ above and 3 or $3\frac{1}{2}$ below lateral line; 10 or 11 scales in front of dorsal; 11 dark bars on sides with 3 or 4 of these between dorsal fins; pelvics inserted closer to tip of snout than midcaudal fin base.-----**Characidium fasciatum** Reinhardt

- 9b. Pectoral rays iii, 8 or iii, 9; anal iii, 7; scales 34, 5 above and 3 below lateral line, with 9 in front of dorsal fin; about 10 dark cross bars, 3 of these between dorsal fins; pelvics equal distance between tip of snout and midcaudal fin base.

Characidium zebra Eigenmann¹⁹

- 9c. Pectoral rays iii, 8 to iii, 10, usually iii, 9; anal iii, 6 or 7; scales 31 to 35; 9 or 10 dark bars on sides with 3 of these between dorsals; pelvics inserted a little closer to midcaudal base than tip of snout.

Characidium marshi Breder

¹⁸ Several other species of *Characidium* no doubt have naked breasts, but I have not been able to study this important character because specimens of various species are not available.

¹⁹ A cotype, Indiana Univ. No. 11687, lent me by the California Academy of Sciences, shows distinct relationships with *C. fasciadorsale* Fowler (Proc. Acad. Nat. Sci. Philadelphia, vol. 66, p. 233, 1914, Rupununi River, Brit. Guiana), which I consider a synonym of *C. zebra*.

9d. Pectoral rays iii, 8 to iii, 9, rarely iii, 10; anal iii, 6 or 7; scales 32 to 35, 3 to $4\frac{1}{2}$ above and 3 below lateral line, with 10 to 12 in front of dorsal fin; 12 to 14 dark bars on sides or sometimes a few are combined, leaving 8 or 9; 3 to 5 of these bars between dorsal fins; immature with black lateral stripe and black spot near center of base of caudal fin; pelvics inserted a little closer to tip of snout than midcaudal base.

Characidium caucanum Eigenmann²⁰

8b. Pectoral rays ii, 11 or 12; dorsal iii, 9 or 10; anal iii, 7 or 8; pelvic i, 8 or 9; scales 33 to 37, with $4\frac{1}{2}$ or 5 above and 3 or 4 below lateral line; 11 to 13 scales in front of dorsal fin; gill rakers on first gill arch 6 or 7+9 or 10; 9 or 10 dark cross bars on sides and a dark lateral band; basal third of caudal fin brownish in adults.

10a. Black cross bars on half-grown and many adults ending abruptly in black lateral streak as enlarged round black spots, in others the bars faint, especially on breeding females; scales 33 to 36.

Characidium chupa chupa, new species and subspecies

10b. Black cross bars usually extending a little below the blackish lateral band and not intensified into round black blotches; scales 35 to 37.

Characidium chupa torbesensis, new subspecies

CHARACIDIUM BLENNOIDES Eigenmann

Characidium blennioides EIGENMANN, Ann. Carnegie Mus., vol 6, No. 1, p. 37, 1909 (Erukin, tributary to Potaro above Kangaruma; Tukeit; creek above Potaro Landing; Tumatumari; Crab Falls; Amatuk).

Through the courtesy of J. T. Nichols, American Museum of Natural History, I was able to examine 5 specimens that probably belong to this species. They were collected at Mount Duida, Venezuela.

CHARACIDIUM DECLIVIROSTRE Steindachner

Characidium declivirostre STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 93, p. 31, 1917 (Río Coquenán, tributary to Río Caroni, in Venezuela).

CHARACIDIUM CATENATUM Eigenmann

Characidium catenatum EIGENMANN, Ann. Carnegie Mus., vol. 6, No. 1, p. 40, 1909 (Warraputa; Rockstone sandbank; Crab Falls, all British Guiana); Indiana Univ. Stud., vol. 7, No. 44, p. 10, 1920 (Río Guaire near Caracas; Río Tuy, Concejo, Venezuela).

I have examined two of Eigenmann's specimens, Ind. Univ. No. 15142, collected by Pearse in the Río Guaire, and find very small lateral points basally on some of the teeth. Through the courtesy of J. T. Nichols, American Museum of Natural History, I examined two specimens of this species from Mount Duida, Venezuela.

²⁰ *C. caucanum* (paratype, U. S. N. M. No. 79183) and *C. phoxocephalum* (cotype, Ind. Univ. No. 12704) have been studied; also additional specimens (U. S. N. M. Nos. 120144, 120145, 120146 and 120209). From this series it is concluded that the coloration is variable, as the young and half grown have vertical bars that disappear on adults, usually completely lacking on mature females. The number of scales is variable, 32 to 35. Thus, I conclude that *phoxocephalum* is a synonym of *caucanum*.

CHARACIDIUM VOLADORITA, new species

FIGURE 32

Holotype.—U. S. N. M. No. 121407, a specimen 40.5 mm. in standard length collected by Leonard P. Schultz, 4 km. above Motatán in the Río Motatán, Maracaibo Basin, March 25, 1942.

Paratypes.—All the paratypes listed below were collected by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942.

U.S.N.M. No. 121408, 40 specimens, 28 to 41 mm. in standard length, taken along with the holotype and bearing same data.

U.S.N.M. No. 121412, 10 examples, 25 to 36 mm., from the Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121414, 98 examples, 20 to 34 mm., from the Río San Juan near the bridge south of Mene Grande, Motatán system, March 17 and 20.

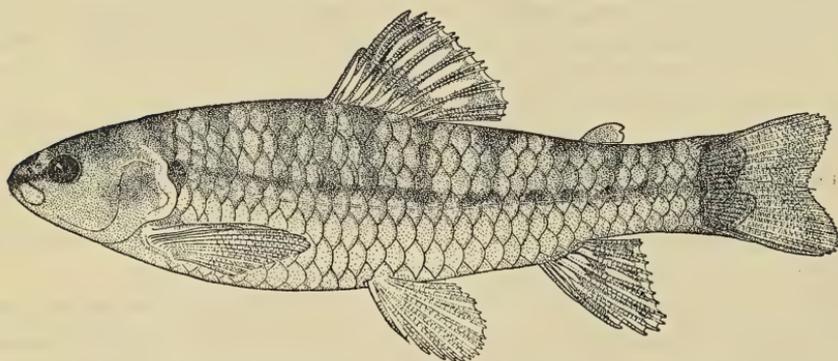


FIGURE 32.—*Characidium voladorita*, new species: Holotype, U.S.N.M. No. 121407, 40.5 mm. in standard length.

U.S.N.M. No. 121410, 27 specimens, 20 to 34 mm., from the Río San Pedro at bridge, south of Mene Grande, Motatán system, March 20.

U.S.N.M. No. 121413, 26 specimens, 18 to 26 mm., from the Río San Juan, 12 km. south of Rosario, Estado de Zulia, February 26.

U.S.N.M. No. 121409, 15 examples, 23 to 32 mm., from the Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121411, 3 specimens, 24 to 32 mm., from the Río Machango, 20 km. above bridge south of Lagunillas, March 21.

This species was abundant in swiftly flowing water among rubble and gravel. It darts swiftly from place to place on the stream bottom and resembles in habit the darters of North America.

Description.—Detailed measurements were made on the holotype and one paratype, and these data, expressed in hundredths of the standard length, are recorded first for the holotype, then for the paratype in parentheses. Standard lengths in mm. 40.5 (35.1).

Length of head 25.7 (25.9); greatest depth of body 27.2 (22.5); diameter of eye 4.94 (4.84); length of snout 6.18 (6.25); length of maxillaries 6.18 (5.98); postorbital length of head 15.6 (15.7); width of interorbital space 5.68 (4.84); least preorbital width 2.46 (2.85);

least depth of caudal peduncle 13.3 (11.7); length of caudal peduncle from base of last anal ray to midbase of caudal fin 19.0 (22.2); distance from tip of snout to dorsal origin 48.2 (46.4); snout to adipose origin 84.0 (80.9); snout to anal origin 78.0 (74.0); snout to pectoral insertion 21.0 (21.4); snout to pelvic insertion 54.1 (50.2); snout to anus 68.6 (65.5); length of longest ray of dorsal fin 18.5 (17.1); longest ray of anal fin 18.0 (17.4); longest ray of pectoral fins 23.0 (24.2); longest ray of pelvic fins 19.0 (20.5); longest ray of upper caudal lobe 20.0 (21.4) and of lower caudal lobe 21.5 (21.4).

The following counts were made, respectively: Dorsal rays iii, 8 (iii, 9); anal iii, 6 (iii, 6); pectoral iii, 9—iii, 9 (iii, 8—iii, 8); pelvic i, 7—i, 7 (i, 7—i, 7); gill rakers on first gill arch -- (5+10); number of scale rows from dorsal edge of gill opening to midcaudal base 32 (32); scales from dorsal base to lateral line $3\frac{1}{2}$ ($3\frac{1}{2}$) and from lateral line to pelvic base 3 ($2\frac{1}{2}$); scales in front of dorsal fin 12 (11); additional counts are recorded in table 11.

This is a small species, the largest specimen being 41 mm. in standard length, and among the various lots are numerous females with fully developed eggs which cause their bodies to be greatly expanded.

Greatest depth 3.8 (females with developed eggs) to 4.5 in immature; head 3.6 to 4.0; eye equal to or a little smaller than snout; maxillary not quite extending to a vertical line through front of eye; least pre-orbital width about 1.8 in interorbital space, the latter equal to the eye in the largest and contained 1.6 in the eye of the immature; pelvic insertion equidistant between or a little closer to base of caudal than to tip of snout; dorsal origin equidistant between adipose origin and anterior two-thirds of eye; 6 or 7 teeth, in outer row on each side of lower jaw, the middle 3 or 4 considerable larger than the lateral 3, the former directed forward, and a second inner row of minute teeth projecting at nearly right angles from near bases of outer row of larger teeth; all teeth with a minute denticle near base on each side; each premaxillary with 6 teeth; first 4 outer rays of pectoral fin thickened and sometimes the tips of the fifth in all adults, but in the immature none of the fin rays thickened; outer 2 pelvic rays thickened in adults; simple rays of both anal and dorsal thickened and sometimes the tips of the first branched ray; the short-pointed gill rakers well developed; gill membranes free and continued far forward before joining with the narrow isthmus; breast naked, no scales between bases of pectoral fins even in breeding adults; adipose fin small, its base over bases of last one or two anal rays or just behind a vertical through posterior end of anal fin base; origin of pelvics under the bases of about the second or third branched dorsal rays; caudal peduncle compressed; caudal fin forked, the lobes nearly equal; distal margin of dorsal fin truncate or a little rounded, that of anal truncate or a little concave in breeding males; second or third branched ray of pectoral longest, the third branched

pelvic ray longest; lateral line complete but not prominent, slightly decurved anteriorly and running just below blackish lateral streak except along caudal peduncle where it is along the midaxis; bases of first rays of dorsal and anal fins provided with free membranous folds; a small axillary scale on upper base of pelvics.

Coloration of breeding males when alive was as follows: Head blackish, a little paler below, iris blackish except a narrow bright line posteriorly next to pupil; a blackish bar across operculum, followed by bright yellow across rear of opercle to in front of pelvic base, this yellow bar extending dorsally to above operculum and fainter to occiput, and set off posteriorly by the blackish humeral bar; basal part of pectoral fin yellowish; upper and anterior parts of body brownish black, gradually becoming purplish brown posteriorly; a bright yellow spot at anterior basal half of first dorsal rays, then a brown bar across middle of fin, distal half of dorsal purplish; anterior basal third of anal fin with a bright yellow spot, the distal half brown; adipose fin purplish; caudal fin brownish, the basal third abruptly darker brown; along the lateral axis on midsides is an irregular or broken dark streak anteriorly, becoming a succession of black dots posteriorly.

The color pattern of the females and of the immature in alcohol consists of about 9 or 10 dark vertical bars on sides, meeting along mid-dorsal line, these most prominent in the immature; a small black spot at midbase of caudal fin; in front of this an embedded blackish bar across base of caudal fin rays that sends off a narrow line of pigment along the outer caudal fin ray; dorsal with one or two brownish bars across the rays, other fins plain in color; humeral spot always blackish and prominent; pale areas at anterior basal third of both dorsal and anal fins; the dark lateral streak narrow, usually formed by a row of small black spots posteriorly on breeding females.

These little fishes are beautifully colored when alive and live among the gravel and stones on the stream bottom much as do the darters of eastern North America.

Remarks.—This new species of *Characidium* with no scales on its breast differs in other respects from all other members of the genus in its color pattern. By means of the key on page 278, it may be separated from other species occurring in northern South America.

Named *voladorita* in reference to its small size and to the common name given it by the Venezuelans who saw me collect this species.

CHARACIDIUM FASCIATUM Reinhardt

Characidium fasciatum REINHARDT, Overs. Danske Vid. Selsk. Forh. Kjøbenhavn, 1866, p. 56, pl. 2, figs. 1, 2 (Lagoa Santa; Rio das Velhas, Brazil).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 155, 1879 (Ciudad Bolívar, Venezuela).—EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 121, 1922 (Orinoco).—EIGENMANN and ALLEN, Fishes of western South America, p. 288, 1942 (Orinoco Basin).

U.S.N.M. No. 121405, 2 specimens, 26.5 and 27.5 mm. in standard length, collected by L. P. Schultz, G. Zuloaga, William Phelps, Jr., and Roger Sherman, May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua.

It is highly probable that the above specimens and others from the Orinoco system, here identified as this species, are really a distinct subspecies. They usually have iii, 9 pectoral rays instead of iii, 8, as counted in two of Lütken's specimens and Reinhardt's count.

CHARACIDIUM CHUPA CHUPA, new species and subspecies

CHUPA

FIGURE 33

Holotype.—U.S.N.M. No. 121417, a female specimen 66.5 mm. in standard length, with fully matured eggs, collected by Leonard P.

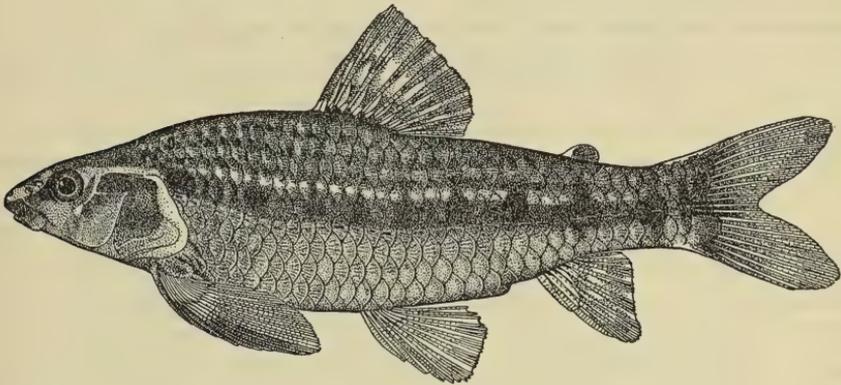


FIGURE 33.—*Characidium chupa chupa*, new species and subspecies: Holotype, U.S.N.M. No. 121417, 66.5 mm. in standard length.

Schultz, April 3, 1942, in the Río Chama at Estanques, Estado de Mérida.

Paratypes.—All collected by Leonard P. Schultz during 1942:

U.S.N.M. No. 121419, 80 specimens, 35 to 80 mm. in standard length, taken along with the holotype and bearing same data.

U.S.N.M. No. 121418, a specimen, 75 mm., from the Río Chama 10 km. below Lagunillas, Estado de Mérida, March 30.

U.S.N.M. No. 121420, 9 examples, 32 to 63 mm., from the Río Chama at La Gonzáles, Estado de Mérida, March 29.

This species lives in swiftly flowing streams among stones and pools among the rocks.

Description.—Detailed measurements were made on the holotype and one paratype, and these data, expressed in hundredths of the standard length, are recorded first for the holotype, then for the paratype in parentheses. Standard lengths in mm. 66.5 (♂39.5).

TABLE 11.—Counts made on species of *Characidium*

Species	Number of fin rays																Number of gill rakers on first gill arch						
	Dorsal			Anal			Pectoral						Pelvic			Above angle			Below angle				
	iii, 8	iii, 9	iii, 10	iii, 6	iii, 7	iii, 8	iii, 7	iii, 8	iii, 9	iii, 10	iii, 11	iii, 12	iv, 8	iv, 9	i, 7	i, 8	i, 9	ii, 6	5	6	7	8	9
<i>chupa chupa</i>	13			12	1					14	11				16	4		3	2	1	2	3	1
<i>chupa torbesensis</i>	6	2		7	1					7	9				9	3				2		1	1
<i>voladorita</i>	1	10	1	10				4	17					19	2			1	2		2	1	
<i>caucanum</i> ¹	9			3	7			3	8	4	1				12			1	1		1	1	
<i>fasciatum</i> ²	3			3			2	4							4								
<i>laterale</i> ³	2			2									6	2			10						
<i>blennioides</i> ⁴	1			1										2			2						

¹ U. S. N. M. Nos. 79183, 120146, 120145, 120144, and 120209 and Ind. Univ. No. 12704.

² U. S. N. M. Nos. 44950 and Lütken's figure.

³ Indiana Univ. Nos. 11674 and 11673, cotypes of *vintoni* and *laterale*, respectively.

U. S. N. M. No. 66129, cotype of *blennioides*.

Species	Number of scales																					
	Rows crossing lateral line							Above lateral line					Below lateral line				In front of dorsal fin					
	30	31	32	33	34	35	36	37	3	3½	4	4½	5	2½	3	3½	4	9	10	11	12	13
<i>chupa chupa</i>				2	4	5	4					4	5		7		2			4	2	1
<i>chupa torbesensis</i>						1	4	3				5	1		5		1			4	1	
<i>voladorita</i>	1	1	6	2					7					8					5	3	1	
<i>caucanum</i>			2	3	1	2			2	1	3	1			7				2	3	2	
<i>fasciatum</i>				1	1		1		1	1	1				3					2		
<i>laterale</i>					1	1					1				2				1			
<i>blennioides</i>					1							1			1			1				

Length of head 26.9 (25.8); greatest depth of body 28.4 (23.8); diameter of eye 5.41 (6.32); length of snout 7.82 (7.34); length of maxillaries 7.06 (6.54); postorbital length of head 16.2 (16.7); width of interorbital space 6.01 (6.54); least preorbital width 2.56 (2.28); least depth of caudal peduncle 12.5 (12.9); length of caudal peduncle from base of last anal ray to midbase of caudal fin 16.8 (19.0); distance from tip of snout to dorsal origin 46.3 (47.0); snout to adipose origin 83.2 (83.5); snout to anal origin 79.0 (77.2); snout to pectoral insertion 22.0 (25.6); snout to pelvic insertion 56.2 (54.4); snout to anus 73.0 (71.9); length of longest ray of dorsal fin 18.9 (21.3); longest ray of anal fin 17.4 (19.5); longest ray of pectoral fin 25.7 (25.8); longest ray of pelvic fin 21.2 (22.8); longest ray of upper caudal lobe 23.6 (26.6) and of lower caudal lobe 24.5 (26.6).

The following counts were made, respectively, on the holotype and paratype: Dorsal rays iii, 9 (iii, 9); anal iii, 7 (iii, 7); pectoral iii,

12-iii, 12 (iii, 11-iii, 11); pelvic i, 8-ii, 7 [this is an abnormal condition] (i, 9-i, 9); gill rakers on first gill arch -- (6+10); number of scale rows from dorsal edge of gill opening to midcaudal base 34 (34); scales from dorsal base to lateral line 5 (5) and from lateral line to pelvic base 4 (3); scales in front of dorsal fin 12 (11). Additional counts are recorded in table 11.

This species reaches a maximum length of about 80 mm. in standard length, and the April 3 collection contains numerous females with their abdomens greatly distended with mature eggs.

Greatest depth 3.5 (in females with eggs) to 4.0; head 3.4 to 3.7 in standard length; eye a little smaller than length of snout; eye $1 \frac{1}{5}$ in interorbital, the latter a little convex; least preorbital width 2 times in the interorbital; posterior edge of maxillary reaching to a vertical through front of eye; pelvic insertion closer to midcaudal base than tip of snout; dorsal origin equidistant between adipose origin and eye; teeth in lower jaw in an outer row on each side numbering about 14 or 15, the inner 4 or 5 of these a little enlarged, then an inner row of minute teeth on the lower jaw a little distance inside of the outer row; 6 or 7 teeth on each premaxillary in a single row, no inner row; all teeth with a minute denticle near base on each side; first 4 outer pectoral rays thickened and sometimes tips of the fifth; first outer two pelvic rays thickened and sometimes tips of the third; third branched ray of pectorals longest, second or third ray of pelvics longest; simple rays of both anal and dorsal thickened in adults and sometimes the tips of the first branched ray; gill rakers short, pointed, gill membranes continued forward and free from the isthmus; breast scaly; adipose fin small, its origin over bases of last 1 or 2 anal rays; insertion of pelvics under about the fourth branched dorsal ray; caudal peduncle compressed, caudal fin forked, the lobes nearly equal; distal margin of dorsal fin truncate, that of anal fin truncate; lateral line complete but difficult to observe as the pores and tubes are more or less obsolete, slightly decurved anteriorly; basal third of first rays of dorsal and anal fin provided with free membranous folds; pelvics with small axillary scale.

Coloration of a breeding female when alive was as follows: General background color pale yellowish with three bright-yellow spots on side of head, one at upper edge of gill opening, one on opercle near tip, and the third on rear of preopercle, in front of which is an oblique brownish bar; upper part of operculum with brown blotch; dorsal fin pale yellowish orange, this crossed by two faint darkish bars; basal half of anal yellowish, distal part pale brownish; caudal fin light brownish; a brownish bar across distal portion of pectoral rays, the basal third yellowish; sides of body with numerous wavy short vertical blackish bars.

In alcohol the color pattern is somewhat variable with sex and age. The immature have about nine vertical color bars that end in an enlarged round spot along the midaxis of the body; also along the midaxis is a black band; humeral spot black and prominent; base of caudal fin with a black blotch that continues part way out along the middle rays of caudal fin; coming off the black caudal spot at base of caudal fin rays are short wings, one dorsally and the other ventrally, and these then continue as faint pigment streaks along outer rays of caudal fin; a black streak through eye to tip of snout.

The adults are similar in color pattern, but the bars and black lateral band are less distinct; the vertical color bars do not continue below the lateral line or below their enlarged ends along midaxis; the dark brown color on the basal half of the caudal fin abruptly ends, so that the distal half of the caudal fin is pale; behind the base of each of the middle caudal fin rays is a small black spot.

Remarks.—This new species differs from other species referred to *Characidium* in color pattern and in the more numerous pectoral rays, iii, 11 or iii, 12 instead of iii, 10 or fewer.

Named *chupa* after the common name of this species as given to me by the Venezuelans of the valley of the Río Chama.

CHARACIDIUM CHUPA TORBESENSIS, new subspecies

FIGURE 34

Holotype.—U.S.N.M. No. 121415, a specimen 61 mm. in standard length, collected by Leonard P. Schultz, March 31, 1942, in the Río Torbes, 1 km. above Táriba, Orinoco drainage.

Paratypes.—U.S.N.M. No. 121416, 7 specimens, 52 to 76 mm., collected along with the holotype and bearing same data. These types were collected in rapidly flowing water among rubble to large boulders.

Description.—Detailed measurements were made on the holotype and one paratype, and these data, expressed in hundredths of the standard length, are recorded first for the holotype then the paratype in parentheses. Standard lengths in mm. 61 (70.5).

Length of head 25.6 (27.6); greatest depth of body 26.5 (31.2); diameter of eye 5.57 (4.96); length of snout 5.90 (6.67); length of maxillaries 6.56 (6.38); postorbital length of head 16.4 (17.9); width of interorbital space 6.06 (6.52); least preorbital width 1.66 (2.83); least depth of caudal peduncle 12.8 (14.0); length of caudal peduncle from base of last anal ray to midbase of caudal fin 18.5 (19.1); distance from tip of snout to dorsal origin 45.7 (49.8); snout to adipose origin 82.8 (84.4); snout to anal origin 76.2 (76.6); snout to pectoral insertion 20.8 (23.1); snout to pelvic insertion 52.0 (56.6); snout to anus 69.0 (71.5); length of longest ray of dorsal fin 18.8 (19.1); longest ray of

anal fin 17.0 (18.4); longest ray of pectoral fin 25.6 (24.8); longest ray of pelvic fin 20.0 (21.3); longest ray of upper caudal lobe 25.1 (25.2) and of lower caudal lobe 26.6 (26.2).

The following counts were made, respectively: Dorsal rays iii, 9 (iii, 9); anal iii, 7 (iii, 7); pectoral iii, 12—iii, 12 (iii, 11—iii, 11); pelvic i, 8—i, 9 (i, 8—i, 8); gill rakers on first gill arch 7+9 (7+10); number of scale rows from dorsal edge of gill opening to midcaudal base 35 (36); scales from dorsal base to lateral line $4\frac{1}{2}$ ($4\frac{1}{2}$) and from lateral line to pelvic base 3 ($3\frac{1}{2}$); scales in front of dorsal fin 12 (11); additional counts are recorded in table 11.

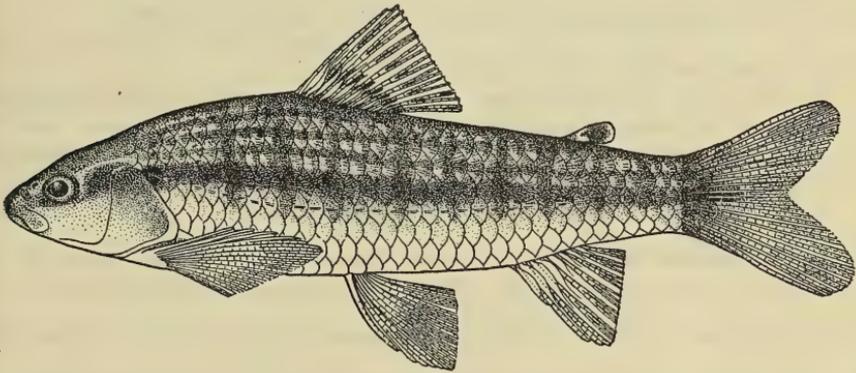


FIGURE 34.—*Characidium chupa torbesensis*, new subspecies: Holotype, U.S.N.M. No. 121415, 61 mm. in standard length.

Remarks.—This subspecies, *Characidium chupa torbesensis*, of the Río Torbes, is essentially like the one in the Río Chama, *Characidium chupa chupa*, except for color pattern and certain statistical differences of doubtful significance (see table 11). There appears to be a slightly greater average number of scales in the lateral line in *torbesensis* and a trifle higher average number of pectoral fin rays. The color bars extend below the blackish lateral band in *C. c. torbesensis* and are not enlarged into round blotches along the midaxis as in *C. chupa chupa*.

Named *torbesensis* after the river from which it was collected.

Subfamily PARODONTINAE

VOLADORAS

A study of this group of fishes indicates considerable confusion in regard to the definition of the species and their separation. An attempt was made by Schultz and Miles (Journ. Washington Acad. Sci., vol. 33, No. 8, pp. 251–255, figs. 1, 2, 1943) to distinguish the genera by the key given below, but material for a revision of the species is inadequate, and about all I am able to contribute at this time in

helping clear up this matter is a redescription of *Parodon suborbitale* and the form collected by me in the Orinoco Basin, along with other data obtained on specimens in the National Museum.

KEY TO THE GENERA OF PARODONTINAE

- 1a. Teeth in upper jaw 0+6+0 and not in a straight line; edge of thin upper lip free and crossing middle of teeth on premaxillaries; no teeth in lower jaw, the edge of which is 5-lobed; pectoral rays ii, 12 to 16; pelvis i, 8.
Saccodon Kner and Steindachner
- 1b. Teeth in upper jaw normally 2+8+2 (2 teeth on each maxillary); upper lip not free but forming part of flesh between bases of teeth on premaxillaries.
 2a. Pectoral rays ii, 14 to 17; pelvis i, 8; no teeth on lower jaw.
Parodontops Schultz and Miles
- 2b. Pectoral fin rays i, 11 to 16; pelvis i, 7, rarely i, 8.
 3a. No teeth on lower jaw.....**Apareiodon** Eigenmann
 3b. Teeth at sides of lower jaw normally 3+3, but one or more may be lacking in young.....**Parodon** Valenciennes

Genus **PARODON** Valenciennes

Parodon VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 50, 1849. (Type: *Parodon suborbitale* Valenciennes.)

TENTATIVE KEY TO THE SPECIES OF PARODON REPORTED FROM VENEZUELA

- 1a. Color pattern consisting of about 13 to 15 vertical blackish color bars on sides, their width narrower than eye; pale interspaces a little narrower than black bars; each pair (usually with one or two exceptions) of these black vertical color bars more or less fuse to form a black saddle across back that meets the corresponding pair on other side, the back thus being crossed with about 9 saddles; no lengthwise black streaks, even along lateral line or on back; origin of dorsal closer to tip of snout than midbase of caudal fin by length of snout and eye; pectoral fin rays i, 14 to i, 16, usually i, 15; dorsal ii, 10; anal ii, 7; pelvic i, 7; scales 35 to 38, usually 36 or 37, with 4 or 4½ above lateral line to origin of dorsal and 4 below lateral line to origin of anal fin; 16 scales in a zigzag row around caudal peduncle; 11½ to 12½ predorsal scales and 11½ to 12½ scales between base of dorsal fin and adipose origin; head 4 to 5½, depth 3½ to 4, in standard length; least depth of caudal peduncle 1.4 to 1.6 in head.
Parodon apolinari Myers
- 1b. Color pattern consisting of a lateral streak, a little intensified at base of caudal fin and continuing nearly to end of midcaudal rays; this lateral streak or band, diffuse in adults, more intense in young about 60 mm. or shorter, crossed with about 18 or 19 very short blackish bars; about 8 or 9 dark saddles across back, diffuse in largest specimens; in other specimens bars lacking and lateral band intensified and in addition a narrow black streak, well defined, extending along upper sides to behind adipose fin where it joins its fellow from the other side, this band separated from lateral band by a wide pale band, crossed by the 8 or 9 dark diffuse dorsal saddles; dorsal fin closer to tip of snout by snout and eye than to midbase of caudal fin; pectoral rays i, 13 to i, 15, usually i, 14; dorsal ii, 10; anal ii, 7; pelvic i, 7; scales 36 or 37 in lateral line to base of caudal, 4½ above and 4

below lateral line; 15 or 16, usually 16 scales in zigzag row around caudal peduncle; $11\frac{1}{2}$ to 13 predorsal scales and 11 to $12\frac{1}{2}$ between base of dorsal and adipose origin; head about $4\frac{1}{2}$, depth $3\frac{1}{2}$ to $3\frac{3}{4}$, in standard length; least depth of caudal peduncle 1.6 in head.

Parodon suborbitale Valenciennes

PARODON APOLINARI Myers

Parodon apolinari MYERS, Proc. Biol. Soc. Washington, vol. 43, p. 66, 1930 (Guai-caramo, Río Guavio, Colombia); Stanford Ichth. Bull., vol. 2, p. 93, 1942 (Río Guárico, at El Sombrero, Guárico, Venezuela).

The following specimens were collected in Venezuela during 1942:

U.S.N.M. No. 121298, 7 specimens, 45.5 to 85 mm. in standard length from the Río Guárico and tributaries between San Sebastián and San Casimiro on May 12, by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr.

U.S.N.M. No. 121296, a specimen, 120.5 mm., collected by Leonard P. Schultz, March 31, in the Río Torbes, 1 km. above Táriba, Táchira, Orinoco Basin.

These fish, living in the swift waters of mountain streams, are difficult to capture. Upon the slightest disturbance, they dart among the stones and hide.

See table 12 for measurements of this and the next species.

PARODON SUBORBITALE Valenciennes²¹

VOLADORA

FIGURE 35

Parodon suborbitale VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 51, pl. 637, 1849 (rivers of Maracaibo).

Parodon suborbitalis GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 301, 1864 (Maracaibo).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 49, 1891 (Maracaibo).—EIGENMANN, Mem. Carnegie Mus., vol. 9, p. 108, pl. 19 fig. 1, 1922 (Maracaibo).

The following specimens were collected by Leonard P. Schultz in the Maracaibo Basin during 1942:

U.S.N.M. No. 121295, 4 specimens, 60.5 to 107 mm. in standard length, Río Jimelles, 12 km. east of Motatán, Río Motatán System, March 24.

U.S.N.M. No. 121293, 3 specimens, 76.5 to 108 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121294, 1 specimen, 70.5 mm., Río San Pedro at bridge south of Mene Grande, Motatán System, March 20.

U.S.N.M. No. 121292, 1 example, 97.5 mm., Río San Juan at bridge south of Mene Grande, Motatán System, March 20.

U.S.N.M. No. 121346, 1 example, 42 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

²¹ Steindachner, Denkschr. Akad. Wiss. Wien, vol. 93, p. 25, pl. 5, fig. 1, 1917, records *Parodon tortuosus* Eigenmann and Norris from the Río Coquenan in Venezuela. His figure does not agree with his measurements in the table on page 27, especially in regard to the origin of the dorsal fin. Probably the specimen from the Río Coquenan is *suborbitale* or a subspecies of it.

TABLE 12.—Measurements, expressed in hundredths of the standard length, made on two species of *Parodon* from Venezuela

Characters	<i>suborbitale</i>		<i>apolinari</i>	
	Río San Juan	Río San Pedro	Río Torbes	Río Guárico
Standard length in millimeters.....	97.7	71.0	120.5	85
Length of head.....	23.0	23.1	25.3	21.2
Greatest depth.....	28.0	28.9	29.1	29.4
Diameter of eye.....	4.40	5.21	3.73	4.12
Length of snout.....	9.00	8.59	9.12	8.24
Interorbital space.....	9.31	9.44	9.95	8.82
Postorbital length of head.....	11.2	11.4	14.1	10.6
Least depth of caudal peduncle.....	15.1	14.2	14.1	13.5
Length of caudal peduncle.....	16.4	19.0	16.3	17.1
Space between nasal openings.....	6.24	4.93	6.60	5.06
Snout to dorsal origin.....	46.8	45.0	49.4	48.6
Snout to adipose origin.....	83.9	83.0	85.2	84.2
Snout to anal origin.....	76.8	78.3	72.6	76.5
Snout to pectoral insertion.....	20.0	19.9	21.1	16.9
Snout to pelvic insertion.....	50.6	48.2	54.8	51.2
Length of longest ray of dorsal fin.....	22.8	20.0	20.2	20.8
Length of longest ray of anal fin.....	17.7	16.6	18.2	17.1
Length of longest ray of pectoral fin.....	22.0	19.0	17.8	17.6
Length of longest ray of pelvic fin.....	18.4	17.6	19.1	17.6
Length of longest ray of upper caudal lobe.....	26.6	25.8	24.0	24.1
Length of longest ray of lower caudal lobe.....	26.7	24.0	25.7	24.1
Snout to anus.....	68.1	70.4	74.0	70.8
Anus to anal origin.....	8.19	7.32	6.72	6.60
Width across lower jaw.....	5.73	4.65	5.81	4.97
Dorsal base to adipose origin.....	28.6	28.3	27.8	24.9

The coloration varies from nearly plain darkish above, paler below, to one with two blackish lateral bands on each side and 8 or 9 dark

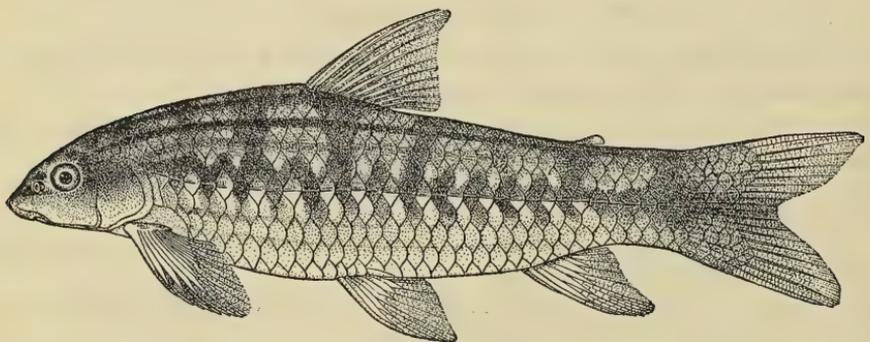


FIGURE 35.—*Parodon suborbitale* Valenciennes: U.S.N.M. No. 121295, 105 mm. in standard length.

saddles across the back. In addition, small specimens have very short vertical bars along the lateral band. When alive, there were two irregular rows of yellow-orange spots along the midsides separated by a series of dark, irregular short cross bars or "parr marks" along

the darkish lateral band; ground color above purplish brown. Thus it must be concluded that the type of the genus *Parodon* is variable in color and that several of the species which have been described on the basis of black streaks or bands as differing from *suborbitale* need careful study and perhaps they should be placed in the synonymy of *suborbitale*. I especially refer to *Parodon bifasciatus* Eigenmann, *P. buckleyi* Boulenger, and *P. carrikeri* Fowler. Probably there are others.

Much of the confusion in separation of the species of *Parodon* has resulted in the almost complete lack of comparative material from the Maracaibo Basin since Cuvier and Valenciennes's time until now.

Genus HEMIODUS Müller

Hemiodus MÜLLER, Monatsb. Akad. Wiss. Berlin, 1842, p. 324. (Type, *Hemiodus crenidens* Müller=*Salmo unimaculatus* Bloch.) (Ref. copied.)

HEMIODUS IMMACULATUS Kner

Hemiodus immaculatus KNER, Denkschr. Akad. Wiss. Wien, vol. 17, p. 157, pl. 5, fig. 9, 1859 (Barra do Rio Negro).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 153, 1879 (Ciudad Bolívar).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 49, 1891 (Orinoco).

No black lateral spot but a dark band along each caudal lobe; upper jaw with 22 teeth in horseshoe-shaped row; dorsal rays ii, 9; anal ii, 10; pelvic i, 11; pectoral i, 17; scales 10 or 11+70 to 72+6 or 7.

Genus PIABUCINA Valenciennes

Piabucina VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 161, 1849. (Type, *Piabucina erythrinoides* Valenciennes.)

In the absence of specimens of *Piabucina* from the rivers draining the western slopes of Lago Maracaibo Basin, it appears necessary to recognize two species, the first described by Valenciennes in 1849 and the second by Regan in 1903. I regret that I was unable to collect *Piabucina* in the streams flowing down from the Perijá region, the type locality of *P. erythrinoides* Valenciennes.

KEY TO THE SPECIES OF PIABUCINA REPORTED FROM VENEZUELA

- 1a. Scales 37; 9 scales between pelvic insertion and base of dorsal fin; dorsal rays 10; anal 12; pectoral 16; pelvic 8; origin of dorsal equal distance between base of caudal and tip of snout; depth 5, head $4\frac{1}{2}$ in standard length; black caudal spot not round, its greatest length through vertical axis (after Valenciennes)-----***Piabucina erythrinoides* Valenciennes**
- 1b. Scales 30 to 32, $7\frac{1}{2}$ scales from insertion of pelvics to base of dorsal fin; dorsal rays usually ii, 8; anal ii, 8 or ii, 9; pectoral i, 13, pelvic i, 7; origin of dorsal equal distance between base of caudal fin and eye; depth 4 to $4\frac{1}{2}$, head 4 to $4\frac{1}{2}$ in standard length; black caudal spot nearly round; dorsal fin with the black spot at base between first four branched rays of dorsal
***Piabucina pleurotaenia* Regan**

PIABUCINA ERYTHRINOIDES Valenciennes

Piabucina erythrinoides VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 161, 1849 (rivers of Maracaibo, coast of "Parija").—GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 311 1864 (Maracaibo).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 52, 1891 (Maracaibo).—EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 125, 1922 (Maracaibo).

PIABUCINA PLEUROTAENIA Regan

VOLADORA

FIGURE 36

Piabucina pleurotaenia REGAN, Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 623, 1903 (Mérida, Venezuela).

The following specimens were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121403, 2 specimens, 108 and 124 mm. in standard length, from the Río San Juan near bridge, tributary to Río Motatán, March 20.

U.S.N.M. No. 121402, 1 specimen, 79 mm., from the Río San Pedro at bridge, Motatán system, March 20.

U.S.N.M. No. 121404, 2 specimens, 86 and 96 mm., taken in the Río Barregas, tributary to Río Chama, just below Egido, Estado de Mérida, March 29.

U.S.N.M. No. 121401, 1 specimen, 41 mm., from the Río Cobre above mouth, tributary to Río Quinta, this tributary to Río La Grita, Catatumbo system, March 31.

U.S.N.M. No. 121400, 27 specimens, 34 to 162 mm., from the Río Chama at Estanques, Estado de Mérida, Venezuela, April 3.

U.S.N.M. No. 86265, a specimen 133 mm. in standard length, from Valera, Estado de Trujillo, Venezuela, was collected by Dr. H. Pittier.

Two specimens, F.M.N.H. Nos. 41997 and 41998, from Río Cogollo, Sierra Perijá, Lago Maracaibo Basin, Osgood and Conover, March 1920, were lent to me by the Chicago Natural History Museum for study and report.

The color pattern of this species is in need of description. Specimens 34 to 41 mm. have a black spot just behind the head, then a pale interspace of $1\frac{1}{2}$ scale rows before the black lateral band begins, the latter fading out on caudal peduncle, but at 56 mm. the black lateral streak is continuous without interruption anteriorly; the round black spot near midbase of caudal fin is prominent; black spot in dorsal fin distinct, but the blackish streaks along back are obsolete.

When alive a specimen 79 mm. in standard length had the following coloration: Lateral streak black, caudal spot intensely black; median fins orange; paired fins orange, with outer rays and margins white; a series of orange spots below the black lateral streak on next row of scales, one on each scale, and anteriorly a second row of orange spots. At this size there is a second black band or streak along the upper part of the back, and this is more or less obvious in larger speci-

mens but fades soon after the fish are removed from the water, blending in with the blackish back.

When alive, a specimen 141 mm. in standard length had the following coloration: Black lateral band extending from the head to caudal peduncle, where it fades out; then at base of midcaudal fin rays is a round black spot, this spot a trifle above midaxis; back blackish; the pale band between black lateral band and blackish back with a row of orange spots, these fading on caudal region; two rows of orange spots, below black lateral band, one on each scale, then below these anteriorly a short row of yellow spots; paired fins brownish orange;

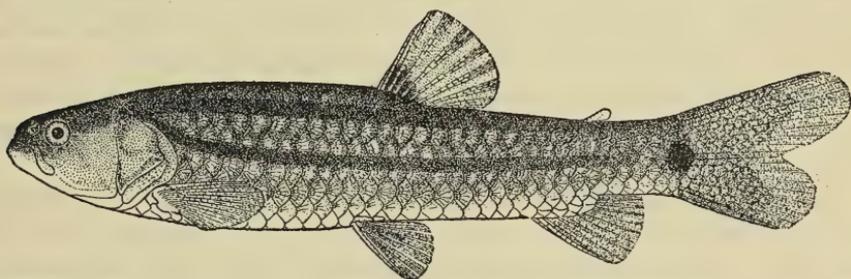


FIGURE 36.—*Piabucina pleurotaenia* Regan: U.S.N.M. No. 121400, 115 mm. in standard length.

anal and dorsal brownish orange, but adipose fin bright orange; caudal fin brownish orange to dull reddish posteriorly.

See table 13 for counts made on this species.

TABLE 13.—Counts made on *Piabucina pleurotaenia*

Number of fin rays				Number of gill rakers on first arch							Number of scales								
Dorsal	Anal	Pelvic	Pectoral	Above angle			At angle	Below angle				Rows on sides		From pelvic insertion to dorsal base					
ii, 8	ii, 8	i, 7	i, 12 i, 13 i, 14 i, 15	9	10	11	12	1	11	12	13	14	15	16	17	31	32	7	7½
7	7	7	2 10 3 1	1	1	2	1	5	1	---	2	---	1	---	1	2	6	3	3

Genus SALMINUS Agassiz

Salminus AGASSIZ, in Spix, *Selecta genera et species piscium . . . Brasiliam . . .*, p. 76, 1829. (Type, *Hydrocyon brevidens* Valenciennes (non *Hydrocyon brevidens* Cuvier) = *Salminus maxillosus* Valenciennes.)

SALMINUS HILARII Valenciennes

DORADA; SALTADORA; SUATA

Salminus hilarii VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 64, 1849 (Río San Francisco).—PELLEGRIN, *Bull. Mus. Hist. Nat. Paris*, vol. 5, p. 157, 1899 (Apure River).

U.S.N.M. No. 121399, a specimen 178 mm. in standard length, collected by Leonard P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

The following counts were made on this specimen: Dorsal rays ii, 9; anal iii, 22; pectoral i, 13-i, 13; pelvic i, 7-i, 7; scales 73, 13 from dorsal to lateral line and 5 or 6 to pelvic insertion.

Subfamily CHARACINAE

There seems to be confusion in regard to the nomenclature and relationships among certain genera related to *Charax*, especially the genera *Cynopotamus*, *Cyrtocharax*, *Gilbertolus*, and *Eucynopotamus*. Some of these have been used indiscriminately for one another. *Roeboides* may be distinguished from this group because it possesses external toothlike processes along the front of the upper jaw and sometimes also on the lower jaw.

After an examination of the type species, or the original description of the genotypes of these genera when actual specimens were not available, the following analysis was made. The key is intended to indicate some of the characters on which the various genera may be separated. The dentition is of the most importance.

- 1a. No external toothlike processes along front of upper or lower jaws.
- 2a. Lower jaw with two series of conical teeth anteriorly, external row with enlarged canines, but inner patch composed of small conical teeth in one or more rows.
- 3a. Two pairs of canines on premaxillaries and 4 or 5 pairs on mandibles; no small conical teeth between canines on lower jaw, inner series of small conical teeth on mandible confined to front of jaw; an outer row of small conical teeth between canines on each premaxillary, a pair of larger conical teeth representing inner row between pair of canines on each premaxillary; lower jaw included; pectoral shield not notched; origin of dorsal in front of anal origin; no keel in front of pelvics, but a low one behind pelvic bases to anus; anterior half of upper portion of first gill arch without elongate gill rakers, rough plates occurring instead.

Cynopotamus Valenciennes

- 3b. No canines; two series of short conical teeth on premaxillaries; mandible with 2 series of short conical teeth on anterior half, a single series posteriorly; origin of dorsal a little behind anal origin; origin of dorsal a trifle closer to snout tip than to midcaudal base; maxillary reaching to under front half of pupil; gill rakers about 5+1+18.

Eucynopotamus Fowler²²

- 2b. Mandible with a single series of teeth, no row or patch of teeth at front of lower jaw inside outer series; canines present in both jaws.

²² *Evermannella* Eigenmann, Smithsonian Misc. Coll., vol. 45, p. 146, 1903. (Type, *Cynopotamus biserialis* Garman.)

Eucynopotamus Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 56, p. 119, 1904 (new name replacing *Evermannella* Eigenmann preoccupied). (Type, *C. biserialis* Garman.)

Evermannolus Eigenmann, in Eigenmann and Ogle, Proc. U. S. Nat. Mus., vol. 33, p. 3, 1907 (new name replacing *Evermannella* Eigenmann, preoccupied). (Type, *C. biserialis* Garman.)

- 4a. No keel in front of pelvic bases; 2 pairs of canines on premaxillaries, one near symphysis and the other pair laterally.
- 5a. Two rows of small conical teeth between two canines on each side of premaxillary; 2 pairs of canines on mandible; all canine teeth relatively short, not excessively elongate; pectoral shield large, acutely notched with an elongate pointed plate along lower base of pectoral fin; gill rakers along entire length of upper half of first gill arch; dorsal origin behind anal origin; dorsal origin a little closer to snout than to midcaudal base; no keel in front of pelvic base but a keel from pelvics to anus.....**Charax Scopoli**²³
- 5b. An outer row of small conical teeth between two canines on each premaxillary, inner row represented by 2 enlarged conical teeth on each side; 3 or 4 pairs of canines on mandible, middle pair more or less excessively elongate and fanglike and on large adults projecting even through snout when mouth is closed; pectoral shield with shallow notch; only platelets along anterior portion of upper half of first gill arch; dorsal origin over or usually behind anal origin; dorsal origin a little closer to snout tip than midcaudal base; a low ridge from behind pelvic base to anus.....**Cyrtocharax Fowler**
- 4b. A sharp keel from anal origin to between bases of pectoral fins, thence as a hard ridge anteriorly on breast, becoming obsolete anteriorly; teeth in a single series on premaxillaries, with a single pair of short canines near their symphysis; 2 pairs of canines at front of mandibles; origin of dorsal much closer to midcaudal fin base than to tip of snout; dorsal origin behind anal origin; pectoral shield with a shallow notch; gill rakers along entire length of upper half of first gill arch; preopercle with platelike spiny projection at lower posterior angle.
Gilbertolus Eigenmann
- 1b. Toothlike external bony protuberances on margins of upper and often on lower jaws.....**Roeboides Günther**

Genus CYNOPOTAMUS Valenciennes

Cynopotamus VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 316, 1849. (Type, *Hydrocyon argenteus* Valenciennes, designated by Eigenmann, Mem. Carnegie Mus., vol. 5, p. 403, 1912, and by Jordan, Genera of fishes, pt. 2, p. 242, 1919.)

Roestes GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, pp. 345, 347, 1864. (Type, *Cynopotamus molossus* Kner.)

After an examination of the descriptions of various species, it is thought that the following species should be referred to this genus: *Cynopotamus humeralis* Valenciennes, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 320, 1849, from Buenos Aires, also referred to as *Anacyrtus humeralis* Valenciennes by Günther,

²³ *Charax* Scopoli, Hist. Nat., p. 455, 1877. (Type, *Salmo gibbosus* Linnaeus.) After examination of the descriptions of the following species, it was concluded that they should be referred to the genus *Charax*. This list of species is not complete, and others that probably should be added I have not examined sufficiently to arrive at a definite conclusion: *Anacyrtus pauciradiatus* Günther, Catalogue of the fishes in the British Museum, vol. 5, p. 346, 1864 (Pará, Rio Capim); *Anacyrtus tectifer* Cope, Proc. Amer. Philos. Soc., vol. 11, p. 565, 1870 (Pebas, Ecuador); *Anacyrtus sanguineus* Cope, Proc. Acad. Nat. Sci. Philadelphia, vol. 23, p. 266, pl. 9, fig. 1, 1872 (Río Ambyiacu); *Charax rupununi* Eigenmann, Mem. Carnegie Mus., vol. 5, p. 402, 1912 (Rupununi); *Charax metae* Eigenmann, Bol. Soc. Colomb. Cienc. Nat., vol. 9, p. 195, 1921, also Mem. Carnegie Mus., vol. 9, No. 1, p. 233, pl. 25, fig. 1, 1922 (Barrigóna, Quebrada Cramalote, Villavicencio, Colombia).

Catalogue of the fishes in the British Museum, vol. 5, p. 348, 1864; *Anacyrtus (Cynopotamus) knerii* Steindachner, Denkschr. Akad. Wiss. Wien, vol. 39, p. 65, 1878 (Cujaba; Río Paraguay; Irisanga); *Cynopotamus gulo* Cope, Proc. Amer. Philos. Soc., vol. 11, p. 565, 1870 (Pebas), referred to as *Eucynopstamus gulo* (Cope) by Pearson, Proc. California Acad. Nat. Sci., vol. 23, No. 7, p. 92, 1937 (Tingo de Pauca and Pusoc, above Balsas, Río Marañón, Peru).

Günther, in describing *Roestes* on page 345, says, "A. Mandibular teeth in a single series" but on p. 347 says, "teeth of the mandible in a double series." Kner's description of *C. molossus* definitely says teeth are in a double series on the mandible but only an outer series is visible in his figure 16a. Of course, the inner series could be behind the outer series and thus not be shown. The type should be re-examined.

CYNOPOTAMUS HUMERALIS Valenciennes

Cynopotamus humeralis VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 320, 1849 (Buenos Aires).

Anacyrtus humeralis PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Pellegrin's record for the Río Apure is somewhat out of the previously recorded range of this species, and it should be restudied to determine with more certainty if another species is involved.

Genus CYRTOCHARAX Fowler

Cyrtocharax FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 58, p. 454, 1906. (Type, *Anacyrtus limaesquamis* Cope.)

Unfortunately, there has been much confusion in regard to the genera related to *Cyrtocharax*, mostly because Eigenmann failed to recognize it and *Eucynopotamus* soon after they were named. Eigenmann (Amer. Nat., vol. 41, p. 770, 1907) states that "*Cyrtocharax* is synonymous with *Cynopotamus*, a subgenus of *Charax*. The type of *Cynopotamus* lacks a second row of teeth in the lower jaw." Again (Mem. Carnegie Mus., vol. 5, p. 403, 1912) he says, "I have examined the type of *Cynopotamus argenteus* (22 mm. long, Buenos Aires) in the Jardin des Plantes. I was unable to find an inner series of teeth in the lower jaw." That Eigenmann did not examine the genotype of *Cynopotamus*, which is *Hydrocyon argenteus* Valenciennes, seems quite certain because Valenciennes (Histoire naturelle des poissons, vol. 22, pp. 318-319, 1849) states definitely that the type of this genus is 8½ inches long and that on the lower jaw there is on the inside of the outer row a series of very small conical teeth. On the basis of our evidence, it is concluded that *Cyrtocharax* is not a synonym of *Cynopotamus*, but a distinct genus.

Among the species that I have noticed in the literature, and some of these are supplemented by specimens in the United States National Museum collections, it is concluded that the following should be referred to the genus *Cyrtocharax* Fowler; without the specimens at hand, it is, of course, not possible to determine which of these forms are valid species and which are synonyms:

Anacyrtus limaesquamis Cope (genotype), Proc. Amer. Philos. Soc., vol. 17, p. 686, 1878 (Peruvian Amazon); *Anacyrtus (Cynopotamus) magdalenae* Steindachner, Denkschr. Akad. Wiss. Wien, vol. 39, pp. 77, 78, pl. 12, figs. 2, 2a, 1878 (= *Anacyrtus (Cynopotamus) argenteus* of Steindachner (not Valenciennes), *ibid.* p. 62) (Río Magdalena); *Anacyrtus (Cynopotamus) amazonum* Günther, Proc. Zool. Soc. London, 1868, p. 246 (Xeberos); *Charax squamosus* Eigenmann and Kennedy, Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 525, 1903 (Pasito Laguna, Paraguay); *Charax atratoensis* Eigenmann, in Eigenmann and Ogle, Proc. U. S. Nat. Mus., vol. 33, p. 33, fig. 8, 1907 (Truando, Colombia, type U.S.N.M. No. 1664); *Charax calliurus* Eigenmann and Kennedy, in Eigenmann, McAtee, and Ward, Ann. Carnegie Mus., vol. 4, No. 2, p. 142, pl. 43, fig. 1, 1907 (Pasito Laguna, Paraguay); *Cynopotamus bipunctatus* Pellegrin, Bull. Mus. Hist. Nat. Paris, vol. 15, No. 1, p. 13, 1909 (mouth of Río Suripa, Venezuela); *Cynopotamus essequibensis* Eigenmann, Mem. Carnegie Mus., vol. 5, p. 403, 1912 (Potaro Landing; Tumatumari; Rockstone, all British Guiana).

LaMonte (Amer. Mus. Nov., No. 784, p. 8, 1935) identified U.S.N.M. No. 94627 from the Río Jurua as *Charax limaesquamis* (Cope), but upon examination I find it has iii,38 anal rays. This is the same number occurring in *Cyrtocharax amazonum* (Günther), and I refer it to this species, although it may be a new one. The humeral spot is as large as the eye and there is a darkish blotch on the back at the posterior tip of supraoccipital process not mentioned for *amazonum*; otherwise, there are no outstanding differences. A study of the original descriptions and what few specimens are available to me at this time indicates that the dorsal and anal rays vary in different localities as recorded in table 14. It would appear that in *C. limaesquamis*, *C. squamosus*, and *C. calliurus* there is a tendency toward ii,10 dorsal rays, but in the other species ii,9 rays.

Steindachner was the first to describe a *Cyrtocharax* from northern South America, *C. magdalenae* from the Río Magdalena, Colombia. Since that time, *C. atratoensis* from the Río Atrato system, Colombia, and *C. essequibensis* from the Río Essequibo system of British Guiana have been named. All these species are very closely related and differ only statistically from each other. Unfortunately, I do not have a large series of *Cyrtocharax*, except from the Maracaibo Basin, else a

more thorough study could be made of this problem. However, since the population of *Cyrtocharax* in the Maracaibo Basin differs statistically from those in adjoining basins, it is thought best to give it the rank of a new subspecies, which is described below. In that way it is possible to emphasize the different races.

CYRTOCHARAX MAGDALENAE VENEZUELAE, new subspecies

DIENTON

FIGURE 37

Holotype.—U.S.N.M. No. 121390, a specimen 203 mm. in standard length, collected by Leonard P. Schultz, March 2, 1942, in the Río Negro below mouth of Río Yasa, Maracaibo Basin.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

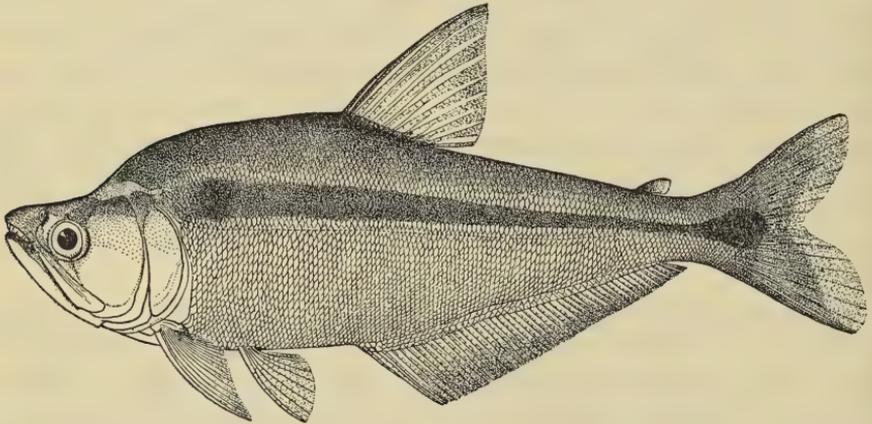


FIGURE 37.—*Cyrtocharax magdalenae venezuelae*, new subspecies: Holotype, U.S.N.M. No. 121390, 203 mm. in standard length.

U.S.N.M. No. 121398, 7 specimens, 165 to 293 mm. in standard length, collected along with the holotype and bearing same data.

U.S.N.M. No. 121394, 4 examples, 162 to 202 mm., collected March 6 in the Río Palmar at bridge, 70 km. southwest of Maracaibo.

U.S.N.M. No. 121395, 4 examples, 161 to 199 mm., taken February 26 in the Río Apón about 35 km. south of Rosaria, Maracaibo Basin.

U.S.N.M. No. 121396, 2 specimens, 205 and 206 mm., taken March 17 in the Río Motatán at bridge, 22 km. north of Motatán.

U.S.N.M. No. 121391, 2 specimens, 240 and 243 mm. obtained March 11 in a caño $\frac{3}{4}$ km. west of Sinamaica.

U.S.N.M. No. 121392, a specimen 208 mm., collected February 21 in the Río Palmar near Totuma, about 100 km. southwest of Maracaibo.

U.S.N.M. No. 121393, 5 specimens, 197 to 250 mm., collected February 24 in the Río Socuy, 3 km. above its mouth, Maracaibo Basin.

U.S.N.M. No. 121397, 2 examples, 225 and 238 mm., taken March 16 in the Río Machango at bridge south of Lagunillas, Maracaibo Basin.

TABLE 14.—Counts recorded for various species of *Cyrtocharax*

Species	Number of fin rays															Number of gill rakers on first gill arch													
	Branched anal rays ¹															Dorsal	Pectoral			Pelvic	Above angle		At angle		Below angle				
	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		53	54	55		ii, 9	i, 15	i, 16	i, 17	1, 7	2	3	1	4
<i>amazonum</i> ²	2																		1	2			2	1		1	1		
<i>m. magdalenae</i> ³											X	X	X	X	X	X	X	X	2	2			3	2		1		1	
<i>m. atratoensis</i> ⁴							1		1										2	3	1		4	2		2	1	1	
<i>m. essequebensis</i> ⁵							X	X	X	X									1					1		1		1	
<i>bipunctatus</i> ⁶													1						1				1						
<i>m. venezuelae</i>		1		2	6	7	6	3	1										16	9	8	2	11	4	2	6		2	4
<i>Himaesquamis</i> ⁷			1	1															2	3			3	1		1		1	
<i>squamosus</i> ⁸												2							2	2			3	1		1			1
<i>calliurus</i>												1							1										

¹ For counts from the literature two simple rays have been subtracted from the total count to bring these counts into line with my counts on specimens.
² U. S. N. M. No. 94627 included with Günther counts.
³ U. S. N. M. No. 79185 from Honda and from Steindachner. X=range of counts by Eigenmann as no numbers were given.
⁴ U. S. N. M. No. 1664 types and Eigenmann. X=range of counts by Eigenmann as no numbers were given.
⁵ All data from Eigenmann. X=range of counts by Eigenmann as no numbers were given.
⁶ All data from Pellegrin.
⁷ U. S. N. M. No. 1694 and from Cope.
⁸ U. S. N. M. No. 44837 and from Eigenmann and Kennedy.

Description.—The description is based on the holotype and paratypes listed above. Detailed measurements were made on the holotype and two paratypes, and these data, along with the same measurements made on the type of *Cyrtocharax atratoensis* (Eigenmann), all expressed in hundredths of the standard length, are recorded in table 15.

The following counts were made, respectively, on the holotype and two paratypes (in parentheses): Dorsal rays ii, 9 (ii, 9; ii, 9); anal iii, 45 (iii, 45; iii, 45); pectoral i, 16-i, 17 (i, 15-i, 15; i, 16-i, 16); pelvic always i, 7; pores in lateral line 112 (108; 113); scales from dorsal origin to lateral line 28 (28; 27); scales from lateral line to pelvic insertion 22 (24; 21); number of scales in a zigzag row around caudal peduncle 39 (37; 36); gill rakers on first gill arch 3+1+6 (2+1+6; 2+1+5); scale rows between tip of supraoccipital process and dorsal origin about 77 (83; --); branched caudal fin rays always 17.

TABLE 15.—*Certain measurements, expressed in hundredths of the standard length, recorded for two subspecies of Cyrtoscharax magdalenae*

Characters measured	<i>venezuelae</i>		<i>atratoensis</i>	
	Paratype	Holotype	Paratype	U.S.N.M. No. 1664 holotype)
Standard length in millimeters.....	160	203	293	298
Length of head.....	28.5	28.8	28.3	29.3
Greatest depth of body.....	35.0	33.8	35.8	32.9
Length of snout (measured from front of bony orbit).....	6.88	7.73	7.51	8.09
Diameter of eye.....	4.66	4.43	4.10	4.02
Diameter of bony orbit.....	6.88	6.90	6.48	6.54
Width of fleshy interorbital space.....	9.06	9.70	9.90	9.23
Length of postorbital part of head.....	15.3	16.2	15.6	15.8
Distance from tip of snout to rear of maxillary or length of mouth.....	19.7	20.2	21.6	21.1
Length of caudal peduncle, from base of last anal ray to midcaudal base.....	11.3	12.5	11.6	11.1
Least depth of caudal peduncle.....	8.94	9.02	8.20	8.56
Length of anal fin base.....	41.3	45.3	44.2	41.6
Length of longest ray of anal fin.....	14.4	15.0	13.0	13.8
Length of longest ray of dorsal fin.....	26.9	27.2	22.5	21.1
Length of longest ray of pectoral fin.....	19.4	20.5	17.7	16.8
Length of longest ray of pelvic fin.....	15.0	15.0	13.3	12.0
Length of longest ray of upper caudal lobe.....	22.2	21.2	19.8	-----
Length of longest ray of lower caudal lobe.....	23.4	21.7	18.1	-----
Distance from snout to dorsal origin.....	51.5	51.5	50.0	53.0
Distance from snout to anal origin.....	50.6	54.2	55.6	51.0
Distance from snout to adipose origin.....	86.9	90.6	86.7	86.6
Distance from snout to pelvic insertion.....	38.1	38.9	39.2	36.9
Distance from snout to pectoral insertion.....	27.2	26.6	27.3	27.5
Distance from snout to anus.....	48.8	50.2	-----	49.6
Distance from tip of supraoccipital process to dorsal origin.....	28.1	29.1	27.0	29.2
Distance from snout to tip of supraoccipital process.....	23.7	22.7	23.2	25.5

Body compressed, greatest depth 2.9 to 3.2 at dorsal origin, head about $3\frac{1}{2}$ to $3\frac{3}{8}$ in standard length; head depressed over snout and eyes, then abruptly curved upward, so that the profile from snout to supraoccipital is greatly concave, then convex along rear of supraoccipital process; upper jaw at front of premaxillaries with a pair of canines followed on each side by about seven short conical sharp-pointed teeth, then another canine, the inner row of teeth on the premaxillaries is represented by two short canines between the pair of canines on each side; the short, sharp-pointed conical teeth on the maxillary numerous, in a single row; the teeth on the lower jaw in a single row, a short pair of conical teeth on dentaries at symphysis, then four pairs of canines, the next-to-last pair being long and fanglike; the posterior half of the dentary equipped with numerous short conical teeth in a single row; no teeth on palatines; the anterior part of the upper half of the first gill arch with 7 or 8 platelets, then 2 or 3 gill rakers, plus one at the angle and then 5 or 6 on lower half of the arch; the longest raker about equal to diameter of the pupil; the

second suborbital not covering the lower part of the cheek, which is naked; the maxillary reaching considerably past the rear of the eye; origin of dorsal a little in front of a vertical line through anal origin; a low keel or ridge from behind pelvic bases to anus; the lateral line running a nearly straight course along side of body, ending a scale row below axis of caudal peduncle; scales very much crowded along the back and more so anteriorly than posteriorly; 2 or 3 scale rows shielding base of anal rays; the pectoral shield in front of pectoral insertion with a shallow notch; lower angle of preopercle rounded, no spinelike projection; adipose fin present over rear of anal fin base; intestine short of one main loop; pyloric caeca numerous; air bladder large, walls very firm; fleshy interorbital about three, bony orbit about 4, snout about 4, all in length of head; the origin of dorsal fin is closer to tip of snout than midcaudal base by $\frac{1}{2}$ length of maxillary bone or $\frac{3}{8}$ bony orbit; the anal origin is equal distance from tip of snout and midcaudal base.

Color.—The side of the body above lateral line has a wide blackish or silvery band ending in a large caudal blotch that extends on base of caudal fin rays as far out as the accessory scales occur; the humeral spot above the lateral line behind the head is no larger than the pupil; peritoneum silvery.

Remarks.—This new subspecies is more like *Cyrtocharax magdalenae atratoensis* Eigenmann than the others in regard to shape and proportions of body, but differs in having fewer anal rays. The key below and table 14 indicate the differences between this form and others referred to this genus. At most, the subspecies of *magdalenae* are statistical races, and this description serves to point out the type of study required to confirm or disprove whether one or four forms should be recognized from British Guiana to the Atrato Basin.

Named *venezuelae* in honor of the country in which this subspecies was collected.

TENTATIVE KEY TO THE SPECIES OF CYRTOCHARAX

- 1a. Dorsal rays usually ii, 10.
 - 2a. Branched anal rays usually 41 or 42—*Cyrtocharax limaesquamis* (Cope)
 - 2b. Branched anal rays usually 50 or 51.
 - 3a. Basal portion of dorsal fin with a black blotch or bar.
 - Cyrtocharax calliurus* (Eigenmann and Kennedy)
 - 3b. Basal portion of dorsal fin without black color.
 - Cyrtocharax squamosus* (Eigenmann and Kennedy)
- 1b. Dorsal rays usually ii, 9.
 - 4a. Branched rays of anal fin usually 38; humeral black blotch as large as orbit.....*Cyrtocharax amazonum* (Günther)
 - 4b. Branched rays of anal fin from 40 to 55 in number.
 - 5a. Humeral spot as large as eye, branched anal rays 50; depth of body $2\frac{3}{4}$ in standard length; pectoral rays said to be i, 13 (Río Suripa of Apure system, Venezuela).....*Cyrtocharax bipunctatus* (Pellegrin)

5b. Humeral spot about size of pupil; depth of body 2.9 to 3.4 in standard length.

6a. Branched anal rays 48 to 55; depth about 3 to 3.4; head 4.2 to 4.33 (Río Magdalena).

Cyrtocharax magdalenae magdalenae (Steindachner)

6b. Branched anal rays 45 to 48; depth about 3; head about 3.7 to 4. (Río Atrato).

Cyrtocharax magdalenae atratoensis (Eigenmann)

6c. Branched anal rays usually 42 to 47; depth about 3; head about 3.5 to 3.8 (Maracaibo Basin).

Cyrtocharax magdalenae venezuelae, new subspecies

6d. Branched anal rays 39 to 44; depth about 3; head about 3.66 to 3.75 (British Guiana):

Cyrtocharax magdalenae essequibensis (Eigenmann)

CYRTOCHARAX BIPUNCTATUS (Pellegrin)

Cynopotamus bipunctatus PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 15, No. 1, p. 13, 1909 (mouth of Río Suripa, Apure system, Venezuela).

Genus GILBERTOLUS Eigenmann

Gilbertella EIGENMANN, Smithsonian Misc. Coll., vol. 45, p. 147, 1903. (Type, *Anacyrtus* (*Raestes*) *alatus* Steindachner.)

Gilbertolus EIGENMANN, in Eigenmann and Ogle, Proc. U. S. Nat. Mus., vol. 33, p. 3, 1907 (replaces *Gilbertella*, preoccupied).

KEY TO THE SUBSPECIES OF GILBERTOLUS ALATUS (STEINDACHNER)

1a. Pores in lateral line 58 to 59; pectoral rays usually i, 17; black caudal spot barely extending on base of middle rays of caudal fin (Magdalena Basin)

Gilbertolus alatus alatus (Steindachner)

1b. Pores in lateral line 63 to 68; pectoral rays usually i, 16; the black caudal spot extends on base of caudal fin rays as much as on the caudal peduncle (Maracaibo Basin)-----*Gilbertolus alatus maracaiboensis* Schultz²⁴

1c. Pores in lateral line 69 to 74; pectoral rays i, 17; the black caudal spot does not extend on base of caudal fin rays, and it becomes less distinct in large specimens (Atrato Basin)-----*Gilbertolus alatus atratoensis* Schultz²⁴

GILBERTOLUS ALATUS MARACAIBOENSIS Schultz

FIGURE 38

Gilbertolus alatus maracaiboensis SCHULTZ, Journ. Washington Acad. Sci., vol. 33, p. 273, 1943 (Maracaibo Basin).

The following specimens were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121386, the holotype, a female, 120 mm. in standard length, March 11, in a caño $\frac{3}{4}$ km. west of Sinamaica, along with four paratypes, U.S.N.M. No. 121387, 107 to 126.5 mm., bearing same data.

Other paratypes: U.S.N.M. No. 121388, an example, 61 mm., collected February 24, in the Río Socuy, 3 km. above its mouth; U.S.N.M. No. 121389, a specimen 75 mm., collected March 2, in the Río Negro below mouth of Río Yasa.

²⁴ Journ. Washington Acad. Sci., vol. 33, p. 275, 1943.

Genus ROEBOIDES Günther

eboides GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 345, 1864 (type, *Epicyrthus microlepis* Reinhardt, designated by Eigenmann, Mem. Carnegie Mus., vol. 5, p. 398, 1912, and by Meek and Hildebrand, Field Mus. Nat. Hist. Publ. Zool., vol. 10, No. 15, p. 291, 1916).—JORDAN, Genera of fishes, pt. 3, p. 333, 1919 (type designation, *Anacyrtus guatemalensis* Günther, and by Eigenmann and Allen, Fishes of western South America, p. 258, 1942).

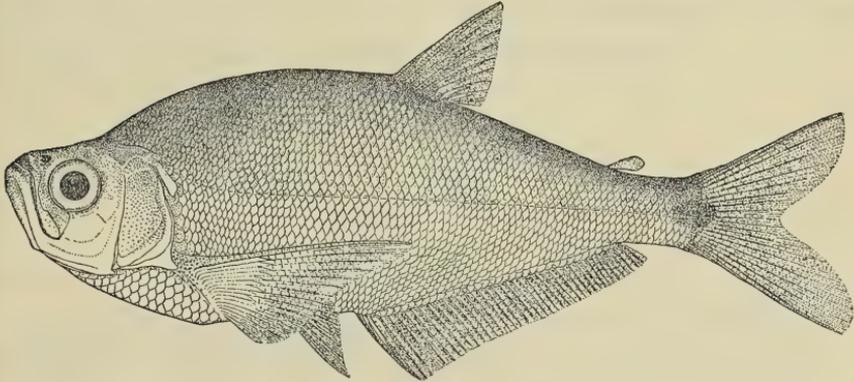


FIGURE 38.—*Gilbertolus alatus maracaiboensis* Schultz: Holotype, U.S.N.M. No. 121386, 120 mm. in standard length.

KEY TO THE SPECIES OF ROEBOIDES REPORTED FROM VENEZUELA

1a. Scale rows crossing lateral line about 110; anal rays 60; humeral and caudal spots present; head 4, depth $2\frac{3}{5}$ in standard length.

Roeboides microlepis (Reinhardt)

1b. Scale rows crossing lateral line fewer than 95.

2a. Scales about 80; anal rays about 52 to 55; humeral and caudal spots more or less present.....**Roeboides affinis** (Günther)

2b. Scales about 53 to 65; anal rays 46 to 52; humeral and caudal spots blackish; origin of anal fin nearer snout than base of last anal ray.

3a. Scales 57 to 65 usually 60 to 64...**Roeboides dayi dayi** (Steindachner)

3b. Scales 53 to 59, usually 54 to 58.

Roeboides dayi dientonito, new subspecies

ROEBOIDES MICROLEPIS (Reinhardt)

Epicyrthus microlepis REINHARDT, Vid. Medd. Naturh. Foren. Kjøbenhavn, 1849, No. 1-2, p. 46 (Brazil).

Anacyrtus microlepis PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

ROEBOIDES AFFINIS (Günther)

Anacyrtus affinis GÜNTHER, Proc. Zool. Soc. London, 1868, p. 246 (Huallaga).—PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (Calabozo, Venezuela).

Roeboides affinis EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 57, 1891 (Calabozo).—EIGENMANN and ALLEN, Fishes of western South America, p. 258, 1942 (Orinoco).

ROEBOIDES DAYI DAYI (Steindachner)

Anacyrtus (Rhaebooides) dayi STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 39, p. 61, 1878 (Río Magdalena).

? *Roebooides dayii* EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 12, 1920 (El Concejo, Río Tiquirito, Venezuela [Lake Valencia Basin]).

Since no specimens from Lake Valencia are available to me, I cannot work out the relationships of "*dayii*" from Lake Valencia in regard to the new subspecies.

ROEBOIDES DAYI DIENTONITO, new subspecies

DIENTONITO

FIGURE 39

Holotype.—U.S.N.M. No. 121370, a specimen 63 mm. in standard length, collected by Leonard P. Schultz, March 6, 1942, in the Río Palmar at the bridge, 70 km. southwest of Maracaibo.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121372, 14 specimens, 25.5 to 65 mm., collected along with the holotype and bearing same data.

U.S.N.M. No. 121380, 1 example, 64 mm., taken February 21 in the Río Palmar near Totuma, about 100 km. southwest of Maracaibo.

U.S.N.M. No. 121376, 2 examples, 16 and 53.5 mm., obtained February 26 from the Río San Juan, 12 km. south of Rosario, Estado de Zulia.

U.S.N.M. No. 121383, 140 specimens, 27 to 76 mm., collected March 2 in the Río Negro below mouth of Río Yasa.

U.S.N.M. No. 121384, 71 specimens, 27 to 76 mm., taken February 24 in the Río Socuy, 3 km. above the mouth.

U.S.N.M. No. 121377, 26 examples, 37 to 60 mm., taken February 26 in the Río Apón, about 35 km. south of Rosario, Estado de Zulia.

U.S.N.M. No. 121374, 24 examples, 11.5 to 45 mm., collected March 8, in a pond tributary to Río Gé near Rosario.

U.S.N.M. No. 121375, 112 specimens, 29.5 to 50 mm., collected May 1 in the Río Agua Caliente, 2 to 3 km. above Lago Maracaibo.

U.S.N.M. No. 121379, 155 specimens, 19 to 68 mm., taken March 1 in Lago Tulé about 75 km. west of Maracaibo, tributary to Río Socuy.

U.S.N.M. No. 121371, 91 examples, 20 to 74 mm., taken March 11 in Ciénaga del Guanavana about 10 km. north of Sinamaica.

U.S.N.M. No. 121378, 5 examples, 27 to 55 mm., taken March 16 in the Río Machango at bridge south of Lagunillas.

U.S.N.M. No. 121382, 20 specimens, 24 to 48 mm., taken March 11 in a caño $\frac{3}{4}$ km. west of Sinamaica.

U.S.N.M. No. 121381, 21 examples, 19 to 59 mm., collected March 17–20 in the Río San Juan near bridge south of Mene Grande, Motatán System.

U.S.N.M. No. 121373, 2 examples, 39 and 53 mm., taken March 20 in the Río San Pedro at bridge, Motatán system.

Description.—This description is based on the holotype and paratypes listed above. Detailed measurements were made on the holotype and one paratype, respectively, and these data are expressed in hundredths of the standard length. Standard length in millimeters 63 and 55.

Length of head 28.3 and 28.5; greatest depth at origin of anal fin 42.4 and 38.6; length of snout 7.94 and 8.00; diameter of eye 6.50 and 7.28; diameter of orbit 9.52 and 9.46; least width of interorbital space 7.14 and 7.46; greatest postorbital length of head 12.1 and 14.0; length of mouth from tip of snout to rear of maxillary 13.7 and 14.4; length of caudal peduncle from base of last anal ray to midbase of caudal fin 9.68 and 9.10; least depth of caudal peduncle 9.68 and 8.91; length of anal fin base 53.3 and 51.3; distance from tip of supra-occipital spine to dorsal origin 22.2 and 22.9; length of longest ray of anal fin 14.9 and 15.8; longest dorsal ray 27.5 and 26.4; longest

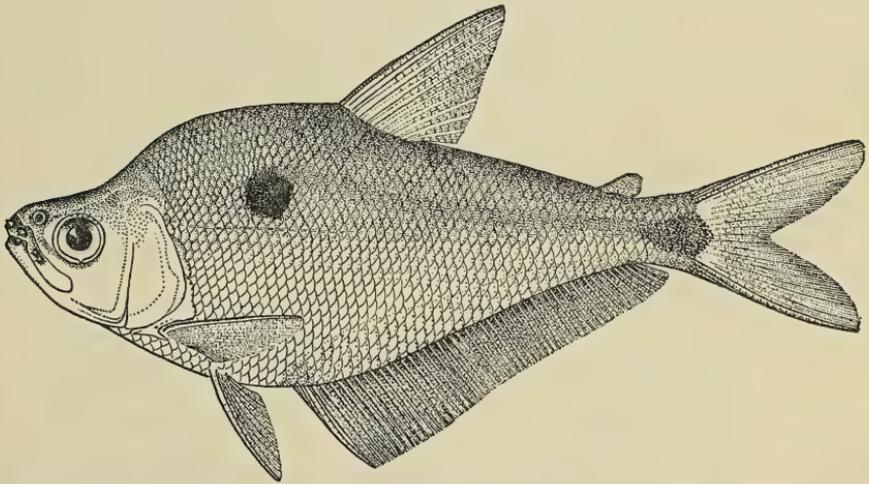


FIGURE 39.—*Roeboides dayi dientonito*, new subspecies: Holotype, U.S.N.M. No. 121370, 63 mm. in standard length.

pectoral ray 20.6 and 20.0; longest pelvic ray 19.1 and 20.6; length of longest ray of upper lobe of caudal fin 26.2 and 25.5, and of lower lobe 26.2 and --; distance from tip of snout to dorsal origin 51.9 and 53.6; snout to anal origin 47.9 and 48.2; snout to adipose origin 88.9 and 88.4; snout to pelvic insertion 37.5 and 37.1; snout to pectoral insertion 27.8 and 28.2; snout to anus 45.2 and 44.6.

The following counts were made, respectively: Dorsal fin rays ii, 9 and ii, 9; anal rays iv, 48 and iv, 43; pectoral i, 13-i, 13 and i, 13-i, 13; pelvic i, 7-i, 7 and i, 7-i, 7; branched rays of caudal fin 16 and 17; number of scale rows crossing lateral line 55 and 58; above lateral line to dorsal origin 15 and 15; below lateral line to anal origin 14 and 14; gill rakers on first gill arch about 6+11 or 12. A summary of all counts is recorded in tables 16 and 17.

Profile from snout to over rear margin of eye nearly straight, then abruptly curving dorsally to origin of dorsal fin, thence tapering to base of caudal fin; greatest depth of body at origin of anal fin $2\frac{1}{2}$ to $2\frac{3}{4}$, head $3\frac{1}{2}$ to $3\frac{3}{4}$ all in the standard length; length of anal fin base 1.8 to 1.9; greatest width of body about equal to least depth of caudal

TABLE 16.—Counts recorded for species of *Roeboides*

Species	Number of scale rows crossing lateral line																												
	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
<i>dayi dayi</i> ¹					1	3		2	3	3	3	4	1																
<i>dayi dientonito</i> ²	1	3	5	5	3	2	1																						
<i>affinis</i> ³																													2

Species	Number of anal rays														
	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<i>dayi dayi</i> ¹	1	4	8	7	4	1	1								
<i>dayi dientonito</i> ²	2	2	8	3	6	2									
<i>affinis</i> ³							1			1					
<i>microlepis</i> ⁴															1

¹ Counts from Eigenmann (1920).

² The counts on this species have been brought in line with those made by Eigenmann, it is thought, by adding the simple and branched rays. However, Eigenmann may not have counted all four simple rays, and if he did not include the first one, which is more or less embedded, then these counts should each be reduced by one to bring them in line with Eigenmann's.

³ Counts from Günther (1868) and Fowler (1939).

⁴ Counts from Günther (1864).

TABLE 17.—Counts made on *Roeboides dayi dientonito*

Number of fin rays											Number of scales															
Dorsal	Anal								Pectoral		Pelvic	Rows of scales crossing lateral line						Above lateral line		To anal origin		To pelvics				
	ii, 9	iv, 42	iv, 43	iv, 44	iv, 45	iv, 46	iv, 47	iv, 48	i, 13	i, 14	i, 15	1, 7	53	54	55	56	57	58	59	14	15	12	13	14	8	9
6	2	2	8	3	6	2	1	6	3	1	10	1	3	5	5	3	2	1	2	3	1	1	3	3	3	2

peduncle; distance from tip of snout to anal origin equal to distance from anal origin to base of last fourth to sixth anal rays; dorsal origin usually a very little closer to tip of snout than midbase of caudal fin; posterior edge maxillary reaches to under front of pupil (young) or to past middle of pupil in adults; front of upper jaw with four external toothlike projections and lower jaw with two such bony projections; origin of dorsal over about the third or fourth branched ray of anal fin. Usually the first branched ray of the dorsal fin longest, last ray shortest, about one-fifth the length of the first; last simple or first branched rays of anal fin longest, those following gradually a little shorter, the margin of anal fin nearly straight; first rays of paired fins longest; pectoral fins reach to anal origin and pelvic to base of fifth branched ray of anal fin; upper and lower lobes of caudal fin nearly equal in length and deeply forked; length of caudal

peduncle about equal to its least depth; intestine short, with one main loop.

Color.—Usually the color in alcohol is pale, with the margins of the scales weakly pigmented, but in the collection from the Río Agua Caliente the general color is blackish and the margins of the scales blackish; in life these fish had a dark purplish sheen. The humeral and caudal spots are blackish and always distinct; the peritoneum silvery with several black pigment spots; upper part of head, tips of snout, and chin usually with black pigment.

Remarks.—This new subspecies, *dientonito*, differs from *Roeboides dayi dayi* (Steindachner) in having fewer scales along the lateral line as indicated in the key on page 303 and in the tables.

Named *dientonito* in reference to the small toothlike protuberances on the upper lips and partly after the common name of this fish.

Genus BRYCON Müller and Troschel

Brycon MÜLLER and TROSCHER, Arch. Naturg., vol. 10, No. 1, p. 90, 1844.
(Type, *Brycon falcatus* Müller and Troschel.)

TENTATIVE KEY TO THE SPECIES OF BRYCON REPORTED FROM VENEZUELA, BASED WHOLLY ON LITERATURE

1a. Scales 54 to 56; anal rays 26; scales above lateral line $10\frac{1}{2}$ or 11, below lateral line 7; pelvics 9; dorsal ii, 9; depth 3 and head 3 in standard length; interorbital 3, snout $3\frac{1}{2}$ to 4, eye $3\frac{1}{2}$ to $3\frac{3}{4}$ all in head; humeral spot a little larger than pupil; caudal spot elongate, as much on peduncle as on base of midcaudal fin rays and not extending to end of caudal rays.

Brycon longiceps Steindachner

1b. Scales 44 or 45; anal rays 25 or 26 (iii, 23 or iii, 24); scales above lateral line 8 and below it 4; pelvic rays i, 7; dorsal ii, 9; depth $3\frac{1}{2}$ and head 3 in standard length; interorbital $3\frac{3}{4}$, eye $4\frac{1}{2}$, snout $3\frac{3}{4}$, all in head; humeral spot not shown in drawing of type; caudal spot elongate-oval shaped, barely extending on midcaudal fin ray-----*Brycon coquenani* Steindachner

BRYCON LONGICEPS Steindachner

Brycon longiceps STEINDACHNER, Anz. Akad. Wiss. Wien, vol. 16, p. 150, 1879 [no locality given]; Denkschr. Akad. Wiss. Wien, vol. 41, p. 156, pl. 1, fig. 5, 1879 (Ciudad Bolívar, Venezuela).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 55, 1891 (Orinoco, Ciudad Bolívar).

BRYCON COQUENANI Steindachner

Brycon coquenani STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 93, p. 37, pl. 1, figs. 1, 2, 1917 (Río Coquenán in Venezuela).

Genus PYRRHULINA Valenciennes

Pyrrhulina VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 19, p. 535, 1846. (Type, *Pyrrhulina filamentosa* Valenciennes.)

PYRRHULINA FILAMENTOSA Valenciennes

Pyrrhulina filamentosa VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 19, p. 535, pl. 589, 1846 (Surinam).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Pitch Lake at Guanoco; Caño Guanoco, Venezuela).

Genus *COPEINA* Fowler

Copeina FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 58, p. 294, 1906. (Type, *Pyrhulina argyrops* Cope.)

COPEINA ARNOLDI Regan

Copeina arnoldi REGAN, Ann. Mag. Nat. Hist., ser. 8, vol. 10, p. 393, 1912 (Amazon).

The following collection was lent to me for identification and report:

Five specimens, 22 to 30 mm., from Caripito, Venezuela, collected by Dr. William Beebe, 1942. A large series from this locality probably will reveal that they differ statistically from *C. arnoldi*.

Genus *HOPLIAS* Gill

Hoplias GILL, Proc. U. S. Nat. Mus., vol. 26, p. 1016, 1903. (Type, *Macrodon tareira* = *trahira* Müller.) (Substitute name for *Macrodon* Müller, preoccupied.)

HOPLIAS MALABARICUS (Bloch)

Esox malabaricus BLOCH, Naturgeschichte der ausländischen Fische, vol. 8, p. 149, pl. 392, 1794.

Hoplias malabaricus FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 433, 1911 (Pedernales, Venezuela).—PEARSE, Univ. Wisconsin Stud., No. 1, p. 21, 1920 (Lake Valencia Maracay, Venezuela).—EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 9, 1920 (Río Tiquirito, and Río Tuy, El Concejo; Isla del Buro, Lake Valencia; Maracay, Río Bue, Venezuela).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Pitch Lake at Guanoco; Caño Guanoco, Venezuela).—RÖHL, Fauna descriptiva de Venezuela, p. 384, 1942 (Lago de Maracaibo).

Macrodon trahira LÜTKEN, Vid. Selsk. Skr., ser. 5, nat. math. Afd., vol. 12, No. 2, p. 184, 1875 (Venezuela).—REGAN, Proc. Zool. Soc. London, 1906, pt. 1, p. 382 (Venezuela).

Macrodon malabaricus PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, 157, 1899 (Apure R., Venezuela).

The following collections, except where otherwise indicated, were made by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942:

U.S.N.M. No. 121554, 5 specimens, 57 to 141 mm., from Río San Pedro at bridge, Motatán system, March 20.

U.S.N.M. No. 121555, 4 specimens, 80 to 109 mm., Río Machango, 20 km. above bridge, south of Lagunillas, March 21.

U.S.N.M. No. 121556, a specimen, 111 mm., Lago Tulé about 75 km. west of Maracaibo, March 1.

U.S.N.M. No. 121557, 2 specimens, 54 and 58 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121558, a specimen, 25 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121559, 5 specimens, 26 to 144 mm., Río San Juan, 12 km. south of Rosario, February 26.

U.S.N.M. No. 121560, a specimen, 203 mm., Ciénaga del Guanavana, about 10 km. north of Sinamaica, March 11.

U.S.N.M. No. 121561, 9 specimens, 38 to 128 mm., Río San Juan at bridge, tributary to Río Motatán, March 20.

U.S.N.M. No. 121562, 3 specimens, 250, 294 and 303 mm., Lago Maracaibo at Palmarejo, April 10, 1942, collected by Frank J. Pospisil.

Field Mus. Nat. Hist. No. 41987, 1 specimen, Lago Maracaibo, W. H. Osgood, 1911.

Genus HOPLERYTHRINUS Gill

Hoplerythrinus GILL, Proc. U. S. Nat. Mus., vol. 18, p. 208, 1896. (Type, *Erythrinus unitaeniatus* Agassiz.)

[HOPLERYTHRINUS UNITAENIATUS (Agassiz)]

Erythrinus unitaeniatus AGASSIZ, in Spix, Selecta genera et species piscium . . . Brasiliam . . ., p. 42, pl. 19, 1829.—REGAN, Proc. Zool. Soc. London, 1906, vol. 1, p. 382 (Venezuela).

?*Erythrinus salvus* EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 45, 1891 (Orinoco).

Erythrinus gronovii PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (Calabozo, Venezuela).

Dr. William Beebe kindly lent the following specimens for my examination and report:

Two specimens, 87 and 210 mm. in standard length, from Caripito, Venezuela, 1942.

Two specimens, 34 and 37 mm., same data.

Genus ERYTHRINUS Scopoli

Erythrinus SCOPOLI, Introductio ad historiam naturalem . . ., p. 449, 1777. (Type, *Salmo erythrinus* Bloch and Schneider = *Erythrinus erythrinus* (Bloch and Schneider) = *Cyprinus cylindricus* Linnaeus.) (Ref. copied.)

ERYTHRINUS ERYTHRINUS (Bloch and Schneider)

Cyprinus cylindricus LINNAEUS, Museum S. R. M. Adolphi Friderici . . ., p. 77, pl. 30, 1754.

Cyprinus cephalus LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 322, 1758.

Synodus erythrinus BLOCH and SCHNEIDER, Systema ichthyologiae, p. 397, 1801 (ref. copied).

The following specimens collected by Dr. William Beebe in Venezuela were kindly lent to me for examination and report:

Two specimens, 29 and 80 mm., from Caripito, 1942.

Two specimens, 130 mm. (both), from Caripito, May 7, 1942.

Genus ELACHOCHARAX Myers

Elachocharax MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 114, 1927. (Type, *Elachocharax pulcher* Myers.)

ELACHOCHARAX PULCHER Myers

Elachocharax pulcher MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 115, 1927 (Caño de Quiribana, near Caicara, Venezuela).

KEY TO THE GENERA AND SPECIES RESEMBLING PARAGONIATES STEINDACHNER

1a. Mouth large, distance from tip of snout to rear of maxillary equal to or longer than postorbital length of head, much longer than interorbital width and

1½ times in distance from tip of snout to tip of occipital process; tip of snout to occiput about 2¾ times in length of anal fin base; adipose fin present; dorsal rays usually ii, 9; palatines toothless.

- 2a. Preventral area trenchant, with low keel, scales forming a median ridge; lateral line incomplete, with about 13 pores anteriorly; base of caudal fin of males without glandular scales; anal sheath of 2 or 2½ rows of scales; lower jaw included; origin of dorsal midway between rear of eye and base of caudal fin; dorsal origin over fifth to seventh branched rays of anal; anal rays v or vi, 40 to 44; pectoral i, 12 or i, 13; pelvic i, 7; scales 39 to 41, 15 ½ between origins of dorsal and anal fins; depth 2¾ to 3¼; head 4 to 4½ in standard length; snout 3½ to 3¾, interorbital 2¾ to 3, eye 2¾ to 3, mouth 1¾ to 1¾, all in length of head; an obscure caudal spot present.

Paragoniates alburnus Steindachner

- 2b. Preventral area rounded, not keeled; lateral line with 3 to 5 pores; base of caudal fin of males with glandular scales; anal rays iv or v, 28; pectoral i, 10; pelvic i, 6; scales 44; 13 or 14 in a transverse series; eye 3 to 3½ and interorbital 2½ to 2¾ in the head; head 1½ in caudal fin; a distinct grayish band along upper side of back.

Mimagoniates microlepis (Steindachner) ²⁵

- 1b. Mouth short, distance from tip of snout to rear of maxillary 1½ in postorbital length of head, about equal to interorbital width, and 2 to 2½ times in distance from tip of snout to occiput; tip of snout to occiput 3 to 5 times in length of anal fin base.
- 3a. Adipose fin absent; palatines toothless; lateral line incomplete, with 9 to 16 pores; dorsal rays ii, 7; anal rays 49 to 53 (about v, 48 to v, 52); pectorals i, 10 or i, 11; pelvics i, 5; scales 40 to 44; origin of dorsal midway between base of caudal peduncle and posterior third of eye; tip of snout to occiput 3½ times in anal base; head 4¾ to 5¼, depth 3½ to 3¾ in standard length; snout 3¾ to 4¼, eye 2¾ to 3, interorbital 2¾ to 3¾ in head; about 5+8 gill rakers on first arch.

Phenagoniates macrolepis (Meek and Hildebrand)

- 3b. Adipose fin present; lateral line complete; dorsal rays 10 or 11; pectoral i, 11 or i, 12; scales from dorsal origin to lateral line 7 and from anal origin to lateral line 7; depth 4, head 5¼ to 6, length of base of anal fin 1¾ all in standard length; dorsal origin over about twenty-second to twenty-fourth anal ray.
- 4a. Anal rays 68, pelvic about i, 6; scales 48; dorsal origin an equal distance between pupil and midbase of caudal fin; palatines without teeth.

Leptagoniates steindachneri ²⁶ Boulenger ²⁷

- 4b. Anal rays 63 to 66; pelvic i, 5 or i, 6; scales 50 or 51; origin of dorsal an equal distance between middle third of length of pectoral fin and midbase of caudal fin; palatines with a small patch of teeth.

Xenagoniates bondi Myers

²⁵ *Paragoniates microlepis* Steindachner, Sitzb. Akad. Wiss. Wien, vol. 74, p. 33, 1876 (Bäche in der Nähe von Rio Janeiro, Rio dos Macacos).—Eigenmann, Repts. Princeton Univ. Exped. Patagonia 1896-1899, vol. 3, pt. 4, p. 441, 1910. This species was included here because it superficially resembles *Paragoniates steindachneri* but differs from that group by having two rows of teeth on each premaxillary.

²⁶ A. Fraser-Brunner, British Museum (Natural History), kindly examined the type of this species and states in a letter to me dated June 19, 1944: "There are no teeth on the palatines, nor on vomer; there are 18 teeth in upper jaw, 10 in the lower. The dorsal fin has 3 simple rays followed by 8 branched rays. All the 68 anal rays are simple. The uppermost pectoral ray is simple and thickened, the 11 following being branched; the pelvic has 1, 6, the first being stout and strong. There are 48 scales."

²⁷ *Leptagoniates steindachneri* Boulenger, Proc. Zool. Soc. London, 1887, pp. 281, 282, pl. 23, fig. 3 (Sarayacu, Ecuador).—Eigenmann, Repts. Princeton Univ. Exped. Patagonia 1896-1899, vol. 3, Zoology, pt. 4, p. 441, 1910.—Eigenmann and Allen, Fishes of Western South America, p. 270, 1942.

Myers (1942) gives for this species the following reference, which I have not seen: Arnold and Ahl, Frem-land, Süßwasserf., 1936, p. 89.

Genus **PARAGONIATES** Steindachner

Paragoniates STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 74, p. 69, pl. 8, fig. 3, 1876. (Type, *Paragoniates alburnus* Steindachner.)

PARAGONIATES ALBURNUS Steindachner

Paragoniates alburnus STEINDACHNER, Sitzb. Akad. Wiss. Wien, vol. 74, p. 69, pl. 8, fig. 3, 1876 (Amazon River at Teffé).

A specimen, 59 mm. in standard length, collected at Caripito, Venezuela, 1942, by Dr. William Beebe, was kindly turned over to me for study and report. A brief description of this specimen follows, all measurements being expressed in hundredths of the standard length, which is 59 mm.

Length of head 25.3; greatest depth 31.4; length of snout 7.12; eye 9.15; interorbital space 8.98; postorbital length of head 10.7; tip of snout to rear of maxillary 12.9; least depth of caudal peduncle 11.9; length of caudal peduncle from base of last anal ray to midcaudal fin base 7.97; length of anal fin base 43.6; longest anal ray 15.7; longest dorsal ray 20.7; longest pectoral ray 24.6; longest pelvic ray 20.0; length of upper caudal fin lobe 26.3 and of lower lobe 29.7; distance from snout tip to dorsal origin 60.2; snout to anal origin 56.0; snout to adipose origin 90.6; snout to pelvic insertion 40.6 and to pectoral insertion 27.1; snout to anus 50.8; snout to occiput 20.5.

The following counts were made: Dorsal rays ii, 9; anal vi, 40; pelvic i, 7-i, 7; pectoral i, 13-i, 13; scales 39, above lateral line to dorsal origin 7 and below it to pelvic insertion 4; pores in lateral line 13; scales in front of dorsal 18; 2½ scale rows in anal sheath anteriorly and 2 posteriorly; gill rakers 7+1+10; branched caudal fin rays 16.

Genus **PHENAGONIATES** Eigenmann and Wilson

Phenagoniates EIGENMANN and WILSON, in Eigenmann, Henn, and Wilson, Indiana Univ. Stud., No. 19, p. 2, 1914. (Type, *Phenagoniates wilsoni* Eigenmann.)

PHENAGONIATES MACROLEPIS (Meek and Hildebrand)

Roeboides macrolepis MEEK and HILDEBRAND, Field Mus. Nat. Hist. Publ. Zoo 1, vol. 10, No. 8, p. 84, 1913 (Río Cupe, Boca de Cupe, Río Tuyra Basin).

Phenagoniates wilsoni EIGENMANN, in Eigenmann, Henn, and Wilson, Indiana Univ. Stud., No. 19, p. 2, 1914 (Manigrú; Certegui; Truando).

Phenagoniates macrolepis MEEK and HILDEBRAND, Field Mus. Nat. Hist. Publ. Zool., vol. 10, p. 272, 1916 (Río Tuyra Basin).—EIGENMANN, Mem. Carnegie Mus., vol. 7, p. 43, pl. 5, fig. 1, 1916 (Manigrú; Certegui; Truando).—EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 128, 1922 (Atrato and Tuyra Basins).—BREDER, Bull. Amer. Mus. Nat. Hist., vol. 57, p. f17, 1927 (Río Chico; Río Sucubti).—HILDEBRAND, Field Museum Nat. Hist., Publ. Zool., vol. 22, No. 4, p. 249, 1938 (Tuyra and Atrato Basins).

Phenagoniates macrolepis MYERS, Stanford Ichth. Bull., vol. 2, No. 4, p. 91, 1942 (Maracaibo Basin).

The following collections were made by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942:

U.S.N.M. No. 121349, 19 specimens, 21 to 35 mm., from the Río Apón, about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121350, 2 examples, 28 and 31 mm., from the Río San Pedro at bridge, tributary to Río Motatán, March 20.

U.S.N.M. No. 121351, 18 examples, 22.5 to 34 mm., taken in the Río San Juan at bridge, tributary to Río Motatán, March 20.

U.S.N.M. No. 121355, 2 specimens, 31 and 33 mm., from the Río Jimelles, 12 km. east of Motatán, tributary to Río Motatán, March 24.

U.S.N.M. No. 121353, 26 specimens, 23.5 to 32.5 mm., taken in the Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121354, 13 examples, 24 to 25 mm., collected in the Río San Juan, 12 km. south of Rosario, February 26.

U.S.N.M. No. 121358, 4 specimens, 32 to 37.5 mm., taken in the Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121352, 2 examples, 25 and 30 mm., collected at the mouth of Caño de Sagua, 35 km. north of Sinamaica (salinity 1.021), March 12.

U.S.N.M. No. 121357, 94 specimens, 12 to 26.5 mm., from the Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121356, a specimen, 30.5 mm., from the Río Motatán at the bridge, 22 km. north of Motatán, March 17.

U.S.N.M. 121553, a specimen 35 mm. from the Río Palmar at bridge 70 km. southwest of Maracaibo, March 6.

Genus XENAGONIATES Myers

Xenagoniates MYERS, Stanford Ichth. Bull., vol. 2, p. 90, fig. 1, 1942. (Type, *Xenagoniates bondi* Myers.)

XENAGONIATES BONDI Myers

Xenagoniates bondi MYERS, Stanford Ichth. Bull., vol. 2, p. 90, 1942 (Río Amana, 6 km. east of Santa Bárbara and 35 km. [?] west [south] of Maturin, [eastern] Venezuela).

Genus APHYOCHARAX Günther

Aphyocharax GÜNTHER, Proc. Zool. Soc. London, 1868, p. 245. (Type, *Aphyocharax pusillus* Günther.)

APHYOCHARAX ERYTHRURUS Eigenmann

Aphyocharax erythrurus EIGENMANN, Mem. Carnegie Mus., vol. 5, p. 313, 1912 (Rockstone sand bank; Maripicru Creek; Crab Falls).

Two specimens, 45.5 and 48.5 mm., collected by Dr. William Beebe, at Caripito, Venezuela, 1942, were lent to me for identification and report.

Genus PRISTELLA Eigenmann

Pristella EIGENMANN, Bull. Mus. Comp. Zool., vol. 52, No. 6, p. 99, 1908. (Type, *Holopristes riddlei* Meek.)

PRISTELLA RIDDLEI (Meek)

Holopristes riddlei MEEK, in Eigenmann and Ogle, Proc. U. S. Nat. Mus., vol. 33, p. 11, 1907 (Los Castillas, Venezuela).

Pristella riddlei FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 407, 1931 (Pitch Lake at Guanoco, Venezuela).

One specimen, 22 mm., from Caripito, Venezuela, 1942, collected by Dr. William Beebe, was lent to me for identification and report.

Subfamily CHEIRODONTINAE

KEY TO THE GENERA AND SPECIES OF CHEIRODONTINAE REPORTED FROM VENEZUELA

1a. Lateral line incomplete, with about 6 to 8 pores; teeth on premaxillary and dentary usually with 7 points; 2 or 3 teeth on maxillary and 5 on each side of premaxillary; scales 27 to 31; about 10 scales in front of dorsal origin; gill rakers about 6 or 7+10 or 11 on first gill arch; dorsal rays usually ii, 9; anal usually iii, 16 to iii, 18 (range iii, 14 to iii, 19); on lower side of caudal peduncle on adult males about 17 to 22 projecting interhaemals; no dermal sac or enlarged scales on base of caudal fin.

Cheirodon insignis Steindachner

1b. Lateral line complete; interhaemals not projecting as in *Cheirodon*; dorsal rays ii, 9.

2a. Teeth on premaxillary and on dentary usually 7-pointed and similar in both jaws, distal part of each tooth enlarged (fig. 41, a, b), much broader than its base and sides of teeth in dentary not parallel; maxillary with 2 teeth and premaxillary usually with 5 teeth on each side.

3a. Lower lobe of caudal fin with a dermal bag more or less covered with a few enlarged scales (fig. 41c); anal rays iii, 17 to iii, 19; scales 33 to 35, with 5 above and 3 or 4 below the lateral line; black pigment at tips of first to fourth or fifth branched rays of dorsal and of anal fins.

Saccoderma melanostigma, new genus and species

3b. Base of caudal fin "naked" without enlarged scales and without a dermal sac developed, the scales of body ending near base of caudal fin as is usual on many species of fishes; anal rays "23 to 25" [probably iii, 21 to iii, 22]; scales 32 to 34.....*Odontostilbe pulcher* (Gill)

2b. Teeth on premaxillary and on dentary not of same shape (fig. 43), but usually 5-pointed, the 2 outer points minute and located at lower sides of next inner point of tooth; maxillary with teeth; caudal fin with scales only at base and none enlarged, no dermal sac on lower lobe of caudal fin; anal rays iii, 20 to iii, 22; scales 35 to 37; 5 above and 4 below lateral line; premaxillary teeth 6 on each side; gill rakers about 8+14; a caudal spot developed.....*Cheirodontops geayi*, new genus and species

Genus CHEIRODON Girard

Cheirodon GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 199, 1854. (Type, *Cheirodon pisciculus* Girard.)

CHEIRODON INSIGNIS Steindachner

Cheirodon insignis STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 42, p. 74, pl. 6, fig. 3, 1879 (Río Cauca).

The following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121518, 134 specimens, 15 to 25 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121513, 114 specimens, 17 to 23 mm., Río San Juan near bridge south of Mene Grande, Motatán System, March 17-20.

U.S.N.M. No. 121511, 357 examples, 14 to 21 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121509, 13 examples, 20 to 23 mm., Río San Pedro at bridge south of Mene Grande, Motatán System, March 20.

U.S.N.M. No. 121514, a specimen, 18.5 mm., from mouth of Caño de Sagua, 35 km. north of Sinamaica, March 12.

U.S.N.M. No. 121516, 3 specimens, 16.5 to 21 mm., Río San Ignacio in drying-up pool, about 20 km. south of Rosario, February 26.

U.S.N.M. No. 121510, 4 examples, 19 to 22 mm., Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121512, a specimen, 24 mm., from caño $\frac{3}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121515, a specimen, 25.5 mm., Río Jimelles, 12 km. east of Motatán, Motatán system, March 24.

U.S.N.M. No. 121517, a specimen, 20 mm., Río San Juan, 12 km. south of Rosario, February 26.

The maxillary has 2 or 3 teeth and on each premaxillary 5 teeth; dentary with 6 or 7 teeth on each side; all teeth are with 6 or 7 points. There are about 6 pores in the lateral line and the scales vary from 27 to 31; about 10 scales in front of the dorsal origin; gill rakers about 6 or 7+10 or 11. Additional counts are recorded in table 18.

In life, the base of each lobe of caudal fin has a bright orange spot; dorsal and anal fins orange.

TABLE 18.—Counts made on *Cheirodon insignis* from the Maracaibo Basin

Number of fin rays												Interhaemals on lower side of caudal peduncle on adult males						
Dorsal			Anal						Pelvic		Pectoral							
ii, 8	ii, 9	ii, 10	iii, 14	iii, 15	iii, 16	iii, 17	iii, 18	iii, 19	i, 6	i, 7	i, 10	i, 11	17	18	19	20	21	22
1	12	1	1	1	6	11	4	1	1	14	9	4	2	4	6	4	-----	1

SACCODERMA, new genus

Genotype.—*Saccoderma melanostigma*, new species.

Named *Saccoderma* in reference to the dermal sac on the caudal fin.

This new genus, *Saccoderma*, is proposed to include those species of fish now referred to the genus *Odontostilbe* Cope that have on the lower lobe of the caudal fin a dermal bag with the opening posteriorly and partially covered by enlarged scales basally and dorsally (fig. 41c), as contrasted with the other species which lack this saclike fold of skin and are usually described as "caudal naked in the male." This latter group remain in the genus *Odontostilbe*. Other characters of this new genus are those of the genotype—*Saccoderma melanostigma*, new species, described below.

I refer to this new genus one other species, *Saccoderma hastata* (Eigenmann) (= *Odontostilbe hastata* Eigenmann), from the Magdalena and Atrato Basins of Colombia, represented by two specimens, U.S.N.M. No. 79223.

I would be inclined to hesitate in naming this new genus *Saccoderma* if the dermal saclike structure occurred only on the males, but on the new species described below I find it fully developed on the females. This discovery causes me to cast serious doubt on Eigenmann's statement that only the males of *O. hastata* have the pouch on the lower lobe of the caudal fin. In fact, Eigenmann's figure 33 (Mem. Carnegie

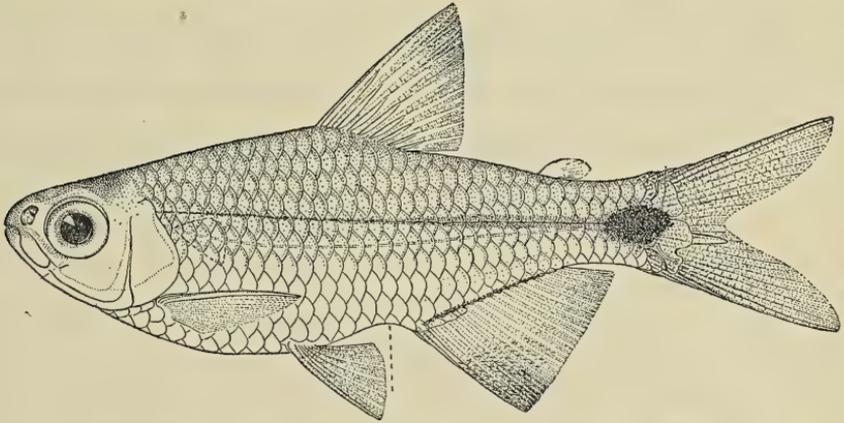


FIGURE 40.—*Saccoderma melanostigma*, new genus and species: Holotype, U.S.N.M. 121519, 27 mm. in standard length.

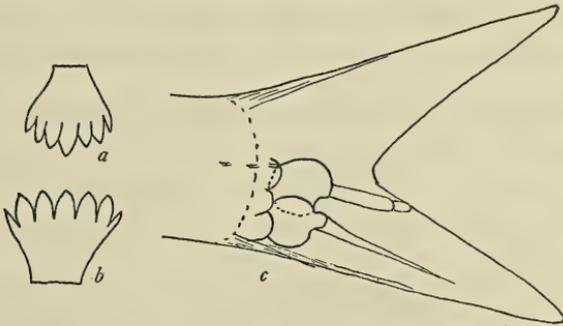


FIGURE 41.—*Saccoderma melanostigma*, new genus and species: *a*, Premaxillary tooth; *b*, mandibular tooth; *c*, enlargement of saclike gland on caudal fin.

Mus., vol. 7, No. 1, p. 91, 1915) resembles the caudal scales on the females of *Saccoderma melanostigma* more than on the males, and I presume that *hastata* should be reexamined carefully with this new information in mind.

SACCODERMA MELANOSTIGMA, new species

FIGURES 40, 41

Holotype.—U. S. N. M. No. 121519, a specimen 27 mm. in standard length, collected by Leonard P. Schultz, March 17 to 20, 1942, in the Río San Juan near bridge, south of Mene Grande, Motatán system.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121525, 23 specimens, 24 to 27 mm. in standard length, collected along with the holotype and bearing same data.

U.S.N.M. No. 121522, 24 specimens, 18 to 29 mm., Ciénaga del Guanavana about 10 km. north of Sinamaica, March 11.

U.S.N.M. No. 121528, 108 examples, 18 to 26 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121524, 3 examples, 23.5 to 28.5 mm., caño $\frac{1}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121527, 4 specimens, 19.5 to 24 mm., Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121529, 9 specimens, 21 to 26 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121521, 44 specimens, 17 to 28 mm., Río Socuy, 3 km. above mouth, February 24.

U.S.N.M. No. 121526, 7 examples, 16.5 to 21 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121530, 4 examples, 25 to 26 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121520, 5 examples, 22.5 to 25 mm., Río San Pedro at bridge south of Mene Grande, March 20.

U.S.N.M. No. 121523, 3 specimens, 19 to 25 mm., Lago Tulé about 75 km. west of Maracaibo, March 1.

This species reaches a length of 29 mm. and at this size and at smaller sizes numerous specimens were fully mature. It occurs in the lower courses of the streams in quiet waters and in swampy areas.

TABLE 19.—Counts made on species of *Saccoderma*

Species	Number of fin rays									Number of scales						
	Dorsal		Anal			Pectoral				Pelvic	Rows on sides			Above lateral line	Below lateral line	
	ii, 9	iii, 17	iii, 18	iii, 19	i, 10	i, 11	i, 12	i, 13	i, 7	33	34	35	5	3	4	
<i>melanostigma</i>	12	5	10	5	4	8	1	1	13	1	3	1	5	2	2	
<i>hastata</i>	2	1	-----	1	2	2	-----	-----	2	-----	1	-----	2	1	1	

Description.—The description is based on the holotype and paratypes listed above. Detailed measurements were made in the former and one of the latter and these data, expressed in hundredths of the standard length, are recorded below, first for the holotype and then the paratype in parentheses. Standard length in millimeters 27 (28).

Length of head 27.8 (28.3); greatest depth 33.3 (30.7); length of snout 6.66 (6.30); diameter of eye 10.0 (11.1); distance from tip of snout to rear edge of maxillary 8.15 (9.63); width of interorbital space 8.15 (8.15); postorbital length of head 11.9 (12.6); least depth of

caudal peduncle 13.0 (11.1); length of caudal peduncle 15.9 (17.0); length of base of anal fin 24.4 (25.9); length of longest ray of anal fin 19.6 (20.7); length of longest ray of dorsal fin 27.0 (27.4); longest pectoral ray 19.6 (21.1); longest pelvic ray 17.8 (18.5); length of upper lobe of caudal fin 30.7 (31.5); length of lower caudal lobe 32.2 (33.3); distance from snout to dorsal origin 51.8 (54.0); snout to adipose origin 83.4 (87.8); snout to anal origin 65.6 (68.9); snout to pelvic insertion 48.2 (48.5); snout to pectoral insertion 27.0 (26.7); snout to anus 61.1 (63.4); distance from dorsal origin to midcaudal fin base 54.4 (53.4); distance from dorsal origin to tip of adipose fin 43.0 (42.6).

The following counts were made, respectively: Dorsal rays ii,9 (ii, 9); anal iii, 18 (iii, 18); pectoral i, 11-i, 11 (i, 11-i, 11); pelvic i, 7-i, 7 (i, 7-i, 7); branched caudal fin rays 17 (17); gill rakers on first gill arch—(8+12); scale rows crossing side of body 35 (34); scales above lateral line 5 (5) and below 4 (3); scales in front of dorsal 11 (11) and along one side of supraoccipital process 2 (2); teeth on each side of premaxillary 5+5 (5+5); teeth on maxillaries 2+2 (2+2); teeth on each side of mandible 2+3—3+2 (1 or 2+3—3+2). Additional counts are recorded in table 19.

Body compressed, its greatest depth 3.0 to 3.6, head 3.4 to 3.8, in standard length; dorsal and ventral profiles equally arched; snout bluntly rounded, about $\frac{3}{4}$ eye, and shorter than interorbital space; eye large, about 2.6 to 2.9, and interorbital space convex, its width 3.2 to 3.3 in head; mouth terminal, a little oblique, both jaws of nearly same length, level of mouth when closed a little above lower edge of pupil; maxillary reaching to under front edge of eye; nasal openings separated by a dermal flap; predorsal and preventral areas evenly and normally scaled; lateral line complete; gill rakers short, slender, about 6 to 8 + 10 to 12 on first gill arch; second suborbital along its lower margin in contact with preopercle and scarcely any or no naked area along its posterior margin; teeth in both jaws in a single series; each tooth at front of jaws with about 6 or 7 points, distal margin of each tooth broad (see figure 41); each maxillary with 2 teeth; premaxillary with 5 teeth on each side; dentary on each side with 3 enlarged teeth at front of jaw and then usually 2 smaller ones at sides; supraoccipital process short, bordered by about 2 or $2\frac{1}{2}$ scales; adipose fin well developed; origin of dorsal a trifle closer to snout tip than to midcaudal fin base; pelvic insertion in advance of a vertical line through dorsal origin; a vertical line through base of last dorsal ray usually passes through anal origin; pelvics inserted an equal distance between tip of snout and base of last anal ray; distal margin of anal fin a little concave, that of dorsal fin truncate; caudal fin deeply forked; distal margins of paired fins a little concave; last simple and first branched ray of all fins longest; gill membranes free from isthmus;

intestine with one main loop; pectoral fins reaching a little past pelvic insertions and pelvics almost to anal origin; depressed dorsal fin reaches to front edge of third scale in front of adipose origin.

In the male the middle two-thirds of the first 10 to 12 branched anal rays have small retrorse hooks, those on the first five rays enlarged; rays of lower lobe of caudal fin of males with retrorse hooks.

The dermal sac on base of lower caudal fin lobe is shown for the holotype in figure 41, *c*.

Coloration.—In alcohol this species is pale, with a black caudal spot that occurs about equally on caudal peduncle and on midbase of caudal fin, posteriorly this spot ending in a blunt point and not extending out on the middle caudal fin rays; midaxis of body posteriorly with a narrow silvery streak, or a series of more or less embedded black pigment cells; base of anal rays outlined with black pigment; along the back the margins of the scale pockets with black pigment; above base of anal fin are 2 or 3 irregular rows of black pigment cells rather widely separated from each other; dorsal surface of head, tip of snout, and front of lower jaw rather heavily black pigmented; tips of second to fourth or fifth branched rays of dorsal fin with black pigment, tips of first to fourth branched anal rays with black pigment.

The following color notes were recorded for this species when it was taken out of the Río San Pedro on March 20, 1942: Base of each lobe of caudal fin bright red above and below black caudal spot; upper part of eye bright red.

Remarks.—This new species differs from the only other species referred to the genus *Saccoderma* as indicated in the following key:

1a. Black pigment at tips of first to fourth or fifth branched rays of dorsal and anal fins; caudal spot bluntly rounded posteriorly when caudal fin is fully spread, and ending abruptly and not continuing halfway out to tips of middle rays; pelvic insertion equidistant between snout tip and base of last anal ray to half a snout length behind anal base.

Saccoderma melanostigma, new species

1b. Black pigment cells evenly distributed on outer third of nearly all branched rays of dorsal and anal fins; caudal spot ending in a blunt point about halfway out on middle caudal fin rays; pelvic insertions equidistant between tip of snout and a snout length behind base of anal fin.

Saccoderma hastata (Eigenmann)

Named *melanostigma* in reference to the black caudal spot.

Genus ODONTOSTILBE Cope

Odontostilbe COPE, Proc. Amer. Philos. Soc., vol. 11, p. 566, fig. 4, 1870. (Type, *Odontostilbe fugitiva* Cope.)

ODONTOSTILBE PULCHER (Gill)

Poecilurichthys pulcher GILL, Ann. Lyc. Nat. Hist. New York, vol. 8, p. 59, 1858 (Trinidad).

Chirodon (Odontostilbe) pulcher LÜTKEN, Vid. Medd. Naturh. Foren. Kjøbenhavn, Nos. 12–16, p. 238, 1874 (locality? [Venezuela]).

Odontostilbe pulcker EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 9, 1920 (Maracay, Río Bue, Venezuela).

A specimen, 41.5 mm., from Caripito, Venezuela, 1942, collected by Dr. William Beebe, was lent to me for identification and report.

CHEIRODONTOPS, new genus

Genotype.—*Cheirodontops geayi*, new species.

This new genus is characterized by its teeth, shown in figure 43, which resemble those of *Holoshesthes* Eigenmann. *Cheirodontops* differs from that genus in lacking all traces of teeth on the maxillaries. The premaxillary teeth have three prominent points, the middle one longest, then on side near base of each outer enlarged point is a minute denticle. The dentary has broader incisorlike teeth, with 3 equally enlarged points fused together with almost a straight cutting edge, and near base of each outer point is a minute denticle (fig. 43).

Lateral line complete; adipose fin present; caudal fin with scales only at base and no saclike organ at base of caudal fin. Other characters of this new genus are those of the new species described below.

This new genus may be separated from all other genera referred to the subfamily Cheirodontinae, with a complete lateral line, by the shape of the premaxillary and dentary teeth, except *Holoshesthes* Eigenmann. The latter genus has teeth on the maxillary, but these are lacking on *Cheirodontops*. *Atopomesus* Myers and *Othonocheirodus* Myers have teeth on the maxillary. Although *Amblystilbe* Fowler has no teeth on the maxillary, all its teeth are tridentate, small, and similar in both jaws. This new genus runs down through the key by Eigenmann (Mem. Carnegie Mus., vol. 7, No. 1, pp. 15-17, 1915) to "*Holesthes*" (= *Holoshesthes*) but differs as indicated above. The teeth in upper and lower jaws of *Odontostilbe* Cope are similar, while they differ in these jaws in *Cheirodontops*.

CHEIRODONTOPS GEAYI, new species

FIGURES 42, 43

Holotype.—U.S.N.M. No. 121507, a specimen 37.3 mm. in standard length, collected in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela, by L. P. Schultz, G. Zuloaga, William Phelps, Jr., and R. Sherman, May 12, 1942.

Paratypes.—U.S.N.M. No. 121508, 6 examples, 35 to 40 mm., taken along with the holotype and bearing same data.

Description.—This description is based on the types listed above. Detailed measurements were made on the holotype and on one paratype, and these data, expressed in hundredths of the standard length,

are recorded below, first for the holotype, then for the paratype in parentheses. Standard length in millimeters 37.3 (35.5).

Length of head 24.1 (24.2); greatest depth of body 33.5 (27.1); length of snout 5.90 (6.20); diameter of eye 8.04 (7.89); distance from tip of snout to end of maxillary 7.77 (8.74); width of interorbital space 7.50 (7.60); postorbital length of head 11.3 (11.3); least depth of caudal peduncle 11.3 (10.4); length of caudal peduncle 16.4 (16.3);

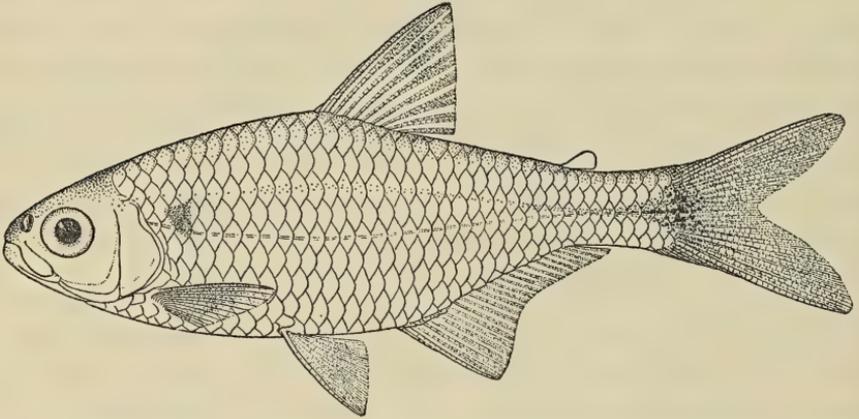


FIGURE 42.—*Cheirodontops geayi*, new genus and species: Holotype, U.S.N.M. No. 121507, 37.3 mm. in standard length.

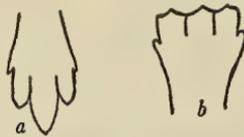


FIGURE 43.—*Cheirodontops geayi*, new genus and species: *a*, Premaxillary tooth; *b*, mandibular tooth.

length of base of anal fin 28.4 (28.2); length of longest anal ray 17.7 (17.5); longest dorsal ray 25.7 (28.2); longest pectoral ray 19.3 (19.2); longest pelvic ray 17.4 (21.7); length of upper caudal fin lobe 28.1 (27.6) and of lower caudal lobe 29.2 (28.2); distance from snout tip to dorsal origin 51.0 (49.6); snout to adipose origin 83.9 (84.0); snout to anal origin 60.8 (58.6); snout to pectoral insertion 23.1 (22.6); snout to pelvic insertion 44.2 (40.9); snout to anus 56.8 (55.0); dorsal origin to midcaudal fin base 56.0 (56.0); dorsal origin to tip of adipose fin 41.6 (43.7).

The following counts were made: Dorsal fin rays ii, 9 (ii, 9; ii, 9; ii, 9; ii, 9; ii, 9; ii, 9); anal iii, 22 (iii, 20; iii, 21; iii, 21; iii, 21; iii, 22; iii, 22); pectoral i, 11-i, 11 (i, 11-i, 11; i, 11-i, 11; i, 11-i, 11; i, 11-i, 11; i, 10-i, 10; i, 10-i, 10); pelvic i, 7 on both sides of all specimens; branched caudal fin rays always 17; scale rows from upper edge of gill opening to base

of caudal fin 37 (36; 36; 35; 36; 37; 36); scales above lateral line 5 and from lateral line to pelvic insertions 4; scales in front of dorsal 11 (12; 12); 3 scales bordering the supraoccipital process; premaxillary teeth always 6 on each side and on each side of the dentary 4 enlarged teeth at front of jaw then 6 smaller ones posteriorly; gill rakers about 8+14.

Body compressed, depth 3.0 to 3.4, head 4.1 to 4.3 in standard length; snout a little shorter than eye, about 3.8 to 4, and eye 3.0 to 3.2 in head; interorbital space convex,* its width equal to eye; second suborbital covering cheek, so that little or no naked area occurs between its ventral and posterior margins and the preopercle; mouth terminal, oblique, the lower jaw about equal to upper, snout not projecting in front of lower jaw; the maxillary without teeth, reaching to under front of eye but not quite to under front of pupil; gill membranes free from isthmus, continued forward; lateral line complete; adipose fin well developed; gill rakers short, pointed, about 8+14 on the first arch; supraoccipital process short, bordered by three scales, usually not quite all the third scale; breast and predorsal area normally and evenly scaled; dorsal origin in front of middle of standard length, closer to tip of snout by postorbital length of head; origin of anal fin equidistant between base of caudal fin and rear edge or middle of second suborbital; scales along base of anal rays anteriorly; anal origin under base of last dorsal ray; pelvic insertions a little more than width of pupil in front of a vertical line through dorsal origin; in females the pectorals not quite reaching to pelvic bases and pelvic fins not quite to anal origin; in males the last simple ray of the dorsal and the simple first ray of pelvics elongate, more or less filamentous, so that the latter reaches past anal origin, but the pectorals not reaching past pelvic insertions; adipose origin over bases of about second or third from last anal rays; length of base of anal fin greater than the distance between rear base of dorsal fin and adipose origin; caudal fin deeply forked; distal margin of anal fin concave, first rays longest; distal margin of dorsal truncate except for the elongated last simple ray of males; margins of pectorals and pelvics a little rounded; the teeth fundamentally 5-pointed, but the two outer points minute and sometimes represented by rounded knobs; always 6 teeth on each premaxillary or 12 teeth in the jaw; the premaxillary teeth (fig. 43) differing from the teeth on the dentary considerably, the former having the middle point longest, but on the dentary all three of the middle points of the same length with straight sides; the dentary teeth on each side numbering 4 enlarged ones at front of jaw, then 6 smaller ones set off by a sharp angle posteriorly; interhaemals not projecting on lower side of the caudal peduncle.

Color, in alcohol, pale with a silvery band posteriorly, sometimes blackish, ending in a dark, caudal spot; margins of scales on back outlined with black pigment cells; top of head behind orbits blackish; snout and tip of chin somewhat speckled with black pigment cells; small dark humeral spot more or less developed; peritoneum silvery with widely spaced black pigment cells; cheeks and isthmus silvery.

Remarks.—This new species differs from all other characinids referred to the subfamily Cheirodontinae that have complete lateral lines and lack a saclike dermal organ, in the shape of its teeth, which are unlike in upper and lower jaws. It is nearest to the genus *Holostethes* but differs in lacking teeth on the maxillary.

Named *geayi* in honor of the French writer F. Geay, who in 1896–97 reported on the fisheries of the Orinoco Basin in his work “Pêches dans les Affluentes de l’Orinoque.”

Genus GEPHYROCHARAX Eigenmann

Gephyrocharax EIGENMANN, Indiana Univ. Bull., vol. 10, No. 8 (Indiana Univ. Stud. No. 16), p. 23, 1912. (Type, *Gephyrocharax choocoensis* Eigenmann.)

The frontal fontanel was observed to be variously developed, becoming reduced with increase in size. Its variance among the several species was too great to use it as a major character in the following key as was done by Eigenmann and Myers (Mem. Mus. Comp. Zool., vol. 43, No. 5, p. 477, 1929):

KEY TO THE SPECIES OF GEPHYROCHARAX

- 1a. Outer caudal rays black, this black pigment joining with black caudal spot; middle rays of caudal fin pale; a darkish humeral spot only slightly developed; lower lip thin, not fleshy at symphysis (both slopes of Panama).
***Gephyrocharax atracaudatus* Meeck and Hildebrand**
- 1b. Outer caudal rays pale.
 - 2a. A dark spot at base of first dorsal rays; tips of pectorals usually black in males; a dark caudal spot and a dark humeral bar (Magdalena Basin, Colombia) ***Gephyrocharax melanocheir* Eigenmann**
 - 2b. No black area at base of dorsal fin rays.
 - 3a. Black caudal spot, if present, not continuing as a black band or streak to end of middle caudal fin ray.
 - 4a. No humeral blackish bar or spot, a collection of dark chromatophores sometimes visible but never forming a distinct vertical bar or spot; the dark caudal spot more or less present, but when best developed not blackish; an underlaid silvery leaden axial streak, most distinct along side of tail.
 - 5a. Origin of dorsal an equal distance between base of caudal fin and opercle; caudal spot somewhat developed, darkish but fading on basal middle caudal fin rays; depth 3.4 to 4 (Río Chapore, Bolivia) ***Gephyrocharax chaporae* Fowler**
 - 5b. Origin of dorsal fin equidistant between base of caudal fin and rear of operculum to a half eye diameter behind head; no humeral spot; depth about 3.0 to 3.75.

- 6a. Caudal spot obsolete; fontanel extending to between middle of interorbital space (Lake Valencia; upper Río Guárico drainage; Caripito, Venezuela)----**Gephyrocharax valencia** Eigenmann
- 6b. Caudal spot developed but not prominent; fontanel not extending quite to middle of interorbital space (San Juan and Atrato Basins, Colombia)---**Gephyrocharax chocoensis** Eigenmann
- 4b. A blackish humeral bar or spot distinctly present; caudal spot present.
- 7a. Depth 4 in standard length; a distinct lateral streak more prominent posteriorly; dorsal origin an equal distance between midbase of caudal fin and a point about equal to postorbital length of head behind head; on males ventral margin of belly blackish from in front of pelvics to anal origin (Cauca Basin, Colombia).

Gephyrocharax caucanus Eigenmann

- 7b. Depth 2.9 to 3.5.

8a. Caudal spot followed by a whitish area near base of rays on each lobe of caudal fin, but black caudal spot not continuing as a black band on middle caudal fin rays.

9a. Lower lip thin; pectorals not quite reaching to middle of pelvics; profile from snout to occiput slightly convex, a definite offset at mouth (Panama).

Gephyrocharax intermedius Meek and Hildebrand

9b. Lower lip thickened and more or less with a fleshy knob at symphysis; pectorals reaching to or a little beyond middle of pelvics; profile from tip of snout to occiput straight, no offset at mouth (Río Chame, Panama).

Gephyrocharax whaleri Hildebrand

8b. Caudal spot not followed by a whitish area at each side at base of caudal fin rays, and usually not prominently developed; origin of dorsal equidistant between caudal base and vertical through opercle to preopercular edge (Río Beni, Bolivia).

Gephyrocharax major Myers

3b. Caudal spot blackish and continuing as a black band to posterior end of middle caudal fin rays; but fading some posteriorly; outer base of each lobe of caudal fin with orange spot, whitish in alcohol; lips thin (Maracaibo Basin)-----**Gephyrocharax venezuelae**, new species

GEPHYROCHARAX VALENCIA Eigenmann

SARDINA

Gephyrocharax valencia EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Isla del Buro, Lake Valencia; Maracay, Río Bue; Lake Valencia, Maracay).—PEARSE, Univ. Wisconsin Stud., No. 1, p. 21, 1920 (mouth Río Bue, Maracay, Lake Valencia).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, No. 5, p. 484, 1929 (Isla del Buro, Lake Valencia; Maracay, Río Bue; Maracay, Lake Valencia).

The following specimens, referred to this species, considerably extend its range:

U.S.N.M. No. 92189, 16 specimens, 28 to 37.8 mm. from Barquisimeto, Venezuela.

U.S.N.M. No. 93111, 4 specimens, 26 to 28.5 mm. from Lake Valencia, Venezuela, collected by International Health Board.

U.S.N.M. No. 121325, 5 specimens, 30 to 37 mm., collected in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, by

Leonard P. Schultz, Guillermo Zuloaga, Roger Sherman, and William H. Phelps, Jr., May 12, 1942.

The following collections, made by Dr. William Beebe, were lent to the author for study and report:

Three specimens, 25 to 27 mm., Río San Pablo, near Caripito, Venezuela, April 11, 1942.

One specimen, 26 mm., from Caripito, Venezuela, 1942.

Two specimens, male of 35 mm., female of 36 mm., from Caripito, Venezuela, 1942.

GEPHYROCHARAX VENEZUELAE, new species

FIGURE 44

Holotype.—U.S.N.M. No. 121369, a male specimen 32.5 mm. in standard length, collected in the Río San Juan at the bridge south of Mene Grande, Motatán system, by Leonard P. Schultz, March 20, 1942.

Paratypes.—The following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121361, 25 specimens, 23.5 to 37 mm., taken along with the holotype and bearing same data.

U.S.N.M. No. 121367, 6 examples, 21 to 28 mm., taken in the Río San Juan, 12 km. south of Rosario, February 26.

U.S.N.M. No. 121368, 107 examples, 19 to 32.5 mm., collected March 16 in the Río Machango at the bridge south of Lagunillas.

U.S.N.M. No. 121362, 11 specimens, 22 to 35 mm., taken February 21 in the Río Palmar near Totuma, about 100 km. southwest of Maracaibo.

U.S.N.M. No. 121359, a specimen, 24.5 mm., collected February 26 in the Río Apón about 35 km. south of Rosario, Maracaibo Basin.

U.S.N.M. No. 121366, 134 examples, 21 to 28 mm., obtained from the Río Negro below mouth of Río Yasa, Maracaibo Basin, March 2.

U.S.N.M. No. 121363, 11 specimens, 21 to 42 mm., collected March 25 in the Río Motatán, 4 km. above Motatán.

U.S.N.M. No. 121360, an example, 23.5 mm., collected March 12 near the mouth of Caño de Sagua, 35 km. north of Sinamaica (water salty on incoming tide).

U.S.N.M. No. 121365, 22 specimens, taken March 24 in the Río Motatán, 8 km. below Motatán.

U.S.N.M. No. 121364, 41 specimens, 19 to 32 mm., collected March 17 in the Río Motatán at the bridge 22 km. north of Motatán.

U.S.N.M. No. 121533, 3 specimens, 24.5 to 30 mm., from Río San Pedro at bridge south of Mene Grande, March 20.

Description.—Detailed measurements were made on the holotype and one paratype, these data, recorded in hundredths of the standard length, are given below, first for the holotype, then the paratype. Standard length in millimeters 32.5 and 32.5.

Length of head 24.3 and 23.7; greatest depth 31.1 and 30.5; length of snout 7.08 and 7.08; diameter of eye 8.37 and 8.00; width of inter-orbital space 8.92 and 9.23; postorbital length of head 10.1 and 11.1; length from tip of snout to rear of maxillary 10.8 and 9.84; length of caudal peduncle from base of last anal ray to midbase of caudal fin

12.3 and 11.1; least depth of caudal peduncle 11.4 and 11.8; length of longest ray of anal fin 16.9 and 14.8; of dorsal 20.9 and 20.0; of pectoral 23.4 and 24.0; of pelvics 16.9 and 12.6; length of longest ray of upper lobe of caudal fin 29.2 and 27.7; of lower lobe 27.7 and 29.2; distance from tip of snout to dorsal origin 64.6 and 61.6; snout to anal origin 60.0 and 58.4; snout to adipose origin 88.9 and 87.1; snout to pelvic insertion 45.8 and 44.0; snout to pectoral insertion 28.3 and 25.5; snout to anus 55.3 and 55.4.

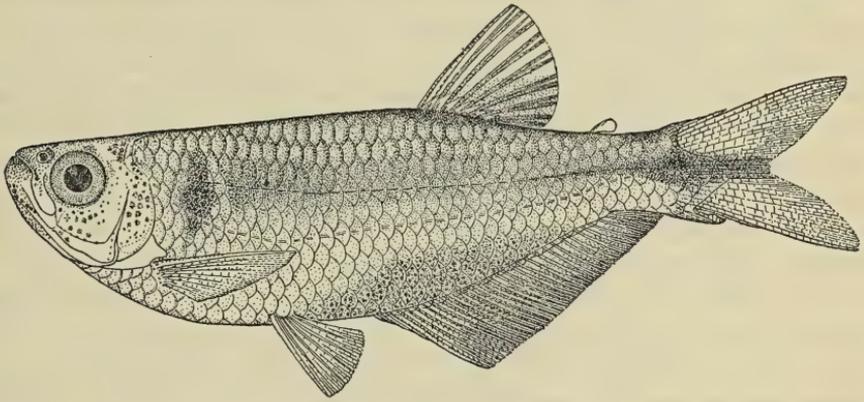


FIGURE 44.—*Gephyrocharax venezuelae*, new species: Holotype, U.S.N.M. No. 121369, 32.5 mm. in standard length.

The following counts were made, respectively: Anal rays v, 28; v, 29 and v, 28; dorsal ii, 8; ii, 8 and ii, 8; pectoral i, 9-i, 9; i, 8; i, 8-i, 8; pelvic i, 6-i, 6; i, 6; i, 6-i, 6; scales 40; 40; 40; scales from dorsal origin to lateral line 6; 6; 5; below lateral line to anal origin $5\frac{1}{2}$; 5; 5; scales in front dorsal 18; 22; dorsal origin over fifth branched ray of anal fin; about 5 or 6 + 10 gill rakers on first gill arch. Additional counts recorded in table 20.

Body and head compressed, the greatest depth near insertion of pelvic fins; profile of back in front of dorsal fin straight; ventral profile greatly curved; mouth nearly vertical, lower jaw projecting but not quite entering profile; snout shorter than diameter of eye; maxillary reaching a little past front of eye; belly in front of pelvics rounded but midventral line behind pelvics with a keel, anus a little in advance of origin of anal fin; adipose fin present, small, its origin over base of about second or third from last rays of anal fin; origin of dorsal fin almost equidistant between rear of head and midbase of caudal fin; pectoral fins pointed, reaching to end of first quarter or first third of the length of the pelvics, the latter reaching to anal origin; first few branched rays of anal fin longest sometimes with tiny teeth distally; margin of dorsal fin rounded; interorbital space rounded, with a shallow groove-like depression, somewhat glandular, each side of interorbital space over orbits; a fontanel occurs along middorsal line

of head from between a line through back of pupils, expanding at the supraoccipital; the latter ends in a point; lateral line decurved forward thence below middle of sides to base of caudal fin.

Teeth on premaxillary in two distinct series, 5 in the inner series of each side and 4 smaller ones on the outer side, a single tooth on the maxillary; teeth with a median triangularly pointed cusp and one or two tiny cusps on each side at base of median cusp. Four similar teeth on each side of lower jaw.

Color.—A blackish humeral bar or spot set off by a paler area above and at side of it; sides of body speckled with black pigment cells; a black line, extending along axis of body above the lateral line more intense posteriorly; a large blackish caudal spot at rear of caudal peduncle, this continuing as a black band to the distal end of the middle rays of caudal fin; middle of back with a narrow blackish band of pigment cells from occiput to dorsal origin, thence dividing and passing along each side of base of dorsal fin, becoming more diffuse on dorsal side of caudal region; all fins with scattered black pigment cells but none of these in spots or streaks; upper lip, lower lip, and chin heavily pigmented; cheek and opercle silvery. When alive, the base of the caudal fin at each side of the black band on middle rays of caudal fin with a bright orange or crimson spot; dorsal side of each eye with a bright orange spot.

Remarks.—This new species differs from all other species referred to the genus *Gephyrocharax* in having the black caudal spot continuing as a black band along middle rays of caudal fin to end of that fin. The key on pages 322–323 will serve to identify all species in the genus *Gephyrocharax*.

Named *venezuelae* after the country by that name.

TABLE 20.—Counts made on species of *Gephyrocharax* from Venezuela

Species	Number of fin rays										Number of scales																
	Branched rays of anal				Dorsal			Pectoral		Pelvic		Along sides			Above lateral line		Below lateral line										
	25	26	27	28	29	30	ii, 7	ii, 8	ii, 9	i, 8	i, 9	i, 10	i, 5	i, 6	39	40	41	42	5	5½	6	6½	5	5½	6	6½	7
<i>valencia</i>	1	4	11	5	5	---	1	4	---	---	---	5	1	---	6	---	---	4	---	---	2	1	---	---	2	---	1
<i>venezuelae</i>	---	1	2	5	3	2	---	6	1	4	5	---	1	10	1	5	1	---	1	1	2	---	3	1	---	---	---

Genus CTENOBRYCON Eigenmann

Ctenobrycon EIGENMANN, Bull. Mus. Comp. Zool., vol. 52, p. 94, 1908. (Type, *Tetragonopterus hauxwellianus* Cope.)

Apodastyanx FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 422, 1911. (Type, *Apodastyanx stewardsoni* Fowler, a specimen without pelvic fins.)

CTENOBRYCON SPILURUS (Valenciennes)

- Tetragonopterus spilurus* VALENCIENNES, in Cuvier and Valenciennes, *Histoire naturelle des poissons*, vol. 22, p. 156, 1849 (Surinam).
Apodastyanax stewardsoni FOWLER, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 63, p. 422, 1911 (Corisal, Venezuela).
Ctenobrycon spilurus EIGENMANN, *Mem. Mus. Comp. Zool.*, vol. 43, No. 4, p. 335, 1927 (Surinam to Venezuela along coast).

CREAGRUTOPS, new genus

Genotype.—*Creagrutops maracaiboensis*, new species.

This new genus, *Creagrutops*, is a *Creagrutus* without a complete lateral line and may be distinguished from that genus and also from *Creagrudite* Myers by its incomplete lateral line of about 9 or 10 pores. *Creagrutops* has tricuspid teeth arranged as shown in figure 46. This arrangement in 3 irregular rows on the premaxillary is practically the same as on *Creagrutus* Günther and on *Creagrudite* Myers, its only near relatives known to me at this writing.

Other characters of this new genus are those of the new species described below.

CREAGRUTOPS MARACAIBOENSIS, new species

FIGURES 45, 46

Holotype.—U.S.N.M. No. 121531, a specimen 22 mm. in standard length, collected by Leonard P. Schultz in the Río Negro below mouth of Río Yasa, March 2, 1942.

Paratypes.—U.S.N.M. No. 121532, 48 specimens, 11 to 22 mm., taken along with the holotype and bearing same data.

Females at 22 mm. standard length contain mature eggs of a rather large size for such a small fish.

Description.—The description is based on the types listed above. Detailed measurements were made on the holotype and one female paratype, and these data, expressed in hundredths of the standard length, are recorded first for the holotype, then the paratype in parentheses. Standard length in millimeters 22 (21.6).

Length of head 27.8 (29.2); greatest depth 29.5 (30.2); length of snout 6.84 (7.40); diameter of eye 10.9 (11.6); tip of snout to rear of maxillary 9.55 (9.72); width of interorbital space 8.19 (9.26); post-orbital length of head 12.3 (12.9); least depth of caudal peduncle 12.3 (11.6); length of caudal peduncle 21.4 (19.9); length of base of anal fin 20.0 (19.9); length of longest ray of anal fin 20.0 (19.9); longest dorsal ray 25.0 (24.1); longest pectoral ray 20.5 (19.5); longest pelvic ray 16.8 (16.2); length of upper caudal fin lobe 28.7 (29.6) and of lower lobe 27.7 (29.6); distance from tip of snout to dorsal fin origin 52.8 (54.6); snout to adipose origin 83.7 (84.7); snout to anal origin 61.4 (68.5); snout to pectoral insertion 27.3 (28.7); snout to pelvic

insertion 47.8 (53.2); distance from dorsal origin to midcaudal fin base 52.3 (51.4); dorsal origin to tip of adipose fin 42.8 (41.7).

The following counts were made, respectively: Dorsal rays ii, 8 (ii, 8); anal iii, 11 (iii, 12); pectoral i, 11-i, 11 (i, 11-i, 11); pelvic i, 6-i, 6 (i, 6-i, 6); scales 31 (31); scales above lateral line 5 (5) and below lateral line to pelvic insertion 4 (4); scales in front of dorsal fin to tip of supraoccipital process 10 (10); scales bordering one side of supraoccipital process $2\frac{1}{2}$ (3); number of teeth and their arrange-

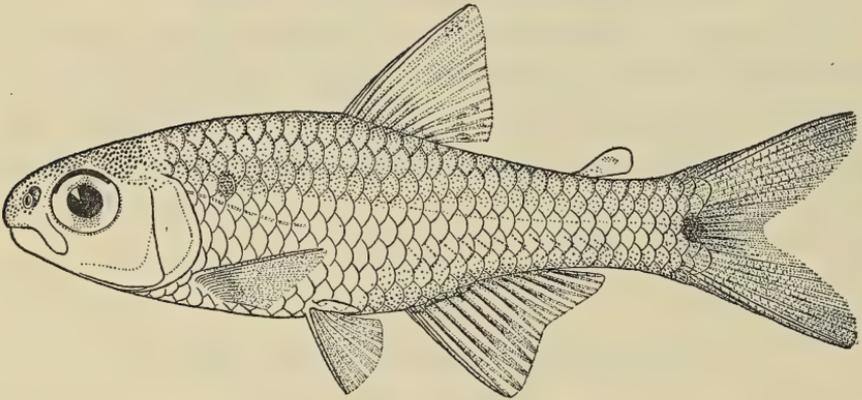


FIGURE 45.—*Creagrutops maracaiboensis*, new genus and species: Holotype, U.S.N.M. No. 121531, 22 mm. in standard length.

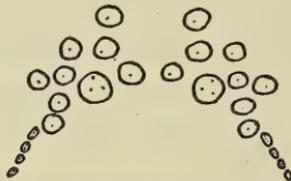


FIGURE 46.—*Creagrutops maracaiboensis*, new genus and species: Arrangement of teeth on premaxillaries and on maxillaries.

ment in upper jaw as shown in figure 46, teeth on mandible 6 on each side.

A summary of my counts is recorded in table 21.

TABLE 21.—Counts made on *Creagrutops maracaiboensis*

Number of fin rays								Number of scales						
Dorsal	Anal		Pectoral			Pelvic		Head to midcaudal base	Pores in lateral line		Above lateral line	Below lateral line	In front of dorsal fin	
ii, 18	iii, 11	iii, 12	i, 10	i, 11	i, 12	i, 6	i, 7	31	9	10	5	4	10	11
11	3	8	2	6	4	6	8	5	3	3	5	5	7	1

Body a little compressed, the head about $3\frac{1}{2}$ and depth 3.0 to 3.2 in standard length; snout $\frac{3}{8}$ eye and about 4 in head; eye large, $2\frac{1}{2}$ in head; interorbital a little convex, not quite so wide as eye, about 3 in head; postorbital length of head twice in distance from dorsal origin to tip of supraoccipital; second suborbital not covering cheek, posteriorly and ventrally naked, so that it does not come in contact with preopercle; gill rakers represented by tiny knobs along first gill arch; lateral line incomplete, usually with only 9 or 10 pores and ending about opposite pelvic insertions; a large fontanel occupying middorsal area of head from between rear of orbits to tip of supraoccipital; lower jaw included, shorter than upper, so that snout projects a little and the outer teeth of premaxillary are exposed; gill membranes free from isthmus, joined to it far forward; predorsal and preventral area normally and evenly scaled; origin of dorsal fin about an equal distance from snout tip and midcaudal fin base; pelvic insertions in front of a vertical through origin of dorsal fin; anal origin usually about under base of the third from last dorsal ray; adipose fin present, a vertical through its origin passing a little behind base of last anal ray; anal origin an equal distance between midcaudal base and preopercle; caudal fin forked, its base with a few scales, but no pouch or enlarged scales are developed; distal margin of anal fin a little concave; the last simple rays of dorsal and of anal fins on males a little elongate; intestine with a few pyloric caeca.

Color, in alcohol: Middle rays of caudal fin blackish, forming an elongate caudal spot that ends before reaching tips of middle caudal fin rays and not extending on the caudal peduncle; tips of each caudal lobe a little dusky, as is tip of dorsal first rays occasionally; a line of black pigment along the anterior margin of each anal ray; tip of snout with black pigment cells and also upper parts of head; margins of each scale pocket, dorsally, outlined with a little black pigment; numerous scattered black pigment cells over anal base to midaxis of body and lower side of caudal peduncle; no humeral spot. When alive, this species had a reddish coloration on the upper third of the eye. Peritoneum silvery, with a few scattered black pigment cells at sides dorsally.

Remarks.—This new species differs from all other characinids with three irregular rows of tricuspid teeth on the premaxillary and a single row on the dentary by having an incomplete lateral line and, in addition, no humeral spot, the caudal spot being confined to the base of caudal fin.

Named *maracaiboensis* in reference to the drainage basin in which it was collected.

Genus *CREAGRUTUS* Günther

Creagrutus GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, p. 339, 1864. (Type, *Creagrutus mulleri* Günther=*Leporinus mulleri* (non Steindachner) Günther, 1859.)

Although Eigenmann revised this genus in 1927 and Myers in the same year split off the genus *Creagrudite*, considerable work needs to be done on these genera before they are well understood. In fact, I cast serious doubt on the distinctness of *Creagrudite* from *Creagrutus* but am unable to reach a definite conclusion at this time because of lack of specimens. Most of the specimens from Venezuela have the teeth in the upper jaws arranged as shown in figure 48, but there is some variation.

KEY TO THE SPECIES OF *CREAGRUTUS* FROM VENEZUELA

- 1a. A black spot at base of middle rays of caudal fin, pigment not embedded; humeral bar, usually with intensification of blackish pigment at midaxis, this bar not crescent shaped; dorsal origin over or a little in front of a vertical line through pelvic insertion; usually 10 scales (occasionally 9 and 11) between dorsal origin and tip of supraoccipital process; anal rays iii, 10 to iii, 12; depth $3\frac{1}{4}$ to $3\frac{3}{8}$ and head $3\frac{3}{8}$ to $3\frac{1}{2}$, in standard length; eye 3 to $3\frac{1}{2}$ in head; when alive dorsal side of eye reddish.

***Creagrutus hildebrandi*, new species**

- 1b. No black pigment spot at base of midcaudal fin rays.
- 2a. Humeral bar crescent-shaped, with concavity anteriorly²⁸; adipose origin over base of last dorsal ray; scales 37 or 38; anal rays iii, 9 or iii, 10.
- 3a. Head $4\frac{1}{2}$, depth $4\frac{1}{2}$, in standard length; dorsal origin directly over pelvic insertion; anal origin under tips of depressed last dorsal ray; second suborbital equals eye; crescent-shaped humeral bar over a black humeral spot; anal 11 (probably iii, 10) — ***Creagrutus phasma* Myers**
- 3b. Head $3\frac{3}{4}$ to 4, depth $3\frac{1}{2}$ to 4 in standard length; dorsal origin directly over to a little in front of pelvic insertion; anal origin under a third to a half of the way out depressed last dorsal ray; width of second suborbital equals $\frac{2}{3}$ eye; no black spot in crescent-shaped humeral bar; anal rays iii, 9, rarely iii, 8 or iii, 10 — ***Creagrutus bolivari*, new species**
- 2b. Humeral bar not crescent-shaped; head $3\frac{3}{4}$ to 4, depth 3 to $3\frac{1}{2}$, in standard length; anal rays iii, 10 or iii, 11, occasionally iii, 12; usually 11 scales in front of dorsal origin; adipose origin over a vertical through half the way out depressed last anal ray; origin of dorsal usually a little behind or sometimes over pelvic insertions; dorsal origin an equal distance between snout tip and one-fourth to one-third eye diameter behind adipose tip — ***Creagrutus beni* Eigenmann**

***CREAGRUTUS HILDEBRANDI*, new species**

FIGURES 47, 48

Holotype.—U.S.N.M. No. 121482, a specimen 50 mm. in standard length, taken by Leonard P. Schultz, April 1, 1942, in the Río Táchira, 7 km. north of San Antonio, Catatumbo system, Venezuela.

²⁸ The shape of the humeral bar and elongate shape of the body are very similar to pl. 45, fig. 1, Mem. Carnegie Mus., vol. 5, 1912 and pl. 34, fig. 2, Mem. Mus. Comp. Zool., vol. 43, pt. 4, 1927, both of *Creagrutus melanzonus*.

Paratypes.—All the following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121491, 10 specimens, 31 to 65 mm. in standard length, taken along with the holotype and bearing same data.

U.S.N.M. No. 121496, 403 examples, 28 to 63 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121494, 261 examples, Río Motatán at bridge, 22 km. north of Motatán, March 17.

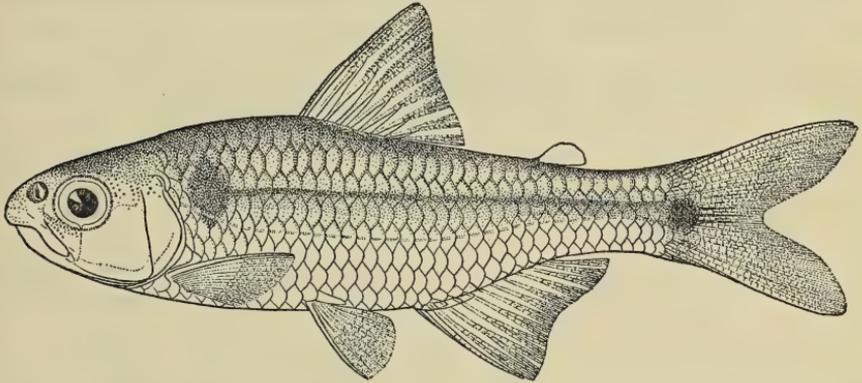


FIGURE 47.—*Creagrutus hildebrandi*, new species: Holotype, U.S.N.M. No. 121482, 50 mm. in standard length.



FIGURE 48.—*Creagrutus hildebrandi*, new species: Arrangement of teeth on premaxillaries and on maxillaries.

U.S.N.M. No. 121485, 97 specimens, 20 to 58 mm., Río Jimelles, 12 km. east of Motatán, Motatán system, March 24.

U.S.N.M. No. 121495, 16 specimens, 19 to 26 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121484, 20 examples, 24 to 45.5 mm., Río San Juan near bridge, Motatán system, March 17–20.

U.S.N.M. No. 121483, a 28-mm. example, Río San Pedro at bridge, Motatán system, March 20.

U.S.N.M. No. 121492, 66 specimens, 18 to 44.5 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121488, 159 specimens, 13 to 45 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121486, 334 specimens, 14 to 40 mm., Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121489, 154 examples, 15 to 47 mm., Río Socuy, 3 km. above mouth, February 24.

U.S.N.M. No. 121487, 229 specimens, 16 to 54 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121490, 148 specimens, 20 to 49 mm., Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121493, 11 examples, 17 to 35.5 mm., Río Machango, 20 km. above bridge, south of Lagunillas, March 21.

This species occupies the rapidly flowing waters of the middle and lower parts of the rivers.

TABLE 22.—Counts and measurements made on species of *Creagrutus* (all measurements expressed in hundredths of the standard length)

Characters	Species			
	<i>hildebrandi</i>		<i>bolivari</i>	
	Holotype U.S.N.M. No. 121482	Paratype U.S.N.M. No. 121491	Holotype U.S.N.M. No. 121497	Paratype U.S.N.M. No. 121498
Standard length (in mm.).....	50.0	39.5	50.5	38.7
Length of head.....	27.2	29.6	26.5	27.1
Greatest depth of body.....	29.0	27.3	29.7	27.1
Length of snout.....	7.8	8.6	7.72	7.75
Diameter of eye.....	9.0	11.6	8.91	9.05
Length of mouth.....	11.0	12.4	10.5	11.1
Width interorbital.....	9.0	8.1	8.51	9.05
Postorbital length of head.....	12.6	12.7	13.7	12.1
Least depth of caudal peduncle.....	12.8	11.1	12.1	11.9
Length of caudal peduncle.....	11.0	22.5	24.0	23.8
Length of base of anal.....	21.0	19.8	16.6	15.0
Length of longest anal ray.....	18.8	19.0	18.2	17.6
Length of longest dorsal ray.....	22.8	19.0	18.4	20.7
Length of longest pectoral ray.....	20.8	20.2	19.6	19.4
Length of longest pelvic ray.....	15.4	16.5	17.4	15.5
Length of upper caudal fin lobe.....	31.0	30.1	26.0	27.6
Length of lower caudal fin lobe.....	31.0	29.6	26.0	25.8
Distance from snout to dorsal origin.....	46.4	45.0	47.7	47.8
Distance from snout to adipose origin.....	80.8	80.5	78.2	80.1
Distance from snout to anal origin.....	63.2	61.8	63.5	65.9
Distance from snout to pectoral insertion.....	25.2	25.8	24.8	25.3
Distance from snout to pelvic insertion.....	46.4	46.6	47.7	48.8
Distance from snout to anus.....	58.2	51.9	56.4	57.4
Dorsal rays.....	ii, 8	ii, 8	ii, 8	ii, 8
Anal rays.....	iii, 11	iii, 11	ii, 9	ii, 9
Pectoral rays.....	i, 12-i, 12	i, 12-i, 13	i, 13-i, 13	i, 12-i, 12
Pelvic rays.....	i, 7-i, 8	i, 7-i, 7	i, 7-i, 7	i, 7-i, 7
Branched caudal rays.....	17	17	17	17
Number of gill rakers on first gill arch.....		5+10		6+11
Number of scales on sides.....	37	36	38	38
Scales above lateral line.....	5	5	5	5
Scales below lateral line.....	3	3	3	3
Scales in front of dorsal fin.....	9	10	9	9

Description.—This description is based on the holotype and paratypes listed above. Measurements were made on the former and

one of the latter, and these data, recorded in hundredths of the standard length, are presented in table 22.

Body somewhat compressed, depth $3\frac{1}{4}$ to $3\frac{3}{8}$ and head $3\frac{1}{3}$ to $3\frac{1}{2}$ in standard length; snout bluntly rounded; lower jaw included, the snout projecting so that the two most anterior teeth of premaxillary show on underside of snout when mouth is closed; mouth when closed a trifle above level of lower edge of eye; maxillary extending a little past a vertical through front of eye, but not quite to one through front of pupil; width of second suborbital about two-thirds eye, covering about one-half of the cheek and ventrally or posteriorly not in contact with preopercle; interorbital space convex, about equal to eye; eye diameter a little greater than length of snout; the ventral profile usually a little more curved than the dorsal profile; the greatest depth at origin of dorsal fin; nasal openings separated by a flap of skin and a small papilla projects backward from the front of margin of anterior nasal opening; dorsal origin usually over or a little in front of a vertical line through pelvic insertions; a vertical line through anal origin passing through a point about two-thirds the way out the depressed last anal ray; a vertical line through adipose origin passing a very little behind base of last anal ray; caudal peduncle longer than base of anal fin; gill rakers 5 or 6+9 or 10 on first gill arch, those on upper part of the arch much smaller than those on lower part of the arch; gill membranes free from isthmus; lateral line complete, depressed a little anteriorly; teeth on the premaxillary arranged as shown in figure 48 and those on mandible in a single row of about 5 tricuspid teeth on each side; breast and predorsal area evenly and normally scaled; length of pectorals not quite reaching or extending a little past pelvic insertions; pelvic fins usually reaching to anal origin; distal margin of dorsal fin truncate to a little concave; distal margin of anal fin a little concave; outer margins of paired fins a little convex; caudal fin deeply forked; lobes of caudal fin scaled out as far as two-fifths their length; peritoneum usually silvery ventrally and anteriorly, but heavily pigmented dorsally and at sides.

Coloration.—In alcohol the back is light brownish, pale on belly, sides with a wide silvery band above lateral line, except anteriorly; sometimes this band is grayish posteriorly and in the young darker; base of middle caudal fin rays with a blackish pigment spot, this pigment on the membranes between the supporting bony rays as much as on the rays, the spot disappearing about halfway out to the end of the middle rays; dorsal fin with a few scattered pigment cells, but never arranged to form a bar or band; humeral bar mostly above lateral line and vertically elongate, somewhat oval or wedge-shaped.

The following colors of the fish in life were recorded: Dorsal fin pinkish, back yellowish; adipose fin orange-yellow; dorsal part of eye bright red; upper and lower lobes of caudal fin yellowish; anal fin

pinkish anteriorly; pectorals pale orange-yellow; lateral band plumbeous, ending in a black spot at midbase of caudal fin; humeral bar black; sides silvery.

Remarks.—This new species of *Creagrutus* differs from others referred to this genus in having a black spot at midcaudal fin base, as well as in having the dorsal fin over or a little in front of a vertical through the pelvic insertions. The lobes of the caudal fin are yellowish instead of red as in *Creagrutus beni* of the Maracaibo Basin.

Named *hildebrandi* in honor of Dr. Samuel F. Hildebrand, of the U. S. Fish and Wildlife Service, who has made extensive contributions on the fish fauna of Panama.

CREAGRUTUS PHASMA Myers

Creagrutus phasma MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 117, 1927 (mouth of Curamuni, Río Cassiquiare, Venezuela).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, p. 548, 1929 (Río Cassiquiare, Venezuela).

CREAGRUTUS BOLIVARI, new species

FIGURE 49

Holotype.—U.S.N.M. No. 121497, a specimen 51.5 mm. in standard length, collected by L. P. Schultz, G. Zuloaga, William Phelps, Jr., Roger Sherman, May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua.

Paratypes.—U.S.N.M. No. 121498, 90 specimens, 29 to 48 mm., collected along with the holotype and bearing same data.

This species occurred in the quieter eddies of the rapidly flowing waters.

Description.—This description is based on the holotype and paratypes listed above. Measurements were made of the former and one of the latter, and these data, recorded in hundredths of the standard length, are presented in table 22. Additional counts are recorded in table 23.

TABLE 23.—Counts made on species of *Creagrutus* from Venezuela

Species	Number of fin rays														Number of scales													
	Dorsal	Anal						Pectoral					Pelvic			Rows crossing lateral line			Above lateral line			Below lateral line				In front of dorsal		
		ii, 8	iii, 8	iii, 9	iii, 10	iii, 11	iii, 12	i, 10	i, 11	i, 12	i, 13	i, 14	i, 6	i, 7	i, 8	35	36	37	38	4	5	6	3	4	9	10	11	12
<i>hildebrandi</i>	12	---	---	4	9	4	1	2	7	---	---	1	5	---	4	1	1	---	3	1	1	5	---	3	10	1	---	
<i>bolivari</i>	6	2	18	1	---	---	---	1	2	5	1	---	4	---	---	2	1	---	2	---	2	3	---	16	---	---	---	
<i>beni</i>	12	---	---	18	51	6	5	8	1	---	---	---	9	1	2	2	9	3	---	15	---	9	6	---	23	1	2	

Body a little compressed, depth $3\frac{1}{2}$ to 4 and head $3\frac{1}{2}$ to 4, in standard length; snout bluntly rounded, projecting in front of lower jaw, so that when the mouth is closed the two most anterior teeth on the premaxillary are fully exposed; mouth when closed on level of lower edge of eye; posterior tip of maxillary under front of eye; second suborbital covering about two-thirds of the cheek, its greatest width equal to $\frac{3}{4}$ eye and ventrally and posteriorly not in contact with the preopercle; interorbital space convex, nearly equal to eye and about equal to length of snout; eye diameter a little greater than length of snout; dorsal and ventral profiles nearly equal, the greatest depth at origin of dorsal; anterior margin of nasal opening with a short papilla projecting into opening, anterior and posterior nasal openings

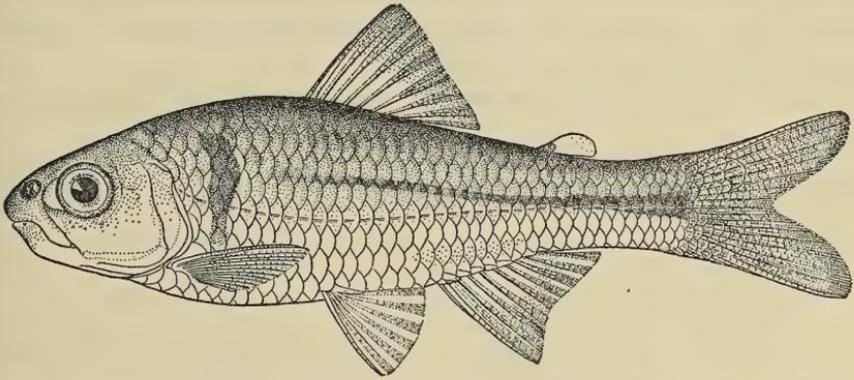


FIGURE 49.—*Creagrutus bolivari*, new species: Holotype, U.S.N.M. No. 121497, 51.5 mm. in standard length.

separated by a flap of skin; dorsal origin over or usually a little in front of vertical line through pelvic insertion; a vertical line through adipose origin, passing just behind the base of last anal ray; a vertical line through anal origin passes one-third to one-half way out the depressed last dorsal ray; caudal peduncle nearly an eye diameter longer than anal fin base; gill rakers about 5+9, very short on anterior part of the first gill arch, much longer on lower part of arch; gill membranes free from the isthmus; lateral line complete, a little decurved anteriorly; teeth tricuspid, arranged essentially as shown in figure 48 of *C. hildebrandi*; maxillary usually with 3 teeth; mandible usually with 5 teeth on each side, the 3 anterior ones on each side enlarged, also tricuspid; breast and predorsal area rounded, evenly and normally scaled; pectorals not quite reaching pelvic insertions and pelvics not quite reaching anal origin; distal margins of dorsal and anal fins a little concave, that of the paired fins a little convex; caudal fin forked, the lobes nearly equal in length and scaled out as far as about one-fourth to two-fifths their length; intestine with one main loop; several pyloric caeca.

Coloration.—In alcohol the back is tan or straw-colored and often with a brownish streak along the middorsal line; dorsal fin with scattered dark pigment cells distally and more numerous anteriorly; other fins unpigmented; no caudal spot; humeral bar brownish, crescent-shaped with the concavity on anterior side and the rear margin a little convex dorsally but nearly straight ventrally; this humeral bar resembles a somewhat flattened question mark on many specimens; peritoneum silvery ventrally, but pigmented with black dorsally.

Remarks.—This new species differs from all other species of *Creagrutus* in having fewer (iii, 8 or iii, 9) anal rays, except *Creagrutus brevipinnis*, which has iii, 9 or iii, 10; it differs also in having a crescent-shaped humeral bar instead of an elongate one as in *brevipinnis*; the latter species is deeper and less elongate than *bolivari*. From *C. phasma* it differs as indicated in the key.

Named *bolivari* in honor of the liberator of northern South America.

CREAGRUTUS BENI Eigenmann

Creagrutus beni EIGENMANN, Ann. Carnegie Mus., vol. 7, No. 1, p. 172, pl. 6, fig. 2, 1911 (Villa Bella on Río Beni); Indiana Univ. Stud., vol. 7, No. 44, p. 12, 1920 (Río Guaire near Caracas; El Concejo, Río Tiquirito; Maracay, Río Bue; Isla del Buro, Venezuela).—PEARSE, Univ. Wisconsin Stud., No. 1, pp. 20, 43, 1920 (Lake Valencia, Isla del Buro, Venezuela).—EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 4, p. 421, pl. 58, fig. 3, pl. 93, figs. 4, 5, 7, 1927 (Lake Valencia Basin, Venezuela).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 408, 1931 (Yarapa River at Yarapa, Venezuela).

The following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121501, 50 specimens, 24 to 70 mm. in standard length, from the Río Cobre above mouth, tributary to Río Quinta, thence into Río La Grita below La Grita, Catatumbo system, March 31.

U.S.N.M. No. 121505, 356 examples, 14.5 to 74 mm., Río Gonzáles, tributary to Río Chama, at La Gonzáles, Estado de Mérida, March 29.

U.S.N.M. No. 121506, 4 examples, 23 to 31 mm., Río Chama, 10 km. below Lagunillas, Estado de Mérida, March 30.

U.S.N.M. No. 121502, 25 specimens, 19 to 57 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121504, 7 specimens, 19 to 54 mm., Río Táchira, 7 km. north of San Antonio, Catatumbo system, April 1.

U.S.N.M. No. 121503, 28 examples, 23 to 55 mm., Río Chama at Estanques, Estado de Mérida, April 3.

U.S.N.M. No. 121499, 378 specimens, 18 to 71 mm., Río Barregas just below Egido, Río Chama system, Estado de Mérida, March 29.

The following collection was made in the Río Tuy system near Caracas: U. S. N. M. No. 121500, 5 examples, 36 to 49 mm., quebrada near El Valle south of Caracas, May 12, 1942, L. P. Schultz, G. Zuloaga, William Phelps, Jr., R. Sherman.

Two specimens, 50 and 59 mm., from Caripito, Venezuela, 1942, collected by Dr. William Beebe, were lent to me for study and report. They are referred to this species with some uncertainty.

Undoubtedly, when sufficient specimens of this form from the Upper Orinoco system and from the Maracaibo Basin are available for critical comparison, the two populations will be shown to be sub-specifically different. However, at the present time it seems advisable to refer all the various populations to the species *beni*, which it closely resembles. See table 23 for counts.

The following color notes were recorded for a specimen from the Río Chama at Estanques: Pelvic, pectoral, and adipose fins yellowish orange; front of anal fin orange; dorsal surface of eye red; area in front of eye yellow; central area of upper and lower caudal lobes bright red; back yellowish orange; lateral band and lower sides silvery, the lateral band is dark grayish or plumbeous in color on caudal peduncle; no caudal spot. The following color notes were recorded for a specimen from the Río Motatán, 4 km. above Motatán: Dorsal surface of eye orange; back yellowish; pelvics yellowish orange as is front of anal fin; central area of caudal lobes bright red, with yellowish color basally; lateral band grayish; dorsal and anal fins slight grayish distally; no caudal spot.

Genus CREAGRUDITE Myers

Creagrudite MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 118, 1927. (Type, *Creagrudite maxillaris* Myers.)

CREAGRUDITE MAXILLARIS Myers

Creagrudite maxillaris MYERS, Bull. Mus. Comp. Zool., vol. 68, No. 3, p. 118, 1927 (sandbank on Colombian border, Rio Negro, Cucuhy, Brazil; mouth of Curamuni, Río Cassiquiare, Venezuela).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, p. 547, 1929 (Cucuhy; mouth of Curamuni, Río Cassiquiare).

Genus TETRAGONOPTERUS Cuvier

Tetragonopterus CUVIER, Règne animal, vol. 2, p. 166, 1817. (Type, *Tetragonopterus argenteus* Cuvier.) (Ref. copied.)

KEY TO THE SPECIES OF TETRAGONOPTERUS FROM VENEZUELA AS REPORTED IN THE LITERATURE (AFTER EIGENMANN)

1a. Anal rays 36 or 37; occipital process bordered by 5 to 7 scales on each side; caudal lobes scaled for about half their length; distance of dorsal from tip of snout greater than distance of pelvics from tip of snout; pelvics equidistant from snout tip and last third or fourth of anal; 12 to 16 azygous predorsal scales; scales 7 to 9–32 to 35–3½ to 5.

Tetragonopterus argenteus Cuvier

1b. Anal rays 32 or 33; occipital process bordered by 3 or 4 scales on each side; caudal lobes densely scaled to near tip; dorsal and pelvics about equidistant from tip of snout; pelvics equidistant from tip of snout and end of anal; 8 or 9 azygous predorsal scales; scales 7–29 to 34–3½.

Tetragonopterus chalceus Agassiz

TETRAGONOPTERUS ARGENTEUS Cuvier

Tetragonopterus argenteus CUVIER, Mem. Mus. Hist. Nat., vol. 4, p. 455, 1818.—STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 155, 1879 (Ciudad Bolívar).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 52, 1891 (Orinoco).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).—EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 1, p. 55, 1917 (Orinoco to Buenos Aires).—EIGENMANN and ALLEN, Fishes of western South America, p. 237, 1942 (Orinoco Basin to the La Plata).

TETRAGONOPTERUS CHALCEUS Agassiz

Tetragonopterus chalceus AGASSIZ, in Spix, Selecta genera et species piscium . . . Brasiliam . . ., p. 70, pl. 33, fig. 1, 1829 (ref. copied).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Genus MOENKHAUSIA Eigenmann

Moenkhausia EIGENMANN, Smithsonian Misc. Coll., vol. 45, p. 145, 1903. (Type, *Tetragonopterus xinguensis* Steindachner.)

KEY TO THE SPECIES OF MOENKHAUSIA AS REPORTED FROM VENEZUELA IN THE LITERATURE

- 1a. Anal rays iii, 29 to iii, 33; scales 8 or 9+30 to 32+8 or 9 (? 10); predorsal scales 14 or 15; depth 2, head $3\frac{1}{4}$ to $3\frac{1}{2}$; no caudal spot; fins not elongate; grayish humeral spot present----- *Moenkhausia bondi* (Fowler)
- 1b. Anal rays iii, 24 to iii, 27; scales about 7+35+6; depth $2\frac{1}{2}$ to $2\frac{1}{2}$, head 4; fins all elongate, depressed dorsal reaching past adipose; no caudal or humeral spots; a narrow lateral band----- *Moenkhausia pittieri* Eigenmann
- 1c. Anal rays iii, 23 to iii, 24; scales 7+35 or 36+6; depth $2\frac{1}{2}$ to $2\frac{1}{2}$, head $3\frac{1}{4}$ to $3\frac{1}{2}$; a blackish round caudal spot; no distinct humeral spot or dark lateral streak----- *Moenkhausia miangi* Steindachner

None of the three species listed here for the genus *Moenkhausia* has been examined by me.

MOENKHAUSIA BONDI (Fowler)

Phenacogaster bondi FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 419, 1911 (Corisal, Orinoco Delta, Venezuela).

Moenkhausia bondi EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 1, p. 69, pl. 14 fig. 3, pl. 100 fig. 7, 1917 (Venezuela).

MOENKHAUSIA PITTIERI Eigenmann

Moenkhausia pittieri EIGENMANN, Indiana Univ. Stud., No. 44, p. 10, pl. 3, 1920 (Concejo, Río Tiquirito; Maracay, Río Bue, all in Valencia Basin, Venezuela).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, n. 520, 1929 (Concejo, Río Tiquirito; Maracay, Río Bue, Venezuela).

MOENKHAUSIA MIANGI Steindachner

Moenkhausia miangi STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 93, p. 43, pl. 3, fig. 5, 1917 (Río Miang, border of Venezuela).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, p. 525, 1929 (Río Miang).

Genus BRYCONAMERICUS Eigenmann

Bryconamericus EIGENMANN, Ann. Carnegie Mus., vol. 4, p. 139, 1907. (Type, *Bryconamericus exodon* Eigenmann.)

Knodus EIGENMANN, Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 216, 1911. (Type, *Knodus meridae* Eigenmann.)

Knodus EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 1, p. 50, 1917; pt. 2, p. 114, 1918 (type, *Knodus breviceps* Eigenmann).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, p. 526, 1929 (genotype corrected to *Knodus meridae* Eigenmann).

The genus *Knodus* Eigenmann was created on a single specimen taken near Mérida, Venezuela. It was not diagnosed until some years later (Eigenmann, Mem. Mus. Comp. Zool., vol. 43, pt. 1, p. 50, 1917, and pt. 2, p. 114, 1918), when Eigenmann injected considerable confusion by basing his generic diagnosis on *Knodus breviceps* Eigenmann instead of on the only permissible genotype, *Knodus meridae*.

The chief difference between *Knodus* and *Bryconamericus* is supposed to be that in the former the basal half of each caudal fin lobe is covered with scales while in *Bryconamericus* the base of each caudal lobe is naked. I have examined several species and find that in certain ones the scales are lacking (as in *B. emperador* from Panama) while in others the scales extend out a short distance (as in *B. peruanus*). Now in *Knodus meridae* the scales extend about one-third to one-half the way out on the caudal lobes but not so far out as in *B. beta*. The amount of gradation is so variable that I cast serious doubt on the supposed difference between *Knodus* and *Bryconamericus*. I conclude that *Knodus* should be referred as a synonym to the genus *Bryconamericus*, at least until someone has adequate material that will permit further studies on this problem.

It should be pointed out that the scales on the base of the caudal fin lobes of cotypes of *Bryconamericus breviceps* Eigenmann, U.S.N.M. No. 120274, are large as in *K. meridae*, and not small as shown for *breviceps* on plate 10, figure 2, of Eigenmann's (1918) "The American Characidae."

The species of *Bryconamericus* collected by me in the Maracaibo Basin fall into two general forms; one is elongate and more or less oval in cross-section and the other species is a compressed form. Both of these appear to be related to species occurring in the Orinoco drainage. Doubt is here cast on the specific distinctness between *B. cismontanus* and *B. deuterodonoides*. Unfortunately the maxillary teeth of the former are not described in sufficient detail, while the maxillary teeth of the latter are said to be broad, and this describes fairly well those of the material that I collected, and I have identified my specimens as a subspecies of the form named *B. deuterodonoides*. A careful study may show that *B. cismontanus* is another form or that these two species are synonymous.

The following tentative key will aid in identifying the species of *Bryconamericus* from Venezuela:

- 1a. Depth 2.5 to 3, usually about 2.6 to 2.8 in standard length; scales above lateral line 5 or 6, usually 6; anal rays iii, 20 to iii, 30; maxillary teeth with

middle denticle longest and strongest, distal surface forming a more or less obtuse angle; outer row of premaxillary teeth usually not all in line; a black line along midaxis of body beginning behind pale area behind vertical humeral spot, thence continuing to elongate blackish caudal spot that extends on middle caudal fin rays, but color diffuse and fading distally on them; dorsal rays always ii, 8; origin of dorsal fin an equal distance between tip of snout and midcaudal fin base or a trifle closer to latter.

- 2a. Anal rays iii, 23 to iii, 30, usually iii, 25 to iii, 28; usually 2 or 3 teeth on the maxillary; scales 5 or 6—36 to 39—3 or 4.

Bryconamericus beta beta Eigenmann

- 2b. Anal rays iii, 20 to iii, 23, rarely iii, 23; usually 3 or 4 teeth on maxillary; scales 6—35 to 37—4 or 5; 4 scales between lateral line and anal origin; pelvic rays i, 7; pectorals i, 9 to i, 11, usually i, 10; gill rakers 4 to 6+8 to 10; outer row of premaxillary usually with 5 teeth.

Bryconamericus beta motatanensis, new subspecies

- 1b. Depth 3.0 to 3.6, usually 3.2 to 3.5 in standard length; scales above lateral line 4 or 5, usually 5, and below it 3, rarely 4; anal rays iii, 13 to iii, 18; middle denticle on maxillary teeth little or no stronger than other denticles, distal edge of these maxillary teeth truncate or a little convex; maxillary teeth as broad as high; a wide dark lateral band, more intense posteriorly, ending in a black caudal spot that does not continue to end of middle caudal fin rays; a dark humeral spot, vertically elongate; peritoneum black; 5 or 6 pyloric caeca.

- 3a. Pelvic rays i, 7, occasionally i, 6; anal iii, 15 to iii, 17; pectoral usually i, 10 or i, 11.

- 4a. Two teeth in outer row of premaxillary, rarely 3; maxillary with 3 teeth, rarely 4; scales above lateral line usually 4, occasionally 5.

Bryconamericus deuterodonoides deuterodonoides Eigenmann²⁹

- 4b. Four teeth, rarely 3 or 5, in outer row of premaxillary; maxillary with 2 or 3 teeth; scales above lateral line 5 and 3 scales between lateral line and anal origin.

Bryconamericus deuterodonoides euryodous, new subspecies

- 3b. Pelvic rays i, 6, rarely i, 5; anal iii, 13 to iii, 16; pectoral usually i, 9 or i, 10; 4 teeth, rarely 3 or 5, in outer row of premaxillary; maxillary with 3 to 5 teeth; scales above lateral line usually 5, and 2 to 2½ scales from lateral line to anal origin.....**Bryconamericus meridae** (Eigenmann)

BRYCONAMERICUS BETA BETA Eigenmann

Bryconamericus beta EIGENMANN, in Eigenmann, Henn, and Wilson, Indiana Univ. Stud., No. 19, p. 7, 1914 (Villavicencio, Colombia); Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Concejo, Río Tiquirito, Venezuela); Mem. Carnegie Mus., vol. 9, No. 1, p. 236, 1922 (northern Venezuela); Mem. Mus. Comp. Zool., vol. 43, No. 4, p. 389, pl. 91, fig. 2, 1927 (Concejo, Río Tiquirito, Venezuela).

? *Bryconamericus* sp. ? EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Isla del Buro, Lake Valencia, Venezuela).

U.S.N.M. No. 121468, 3 specimens, 21 to 25 mm., Río Guárico and tributaries between San Sebastián and San Casimiro, collected by L. P. Schultz, G. Zuloaga, R. Sherman, and William Phelps, Jr., May 12, 1942.

²⁹ Not reported from Venezuela but from Villavicencio, Colombia.

Thirteen specimens, 23 to 45 mm., from Caripito, Venezuela, William Beebe, 1942, were lent to me for study and report.

BRYCONAMERICUS BETA MOTATANENSIS, new subspecies

FIGURE 50

Holotype.—U.S.N.M. No. 121477, a specimen 39.5 mm. in standard length, collected by Leonard P. Schultz, March 20, 1942, in the Río San Juan at bridge south of Mene Grande, Motatán system.

Paratypes.—All paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121478, 77 specimens, 22 to 47 mm., taken along with the holotype and bearing same data.

U.S.N.M. No. 121479, 10 examples, 22.5 to 36 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121481, 45 examples, 22 to 44 mm., Río San Pedro at bridge south of Mene Grande, Motatán system, March 17 to 20.

U.S.N.M. No. 121480, 1 specimen, 34.5 mm., from Río Jimelles, 12 km. east of Motatán, Motatán system, March 24.

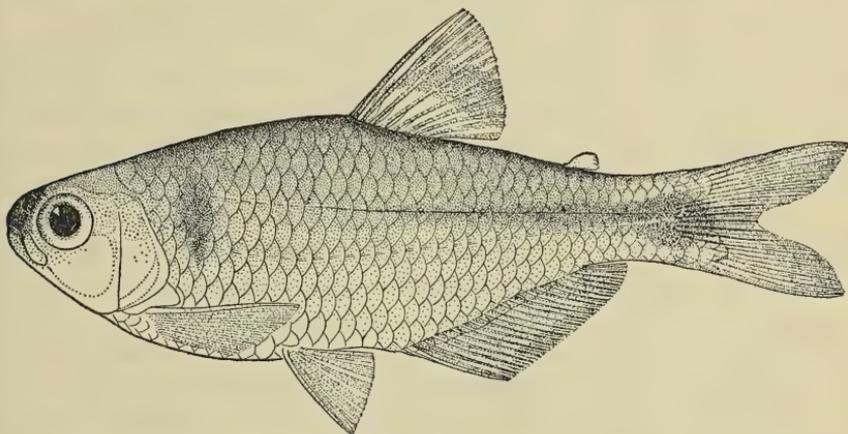


FIGURE 50.—*Bryconamericus beta motatanensis*, new subspecies: Holotype, U.S.N.M. No. 121477, 39.5 mm. in standard length.

This species occurred in the quieter eddies of these rivers.

Description.—Based on the holotype and paratypes listed above. Detailed measurements were made on the holotype and one paratype, and these data, recorded in hundredths of the standard length, are given first for the holotype, then the paratype in parentheses. Standard lengths in mm. 39.5 (46).

Length of head 29.1 (28.3); greatest depth 36.7 (36.1); length of snout 7.09 (6.74); diameter of eye 10.6 (9.78); length of maxillaries 10.6 (10.9); width of interorbital 9.37 (9.35); postorbital length of head 12.9 (13.5); least depth of caudal peduncle 13.2 (12.8); length of caudal peduncle or distance from base of last anal ray to midcaudal

fin base 15.2 (14.1); least preorbital width 1.52 (1.74); length of anal fin base 31.7 (33.7); longest ray of anal fin 17.7 (17.8); longest ray of dorsal 21.5 (22.8); longest ray of pectoral 22.0 (25.0); longest ray of pelvics 16.5 (17.4); longest ray of upper lobe of caudal fin 29.9 (33.3); longest ray of lower lobe of caudal fin 29.9 (33.2); distance from snout to dorsal origin 53.2 (55.2); snout to anal origin 62.2 (62.8); snout to adipose 84.8 (87.0); snout to pectoral insertion 25.8 (27.4); snout to pelvic insertion 45.6 (47.4); snout to anus 55.7 (56.5); distance from dorsal origin to midcaudal fin base 50.4 (50.0).

The following counts were made, respectively: Dorsal rays ii, 8 (ii, 8); anal iii, 22 (iii, 21); pectoral i, 10-i, 10 (i, 11-i, 11); pelvic i, 7-i, 7 (i, 7-i, 7); branched caudal rays 17 (17); number of gill rakers on first gill arch -- (6+10); scales from upper edge of gill opening to midcaudal fin base 37 (37); scales above lateral line 6 (6) and below it to pelvic insertion 4 (4); scales in front of dorsal 12 (14) and along one side of the supraoccipital process 2 (2); number of teeth in outer row of premaxillary 5-5 (5-4) and in the inner row 4-4 (4-4); teeth on maxillary 2-2 (4-4). See table 24 for additional counts.

Body compressed, its depth 2.7 to 2.9, head 3.5 to 3.8 in standard length; snout $1\frac{1}{2}$ in eye and about 4 in head; interorbital about equal to eye and 3 in head; dorsal and ventral profiles about equally arched; predorsal and preventral areas rounded, normally scaled; supraoccipital process short, its length contained $5\frac{1}{2}$ to $6\frac{1}{2}$ times in distance from tip to dorsal origin; snout blunt, the lower jaw a little included so that when mouth is closed the outer row of teeth on the premaxillary show; mouth when closed a little above lower edge of pupil; rear tip of maxillary not quite extending to a vertical through front edge of pupil; ventral margin of second suborbital meeting preopercle; lateral line complete, decurved anteriorly; gill rakers short, pointed, sometimes a few of those on the lower part of the arch branched; teeth all 3- to 5-pointed, the middle denticle longest and strongest; anal origin usually under the second or third, from the last dorsal ray; adipose origin about over the fifth from last anal ray; dorsal origin a little closer to midcaudal fin base than tip of snout; pelvic insertion a trifle closer to base of last anal ray than to tip of snout; the first branched rays of all fins longest; caudal fin forked; the distal margin of anal fin truncate or a trifle concave, and that of dorsal a little rounded; the pectorals reaching a little past pelvic insertions and the pelvic fins reach almost to the anal origin; intestine with one main loop; about 7 or 8 pyloric caeca; scales on basal part of caudal fin extend out a little over one-third the length of that fin; no pouch on caudal fin.

Coloration.—In alcohol there is a black line along midaxis of body from behind the vertically elongate humeral spot to midcaudal fin base, where it ends in a blackish caudal spot, the latter diffusing on middle caudal fin rays and usually not quite reaching the distal margin of the

caudal fin; at base of each caudal fin lobe, above and below the blackish caudal spot, is a pale area, then rest of fin is dusky; sometimes the black line along midaxis of body lies in a blackish lateral streak posteriorly; middorsal edge of back more intensely pigmented than adjacent sides, forming a more or less dark brownish dorsal streak; upper lip blackish, the teeth of outer row of premaxillary showing as pale spots in the dark pigmented area; distal margin of anal fin with a little intensification of the dark pigment.

Remarks.—This new subspecies differs from *B. beta beta* chiefly in the decreased number of anal rays and in the increased number of teeth on the maxillary. These differences, among other average differences, are recorded in table 24. The largest females had nearly mature eggs in the body cavity. These eggs were large in diameter for such a small fish, though not very numerous.

Named *motatanensis* after the stream system in which it was captured.

BRYCONAMERICUS DEUTERODONOIDES EURYODOUS, new subspecies

FIGURE 51

Holotype.—U.S.N.M. No.121437, an example 33.2 mm. in standard length, collected by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

Paratypes.—U.S.N.M. No. 121438, 408 specimens, 18 to 37 mm., taken along with the holotype and bearing same data.

Description.—Based on the holotype and paratypes; detailed measurements were made on the former and one of the latter. These data, recorded in hundredths of the standard length, are given first for the holotype, then the paratype in parentheses, respectively. Standard length in mm. 33.2 (36.2).

Length of head 27.1 (28.5); greatest depth 31.0 (29.5); length of snout 6.93 (6.90); diameter of eye 10.5 (9.67); length of maxillaries or distance from tip of snout to posterior tip of the maxillary 10.8 (11.1); width of interorbital 9.04 (8.84); postorbital length of head 13.9 (13.8); least depth of caudal peduncle 12.0 (11.9); length of caudal peduncle 16.6 (18.0); least width of preorbital 1.54 (1.41); length of base of anal 24.7 (24.8); longest ray of anal fin 16.9 (16.6); longest ray of dorsal fin 22.6 (21.3); longest ray of pectoral fin 22.3 (21.3); longest pelvic fin ray 15.1 (14.6); length of upper caudal lobe 28.6 (27.6); length of lower caudal lobe 28.6 (26.8); distance from snout tip to dorsal origin 52.7 (51.0); snout to anal origin 61.5 (63.2); snout to adipose origin 85.6 (85.0); snout to pectoral insertion 24.7 (25.7); snout to pelvic insertion 48.5 (48.8); snout to anus 60.2 (58.0); distance from dorsal origin to midcaudal fin base 53.0 (53.4).

The following counts were made, respectively: Dorsal rays ii, 8 (ii, 8); anal iii, 16 (iii, 16); pectoral i, 11-i, 11 (i, 11-i, 11); pelvic i, 7-i, 7 (i, 7-i, 7); branched caudal fin rays 17 (17); gill rakers on first gill arch -- (5+9); number of scales from upper edge of gill opening to midcaudal fin base 36 (36); scales above lateral line 5 (5); below lateral line to pelvic insertion 3 (3); predorsal scales to tip of supraoccipital process 11 (12), and 2 (2) scales along side of that process; number of teeth in outer row of premaxillary 4-4 (3-4) and inner row 4-4 (4-4); teeth on maxillary 2-3 (2-2). Additional counts are recorded in table 24.

Body only a little compressed, the greatest depth usually 3.1 to 3.3, head 3.5 to 3.7, in standard length; snout $1\frac{1}{2}$ in eye and about 4.0 to

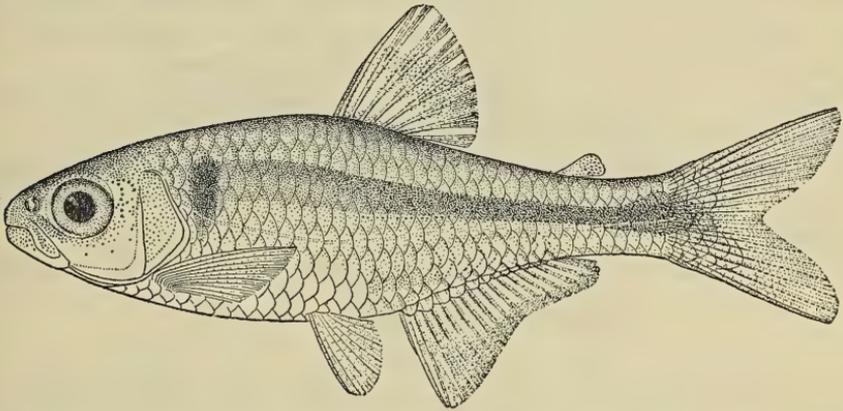


FIGURE 51.—*Bryconamericus deuterodonoides euryodous*, new subspecies: Holotype, U.S.N.M. No. 121437, 33.2 mm. in standard length. (The last dorsal ray has two separate bases and not a single one as shown in the drawing.)

4.2 in head; interorbital about equal to eye and 3.0 to 3.2 in head; dorsal and ventral profiles about equally arched; predorsal and pre-ventral areas rounded and normally scaled; supraoccipital process short, its length about 8 times in distance from tip of this process to dorsal origin; snout blunt, rounded, the lower jaw slightly included, the outer row of premaxillary teeth scarcely showing; mouth when closed on a level a little above lower edge of pupil; rear tip of the maxillary extending to a vertical through front edge of pupil; ventral edge of second suborbital in contact with preopercle below; lateral line complete, a little decurved anteriorly; gill rakers short-pointed; teeth all 3- to 5-pointed, with middle denticle longest and strongest, except those on the maxillary, the teeth on the latter usually have about 6 denticles of nearly equal size; anal origin under rear edge of dorsal fin base; adipose origin over base of last anal ray; dorsal origin almost an equal distance between tip of snout and midcaudal fin base; pelvic insertion much closer to base of last anal ray than snout

tip, or an equal distance between last anal ray and pupil; caudal fin forked; the first branched ray of all fins longest; distal margin of anal fin a little concave, that of dorsal, pelvics and pectorals a little convex; pectorals not quite reaching to pelvic insertion and pelvics not quite to anal origin; intestine with one main loop and about 6 pyloric caeca; basal part of caudal fin scaled, the scales extending out on the lobes a little over one-third the distance to tips of each lobe; no pouch on caudal fin.

Coloration.—In alcohol the lateral band is blackish, more intense posteriorly but not ending in a distinct caudal spot; the black pigment continues a short distance out on the middle caudal fin rays but fades out before reaching their tips; the dark humeral spot is vertically elongate, with pale areas before and behind it; peritoneum black. On some specimens a more or less obscure pale streak occurs above the blackish lateral band; midline of back with a dark streak.

Remarks.—This new subspecies differs from the other subspecies of *deuterodonoides* as indicated in the key.

The largest females have in their body cavities large eggs, nearly mature. These eggs are not numerous, only a few dozen in each specimen.

Named *euryodous* in reference to the broad teeth on the maxillary.

BRYCONAMERICUS MERIDAE (Eigenmann)

FIGURE 52

Knodus meridae EIGENMANN, Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 216, 1911 (Mérida, Venezuela); Mem. Mus. Comp. Zool., vol. 43, pt. 2, p. 116, 1918 (Mérida, Venezuela).—EIGENMANN and MYERS, Mem. Mus. Comp. Zool., vol. 43, pt. 5, p. 526, 1929.

The following specimens were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121469, 206 specimens, 15 to 43 mm., in standard length, collected in the Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121474, 66 examples, 14.5 to 34.5 mm., from the Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121471, 20 examples, 31.5 to 42.5 mm., Río San Pedro at bridge, south of Mene Grande, Motatán system, March 20.

U.S.N.M. No. 121470, 22 specimens, 15 to 41 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17.

U.S.N.M. No. 121476, 2 specimens, 27 and 36 mm., Río Táchira, 7 km. north of San Antonio, Catatumbo system, April 1.

U.S.N.M. No. 121475, 73 examples, 21 to 37 mm., Río Jimelles, 12 km. east of Motatán, tributary Río Motatán, March 24.

U.S.N.M. No. 121473, 51 examples, 17 to 37.5 mm., Río San Juan near bridge, south of Mene Grande, Motatán system, March 17–20.

U.S.N.M. No. 121472, 3 specimens, 26.5 to 37 mm., from Río Gonzáles, tributary to Río Chama, at La Gonzáles, Estado de Mérida, March 29.

The following description is given to supplement that made by Eigenmann in 1911. Detailed measurements were made on two specimens, and these data, recorded in hundredths of the standard length, are given below, respectively. Standard length in mm. 37.3 (42.0).

Length of head 25.5 (28.6); greatest depth of body 31.1 (31.4); length of snout 5.90 (7.62); diameter of eye 8.58 (8.33); length from tip of snout to rear edge of the maxillary 9.65 (11.0); width of interorbital space 8.31 (9.28); postorbital length of head 12.6 (14.8); least depth of caudal peduncle 12.9 (12.1); length of caudal peduncle 18.0 (18.8); least preorbital width 1.34 (1.43); length of anal fin base 23.1 (22.1); length of longest ray of anal fin 14.7 (14.3); longest dorsal ray

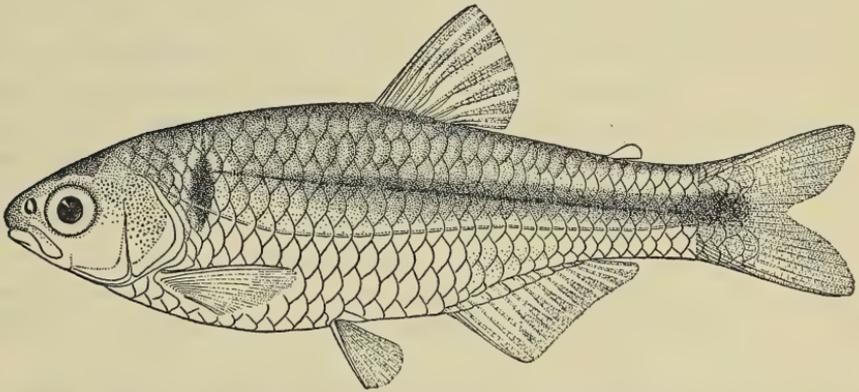


FIGURE 52.—*Bryconamericus meridae* (Eigenmann): U.S.N.M. No. 121469, 38 mm. in standard length.

20.1 (18.3); longest pectoral ray 19.6 (20.2); longest pelvic ray 13.9 (13.8); length of upper caudal fin lobe 22.8 (24.5); of lower caudal fin lobe 24.1 (23.8); distance from snout to dorsal fin origin 55.0 (55.0); snout to anal origin 63.8 (65.4); snout to adipose origin 86.0 (87.4); snout to pectoral insertion 24.1 (25.2); snout to pelvic insertion 47.2 (48.4); snout to anus 57.8 (60.2); distance from dorsal origin to midcaudal fin base 51.0 (51.6).

The following counts were made, respectively: Dorsal rays ii, 8 (ii, 8); anal iii, 13 (iii, 15); pectoral i, 10-i, 10 (i, 9-i, 9); pelvic i, 6-i, 6 (i, 6-i, 6); branched caudal fin rays 17 (17); number of scales from upper edge of gill opening to midcaudal fin base 35 (34); scales above lateral line 5 (5) and below it to pelvic insertion 3 (3); scales in front of dorsal 12 (12) and $1\frac{1}{2}$ ($1\frac{1}{2}$) alongside of supraoccipital process; teeth in outer premaxillary row 4-4 (4-4) and in the inner row 4-4 (4-4); teeth on maxillary 3-3 (4-5).

Body a little compressed, greatest depth usually 3.2 to 3.4, head about 3.6 to 3.8 in standard length; snout $1\frac{1}{3}$ in eye and about 4.1 or

4.2 in head; interorbital convex, equal to eye, and 3.0 to 3.2 in head; dorsal and ventral profiles equal; predorsal and preventral areas rounded, normally scaled; supraoccipital process short, about 8 times from its tip to dorsal origin; snout bluntly rounded; lower jaw a little shorter than upper, outer row of premaxillary teeth usually evident; mouth when closed a trifle above lower level of pupil; rear tip of maxillary reaches to a vertical through front edge of pupil; ventral edge of second suborbital in contact with preopercle below; lateral line complete, anteriorly decurved; gill rakers short, pointed; teeth all 3- to 5-pointed with the middle denticle longest and strongest, except in the maxillary teeth, which have their denticles more or less of equal size; maxillary teeth as broad as high; anal origin under fourth or fifth from last dorsal fin ray; adipose origin a little behind a vertical through posterior end of anal fin base; dorsal origin about equidistant between snout tip and midcaudal fin base; pelvic insertion much closer to base of last anal ray than snout tip, equidistant between base of last anal ray and pupil; caudal fin forked; first rays of all fins longest; distal margin of anal fin truncate or a little concave, that of other fins a little convex; pectorals not reaching pelvic insertions and pelvic fins not reaching anal origin; intestine with one main loop and about 6 pyloric caeca; basal part of caudal fin scaled, the scales extending out as far as one-half the length of the lower caudal fin lobe; no pouch on caudal fin.

Coloration.—In alcohol the blackish lateral band is wide, more intense posteriorly, ending in a more or less blackish caudal spot, but the black spot at base of middle caudal fin rays does not extend to the tips of the middle rays, ending gradually about halfway out; the dark humeral spot is vertically elongate, bordered in front and behind by a distinct pale area; peritoneum black; midline of back with a dark streak.

Genus **HEMIGRAMMUS** Gill

Hemigrammus GILL, Ann. Lyc. Nat. Hist. New York, vol. 6, p. 420, 1858. (Type, *Poecilurichthys unilineatus* Gill.)

Since I have at hand but one species of this genus from Venezuela, I can do no better than copy the information from the various works by Eigenmann for the three species reported from Venezuela.

KEY TO THE SPECIES OF HEMIGRAMMUS AS REPORTED IN THE LITERATURE FROM VENEZUELA (AFTER EIGENMANN, 1918)

- 1a. Dorsal fin with a well-defined black spot; anal with an intense black bar from a little in front of the base of the first ray to the tips of fourth and fifth rays; humeral spot vertically elongate, often faint and sometimes lacking; second suborbital leaving a narrow naked area below; six small, tricuspid and conical teeth on the maxillary; dorsal rays 11; anal 23 to 27; scales 5—32 to 34—3 to 4½-----**Hemigrammus unilineatus** (Gill)

HYPHESSOBRYCON RIDDLEI (Meek)

Hemigrammus riddlei MEEK, in Eigenmann and Ogle, Proc. U. S. Nat. Mus., vol. 33, p. 13, 1907 (Los Castillas, Orinoco system, Venezuela).

HypheSSobrycon riddlei EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 2, p. 189, pl. 26, fig. 3, pl. 79, fig. 6, 14a, 1918 (Los Castillas).

HYPHESSOBRYCON SOVICHTHYS, new species

FIGURE 53

Holotype.—U. S. N. M. No. 121534, a specimen 27 mm. in standard length, collected by Leonard P. Schultz, March 11, 1942, in Ciénaga del Guanavana, about 10 km. north of Sinamaica, Maracaibo Basin, Venezuela.

Paratypes.—All the following paratypes were collected by Leonard P. Schultz (unless otherwise indicated) during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121539, 7 specimens, 18 to 28 mm., taken along with the holotype and bearing same data.

U.S.N.M. No. 121540, 28 specimens, 26 to 29 mm., from Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121536, 14 examples, 22 to 31 mm., from Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121537, an example, 22.5 mm., from the Río Agua Caliente, 2 to 3 km. above Lago Maracaibo, May 1.

U.S.N.M. No. 121535, an example, 27.5 mm., from the Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121542, 7 specimens, 17 to 28.5 mm., from a caño $\frac{3}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121541, 2 specimens, 22 to 26 mm., from Río Socuy, 3 km. above its mouth, February 24.

U.S.N.M. No. 121538, 37 examples, 10 to 30 mm., from a muddy pool tributary to the Río Gé near Rosario, Venezuela, collectors L. P. Schultz, Walter W. Butcher, and B. C. Refshauge, March 8, 1942.

This species was taken most frequently among aquatic plants in quiet waters and in swampy areas.

Description.—Based on the holotype and paratypes listed above, the former and one of the latter being carefully measured, and these measurements, expressed in hundredths of the standard length, are recorded below, first for the holotype, then for the paratype in parentheses. Standard length in mm. 27 (30.2).

Length of head 30.8 (28.8); greatest depth of body 33.6 (34.7); snout 7.78 (6.62); diameter of eye 11.1 (9.93); least width of interorbital space 11.1 (10.3); postorbital length of head 15.6 (14.6); least depth of caudal peduncle 12.6 (11.6); length of caudal peduncle 15.2 (14.3); length from tip of snout to rear of maxillary 10.4 (9.93); length of base of anal fin 25.2 (26.5); length of longest anal ray 18.5 (20.2); longest dorsal fin ray 25.9 (28.8); longest pectoral ray 20.7 (22.2); longest pelvic ray 18.5 (17.9); length of upper caudal fin lobe 31.5 (31.5) and of lower caudal fin lobe 33.4 (33.2); distance from snout

tip to dorsal origin 52.6 (53.0); snout to adipose origin 85.2 (86.8); snout to anal origin 65.2 (66.0); snout to pectoral insertion 27.8 (27.5); snout to pelvic insertion 47.8 (49.6); distance from dorsal origin to midcaudal fin base 53.0 (52.3); dorsal origin to tip of adipose fin 41.0 (47.0).

The following counts were made, respectively: Dorsal rays ii, 9 (ii, 9); anal iii, 17 (iii, 21); pectoral i, 13-i, 13 (i, 12-i, 12); pelvic i, 7-i, 7 (i, 7-i, 7); branched caudal rays 17 (17); number of scale rows from upper edge of gill opening to midcaudal base 31 (31); scales from origin of dorsal fin to last pore of lateral line 5 (5), and from pelvic base to last pore of lateral line 4 (4); scales in front of dorsal fin along middorsal line 10 (10); number of scales along one side of supraoccipital process $2\frac{1}{2}$ (3). All the counts made for this new species are summarized in table 25.

Body compressed, its depth 2.8 or 2.9, head 3.4 or 3.5, in standard

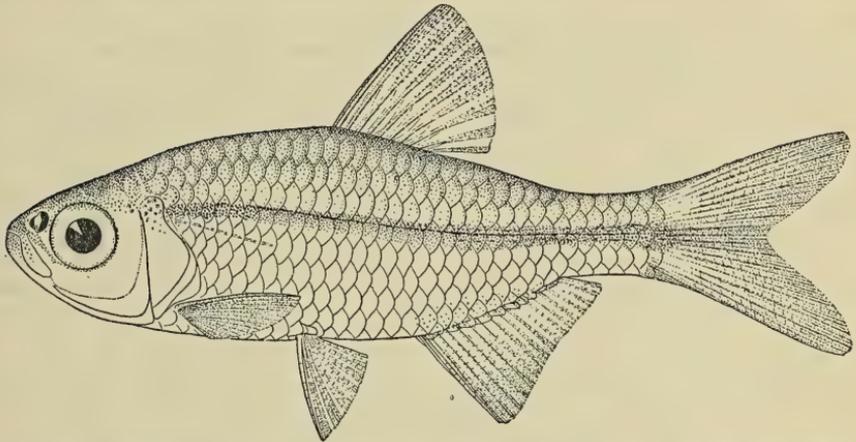


FIGURE 53.—*Hyphessobrycon sovichthys*, new species: Holotype, U.S.N.M. No. 121534
27 mm. in standard length.

length; lower profile of body a little more arched than dorsal profile; snout rounded, short, about 1.6 to 1.8 in eye, 4.5 in head; eye 3 in head and about equal to width of convex interorbital space; second suborbital covering cheek, without naked area behind and below where it joins the preopercle; adipose fin present; lateral line incomplete, of 9 or 10 pores; supraoccipital process short, usually bordered by about $2\frac{1}{2}$ scales on each side; a large fontanel from between eyes to tip of supraoccipital process; mouth terminal oblique, lower jaw equal to upper or extending a trifle in front of snout tip and when closed mouth on level of middle of pupil; dorsal origin about equidistant between snout tip and midcaudal fin base; pelvic insertions in front of a vertical line through dorsal origin; anal origin usually a trifle behind a vertical line through base of last dorsal ray; adipose origin usually over base of second or third from last anal rays; anal origin an

equal distance between midcaudal fin base and pectoral insertion; pectoral fins reach to pelvic insertions and pelvics extend to anal origin; first branched ray of dorsal and of anal fins usually longest, about equal to last simple ray of these fins; first two rays of both paired fins about equal and longer than others; caudal fin deeply forked; distal margin of anal fin concave, that of dorsal a little rounded or truncate; usually adult males have small retrorse hooks on first 5 or 6 branched anal rays; base of caudal fin normally scaled, without small scales or enlarged ones developed out on the caudal fin lobes; gill rakers short, conical about 7+11 to 13; teeth all tricuspid, in two even rows on the premaxillary, the outer with 3 or 4 teeth and the inner always with 5 teeth; maxillary with one tooth; the maxillary bone is rather short, oblique, and barely reaches to a vertical through front of eye; maxillary from anterior angle to its rear tip about $\frac{1}{2}$ eye; gill membranes free from isthmus; predorsal and prepelvic areas evenly and normally scaled; a single row of scales sheathing base of first six branched anal rays.

TABLE 25.—Counts made on *Hyphessobrycon sovichthys*

Number of fin rays											Number of teeth on each side of					
Dorsal	Anal								Pelvic	Pectoral				Premaxillary		Maxillary
	iii, 15		iii, 16		iii, 17		iii, 18			iii, 19		iii, 20		iii, 21		
ii, 9	iii, 15	iii, 16	iii, 17	iii, 18	iii, 19	iii, 20	iii, 21	i, 7	i, 11	i, 12	i, 13	4	3	5	1	
10	1	5	5	10	9	7	2	6	2	2	2	3	9	12	12	

Number of gill rakers on first gill arch			Number of scales					Number of pores in lateral line		
			On sides		Before dorsal	Below lateral line	Above lateral line			
7+11	7+12	7+13	30	31	10	4	5	8	9	10
1	4	1	2	6	4	4	4	1	4	2

Color.—Pale all over, with a wide, prominent black band or streak along midaxis from back of head to tip of middle caudal fin rays; tips of dorsal and of anal rays with several black pigment cells; a row of black pigment cells over each pterygiophore opposite anal fin; back with edges of scale pockets pigmented; snout and tip of lower jaw pigmented; peritoneum silver ventrally but dorsolaterally blackish.

Remarks.—Since Eigenmann (Mem. Mus. Comp. Zool., vol. 43, pt. 2, 1918) and Eigenmann and Myers (*ibid.*, pt. 5, 1929) revised the genus *Hyphessobrycon*, numerous new species have been described in

this genus. Many of these species are very similar to those already described and the genus is in need of a critical revision.

The new species here described and named *Hyphessobrycon sovichthys* is close to *H. poecilioides* in coloration but differs in lacking a humeral spot and in having more numerous anal rays, usually iii, 16 to iii, 21 instead of iii, 14 or iii, 15 in *poecilioides*. These two species are alike in having the black lateral streak continuous from behind head to tips of middle caudal fin rays. *H. sovichthys* has 30 or 31 scales and *H. poecilioides* has about 35 or 36 scales.

Since *H. sovichthys* has but one tooth on the maxillary, it differs from the following species: *H. coelestinus* Myers, in Eigenmann and Myers, 1929, which has 4 to 6 teeth; *H. iheringi* Fowler, 1941, *H. latus* Fowler, 1941, *H. innesi* Myers, 1936, which have 2 or 3 maxillary teeth. *H. sovichthys* in lacking a humeral spot or bar and also a black caudal spot differs from the following species: *H. balbus* Myers, 1927; *H. flammeus* Myers, 1924; *H. iheringi* Fowler, 1941; *H. maxillaris* Fowler, 1932; *H. schauenseei* Fowler, 1926; *H. innesi* Myers, 1936; *H. scholzei* Ahl, 1937; *H. peruvianus* Ladiges, 1938; *H. loretoensis* Ladiges, 1938; *H. maculicauda* Ahl, 1936; and *H. nigrifrons* Ahl, 1936. *H. ornatus* Ahl, 1934, has a large ornate black spot in the dorsal fin lacking in *H. sovichthys*. *H. iheringi* Fowler, 1941, has a black lateral band that ends in a large caudal spot. *H. piabinhas* Fowler, 1941, completely lacks a black lateral band as found in *H. sovichthys*. There are more numerous anal rays 22 to 24 in *H. peruvianus*, *H. loretoensis*, than in *sovichthys* and *H. maculicauda*, and *H. nigrifrons* have 32 or 33 scales instead of fewer.

Other species may be distinguished from *H. sovichthys*, except *H. poecilioides*, by tracing the new species through the key to this genus on pp. 172–176 of Eigenmann's revision (Mem. Mus. Comp. Zool., vol. 43, pt. 2, 1918).

Named *sovichthys* in honor of the Standard Oil Co. of Venezuela, which aided me in the collection of fishes during 1942 while I was in Venezuela.

Genus ASTYANAX Baird and Girard

Astyanax BAIRD and GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 26, 1854. (Type, *Astyanax argentatus* Baird and Girard.)

KEY TO THE SPECIES OF ASTYANAX REPORTED FROM VENEZUELA (See table 26 for counts)

1a. Anal rays 18 or 19 (probably iii, 17 or iii, 18); scales 5–31–4; premaxillary with 2 or 3 teeth on each side in outer series and 5 in inner series; a small tooth at upper limit of maxillary; dorsal origin midway between snout tip and midcaudal fin base; sides silvery, with a darkish wide lateral band but no humeral or caudal spots are discernible; fins all clear.

Astyanax scintillans Myers

1b. Anal rays in greater number than iii, 21.

2a. The number of scales from upper edge of gill opening to midcaudal fin base 47 to 50, with 9 or 10 above lateral line and 7 or 8 below it to base of pelvics; anal rays iii, 26 to iii, 31; humeral spot vertically elongate with pale

areas behind and a smaller pale area in front; a silvery or darkish wide lateral band not continuing on caudal fin or at most only faintly discernible on midcaudal fin rays of young specimens; caudal spot absent, pectorals reaching to or a little past pelvic insertion; each side of premaxillary with 4 teeth in outer row and 5 teeth in inner row, the last outer tooth minute; maxillary with one tooth.

Astyanax abramoides Eigenmann

2b. Scales fewer than 45 from head to midcaudal fin base.

3a. Middorsal line in front of dorsal fin "naked," i. e., scale row along acute edge of predorsal midline lacking anteriorly, margins of normal-sized scales at sides not crossing midline but just in front of dorsal fin may occur a few scales on middorsal line; scales on midline of belly in front of pelvics normal; maxillary with none or (?) only one tooth on each side; dorsal origin equidistant between tip of snout and midcaudal fin base or a little closer to former; humeral spot black, oval shaped and sometimes with a vertically projecting streak of pigment below it, spot otherwise in a pale area extending nearly to midline of back; blackish lateral band forming an elongate triangular black caudal streak continuing to end of midcaudal fin rays; dorsal fin equal to head length; anal rays about iii, 27 to iii, 32; scales about 7 to 9-36 to 42-7 to 9;

Astyanax bimaculatus (Linnaeus)

3b. Middorsal line in front of dorsal fin with some scales along rounded or acute edge as large as those along its sides.

4a. Proximal end of maxillary with 5 or 6 teeth; color pattern consisting of distinct wavy brown streaks parallel with scale rows; humeral black spot distinct; black lateral dark band intense posteriorly on caudal peduncle and continuing to end of midcaudal fin rays; dorsal fin longer than head and pectorals reaching past pelvic insertions; first rays of dorsal elongate on males; anal rays iii, 27 to iii, 29; scales 40 to 42 from upper edge of gill opening to midcaudal fin base, usually 8 above and 6 below lateral line; gill rakers 9 or 10+12 to 14 on first gill arch.-----*Astyanax superbus* Myers

4b. Proximal end of maxillary with only one or two teeth.

5a. Series of predorsal scales along middorsal line about half size of those at each side; midline of belly in front of pelvics with a row of minute or small scales, inner margins of adjoining row of normal-sized scales on each side with truncate margins that do not cross midline of belly; depth about 2 to 2.2 in standard length; 4 teeth in outer row and 5 in inner row on each side of premaxillary; dorsal fin much longer than head; humeral spot black surrounded by a pale area; black caudal spot oval but not continuing to end of midcaudal fin rays; anal rays iii, 29 to iii, 37, usually iii, 33 or iii, 34; scales 8-37 to 39-6 or 7.

Astyanax magdalenae Eigenmann and Henn

5b. Series of scales along middorsal line in front of dorsal fin of same size or nearly so as those in adjoining rows; scales on belly in front of pelvics normal in shape and in normal rows, not as in 5a; depth 2.5 to 3.1 in standard length.

4 teeth in outer row and 5 in inner row on each side of premaxillary; greatest depth in large adults 2 to 2.6 and in young 2.9.

6a. Black on middle caudal fin rays most intense on inner 4 rays of upper caudal fin lobe; practically no black pigment on inner ray of lower caudal lobe; a black band along base of anal continuing posteriorly to form black caudal spot, thence on middle

rays of caudal fin; this blackish anal band almost completely absent on large specimens; humeral spot represented by an oblique streak, with pale area behind it; origin of dorsal an eye diameter closer to snout tip than to midcaudal base or equidistant between them; outer row of premaxillary sometimes with 5 teeth; anal rays iii, 24 to iii, 30; scales 8 or 9–39 to 41–6 or 7; gill rakers usually 11+15 to 17.—*Astyanax metae* Eigenmann

6b. Black elongate caudal spot continued on middle 3 or 4 caudal fin rays, not as in 6a; no blackish anal band extending into caudal spot, anal region instead distinctly pale; a vertically elongate humeral streak present, sometimes intensified a little above lateral line, bordered by pale areas in front and behind.

7a. Scales 7–36 to 38–5 or 6; anal rays iii, 23 to iii, 26; origin of dorsal only a trifle closer to tip of snout than to midcaudal base; depth 2.5 to 2.6 in standard length.

Astyanax fasciatus viejita (Valenciennes)

7b. Scales 8 or 9–40 or 41–6 or 7; anal rays iii, 24 or iii, 25; origin of dorsal about 1 to 1½ eye diameters closer to snout tip than to midcaudal fin base; depth 2.6 to 2.8 in standard length.

Astyanax venezuelae, new species

ASTYANAX SCINTILLANS Myers

Astyanax scintillans MYERS, Ann. Mag. Nat. Hist., ser. 10, vol. 2, p. 88, 1928 (Playa Matepalma, Río Orinoco, Venezuela).

ASTYANAX ABRAMOIDES Eigenmann

Astyanax abramoides EIGENMANN, Ann. Carnegie Mus., vol. 6, No. 1, p. 21, 1909 (Guianas).

Astyanax (Poecilurichthys) abramoides EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, pt. 3, p. 245, pl. 54, fig. 2, 1921 (Venezuela and Guiana).

Tetragonopterus abramis STEINDACHNER, Denkschr. Akad. Wiss. Wien, vol. 41, p. 156, 1879 (Ciudad Bolívar).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 52, 1891 (Orinico).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River, Venezuela).

Astyanax abramis EIGENMANN and ALLEN, Fishes of western South America, p. 222, 1942 (Orinoco Basin).

U.S.N.M. No. 121452, 11 specimens, 52 to 97 mm. in standard length, collected by Leonard P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

ASTYANAX BIMACULATUS (Linnaeus)

Salmo bimaculatus LINNAEUS, Systema naturae, ed. 10, p. 311, 1758 (South America). (Ref. copied.)

Astyanax bimaculatus EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Maracay, Río Bué; mouth Río Tapa; Río Castaño; Isla del Buro, Lake Valencia; Río Tiquirito, Concejo; all Venezuela).—PEARSE, Univ. Wisconsin Stud., No. 1, p. 19, 1920 (Lake Valencia and mouth Río Bué, Venezuela).—FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 83, p. 408, 1931 (Guanoco; Río Yarapa at Yarapa; La Soledad; Pitch Lake at Guanoco, all Venezuela).

Tetragonopterus maculatus PETERS, Monatsb. Akad. Wiss. Berlin, 1877, p. 472 (Calabozo, Venezuela).—PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 5, p. 157, 1899 (Apure River).—REGAN, Proc. Zool. Soc. London, 1906, vol. 1, p. 384, (Venezuela).

U.S.N.M. No. 121451, a specimen 65 mm. in standard length, taken by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

The following collections, made by Dr. William Beebe, were lent to me for study and report:

A specimen, 86 mm., Caripito, Venezuela, 1942.

Four specimens, 41 to 45 mm., Caripito, Venezuela, 1942.

Seven specimens, 26 to 35 mm., Caripito, Venezuela, 1942.

ASTYANAX SUPERBUS Myers

Astyanax superbus MYERS, Stanford Ichth. Bull., vol. 2, No. 4, p. 92, fig. 2, 1942 (brook tributary to Río Tamanaco [tributary to Río Paye, Río Portuguesa drainage], Camoruco, 20 km. northeast of San Carlos, Venezuela).

U.S.N.M. No. 121454, 5 specimens, 70 to 95 mm. in standard length, collected by Leonard P. Schultz, March 31, 1942, in the Río Torbes, 1 km. above Táriba, Venezuela (Orinoco system).

ASTYANAX MAGDALENÆ Eigenmann and Henn

Astyanax magdalenae EIGENMANN and HENN, Ann. Carnegie Mus., vol. 10, p. 89, 1916 (Girardot).

The specimens from the Maracaibo Basin have a few small pre-ventral scales along the midline of the breast and a similar arrangement along the predorsal midline of back; the humeral spot is black, larger than pupil, with a whiff of smokelike pigment off the posterior-dorsal side, this black spot being set off by a large pale area in front and behind; the pale area behind the black spot is margined posteriorly by an intensification of pigment; the dark or silvery lateral band begins behind the wide pale area behind the black humeral spot; the caudal spot is black, always very intense, horizontally oval, but not continuing on middle caudal fin rays; the profile is slightly concave near a vertical line through rear of orbit then convex to dorsal fin; depth 2.0 to 2.2 and head 3.4 to 3.6, in standard length; the distance from dorsal origin to tip of snout is a little shorter than from dorsal origin to midcaudal base. Table 26 gives numerous counts made on this species from the Maracaibo Basin.

It is likely that the population of this form in the Maracaibo Basin is statistically different from that in the Magdalena Basin, but no specimens of the latter are available for study at present, so it seems best to identify my specimens as *A. magdalenae*.

The following collections were made by Leonard P. Schultz in the Maracaibo Basin of Venezuela during 1942:

U.S.N.M. No. 121424, 19 specimens, 40 to 92 mm. in standard length, taken in the Río Socuy, 3 km. above the mouth, February 24.

U.S.N.M. No. 121430, 6 examples, 68 to 94 mm., from the Río Motatán at bridge, 22 km. north of Motatán, March 17.

U.S.N.M. No. 121426, a specimen, 76 mm., taken in the Río Jimelles, 12 km. east of Motatán, March 24.

U.S.N.M. No. 121429, 8 specimens, 57 to 75 mm., from the Río San Juan about 12 km. south of Rosario, February 26.

U.S.N.M. No. 121433, 13 examples, 48 to 100 mm., from the Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121425, 6 examples, 41 to 82 mm., from a caño $\frac{3}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121431, 11 examples, 46 to 106 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121434, a specimen, 81 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121435, 19 specimens, 58 to 86 mm., Río Palmar at bridge, 70 km. southwest of Maracaibo, March 6.

U.S.N.M. No. 121427, 8 specimens, 66 to 81 mm., from Río San Juan near bridge, tributary Río Motatán, March 20.

U.S.N.M. No. 121428, 27 examples, 60 to 85 mm., Río Apón about 35 km. south of Rosario, February 26.

U.S.N.M. No. 121432, 49 examples, 43 to 85 mm., Lago Tulé about 75 km. west of Maracaibo, 5 km. from Río Socuy, March 1.

U.S.N.M. No. 121436, 82 specimens, 48 to 112 mm., Río Negro below mouth of Río Yasa, March 2.

ASTYANAX METAE Eigenmann

Astyanax metae EIGENMANN, in Eigenmann, Henn, and Wilson, Indiana Univ. Stud., No. 19, p. 11, 1914 (Río Negro, Villavicencio, Colombia); Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Río Castaño; Río Bué; Concejo, Río Tiquirito and Río Tuy; mouth Río Tapa Tapa, Venezuela).—PEARSE, Univ. Wisconsin Stud., No. 1, pp. 19, 42, 1920 (Lake Valencia, Río Castaño, Venezuela).—EIGENMANN, Mem. Carnegie Mus., vol. 9, No. 1, p. 235, 1922 (Lake Valencia, Río Tuy Basin, Venezuela).

U.S.N.M. No. 121453, 9 specimens, 54 to 110 mm. in standard length, collected by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries, between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

One specimen, 83.5 mm., Caripito, Venezuela, William Beebe, 1942, was lent to me for study and report.

ASTYANAX FASCIATUS VIEJITA (Valenciennes)

Tetragonopterus viejita VALENCIENNES, in Cuvier and Valenciennes, Histoire naturelle des poissons, vol. 22, p. 154, 1849 (Lake Maracaibo).—EIGENMANN and EIGENMANN, Proc. U. S. Nat. Mus., vol. 14, p. 53, 1891 (Lago Maracaibo).—ULREY, Ann. New York Acad. Sci., vol. 8, p. 288, 1895 (Lake Maracaibo). *Astyanax fasciatus* MYERS, Copeia, 1932, No. 3, p. 137 (Cúcuta Lake, Maracaibo drainage).

The following collections were made by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121448, 166 specimens, 30 to 80 mm. in standard length, Río San Pedro at bridge south of Mene Grande, Motatán system, March 20.

U.S.N.M. No. 121439, 8 examples, 30 to 40 mm., caño $\frac{3}{4}$ km. west of Sinamaica, March 11.

U.S.N.M. No. 121447, 12 examples, 37 to 63 mm., Lago Tulé about 75 km. west of Maracaibo, tributary to Río Socuy, March 1.

U.S.N.M. No. 121442, 4 specimens, 42 to 53.5 mm., from Río San Juan, 12 km. south of Rosario, Estado de Zulia, February 26.

U.S.N.M. No. 121446, 3 specimens, 32.5 to 73.5 mm., Río Socuy, 3 km. above its mouth, February 24.

U.S.N.M. No. 121444, 2 examples, both 48 mm., Río Negro below mouth of Río Yasa, March 2.

U.S.N.M. No. 121445, a specimen, 62 mm., Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121440, 3 examples, 27.5 to 41 mm., Río Machango at bridge south of Lagunillas, March 16.

U.S.N.M. No. 121441, a specimen, 36 mm., Río Táchira, 7 km. north of San Antonio (Catatumbo system), April 1.

U.S.N.M. No. 121443, 6 examples, 26 to 69 mm., Río Motatán at bridge 22 miles north of Motatán, March 17.

The following specimen was collected by Nicéforo María:

U.S.N.M. No. 101600, 97 mm., Río Pamplonita near Cúcuta, Colombia.

Seven specimens, F. M. N. H. Nos. 42002-42008, Río Cogollo, Sierra Perijá, Maracaibo Basin, Osgood and Conover, March, 1920, were lent to me for study and report by the Chicago Natural History Museum.

When alive, the following color notes were recorded for this species: Anal fin dull red anteriorly, yellowish posteriorly; the outer half of first anal ray white, middle rays of caudal fin yellowish, lower rays dull reddish; pectorals yellowish; pelvics pinkish; upper part of eye yellow; head with yellow reflections.

ASTYANAX VENEZUELAE, new species

FIGURE 54

Holotype.—U.S.N.M. No. 121449, a specimen 86.5 mm. in standard length, collected by Leonard P. Schultz, March 31, 1942, in the Río Torbes, 1 km. above Táriba, Orinoco system.

Paratypes.—U.S.N.M. No. 121450, 5 specimens, 76 to 90 mm., taken along with the holotype and bearing same data.

Description.—Detailed measurements were made on the holotype and one paratype, and these data are recorded in hundredths of the standard length, first for the holotype, then for the paratype in parentheses, respectively. Standard lengths in mm. 86.5 and 75.

Length of head 26.8 (27.1); greatest depth of body 36.3 (36.8); length of snout 7.52 (7.20); diameter of eye 7.52 (8.67); length of maxillaries 9.83 (10.0); interorbital space 9.14 (9.20); postorbital length of head 13.5 (12.7); least depth of caudal peduncle 11.6 (12.3); length of caudal peduncle 15.7 (14.9); least preorbital width 1.85 (2.0); length of anal fin base 26.6 (25.6); length of longest anal ray

14.5 (15.5); longest dorsal ray 23.5 (25.6); longest pectoral ray 20.5 (21.5); longest pelvic ray 15.1 (16.1); longest ray of upper caudal lobe 27.8 (—); longest ray of lower caudal lobe 28.9 (28.4); distance from tip of snout to dorsal origin 49.0 (49.0); snout to anal origin 65.4 (65.4); snout to adipose origin 85.1 (86.4); snout to pectoral insertion 24.3 (26.2); snout to pelvic insertion 46.2 (48.0); snout to anus 60.7 (61.4); distance from dorsal origin to midcaudal base 56.2 (59.3).

The following counts were made, respectively: Dorsal rays ii, 9 (ii, 9); anal iii, 24 (iii, 25); pectoral i, 13-i, 13 (i, 13-i, 13); pelvic i, 7-i, 7 (i, 7-i, 7); branched rays of caudal fin 17 (17); gill rakers on first

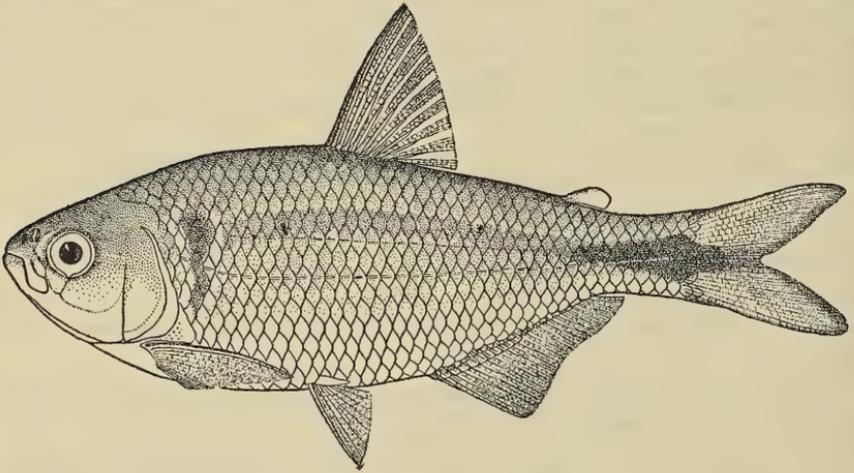


FIGURE 54.—*Astyanax venezuelae*, new species: Holotype, U.S.N.M. No. 121449, 86.5 mm. in standard length.

gill arch — (11+1+14); scales from upper edge of gill opening to midcaudal fin base 40 (40); scales from dorsal origin to lateral line 8 (9), and from lateral line to pelvic base 6 (7); scales in front of dorsal to tip of supraoccipital process 12 (12), and along side of that bony process 4 (4); zigzag scale rows around caudal peduncle 16 (18); number of teeth in outer row of the premaxillary — (5-5; 4-5; 5-5; 5-5; 5-5), and in inner row of premaxillary always 5 on each side; proximal end of maxillary with one tooth; all teeth 3- to 5-pointed, middle cusp longest.

Body compressed, its depth about 2.6 to 2.8, head 2.8 to 2.9, snout to dorsal 2.1 to 2.2, all in the standard length; origin of dorsal closer to tip of snout than to midcaudal fin base by more than diameter of eye; second suborbital not quite meeting the preopercle so that a narrow naked space occurs around it; mouth evenly rounded, not pointed, the snout about equal to the eye; preorbital with a shallow depression to receive the posterior part of the maxillary; interorbital space convex; mouth when closed on level of lower edge of pupil; lateral line a little decurved anteriorly, complete, the scale rows

parallel with lateral line but not quite so with anal base; anal base sheathed with two rows of scales anteriorly, one posteriorly; belly normally scaled, rounded; predorsal area more or less rounded, hardly bluntly keeled, normally scaled, the middle row of scales similar to those along the adjacent upper sides; length of predorsal process about 3 times in the distance from its tip to dorsal origin; distal margins of dorsal and of anal fins a little concave; first branched rays of dorsal, anal, pectoral and of pelvics longest, the first dorsal rays of males longer than for females; caudal fin forked; origin of anal fin a little behind base of last dorsal ray; origin of adipose fin over the base of the eighteenth to twentieth anal ray; pectorals scarcely or not reaching pelvic insertion and pelvics reaching to anus but not quite to anal origin; length of caudal peduncle a little longer than its least depth; least depth of caudal peduncle about 2.2 to 2.3 in the head.

Color.—Silvery on lower sides, upper sides and back brownish; the wide dark lateral band is faint but the elongate caudal "spot" is black and continues to end of middle (3 or 4) caudal fin rays; the outer tips of anal rays are black pigmented; inside of operculum with dark pigment; peritoneum blackish; humeral spot vertically elongate extending from above lateral line where the pigmentation is greatly intensified to over base of pectoral fin, an area in front of this humeral streak pale and another wider one behind it.

Remarks.—This new species resembles *A. fasciatus* in coloration, but the dorsal is farther forward, by over an eye diameter; the dorsal position is similar to that in *A. metae* and *A. maximus* but differs from them in having a well-defined humeral spot as in *fasciatus*. The five teeth in the outer row on each side of the premaxillary separate it from *A. regani* and *A. albeolus*.

This species could be lined up with *fasciatus* if the dorsal were in the middle of the length of the body without caudal fin.

This species lived among the rocks and rubble in swiftly flowing water. It is named *venezuelae* after the country in which it was collected.

Genus HEMIBRYCON Günther

Hemibrycon GÜNTHER, Catalogue of the fishes in the British Museum, vol. 5, pp. 318, 330, 1864. (Type, *Tetragonopterus polyodon* Günther.)

The species of *Hemibrycon* from Venezuela are all closely related, and I identify them as subspecies of *dentatus* on the basis of the much-decurved lateral line. This character needs further consideration and comparison among the various species, as it appears to become more decurved with age as the body gets deeper and deeper. Certain species of *Hemibrycon* have been recognized almost wholly on the basis of depth in length, but I find in the large series of *Hemibrycon* from the Maracaibo Basin a profound difference in depth with age, the adult

TABLE 27.—Counts made on species of Hemibrycon

Species	Number of fin rays																Number of teeth														
	Dorsal				Anal				Pelvic								Pectoral					Number of teeth									
	ii, 8	ii, 9	iii, 23	iii, 24	iii, 25	iii, 26	iii, 27	iii, 28	iii, 29	iii, 30	iii, 31	iii, 32	iii, 33	i, 6	i, 7	i, 8	i, 10	i, 11	i, 12	i, 13	Number of teeth										
<i>dentatus dentatus</i>	x								x	x	x	x									Number of teeth										
<i>dentatus metae</i>	23	1				8	13	16	3	1				2	28	4					Number of teeth										
<i>dentatus jabonero</i>	24		1	8	17	12	6								15		1	13	10		Number of teeth										
Species	Number of scales																Number of teeth														
	Number of scales																Number of teeth														
	Number of scales																Number of teeth														
	41	42	43	44	45	46	47	48	7	8	5	6	6	7	8	9	10	11	12	13	3	4	5	6	4	Number of teeth					
					x	x	x	x	x	x	x	x	x														Number of teeth				
<i>dentatus dentatus</i>																											Number of teeth				
<i>dentatus metae</i>	4	8	3						2	2	1	3	1	2	1	1					1	2	1	7	1		Number of teeth				
<i>dentatus jabonero</i>	5	7	2	1					7		6	1		6	4		3	3	2	2			4	5	1		Number of teeth				

females with mature eggs being deepest, their depth about 2.6 to 3 in the standard length, whereas the immature are slenderer, often 3.3.

Another character very variable with age is the number of teeth on the maxillary. These teeth number about 2 or 3 in the young and increase in number with age until about 11 are formed in the largest specimens.

Hemibrycon in Venezuela occurs most frequently in the mountain streams among rubble and in rock pools and less frequently at lower elevations.

KEY TO THE SPECIES OF HEMIBRYCON FROM VENEZUELA

- 1a. Number of scale rows crossing the lateral line 45 to 48; anal rays iii, 29 to iii, 33 (see table 27)-----**Hemibrycon dentatus dentatus** Eigenmann ³²
 1b. Number of scale rows crossing lateral line 42 to 44, usually 43; anal rays iii, 26 to iii, 30, usually iii, 26 to iii, 28-----**Hemibrycon dentatus metae** Myers
 1c. Number of scale rows 41 to 44, usually 42; anal rays iii, 23 to iii, 27, usually iii, 24 to iii, 26-----**Hemibrycon dentatus jabonero**, new subspecies

HEMIBRYCON DENTATUS METAE Myers

Hemibrycon metae MYERS, Proc. Biol. Soc. Washington, vol. 43, p. 68, 1930 (Guaicaramo, Río Guavio, Colombia).

? *Hemibrycon taeniurus* (not Gill) EIGENMANN, Indiana Univ. Stud., vol. 7, No. 44, p. 11, 1920 (Concejo, Río Tuy and Río Tiquirito, Venezuela).—EIGENMANN, Mem. Mus. Comp. Zool., vol. 43, No. 4, p. 412 [?] pl. 39, fig. 2, 1927 (Concejo, Río Tuy and Río Tiquirito, Venezuela).

U.S.N.M. No. 121467, 117 specimens, 40 to 77 mm. in standard length, collected by Leonard P. Schultz, March 31, 1942, in the Río Torbes, 1 km. above Táriba, Venezuela (Orinoco system).

U.S.N.M. No. 121466, 18 examples, 35 to 51 mm., taken by L. P. Schultz, G. Zuloaga, Roger Sherman, and William Phelps, Jr., May 12, 1942, in the Río Guárico and tributaries between San Sebastián and San Casimiro, Estado de Aragua, Venezuela.

HEMIBRYCON DENTATUS JABONERO, new subspecies

FIGURE 55

Holotype.—U.S.N.M. No. 121455, a female, 96 mm. in standard length, collected by Leonard P. Schultz, April 3, 1942, in the Río Chama at Estanques, Estado de Mérida, Venezuela.

Paratypes.—All the paratypes were collected by Leonard P. Schultz during 1942 in the Maracaibo Basin of Venezuela:

U.S.N.M. No. 121460, 52 examples, 39 to 96 mm. in standard length, collected along with the holotype and bearing same data.

U.S.N.M. No. 121458, 2 examples, 47 and 57 mm., Río Chama, 10 km. below Lagunillas, Estado de Mérida, March 30.

U.S.N.M. No. 121456, 601 specimens, 27 to 115 mm., Río Gonzáles, tributary to Río Chama, at La Gonzáles, Estado de Mérida, March 29.

³² Not reported from Venezuela.

U.S.N.M. No. 121465, 25 examples, 26 to 66 mm., Río Motatán, 4 km. above Motatán, March 25.

U.S.N.M. No. 121463, 9 specimens, 31.5 to 60 mm., Río San Pedro at bridge, Motatán system, March 20.

U.S.N.M. No. 121464, 2 specimens, 24 and 59 mm., Río Motatán, 8 km. below Motatán, March 24.

U.S.N.M. No. 121457, 11 examples, 27 to 51.5 mm., Río Jimelles, 12 km. east of Motatán, Motatán system, March 24.

U.S.N.M. No. 121461, a specimen, 53 mm., Río Táchira, 7 km. north of San Antonio, Catatumbo system, April 1.

U.S.N.M. No. 121459, 4 examples, 24 to 37 mm., Río Palmar near Totuma, about 100 km. southwest of Maracaibo, February 21.

U.S.N.M. No. 121462, 3 examples, 23 to 25 mm., Río Motatán at bridge, 22 km. north of Motatán, March 17.

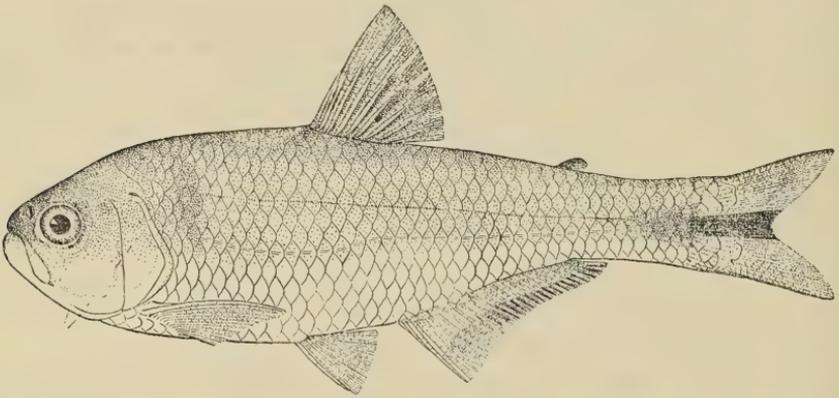


FIGURE 55.—*Hemibrycon dentatus jabonero*, new subspecies: Holotype, U.S.N.M. No 121455, 96 mm. in standard length

With uncertainty I am referring to this species a specimen from Río San Pedro at bridge, south of Mene Grande, collected March 20, 1942 (U.S.N.M. No. 121563), 59 mm. in standard length, not as a paratype, because it has the second suborbital not in contact with preopercle. The fin rays are anal iii,24; dorsal ii,8; pelvic i,7-i,7; pectoral i,12-i,12; scales 41, 7 above and 5 below lateral line; teeth 5-5 in outer row, 4-4 in inner row on premaxillaries; maxillary with about 5 teeth.

Description.—Based on the holotype and paratypes listed above. Detailed measurements were made on the holotype and one paratype, and these data are recorded below in hundredths of the standard length, respectively, for the holotype and the paratype in parentheses. Standard length in mm. 96 (86).

Length of head 26.0 (26.7); greatest depth 32.8 (34.9); length of snout 7.29 (6.04); diameter of eye 7.08 (8.14); length of maxillaries from tip of snout to rear tip of maxillary 11.7 (11.2); interorbital width 9.38 (8.84); postorbital length of head 14.8 (14.5); least depth

of caudal peduncle 12.1 (11.0); length of caudal peduncle 16.7 (15.7); least width of preorbital 1.56 (1.74); length of anal fin base 29.7 (31.0); length of longest anal fin ray 13.0 (14.0); longest dorsal ray 20.3 (21.5); longest pectoral ray 20.3 (22.1); longest pelvic ray 12.7 (—); length of upper caudal fin lobe 26.0 (25.1); and of lower lobe of caudal fin 24.5 (24.9); distance from snout tip to dorsal origin 49.8 (53.5); snout to anal origin 59.9 (62.8); snout to adipose origin 83.5 (85.6); snout to pectoral insertion 25.0 (25.6); snout to pelvic insertion 45.3 (47.9); snout to anus 55.5 (58.1); dorsal origin to midcaudal fin base 55.6 (52.3).

The following counts were made, respectively: Dorsal rays ii, 8 (ii, 8); anal iii, 25 (iii, 26); pectoral i, 11-i, 11 (i, 12-i, 12); pelvic i, 7-i, 7 (—); gill rakers — (8+13); scales 41 (41); scales above lateral line 7 (7) and below it to pelvic base 5 (5); scales before dorsal — (16); teeth in outer row of premaxillary 5—4 (5—4) and in inner row 4—4 (4—4); teeth on maxillary 11—10 (11—10); scales along one side of occipital process 2 (2).

Body and head compressed; the lower jaw prominent, equal to upper; mouth when closed a little above lower edge of pupil; lower edge of second suborbital in contact with preopercle; snout bluntly rounded, not so long as diameter of eye, about 1.7 to 1.9 in latter and 4.0 to 4.2 in head; eye 3.1 to 4.1 in head; interorbital convex, a little wider than eye, about 2.9 to 3.3 in head; preventral and predorsal area rounded, normally scaled; maxillary reaches to under front of pupil but not quite to suture between first and second suborbitals; lateral line complete, decurved anteriorly; anal rays of males with numerous spinules directed basally; base of anal sheathed with a row of scales anteriorly; base of caudal fin scaled a little over $\frac{1}{3}$ out on middle of lobes; origin of dorsal an equal distance or a trifle closer to tip of snout than to midcaudal fin base; adipose fin origin over base of about next to last fourth or fifth anal fin ray; anal origin under about base of last dorsal fin ray; pelvic insertion a little closer to snout tip than to rear of anal fin base; distal margin of anal fin a little concave, that of dorsal and pelvics truncate, and of pectoral concave, the latter fin pointed; pectorals usually not quite reaching to pelvic insertions, and pelvics reaching past anus but not quite to anal origin; the last simple ray and first branched ray of dorsal and anal fins longest, and first two rays of paired fins longest; usually the dorsal profile is a little less curved than the ventral profile; the maxillary teeth are very variable in number, about 3 in the young and 11 in the largest adults.

Color.—The following color notes were recorded soon after this species was removed from the water: Iris yellowish; margin of operculum yellowish or orange; sides of back yellowish, becoming bright yellow-orange on caudal fin and extending as a band to tip of rays; middle caudal rays blackish, below which is another orange band

similar to the dorsal one; outer third of caudal lobes dull red; adipose fin dull red; base of dorsal orange; pelvics yellowish; humeral spot an elongate blackish streak, fainter in adults; the lateral band is silvery on adults but brownish on the young; just inside of anal margin is a narrow brownish streak and another one along anal fin base.

Remarks.—This new subspecies may be recognized from the other subspecies of *dentatus* by its fewer average number of anal rays and fewer scales, as indicated in the table and in the key.

Named *jabonero* after the common name by which this fish was called in the upper Río Chama Valley.

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NEW GENERA AND SPECIES OF ORIENTAL AND AUSTRALIAN PLANT BUGS IN THE UNITED STATES NATIONAL MUSEUM

By TSAI-YU HSIAO

DURING part of my stay in the United States, made possible through the interest of the Department of State, an opportunity came for me to make a study of Oriental Miridae (Hemiptera-Heteroptera). Certain species of bugs of this family, e. g., the "tea bugs" (*Helopeltis* spp.), are of considerable economic importance in the Oriental region.

The present paper contains descriptions of 7 genera, 24 species, and 1 variety of Miridae. It is based mainly on material from the C. F. Baker collection of Hemiptera deposited in the United States National Museum. All the holotypes and allotypes are deposited in the Museum, and part of the paratypes are in my collection. All the figures were drawn to the same scale from the holotypes. I am grateful for the aid given by Mrs. Sara Hoke DeBord in making the illustrations.

Subfamily CAPSINAE

Genus HYALOPEPLOIDES Poppius

HYALOPEPLOIDES NIGRIFRONS, new species

Male.—Body elongate, length 9.7 mm., width 2.45 mm., somewhat dull, clothed beneath with very short, simple, golden hairs; ochraceous, with black markings.

Head subvertical, shining, width across eyes 1.7 mm., length seen from above 0.85 mm., height seen from side 0.95 mm.; above black, two transverse spots on vertex, a triangular spot behind each eye, a spot

at base of antennae, apical third of clypeus, lorum, and whole underside of head ochraceous. Vertex longitudinally sulcate, immarginate, width 0.65 mm.; frons a little convex anteriorly in the middle; clypeus vertical, prominent, discrete from frons. Eyes large, finely granulate, prominent. Rostrum ochraceous, apex fuscous, length 3.3 mm., nearly reaching apex of intermediate coxae, first segment distinctly surpassing apex of pronotum. Antennae inserted at below middle of anterior margin of eyes, black, densely clothed with minute hairs; length of segments I: II: III: IV = 1 mm.: 4.4 mm.: 1.95 mm.: 1.3 mm., first segment the thickest, second slenderer than first, third slenderer than second; fourth, the slenderest.

Pronotum inclined anteriorly, strongly regularly transversely rugose; apical collar (except a large spot on each side), calli, a longitudinal median line tapering anteriorly, and basal margin very broadly, black; length 1.45 mm., width at base 2.35 mm., at apex 1.1 mm.; basal margin slightly broadly sinuate at middle, lateral margins nearly straight; apical collar flat, a little longer than the thickness of first antennal segment; calli flat, not confluent, deeply impressed behind; humeral angles rounded, slightly elevated. Scutellum transversely rugose as pronotum, depressed in the middle, longitudinally sulcate; black, lateral margins except apical fourth ochraceous; length 1.45 mm., width 1.25 mm.

Hemelytra transparent, corium and clavus without veins, embolium and cuneus opaque, margins of embolium, corium, clavus, and cuneus and veins of membrane dark; embolar margins nearly straight, length 4.5 mm.; cuneus reddish, bearing fine black hairs, length 1.1 mm., width 0.6 mm.; membrane transparent as corium, slightly tinged with ochraceous, inner apex of major areole rounded.

Posterior lobe of ostiolar peritreme, posterior legs, side of ventral segments, apex of abdomen, and all third tarsal segments dark. Posterior femora incrassate at apical half, length 3.5 mm., posterior tibiae dark spinulose, length 4.65 mm. Both genital claspers long slender, and strongly curvate.

Differs from *H. cyanescens* Poppius by its larger size, different coloration, and longer second antennal segment. The calli flat, not confluent, and apical half of posterior femora incrassate.

Holotype.—U.S.N.M. No. 56715, male, Mount Maquiling, Luzón, P. I. (Baker).

EUHYALOPEPLUS, new genus

Body elongate, above glabrous, beneath clothed with short, fine, simple hairs.

Head vertical, seen from above three times as wide as long (excluding collum), seen from side more than twice as high (to apex of clypeus).

eus) as long; vertex flat, immarginate, wider than the width of eye seen from above; frons vertical, clypeus moderately prominent, confluent with frons, bucculae short and high. Eyes large, subpedunculate, prominent, seen from above rounded, seen from side vertically ovate. Antennae inserted below middle of inner margins of eyes, slender, first segment thickened at base, shorter than width of head, second more than twice as long as first. Rostrum reaching upon intermediate coxae.

Pronotum subhorizontal, posterior lobe convex, coarsely regularly transversely rugose, a little wider than long, about twice as wide at base as at apex; posterior margin slightly sinuate before scutellum, lateral margins nearly straight, humeral angles rounded, distinctly thickened; apical collar flat, as long as first antennal segment thick at base; calli prominent, smooth, deeply impressed behind, confluent anteriorly. Scutellum triangular, convex, longer than wide, lateral margins finely corrugated.

Hemelytra complete, hyaline except clavus; corium and clavus without veins, embolar margins nearly parallel, cuneus horizontal, much longer than wide, membrane bicellulate.

Propleura punctate, ostiolar peritreme conspicuous. Legs linear, moderately long, tibiae not spinulose, arolia large, free, divergent at apex.

Close to *Hyalopeploides* Poppius, but clypeus confluent with frons, calli not confluent, apical collar narrow and smooth, tibiae not spinulose, and first antennal segment enlarged at base. Differs from *Hyalopeplus* Stål by the vertical head and different structure of first antennal segment.

Genotype.—*Euhyalopeplus pulchellus*, new species.

EUHYALOPEPLUS PULCHELLUS, new species

FIGURE 57, *e*

Female.—Body, length 5.9 mm., width 1.5 mm., ochraceous.

Head, width across eyes 1.18 mm., length seen from above (excluding collum) 0.35 mm., height seen from side (to apex of clypeus) 0.85 mm., width of vertex 0.45 mm. Rostrum, length 1.85 mm., surpassing middle of intermediate coxae. Antennal segment I, length 1.1 mm., II, length 2.35 mm., dark brown (third and fourth mutilated).

Pronotum, length 1.25 mm., width at base 1.45 mm., at apex 0.7 mm.; humeral angles, lateral margin, and a large spot in middle of posterior lobe faintly dark brownish. Scutellum, length 0.75 mm., width 0.65 mm.; middle at base, apex and a faint longitudinal line brownish.

Hemelytra considerably surpassing apex of abdomen, clavus, margins of embolium, corium and cuneus, and veins of membrane dark brownish; inner apex of major areole rounded.

Femora with faint brown spots, third tarsal segment dark brown; length of posterior femora 2.2 mm., length of posterior tibiae 2.7 mm.

Holotype.—U.S.N.M. No. 56716, female, Island of Peñang, Straits of Malacca (Baker).

MACRALONIDEA, new genus

Body elongate, shining, clothed sparingly with very short hairs; pronotum very coarsely and deeply punctate, hemelytra hyaline.

Head inclined, more or less rounded, seen from above wider than long, seen from side about as long as high; vertex very slightly convex, shortly longitudinally sulcate, immarginate, about as wide as an eye seen from above; frons slightly convex, clypeus moderately prominent, with apical two-thirds nearly perpendicular, jugum flat, bucculae short, lower margin rounded. Eyes of medium size, moderately prominent, not touching anterior margin of pronotum, seen from side obliquely ovate, anterior margin moderately sinuate. Rostrum reaching base of intermediate coxae, first segment thick. Antennae linear, inserted near the middle of anterior margin of eyes, longer than body, first segment about as long as pronotum, second about twice as long as first and a little longer than third and fourth taken together.

Pronotum coarsely and deeply punctate, a little wider than long, more than twice as wide at base as at apex, posterior lobe strongly convex, posterior margin straight before scutellum, humeral angles rounded and thickened, lateral margins vertically rounded, sinuate at apical third; apical collar not separated at middle, longer than thickness of first antennal segment, punctate at the disk of pronotum; calli small, smooth, slightly elevated. Mesoscutum covered, scutellum smooth, strongly elevated posteriorly before the narrow apex, punctate along the lateral margins.

Hemelytra hyaline, horizontal, embolar margin slightly sinuate at middle, a series of punctures extending beyond the middle, corium and clavus without veins, a series of punctures along claval suture; cuneus longer than wide, membrane bicellulate. Xyphus concave, anterior part punctate, lateroposterior margins reflected. Propleura punctate. Ostiolar peritreme large. Legs moderately long, posterior femora thickened before apex, tibiae minutely and sparingly spinulose. Arolia large, divergent at apex.

Related to *Macralonius* Stål and *Malalasta* Distant but differing from both by different type of punctures on pronotum, longer pronotum, different apical collar, and smooth and strongly elevated scutellum.

Genotype.—*Macralonidea cyanescens*, new species.

MACRALONIDEA CYANESCENS, new species

FIGURE 57, d

Male.—Body, length 5.9 mm., width 1.6 mm., clothed beneath with flavous simple hairs; flavous with dark brown markings.

Head, width across eyes 0.9 mm., length seen from above 0.57 mm., height seen from side 0.55 mm., width of vertex 0.3 mm. Rostrum reaching base of intermediate coxae, length 1.8 mm., first segment reaching anterior margin of pronotum. Length of antennal segments I: II: III: IV = 1.25 mm.: 2.6 mm.: 1.7 mm.: 0.75 mm.; second, third, and fourth segments dark brown.

Pronotum, length 1.25 mm., width at base 1.45 mm., at apex 0.62 mm.; lateral part of apical collar, calli, humeral angles, and two elongate spots between humeral angles dark brown. Scutellum strongly elevated, slightly depressed in the middle, length 0.55 mm., width 0.55 mm.

Hemelytra hyaline, considerably surpassing apex of abdomen, length of embolar margin 2.77 mm., slightly convex beyond the middle; cuneus, length 0.55 mm., width 0.4 mm.; margins and apex of clavus, extreme margin of embolium, apical margin of corium, cuneus, and veins of membrane dark brown; membrane transparent, inner apex of major areole broadly rounded.

Metapleura, apex of abdomen, apex of anterior tibiae, apical fourth of posterior femora, and all third tarsal segments dark brown. Posterior femora subapically incrassate, length 2.5 mm., length of posterior tibiae 3.05 mm. Left genital clasper simple, broad at base, gradually tapering at apex, apical third strongly curvate fitting closely to the curvature of posterior margin of ninth ventral segment; right one with a broad hook at apex.

Female.—Similar to the male, propleura with more dark brown, second antennal segment thicker. Body, length 6.45 mm., width 1.75 mm. Length of antennal segments I: II: III: IV = 1.3 mm.: 2.7 mm.: 1.65 mm.: 0.7 mm.

Types.—U.S.N.M. No. 56717, holotype, male; allotype, female; paratypes, 2 males and 1 female, all from Sandakan, Borneo (Baker).

Genus RAMBEA Poppius

RAMBEA ANNULICORNIS, new species

Female.—Body elongate, length 6.35 mm., width 1.85 mm., clothed sparingly with long simple yellowish hairs, stramineous.

Head inclined, width across eyes 1.05 mm., length seen from above 0.6 mm., height seen from side 0.6 mm.; vertex longitudinally sulcate, slightly convex, width 0.5 mm.; frons moderately convex, clypeus very prominent, deeply discrete with frons, nearly vertical with the anterior

three-fourths; lorum and lateral margin of postocular part of head fuscous; bucculae short, gula long. Eyes granulate, far removed from apex of pronotum, seen from above small and rounded, seen from side obliquely ovate, postocular part of head gradually but strongly narrowed. Rostrum moderately thick, length 2.75 mm., distinctly surpassing apex of posterior coxae. Antennae linear, slender, inserted below middle of anterior margins of eyes, dark brown, first segment stramineous, a broad ring beyond basal fourth of second segment, basal fourth of third and basal fifth of fourth whitish; length of segments I:II:III:IV=1.3 mm.:2.85 mm.:2.1 mm.:1.2 mm.

Pronotum, length 1.25 mm., width at base 1.85 mm., at apex 0.67 mm.; posterior lobe strongly convex, posterior margin broadly rounded, lateral margins strongly sinuate behind calli and with posterior half roundedly elevated; apical collar nearly as long as thickness of first antennal segment; calli convex, reaching side of pronotum, anteriorly confluent, posterior margin broadly impressed, strongly punctate along the impression, together with apical collar forming an anterior lobe about half as long as the posterior lobe; lateral margins and three longitudinal bands on posterior lobe silvery, seen from the side a longitudinal line along the anterior half of lateral margin fuscous. Scutellum triangular, strongly convex before apex, depressed and deeply medially bipunctate, length 0.7 mm., width 0.85 mm.

Hemelytra with apex of cuneus attaining apex of abdomen, finely punctulate, semitransparent, clavus and corium without veins, claval suture strongly punctate; embolar margins subparallel, very narrowly fuscous; cuneus horizontal, length 0.65 mm., width 0.4 mm., fracture distinct, exterior margin narrowly fuscous; membrane transparent, bicellulate, inner apex of major areole rounded.

Disk of xyphus slightly concave, lateroposterior margins reflected. Ostiolar peritreme distinct. Legs long and slender, tibiae very finely spinulose, length of posterior femora 2.5 mm., length of posterior tibiae 3.35 mm., base of tibiae white, extreme apex of femora, a narrow subbasal ring of tibiae and third tarsal segments fuscous. Arolia prominent, divergent at apex.

Male (teneral specimen).—Very similar to female; body, length 5.4 mm., width 1.55 mm.; length of antennal segments I:II:III:IV=1.25 mm.:2.7 mm.:1.8 mm.:1.2 mm.(?).

This species fits the generic description of *Rambea* Poppius very well, but it differs from *R. gracilipes* Poppius by the different coloration and longer second antennal segment. It is a beautiful yellowish green bug when alive, as shown in one of the paratypes (in the U. S. National Museum).

Types.—U.S.N.M. No. 56718, holotype, female; allotype, male; paratypes, 3 females, all from Mount Maquilung, Luzón, P. I. (Baker).

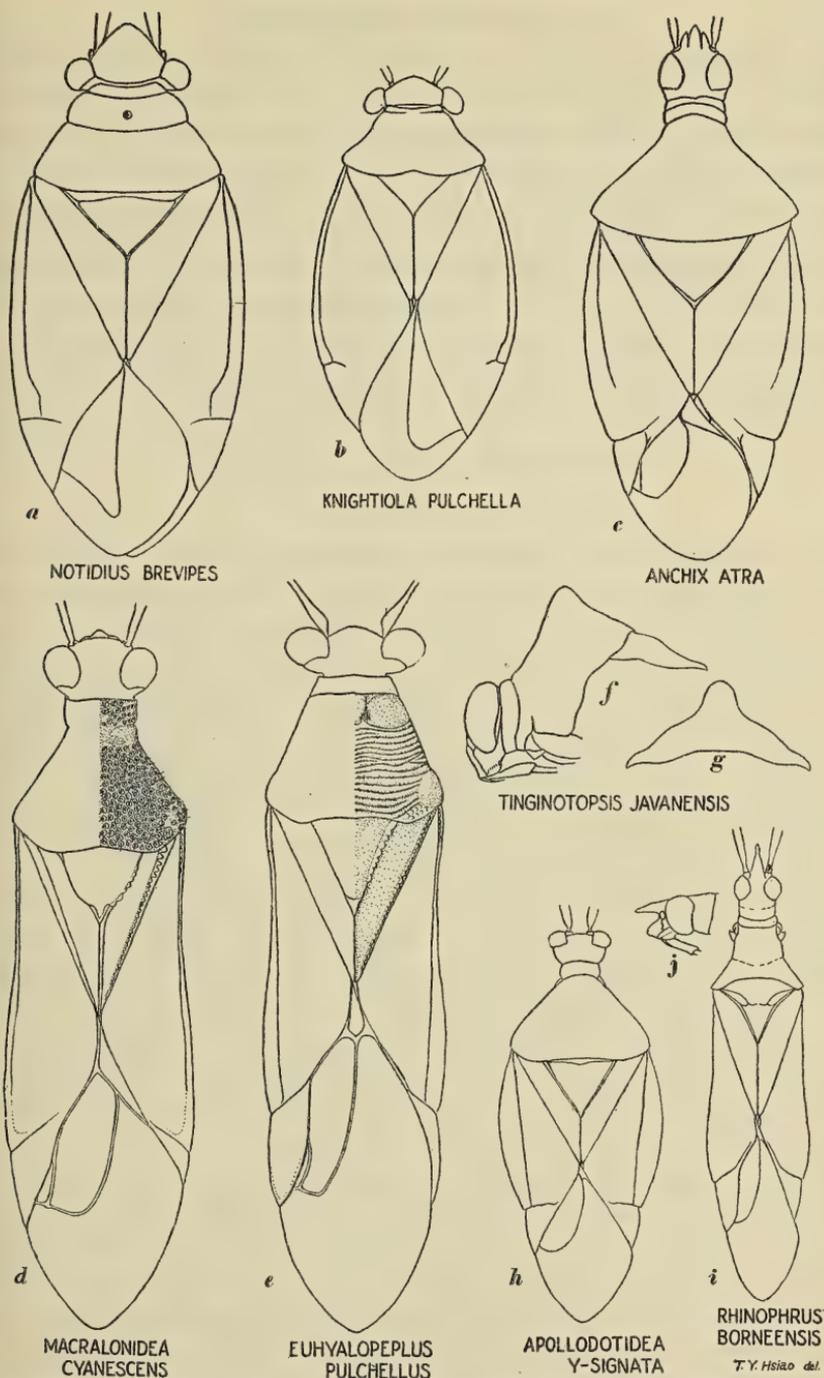


FIGURE 57.—a, *Notidius brevipes*, new genus and species; b, *Knightiola pulchella*, new genus and species; c, *Anchix atra*, new genus and species; d, *Macralonidea cyanescens*, new genus and species; e, *Euhyalopeplus pulchellus*, new genus and species; f, *Tinginotopsis javanensis*, new species, lateral view of head; g, same, posterior view of pronotum; h, *Apollodotidea y-signata*, new genus and species; i, *Rhinophrus borneensis*, new genus and species; j, same, lateral view of head.

T. Y. Hsiao del.

Genus *TINGINOTOPSIS* Poppius

In 1915 Poppius (Arch. für Naturg., vol. 80A, No. 8, p. 23) established the genus *Tinginotopsis*. In 1926 Cheesman (Entomologist, vol. 59, p. 266) suggested that "*Tinginotopsis* is a synonym of *Hermotinus*" on the basis that Poppius's description "agrees extremely well with *Hermotinus* Dist., 1904." However, the specimens at hand agree with Poppius's description very well, especially in the structure of pronotum "die Scheibe sehr stark gewölbt und geneigt, in der Mitte etwas vor der Basis buckelförmig aufgetrieben," and are altogether different from *Hermotinus* Distant as illustrated by Cheesman and by Distant himself. Therefore, *Tinginotopsis* Poppius is a good genus and not a synonym of *Hermotinus*.

TINGINOTOPSIS JAVANENSIS, new speciesFIGURE 57, *f, g*

Male.—Body oblong, length 4.2 mm., width 1.55 mm., dull, clothed above with long, simple, golden hairs and beneath with short, fine hairs; ground color brown, frosted with silvery on dorsum.

Head vertical, light brown, width across eyes 0.95 mm., length seen from above 0.2 mm., height seen from side 0.75 mm.; vertex narrowly marginate, width 0.3 mm., a longitudinal median line extending to the base of clypeus and a small dot at base of jugum brown, lorum and gena with reddish markings, vertex and frons flat, clypeus not distinctly separated from vertex; eyes large, coarsely granulate, inner margins broadly sinuate. Antennae linear, moderately long, inserted at the middle of the inner margins of eyes, densely clothed with fine short hairs; reddish brown, the middle of first and second segments widely, base of first segment and extreme apex of second and third segments flavous; length of segments I:II:III:IV=0.9 mm.:2.1 mm.:0.8 mm.:0.75 mm.; first segment enlarged near base where the thickness is 0.1 mm., second segment slightly curvate. Rostrum, length 1.4 mm., surpassing the middle of intermediate coxae, first segment surpassing the middle of xyphus.

Pronotum coarsely punctate, strongly convex and declivent anteriorly; basal two-thirds dark brown, basal margin narrowly pale; length 1.05 mm., width at base 1.5 mm., at apex 0.6 mm.; lateral margins vertically rounded, almost straight, basal margin slightly sinuate at the middle, humeral angles thickened; apical collar punctate, length 0.1 mm., calli indistinct, the tubercle on the posterior lobe of pronotum large, diameter at base 0.45 mm., height 0.35 mm. Scutellum moderately convex, punctate as pronotum, length 0.65 mm., width at base 0.65 mm., paler apically.

Hemelytra impunctate; embolar margin straight with apical half slightly convex, length 2.1 mm.; clavus, a large irregular shaped

spot at apex of corium, and four small ones along cubital vein dark brown, embolium subtransparent; cuneus pale, apex reddish, width at base 0.45 mm., length 0.5 mm., barely reaching apex of abdomen; membrane fumate, very finely rugulose, apex of major areole angulate.

Xyphus concave, lateral margins strongly elevated; pleura dark brown, coarsely punctate; ostiolar peritrème large, flavous. Venter light brown, laterally tinged with reddish. Legs moderately long, light brown, two apical rings on femora, apex and three rings on tibiae and apex of tarsi dark brown.

Distinguished from the known species in the genus by the long second antennal segment as well as the coloration.

Types.—U.S.N.M. No. 56719, holotype, male; paratype, male. Both from Buitenzorg, Java, March 1909 (Bryant and Palmer).

Subfamily DERAEOCORINAE

ANCHIX, new genus

Body ovate, glabrous, robust; pronotum, scutellum, hemelytra, and propleura coarsely punctate.

Head small, subhorizontal, seen from above distinctly longer than wide, seen from side much longer than height; vertex narrow, indistinctly longitudinally sulcate; clypeus prominent, anterior margin broadly rounded, confluent with frons at base; jugum flat, lorum tumid. Eyes large but not prominent, occupying the whole height of the head, removed from the anterior margin of pronotum, antecular part longer than postocular part, a distinct constriction separating the postocular part into a broad collum. Rostrum surpassing middle of mesosternum, thickened at base, tapering toward apex, first and second segments subequal in length, third longer, fourth longest, about as long as first and second taken together. Antennae linear, inserted at anterior margin of eyes, first segment incrassate, distinctly surpassing apex of head, the remaining segments slender; second slightly incrassate toward apex, second and third subequal in length, fourth short.

Pronotum a little broader than long, strongly narrowed toward apex, posterior lobe strongly convex, declivent, posterior margin broadly rounded, humeral angles obtuse, lateral margins vertically rounded, strongly sinuate, with a slightly raised smooth carina separating propleura from pronotum; apical collar distinct, flat, about as long as the width of vertex; calli moderately elevated, confluent, impunctate. Scutellum somewhat flat, covered at base, wider than long.

Hemelytra complete, considerably surpassing apex of abdomen; embolium broad, strongly inclined laterally, lateral margins strongly

convex; cuneus strongly declivent, fracture deep; membrane well developed, bicellulate. Ostiolar peritreme opaque. Legs of moderate length, coxae long, femora incrassate, tibiae shortly pilose; claws strongly curved, dentate at base, arolia and pseudarolia absent.

Closely related to *Iax* Bergroth, but distinguished from it by the more robust body, declivent pronotum, incrassate femora, and strongly discrete cuneus.

Genotype.—*Anchix atra*, new species.

ANCHIX ATRA, new species

FIGURE 57, c

Female.—Body, length 4.2 mm., width 1.57 mm.; shining reddish black, antennae (except first segment), fourth segment of rostrum, apical half of tibiae and tarsi flavous; above glabrous, coarsely punctate except head and calli and pronotum; beneath clothed with fine, short, flavous hairs, impunctate except propleura.

Head, width across eyes 0.55 mm., length seen from above (excluding collum) 0.55 mm., height seen from side 0.4 mm.; vertex brownish, width 0.1 mm. Length of antennal segments I : II : III : IV = 0.35 mm. : 0.9 mm. : 0.9 mm. : 0.4 mm.; extreme apex of second segment, apical half of third and fourth slightly fuscous. Rostrum strongly thickened at base, gradually tapering toward apex, length 1.65 mm., reaching apex of mesosternum.

Pronotum strongly narrowed toward apex, length 1.15 mm., width at base 1.55 mm., at apex 0.52 mm., apical collar with posterior margin sinuate, length 0.1 mm.; calli moderately convex, confluent, reaching lateral margin of pronotum. Scutellum covered at base, length 0.5 mm., width 0.7 mm.

Hemelytra with apex of cuneus attaining apex of abdomen, embolar margins broadly rounded, length 1.6 mm.; cuneus strongly declivent, length 0.4 mm., width 0.3 mm.; membrane fuscous, a large spot on lateral margin near base and another one near inner angle transparent. Posterior femora slightly curvate, length 1.4 mm., thickness 0.25 mm.; length of posterior tibiae 1.4 mm., hairs concolorous with the area where they are located.

Male.—Very similar to the female in coloration, but body and apparatus, female. All from Mount Maquiling, Luzón (Baker, antennal segment 0.4 mm., second 1.3 mm. (third and fourth missing)).

Types.—U.S.N.M. No. 56720, holotype, female, Mount Maquiling, Luzón, P. I. (Baker); allotype, male, Zamboanga, Mindanao, P. I. 1927 (C. F. Baker); paratypes, female, same data as holotype, male, same data as allotype, and female, Island of Basilan (Baker).

Subfamily CYLAPINAE

Genus RHINOMIRIS Kirkaldy

RHINOMIRIS INSULARIS, new species

Male.—Body elongate, length 8.45 mm., width 1.95 mm., opaque, above obscurely brown with irregular yellow spots, beneath mainly reddish brown; clothed sparingly with fine, simple, flavous hairs.

Head subhorizontal, apical third except base of clypeus and apex of lorum, and along lower margin of eyes widely reddish brown; width across eyes 1.25 mm., length seen from above 1.25 mm., height seen from side 0.85 mm., length of anteocular part 0.72 mm.; vertex flat, longitudinally sulcate, immarginate, width 0.42 mm.; clypeus flat, confluent with frons. Eyes large, prominent, rounded. Antennae very long, linear, slender, inserted near anterior margin of eyes, dark brown, first segment (except the reddish apex), basal half and extreme apex of second and base of third pale; length of segments I : II : III : IV = 1.7 mm. : 3.8 mm. : 6.35 mm. : 2.5 mm. Rostrum barely reaching apex of abdomen, first segment not quite reaching posterior margin of xyphus, last two segments reddish, length of segments I : II : III : IV = 1.65 mm. : 2.8 mm. : 1.45 mm. : 0.9 mm.

Pronotum campanulate, length 1.25 mm., width at base 1.9 mm., at apex 0.75 mm., basal margin slightly sinuate each side of the middle, lateral margins distinctly sinuate, apical collar slender, convex; calli confluent, convex, forming an anterior lobe of pronotum which is longer than the posterior lobe, marked irregularly with dark brown. Mesoscutum broadly exposed, scutellum convex, a longitudinal median line pale, length (excluding mesoscutum) 0.64 mm., width 0.8 mm.

Hemelytra with sides subparallel, series of irregular spots along the veins and between them on corium and clavus yellowish, a transverse irregular band across beyond apex of clavus and cuneus darkened; cuneus small, thickened, cuneal fracture obsolete, membrane fumate, apex of major areole rounded.

Margin of xyphus, margin of propleura, ostiolar peritreme, and a few large spots on venter yellow. Legs long, reddish brown, three broad rings on femora and one near middle of tibiae yellowish; length of posterior femora 4.15 mm., length of posterior tibiae 6.05 mm. Left genital clasper pointed apically, with a large process at base of upper margin; right clasper smaller, dentate at base.

Female.—Coloration very similar to the male, size larger, length 8.9 mm., width 2.07 mm., length of antennal segments I : II : III : IV = 1.6 mm. : 3.52 mm. : 5.8 mm. : 1.6 mm. (?).

Close to *R. intermedius* Poppius but distinguished by the shorter antennal segment as well as the different coloration.

Types.—U. S. N. M. No. 56721, holotype, male; allotype, female; paratype, female. All from Mount Maquilung, Luzón (Baker).

RHINOMIRIS BORNEENSIS, new species

Female.—Body elongate, length 8.7 mm., width 2.25 mm.; coloration very similar to *R. insularis*, but calli of pronotum and scutellum more strongly convex.

Head, width across eyes 1.2 mm., length seen from above 1.4 mm., height seen from side 0.8 mm.; length of antecular part 0.65 mm.; vertex longitudinally sulcate, width 0.45 mm. Length of antennal segments I : II : III : IV = 1.55 mm. : 3.55 mm. : 5.25 mm. : 2.25 mm. Rostrum surpassing posterior margin of eighth ventral segment, length of segments I : II : III : IV = 1.6 mm. : 2.95 mm. : 2.95 mm. : 0.9 mm. Length of posterior femora 3.15 mm., of posterior tibiae 3.75 mm.

Male.—Similar to the female in coloration, but size smaller, length 7.95 mm., width 1.95 mm. Length of antennal segments I : II : III : IV = 1.4 mm. : 3.4 mm. : 6.2 mm. : 2.45 mm. Process of left genital clasper longer than that of *insularis*.

Types.—U. S. N. M. No. 56722, holotype, female; allotype, male; and 5 male and 9 female paratypes. All from Sandakan, Borneo (Baker).

Genus RHINOCYLAPUS Poppius

RHINOCYLAPUS SCUTATUS, new species

Male.—Body, length 7.4 mm., width 2.05 mm., reddish brown, middle third of second antennal segment, base of third segment, a large spot in middle of scutellum, extreme inner apical angle of corium, inner basal angle of cuneus and tarsi pale; hemelytra and abdomen clothed with concolorous fine short hairs.

Head horizontal, width across eyes 1.1 mm., length seen from above 1.5 mm., height seen from side 0.72 mm., length of antecular part 0.95 mm.; vertex narrowly marginate, distinctly longitudinally sulcate, width 0.55 mm. Eyes moderately large, not prominent, not touching anterior margin of pronotum. Antennae linear, very long, inserted about 0.2 mm. in front of eyes, length of segments I : II : III : IV = 1.3 mm. : 2.15 mm. : 4 mm. : 2.45 mm., first segment gradually thickened in the middle, second slenderer than first, third and fourth very slender. Rostrum long, considerably surpassing apex of abdomen, gradually tapering toward apex, length of segments I : II : II : IV = 2.55 mm. : 1.75 mm. : 2 mm. : 1.4 mm.

Pronotum slightly declivent, length 1.3 mm., width at base 1.7 mm., at apex 0.74 mm., posterior lobe coarsely punctate, lateral margins nearly straight, posterior margin broadly shallowly excavated each side of middle, humeral angles rounded; apical collar slender, flat; calli smooth, large, confluent anteriorly, separated posteriorly by a longitudinal sulcus, together with apical collar occupying about half

the length of pronotum. Mesoscutum broadly exposed, scutellum transversely rugulose, triangular, length 0.8 mm. (excluding mesoscutum), width 0.8 mm.

Hemelytra coarsely punctate; embolar margins slightly convex, length 5.6 mm.; cuneus small, impunctate, length 0.5 mm., width 0.35 mm.; inner apical angle of major areole acute.

Propleura coarsely punctate, mesopleura and metapleura finely punctulate. Legs long, length of posterior femora 3.6 mm., posterior tibiae concolorously spinulose, length 5.25 mm. Both genital claspers simple, left one larger, fingerlike, gradually tapering at apex, strongly curvate; right one with apex flattened.

Female.—Very similar to male in coloration except second antennal segment, which is broadly pale with only apex and base dark. Body length 9.5 mm., width 2.75 mm. Head, length 1.75 mm., width 1.35 mm.; vertex, width 0.6 mm. Length of rostral segments I:II:III:IV=3.2 mm.:1.85 mm.:2.55 mm.:1.7 mm.; length of antennal segments I:II:III:IV=1.55 mm.:2.9 mm.:5.1 mm.:2.6 mm.

Close to *R. simplicicollis* Poppius but distinguished by longer rostrum, different relative length of antennal segments, and different color of scutellum.

Types.—U.S.N.M. No. 56723, holotype, male; allotype, female; and 4 male and 3 female paratypes. All from Sandakan, Borneo (Baker).

RHINOCYLAPUS VITTATUS, new species

Female.—Body, length 6.55 mm., width 2.45 mm., dark brown with yellowish stripes, clothed on hemelytra and abdomen with short, flavous, simple hairs.

Head horizontal, width across eyes 1.1 mm., length seen from above 1.22 mm., height seen from side 0.75 mm., length of anteocular part 0.7 mm.; yellowish brown, middle of vertex and frons, and clypeus broadly dark brown; vertex longitudinally sulcate, width 0.5 mm. Antennae linear, length of segments I:II:III:IV=0.95 mm.:2.25 mm.:1.95 mm.:1.8 mm. Rostrum, length 5.5 mm., reaching posterior margin of eighth ventral segment.

Pronotum coarsely punctate, somewhat constricted behind calli, length 1.16 mm., width at base 1.7 mm., at apex 0.65 mm., three broad longitudinal bands and two narrow ones each side along lateral margin yellowish; lateral margin sinuate, posterior margin slightly sinuate each side of the middle before scutellum, humeral angle rounded; apical collar short, convex; calli smooth, anterior margin with a row of punctures, convex, confluent anteriorly. Mesoscutum broadly exposed, scutellum transversely rugulose, slightly convex, length (excluding mesoscutum) 0.75 mm., width 0.75 mm., lateral margins and apex yellow.

Hemelytra coarsely punctate, veins on clavus and corium and apical margin of corium yellow; embolar margin broadly convex, length 2.95 mm.; cuneus small, impunctate, length 0.3 mm., width 0.3 mm., reddish yellow, exterior margin dark brown; membrane dark brown, rugulose, inner apical angle of major areole acutely angulate.

Propleura coarsely punctate, mesopleura and metapleura finely punctate and rugulose. Xyphus, ostiolar peritreme, venter and legs yellowish brown. Length of posterior femora 2.45 mm., length of posterior tibiae 3.55 mm.

Differs from all the known species by the unusual coloration, length of rostrum, and size of the body.

Types.—U.S.N.M. No. 56724, holotype, female, Sandakan, Borneo (Baker); paratypes, 11 females, same data as holotype; 9 females, Island of Basilan (Baker).

Note.—I have before me a few male specimens collected from the same locality as the type. They are very similar to this species in coloration but are so much smaller that I prefer to await study of additional material before placing them with certainty.

RHINOPHRUS, new genus

Body elongate, shining, clothed very sparingly with simple hairs.

Head small, horizontal, a little wider than the apex of pronotum, seen from above about one and one-half times as long as wide, seen from side longer than high; vertex immarginate, narrower than the width of eye seen from above, destitute of longitudinal sulcus; frons horizontal, strongly produced into a cone-shaped process over clypeus; clypeus compressed, very prominent; bucculae united behind. Eyes large, granulate, occupying whole height of head, seen from above not prominent, far removed from apex of pronotum, antecular part longer than postocular part. Antennae linear, shorter than the length of body, inserted at the middle of anterior margin of eyes, first segment thickest, second slightly thickened at apex. Rostrum gradually tapering toward apex, reaching upon intermediate coxae.

Pronotum horizontal, finely transversely rugulose, wider than long, over twice as wide at base as at apex, strongly widened behind calli, lateral margins vertically rounded, posterior margin broadly sinuate before scutellum; apical collar flat; calli flat, confluent. Mesoscutum widely exposed, scutellum triangular, flat, wider than long.

Hemelytra complete, embolar margins nearly parallel, cuneus horizontal, longer than wide, fracture distinct; membrane well developed, unicellulate.

Xyphus with disk flat, lateroposterior margins elevated; ostiolar peritreme small. Last dorsal segment produced in both sexes. Legs

of medium length, anterior coxae long, anterior femora distinctly incrassate, posterior femora slightly thickened at apical third, tibiae destitute of spinules, slightly more slender at apex, first tarsal segment not longer than second, claws broadly curvate, arolia and pseudarolia absent.

This genus is referred to the subfamily Cylapinae and probably related to *Fulvius* Stål, but it is distinguished from this and other genera by the produced frons, compressed clypeus, long anterior coxae, and incrassate anterior femora and belongs to a new tribe, which may be known as **Rhinophrini**.

Genotype.—*Rhinophrus borneensis*, new species.

RHINOPHRUS BORNEENSIS, new species

FIGURE 57, i, j

Female.—Body, length 3.8 mm., width 0.82 mm., reddish black, very sparingly clothed with golden hairs.

Head, width across eyes 0.4 mm., length seen from above 0.6 mm., height seen from side 0.3 mm.; width of vertex 0.1 mm., length of frontal process 0.2 mm. Length of antennal segments I:II:III:IV=0.45 mm.:0.92 mm.:0.75 mm.:0.75 mm., first segment thickened in the middle, slightly curvate, second very slightly thickened at apex, gradually pale towards base. Rostrum, length 1.3 mm., first segment pale.

Pronotum horizontal, length 0.5 mm., width at base 0.8 mm., at apex 0.35 mm. Scutellum flat, length (excluding mesoscutum) 0.2 mm., width 0.27 mm.

Hemelytra reddish brown, distinctly surpassing apex of abdomen, embolar margin slightly convex behind the middle, length 1.55 mm., cuneus reddish, length 0.47 mm., width 0.2 mm.

Anterior coxae, middle of anterior tibiae, tarsi, middle legs (except base of coxae), basal two-thirds of posterior femora, extreme base and extreme apex of posterior tibiae and posterior tarsi flavous. Anterior coxae a little more than half as long as anterior femora, length of posterior femora 1.4 mm., length of posterior tibiae 1.65 mm.

Male.—Very similar to the female. Body, length 3.45 mm., width 0.5 mm.; length of antennal segments I:II:III+IV=0.45 mm.:0.9 mm.:1.43 mm. (the joint between III and IV is covered). Both genital claspers are narrow and more or less straight and flavous.

Types.—U. S. N. M. No. 56725, holotype, female; allotype, male; paratypes, 1 male and 2 females. All from Sandakan, Borneo (Baker).

Subfamily BRYOCORINAE

NOTIDIUS, new genus

Body oblong, robust, impunctate, clothed densely with short, fine, simple hairs.

Head large, strongly declivent, broader than long, seen from front triangular in form; vertex broad, more than twice as broad as an eye seen from above, without longitudinal sulcus, basal margin slightly convex, immarginate; frons moderately convex, clypeus moderately prominent, vertical, discrete at base; jugum and lorum discrete, gena high, bucculae long. Eyes rather small but prominent, touching and producing over anterior angles of pronotum. Rostrum reaching upon posterior coxae, first segment reaching base of head. Antennae short, inserted at base of jugum, first and second segments incrassate, third and fourth segments very slender.

Pronotum slightly inclined anteriorly, wider than long, about twice as wide at base as at apex. Basal margin somewhat straight before scutellum, humeral angles rounded, lateral margin straight, ecarinate; apical collar convex, as long as first antennal segment thick; calli very distinct, confluent except a small round depression between them, separated posteriorly from the posterior lobe of pronotum by a deep transverse line, forming a broad ring about twice as thick as the apical collar, posterior lobe about as long as apical collar and calli taken together. Scutellum covered at base, triangular, moderately convex in middle, broader than long.

Hemelytra complete, embolium narrow, embolar margin slightly convex; cuneus longer than broad, fracture distinct; membrane well developed, unicellulate, inner apex of cell acutely angulate, veins covered with fine hairs.

Xyphus of prosternum marginate, ostiolar peritreme obsolete. Legs short, femora incrassate, tibiae destitute of spinules; third tarsal segment distinctly incrassate, claws broadly curvate, pseudarolia prominent, shortly laminate, projecting free at tip.

This genus is unique in the subfamily Bryocorinae. It differs from all other genera by the peculiar structures of pronotum, antennae, and legs.

Genotype.—*Notidius brevipes*, new species.

NOTIDIUS BREVIPES, new species

FIGURE 57, a

Female.—Body, length 4.35 mm., width 1.95 mm.; dark castaneous; head, antennae, legs, beneath for the most part, light castaneous; clothed densely with short, fine hairs concolorous with the areas

where they are located, the hairs on antennae and legs not appreciably longer or thicker.

Head, width across eyes 1.1 mm., length seen from above 0.75 mm., height seen from side 0.65 mm., length of antecular part 0.5 mm.; vertex, width 0.6 mm. Eyes red, granulate, seen from above more or less rounded, seen from side obliquely subovate, posterior margin concave. Length of antennal segments I:II:III:IV=0.4 mm.:0.75 mm.:0.25 mm.:0.45 mm.; thickness of first segment 0.12 mm., narrowed at base; second nearly as thick as first, very slightly narrowed towards both ends, dark; third and fourth segments very slender, third flavous. Rostrum, length 2.15 mm., surpassing apex of posterior coxae.

Pronotum, length 0.9 mm., width at base 1.6 mm., at apex 0.8 mm.; apical collar slightly sinuate at apex, length, 0.13 mm.; length of calli 0.25 mm. Scutellum covered at base, length 0.5 mm., width 0.8 mm.

Hemelytra with apex of cuneus attaining apex of abdomen, color a little lighter than pronotum, embolium light castaneous; embolar margin very slightly convex, length 1.8 mm.; cuneus strongly declivent, length 0.7 mm., width 0.5 mm., exterior margin paler; membrane concolorous with corium, finely rugulose along the margin.

Pleura dark castaneous. Legs short, femora incrassate; posterior femora, length 1.3 mm., thickness 0.4 mm.; length of posterior tibiae 1.4 mm.

Type.—U.S.N.M. No. 56726, holotype, female, Sandakan, Borneo (Baker).

Genus FELISACUS Distant

FELISACUS CARPENTERAE, new species

Male.—Body elongate, length 3.15 mm., width 0.8 mm., shining, clothed very sparingly with simple flavous hairs, ochraceous tinged with reddish, hemelytra transparent.

Head vertical, width across eyes 0.52 mm., length seen from above (excluding the collum) 0.22 mm., height seen from side 0.5 mm.; vertex slightly convex, width 0.23 mm.; frons somewhat flat; clypeus prominent, narrow, distinctly impressed at base; jugum and lorum confluent, flat. Eyes moderately large, not prominent, far removed from anterior margin of pronotum. Antennae linear, inserted near the middle of inner margins of eyes, length of segments I:II:III:IV=0.8 mm.:1.02 mm.:1.1 mm.:0.5 mm., first and second segments reddish, the last two segments darkened. Rostrum tapering from the base to the apex, length 0.85 mm., surpassing apex of anterior coxae.

Pronotum smooth, length 0.6 mm., width at base 0.75 mm., at apex 0.32 mm., median constriction very deep, basal margin slightly sinuate

before scutellum; calli lightly reddish, anterior margin very narrowly fuscous. Scutellum moderately convex, as long as wide at base.

Hemelytra transparent (excluding cuneus), veins, embolar margins, inner claval margins, commissure and cuneus reddish; an oblique linear spot near apex of clavus fuscous; embolar margins very slightly convex, length 1.35 mm.; cuneus opaque, more than twice as long as wide. Lateral margins of abdomen behind middle and apex red. Right clasper long, narrow, broadly curvate at apical third, left clasper small.

Female.—Very similar to male; body, length 3.35 mm., width 0.85 mm., embolar margins a little more convex.

Close to *F. glabratus* (Motschulsky) but distinguished by the smaller size, longer third antennal segment, and different color of cuneus.

Types.—U.S.N.M. No. 56727, holotype, male; allotype, female; paratypes, 4 males and 4 females. All from Singapore (Baker).

This species is named in honor of Miss Mathilde M. Carpenter, librarian of the Division of Insects, U. S. National Museum, in appreciation of her help in securing literature for my studies.

FELISACUS CARPENTERAE SIGNIS, new variety

Very similar to the typical form, but body larger, length 3.4 mm., width 0.8 mm., posterior margin of pronotum broadly (excluding middle fourth to third), inner half of clavus, and margins around inner apical angles of corium fuscous. Length of antennal segments I:II:III:IV=0.9 mm.:1.05 mm.:1.4 mm.:0.4 mm.

Types.—U.S.N.M. No. 56728, holotype, male; allotype, female; paratypes, 6 males and 2 females. All from Sandakan, Borneo (Baker).

FELISACUS PHILIPPINENSIS, new species

Male.—Body elongate, length 4.1 mm., width 0.95 mm., shining, clothed sparingly with simple flavous hairs. Head, pronotum, and scutellum ochraceous; apex of clypeus, basal margin of pronotum, clavus, margins of inner apical angle of corium, mesosternum and last two segments of antennae, exterior margin of embolium (except the base) and external margin of cuneus very narrowly, fuscous, first two segments of antennae reddish.

Head, width across eyes 0.57 mm., length seen from above 0.35 mm., height seen from side 0.5 mm.; vertex, width 0.25 mm. Length of antennal segments I:II:III:IV=0.75 mm.:1.15 mm.:1.15 mm.:0.7 mm., first segment gradually but distinctly enlarged at middle. Pronotum, length 0.75 mm., width at base 0.9 mm., at apex 0.4 mm.

Female.—A little broader than male, length 4.25 mm., width 1.12 mm., length of antennal segments I:II:III:IV=0.52 mm.:1.05 mm.:1.15 mm.:0.65 mm.

Close to *F. pulchellus* Poppius but distinguished by the longer second antennal segment and different markings on dorsum. Distinguished from *F. carpenterae* by the different structure of the first antennal segment and the relative length of the antennal segments.

Types.—U.S.N.M. No. 56729, holotype, male; allotype, female; and paratypes, 2 males and 1 female. All from Mount Maquilíng, Luzón, P. I. (Baker).

Genus **THAUMASTOMIRIS** Kirkaldy

THAUMASTOMIRIS PHILIPPINENSIS, new species

Female.—Body ovate, length 5.45 mm., width 2.7 mm., somewhat shining, clothed with short simple flavous hairs, sanguineous; antennae, apex of rostrum, and apex of tarsi fuscous; membrane pale transparent.

Head vertical, strongly produced below eyes, width across eyes 1.2 mm., length seen from above 0.4 mm., height seen from side 0.95 mm.; vertex flat, width 0.64 mm., strongly transversely impressed before posterior margin, forming a distinct callous behind it; frons broadly convex; clypeus moderately elevated, discrete from frons; jugum and lorum confluent, separated only by a fine suture; bucculae short, partly united behind. Eyes rather small, rounded, very prominent, touching anterior margin of pronotum. Antennae linear, gradually tapering toward apex, inserted on frons a little distance from the eyes; length of segments I: II: III: IV = 0.65 mm.: 1.3 mm.: 1 mm.: 1.1 mm., first segment the thickest. Rostrum, length 2.05 mm., considerably surpassing apex of posterior coxae, first segment barely reaching apex of anterior coxae, second segment longest, slightly longer than third and fourth taken together.

Pronotum finely granulate, nearly horizontal, length 1 mm., width at base 1.7 mm., at apex 1.05 mm., lateral margins rounded, strongly sinuate, posterior margin straight, posterior angles rounded; apical collar distinct, granulate, shorter than the thickness of first antennal segment; calli somewhat smooth, convex, deeply separated from each other. Scutellum small, triangular, covered at base, impunctate, flat, depressed in the middle at base.

Hemelytra impunctate, with base of cuneus attaining apex of abdomen; embolar margins convex, cuneus long, membrane pale transparent, unicellular, veins sanguineous. Mesosternum slightly fuscous, ostiolar peritreme very small. Legs of moderate length, length of posterior femora 2.2 mm., length of posterior tibiae 2.5 mm.

Male.—Very similar to female, but a little smaller, length 5 mm., width 2.15 mm., the color of the specimen at hand faded from sanguineous to orange. Left genital clasper broad at basal part and abruptly

narrowed at apical portion, strongly bent inwardly, a broad spinelike process on left apical margin of ninth ventral segment.

Distinguished from the other species in the genus by the longer rostrum and different length of antennal segments; from *T. sanguinalis* Kirkaldy and *T. minutus* Poppius by the pale membrane and from *T. piceatus* Distant and *T. discoidalis* Poppius by the uniform color of hemelytra.

Types.—U.S.N.M. No. 56730, holotype, female, Puerto Princesa, Palawan, P. I., September 1925 (R. C. McGregor); allotype, male, Cotabato, P. I. (Taylor); paratypes, male, same data as the holotype, female, same data as the allotype and 2 females, Philippine Islands (B. Arce).

THAUMASTOMIRIS DISSIMILIS, new species

Male.—Body ovate, length 3.25 mm., width 1.35 mm., clothed with short simple pale hairs which are somewhat longer on pronotum; yellowish brown with dark brown markings on dorsum.

Head yellowish brown, vertical, strongly produced below eyes, width across eyes 0.8 mm., length seen from above 0.35 mm., height seen from side 0.56 mm.; vertex somewhat flat, width 0.45 mm., transversely impressed, forming a distinct posterior callus; frons strongly convex, clypeus moderately prominent, discrete from frons, jugum and lorum confluent. Eyes medium, rounded, prominent, touching anterior margin of pronotum. Antennae linear, inserted a little distance in front of eyes, dark brown, first segment for the most part and second segment at apex paler, length of segments I:II:III:IV=0.35 mm.:0.62 mm.:0.45 mm.:0.6 mm., first segment the thickest, second segment very slightly incrassate towards apex, where the thickness equals that of the first segment. Rostrum thick, length 1.05 mm., reaching apex of intermediate coxae, third and fourth segments taken together longer than the first but shorter than the second.

Pronotum anteriorly slightly declivent, distinctly granulate, dark brown, two large spots each on the lateral margin behind callus yellowish brown; length 0.55 mm., width at base 1.1 mm., at apex 0.5 mm., posterior margin straight, lateral margins slightly sinuate, posterior angles rounded; apical collar nearly as long as the thickness of first antennal segment; calli distinct, smooth, separated from each other by a broad impression. Scutellum small, triangular, flat, dark brown.

Hemelytra with base of cuneus attaining apex of abdomen, pale grayish, a broad transverse band on corium behind the middle, inner margin on clavus broadly, commissure broadly, and embolar margins very narrowly, dark brown; embolar margins slightly and evenly convex, length 1.5 mm.; cuneus long, lateral margins at base narrowly

dark brown; membrane semitransparent, veins concolorous with cuneus. Venter brown. Legs yellowish brown, length of posterior femora 1.05 mm., length of posterior tibiae 1.3 mm. Genitalia similar to those of *T. sanguinalis* Kirkaldy, left clasper leaflike, with apex concealed by the apical margin of the ninth ventral segment.

This species is unique in the genus. It can be readily distinguished from the other species by its small size and the absence of reddish color.

Types.—U.S.N.M. No. 56731, holotype, male; paratypes, 8 males. All from Island Sámar, P. I. (Baker).

KNIGHTIOLA, new genus

Body oval, broadened posteriorly, shining, clothed with short fine simple hairs.

Head vertical, seen from above about three times as wide as long, seen from side about twice as high (to apex of clypeus) as long; vertex slightly convex, immarginate, transversely impressed before collum, about twice as wide as an eye seen from above; frons slightly convex; clypeus vertical, distinctly discrete with frons, moderately prominent; jugum and lorum separated by a distinct suture; bucculae large, united behind; gula short. Eyes moderately large, prominent, seen from side nearly rounded, posterior margin sinuate, touching apex of pronotum and protruding backward over lateral side of apical collar. Rostrum thick, surpassing intermediate coxae, first segment the longest, second about as long as third and fourth taken together. Antennae inserted at middle of anterior margin of eyes, sublinear, first segment about as long as width of vertex, second longer than third.

Pronotum moderately inclined, distinctly punctate, about twice as wide at base as long, posterior margin broadly rounded, distinctly sinuate at middle, lateral margin broadly sinuate, anterior margin sinuate; apical collar indistinct; calli smooth, moderately convex, widely separated at middle. Mesoscutum covered; scutellum triangular, impunctate, distinctly convex, wider than long.

Hemelytra well developed, with base of cuneus attaining apex of abdomen, obsoletely punctulate, lateral margins rounded, embolium narrow and thickened; cuneus large, about as long as wide, not separated from corium except at the fracture, strongly declivent; membrane unicellate, finely rugulose, veins finely pilose.

Xyphus concave, margins elevated, ostiolar peritreme obsolete. Legs moderately long, femora furnished with long hairs, anterior and posterior pairs slightly thickened; tibiae not spinulose; third tarsal segment distinctly enlarged; pseudarolia prominent, very broad, arolia indistinct.

Closely related to *Thaumastomiris* Kirkaldy and *Prodromus* Distant, but readily distinguished from the former by the different structure of cuneus and membranal cell, and from the latter by the different structure of head. This genus is named in honor of Dr. H. H. Knight, of Iowa State College, who is an authority on the family Miridae.

Genotype.—*Knightiola pulchella*, new species.

KNIGHTIOLA PULCHELLA, new species

FIGURE 57, b

Female.—Body, length 3.3 mm., width 1.65 mm.; pubescence flavous; above ochraceous, beneath blood red.

Head, width across eyes 0.85 mm., length seen from above 0.25 mm., height seen from side (to apex of clypeus) 0.55 mm., width of vertex 0.45 mm., clypeus red. Eyes granulate, reddish dark. Rostrum, length 1.05 mm., surpassing apex of intermediate coxae, apical half red, apex dark. Length of antennal segments I : II : III : IV = 0.42 mm. : 0.75 mm. : 0.5 mm. : 0.45 mm., first segment red except extreme base, apices of second and third segments and fourth segment reddish dark to dark.

Pronotum, length 0.6 mm., width at base 1.25 mm., at apex 0.5 mm.; calli reddish. Scutellum, width 0.55 mm., length 0.4 mm. Length of embolar margin 1.6 mm.; cuneus, length 0.55 mm., width 0.55 mm., exterior margin reddish; membrane transparent, inner apical angle of membranal cell narrowly rounded. Xyphus and middle of mesosternum ochraceous, apex of femora and base of tibiae reddish, length of posterior femora 1.25 mm., length of posterior tibiae 1.4 mm.

Male.—Very similar to female; body, length 3.2 mm., width 1.7 mm., a little more broadened posteriorly than female; length of antennal segments I = 0.45 mm., II = 0.75 mm. (III and IV covered by card point.)

Types.—U.S.N.M. No. 56732, holotype, female; allotype, male; and paratypes, male and 4 females. All from Mount Banájao, P. I. (Baker).

Genus BROMELIAEMIRIS Schumacher

I place the following species provisionally in the genus *Bromeliaemiris* Schumacher. It is possible that this genus is a synonym of *Lopidolon* Poppius, but at the present time I do not have sufficient material fully to justify this conclusion.

BROMELIAEMIRIS DISSIMILIS, new species

Male.—Body elongate, length 5.95 mm., width 1.9 mm., densely clothed with fine simple pale hairs; reddish yellow, antennae, lateral margins of pronotum, hemelytra, and legs (excluding coxae and basal half of femora) black.

Head vertical, width across eyes 1.3 mm., length seen from above 0.4 mm., height seen from side (to apex of clypeus) 0.85 mm.; vertex flat, immarginate, width 0.57 mm.; frons a little convex in the middle, clypeus discrete from frons. Eyes moderately large, rounded, prominent, not touching apex of pronotum. Rostrum thick, length 1.85 mm., surpassing middle of posterior coxae, first segment reaching middle of anterior coxae, second the longest, third and fourth short. Antennae linear, inserted near lower end of inner margins of eyes, second, third, and fourth segments clothed with erected long fine hairs; length of segments I : II : III : IV = 0.45 mm. : 1.75 mm. : 0.9 mm. : 0.42 mm., last two segments distinctly more slender than second.

Pronotum subhorizontal, length 1.05 mm., width at base 1.75 mm., at apex 0.82 mm., posterior lobe slightly convex, very finely punctulate, posterior margin nearly straight before scutellum, lateral margins strongly sinuate, humeral angles rounded; apical collar sinuate at apex; calli distinct, smooth, connected anteriorly by an elevated area. Scutellum triangular, length 0.7 mm., width 0.8 mm., triangularly impressed at middle of base.

Hemelytra finely and shallowly punctulate, with apex of corium reaching apex of abdomen; embolar margins subparallel, length 2.75 mm.; cuneus subhorizontal, length 0.1 mm., width 0.45 mm.; membrane finely rugulose, minor areole obsolete, inner apex of major areole narrowly rounded.

Ostiolar peritreme obsolete, venter reddish. Femora slightly thickened, tibiae destitute of spinules, third tarsal segment incrassate, claws broadly curvate, pseudarolia large, connate with claws. Genitalia prominent, right clasper simple, broadened and rounded apically, left clasper very small, aedeagus (?) large, posteroventral view abomasum-shaped.

Female.—Very similar to male; body, length 5.65 mm., width 1.9 mm. Vertex a little wider, length of antennal segments I:II:III:IV = 0.5 mm. : 1.5 mm. : 0.9 mm. : 0.5 mm.

Close to *B. bicolor* Schumacher, but distinguished by longer second antennal segment, pale clypeus and scutellum.

Types.—U.S.N.M. No. 56733, holotype, male, Manila, P. I., collected on orchid (*E. Maskew*); allotype, female, Philippines, collected at Honolulu, Hawaii, on root of *Phalaenopsis amabilis*, September 4, 1931; paratypes: male and 2 females, same data as holotype (all bearing hand written label "700A"); male, Philippines, intercepted at San Francisco, November 16, 1933, on *Dendrobium euperbum* (in cargo); female, Manila, collected on orchid, May 1, 1914; female, Bur. Agr. P. I., acc. No. 285 (C. R. Jones); female, Philippines, May 1, 1933, collected at Honolulu on orchid plant debris.

BROMELIAEMIRIS MARGINATUS, new species

Male.—Similar to *B. dissimilis*, but embolium, exterior margin of corium, cuneus, and legs reddish yellow. Body, length 5.4 mm., width 1.8. mm.

Head, width across eyes 1.12 mm., length seen from above 0.4 mm., height seen from side (to apex of clypeus) 0.8 mm.; vertex, width 0.5 mm. Rostrum, length 1.7 mm. Length of antennal segments I : II : III : IV = 0.5 mm. : 1.5 mm. : 0.9 mm. : 0.4 mm.

Pronotum, length 1 mm., width at base 1.7 mm., width at apex 0.77 mm. Embolar margins of hemelytra slightly convex, length 2.5 mm.; cuneus, length 0.64 mm., width 0.35 mm. Right genital clasper simple, elongate, slightly narrowed at apex, left clasper small, aedeagus (?) large, avicephaliform.

Female.—Similar to male, length 5.65 mm., width 1.95 mm.; vertex a little wider; length of antennal segment I = 0.5 mm.; II = 1.2 mm., incrassate at apex (III and IV missing).

Types.—U.S.N.M. No. 56734, holotype, male, Philippines, intercepted at Honolulu, April 13, 1932; allotype, female, Manila, P. I., April 29, 1914 (B. Whitney); paratypes: male, same data as allotype; 2 females, Manila, P. I., on orchid (F. Maskew); female, Philippines, on *Phalaenopsis schilleriaria*, at San Francisco; male, Philippines, June 27, 1934, on *Phalaenopsis sanderiana*; male, Philippines, May 11, 1934 (San Francisco Quar. 3516).

BROMELIAEMIRIS PUNCTICOLLIS, new species

Male.—Coloration very similar to *B. marginatus*, but exterior margin of corium very narrowly pale, cuneus reddish. Pronotum more distinctly punctate, frons more convex, clypeus curved backward. Body, length 4.45 mm., width 1.25 mm.

Head, width across eyes 0.95 mm., length seen from above 0.35 mm., height seen from side 0.7 mm.; vertex, width 0.5 mm. Rostrum, length, 1.4 mm., surpassing apex of posterior coxae. Length of antennal segments I : II : III : IV = 0.32 mm. : 1.25 mm. : 0.85 mm. : 0.37 mm.

Pronotum, length 0.82 mm., width at base 1.5 mm., at apex 0.75 mm., posterior margin broadly rounded. Scutellum, length 0.65 mm., width 0.6 mm. Hemelytra impunctate; embolar margin subparallel, length 2 mm.; cuneus, length 0.65 mm., width 0.35 mm.; membrane bicellulate.

Type.—U.S.N.M. No. 56735, holotype, male, Australia, December 28, 1933, on *Dendrobium superbiens* (at Hawaii).

BROMELIAEMIRIS NIGRITUS, new species

Male.—Body, length 5.5 mm., width 1.55 mm., dark, clothed with whitish pubescence; legs and rostrum paler.

Head structure much like *B. puncticollis*, width across eyes 1.1 mm., length seen from above 0.4 mm., height seen from side 0.85 mm.; vertex, width 0.6 mm. Rostrum, length 1.75 mm., reaching middle of posterior coxae. Length of antennal segments I:II:III:IV=0.4 mm.:1.4 mm.:0.8 mm.:0.35 mm.

Pronotum impunctate, posterior lobe more convex than in *B. puncticollis*; length 1 mm., width at base 1.55 mm., at apex 0.8 mm.; posterior margin broadly rounded; apical collar not sinuate at apex. Scutellum slightly impressed at base, length 0.6 mm., width 0.7 mm. Embolar margin slightly broadly sinuate, length 2.5 mm.; cuneus, length 1 mm., width 0.32 mm.; membrane bicellulate.

Female.—Very similar to the male, length 4.9 mm., width 1.4 mm.; length of antennal segments I:II:III:IV=0.3 mm.:1.25 mm.:0.75 mm.:? (fourth missing).

Types.—U.S.N.M. No. 56736, holotype, male, Borneo, in orchid packing, intercepted at San Francisco, Calif., September 21, 1934; allotype, female, same data as for holotype.

BROMELIAEMIRIS VIRIDIPICTUS, new species

Female.—Body elongate, length 4.85 mm., width 1.8 mm., clothed with fuscous and pale hairs; black, areas around eyes on head, first antennal segment, a longitudinal line and a spot behind middle of lateral margin of pronotum, base and apex of clavus, base and narrow margin of inner apical angle of corium, cuneus (except a dark apical spot), basal half of femora, and apical half of tibiae greenish.

Head vertical, width across eyes 1.1 mm., length seen from above 0.32 mm., height seen from side 0.9 mm.; vertex, width 0.5 mm. Rostrum, length 1.9 mm., distinctly surpassing apex of posterior coxae. Length of antennal segments I:II:III:IV=0.35 mm.:1.05 mm.:0.52 mm.:0.5 mm.

Pronotum very minutely punctulate, length 0.84 mm., width at base 1.65 mm., at apex 0.8 mm., posterior margin straight before scutellum, apex of apical collar sinuate. Mesoscutum broadly exposed; scutellum small, length 0.5 mm., width 0.7 mm. Embolar margins subparallel, length 2.2 mm.; cuneus, length 0.75 mm., width 0.42 mm.; membrane bicellulate, inner apex of major areole angulate and pale.

Type.—U.S.N.M. No. 56737, holotype, female, Philippines, on *Phalaenopsis grandiflora* (at San Francisco, Calif.), January 17, 1941.

BROMELIAEMIRIS NIGRIPICTUS, new species

Male.—Body elongate, length 5.8 mm., width 2 mm., red, with black markings on dorsum, clothed with yellow and black hairs.

Head, width across eyes 1.07 mm., length seen from above 0.4 mm., height (to apex of clypeus) seen from side 0.8 mm.; vertex flat, width

0.54 mm., frons moderately convex, clypeus curvate backward, deeply discrete from frons. Eyes rather small, less prominent than *B. puncticollis*. Rostrum darkened at apex, length 2 mm., surpassing apex of posterior coxae. Antennae black, length of segments I:II:III:IV=0.55 mm. :1.25 mm. :0.5 mm. :0.4 mm.

Pronotum, length 0.95 mm., width at base 1.82 mm., at apex 0.77 mm., two parallel longitudinal lines one on each side of anterior lobe, two spots on posterior lobe, and humeral angles black; posterior lobe very finely punctulate, posterior margin moderately sinuate each side of the middle; apex of apical collar strongly sinuate. Mesoscutum broadly exposed; scutellum depressed at base, lateral margins and basal angles black; length 0.6 mm., width 0.7 mm.

Embolar margins of hemelytra slightly convex, length 2.75 mm.; clavus (except apex), a large area occupying more than inner apical half of corium and a small one outside of, and confluent with it black; cuneus, length 0.75 mm., width 0.45 mm.; membrane black, bicellate, inner apical angle of major areole broadly angulate. Middle of mesosternum, a longitudinal line each side of venter, base and apex of tibiae, tarsi, and claws black. Right clasper long, tapering apically, slightly curvate; left clasper indistinct; aedeagus (?) large, slightly curvate.

Female.—Very similar to male, length 5.5 mm., width 2.2 mm.; length of antennal segments I:II:III:IV=0.6 mm. :1.25 mm. :0.6 mm. :0.5 mm.

Differs from all other species by the different coloration, sinuate posterior margin of pronotum, and short antennae.

Types.—U.S.N.M. No. 56738, holotype, male; allotype, female; and paratypes, 3 males and female, Burma, on orchid (Hoboken, N. J.), October 19, 1940.

KEY TO SPECIES OF BROMELIAEMIRIS

- | | |
|--|-----------------------------------|
| 1. Hemelytra uniformly dark..... | 2 |
| Hemelytra bicolorous..... | 4 |
| 2. Pronotum unicolorous..... | 3 |
| Pronotum with lateral margins black..... | <i>dissimilis</i> , new species |
| 3. Head and pronotum uniformly black..... | <i>nigritus</i> , new species |
| Head and pronotum reddish, clypeus black..... | <i>bicolor</i> Schumacher |
| 4. Body beneath uniformly reddish or yellowish, destitute of dark markings,
clavus uniformly black..... | 5 |
| Body beneath black or marked with black, clavus bicolorous..... | 6 |
| 5. Pronotum distinctly punctate, first antennal segment distinctly shorter
than width of vertex..... | <i>puncticollis</i> , new species |
| Pronotum impunctate, first antennal segment equal to (♂) or very
slightly shorter than (♀) width of vertex..... | <i>marginatus</i> , new species |
| 6. Body beneath black, above green and black..... | <i>viridipictus</i> , new species |
| Body beneath predominantly reddish, above red and black. | <i>nigripictus</i> , new species |

Subfamily DICYPHINAE

APOLLODOTIDEA, new genus

Body oblong, shining, clothed with fine long simple hairs.

Head small, about half as long as wide, vertical before eyes; vertex nearly as broad as first antennal segment long, finely marginate; frons flat; clypeus long, not prominent, discrete at base; jugum and lorum somewhat confluent. Eyes large, coarsely granulate, seen from side vertically ovate, occupying nearly the whole height of the head, seen from above small, somewhat rounded, far removed from base of head, postocular part about as long as length of eye seen from side. Antennae inserted at about the middle of inner margins of eyes, linear, first segment short, a little thickened, second longer than first, third, and fourth taken together, third longer than fourth. Rostrum surpassing apex of anterior coxae.

Pronotum coarsely punctate, strongly convex, declivent, greatly narrowed toward apex, wider than long, more than three times as wide at base as at apex, posterior and lateral margins straight, humeral angles rounded; apical collar impunctate, convex, about as long as first antennal segment, thick; calli obsolete, a small triangular area behind apical collar impunctate and elevated. Scutellum covered at base, triangular, strongly convex.

Hemelytra semitransparent, embolar margins distinctly convex; embolium widest at middle, gradually narrowed towards both ends, inner margin straight; cuneus longer than wide, fracture profound, exterior margin slightly convex; membrane well developed, unicel-lulate.

Xyphus of prosternum with disk moderately concave. Ostiolar peritreme small. Vagina in female much reduced. Legs moderately long, slender, tibiae destitute of spinules, third tarsal segment very slightly thickened; claws sharply bent, without cleft at base, arolia bristlelike, pseudarolia absent.

This genus is closely related to *Apollodotus* Distant, but with calli obsolete, scutellum not gibbous, and embolium and cuneus differently formed. Distinguished from the Palaearctic genus *Stethoconus* Flor (cf. Fieber, Wien. Ent. Monatsb., vol. 8, p. 79, pl. 2, fig. 8, 1864, and Reuter, Hem. Gym. Eur., vol. 5, p. 8, pl. 1, fig. 2, 1896) by more convex pronotum and not elevated scutellum.

Genotype.—*Apollodotidea y-signata*, new species.

APOLLODOTIDEA Y-SIGNATA, new species

FIGURE 57, h

Female.—Body, length 3.2 mm., width 1.3 mm., above light brown with dark brown markings; beneath black; clothed with long fine flavous hairs.

Head brown, width across eyes 0.52 mm., length seen from above 0.22 mm., height seen from side 0.4 mm.; vertex, width 0.2 mm. Eyes granulate. Antennae linear, length of segments I:II:III:IV=0.22 mm.:1.22 mm.:0.42 mm.:0.2 mm.

Pronotum coarsely punctate, length 0.8 mm., width at base 1.15 mm., at apex 0.35 mm.; dark brown, apical collar, a Y-shaped marking on the disk, a spot each side along the posterior margin near humeral angle, and posterior margin very narrowly, light brown; apical collar convex, length 0.1 mm. Scutellum black, length 0.45 mm., width 0.55 mm.

Hemelytra with apex of corium reaching apex of abdomen, pellucid; clavus, base of corium and a broad transverse band across middle of corium, dark brown; length of embolar margin 1.3 mm.; cuneus slightly declivent, length 0.35 mm., width 0.25 mm.; membrane slightly fumate, inner apical angle of membranal cell rounded. Xyphus (except dark marking at middle), apex of abdomen, and legs, light brown. Length of posterior femora 1.15 mm., length of posterior tibiae 1.2 mm.

Male.—Body, length 2.9 mm., width 1.2 mm.; coloration very similar to the female; length of first antennal segment 0.22 mm., second 1.25 mm., apical half of the latter darker.

Types.—U.S.N.M. No. 56741, holotype, female; allotype, male. Both from Sandakan, Borneo (Baker).

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NEW SPECIES OF BUPRESTID BEETLES FROM
TRINIDAD

W. S. FISHER

IN A collection of buprestid beetles received for identification during the past year from E. McC. Callan, Lecturer in Entomology, Imperial College of Tropical Agriculture, Trinidad, a number of undescribed species were found. These are here described as new. Mr. Callan is very much interested in the prey of wasps, and most of the species described in this paper were found in the cells of a sphecoid wasp (*Cerceris* sp.).

Genus *CHRYSOBOTHRIS* Eschscholtz*CHRYSOBOTHRIS CORNIGERA*, new species

Male.—Small, oblong, subopaque, glabrous, purplish red above, pronotum sometimes with sides and anterior margin bright green, each elytron with three bright-green spots—an oblong spot in basal depression, an irregular transverse spot at middle, and an irregular lunate spot at apical third; head bronzy green, with median part brownish black; antennae bronzy green, outer segments bluish green; body beneath strongly shining, black, with a faint purplish reflection, anterior legs in part blackish green or blue.

Head very deeply, broadly, transversely depressed on vertex, feebly, triangularly flattened behind clypeus, armed on each side at vertex along margin of eye with a long, broad, subtriangular horn, which is flattened, slightly twisted, and acute at apex, surface glabrous, densely, finely granulose, sparsely, finely punctate; eyes narrowly elongate, widely separated on occiput, clypeus transversely sinuate in front, with a small, median notch, and a small, acute tooth on each side midway between notch and outer angle. Antenna slightly nar-

rowed to apex; intermediate segments compact, slightly transverse; third segment as long as following three segments united.

Pronotum more than twice as wide as long, distinctly wider at apex than at base, widest near apex; sides strongly sinuate, and strongly converging posteriorly; posterior angles obtuse; anterior margin slightly sinuate, without a distinct median lobe; base triangularly emarginate on each side, median lobe broadly rounded in front of scutellum; disk moderately convex, with a broad, shallow, transverse depression behind middle; surface finely, densely granulose, sparsely, shallowly punctate, rather coarsely reticulate at sides. Scutellum small, triangular.

Elytra at base slightly wider than pronotum near apex; sides parallel along basal half, strongly, obliquely converging posteriorly, tips separately broadly rounded; lateral margins finely serrate; basal depressions broad and deep; humeral depressions shallow; surface finely, sparsely, shallowly punctate, slightly rugose basally, the median green spot on each side slightly depressed, without longitudinal costae.

Abdomen beneath glabrous, finely, densely granulose, finely, densely punctate, more sparsely punctate on basal sternite; without lateral callosities; last visible sternite broadly, arcuately emarginate at apex, without a submarginal ridge, lateral margins not serrate. Prosternum glabrous, sparsely, coarsely, shallowly punctate; anterior margin broadly rounded. Anterior femur with a large, rather acute tooth, which is not distinctly dentate on outer margin. Anterior tibia strongly arcuate, unarmed at apex; middle and posterior tibiae straight.

Female.—Differs from the male in having the antennae black, the head brown in front, becoming reddish cupreous on the vertex and occiput, broadly, triangularly depressed on the front, but not deeply, transversely depressed on the vertex, and without frontal horns, and the last visible abdominal sternite with a short triangular tooth at the apex.

Length 5-5.5 mm., width 2-2.4 mm.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type, allotype, and paratype.—U. S. N. M. No. 56864. Paratypes returned to Mr. Callan.

Remarks.—Described from seven specimens—six males and one female (one male type)—collected at the type locality, April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.

This species differs from nearly all the other species of this genus in having two distinct horns on the front of the head in the males. It is allied to *Chrysobothris cornuta* Kerremans but differs from the description given for that species in having the horns on the front of the head of different shape and arising from the inner margins

a median green spot in front of scutellum; elytra greenish black, with a faint purplish reflection and a distinct bluish-green space behind scutellum; body beneath strongly shining, brown, with cupreous and greenish reflections in different lights.

Head with front broad, subequal in width at top and bottom, with a deep, elongate depression in front of clypeus; sides nearly parallel, vaguely rounded at middle; surface densely, finely granulose, coarsely, rather densely punctate in front, vaguely, longitudinally costate on vertex and occiput, densely clothed with short, recumbent, white hairs in depression in front of clypeus; clypeus quadrate, rather wide between antennae, deeply, rectangularly emarginate in front; antenna extending to near middle of pronotum, serrate from fourth segment.

Pronotum wider than long, wider at apex than at base, widest along apical half; sides parallel anteriorly, vaguely converging posteriorly; posterior angles rectangular; marginal and submarginal carinae slightly sinuate, rather widely separated anteriorly, united at basal fourth; anterior margin vaguely sinuate, without a distinct median lobe; base arcuately emarginate on each side, median lobe broadly subtruncate in front of scutellum; disk very uneven, broadly depressed along sides, broadly, transversely concave on basal half, with a shallow, elongate depression in front of scutellum, and a shallow, transverse, median depression behind anterior margin; prehumeral carinae strongly elevated, strongly arcuate at base, united to marginal carinae in front of middle; surface glabrous, densely, finely granulose, finely, irregularly, transversely rugose, finely indistinctly punctate between rugae. Scutellum strongly, transversely carinate.

Elytra broadly, shallowly constricted along middle, tips bidentate, outer tooth longer than inner one; surface flattened, depressed along sutural margins, finely, densely imbricate-punctate, uniformly clothed with very short, recumbent, inconspicuous hairs, and each elytron with an inconspicuous, elongate, white pubescent spot along sutural margin in front of middle, and an inconspicuous, white pubescent, sutural vitta on apical third.

Abdomen broadly exposed above, strongly convex beneath; surface densely, finely granulose, finely, sparsely punctate posteriorly, transversely rugulose on basal segment, sparsely clothed with very short, inconspicuous hairs, with a transverse white pubescent fascia on each side along suture between first and second visible sternites; vertical portions of first sternite clothed with reddish-brown pubescence, and third, fourth, and fifth sternites with white pubescence; suture obsolete between first and second sternites; mesosternum and metasternum densely clothed at sides with recumbent, reddish-brown pubescence. Prosternum coarsely, shallowly punctate, sparsely clothed with recumbent, whitish hairs, with a median spot of short, erect hairs; prosternal lobe broadly, shallowly emarginate in front; prosternal process broad,

constricted between coxal cavities, with an obtuse, median tooth at apex. Tarsal claws similar on all feet, cleft near middle, inner tooth shorter than outer one, slightly turned inward, but not touching tooth on opposite side.

Length 9 mm., width 2.2 mm.

Female.—Unknown.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type.—U. S. N. M. No. 56865. Paratype returned to Mr. Callan.

Remarks.—Described from two males (one type) collected at the type locality April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.

AGRILUS ANIMATUS, new species

Male.—Elongate, moderately robust, subopaque; antennae brownish black; head green, slightly bronzy on occiput, with a median brown spot on vertex; pronotum and scutellum green, the former bronzy toward apical angles, violaceous blue along base and at posterior angles, with a large, median, black spot along anterior margin; elytra greenish black, with a distinct purplish tinge; body beneath strongly shining, cupreous, with a distinct purplish tinge.

Head with front broad, subequal in width at top and bottom, broadly flattened on vertex, with a deep, elongate depression behind clypeus; sides nearly parallel, vaguely rounded at middle; surface densely, finely granulose, coarsely, rather densely punctate on front, coarsely, longitudinally costate on occiput and vertex, densely clothed with short, recumbent, white hairs in depression behind clypeus; clypeus wider than long, wide between antennae, deeply, rectangularly emarginate in front; antenna extending to middle of pronotum, serrate from fourth segment.

Pronotum wider than long, subequal in width at base and apex, widest along apical half; sides parallel anteriorly, vaguely converging posteriorly; posterior angles rectangular; marginal and submarginal carinae strongly sinuate, narrowly separated anteriorly, united near base; anterior margin vaguely sinuate, without a distinct median lobe; base arcuately emarginate on each side, median lobe broadly subtruncate in front of scutellum; disk uneven, broadly, deeply depressed along sides, broadly, transversely concave on basal half, shallowly, broadly depressed at middle behind anterior margin; prehumeral carinae strongly elevated, strongly arcuate at base, united to marginal carinae at middle; surface glabrous, finely, densely granulose, coarsely, transversely, irregularly rugose, finely, indistinctly punctuate between rugae. Scutellum strongly, transversely carinate.

Elytra broadly, shallowly constricted in front of middle, slightly depressed along sutural margins, tips separately obliquely truncate,

with a short spine at outer angle; surface finely, densely imbricate-punctate, with apical fourth and antemedian space rather densely clothed with short, inconspicuous, white hairs.

Abdomen narrowly exposed above, strongly convex beneath; surface finely, densely granulose, finely, sparsely punctate posteriorly, transversely rugulose on basal segment, sparsely clothed with short, recumbent, white hairs, with dense, white-pubescent spots at sides of first, third, and fourth sternites, and vertical portions of all sternites with short, recumbent, white pubescence; mesosternum and metasternum densely clothed at sides with short, recumbent, reddish-brown pubescence; suture obsolete between first and second visible sternites. Prosternum coarsely punctate, sparsely clothed with short, recumbent, whitish hairs, with a median spot of short, erect hairs; prosternal lobe broadly rounded in front; prosternal process broad, arcuately constricted between coxal cavities, with an obtuse, median tooth at apex. Tarsal claws similar on all feet, cleft near middle, inner tooth of each shorter than outer one, turned slightly inward, but not touching tooth on opposite side.

Length 9 mm., width 2 mm.

Female.—Unknown.

Type locality.—Cumaca, Trinidad, British West Indies.

Type.—U. S. N. M. No. 56866.

Remarks.—Described from a single male collected at the type locality on May 16, 1942, by E. McC. Callan.

AGRILUS ADAMSONI, new species

Male.—Elongate, slender, subopaque; uniformly brownish black above, except front of head, which is bright green, the elytra with vague pubescent spots; body beneath moderately shining, brown, with a cupreous tinge, legs in part greenish or bronzy.

Head with front broad, slightly convex, without a median depression, subequal in width at top and bottom, shallowly, transversely depressed behind clypeus; sides broadly, arcuately constricted in front; surface glabrous, densely, finely granulose, sparsely, finely punctate, longitudinally costate on occiput; clypeus quadrate, wide between antennae, shallowly, arcuately emarginate in front. Antennae missing.

Pronotum slightly wider than long, subequal in width at base and apex, widest along apical half; sides parallel anteriorly, vaguely converging posteriorly; posterior angles rather acute; marginal and submarginal carinae sinuate, widely separately anteriorly, united at basal fourth; anterior margin strongly sinuate, median lobe moderately produced and broadly rounded; base arcuately emarginate on each side, median lobe shallowly, arcuately emarginate in front

of scutellum; prehumeral carinae strongly elevated, slightly arcuate, extending forward from posterior angles to middle of pronotum, and widely separated from marginal carinae; disk convex, shallowly depressed along sides, shallowly, transversely concave on basal half, vaguely flattened at middle behind anterior margin; surface densely, finely granulose, feebly, transversely, irregularly rugose, finely, indistinctly punctate between rugae, with a few short, recumbent, white hairs along sides. Scutellum strongly, transversely carinate.

Elytra broadly, shallowly constricted in front of middle, vaguely, irregularly depressed along sutural margins, tips separately broadly rounded and finely dentate; surface finely, densely imbricate-punctate, sparsely clothed with very short, inconspicuous hairs, and each elytron ornamented along sutural margin with two elongate, inconspicuous, white-pubescent spots, one in front of middle and one at apical third.

Abdomen narrowly exposed above, strongly convex beneath; surface indistinctly granulose, finely, sparsely punctate posteriorly, vaguely imbricate on first visible sternite, very sparsely clothed with short, inconspicuous hairs; first sternite longitudinally depressed at middle, vertical portions of sternites not conspicuously pubescent; suture obsolete between first and second visible sternites. Prosternum finely, densely rugose, sparsely clothed with short, recumbent, white hairs; prosternal lobe broadly rounded in front; prosternal process broad, constricted between coxal cavities, with an obtuse, median tooth at apex. Tarsal claws similar on all feet, cleft near base, inner tooth of each short and not turned inward.

Length 4.5 mm.; width 1 mm.

Female.—Unknown.

Type locality.—St. Augustine, Trinidad, British West Indies.

Type.—U. S. N. M., No. 56867.

Remarks.—Described from a single male collected at the type locality, May 12, 1942, by A. M. Adamson. This species is named for the collector. Since the antennae are missing, it may be a species having the antenna serrate from either the fourth or the fifth segment, and so it is placed under both sections in the key.

AGRILUS ESCULENTUS, new species

Male.—Elongate, slender, moderately shining; head bright green in front, black on occiput; pronotum and elytra purplish black, the latter with a faint bronzy tinge at humeral angles and at middle of each elytron, and ornamented with irregular pubescent markings; body beneath more strongly shining than above, dark brown, with a cupreous tinge, the legs in part greenish or cupreous.

Head with front rather broad, convex, slightly wider at top than at bottom, with a deep depression behind clypeus; sides nearly

parallel, vaguely rounded at middle; surface nearly glabrous, densely, finely granulose over entire surface, with a few coarser granules intermixed; clypeus quadrate, rather wide between antennae, depressed posteriorly, shallowly, arcuately emarginate in front; antenna extending to middle of pronotum, serrate from fourth segment.

Pronotum slightly wider than long, subequal in width at base and apex, widest along apical half; sides parallel anteriorly, vaguely converging posteriorly; posterior angles rectangular; marginal and submarginal carinae straight, rather widely separated anteriorly, united at basal fourth; anterior margin strongly sinuate, median lobe strongly produced and broadly rounded; base transversely sinuate on each side, median lobe scarcely produced, broadly rounded in front of scutellum; prehumeral carinae strongly elevated, straight, extending obliquely inward from posterior angles to middle at some distance from lateral margins; disk uneven, broadly depressed along sides, with three broad depressions at base and an elongate, median depression in front of middle; surface densely, finely granulose, feebly, coarsely, transversely, irregularly rugose, finely, indistinctly punctate between rugae, sparsely clothed at sides and in basal depressions with short, recumbent, white hairs. Scutellum transversely carinate.

Elytra broadly, shallowly constricted in front of middle, not distinctly depressed along sutural margins, tips separately broadly rounded and finely, irregularly dentate; surface rather coarsely, densely imbricate-punctate, each elytron clothed with short, recumbent, white pubescence as follows: A large spot in basal depression, an elongate spot in front of middle, the spot deeply emarginate externally, and nearly separated into two spots, a large triangular spot at apical third, and a few inconspicuous hairs at apex.

Abdomen scarcely exposed above, strongly convex beneath; surface finely, sparsely punctate, with fine, undulating lines, sparsely clothed with very short, inconspicuous hairs, a spot of erect hairs at middle of first sternite, and a spot of dense, recumbent, white hairs at sides of third sternite; suture obsolete between first and second visible sternites; vertical portions of sternites not conspicuously pubescent; posterior coxae densely clothed with recumbent, white hairs. Prosternum finely, densely granulose, densely clothed with long, erect hairs; prosternal lobe shallowly, arcuately emarginate in front; prosternal process broad, sides obliquely converging posteriorly to the obtuse tooth at apex, not expanded behind coxal cavities. Tarsal claws similar on all feet, cleft near middle, inner tooth of each very short and not turned inward.

Female.—Differs from the male in having the front of head cupreous, and in not having long, erect hairs on the prosternum and first abdominal sternite.

Length 5 mm., width 1.2 mm.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type.—U. S. N. M. No. 56868. Allotype returned to Mr. Callan.

Remarks.—Described from one male and one female (male type) collected at the type locality, April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.

AGRILUS HOSTIA, new species

Male.—Elongate, slender, subcylindrical, strongly shining, uniformly purplish brown above, except front of head, which is dark bluish green; body beneath dark brown, with a distinct cupreous tinge.

Head with front rather broad, flattened, wider at top than at bottom, with a broad, shallow, longitudinal depression on front; sides parallel posteriorly, distinctly converging anteriorly; surface glabrous, finely, densely granulose, coarsely, sparsely, shallowly punctate, slightly rugose on occiput; clypeus narrow between antennae, broadly, deeply, arcuately emarginate in front; antenna extending to apical third of pronotum, serrate from fourth segment.

Pronotum slightly wider than long, distinctly wider at apex than at base, widest near apex; sides converging from near apical angles to posterior angles, which are rectangular; margin and submarginal carinae vaguely sinuate, rather widely separated their entire length; anterior margin strongly sinuate, median lobe moderately produced and broadly rounded; base arcuately emarginate on each side, median lobe broadly rounded and vaguely emarginate in front of scutellum; prehumeral carinae faintly indicated, narrowly separated from lateral carina and united to it near middle; disk convex, broadly depressed along sides, broadly, transversely concave on basal half, without a median depression; surface glabrous, densely, finely granulose, vaguely transversely, arcuately rugose, indistinctly punctate between rugae. Scutellum feebly, transversely carinate.

Elytra broadly, shallowly constricted in front of middle, slightly depressed along sutural margins, tips separately broadly rounded, and finely, irregularly dentate; surface coarsely, densely imbricate-punctate; sparsely clothed with very short, recumbent, inconspicuous hairs.

Abdomen not exposed above, strongly convex beneath; surface finely, densely granulose, finely, indistinctly punctate posteriorly, faintly imbricate-punctate on basal sternite, sparsely clothed with short, recumbent and semierect, white hairs; vertical portions of sternites not conspicuously pubescent; suture obsolete between first and second visible sternites. Prosternum glabrous, finely, densely granulose, vaguely rugose; prosternal lobe broadly rounded in front; prosternal process broad, sides parallel, truncate and with an acute median tooth at apex, not expanded behind coxal cavities. Tarsal

claws similar on all feet, cleft near middle, inner tooth of each slightly shorter than outer one, turned inward and nearly touching tooth on opposite side.

Length 5.5–6.2 mm., width 1–1.2 mm.

Female.—Unknown.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type and paratype.—U. S. N. M. No. 56869. Paratype returned to Mr. Callan.

Remarks.—Described from three males (one type) collected at the type locality, April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.

AGRILUS CAPTIVUS, new species

Female.—Elongate, slender, subopaque; head and anterior margin of pronotum reddish cupreous; posterior part of pronotum blackish green, strongly shining; scutellum black; elytra olive-green anteriorly, becoming bluish black posteriorly; body beneath more strongly shining than above, black, with a slight bronzy tinge.

Head with front wide, convex, slightly wider at top than at bottom, vaguely, broadly flattened behind clypeus, without a median depression; sides parallel posteriorly, feebly converging toward bottom; surface finely, densely granulose, rather coarsely, irregularly, transversely rugose, indistinctly punctate between rugae, with a few short, recumbent, white hairs behind clypeus; clypeus narrow between antennae, broadly, rather deeply, arcuately emarginate in front; antenna extending slightly beyond anterior margin of pronotum, serrate from fifth segment.

Pronotum distinctly wider than long, subequal in width at apex and base, widest near apical third; sides broadly rounded anteriorly, parallel near posterior angles, which are rectangular; marginal and submarginal carinae sinuate, widely separated anteriorly, united near basal third; anterior margin strongly sinuate, median lobe strongly produced and broadly rounded; base arcuately emarginate on each side; median lobe arcuately emarginate in front of scutellum; prehumeral carinae rather strongly elevated, arcuate, extending forward from posterior angles to near middle of pronotum, but not united to marginal carinae; disk convex, deeply depressed on each side, broadly, transversely depressed in front of scutellum, without a median depression; surface coarsely, irregularly, transversely rugose, indistinctly punctate between rugae, with a spot of dense, recumbent, white hairs near apical angles. Scutellum strongly, transversely carinate.

Elytra broadly, shallowly constricted at middle, slightly depressed along sutural margins, tips separately broadly rounded and finely dentate; surface finely, densely imbricate-punctate, rather densely, uniformly clothed with short, recumbent, scalelike, white hairs.

Abdomen slightly exposed above, strongly convex beneath; surface faintly granulose, indistinctly punctate posteriorly, slightly imbricate on basal sternites, sparsely clothed with very short, recumbent hairs, with a spot of dense white pubescence at sides of second, third, fourth, and fifth sternites; vertical portions of sternites not conspicuously pubescent; suture obsolete between first and second sternites. Prosternum densely rugose, sparsely clothed with short, recumbent, white hairs; prosternal lobe broadly rounded in front; prosternal process broad, constricted between coxal cavities, with an obtuse, median tooth at apex. Tarsal claws similar on all feet, cleft near middle, inner tooth of each short, broad, and not turned inward.

Length 5 mm., width 1.2 mm.

Male.—Unknown.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type.—U. S. N. M. No. 56870.

Remarks.—Described from a single female collected at the type locality, April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.

AGRILUS CONSUMPTORIS, new species

Female.—Elongate, slender, subcylindrical, subopaque above, strongly shining beneath, uniformly black, the elytra with white-pubescent spots.

Head with front rather narrow, convex, subequal in width at top and bottom, vaguely, broadly flattened behind clypeus, without a median depression, sides parallel; surface densely, finely granulose, transversely rugose, with a few short, recumbent, white hairs behind clypeus; clypeus very narrow between antennae, transversely carinate at middle, vaguely, arcuately emarginate in front; antenna short, extending slightly beyond anterior margin of pronotum, serrate from fifth segment.

Pronotum slightly wider than long, subequal in width at base and apex, widest at apical third; sides broadly rounded anteriorly, more strongly converging posteriorly; posterior angles rectangular; marginal carina straight, submarginal carina arcuate, the two carinae broadly separated at middle, united at apex and basal fourth; anterior margin strongly sinuate, median lobe strongly produced and broadly rounded; base arcuately emarginate on each side, median lobe broadly rounded in front of scutellum; prehumeral carinae short, vaguely indicated, not united to base or to marginal carina; disk convex, broadly depressed at middle on each side, vaguely, transversely concave on basal half, without a median depression; surface densely, finely granulose, finely irregularly, transversely rugose, finely, indistinctly punctate between rugae, clothed in lateral depressions with a few short, semi-erect, white hairs. Scutellum strongly, transversely carinate.

Elytra broadly, shallowly constricted at middle, broadly flattened along sutural margins, tips separately broadly rounded and coarsely, irregularly dentate; surface finely, densely imbricate-punctate, sparsely clothed with short, inconspicuous hairs, each elytron ornamented along sutural margins with white-pubescent spots as follows: A small spot in basal depression, a round spot at basal fourth, an elongated spot just in front of middle, and an oblique spot at apical fourth.

Abdomen narrowly exposed above, strongly convex beneath; surface slightly imbricate posteriorly, densely, finely imbricate on basal segments, sparsely clothed with very short, inconspicuous hairs, and ornamented on each side of third sternite with a transverse spot of dense, white hairs, and median parts of first and second sternites densely clothed with long, erect, yellowish hairs; vertical portions of second sternite with a small spot of white pubescence; suture obsolete between first and second sternites. Prosternum densely, finely granulate, slightly rugose, sparsely clothed with short, recumbent, white hairs; prosternal lobe broadly rounded in front; prosternal process broad, the sides obliquely converging posteriorly, with an obtuse tooth at apex, not expanded behind coxal cavities. Tarsal claws similar on all feet, cleft near middle, inner tooth of each very short and not turned inward.

Length 6.5 mm., width 1.4 mm.

Male.—Unknown.

Type locality.—"11th mile Arima-Blanchisseuse Road, Trinidad, British West Indies."

Type.—U. S. N. M. No. 56871.

Remarks.—Described from a single female collected at the type locality, March 31, 1943, by E. McC. Callan.

AGRILUS VICTIMA, new species

Male.—Elongate, slender, moderately shining; uniformly dark brown above (except front of head, which is dull, blackish green), with a vague purplish reflection in different lights; body beneath more strongly shining than above, brown, with a distinct cupreous tinge, the legs in part greenish or bronzy.

Head with front broad, slightly convex, without a median depression, subequal in width at top and bottom, shallowly, transversely depressed behind clypeus; sides broadly, arcuately constricted in front; surface glabrous, finely, densely granulate, coarsely, sparsely, shallowly punctate; clypeus quadrate, broad between antennae, broadly, shallowly, arcuately emarginate in front; antenna extending nearly to middle of pronotum, serrate from fifth segment.

Pronotum slightly wider than long, subequal in width at base and apex, widest near apex; sides feebly converging from apical angles to posterior angles, which are nearly rectangular; marginal and sub-

marginal carinae sinuate, separated their entire length, more widely separated anteriorly; anterior margin strongly sinuate, median lobe strongly produced and broadly rounded; base arcuately emarginate on each side, median lobe shallowly, arcuately emarginate in front of scutellum; prehumeral carinae short, arcuate, vaguely indicated; disk convex, shallowly depressed along sides, shallowly, transversely concave on basal half, without a median depression; surface glabrous, densely, finely granulose, finely, transversely, irregularly rugose; finely, sparsely punctate between rugae. Scutellum finely, transversely carinate.

Elytra broadly, shallowly constricted in front of middle, slightly flattened or depressed along sutural margins, tips separately broadly rounded and finely dentate; surface finely, densely imbricate-punctate, sparsely, uniformly clothed with short, recumbent, white hairs.

Abdomen slightly exposed above, strongly convex beneath; surface finely, densely granulose, vaguely imbricate, sparsely clothed with short, recumbent, white hairs; vertical portions of sternites not distinctly pubescent; first visible sternite longitudinally depressed at middle, with a small gibbosity on each side of depression, suture obsolete between first and second sternites. Prosternum finely, densely granulose, slightly rugose, sparsely clothed with short, recumbent, white hairs; prosternal lobe broadly rounded in front; prosternal process broad, sides parallel, truncate and with an acute median tooth at apex, not expanded behind coxal cavities. Tarsal claws similar on all feet, cleft near middle, inner tooth of each very short and not turned inward.

Female.—Differs from the male in having the front of the head cupreous, the antenna extending to the apical third of the pronotum, and the first abdominal sternite convex at the middle.

Length 4.5–5.5 mm., width 1–1.2 mm.

Type locality.—Mundo Nuevo, Trinidad, British West Indies.

Type.—U. S. N. M. No. 56872. Allotype returned to Mr. Callan.

Remarks.—Described from one male and one female (male type) collected at the type locality, April 4, 1943, in the cells of a sphecoid wasp (*Cerceris* sp.) by E. McC. Callan.



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THE FULGOROIDEA, OR LANTERNFLIES, OF TRINIDAD
AND ADJACENT PARTS OF SOUTH AMERICA

By R. G. FENNAH

THE major portion of the material with which the present report is concerned was collected in Trinidad by the writer partly during occasional visits dating from 1937 but chiefly between April 1942 and March 1943. To this was added a small but very interesting group from the collection of the Imperial College of Tropical Agriculture, built up since 1933, and a few specimens in an imperfect condition from an older collection originally belonging to the former Imperial Department of Agriculture for the British West Indies. Types, paratypes, or representative material of species discussed have been deposited in the United States National Museum (U.S.N.M.) and the British Museum of Natural History (B.M.N.H.) as stated under each. Certain paratypes have also been placed in the Museum of Comparative Zoology, Cambridge, Mass., and in the collection of the Imperial College of Tropical Agriculture, Trinidad.

The warmest thanks of the writer are due to Dr. A. M. Adamson, professor of zoology at the Imperial College of Tropical Agriculture, for his ready offer of the material in his charge for the present study, and to Dr. E. McC. Callan, lecturer in zoology, for gifts of specimens from time to time. For his constant assistance in the naming of species the writer is deeply indebted to W. E. China, of the British Museum. Mr. China has examined more than half the species and has commented on notes and drawings submitted to him from time to time, and his remarks are added below the species to which they refer.

In this report the terms *vertex* and *frons* are retained as a matter of convenience; there is good reason to believe that the former represents the basal part of the orthopteroid vertex, while the latter, as far as the frontoclypeal suture, represents the anterior portion of the vertex lying basad of the median ocellus. The lateral carinae of the frons are the carinae lying between the median carina and the lateral margins; the lateral carinae of the pronotal disk lie between the middle line and the apparent edge, seen in dorsal view, between the eye and the tegula on each side. In the tegmina the *apical line* is the first transverse line of cross veins basad of the apical margin; the *nodal line* is the shortest transverse line between the nodal area, near the apex of Sc, and the apex of the clavus. In the female genitalia the third pair of valvulae, which compose the ovipositor sheath in forms with a complete ovipositor, are termed *lateral styles* where the ovipositor is incomplete.

In the descriptions that follow, the characters of the genitalia are considered in some detail, irrespective of sex. Although those afforded by the female genitalia are usually not so conspicuous as their counterparts in the male, they have in many cases equally high diagnostic value, and in the writer's opinion are of importance in indicating the relationship of genera. Whenever possible the form of the egg has been described; it is not yet certain whether the variations observed are of specific or of generic value. In the case of the compact Antillean flatid genera *Antillormenis* and *Ilesia* it is definitely established that the shape of the egg does not vary within the genus. In the Trinidadian Flatidae the difficulty is not to discover differences between the eggs of obviously different genera, but to find eggs that are alike within any supposedly homogeneous genus.

The classification used herein follows that adopted by Muir (Ann. Mag. Nat. Hist., ser. 10, vol. 6, pp. 461-478, 1930). For the rapid determination of genera the student is referred to keys given by Metcalf (Bull. Mus. Comp. Zool., vol. 82, No. 5, 1938), which although relating to Central America are sufficiently applicable to genera occurring in Trinidad; in the same work may be found an extensive bibliography of American Fulgoroidea. The figures that illustrate the present paper have been drawn by the writer.

In Trinidad only a very limited amount of collecting has so far been done in this group, but sufficient evidence is already available to prove that the fulgoroid fauna of the island is continental and has a close affinity to that of the Brazilian subregion, though being relatively impoverished. So far no representatives of the families Tettigometridae, Achilixiidae, or Lophopidae have been recorded in Trinidad, although species of all occur in South America. Three families found in Trinidad (Fulgoridae, Dictyopharidae, and Nogodinidae) are absent from the Lesser Antilles, which lie to the

north. (The references to Lesser Antillean Dictyopharidae in literature are all due to misinterpretation of tropiduchid genera.) The genera found in Trinidad, excluding genera described below, about the distribution of which little is known, also occur on the mainland; in contrast to this comparatively few genera are common to Trinidad and the Lesser Antilles, and include *Oliarus*, *Pintalia*, *Bothriocera* (Cixiidae), *Burnilia*, *Saccharosydne*, *Peregrinus*, *Sogata*, *Delphacodes* (Delphacidae), *Neocenchrea*, *Cedusa*, *Patara*, *Otiocerus* (Derbidae), *Catonia* (Achilidae), *Euhyloptera*, *Flatoidinus* (Flatidae), *Acanalonia* (Acanaloniidae), and *Thionia* (Issidae). That the Lesser Antillean fulgoroid fauna is not in turn to be regarded as a greatly impoverished Trinidadian fauna is shown by the number of genera that do not appear to occur in Trinidad, such as *Cyphocerotops*, *Tangidia* (Tropiduchidae), *Quilessa*, *Prosotropis* (Kinnaridae), *Cionoderus* (Achilidae), *Scarposa*, *Antillormenis*, and *Ilesia* (Flatidae).

Occasional specimens of most fulgoroid species may be found resting or feeding on crops that have been planted in cultivations encroaching on their natural habitat, and most of these are of economic importance only as possible vectors of disease. The most serious pest species is the delphacid *Peregrinus maidis* (Ashmead), which has been shown to be a local vector of stripe disease of maize (H. R. Britton-Jones and R. E. D. Baker, *Tropical Agriculture*, vol. 10, Nos. 5 and 8, 1933); another species of the same family, *Saccharosydne saccharivora* (Westwood), is quite common on sugarcane but in Trinidad does not appear to develop in great numbers. The cixiid *Paramyndus cocois* (described below) occurs in the adult stage in abundance on the lower surface of leaves of coconut, where many may be found killed by fungus; the nymphal stages are subterranean. This insect forms an interesting parallel to *Euryphlepsia cocois* Muir, which infests coconuts in a similar manner in the south Pacific. *Paramyndus* has been collected on sugarcane and Guatemala grass and is not obligately restricted in its choice of host. Among pests of minor importance may be listed the dictyopharid species *Taosa herbida* (Walker) and *Retiala viridis* (described below), which for short periods may be abundant on coffee, a crop also attacked by the ever-present flatids *Flatormenis squamulosa* (Fowler), *Epormenis fuliginosa* (Fennah), and *Ormenis antoniae* Melichar, which occur on the plant in all stages. The last-named species is common also on the leaves and stems of mango, the large squat nymph apparently preferring the former and the adult the latter situation. In forested areas the kinnarid *Bytrois nemoralis* (described below) often feeds in the adult stage on the leaves of cacao, which is also attacked over a wider area by *Epormenis unimaculata* (Fennah) and the acanaloniids *Acanalonia theobromae* and *A. umbellicauda* (described below). The former of these has been taken

in abundance on *Flacourtia*, and in lesser numbers on the ornamental *Caesalpinia pulcherrima*, with all stages occurring on the stems of the host. *Poekilloptera phalaenoides* (Linnaeus) (Flatidae) is common in all stages on saman (*Samanea*), where it is restricted to branches that are dying back. An otherwise uninfested tree often bears one or two small branches that are heavily encrusted with the white flocculence laid over the row of inserted eggs or exuded from the thoracic and abdominal glands of the nymph. It is apparently not possible to rear this species unless twigs in a condition of senescence (and not artificially induced moribundity) are provided as food; fresh healthy twigs are ignored, even if they are collected from an adjoining branch on the limb from which the nymphs and eggs were taken. From the writer's fairly extended observations it would seem that seasonal abundance of certain fulgoroid species is occasioned fully as much by seasonal suitability of the sap of the host plant group—it is rare that only a single plant species is involved—as by a temporary scarcity of parasites, though the evidence in support of this supposition cannot be presented here. The nogodinid *Bladina fusca* Stål attacks pineapple and the ornamental *Rhoeo discolor*, spending the day among the brown vegetable debris that collects at the leaf bases and becoming active toward dusk. The minor fulgoroid pests of Gramineae are too numerous to list; it is permissible to single out *Oliarus maidis* (described below), which is rather abundant on maize, living like other members of this cixiid genus below ground in the nymphal stage and feeding on roots, and to mention the extensive delphacid genus *Delphacodes*, species of which attack *Axonopus compressus*, the common lawn and pasture grass of Trinidad.

The following notes outline the characteristics of the two localities most frequently given in the descriptions:

Santa Margarita, Mount St. Benedict, Northern Range, Trinidad: A small narrow valley traversed by a seasonal stream. It is occupied for most of its length by peasant cultivations and by shrubby secondary growth, and in its upper reaches passes into a cacao plantation and the drier type of mountain forest.

St. John's Valley, Northern Range: A wide valley lying to the east of the foregoing almost entirely occupied by cacao and mountain forest. Most of the collecting here was done along tracks on the edge of the forest at about 400 feet.

Superfamily FULGOROIDEA

Family CIXIIDAE

- 1a. *Antennae situated before eyes, in deep cavities, or with laminate or ledge-like processes below.*

Subfamily BOTHRIOCERINAE

Tribe BOTHRIOCERINI

Genus BOTHRIOCERA Burmeister

Bothriocera BURMEISTER, Handbuch der Entomologie, vol. 2, pt. 1, p. 156, 1835.
(Genotype, *B. tinealis* Burmeister, *ibid.*)

Vertex short, lateral margins somewhat produced anteriorly. Antennae placed before eyes, in deep cavities. Pronotum short; mesonotum large, tricarinate; tegmina moderately broad, Sc and R with a common stalk subequal in length to basal cell; R 3-branched, M 5-branched. Ovipositor complete.

BOTHRIOCERA BICORNIS (Fabricius)

PLATE 7, FIGURE 1

Issus bicornis FABRICIUS, Systema rhyngotorum, p. 101, 1803.—STÅL, Hemiptera Fabriciana, p. 93, 1869.

Two female specimens taken by the writer at Santa Margarita, Trinidad, B. W. I. (Aug. 17 and 28, 1942), resting on leaves of *Heliconia bihai* and cacao approach in tegminal pattern and general facies very closely to *B. bicornis* (Fabricius), where in the absence of type comparison they are provisionally placed.

1b. *Antennae situated below eyes, not in cavities, and devoid of processes below.*

Subfamily CIXIINAE

2a. *Tegmina steeply tectiform; abdomen laterally compressed, devoid of processes on segments 3 and 4; pygofer not flattened, usually slightly tumid; ovipositor complete.*

Tribe PINTALIINI

Genus PINTALIA Stål

Pintalia STÅL, Svenska Vet.-Akad. Handl., new ser., vol. 3, No. 6, p. 4, 1862.
(Genotype, *P. lateralis* Stål, designated by Muir, Pan-Pacific Ent., vol. 1, p. 103, 1925.)

Vertex with two subparallel transverse carinae; mesonotum tricarinate; tegmina steeply tectiform, Sc and R with a common stalk; R 3-branched, M 5-branched, arising separately from basal cell. Pygofer laterally compressed, lateral margins near anal angle often produced, medioventral process present. Anal segment of male much longer than broad, sometimes deflexed beyond anus, with ventral margin produced. Genital styles usually long, narrow at base, broader near apex. Periandrium tubular, penis reflexed distally. Ovipositor complete; pygofer longer than wide, depressed along middle line.

PINTALIA ALBOLINEATA Muir

PLATE 7, FIGURES 2-10

Pintalia albolineata MUIR, Trans. Ent. Soc. London, vol. 82, p. 435, 1934.

Male: Length, 4.4 mm.; tegmen, 5.0 mm. Female: Length, 4.9 mm.; tegmen, 5.5 mm.

Width of vertex between basal angles twice the length in middle, 2.6 times the width at apex; base deeply roundly emarginate, the transverse carina nearer to apex than to base, apex in dorsal view shallowly emarginate on each side of middle line. Length of frons in middle 1.4 times the greatest width, width at apex slightly more than twice width at base; median ocellus distinct.

Head pallid testaceous, sides of labrum and clypeus, and genae behind level of antennae brown, a small oblique pale stripe on genae behind ocellus and between eye and antenna; a sharply defined piceous area above posterior two-thirds of eye, extending on to vertex as far as a line between the side of the transverse carina and the trisection of the basal margin. Pronotum pallid on disk, fuscous behind eyes, and mottled with fuscous between postocular carinae and posterior margin; mesonotum reddish brown, fuscous laterally, with three or four pallid spots in posterior half of each lateral area. Legs dark testaceous or pale fuscous, abdomen fuscous. Tegmina translucent, lightly clouded with fuscous; three small spots in costal cell fuscous; longitudinal veins posterior to stigma and all transverse veins overlain with a slightly darker fuscous band; the apical margin lightly colored, the area between the commissural margin, the posterior claval vein, and the apex of the clavus pale; veins concolorous with membrane or slightly darker. Wings hyaline, faintly clouded with fuscous, veins darker. Pygofer of female pale with a fuscous border anteriorly.

Anal segment of male tubular with postanal portion deflexed through 60°, with a bulbous prominence ventrally at base. Aedeagus tubular, on right side a short spine directed posteriorly and a round fleshy pad distad of it near attachment of recurved membranous portion; on left side two spines near this attachment, one directed upward, then forward and slightly downward, the other posterior to it directed obliquely forward and upward; apical membranous portion with a spine arising from right side directed forward, then curved below appendage to left side and bending slightly upward. Genital styles in side view expanding apically, then tapering to a blunt point, a triangular projection on inner face near base. Pygofer with lateral angles only slightly produced, forming a blunt lobe; medioventral process triangular, wider across its base than long.

Anal segment of female short, tubular, 1.5 times as long as wide. ovipositor complete, long and curved upward.

Described from five males and six females collected by the writer at Santa Margarita (Oct. 25, 1942, Feb. 17, Mar. 12, 1943) resting on low bushes. Material deposited in U. S. N. M. and B. M. N. H. A male and a female were assigned to this species by Mr. China, who indicated that it is allied to *P. delicata* Fowler.

PINTALIA STRAMINEA, new species

PLATE 7, FIGURES 11-16

Male: Length, 4.0 mm; tegmen, 5.0 mm.

Width of vertex between posterior angles 1.6 times length in middle, 2.1 times width at apex, base deeply roundly emarginate, the transverse carina about equidistant from base and apex; apex in dorsal view shallowly emarginate. Length of frons in middle 1.2 times the width, width at apex slightly more than twice width at base; median ocellus distinct.

Head pallid testaceous, a yellowish-brown band on each side of middle line of frons, lateral margins of frons narrowly fuscous; sides of labrum, posterior half of sides of clypeus, and posterior third of genae below antennae fuscous; antennae pale, minutely speckled with black. Pronotum pale; mesonotum pale, suffused with fuscous on basal third of disk and narrowly along posterior lateral margin; carinae and scutellum pale; on each side of middle line anteriorly a clearly defined pale fuscous V extending basad for one-third of length of disk. Legs pale yellow, protibiae and mesotibiae pale fuscous. Abdomen pallid ventrally, tergites pale fuscous, genitalia pale yellow. Tegmina hyaline, yellowish, faintly suffused fuscous, slightly darker near commissural margin beyond apex of clavus; the margin itself is very pale yellow.

Anal segment of male tubular, the postanal portion scarcely deflexed, directed downward at extreme tip. Pygofer with each lateral angle considerably produced into a fingerlike lobe; medioventral process triangular, narrower across the base than long. Aedeagus tubular, on right side a process bifurcating into two spines two-fifths from base of aedeagus; on left side a horizontal spine directed posteriorly near base, a second spine directed anteriorly and slightly upward near attachment of reflexed membranous portion; membranous portion tubular with a sinuate flange on its left side. Styles long, narrow, almost symmetrically rounded at apex.

Described from two males collected by the writer at Santa Margarita, Trinidad, B. W. I. (Mar. 12, 1943), resting on a low bush. Holotype is U. S. N. M. No. 56674. This species is well distinguished from the preceding by its color pattern and by the shape of the genitalia.

2b. *Tegmina not usually steeply tectiform; abdomen generally not laterally compressed, devoid of processes on segments 3 and 4; ovipositor incomplete, pygofer broad, posteriorly flattened.*

Tribe CIXIINI

3a. *Media arising from basal cell.*

Subtribe CIXIINA

Genus MNEMOSYNE Stål

Mnemosyne STÅL, Berliner Ent. Zeitschr., vol. 10, p. 391, 1866. (Genotype, *M. cubana* Stål, *ibid.*)

Mesonotum with median and lateral carinae straight and strongly developed, with a more feeble arcuate carina on each side of middle line. Tegmina with M_3 and M_4 forking close to Mf , M_1 and M_2 forking at a greater distance from Mf .

MNEMOSYNE ARENAE, new species

PLATE 7, FIGURES 17-26

Male: Length, 6.3 mm.; tegmen, 6.7 mm. Female: Length, 6.0 mm.; tegman, 7.8 mm.

Vertex hollowed out, width between basal angles equal to length in middle, 2.3 times width at apex, base roundly emarginate; transverse carina curved anteriorly in middle to touch apex; no median carina on vertex. Base of frons visible from above, its anterior border in dorsal view slightly convex; lateral areolets not present at apex of vertex. Frons almost flat, its lateral margins diverging to level of antennae, thence curving mesad somewhat angularly down to frontoclypeal suture; width of frons 1.1 times length in middle, width at apex 2.8 times width at base; median ocellus represented by a scar; median carina present throughout on frons and clypeus, sides of both carinate; rostrum reaching almost to tip of abdomen. Pronotum with a median carina and a carina on each side following the outline of the posterior margin of the eyes and turning posteriorly between eye and tegula. Tegulae carinate. Mesonotum with five carinae. Hind tibiae with two spines. Tegmina with veins granulate, a row of granules in cells Sc , R_1 , M_3 , M_4 , Cu_{1a} , and Cu_{1b} , each granule bearing a microtrichous seta.

Vertex, clypeus, and genae testaceous, frons and labrum fuscous, median carina and frontoclypeal suture pallid, rostrum testaceous with the apical joint fuscous. Pronotum testaceous, a fuscous band between eye and tegula, a fuscous spot at inner angle of lateral lobe near antenna on each side; mesonotum testaceous or rufous, clouded fuscous anteriorly and outside lateral carinae. Legs testaceous, profemora

and mesofemora tinged rufous, tarsi and postfemora fuscous. Abdomen testaceous, suffused reddish brown. Tegmina transparent ivory yellow, two faint fuscous spots in costal cell, a spot adjoining stigma basally, a diffuse fuscous cloud between R and M extending faintly across to claval suture; an irregular pale fuscous band from stigma to apex of clavus along transverse veins, a second irregular band across middle of apical cells of R and M, distal portion of apical cells and apical margin pale fuscous. Wings hyaline, faintly clouded fuscous, slightly darker near apical margin, veins fuscous.

Anal segment of male deflexed through 110° beyond anal opening, in side view expanded at apex. Pygofer viewed laterally with an angular prominence, a small but distinct emargination below it, whence the margin is produced posteriorly into an obtuse angle; medioventral process almost quadrate, its posterior margin sinuate and culminating in a median point. Aedeagus tubular, a sclerotized horizontal portion passing upward at tip into a membranous flagellum, which is beset dorsally with a row of thin prominent spines and curves obliquely downward and anteriorly to the left side; an elongated sinuate horizontal process arising near base of aedeagus on left side produced posteriorly in a broad spine for two-thirds length of aedeagus. Genital styles stout, broad in side view, curved in basal half upward and forward through 120° and expanding in distal half into a broad plate truncate apically.

Anal segment of female tubular, 2.5 times as long as broad. Ovipositor narrow, porrect, the sheath longer than the anal segment.

Described from one male and one female collected in Arena Forest, Trinidad, B. W. I., by Dr. A. M. Adamson (Apr. 13, 1938) and one male collected by the writer in forest, Los Bajos, Trinidad (Nov. 15, 1942). Type, U.S.N.M. No. 56776.

Genus *OLIARUS* Stål

Oliarus STÅL, Berliner Ent. Zeitschr., vol. 6, p. 306, 1862. (Genotype, *O. walkeri* Stål, designated by Distant, Fauna of British India, Rhynchota, vol. 3, p. 256, 1906.)

Mesonotum with five carinae; frons with a percurrent median carina, vertex with an acutely angular or curved transverse carina which joins the middle portion of the apical transverse carina, forming an areolet apically on each side. Fork of M_1 and M_2 in the tegmina nearer to M_f than is the fork of M_3 and M_4 .

OLIARUS BIPERFORATUS, new species

PLATE 7, FIGURES 27-36

Male: Length, 7.3 mm.; tegmen, 6.7 mm. Female: Length, 8.2 mm.; tegmen, 9.5 mm.

Vertex hollowed out, width between basal angles equal to or only slightly less than length in middle, 1.6 times width at apex, sub-angularly emarginate at base; transverse carina rounded apically, apical carina almost obsolete, a quadrate cell in middle line between anterior and posterior transverse carinae; base of frons visible from above, its anterior border in dorsal view slightly convex; frons almost flat in middle, raised near sides to form broad flanges in which a clear fenestra is situated a short distance in from the margin at the level of the antennae on each side; lateral margins diverging from base to level of antennae, thence evenly curved inward to frontoclypeal suture; width of frons 1.2 times length in middle, width at apex twice width at base; median ocellus present; median carina forked at extreme base, percurrent on frons and clypeus; rostrum reaching to apex of abdomen. Pronotum short, carinate medially and with lateral carinae following the posterior margin of the eyes, posterior border acutely angularly emarginate; mesonotum with five carinae, the intermediate pair almost complete. Posttibiae with three spines.

Vertex testaceous, areolets fuscous in middle; frons pale testaceous, a fuscous band on each side of middle line, fenestrae hyaline; clypeus fuscous, almost piceous basally on each side of median carina; genae pallid yellow, antennae testaceous; rostrum fuscous, piceous at tip. Pronotum fuscous anteriorly, pallid yellow on disk and between post-ocular carinae and posterior margin; mesonotum fuscous, a piceous band along middle line and outside lateral carinae. Legs testaceous, femora reddish fuscous. Abdomen testaceous, a piceous band along middle line dorsally, two round dark spots near each lateral border; sternites pallid, fuscous near sides anteriorly; genitalia testaceous. Tegmina hyaline, ivory yellow; stigma pale yellowish brown, a narrow fuscous spot in cell posterior to it; transverse veins overlaid with fuscous patches; apical cells distally fuscous, that of Cu_{1b} being wholly infuscate; veins dark, sparsely and minutely granulate. Wings hyaline, suffused fuscous near apical margin, veins fuscous, minutely granulate.

Anal segment of male tubular, not greatly produced behind anal opening, ovate in dorsal view. Aedeagus complex, consisting of a sclerotized tube directed horizontally backward with a membranous flagellum attached apically, reflected forward to lie above and to the left of the sclerotized limb; a large thick spine near base of aedeagus on right side curved outward then inward; two small spines on left side arising close together on a slight ridge, one directed outward, the other curved angularly inward and slightly upward; a large thick spinose process arising at about same level, crossing from left side to right and projecting outward and upward above aedeagus on right side; membra-

nous flagellum slightly bulbous at base with a small basal spine, thence expanding distally into an elongate hollow cone with the ventral lip produced into a point. Genital styles short, each consisting of a straight limb terminating in a flat plate, quadrate in side view, with the inner angle slightly falcate; a small triangular flange on the inner face of each style. Pygofer with lateral angles smooth, bluntly rounded; medioventral process acutely triangular.

Anal segment of female approximately triangular in dorsal view, almost as broad as abdomen, width at base 1.9 times length. Pygofer broad, flattened. Ovipositor directed horizontally.

Described from one male and two females collected by the writer at Verdant Vale, Trinidad, B. W. I., on cacao (June 1936). Holotype male and allotype female, U.S.N.M. No. 56777; one paratype in B.M.N.H. This species is distinguished from other Trinidad forms by its large size, as well as by the coloring and by the genitalia of both sexes.

OLIARUS OPALINUS, new species

PLATE 7, FIGURES 37-41

Female: Length, 3.3 mm.; tegmen, 4.2 mm.

Vertex hollowed out, median length distinctly exceeding width across base (1.2 to 1), areolets reaching back to behind middle of lateral margins, a small quadrate cell between them apically; median carina absent. Frons longer than wide (1.1 to 1), margins sinuately diverging to below level of antennae then curving inward to suture; median carina present on frons and clypeus; median ocellus present. Pronotum short, lateral carinae diverging to follow hind margin of eyes; mesonotum with intermediate carinae distinct in basal half, obsolete in apical half. Hind tibiae with four spines, the basal pair minute. Tegmina with Cu forking basad of Sc and R, stigma elongate, oblique, narrowly oval; veins sparsely and minutely granulate.

Vertex brownish testaceous, slightly darker near margins and inside areolets; frons clouded with fuscous, darkest near middle, median carina and lateral submarginal areas testaceous, lateral margins narrowly fuscous; clypeus testaceous, lightly clouded fuscous on disk, dark fuscous on sides and distally, excluding the median carina which is testaceous. Pronotum testaceous clouded with pale fuscous except near margins; mesonotum reddish brown. Legs testaceous. Abdominal tergites and sternites reddish brown, anal segment testaceous. Tegmina transparent, slightly yellowed; stigma rather pale, veins yellow. Wings vitreous.

Anal segment very much broader than long (2.4 to 1), broadly triangular.

Described from one female collected at Caracas, Venezuela, by Dr. J. G. Myers (Dec. 23, 1930). Type, U.S.N.M. No. 56675. This species differs from *O. maidis* (described below), in size, the shape of the vertex, and the color, and from other species treated in the present report in the shape of the anal segment.

OLIARUS QUADRATUS, new species

PLATE 7, FIGURES 42-44

Female: Length, 3.0 mm.; tegmen, 3.8 mm.

Vertex hollowed, median length markedly exceeding width across base (1.3 to 1), areolets reaching back to one-third from base of lateral margin, a small quadrate cell between them apically; median carina absent, a median notch present basally; greatest length of frons slightly exceeding greatest width (13 to 12), frons shallowly grooved near margins; median carina present, distinctly forked near base; median ocellus present; lateral margins diverging to below level of antennae then curving inward. Pronotum short, lateral carinae diverging to follow hind margin of eyes. Hind tibiae with four spines, the basal pair minute; hind tarsi very long, three-quarters as long as hind tibiae, the basi-tarsal joint about twice as long as second and third combined. Tegmina with M forking about level with apex of clavus, Cu forking basad of Sc and R; veins conspicuously granulate, each granule bearing a macrotrichous seta. Anal segment a little broader than long (1.2 to 1), almost quadrate.

Vertex, frons, genae, and antennae fuscous to piceous, margins testaceous, clypeus testaceous to fuscous, piceous near apex; rostrum testaceous, apical joint fuscous. Pronotum fuscous, margins testaceous; mesonotum and abdomen fuscous. Fore and middle legs pale fuscous, tibiae testaceous, tarsi dark, hind femora pale fuscous, tibiae and tarsi pale testaceous. Anal segment fuscous. Tegmina vitreous, stigma dark, rather broadly ovoid, veins yellow, clouded fuscous, granules clear, bordered fuscous, setae dark; a fuscous cloud across base of costal cell, basal cell, and along inner border of clavus; a fuscous spot at Sc fork, Cu₁ fork and on M between these two, and also on commissural margin near its juncture with the united claval veins; a fuscous cloud over all the transverse veins and over the tip of Cu_{1b}. Wings vitreous, veins pale fuscous.

Described from one female collected by Dr. Myers at Caracas, Venezuela (Dec. 23, 1930). Type, U.S.N.M. No. 56676. This species differs from the preceding in the shape of the vertex, in the forking of the median carina, the proportionate length of the hind tarsus, the color, and size.

OLIARUS MAIDIS, new species

PLATE 7, FIGURES 45-54

Male: Length, 3.0 mm.; tegmen, 3.5 mm. Female: Length, 3.0 mm.; tegmen, 4.5 mm.

Median length of vertex scarcely shorter than width across base; areolets reaching back to midpoint of lateral margins, a small quadrate cell between them medially at apex; median carina absent or scarcely indicated near notch at base. Frons with lateral margins sinuately diverging to level of antennae, thence curving inward to suture; greatest width 1.25 times median length; median carina percurrent on frons and clypeus, forked very near base. Pronotum with median carina and with lateral carinae following hind margin of eyes; mesonotum with five carinae, the intermediate carinae long and complete. Hind tibiae with two spines, one minute basally, the other at middle. Tegmina with Cu_1 forking distinctly basad of Sc and R.

Head piceous, a dull yellow spot at posterior end of areolets; median areolet, median carina and lateral margins of frons, outer portion of frontoclypeal suture and second joint of antennae dull yellow. Pronotum fuscous or piceous, lateral carinae and posterior margin dull yellow, mesonotum piceous; abdomen fuscous or piceous, membrane pallid. Femora piceous, protibiae and mesotibiae testaceous bordered fuscous, protarsi and mesotarsi fuscous, metatibiae and tarsi pale testaceous. Tegmina hyaline, a light mark at basal end of stigma, veins brown with sparse swollen tubercles. Wings hyaline, veins brown, granular.

Anal segment of male broadly ovoid in dorsal view, longer than broad (1.3 to 1). Aedeagus complex, apodeme of penis curving toward right posteriorly, a prominent finger-shaped tube lying obliquely from near posterior end of apodeme across to left side of aedeagus, a set of four spines near its posterior end, comprising two apical spines, of which one is curved almost in a circle and the other directed upward and backward, and two lateral spines directed forward. Periandrial membrane broad, shallowly curved, forming a broad lobe distally on right side.

Anal segment of female very broad in dorsal view, three times as broad as long, subtriangular in outline.

Described from 3 males and 11 females collected by the writer at St. Augustine, Trinidad, B. W. I., on maize (July 13, 14, 1942). Holotype and allotype, U.S.N.M. No. 56677; paratypes in B.M.N.H. This species is distinguished by the shape of the male genitalia and in the female by that of the anal segment.

3b. *Media arising from a common stalk with Sc and R.*

Subtribe MYNDINA

PARAMYNDUS, new genus

Vertex longer than broad, shallowly depressed in middle, more so near base, sides elevated, anterior margin very slightly convex, posterior margin very shallowly excavated, median carina present only at base. Frons longer than broad, slightly curved in side view, margins diverging to below level of antennae thence incurved to frontoclypeal suture; median carina distinct, median ocellus absent; a shallow depression inside and parallel to each lateral margin. Clypeus almost flat with median and lateral carinae present. Eyes slightly excavated ventrally; antennae with first joint ringlike, second joint globose. Pronotum narrow near middle, posterior border rather shallowly emarginate; median carina present, disk almost square, a curved oblique carina on each side from behind eye to posterior lateral angle, a straight carina on each side between eye and tegula; mesonotum with median and lateral carinae, the latter diverging slightly posteriorly; scutellum pointed. Hind tibiae without lateral spines but with six apical spines arranged in two groups of three. Tegmina rather long with costal and commissural margins almost parallel, apical margin almost symmetrically rounded. Stem Sc+R+M long, half as long as stem Sc+R; Sc and R forking at apical third, M forking distinctly distad of Sc fork, Cu₁ forking slightly basad of fork of Sc and R, a conspicuous indentation in middle of Cu_{1a}; veins studded with sparse granules with a seta arising from each. Ovipositor complete.

Genotype: *Paramyndus cocois*, new species.

PARAMYNDUS COCOIS, new species

PLATE 8, FIGURES 55-63

Male: Length, 3.7 mm.; tegmen, 3.8 mm. Female: Length, 3.9 mm.; tegmen, 3.9 mm.

Vertex longer than broad (2.3 to 1), frons longer than broad (1.1 to 1).

Head and body uniformly pallid green in life, with anterior border of mesonotum narrowly fuscous or piceous beneath overlapping edge of pronotum; tergites of abdomen medially faintly clouded fuscous. Spines on legs black-tipped. Eyes purplish red.

Anal segment of male long, projecting just beyond aedeagus, tubular. Pygofer with lateral margins triangularly lobate; ventral margin straight, medioventral process tonguelike, curved downward apically, with a median vertical plate below. Aedeagus tubular, a long spine on left side near apex curved upward then horizontally and anteriorly,

a second long spine on right side near apex directed obliquely downward and anteriorly; a sclerotized rod on left side below apex expanding abruptly into a rounded membranous plate adpressed to aedeagus. Genital styles with a narrow basal stalk, expanding abruptly near apex into an approximately ovate plate.

Anal segment of female tubular, short, about as long as telson.

Described from 15 males and 25 females taken by the writer at St. Augustine, Trinidad, B. W. I., on coconut leaves, sugarcane, and Guatemala grass on various dates in each month between July and November 1942. Holotype and allotype, U.S.N.M. No. 56678; paratype in B.M.N.H. This genus is apparently near *Haplaxius* Fowler, and according to Mr. China, who compared it with the type, differs in the absence of tubercles on the veins (the tubercles being very pronounced in *Haplaxius*), and in having the frons less broad, its margins less convex, and the vertex more parallel-sided than Fowler's genus.

Family DELPHACIDAE

4a. *Calcar subulate or spiniform, without lateral teeth.*

Subfamily ASIRACINAE

Genus PENTAGRAMMA Van Duzee

Pentagramma VAN DUZEE, Bull. Buffalo Soc. Nat. Sci., vol. 5, p. 260, 1897. (Genotype, *Liburnia vittatifrons* Uhler, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 2, p. 351, 1876; vol. 4, p. 510, 1878.)

Head about as broad as prothorax, vertex longer than broad, sides subparallel, anteriorly rounded; frons broadly ovate, devoid of median carina but with two intermediate carinae parallel to lateral margins; antennae rather long, smooth, narrow, II much longer than I. Pronotum with lateral carinae not reaching hind margin; mesonotum with five carinae. Pygofer long, styles directed posteriorly rather than vertically.

PENTAGRAMMA BIVITTATA Crawford

PLATE 8, FIGURES 64-67

Pentagramma bivittata CRAWFORD, Proc. U. S. Nat. Mus., vol. 46, p. 566, 1914.

Female: Length, 6.5 mm.; tegmen, 6.1 mm.

Frons and genae fuscous, a pale band passing below each eye and somewhat arcuately across basal third of frons; a second pale band across frons near frontoclypeal suture, continued below antennae. Antennae with second joint prismatic, both joints with a black longitudinal stripe anterodorsally. Clypeus fuscous, paler on sides, where there is a single dark spot distad of middle.

Anal segment of female short, tubular, in dorsal view not quite so broad as long; preceding abdominal segment in dorsal view narrow.

Ovipositor with numerous small, even, peglike teeth on dorsal border of first valvulae.

A single female collected on sugarcane in Trinidad, B. W. I., by D. Farrell (1920) is placed here.

Genus EUCANYRA Crawford

Eucanyra CRAWFORD, Proc. U. S. Nat. Mus., vol. 46, p. 568, 1914. (Genotype, *E. stigmata* Crawford, *ibid.*, p. 569.)

Vertex narrow, longer than wide, projecting beyond eyes; frons with a median carina narrowly forked toward base; antennae rather long, terete. Pronotum tricarinate; mesonotum quinquecarinate. Tegmina large, with a prominent stigma; a very distinct transverse vein from stigma to apex of clavus. Pygofer elongate; genital styles short. Anal segment asymmetrical.

EUCANYRA FLAGELLATA, new species

PLATE 8, FIGURES 68-74

Male: Length, 4.6 mm.; tegmen, 4.3 mm.

Vertex longer than broad, curving uninterruptedly on to frons, a transverse carina about level with middle of eye, a carina arising at each of its ends and converging anteriorly to form median frontal carina one-third from base of frons; frons longer than broad (2.3 to 1), lateral margins diverging to below level of antennae, thence slightly curved inward to suture; clypeus long, with median and lateral carinae; antennae cylindrical, long, the first joint smooth, the second 1.6 times longer than the first, beset with round sensory pits and setae. Pronotum short, tricarinate; mesonotum broad, quinquecarinate. Tegmina with fork of Sc and R basad of Cu_1 fork, a broad stigmatic area at anterior end of transverse veins; veins setigerous. Legs long, hind tibiae with three spines before apex; posttibial spur quadrangular, spinose, slightly more than half as long as basitarsus.

Head testaceous, median carina of frons and clypeus with an indistinct fuscous band on each side, a small fuscous or piceous area on genae with four pale spots below base of antennae, rostrum testaceous. Pronotum and mesonotum pale fuscous. Legs testaceous, apex of femora, two bands on protibiae and mesotibiae, and protarsi and mesotarsi fuscous. Abdomen pale fuscous strongly tinged red. Tegmina hyaline, yellowish, veins broad, interruptedly marked fuscous; stigma pale fuscous; transverse veins hyaline, bordered fuscous; apical cells fuscous at margin. Wings hyaline, faintly clouded fuscous, veins brown.

Anal segment of male in dorsal view short, with sides expanding unequally to near apex; greatest width subequal to length; telson one-

half as long as anal segment. Pygofer long, anal emargination wide and rather deep, lateral margins produced caudad to form a lobe shallowly indented at apex, and about two-thirds as long as genital styles; ventral hind margin sinuate, devoid of medioventral process. Aedeagus comprising a narrow tube with a very long tubular flagellar appendage at apex, this appendage being widely curved through a complete circle dorsad; a small flat pointed lobe on its inner margin halfway from base, a very long thin filament arising on inner margin toward apex, the flagellar appendage itself tapering to a short sharply deflexed point. Genital styles broad at base, slightly diverging to their midpoints, then angularly converging almost to meet at apex; outer margin with sides almost straight, angularly bent at middle, inner margin straight for one-quarter from base, then deeply concave, becoming slightly convex before apex, so that the two styles enclose a heart-shaped cavity; apex of each style rounded into a blunt point.

Described from one male specimen collected in Trinidad, B. W. I., by F. W. Urich (1920). This species differs from *stigmata* Crawford in size, in the shape of the genital styles, aedeagus, and anal segment, and in the color pattern. Holotype, U.S.N.M. No. 56679.

Genus TETRASTEIRA Muir

Tetrasteira MUIR, Bull. Hawaiian Sugar Planters' Exp. Stat., ent. ser., No. 18, pt. 1, p. 4, 1926. (Genotype, *T. minuta* Muir, *ibid.*)

Head narrower than pronotum; vertex wider than long, with a V-shaped transverse carina dividing frons from vertex; frons longer than broad, median carina simple; antennae terete, small. Pronotum with lateral carinae reaching hind margin, median carina feeble; mesonotum with four carinae, inner pair not reaching hind margin, outer pair attaining it. Legs comparatively short, tibial spur awl-shaped. Ovipositor complete.

TETRASTEIRA ALBITARSIS, new species

PLATE 8, FIGURES 75-84

Male: Length, 1.9 mm.; tegmen, 2.0 mm.

Vertex very short and wide, with a carina in the shape of a wide inverted V; frons 1.6 times longer than broad, widest in apical half. Pronotum with median carina strongly present, mesonotum with four carinae, both pairs distinctly reaching hind margin. Hind tibiae with two spines. Tegmina with a strong fold on costal margin at stigma. Wings emarginate at suture.

Dark brown, lighter over tegulae, base of tegmina, and a small triangular spot at costal fold; veins dark, except the cross veins at

nodal line which are light; wings smoky, veins dark, tibiae at apex and tarsi pallid.

Anal segment small, short, very symmetrically produced posteriorly on each side into a small rounded deflexed lobe; lateral margins deeply sinuate, produced into a rounded lobe ventrally; ventral hind margin deeply excavated. Diaphragm short, without armature. Periandrium produced into a broad plate along right side with an outwardly directed point near apex; penis with apodeme traversing periandrium, with a curved spine directed ventrad at apex, and a curved membranous lobe, supported by a sclerotized rod, on left directed laterad. Genital styles narrow, outer margin straight, somewhat convex near apex, inner margin slightly convex at base, concave near apex. Apex rounded, somewhat bent mesad.

Described from one male taken by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, 1942). This species differs from *minuta* Muir in size, in the carinae of the pronotum and mesonotum, in the anal segment, and in the genitalia. Type, U.S.N.M. No. 56680. It will be noted that the length of the inner pair of mesonotal carinae is variable, and does not constitute a character of generic value as originally believed.

4b. *Calcar cultrate, thick, convex on each side or slightly concave on inner face, or thin and tectiform, toothed along hind margin, or without teeth.*

Subfamily DELPHACINAE

5a. *Calcar convex on each side, toothed on posterior margin.*

Tribe ALOHINI

Genus BURNILIA Muir

Burnilia Muir, Bull. Hawaiian Sugar Planters' Exp. Stat., ent. ser., No. 15, p. 7, 1924. (Genotype, *Delphae pictifrons* Stål, Ent. Zeit. Stettin, vol. 25, p. 50, 1864.)

Head narrower than thorax; vertex 1.5 times as long as wide across base, base 1.5 times width at apex, sides straight, carinae forming an inverted Y in apical half; frons twice as long as wide at apex, apex 2.7 times width of base, frons strongly depressed across middle; antennae terete, nearly reaching to apex of clypeus, length of segment I twice its width, II 2.4 times length of I; clypeus in side view produced angularly in middle, carinate medially and laterally. Pronotum tricarinate, lateral carinae reaching hind margin; mesonotum tricarinate, flat on disk. Hind basitarsus considerably longer than other two joints together; calcar narrow, cultrate, thick, convex on both sides with about nine spines on hind margin.

BURNILIA SPINIFERA, new species

PLATE 8, FIGURES 85, 86

Male: Length, 3.8 mm.; tegmen, 4.1 mm.

Length of vertex 1.4 times width at base, base not quite twice as wide as apex, sides straight, apex projecting slightly beyond eyes, base situated slightly behind middle of eyes; frons 1.7 times longer than wide at apex, lateral margins almost straight on basal two-thirds, thence arcuately expanding to apex; concave in middle; median carina distinct except at apex; antennae not reaching to apex of clypeus, second segment three times as long as the first.

Stramineous, apex of vertex and basal third of frons very pale fuscous, a round fuscous spot above each eye; a white band across apical third of frons widely bordered fuscous basally, narrowly so distally; a white spot bordered with black near lateral margin of pronotum; second antennal segment fuscous dorsally and at apex; pro- and mesofemora with a very pale fuscous spot at apex, metafemora with a dark spot. Tegmina hyaline, yellowish, veins concolorous; wings hyaline, veins stramineous.

Anal segment long, semitubular, anus at apex. Pygofer with anal angle produced about half the length of anal segment, somewhat flattened and roughened distally and curved mesad, rounded at apex; a broad short spine, directed outward, arising inside lateral margin below anal angle, ventrad of this a second more slender spine directed obliquely upward; medioventral process consisting of two straight slender spines joined near base. Diaphragm with a long slender spine dorsally on each side of middle. Penis very slender, cylindrical. Genital styles in side view broad with dorsal margin deeply concave, apex obliquely truncate; a stout triangular tooth on inner face of style at apex; outer margin of style sinuately convex.

Described from one male specimen collected at Mabaruma, North-west District, British Guiana, by J. G. Myers (Feb. 1931). Type, U. S. N. M. No. 56681. This species differs from *pictifrons* Stål and *williamsi* Muir in the genitalia, and from both and the female types of *belemensis* Muir, *heliconiae* Muir, and *longicaput* Muir in the proportions of the head and antennae, and in color pattern.

5b. *Calcar* thick or thin, concave on inner surface, devoid of teeth on hind margin.

Tribe TROPIDOCEPHALINI

Genus MALAXA Melichar

Malaxa MELICHAR, Philippine Journ. Sci., vol. 9D, p. 275, 1914. (Genotype, *M. acutipennis* Melichar, *ibid.*)

Vertex longer than broad, wider at base than at apex, the inverted V-shaped carina nearly touching the apex. Frons long, narrow, gradually widened to apex, sides straight, median carina simple; clypeus tricarinate; genae wide; antennae reaching beyond apex of clypeus, cylindrical, second segment much longer than first. Hind basitarsus longer than other two joints together; calcar shorter than basitarsus, thick, slightly concave on inner surface, devoid of teeth on hind margin. Tegmina narrow, apex of clavus almost bisecting hind border.

MALAXA GRACILIS, new species

PLATE 8, FIGURES 87-94

Male: Length, 3.0 mm.; tegmen, 4.3 mm.

Head distinctly narrower than pronotum; vertex longer than broad (1.5 to 1), slightly hollowed out, anteriorly curving on to frons, apex slightly narrower than base, only slightly projecting before eyes; an inverted V-shaped carina anteriorly nearly reaching apex in middle; posterior border transverse; frons narrow, flattened, twice as long as wide at apex, apex almost three times as wide as base, median carina unforked, lateral margins very slightly concave, sutural line impressed; clypeus markedly tumid, slightly longer than frons, gradually tapering distally, tricarinate; antennae long, tubular, basal joint three-quarters length of frons, seven times as long as wide, second joint twice as long as first, 11 times as long as wide, beset with setae and on distal half with rather sparse sensorial pits, third joint and flagellum subequal to basal joint; eyes large, widely emarginate below. Pronotum short, posterior margin obtusely angularly excavated, lateral carinae not reaching posterior margin; mesonotum tricarinate, disk curved, scutellum flat. Legs long and slender; spur thick, crescentic, concave on inner surface, devoid of teeth on hind border. Tegmina long, narrow, produced well beyond apex of abdomen, expanding in width for three-quarters of length from base then tapering; fork of Sc and R slightly basad of apex of clavus, Cu₁ fork at basal third; Cu_{1b} forked near apex, remainder simple at apex. Wings scarcely three-quarters length of tegmina.

Head stramineous, base of clypeus with a piceous band, a fuscous transverse band near apex; second joint of antennae pale fuscous in basal third, piceous in apical third; eyes red. Pronotum stramineous, inner angle of lateral lobes broadly piceous; a fuscous band on pleurite before mesocoxae; mesonotum fuscous, stramineous at lateral angles, tegulae stramineous. Legs stramineous, femora darker dorsally. Abdominal sclerites dorsally fuscous, ventrally pallid, fuscous anterolaterally, flecked with an orange spot posterolaterally; genitalia fuscous.

Anal segment short, ringlike, sunk into anal emargination of pygofer, anal style very short, triangular. Pygofer with a deep anal emargination, anal angles produced into points and nearly meeting beneath anal segment, opening about as long as wide; a slender stalked bifurcate process medioventrally a little below lower margin of opening. Penis narrowly tubular basally, with a wide, pendent, laterally compressed semimembranous appendage, devoid of teeth, arising subapically and reflected anteriorly ventrad. Genital styles broad, especially at middle, directed upward and outward, basal angles strongly produced upward; outer margin concave near base, then strongly convex, becoming concave again before apex, inner margin concave basally, then convex, then sinuately tapering to pointed apex.

Described from a single male specimen collected at Caracas, Venezuela, by Dr. J. G. Myers (Dec. 6, 1930). Type, U.S.N.M. No. 56682. This species differs from *occidentalis* Muir in the shape of the genitalia, especially of the penis.

5c. *Calcar thin, foliaceous or tectiform, with teeth along hind margin.*

Tribe DELPHACINI

Genus SACCHAROSYDNE Kirkaldy

Saccharosydne KIRKALDY, Bull. Hawaiian Exp. Stat. Div. Ent. No. 3, p. 139, 1907.
(Genotype, *Delphax saccharivora* Westwood, Mag. Nat. Hist., vol. 7, pp. 496, 610, 1834.)

Head angular in profile; vertex about twice as long as wide at base, projecting well beyond eyes, an inverted V-shaped carina present; frons about twice as long as wide; antennae short, reaching to base of clypeus; second segment of antenna twice the length of the first.

SACCHAROSYDNE SACCHARIVORA (Westwood)

PLATE 8, FIGURES 95-102

Delphax saccharivora WESTWOOD, Mag. Nat. Hist., vol. 7, pp. 496, 610, 1834.

Male: Length, 2.6 mm.; tegmen, 3.6 mm. Female: Length, 3.4 mm.; tegmen, 3.7 mm.

Light green during life; a narrow longitudinal black line anterodorsally on both segments of antennae.

Genital styles tapering distally, curved beyond middle and recurved near apex. Penis consisting of a horizontal, slightly curved plate directed posteriorly; below this a short stout spine, curving upward distally, and directed posteriorly; at base of this spine a long whiplike tapering filament, broad and sinuate near point of attachment, with a strongly refractive line in middle traversing the basal part.

Two males and two females collected by D. Farrell on sugarcane in Trinidad (July 31, 1920) and one female collected by the writer on the same host at Caroni, Trinidad, B. W. I. (May 5, 1936), are at hand. This species is distinguished from the other six of the genus by the proportions of the vertex and by the shape of the genitalia.

Genus PEREGRINUS Kirkaldy

Peregrinus KIRKALDY, Entomologist, vol. 37, p. 175, 1904. (Genotype, *Delphax maidis* Ashmead, Psyche, vol. 5, p. 323, 1890.)

Frons at least twice as long as wide; vertex not longer than broad, truncate or slightly rounded at apex, carinae of vertex distinct; antennae terete, not flattened, II considerably longer than I, I longer than broad. Head narrower than pronotum; lateral carina of pronotum straight, diverging, reaching hind margin or near it.

PEREGRINUS MAIDIS (Ashmead)

Delphax maidis ASHMEAD, Psyche, vol. 5, p. 323, 1890.

Twenty-three males and 28 females collected by the writer on maize at St. Augustine, Trinidad, B. W. I. (May 3, 1942), were typical. Representative material in U.S.N.M.

Genus SOGATA Distant

Sogata DISTANT, Fauna of British India, Rhynchota, vol. 3, p. 471, 1906. (Genotype, *S. dohertyi* Distant, *ibid.*, p. 471, fig. 258.)

Body narrow and slender, head approximately as wide as pronotum; vertex truncate or slightly rounded at apex, not wider than eye on same level at base; carinae of vertex and frons distinct; frons longer than broad; antennae terete, with II longer than I, I longer than broad. Pronotum with lateral carinae reaching hind margin, not in line with mesonotal carinae.

SOGATA FURCIFERA (Horváth)

PLATE 9, FIGURES 116, 117

Delphax furcifer HORVÁTH, Termés. Füzetek, vol. 22, p. 372, 1899.

One macropterous male collected at St. Augustine, Trinidad, B. W. I., by the writer (May 3, 1942) on *Axonopus compressus*.

Genus DELPHACODES Fieber

Delphacodes FIEBER, Verh. zool.-bot. Ges. Wien, vol. 16, p. 524, pl. 8, fig. 32, 1866. (Genotype, *D. mulsanti* Fieber, *ibid.*)

Head almost as broad as pronotum; vertex not longer than broad, or scarcely so, truncate or slightly rounded at apex; frons narrow, much longer than broad, carinae distinct, the median carina forked at base; antennae terete, rounded, first segment short, as broad as long.

Tegmina and wings normal (macropterous forms) or reduced (brachypterous forms). Posttibial spur thin, tectiform, minutely toothed on hind margin.

DELPHACODES TEAPAE (Fowler)

PLATE 9, FIGURE 115

Liburnia teapae FOWLER, *Biologia Centrali-Americana*, Rhynch.: Hom., vol. 1, p. 135, 1905.

One macropterous male was collected by the writer on *Axonopus compressus* at St. Augustine, Trinidad, B. W. I. (May 3, 1942).

DELPHACODES PROPINQUA (Fieber)

Delphax propinqua FIEBER, *Verh. zool.-bot. Ges. Wien*, vol. 16, p. 525, pl. 8, fig. 24, 1866.

Eight males (7 macropterous and 1 brachypterous) and four brachypterous females collected by Dr. E. McC. Callan at St. Augustine, Trinidad, B. W. I., are at hand. The detailed structure of the genital styles and penis agrees entirely with Muir's figures of a Puerto Rican specimen.

DELPHACODES PALLIDIVITTA, new species

PLATE 9, FIGURES 103-106

Male: Length 1.9 mm.; tegmen, 2.1 mm.

Width of vertex subequal to length, or very slightly greater, base wider than apex, situated just behind middle of eyes; frons viewed anteroventrally twice as long as broad, sides very slightly arcuate; second segment of antennae scarcely twice length of first, first distinctly longer than wide. Pronotum with lateral carinae divergent, slightly curved, not reaching hind margin. Hind basitarsus subequal to second and third joints together, posttibial spur about two-thirds as long as basitarsus, thin, tectiform, with teeth on hind margin.

Fuscous, middle line of clypeus and frons, vertex, disk of pronotum and mesonotum, posterior half of genae, lateral lobes of pronotum, tegulae, and abdominal membrane white; clypeus, lateral carinae of frons and pronotum, antennae, a row of four round spots on genae below antennae, rostrum, and legs testaceous or stramineous, apart from a round spot on metacoxae; tegmina hyaline, faintly yellowish, veins yellow, a faint curved fuscous band across fourth to seventh apical cells submarginally, and overlying transverse veins at their bases, apex of claval veins fuscous. Wings hyaline, veins fuscous.

Opening of pygofer slightly longer than wide, anal emargination large, anal angles not produced, lateral margins entire, almost straight. Anal segment comparatively small with a pair of short slender spines on apical margin near middle directed ventrad. Penis tubular, nar-

rowing apically, slightly sinuate and slightly laterally compressed, orifice on left side at apex, an oblique row of five spines above orifice, an oblique row of five spines on right side near middle, an oblique row of eight spines on left side arising dorsally in apical quarter and ending ventrally at basal quarter. Diaphragm with a narrow V-shaped process, minutely irregularly denticulate, situated medially below penis. Genital styles broad, outer margin sinuately curved, distally convex, inner margin convex in basal half, strongly concave in apical half, outer margin bent mesad distally to meet inner margin at apex.

Described from 25 macropterous males and 38 macropterous females collected by the writer on *Axonopus compressus* at St. Augustine, Trinidad, B. W. I. (Sept. 12, 1942). Holotype male and allotype female, U.S.N.M. No. 56683.

DELPHACODES AXONOPI, new species

PLATE 9, FIGURES 107-110

Male (macropterous): Length, 1.8 mm.; tegmen, 2.4 mm. Female (macropterous): Length, 2.1 mm.; tegmen, 2.9 mm.

Vertex as broad as long, or a very little shorter, base at middle of eyes, base as wide as apex; frons twice as long as wide, margins very slightly arcuate; antennae reaching slightly beyond base of clypeus, first segment longer than wide, second segment not quite twice as long as first. Posttibial spur three-quarters as long as basitarsus, thin, tectiform, with about 16 fine teeth.

Frons and clypeus black between yellow carinae, anterior portion of genae, apart from a few pale spots, basal joint of antennae, mesonotum, pleurites, abdominal sclerites, and genitalia fuscous, posterior half of genae, second joint of antennae, vertex, pronotum, and legs testaceous to light brown; tegmina hyaline, yellowish, veins dark yellow, sparsely granulate; wings vitreous, veins testaceous.

Opening of pygofer slightly wider than long, rounded, margins entire, anal emargination large, anal angles rounded, produced and curved mesad; diaphragm with dorsal margin sinuate, indented shallowly in middle. Anal segment comparatively small, sunk deeply into emargination, with a pair of slender spines apically, approximated at point of origin and directed downward. Penis subcylindrical, slightly compressed laterally, rounded at apex with orifice on left side; a row of 14 spines on left side arising dorsally near margin of orifice and passing downward to near ventral margin where six of the spines form a horizontal ledge; a horizontal row of six or seven spines ventrolaterally on right side. Genital styles flat, broad at base, narrower distally, apex produced into two short projections, the inner more slender, the margin between them shallowly convex

toward its outer end, rather more markedly concave near inner projection, outer margin of style very slightly sinuate, inner margin with a slight projection beyond middle making the outline two unequal shallow concavities.

Female similar in color to male.

Described from one macropterous male and one macropterous female taken by the writer at St. Augustine, Trinidad, B. W. I. (July 18, 1942), on *Axonopus compressus*. Type male and allotype female, U.S.N.M. No. 56684. This species appears to be near *nigra* (Crawford), but differs in the aedeagus, having the orifice on the left side and a distinctly greater number of spines, as well as in the shape of the diaphragm and in the color of the antennae.

DELPHACODES SPINIGERA, new species

PLATE 9, FIGURES 111-114

Male (macropterous): Length, 2.4 mm.; tegmen, 3.0 mm.

Width of vertex across base subequal to length or very slightly greater, base wider than apex, situated at middle of eyes; frons twice as long as wide, margins slightly arcuate; second segment of antennae scarcely twice length of first, first distinctly longer than wide. Pronotum with lateral carinae diverging, curved, not reaching hind margin. Hind basitarsus subequal to other two joints together; post-tibial spur two-thirds as long as basitarsus, thin, tectiform, toothed on hind margin.

Stramineous, a narrow sinuate band on each side of middle line of frons and clypeus, a horizontal band near lower edge of lateral lobes of pronotum, a spot on pronotum between eye and tegula, and a narrow line on inner margin of tegulae fuscous; median carina of frons at basal fork, middle of vertex, pronotum and mesonotum pallid, bordered laterally tawny yellow on pronotum and mesonotum; tegmina hyaline, yellowish, veins concolorous, six apical veins with a small fuscous spot at margin; wings hyaline, veins darker.

Opening of pygofer about as long as wide, anal emargination large, anal angles not produced, lateral margins entire, very slightly curved, a minute point on each side level with ventral margin of diaphragm, a short setigerous toothlike process on posterior margin medioventrally. Anal segment comparatively small, with a single stout median spine directed ventrad on apical margin. Penis compressed laterally, deflexed obliquely, lower margin almost straight, dorsal margin curved downward apically and tapering to join lower in a slender point, much broader than lower margin, so that penis is narrowly V-shaped in cross section; diaphragm rather narrow, with armature absent or inconspicuous. Genital styles narrow, rounded, with an asymmetrical knob

at apex, outer margin arcuate, inner margin correspondingly concave, basal angles obtuse, not prominent.

Described from a single macropterous male taken by the writer on *Axonopus compressus* at St. Augustine, Trinidad, B. W. I. (May 15, 1942.). Type, U.S.N.M. No. 56685.

Family DERBIDAE

Tegmina relatively large, wings usually not less than half as long as tegmina, venation not greatly reduced.

Subfamily DERBINAE

6a. *Clavus* closed, sometimes narrowly open; common stalk of united claval veins not extending beyond apex of clavus; anterior sector of Cu_1 with not less than three veins.

Tribe DERBINI

Genus DERBE Fabricius

Derbe FABRICIUS, *Systema rhyngotorum*, p. 80, 1803. (Genotype, *D. haemorrhoidalis* Fabricius, designated by Westwood, *Proc. Linn. Soc. London*, 1840, vol. 1, p. 83.)

Head narrow; antennae with first segment short, second segment large, subcylindrical, truncate at apex, densely studded with sensorial pits; tegmina large, veins prominent, media with anterior sector with five apical branches, posterior sector with six to eight apical branches; a short row of wax-bearing prominences developed on Sc and R, M, and Cu_1 basad of apex of clavus.

DERBE ULIGINOSA, new species

PLATE 9, FIGURES 118-123

Female: Length, 6.8 mm.; tegmen, 14.5 mm.

Tegmen with posterior sector of M with eight branches reaching margin, the cells posterior to the fourth to eighth of these branches each nine times as long as wide.

Fuscous, clypeus darker; posterior half of pronotum pallid, mesonotum with a large piceous spot on each side basally, legs testaceous, abdomen dorsally fuscous with a row of testaceous spots on each side of middle line, ventrally testaceous, genitalia fuscous; tegmina hyaline, ivory yellow, veins dark fuscous, a fuscous stripe along middle of cells basad of apex of clavus or anterior to posterior sector of media, a fuscous patch at commissural margin at end of oblique line of transverse veins; wings hyaline, a narrow fuscous stripe along middle of basal cells of R and M, apical margin clouded fuscous anteriorly, veins fuscous.

Anal segment obliquely deflexed, produced below anal opening into a quadrate plate with lateral angles produced, a pair of sclerotized sinuate rodlike processes arising near middle of hind margin directed posteriorly. Ovipositor with lateral styles moderately broad, tapering distally to a blunt point, not attaining tip of processes of anal segment, first valvulae with five or six oblique spines on dorsal margin distally. Subgenital plate in ventral view with hind margin curved backward into a broad median plate, approximately hexagonal in outline, with a narrow triangular process directed caudad arising on hind margin at middle.

Described from three female specimens collected in Trinidad, B. W. I., as follows: F. W. Urich, two specimens, one accompanied with a locality label "Maraval" (1916); D. Farrell, one specimen (1920). These specimens were taken by the writer from the collection of the former Imperial Department of Agriculture. This species is distinguished by the proportions of the apical cells of M in the tegmina, by the shape of the posterior border of the subgenital plate, and by the color pattern of tegmina and wings. Type, U.S.N.M. No. 56686.

DERBE BOLETOPHILA, new species

PLATE 9, FIGURES 124-128

Male: Length, 6.3 mm.; tegmen, 13.0 mm.

Tegmina with posterior sector of M with six branches reaching margin, the cells posterior to the third to sixth of these branches ten times as long as wide.

Head, thorax, legs, and genitalia pale stramineous; posterior half of pronotum, metanotum, and abdomen pallid, almost white; abdominal sclerites narrowly bordered red; tegmina and wings vitreous, anterior margin of tegmina narrowly lined red. Insect in life is very pale.

Anal segment long, rather flattened dorsoventrally, folded and deflexed at tip. Pygofer with lateral margins sinuate, ventral margin straight, medioventral process in form of a small lobe not quite semi-circular. Aedeagus a simple sclerotized tube in basal portion; reflected apical portion viewed from left side trapezoidal with a membranous tube attached apically; three spines on left side of reflected limb, one anteroventrally near attachment, two near distal part of line of attachment, one spine long, decurved at tip, the other straight, two-thirds as long as preceding; on right side of aedeagus a long spine basad of reflected part directed obliquely upward, laterad of reflected part a broad lamina narrowing to a twisted bladelike process directed anteriorly, two spines of equal length on dorsal side of reflected part near its point of attachment. Genital styles narrow at base, widening to just beyond middle then narrowing to a point at apex, this being

directed mesad; a complex cuplike fold projecting above dorsal margin at middle.

Described from a single male specimen taken by the writer in Caura Valley, Northern Range, Trinidad, B. W. I. (April 5, 1941), in forest, resting on fungus. Type, U.S.N.M. No. 56687. This species is well distinguished by the proportions of the apical cells of M in the tegmina, by the structure of the genitalia, and by the very pale color.

DERBE SEMIFUSCA, new species

PLATE 9, FIGURES 129-135

Male: Length, 6.5 mm.; tegmen, 15.0 mm.

Vertex short, subquadrate, somewhat produced before eyes; frons longer than broad (2.5 to 1), lateral margins slightly diverging distally, median carina absent; frontoclypeal suture deeply impressed; clypeus tricarinate, median carina obsolete at base; antennae with second segment subcylindrical, slightly expanding toward apex, terminal joint inserted apically on second. Pronotum short in middle, longer laterally anterior margin straight, posterior deeply emarginate; mesonotum inflated, upturned at scutellum. Tegmina with posterior sector of M with seven branches reaching margin, the cells posterior to the fifth, sixth, and seventh of these branches each six times as long as wide.

Head and body fuscous, clypeus at apex and on sides and mesonotum very dark, pronotum abruptly testaceous in posterior half, tegulae pale, abdomen dark testaceous dorsally, paler ventrally; tegmina with veins fuscous, all, with the exception of the apical veins of M and Cu_1 , bordered with a broad hyaline band, middle portion of cells fuscous, apical cells of R and M_1 hyaline, a small dark patch on each of the apical branches of these veins near margin, remainder of apical cells fuscous; wings fuscous, veins fuscous bordered hyaline except near apical margin.

Pygofer with lateral margin sinuate, medioventral process large, nearly two-thirds as long as ventral posterior plate of pygofer, narrowly triangular, rounded at apex. Aedeagus in dorsal view subovate with three spinose processes arising two-thirds from base near left side, directed anteriorly, a long curved spine arising at same level and crossing obliquely forward to project beyond right margin, a broad lamina arising apically, directed forward and narrowing to a ribbonlike blade directed obliquely upward; at the basal end of this lamina a flattened spine directed anteriorly. Genital styles long, narrow, incurved at apex in a pincerlike manner, dorsal margin sinuate, a complex cuplike fold on dorsal margin at basal third.

Described from one male collected by F. W. Urich, Trinidad, B. W. I. (1916), taken from the collection of the former Imperial Depart-

ment of Agriculture. Type, U.S.N.M. No. 56688, devoid of one tegmen, fore and middle tibiae and tarsi, and anal segment. This species is distinguished by its heavily infuscated tegmina and by the genitalia.

Genus *MYSIDIA* Westwood

Mysidia WESTWOOD, Proc. Linn. Soc. London, vol. 1, p. 83, 1840. (Genotype, *Derbe pallida* Fabricius, designated by Kirkaldy, Entomologist, vol. 36, p. 216, 1903.)

Vertex rather broad, short, lateral margins converging anteriorly; antennae cylindrical, expanding apically, heavily beset with sensory pits, a prominent notch on dorsal side at apex, in which terminal joint is inserted, arising therefore subapically; shoulder keels on pronotum absent or small; tegmina with M with three sectors, and with six or seven branches at margin, not even and parallel, Cu₁ with three sectors, the second forked before margin. Medium sized, usually pale colored, with a habit of carrying the tegmina and wings divergently upraised when at rest.

MYSIDIA CINEREA, new species

PLATE 9, FIGURES 136-150

Male: Length, 3.2 mm.; tegmen, 5.7 mm. Female: Length, 3.6 mm.; tegmen, 7.6 mm.

Vertex narrow in dorsal view, produced beyond eyes, about 1.1 times longer in middle than wide at base, 1.4 times wider across base than at apex, lateral margins slightly converging anteriorly, prominent; frons narrow, lateral margins gradually converging to below eyes then smoothly diverging to suture; clypeus about as long as frons, tricarinate; antennae with second joint longer than broad, slightly compressed laterally, strongly excavated at dorsal insertion of apical joint, beset with large sensoria. Pronotum short, anterior margin transverse, posterior margin angularly excavated, lateral lobes rather large; tegulae large; mesonotum broad, somewhat inflated, median carina obsolete. Tegmen with 8 to 12 pustules near base of Sc+R, three pustules near base of M.

Head, thorax, legs, and abdomen pallid, eyes red; tegmina hyaline, all veins faintly and broadly overlain with brown, a clear ellipsoidal spot near apical fork of M₁, with the vein tinged brown at fork, veins otherwise concolorous; wings hyaline, veins irregularly pale brown, apical cells clouded near margin, veins concolorous. Insect in life powdered pearly gray.

Anal segment of male short in dorsal view, produced distally below anal opening into a subquadrate plate, bearing an elongated process at each posterior angle. Pygofer with posterior margin sinuate, sloping obliquely forward at sides, medioventral process absent or repre-

sented by a slight sinuate dilation of the hind margin. Aedeagus a simple tube, a minute very broadly triangular spine on each side ventrally distad of middle, on dorsal surface a V-shaped groove above apex deepening distad to its midpoint. Genital styles broad, expanding distally, posterior margin in side view rounded, a small scroll-like process on dorsal margin near base.

Anal segment of female short, deflexed, bluntly triangular below anal opening. Lateral styles broad, bluntly rounded at apex, slightly longer than anal segment; first valvulae narrowed to a single apical spine curving upward at tip, two or three minute teeth subapically on dorsal margin. Medioventral process of subgenital plate in ventral view somewhat triangular, but bluntly rounded at apex.

Egg ellipsoidal, pointed at each pole, with three equidistant longitudinal carinae; pale, smooth, 0.5 mm. long, 0.3 mm. broad.

Described from two males and two females collected by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, Sept. 13, 1942), resting on leaves in thick undergrowth. Holotype male and allotype, U.S.N.M. No. 56689; paratype in B.M.N.H.

6b. *Clavus and common stalk of united claval veins as above; anterior sector of Cu₁ with less than three veins, not joining media.*

Tribe CENCHREINI

OMOLICNA, new genus

Vertex broad, depressed along middle, lateral margins converging apically, apical margin straight or slightly concave, posterior margin shallowly excavated, width across base greater than length down middle, two rows of sensoria on raised area near each lateral margin; frons longer than wide at apex (about 2 to 1), width at apex approximately one and one-half times width at base, lateral margins diverging gradually to apex, devoid of granules, median carina absent, usually a longitudinal depression down middle of frons, a series of sensory pits inside each lateral margin; frontoclypeal suture impressed, clypeus slightly tumid with a median carina; genae devoid of a subantennal process. Pronotum with antennal foveae large. Tegmina long, parallel sided, Sc+R+M fork at basal quarter, Sc+R fork between basal third and middle of costal margin, subcostal cell long, M forking about level with apex of clavus, Cu₁ forking level or slightly distad of junction of claval veins, M with five veins reaching apical margin, three arising from a discal cell. Wings with R and M simple to apex, linked by a transverse vein four-fifths from base, Cu_{1a} forked just basad of its midpoint, where it is joined by a transverse vein from M, the limbs of the fork scarcely diverging to

margin, Cu_{1b} simple to apex, Cu_2 simple. Anal segment of male narrow, tubular, pygofer with a simple pointed medioventral process, genital styles incurved at apex. Anal segment of female very short, pregenital sternite with a broad lobe at middle of posterior margin. Egg bluntly ovoid, smooth, transparent, twice as long as broad.

Genotype: *Omolicna proxima*, new species.

This genus differs from *Syntames* Fowler in the absence of a median carina on the frons, from *Cenchrea* Westwood in the lower lateral carinae of the vertex and the tegminal and wing venation, and from *Phaciocephalus* Kirkaldy in tegminal and wing venation.

OMOLICNA PROXIMA, new species

PLATE 9, FIGURES 151-157; PLATE 10, FIGURES 158-160

Male: Length, 3.1 mm.; tegmen, 3.5 mm. Female: Length, 3.1 mm.; tegmen, 3.6 mm.

Vertex wider between basal angles than long in middle (1.6 to 1), apical margin straight, basal margin obtusely excavated, 12 prominent sensory pits inside each lateral margin; frons twice as long as wide at apex, width at apex 1.8 times width at base, lateral margins diverging gradually to apex, lateral margins of vertex and frons not granulate, median carina absent, a longitudinal depression down middle of frons, a series of about 25 sensory pits inside each lateral margin; frontoclypeal suture impressed, clypeus slightly tumid with a median carina; no subantennal process present. Pronotum with antennal foveae large. Tegmina with $Sc+R$ forking at basal two-fifths, M with five branches at apex, apical margin of tegmina minutely serrate, $Sc+R$ and anterior claval vein with large pustules.

Vertex, clypeus, genae, rostrum, pronotum, and legs pale testaceous or pallid; frons, mesonotum, pleural and abdominal sclerites, and genitalia fuscous; tegmina pale fuscous, darker distad of stigma, veins pallid, margin hyaline to stigma, clear red around apex; wings hyaline, clouded fuscous, veins darker.

Anal segment of male long, tubular, deflexed through 40° beyond anal opening and angularly bent before tip to point almost vertically downward, a small lobe laterally midway along ventral margin. Pygofer with posterior margin almost straight laterally curving caudad ventrally, medioventral process broad, lobate at apex, produced laterally at middle of lateral margins, which are concave basally. Aedeagus tubular, two stout spines on right side, arising at base of flexible portion of aedeagus and directed anteriorly, slightly curved, three slender spines on left side; flexible portion medial, though arising from left side, shallowly hoodlike, sclerotized apically into a slender spine. Genital styles broad, abruptly rounded at apex and tapering

to an incurved point; a pointed process on dorsal margin toward base, a small bifurcate process on ventral margin one-fifth from base.

Anal segment of female very short, postanal portion minute, lateral styles broad, parallel-sided, symmetrically rounded at apex. Ovipositor with first valvulae with two long spines apically, upturned at tip, above these an uncinat process bearing dorsally two or three minute spines and two larger spines apically. Medioventral portion of pregenital sternite somewhat longer than broad, posteriorly smoothly rounded. Egg 0.45 by 0.23 mm.

Described from 11 males and 9 females taken by the writer in St. John's Valley, Trinidad, B. W. I. (Sept. 21, 1942), resting on foliage. Holotype male and allotype, U.S.N.M. No. 56778; paratypes in B.M.N.H.

OMOLICNA RUBRIMARGINATA, new species

PLATE 10, FIGURES 161-168

Male: Length, 4.0 mm.; tegmen, 4.7 mm. Female: Length, 4.2 mm.; tegmen, 5.3 mm.

Width of vertex across base greater than length along middle (1.8 to 1), vertex curving into frons apically, not clearly separated from it, posterior border very obtusely emarginate; three rows of sensoria on each side of middle line, the outer pair on each side with larger sensoria than the inner row; frons longer than wide at apex (1.8 to 1), 1.4 times as wide at apex as at base, lateral margins expanding gradually to apex, median carina absent, middle of frons not much depressed, a series of about 30 sensory pits inside each lateral margin, which is slightly raised; frontoclypeal suture impressed; clypeus somewhat tumid with a distinct median carina; no subantennal process. Pronotum with antennal foveae large. Tegmina with Sc+R forking at basal two-fifths, M with five veins at apical margin, apical margin minutely serrate, Sc+R and anterior claval vein with large pustules.

Head, thorax, and abdominal sclerites testaceous, faintly suffused fuscous; rostrum and legs pale stramineous; tegmina transparent, yellow, slightly suffused fuscous, especially near stigma; apical margin and sometimes distal portion of apical veins pink, veins otherwise concolorous; wings hyaline, faintly clouded fuscous, veins darker.

Anal segment of male long, tubular, deflexed through 40° beyond anal opening and bent before apex to point downward, no lobe in middle of ventrolateral margin, but a slight flange before apex. Pygofer with lateral margins broadly sinuate, curved backward ventrally into a long tapering median process rounded at apex, keellike in lateral view and subequal in length to the pygofer. Aedeagus tubular, a pair of slender spines on dorsolateral margin about two-thirds from base, a large median membranous tube reflected to point

anteriorly, with a pair of spines above and a pair below it, projecting somewhat beyond its tip, a pair of slender filaments two-thirds as long as aedeagus arising at point where it is recurved and directed anteriorly above the whole structure. Genital styles broad, expanding from base to middle, then narrowing to an inwardly directed point at apex; a small lobe between two notches on dorsal border about one-third from base.

Anal segment of female very short, postanal portion minute. Lateral styles broad, almost parallel-sided, symmetrically and bluntly rounded at apex. Ovipositor with first valvulae with two long spines apically, upturned at tip; above these an uncinuate process bearing dorsally four curved spines near apex. Medioventral process of pregenital sternite almost semicircular.

Described from one male and two females collected by the writer in St. John's Valley, Trinidad, B. W. I. (Oct. 8, 1942), resting on low herbage. This species is distinguished by its size, by the shape of the frons and vertex, and by the arrangement of the sensoria on the vertex, by the shape of the anal segment, by the structure of the male genitalia, or in the female by the shape of the hind margin of the pregenital sternite, and by the color. Holotype male and allotype, U.S.N.M. No. 56690; paratype in B.M.N.H.

Genus *NEOCENCHREA* Metcalf

Neocenchrea METCALF, Journ. Elisha Mitchell Sci. Soc., vol. 38, p. 193, 1923.
(Genotype, *Cenchrea heidemanni* Ball, Can. Ent., vol. 34, p. 261, 1902.)

Vertex rather narrow, lateral margins raised, converging anteriorly; frons narrow, devoid of median carina, margins raised. Pronotum with deep antennal foveae. Tegmina elongate, narrow; Sc+R forking before level of apex of clavus, M forking just beyond apex of clavus, Cu₁ forking at level of junction of claval veins. Egg ovoid, smooth, transparent.

NEOCENCHREA GREGARIA, new species

PLATE 10, FIGURES 169-181

Male: Length, 4.5 mm.; tegmen, 5.4 mm. Female: Length, 5.0 mm.; tegmen, 5.9 mm.

Vertex as wide across base as long in middle, apex straight, minutely notched medially, hind border emarginate in a right angle; frons three times as long as wide in widest part, apex 1.2 times as wide as base, lateral margins almost straight, slightly widened at level of antennae, median carina absent; lateral margins of frons and vertex granulate; genae devoid of a subantennal process. Pronotum with antennal foveae large. Tegmina with Sc+R forking about middle, M forking

at level of apex of clavus, with four veins reaching apical margin, Cu_1 forking level with junction of claval veins; anteroapical margin of tegmen minutely serrate.

Pale yellow, in life powdered a whitish fawn; lateral margins of vertex and frons, apical joint of rostrum, middle portion of abdominal tergites and genitalia fuscous; tegmina subopaque, powdered a very pallid fawn, veins concolorous; wings hyaline.

Anal segment of male long, tubular, deflexed through 40° beyond anal opening, bent before apex to point downward. Pygofer with sides slightly curved, ventrally curving backward to medioventral process, process subtriangular, truncate at apex and minutely notched medially. Aedeagus with a tubular sclerotized basal portion and an eversible apical lobe, the former with two spinose processes adpressed on right side at base, one process curved backward, downward, then upward, the other curved backward and upward, and bifurcate in a pincerlike manner apically; the flexible lobe complex and symmetrical, three spinose processes directed backward, arising near its base on each side, and above them a spinose process, slightly swollen in middle, directed obliquely upward and backward, a pair of large, somewhat bladelike, processes directed posteriorly, each swollen before apex, then narrowing to a deflexed sinuate filament; between these ventrally a pair of simple spinose processes directed posteriorly, curved upward distally. Genital styles in side view sinuately tapering to apex, a broad rounded flange projecting dorsally one-third from base, emarginate in middle of its upper edge, a minute outwardly directed tooth basad of the emargination, a digitate process, adpressed to side, arising near margin just distad of it.

Anal segment of female short, in side view with postanal portion deflexed through 60° . Lateral styles broad, curved inward, with dorsal and ventral apical angles shortly produced and bent mesad. First valvulae with four or five teeth on dorsal limb, two spinose processes at apex of ventral limb. Posterior border of pregenital plate almost semicircular. Egg ovoid, smooth, transparent, 0.45 by 0.26 mm.

Described from 15 males and 21 females taken by the writer at Santa Margarita, Trinidad, B. W. I. (June 15-20, 1942), resting in numbers on a single bush of *Cordia cylindrostachya*. Holotype male and allotype, U.S.N.M. No. 56691; paratypes in B.M.N.H. This species is distinguished by the shape of the aedeagus and of the posterior lobe of the pregenital sternite.

Genus CEDUSA Fowler

Cedusa FOWLER, Biologia Centrali-Americana, Rhynch. Hom., vol. 1, p. 112, 1904.
(Genotype, *C. funesta* Fowler, designated by Muir, Bull. Hawaiian Sugar Planters' Exp. Stat., No. 12, p. 35, 1913.)

Vertex very short, scarcely produced before eyes, frons and clypeus rather narrow, about equal in length, with median carina; lateral margins subparallel, carinate, genae with a lamelliform subantennal process. Pronotum with carinae feeble or obsolete on disk, scarcely hollowed behind eyes, with an oblique transverse carina between eye and margin on each side, lateral lobes below this flat or nearly so. Mesonotum convex, very feebly tricarinate. Tegmina rather short and broad, dilated somewhat distad of apex of clavus, M leaving common stem at basal fifth, Sc+R forking at basal third, Cu₁ forking basad of apex of clavus.

CEDUSA CYANEA, new species

PLATE 10, FIGURES 182-190

Male: Length, 2.5 mm.; tegmen, 3.1 mm. Female: Length, 2.5 mm.; tegmen, 3.1 mm.

Vertex short, quadrate, much wider across base than long (3.3 to 1); apex straight, base shallowly emarginate, lateral margins slightly raised; frons twice as long as wide, apex 1.1 times as wide as base, lateral margins very slightly expanded below level of antennae, then very slightly incurved to suture; median carina present; a prominent subantennal process on genae, in front view about twice as long as antennae. Pronotum very short, anterior margin convex, posterior roundly emarginate, a thick carina between eye and tegula on each side, ventral lateral portions of pronotum not markedly bent anteriorly. Tegmina with M 5-branched at margin.

Head, pronotum, mesonotum, fore and middle legs, and genitalia dark fuscous; subantennal process, hind legs, and abdominal sclerites rather paler fuscous; abdominal membrane pale, sometimes tinged red medially; tegmina smoky brown, basal cell, a spot at base of stigma, a short transverse vein near apex of stigma, and an oblique line from apical fork of R to apex of clavus hyaline; veins slightly darker; wings hyaline, clouded pale fuscous, veins darker. Insect in life powdered a dusky blue.

Anal segment of male tubular, in dorsal view slightly longer than broad (1.2 to 1), exposed membranous portion rather broadly conical. Pygofer with lateral margins broadly sinuate, devoid of a median process ventrally. Aedeagus tubular, a broad twisted fold arising ventrally at base and curling to right side and upward at apex; a stout spine, deeply curved, directed dorsally and anteriorly at apex; on left side subapically and dorsally a flat lobe directed anteriorly with a short downward spine on its inner face distally; below this lobe a flat bladelike process directed anteriorly above dorsal surface of aedeagus, then twisted upward through 90° distally. Genital styles broad; in lateral view a short process on dorsal border near

base, the tip of the process bent outward; inner margin simple, devoid of lobes.

Anal segment of female short, lateral angles not produced. Lateral styles simple, rather narrow, tapering bluntly to apex.

Described from 15 males and 9 females collected by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, July 24, 26, 1942), resting on low bushes. Holotype male and allotype, U.S.N.M. No. 56692; paratypes in B.M.N.H. This species is distinguished by the shape of the anal segment of the male, of the genital styles, and of the aedeagus and by the dark color of the rostrum, legs, and abdomen.

CEDUSA RUBRIVENTRIS, new species

PLATE 10, FIGURES 191-194

Male: Length, 2.6 mm.; tegmen, 3.1 mm. Female: Length, 2.6 mm.; tegmen, 3.1 mm. Head, thorax, and tegmina as in *C. cyanea*.

Head and thorax dark fuscous; sclerites of abdomen and genitalia sometimes testaceous or fuscous; subapical joint of rostrum pallid, apical joint piceous; legs pallid or testaceous; membrane of abdomen crimson red; tegmina smoky brown, a spot at base of stigma, a short transverse vein near apex of stigma, and a narrow line from apical fork of Sc to apex of clavus hyaline; veins concolorous or slightly darker brown; wings hyaline, clouded fuscous, veins darker. In female first valvulae pallid or testaceous; insect in life powdered dusky blue.

Anal segment of male tubular, elongate, 2.4 times longer than wide at base, in dorsal view narrowing distally but expanding just before apex; membranous portion forming an elongated triangle medially. Pygofer with lateral margins very slightly sinuate, devoid of a median process ventrally. Aedeagus basally a simple tube; distally on left side of flexible portion a broad spinose process, angularly bent in middle, directed anteriorly in repose; mesad of this process and about as long, a membranous tube, sclerotized along its right side, terminating in two short falcate processes, one being rather blunt, the other spinose; on right side of flexible portion of aedeagus a sinuate spine directed obliquely upward, and distad of it a narrow, curved, bladelike process expanding into a flat blunt lobe at apex. Genital styles large, in ventral view with a blunt lobe on inner margin near base, then expanding and abruptly tapering toward exterior margin, which is produced at apex into a sharp point directed mesad.

Anal segment of female short. First valvulae of ovipositor with margins straight and almost parallel, bearing five spinose processes, long and slightly diverging.

Described from two males and two females taken by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, 1942), resting on low bushes. Holotype male and allotype, U.S.N.M. No. 56693; paratype

in B.M.N.H. This species is very like *cyanea* but is readily distinguishable by the shape of the male anal segment, genital styles, and aedeagus, and less easily in the female by the straight-sided first valvulae. In color it is distinguished by the pale subapical joint of the rostrum, the pale legs, the crimson abdomen, and in the female by the pale yellow first valvulae.

Genus PATARA Westwood

Patara WESTWOOD, Trans. Linn. Soc. London, vol. 19, p. 13, figs. 6a-d, 1845.
(Genotype, *P. guttata* Westwood, *ibid.*)

Vertex small, triangular; frons very narrow, margins contiguous to near apex; vertex and frons in profile forming a curve; genae devoid of a subantennal process; antennae reaching beyond apex of head, second segment large, cylindrical, not compressed. Small, delicate species, exhibiting sexual dimorphism in the second segment of the antennae.

PATARA TRIGONA, new species

PLATE 10, FIGURES 195-201

Male: Length, 2.3 mm.; tegmen, 2.7 mm.

Antennae with second segment subcylindrical, expanding slightly to apex, uniformly minutely granular except at apex and along a narrow dorsal triangular area extending basad from apex. Tegmina with commissural margin only slightly excavated at apex of clavus.

Vertex, frons, genae, pronotum, and lateral areas of mesonotum fuscous; clypeus, rostrum, scutellum, and legs pallid; antennae yellow, clouded with very numerous minute piceous granules, bare portion pallid; eyes red; abdominal sclerites and genitalia pale fuscous, membrane red; tegmina fuscous, margin from middle of costa to apex of clavus white, apical veins white submarginally, claval vein distad of junction white to near apex, apical margin of tegmina tinged pink; wings hyaline, slightly suffused fuscous, veins darker.

Anal segment very short, subquadrate, posterior angles produced obliquely outward. Pygofer with lateral margins slightly sinuate, hind margin ventrally somewhat emarginate in middle, devoid of a medioventral process. Aedeagus tubular, bent dorsad apically, a small lobe on left dorsal margin two-fifths from base; two spines on left side toward apex, both directed anteriorly, the ventral spine at least 1.5 times as long as the dorsal; two longer spines on right side directed anteriorly, the lower sloping obliquely upward.

Described from one male taken by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, 1942), resting on a low bush. Type, U.S.N.M. No. 56694. This species is distinguished by the bare tri-

angular patch on the dorsoapical area of the second antennal segment, by the structure of the male genitalia, and by the color.

PATARA VITTATIPENNIS, new species

PLATE 10, FIGURES 202-207

Male: Length, 2.0 mm.; tegmen, 2.5 mm.

Antennae with second segment subcylindrical, expanding toward apex, uniformly minutely granular to apex, where it is bare in a circle around base of third segment. Tegmina with commissural margin distinctly and widely excavated distad of apex of clavus.

White or pallid; protarsi and mesotarsi very pale fuscous, membrane of abdomen red ventrally; tegmina hyaline, veins milky, costal cell fuscous basally, a distinct oblique pale fuscous band from middle of costal margin to anal angle, a paler band parallel to this from apical fork of Sc to tip of apical margin (cell M_1), a faint fuscous cloud submarginally in intervening apical cells, a faint oblique fuscous bar at apex of clavus, a second bar on the transverse vein between M and Cu_1 , a fuscous band posterior and parallel to claval suture, an oblique band from junction of claval veins across Cu_1 then bent through 40° to lie horizontally between M and Cu_1 , posterior claval vein bordered fuscous on each side basad of junction; wings hyaline.

Anal segment very short, subquadrate. Pygofer with lateral margins slightly sinuate, ventral margin straight, devoid of medioventral process. Aedeagus tubular, curved dorsad distally; on right side two short, broad bladelike pointed laminae arising at apex and directed anteriorly; on left side a long sinuate spine arising three-quarters from base and directed anteriorly, a second spine arising slightly distad of former, curving dorsad and somewhat anteriorly. Genital styles in lateral view narrow at base, expanding in basal two-thirds then narrowed to apex, which is bluntly rounded; a vertical granular finger-like process on dorsal margin near base.

Described from one male collected by the writer in St. John's Valley, Trinidad, B. W. I. (Sept. 21, 1942), resting on a leaf. Type, U.S.N.M. No. 56695. This species is distinguished by its uniformly granulate antennae, by the distinctly excavated commissural margin of the tegmina, by the shape of the genitalia, and by the tegminal pattern.

PATARA POECILOPTERA, new species

PLATE 10, FIGURES 208-213; PLATE 11, FIGURE 214

Male: Length, 2.1 mm.; tegmen, 2.9 mm.

Antennae with second segment subcylindrical, expanding toward apex, four times as long as wide in middle, as long as mesonotum with scutellum, somewhat obliquely truncate at apex, uniformly minutely

granular, except at apex and on a small round spot on dorsal surface near base. Tegmina with commissural margin not excavated distad of apex of clavus.

Vertex, genae below eyes, basal joint of antennae, basal part of clypeus, rostrum, posterior part of pronotum, mesonotum, pleurites, legs, and genital styles pale yellow; genae before eyes, distal part of clypeus, coxae, abdominal sclerites, anal segment, and pygofer pale fuscous; antennae dull yellow with a delicate piceous granulation; tegmina hyaline, clouded with fuscous, a series of six clear round spots on Sc+R, a spot on Sc beyond fork, followed distally by a large clear area extending across to R, three more spots before apical transverse vein, R with two clear spots near transverse vein, and an elongated spot basad of Sc+R fork, a large clear area over common stem at base of tegmina, M with four clear spots on basal third, three in apical third, six clear spots in basal third of Cu₁, thence a spot at each veinal junction, a clear spot at junction of apical veins with margin; costal cell, transverse veins, and an oblique band near apex of clavus darker fuscous, veins mostly pale, anteroapical margin tinged reddish orange; wings hyaline, fuscous at base of anal area, veins fuscous.

Anal segment of male deflexed through 30° beyond anal opening, produced posteriorly into a narrow lobe. Pygofer with lateral margin broadly sinuate, devoid of medioventral process. Aedeagus tubular, directed upward distally to a flattened lobe; a spine on left side ventrally, directed anteriorly, a second spine, arising somewhat more dorsally, directed vertically then bent through 90° to point posteriorly; two large spines directed anteriorly from apical lobe, the upper short, the lower three-quarters as long as aedeagus. Genital styles narrow at base, expanding to an almost quadrate lobe at apex, a vertical process on dorsal margin at middle bearing at its tip two spines, one directed inward, the other outward.

Described from two males collected by the writer in St. John's Valley, Trinidad, B. W. I. (July 27, 1942). Type, U.S.N.M. No. 56696. This species is distinguished by the clear spot at the base of the second segment of the antennae, by the structure of the genitalia, and by the color pattern of the tegmina.

Family KINNARIDAE

The possession of wax-secreting plates on the terga of the sixth, seventh, and eighth abdominal segments is not a family character, unless *Prosotropis* and allied genera be separated into another family. The writer at present recognizes two subfamilies: KINNARINAE, including forms possessing such wax-bearing plates, and PROSOTROPINAE, including forms with them reduced on the sixth tergite, obsolete on the seventh, and absent from the eighth.

Subfamily KINNARINAE

BYTROIS, new genus

Vertex small, short, shallowly excavated basally, lateral margins greatly raised, strongly converging to level of middle of eyes, where they are joined by a short transverse carina; vertex in profile forming an unbroken curve with frons; frons narrow, deeply troughlike, lateral margins greatly elevated, gradually diverging to apex, apex about twice as wide as base, median carina absent, median ocellus distinct; frontoclypeal suture impressed; clypeus narrow, tumid, tricarinate; second segment of antennae more than twice length of first. Pronotum short, produced anteriorly into posterior emargination of head, shallowly excavate on hind border, median carina distinct, lateral carinae following hind margin of eyes, turning posteriorly between eyes and tegulae; mesonotum with disk flat, curved upward at scutellum, median carina distinct, lateral carinae somewhat less so. Hind tibiae unarmed, sometimes with eight or nine minute denticles. Tegmina with costal cell wide, Sc+R forking slightly before stigma, common stalk Sc+R+M fully two-thirds as long as basal cell; typically ten apical cells and an antepical series of five cells, of which the anterior three are large; claval suture meeting commissural margin beyond middle of tegmen, clavus not granulate. Wings with third apical cell of M, a triangular cell, subequal in length to its stalk. Anal segment of male not bifid. Ovipositor incomplete.

Genotype: *Bytrois nemoralis*, new species.

BYTROIS NEMORALIS, new species

PLATE 11, FIGURES 221-229

Male: Length, 2.1 mm.; tegmen, 3.3 mm. Female: Length, 2.3 mm.; tegmen, 3.5 mm.

Vertex, frons, genae before antennae, lateral lobes of pronotum, pleura, procoxae and mesocoxae, and ventral sclerites of abdomen dark fuscous to piceous; clypeus, genae below antennae, basal segment of antennae, pronotum dorsally, mesonotum, protarsi and mesotarsi, post-femora, and abdominal tergites lighter fuscous; carinae of head and pronotum, second segment of antennae, and genitalia testaceous or pale fuscous; rostrum, profemora and mesofemora and tibiae, metatibiae and tarsi, and membrane of abdomen pallid.

Anal segment of male rather short, in dorsal view narrowed apically, slightly indented on posterior margin. Pygofer short, rather deep dorsoventrally, lateral margins excavated in upper half, produced into a blunt lobe at level of genital styles, ventral surface of pygofer tumid. Aedeagus short, consisting of a broad, short dorsal hoodlike lobe, flat above, curved downward laterally, with posterior margin sinuate,

drawn out into a short point lateroapically, and below this a broad scooplike process, slightly longer than the dorsal hood, with a median ridge, minutely serrate, on its upper surface, and a corresponding groove on its lower. Genital styles short, broad, in side view to lower border sinuate, curving distally upward, the dorsal border mostly straight, turned slightly upward at apex, with a short vertical lobe subapically.

Anal segment of female small, lateral angles produced posteriorly almost as far as apex of telson. Lateral styles broad, lower margin rounded, dorsal margin deeply excavated, an expanded lobe, approximately quadrate, at apex. Ovipositor greatly reduced, largely membranous, with slender sclerotized components.

Described from 31 males and 44 females taken by the writer in St. John's Valley, Trinidad, B. W. I., on various dates between May 1942 and March 1943, on various shrubs and on cacao. Holotype male and allotype, U.S.N.M. No. 56697; paratypes in B.M.N.H. This genus differs from *Atopocixius* Muir, *Oeclidius* Van Duzee, and *Paroeclidius* Myers in not having the vertex produced in front of the eyes and in the details of the tegminal venation.

Subfamily PROSOTROPINAE

EPARMENOIDES, new genus

Head, with eyes, scarcely two-thirds width of pronotum; vertex longer than wide, shallowly excavated at base, lateral margins converging somewhat anteriorly, vertex in profile curving uninterruptedly onto frons, median carina distinct, no transverse carina at apex; frons one and three-quarters times longer than wide, apex about twice as wide as base, lateral margins diverging for two-thirds from base, then curving in toward suture, carinate, median carina distinct, percurrent, basal half of frons sloping evenly into vertex, distal half somewhat convex; median ocellus absent; clypeus at base not quite so wide as widest part of frons, tapering acutely to apex, carinate medially and laterally, somewhat convex; genae slightly tumid below antennae, devoid of a subantennal process; antennae with basal segment very short, second segment distinctly longer than broad; eyes moderately emarginate ventrally. Pronotum shorter than vertex, anterior margin incurved behind eyes, posterior margin shallowly excavated, median carina distinct, lateral carinae of the disk feebly present, a carina on each lateral margin between eye and tegula; mesonotum feebly convex, posteriorly concave, median and lateral carinae distinct, scutellum acute at tip. Hind tibiae unarmed. Tegmina slightly more than two and a half times as long as wide, seven apical cells, two ante-apical cells distad of nodal line; common stalk of Sc+R+M about one-quarter

length of basal cell, Sc+R forking close to stigma, anterior branch of M simple to apex; claval suture meeting commissural margin beyond middle of tegmen; clavus not granulate. Wings with veins of fourth apical cell without a common stalk at base, or with only a vestige. Anal segment of male bifid, the lateral lobes deflexed distally. Genital styles with a setose eminence on dorsal border behind apex. Ovipositor incomplete. Egg bluntly ovoid.

Genotype: *Eparmenoides ripalis*, new species.

EPARMENOIDES RIPALIS, new species

PLATE 11, FIGURES 215-220

Male: Length, 1.9 mm.; tegmen, 2.0 mm. Female: Length, 1.8 mm.; tegmen, 2.0 mm.

Vertex testaceous, lateral carinae dark, a fuscous band transversely across middle, sometimes a pale line near each posterolateral angle; frons yellow, sometimes testaceous basally; clypeus very pale, genae pallid with a square black spot with its lower edge level with frontoclypeal suture, first segment of antennae pale, second segment piceous, paler distally; pronotum testaceous, sometimes distinctly darker in anterior half, mesonotum narrowly fuscous anteriorly, otherwise testaceous, posterior margins and scutellum sometimes pallid; legs pallid; abdominal sclerites fuscous, membrane tinged red; tegmina yellowish, wings vitreous.

Anal segment of male deeply bifid, lateral lobes symmetrical, deflexed at apex. Pygofer with lateral margins sinuate, somewhat lobate in upper half. Aedeagus tubular, sharply upturned and tapering in apical half, a conical projection ventrally near base, an inner pair of slender processes curving upward and caudad, a longer pair of filamentous processes arising on upper margin about halfway from base, directed caudad and strongly upward, then looping forward, downward, and outward. Genital styles narrow, bent upward through 45° two-thirds from base, tapering to a point, with a rounded lobe on dorsal margin subapically.

Lateral styles of female deeply cleft, the dorsal lobe narrow and tapering, the ventral lobe almost ovoid in outline. Pregenital plate subquadrate, about one and a half times as broad as long.

Described from 12 males and 8 females taken by the writer in St. John's Valley, Trinidad, B. W. I. (July 27, 1942), feeding below leaves of *Cordia* sp. Holotype male and allotype, U.S.N.M. No. 56698; paratype in B.M.N.H. This genus differs from *Eparmene* Fowler in the shape of the frons and from *Quilessa* Fennah in the proportions of the frons and in the venation of the tegmina and wings.

Family DICTYOPHARIDAE

Subfamily DICTYOPHARINAE

Tribe DICTYOPHARINI

Genus LAPPIDA Amyot and Serville

Lappida AMYOT and SERVILLE, Histoire naturelle des insectes. Hémiptères, p. 505, 1843. (Genotype, *Dictyophara proboscidea* Spinola, Ann. Soc. Ent. France, ser. 1, vol. 8, p. 292, pl. 13, fig. 4, 1839 (as *Dyctiophora proboscidea*).)

Vertex with an elongate, narrow cephalic process, usually expanded at apex. Pronotum produced anteriorly, shallowly angularly emarginate on hind margin, tricarinate, lateral carinae diverging basad; mesonotum tricarinate, lateral carinae arcuate.

Protibiae elongated, distinctly exceeding length of profemora, posttibiae with four or five spines. Tegmina elongate, rather narrow, vitreous, with supernumerary longitudinal veins, and an apical, subapical and nodal line of transverse veins; stigma with three or four cells, sometimes fewer.

LAPPIDA species (?)

PLATE 11, FIGURES 230-234

Female: Length, 9.7 mm.; tegmen, 9.4 mm.

Vertex with a narrow groove medially, as long as eyes, a definite constriction before eyes, lateral margins raised, slightly rounded in profile; cephalic process expanded at tip; frons with lateral margins parallel, ampliate in apical third, converging to frontoclypeal suture. Pronotum with an impression on each side of median carina at middle, an oblique row of six granules followed by a row of three on each side. Profemora not toothed, posttibiae with five and six spines respectively. Stigma 2-celled.

Green; margins of cephalic process, lateral carinae of frons basad of ocelli, granulation of pronotum, marginal carinae of pronotum, and a line below them, apex of rostrum, apex of femora, a basal spot on protibiae, protarsi and mesotarsi, and anal segment dark fuscous to piceous, a red and black line along sides of cephalic process; tegmina yellowish, hyaline, stigma yellow, apical cells of M and Cu_{1a} infuscate, less so basad, veins brown; wings vitreous, veins fuscous.

Anal segment long, in side view expanding apically, obliquely truncate at apex. Ovipositor with first valvulae bearing six teeth on dorsal margin, second valvulae broad, greatly compressed laterally, sclerotized along outer margin near base, tapering evenly to apex, covered dorsally with a very thin foliaceous lobe narrowing abruptly to a slender point, third valvulae (lateral styles) rather broad, elongate, roundly tapering to apex, where there is a constriction followed by a short narrow appendage.

Described from a single female collected by F. W. Urich, Trinidad, B. W. I. (1919), taken from the collection of the former Imperial Department of Agriculture. It has not proved possible to place this specimen with accuracy owing to its poor condition. It is not represented in the collection of the B.M.N.H.

Genus **TOROPA** Melichar

Toropa MELICHAR, Abh. zool.-bot. Ges. Wien, vol. 7, p. 80, 1912. (Genotype, *Dictyophora ferrifera* Walker.)

Vertex quadrate, lateral margins parallel, basal margin angularly excavate, a transverse impression before eyes, at which vertex narrows into a cephalic process projecting obliquely upward, slightly expanded in apical third, rounded-truncate at apex, with lateral margins distinctly concave; frons with median carina present only in basal half, lateral carinae distinct throughout; clypeus tricarinate. Pronotum produced anteriorly, tricarinate, with an impression on each side of middle line; mesonotum tricarinate, lateral carinae arcuate. Pro-tibiae not markedly longer than profemora, posttibiae with five spines. Tegmina long, rather narrow, with supernumerary longitudinal veins and an apical, subapical, and nodal line of transverse veins, stigma with three or four cells.

TOROPA FERRIFERA (Walker)

PLATE 11, FIGURES 243-250

Dictyophora ferrifera WALKER, List of specimens of homopterous insects in the collection of the British Museum, vol. 2, p. 313, 1851.

Male: Length, 11.3 mm.; tegmen, 13.9 mm. Female: Length, 12.0 mm.; tegmen, 15.0 mm.

Vertex with process nearly four times as long as wide at base, process directed upward at 35°; frons with median carina present only in basal half, lateral carinae reaching apex; cephalic process subrectangular in profile and in section. Hind tibiae with five spines. Tegmina with stigma with three or four cells.

Head, thorax, legs, and abdomen dark emerald-green; eyes dark red; lateral margins of cephalic process, dorsally and ventrally, lateral carinae of frons, pronotum behind eyes red, marginal carinae of pronotum between eyes and tegulae black in basal half, the carina below them on each side broadly black except on basal quarter. Tegmina hyaline, clouded with brown around apex, veins green, dark distad of nodal line. Wings hyaline.

Anal segment of male rather long, narrow, with upper margin, as seen in profile, almost straight, the lower somewhat curved, apex obliquely truncate. Aedeagus with perianthium narrow, tubular, elongate, deeply cleft laterally at apex; spines of penis arising from

basal ring directed posteriorly to apex of periandrium, then recurving, the spine on left side straight, sloping obliquely ventrad, with a line of minute denticles on its upper surface, the spine on right side looping abruptly and sloping above periandrium to left side, then turning ventrad, minutely and somewhat sparsely corrugate near apex. Genital styles triangular, expanding distally, obliquely truncate at apex, a rounded prominence on dorsal margin near base, a short curved spine at apex, a short triangular lobe projecting laterally near base.

Anal segment of female rather long, narrow, margins as viewed laterally diverging gradually distally, apex obliquely truncate. Pregenital segment with a median ventral lobe. Ovipositor with first valvulae bearing four small and two large teeth dorsally with a broad deeply cleft lobe ventrally, second valvulae tubular narrowly sclerotized laterally, lateral styles elongate, rather narrow, dorsal margin almost straight, ventral margin curved, both narrowing distally to a constriction with a small triangular lobe distally.

Described from eight males and seven females taken by the writer, one female at St. Augustine (Dec. 5, 1935), the remainder at Santa Margarita, Trinidad, B. W. I., on various dates in August and September 1942, resting or feeding on bushes, including *Croton* sp. and bamboo. W. E. China has compared Trinidad material with the type.

Genus HYALODICTYON Fennah

Hyalodictyon FENNAH, Proc. Biol. Soc. Washington, vol. 57, p. 86, 1944. (Genotype, *Dictyophara nodivena* Walker, Insecta Saundersiana, Homoptera, p. 37, 1858.)

Vertex produced into a more or less elongated conical process, flattened or nearly so dorsally, lateral margins carinate, converging apically, apex bluntly angulate or rounded, posterior border shallowly excavated, median carina present reaching to apex; frons elongate, narrow, with a percurrent median carina and lateral carinae, usually complete; clypeus tricarinate; pronotum produced anteriorly, tricarinate, with an impression on each side of middle line, devoid of granules, two carinae present laterally behind eye on each side; mesonotum tricarinate. Protibiae moderately long, posttibiae with four to six spines. Tegmina vitreous, with seven rows of irregular transverse veins beyond nodal line, devoid of transverse veins on clavus.

HYALODICTYON TRUNCATUM (Walker)

PLATE 11, FIGURES 235-238

Dictyophara truncata WALKER, List of homopterous insects in the collection of the British Museum, vol. 2, p. 316, 1858.

Vertex produced before eyes for more than twice their length, slightly more than 1.5 times as long as wide across base, lateral margins

converging, more so just distad of eyes, rounded to apex distally; frons in profile slightly concave in middle, median and lateral carinae present, the latter incurved basally to meet at an acute angle; rostrum not reaching nearly to middle of porrect postfemora. Legs with protibiae rectangular, 25 times longer than width of their widest side at middle. Tegmina with stigma 4- to 7-celled.

Anal segment of female in side view with dorsal margin gradually and sinuately raised, apex obliquely truncate, lower margin shallowly curved, total length equal to width across base. First valvulae of ovipositor with four small and distally two large teeth on dorsal margin; lateral styles approximately ovoid, dorsal border shallowly curved, ventral border more strongly so, with a very short broad lobe on distal margin.

Described from six females, one collected by M. D. French-Mullen (Feb. 14, 1937), the remainder by the writer (July-Dec. 1942, on various dates) resting on bushes. A Trinidadian specimen was compared by Mr. China with the type.

HYALODICTYON FALLAX, new species

PLATE 11, FIGURES 239-242

Female: Length, 12.0 mm.; tegmen, 12.5 mm.

Vertex rather elongate, produced before the eyes for twice their length, shallowly excavate at base, median carina present, lateral margins straight, gradually converging apically, roundly incurved at apex; frons in profile flat, not concave, lateral margins parallel, lateral carinae very roundly arched, not at all angulate, at their basal junction; rostrum reaching posteriorly well beyond posterior coxae, base of last joint level with postcoxae, tip reaching almost to middle of porrect postfemora. Legs long and slender, protibiae rectangular in section, fully 32 times longer than wide across middle of widest side, or even more. Tegmina without cross veins on the corium, Sc + R forking near stigma, stigma with three cells, M forking about middle of tegmen, Cu₁ forking markedly basad of M fork.

Green, apex of rostrum piceous; tegmina hyaline, veins green; wings vitreous, veins pale.

Anal segment short, in dorsal view as broad as long, excluding telson, dorsal margin abruptly raised from base, passing straight to anal foramen, lower margin curved. Lateral styles of ovipositor broad, subtriangular, tapering distally, upper margin almost straight, lower margin curved. First valvulae with five rather slender spines on dorsal margin, passing into grooves at their bases, and two larger upturned spines apically.

Described from two females, one collected by F. W. Ulrich, Trinidad, B. W. I. (1921), the other by the writer in St. John's Valley, Trinidad,

B. W. I. (June 12, 1942). Type, U.S.N.M. No. 56673. This species is close to *H. truncatum* but is readily distinguished by the lateral margins of the cephalic process being straight, the vertex being proportionately narrower than in *truncatum*, by the frons in profile being straight, not slightly concave, by the lateral carinae of the frons being perfectly arched in a curve where they meet basally, not slightly angulate, by the distinctly more slender protibiae, and by the shape of the anal segment of the female.

Genus RETIALA Fennah

Retiala FENNAH, Proc. Biol. Soc. Washington, vol. 57, p. 83, 1944. (Genotype, *R. proxima* Fennah, *ibid.*)

Vertex longer than broad (about 1.5 to 1), slightly curved upward anteriorly, basal margin shallowly excavated, lateral margins straight or very slightly convex between eyes, thence narrowing to apex in a straight line without an abrupt constriction in front of eyes, not quite meeting at apex, joining lateral margins of frons; sides of frons visible in dorsal view, and junction of lateral carinae of frons visible beyond apex of vertex, median carina feebly present on vertex, a short feeble carina at base on each side; frons narrow, longer than broad (about 2.5 to 1), widest at basal third, lateral margins sinuate, median carina percurrent, thick at base, narrowing apically, lateral carinae diverging as far as basal two-fifths, then sinuately converging to meet in middle line at apex, between these carinae frons somewhat tumid; clypeus narrow, tricarinate; rostrum reaching beyond postcoxae; antennae with basal segment short, second segment ellipsoidal, studded with sensory pits, the terminal segment inserted dorsally and exteriorly before apex of second. Pronotum produced anteriorly in middle, posteriorly angularly emarginate, tricarinate on disk with the lateral carinae becoming obsolete basally, an impression on each side of middle line, two carinae at lateral margin of each side, between eye and tegula; two carinae on each tegula, mesonotum elongate, tricarinate, disk flat. Legs long and slender, protibiae longer than profemora, posttibiae typically with four spines. Tegmina rather long and narrow, Sc+R+M stalk about half as long as basal cell, Sc+R forking just before stigma, level with apex of clavus, M forking at middle of tegmen, Cu₁ forking at apical third of clavus, stigma with three cells, a nodal line and a subapical line of transverse veins present, R typically with three branches at apical margin, M with seven, Cu_{1a} with three, Cu_{1b} with two.

RETIALA VIRIDIS, new species

PLATE 11, FIGURES 251-264

Male: Length, 8.4 mm.; tegmen, 7.9 mm. Female: Length, 8.3 mm.; tegmen, 8.3 mm.

Vertex longer than broad (1.4 to 1); frons longer than broad (2.6 to 1). Protibiae longer than profemora (1.4 to 1).

Bright green in life; lateral margins of vertex at apex, of frons at base, lateral carinae of frons at base, a pair of laterad spots at apex of each femur, apex of rostrum and posttibial spines black; protarsi and mesotarsi fuscous; tegmina vitreous, veins and stigma pale green; wings vitreous, veins pale yellow, becoming brown near apical margin.

Anal segment of male elongate, in lateral view expanding apically, sinuately truncate at apex with a small lip protruding posteriorly, anus subterminal. Pygofer with lateral margin bent posteriorly almost in a right angle, ventral margin transverse. Aedeagus with a short ringlike component at base, extended caudad ventrally and furcate at its apex, a large membranous fold, symmetrically biramous, with a sclerotized rod, arising from a median common stem, traversing the membrane on each side, each rod in ventral view being angularly S-shaped, and meeting its counterpart at apex; middle portion of aedeagus consisting of a flat elongated plate, stiffened with a pair of sclerotized rods, overlying a subrectangular membranous apodeme, laterally compressed and apically truncate.

Anal segment of female similar to that of male. Lateral styles broad, with margins subparallel, tapering somewhat abruptly near apex, with a setigerous area apicodorsally, a large shallowly domed thin flange projecting caudad dorsally joined to lateral portion at base; first valvulae with five very small teeth dorsally, passing into long grooves at their bases, and two large teeth apically, on inner aspect ventrally an elongate foliaceous lobe; second valvulae thin and pointed.

Described from five males and six females collected by the writer at St. Augustine, Trinidad, B. W. I., on various dates between July and December 1942 on Liberian coffee, *Casuarina*, and *Hibiscus*. Holotype male and allotype, U.S.N.M. No. 56699; paratype in B.M.N.H.

Genus TAOSA Distant

Taosa DISTANT, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 355, 1906. (Genotype, *Plata suturalis* Germar, Ent. Arch. Thon, vol. 2, p. 48, 1830.)

Vertex short, not much exceeding eyes, at most as broad as long, usually much broader, rounded or truncate at apex, very shallowly excavated at base, lateral margins parallel between eyes, or very slightly converging, transverse carina at apex curved, a distinct triangular or quadrangular facet on each side of head distad of junction of lateral margins with transverse carina, vertex slightly depressed, median carina absent or scarcely present at base; frons not much longer than broad, lateral margins sinuate, expanding to below level of antennae, then curving inward to suture, median and lateral carinae

present, the latter sometimes feeble; clypeus with a median carina and carinate lateral margins. Pronotum with anterior margin convex, posterior margin shallowly excavated, with a deeper median notch, median carina present; mesonotum tricarinate. Tegmina long and rather narrow, Sc+R forking near stigma, M forking basad of apex of clavus. Cu₁ forking still further basad, stigma with two to four cells, nodal line of transverse veins present, a subapical line which is sometimes rather irregular, and an apical line, veins of clavus uniting before middle.

This genus is the same as *Cuernavaca*, a subgenus of *Dictyophara* erected by Kirkaldy with *Dichoptera herbida* Walker as its type (Kirkaldy, Bull. Hawaiian Sugar Planters' Assoc., Div. Ent., No. 12, p. 14, 1913). The species are most readily separated by the shape of the vertex, while the writer has made use of the genitalia, that of the first valvulae of the ovipositor being exceptionally useful.

TAOSA VITRATA (Fabricius)

PLATE 11, FIGURES 265-271

Flata vitrata FABRICIUS, Systema rhyngotorum, p. 48, 1803.

Cladodiptera viridifrons WALKER, Insecta Saundersiana, Homoptera, p. 41, 1858.

Vertex broader than long (1.7 to 1), not projecting before eyes, anterior margin weakly curved, triangular facet on each side apically distinct, base of frons visible from above; frons with median carina distinct, lateral carinae less so, frons about 1.7 times longer than wide. Posttibiae with four spines. Stigma of tegmina with two or four cells.

Dark brown; vertex pale, frons pale with a transverse piceous band across basal eighth, clypeus pale in basal half, piceous in apical half, rostrum pale greenish yellow, genae pale; pronotum pale anteriorly in middle, piceous anteriorly behind and below eyes, basal margin infusate; mesonotum with two or three pairs of transverse brown spots on disk between median and lateral carinae, scutellum very pale, almost white; femora piceous on inner surface, protibiae and tarsi dark; abdomen dark brown, a pale broad longitudinal band medially on dorsal and ventral surfaces, lateral margins pale, genitalia fuscous; tegmina with veins of membrane very dark, nodal line of cross veins narrowly infusate from R, a broad dark oblique line from apex of R to apex of clavus, with a second dark band arising at apex of R and following apical margin to Cu_{1a}, commissural margin infusate from apex of Cu_{1s} to a point halfway along clavus; wings with veins dark, anal area fuscous toward margin.

Anal segment of male rather short, dorsal margin in profile decurved, then passing straight to apex, lower margin curved, apical margin obliquely truncate. Aedeagus narrow, tubular, slightly ex-

panding distally, then converging, with a bluntly rounded lobe projecting posteriorly on each side at apex, ventral border with a pair of triangular plates at apex, each with a spine projecting a short distance beyond it. Genital styles in side view subovate, strongly excavated on dorsal margin toward base, with a short decurved tooth directed outward at middle of excavation, and a second tooth pointed anteriorly just distad of it.

Described from one male specimen collected by Dr. J. G. Myers at Ocumare de la Costa, Venezuela (Dec. 17, 1930), and since sent to the British Museum.

Distant has synonymized *T. viridifrons* Walker with *T. virata* and Melichar gives the same synonymy. Melichar's description of *virata* does not agree with the original description, whereas his description of *suturalis* Germar agrees with Fabricius's description of *virata*, "caput atrum fronte rostroque fuscis: labio tamen atro. Thorax elevato lineatus, ater scutello apice fusco. Abdomen atrum margine fusco. Elytra hyalina margine postico fusco. Pedes fusci." W. E. China states that the type of *viridifrons* appears to be missing.

TAOSA BIMACULIFRONS Muir

PLATE 11, FIGURES 272-274; PLATE 12, FIGURES 275-277

Taosa bimaculifrons MUIR, Proc. Hawaiian Ent. Soc., vol. 7, p. 470, 1931.

Female: Length, 10.0 mm.; tegmen, 12.5 mm.

Length of vertex slightly more than half width at base, vertex not projecting before eyes, anterior margin shallowly curved, triangular facet on each side anteriorly distinct, lateral margins almost parallel, basal margin shallowly excavate; base of frons visible from above, carinae of frons distinct except at base. Hind tibiae with four spines. Stigma with three cells.

Green; a piceous quadrate spot overlying base of each lateral carina of frons; metanotum, a spot on metapleurites, protibiae and tarsi, metacoxae and trochanters dark brown; tegmina vitreous, veins greenish, dark on membrane distad of nodal line, stigma greenish brown, a fuscous semicircular spot extending over three cells at apical margin, and slightly overlapping into a further cell on each side; wings hyaline.

Ovipositor with first valvulae deflexed distally, then upturned apically, two recurved teeth on dorsal margin three-quarters from base, three much smaller teeth distad, directed posteriorly, and a pair of teeth at apex, curved upward, the distal tooth longer than the sub-apical tooth; second valvulae narrow, elongate, expanding before apex, rather deeply cleft at apex, the tip of each lobe pointed; lateral styles rather broad, dorsal margin shallowly concave, ventral margin convex, two processes at apex, directed caudad, a smaller process on apical

margin below them, a broad thin lamina dorsally attached at base, horizontal, lying mesad of lateral portion.

Described from one female collected on the Amakura River, Venezuela, by Dr. J. G. Myers (February 1931). On p. 472 of his paper Muir states that the base of the frons visible in dorsal view is swollen in the middle in *bimaculifrons*, and elsewhere that a female allotype is deposited in the collection of the Hawaiian Sugar Planters' Association Experiment Station. On inquiry, Dr. C. E. Pemberton kindly informed the writer that no specimens of the genus could be found in the collection of the Station. W. E. China, to whom the matter was referred, stated that the type is not in the British Museum collection but that the collection does possess "a female paratype from Tena, Ecuador (F. X. Williams IV, 1923)." This paratype does not show the swollen frons, viewed from above, and it is possible that the description and figure were taken from the male type, in which case the character may be more pronounced in this sex. Myers's specimen is in the British Museum.

Of the species treated by Muir the British Museum does not possess specimens of *T. viridis* Muir, *T. lineatifrons* Muir, and *T. sororecula* Berg, or as already indicated, the type of *T. viridifrons* Walker.

TAOSA MULIEBRIS (Walker)

PLATE 12, FIGURES 278-283

Cladodiptera muliebris WALKER, List of specimens of homopterous insects in the collection of the British Museum, Suppl., p. 76, 1858.

Male: Length, 8.0 mm.; tegmen, 10.0 mm. Female: Length, 8.0 mm.; tegmen, 10.1 mm.

Vertex 1.7 times as broad as long, not projecting before eyes, lateral margins almost parallel, basal margin shallowly excavate, anterior margin shallowly curved, median carina present at extreme base; triangular facet on each side apically distinct; frons not much visible from above, carinae rather feeble, the lateral carinae curved, obsolete at base and at apex. Hind tibiae 4-spined. Stigma 2-3-celled.

Greenish brown; frons yellowish; legs dark testaceous, posttibiae banded fuscous, abdomen reddish at margin of segments; tegmina vitreous, stigma fuscous, a fuscous area distally on margin from apical veins of R to apex of clavus, this dark area straight on inner margin except for an indentation near middle, clavus fuscous between common stalk of united claval veins and commissural margin.

Anal segment of male rather short, dorsal margin in side view curved downward near base, then passing in a straight line to apex, lower margin curved, apex obliquely truncate. Aedeagus narrow, tubular, cleft dorsally at apex with each lateral lobe tapering to a point, curv-

ing somewhat mesad, and overlain by a thin membranous lamella, dorsally a pair of penial spines emerging subapically and abruptly recurved anteriorly. Genital styles subovate, dorsally excavated near base, with a tooth directed outward and downward and a second tooth directed anteriorly in basal half of upper margin.

Ovipositor with first valvulae rather broad, with four large curved teeth on dorsal margin in distal half, followed posteriorly by a row of four much smaller teeth; second valvulae in side view broad, with upper and lower margins convex, the former less so, a marked cleft at apex; lateral styles with dorsal margin straight or nearly so, the lower margin deeply curved, a narrow point at apex, a thin horizontal lamella lying mesad and attached at base.

Described from one male specimen taken at Yarikita, Northwest District, British Guiana (March 1931), and one female taken at Bom Jardim, Lower Amazon (Sept. 16, 1933), by Dr. J. G. Myers. The male specimen and drawings of the valvulae of the ovipositor were found by W. E. China to agree very well with Walker's type of *T. muliebris*, which is a female. Melichar synonymizes *T. muliebris* under *T. suturalis* Germar, but his description of *suturalis* does not agree with *muliebris*, whereas his description of *T. vitrata* (Fabricius) does so reasonably well. It is possible that there has been some confusion of *suturalis* and *vitrata*, and the writer believes that these names along with their synonymies should be transposed in Melichar's monograph.

TAOSA AMAZONICA, new species

PLATE 12, FIGURES 284-291

Female: Length, 9.3 mm.; tegmen, 12.0 mm.

Vertex wider across base than long (1.6 to 1), scarcely projecting before eyes, lateral margins slightly converging, anterior margin rather strongly curved, basal margin shallowly excavated, median carina feebly present on basal half, triangular facet anterolaterally distinct, base of frons visible from above; frons with carinae distinct, though feeble at base; hind tibiae with four spines; stigma with three cells.

Green; frons paler at base, lateral carinae of frons broadly overlain with a band of reddish brown in basal two-thirds, rostrum piceous at apex, vertex with a dark linear spot on each side of median carina, pronotum with a spot behind each eye, mesonotum with a brown spot anteriorly at apex of median carina, a spot immediately outside each lateral carina at apex, and a spot inside at base, a few dark suffusions laterad, pro- and mesotibiae and tarsi slightly infusate; tegmina vitreous, veins green, fuscous between subapical line and margin, stigma green; wings vitreous, veins dark.

Anal segment subequal in length to hind tarsus, narrow, in side view parallel-sided, obliquely truncate at apex. Lateral styles nar-

row, almost as long as anal segment, gradually expanding distally, rounded at apex, a thin horizontal lobe dorsally, attached at base and lying mesad. First valvulae long, narrow, with a row of three small simple teeth three-quarters from base on dorsal border, with a sclerotized plate distally bearing on its dorsal border a row of 11 minute teeth, short and evenly spaced, each tooth bifid or notched at apex.

Egg elongate-oval, 0.23 by 0.91 mm., thin-walled, but slightly expanded into a thickened shallowly domed cap at one pole.

Described from two females collected by Dr. J. G. Myers at Arumanduba, Lower Amazon (Sept. 17, 1933). Type in B.M.N.H.; paratype, U.S.N.M. No. 56779. This species differs from the others in the shape of the vertex, being approached only by *T. herbida* (Walker) and *T. paraherbida* Muir in this character, and in the unusually long anal segment and ovipositor, as well as in the detailed structure of the valvulae.

TAOSA HERBIDA (Walker)

PLATE 12, FIGURES 292-302

Dichoptera herbida WALKER, List of specimens of homopterous insects in the collection of the British Museum, vol. 2, p. 306, 1851.

Male: Length, 9.0 mm.; tegmen, 11.8 mm. Female: Length, 9.1 mm.; tegmen, 12.0 mm.

Length of vertex two-thirds width across base, about one-third projecting in front of eyes, anterior margin rather strongly curved, lateral margins slightly converging anteriorly, basal margin shallowly excavate, median carina present basally; facet distinct on each side antero-apically, subquadrate rather than triangular, base of frons visible from above, distinctly swollen in middle between lateral carinae; frons with carinae not strongly present, lateral carinae feeble. Hind tibiae with four spines. Stigma usually 4-celled.

Green; a broad orange band overlying lateral carinae of frons in basal half, passing into black basally; apex of rostrum piceous, protibiae and tarsi fuscous, posttibial spines black. Tegmina vitreous, stigma green. Wings vitreous.

Anal segment of male in side view with dorsal margin curved downward slightly near base then passing straight to apex, lower margin shallowly convex, apex obliquely truncate. Aedeagus tubular with two ventral spinose processes arising subapically, directed posteriorly and obliquely upward, and two dorsal spines emerging at apex and abruptly recurved anteriorly. Genital styles somewhat elongate, lower margin convex, dorsal margin with two teeth at basal third, thence sloping concavely to apex, a small blunt lobe at apex produced posteriorly.

Anal segment of female short, in side view dorsal margin straight, lower convex, apex obliquely truncate. First valvulae each with two

unequal rows of teeth dorsally, one row consisting of about eleven teeth, the other of about eight teeth, these being on a descending row arising near base of first. Second valvulae with a narrow, sinuate, sclerotized apodeme very obliquely truncate apically; below this a thin flange, obliquely truncate posteroventrally, with apical margin minutely serrate. Lateral styles with subparallel sides, the upper margin slightly concave, the lower convex, strongly curving upward to apex which is devoid of any process or lobe, a thin horizontal flange attached at base and lying mesad dorsally.

Described from three males and four females taken by the writer at St. Augustine, Trinidad, B. W. I., on various dates between May and November 1942 on Liberian coffee, and from one female collected by Dr. J. G. Myers at Ocumare de la Costa, Venezuela (Dec. 17, 1930).

TAOSA PARAHERBIDA Muir

PLATE 12, FIGURES 303-307

Taosa paraherbida MUIR, Proc. Hawaiian Ent. Soc., vol. 7, p. 471, 1931.

Female: Length, 9.0 mm.; tegmen, 11.8 mm.

Vertex as long as broad across base, produced for about half its length in front of eyes, lateral margins parallel between eyes, basal margin rather shallowly angularly excavated, anterior margin strongly curved, median carina very feebly present at base, triangular facet anteroapically elongate; base of frons not visible from above, carinae of frons very feeble. Hind tibiae with four spines. Stigma with three cells.

Green; lateral carinae of frons overlain with a broad orange band, not black at base. Tegmina hyaline, stigma green. Wings hyaline.

Lateral styles of ovipositor rather narrow and elongate, dorsal margin in side view very shallowly concave, lower margin subparallel, curving upward to apex, which is not produced. First valvulae narrow, sinuate, with a row of eight stout, short, triangular teeth on dorsal margin, with a point at apex.

Described from a single female specimen collected by Dr. C. B. Williams on sugarcane (1921), no locality label being present. This specimen was taken from the collection of the former Imperial Department of Agriculture, in a group of miscellaneous insects collected in canefields, most of which bore a locality label, this being marked "Trinidad" in the great majority of cases. As *paraherbida* is known only from the mainland, it can only be classed on this evidence as a doubtful Trinidad record.

Family FULGORIDAE

7a. Cephalic process absent.

8a. A single transverse carina between vertex and frons.

Subfamily PHENACINAE

Genus PHENAX Germar

Phenax GERMAR, Rev. Ent. Silbermann, vol. 1, p. 175, 1833. (Genotype, *Fulgora variegata* Olivier.)

Vertex broader than long (4 to 1), quadrate, impressed on each side of middle, separated from frons by a single slightly curved carina, lateral margins elevated, basal margin shallowly excavate; frons broader at widest part than long, margins expanding sinuately and gradually to below level of antennae, then abruptly dilated and curved posteriorly to form a strong flange below antennae, the width of the frons at this level being twice its width at base, median carina present on basal half only, lateral carinae joined basally at middle at level of eyes, curving outward, downward, and then slightly inward to level of apex of median carina, then strongly diverging to suture, a short curved carina basally, directed distally, terminating at level of middle of eyes; clypeus almost equilaterally triangular, lateral margins curved sharply inward near suture, elevated middle portion of clypeus tumid, median carina present; antennae with first segment short, cylindrical, second segment globose, pitted with sensoria. Pronotum much broader than head, anterior margin of disk straight, posterior margin slightly convex, median carina present, lateral carinae diverging in a straight line to tegulae, lateral margins carinate between eye and lower margin of tegula on each side, ventrolateral margin of pronotum bent forward, forming a furrow; mesonotum more than twice as wide as long, devoid of median carina except at apex, lateral carinae obscure. Legs long, femora and tibiae rectangular, margins minutely setose, posttibiae with five or six spines. Tegmina expanding for two-thirds of length from base, apical margin very oblique, almost straight, coriaceous or papyraceous, Sc strong to middle, R forking at basal third, M and Cu₁ forking about basal quarter, transverse veins numerous beyond nodal line, regular, crescentically curved, occurring between all the supernumerary longitudinal veins. Wings densely reticulate.

PHENAX VARIEGATA (Olivier)

PLATE 12, FIGURES 308-310

Fulgora variegata OLIVIER, Encyclopédie méthodique: Histoire naturelle des insectes, vol. 6, p. 573, 1791.

Female: Length, 25 mm.; tegmen, 54 mm.

Frons about 3.5 mm. wide at base, 7.0 mm. wide at apex. Protibiae and mesotibiae one-fifth longer than femora.

Head yellowish brown, a piceous spot on vertex on each side of middle line, a piceous area between carinae on basal half of frons, distally two

spots on each side between lateral carinae and margins, a piceous spot on each side of tumid area of clypeus basally, second segment of antennae dull fuscous; pronotum yellow-brown with two spots on callus of disk anteriorly, three large spots near posterior margin, four spots on each side behind lateral carinae, two spots on each side between upper carinae and the lower carinae of the lateral margin, two large elongated spots on lateral lobes below lateral carinae of margin; mesonotum pale brown, four small dark spots on each side close to anterior margin, a small spot on each side near base of scutellum; legs yellow, three dark zones on profemora and mesofemora and tibiae, a dark spot on posterior femora, three dark bands on posterior tibiae, protarsi and mesotarsi fuscous, metatarsi pale yellow; abdomen pale yellow; tegmina pearly yellow, translucent, barred with red and black between Sc and C in basal half, a series of narrow black bars running obliquely across most of basal half, with a more prominent group at midpoint of claval suture directed anteriorly to M, a distinct black and orange band, indented at middle, transversely between costa and apex of clavus, membrane beyond nodal line minutely transversely barred, a broad interrupted band of black and yellow-brown approximately parallel to apical margin, apical margin barred with about six dark spots; wings transparent, fuscous at margin, with pale areas forming a broken submarginal line.

Insect powdered with fawn in life; the female sometimes bearing waxy filaments more than 3 cm. long at apex of abdomen.

Described from one female taken by Dr. J. G. Myers, at Wanaina, Northwest District, British Guiana (March 1931). Specimen in B.M.N.H.

Sb. Two parallel carinae between vertex and frons, with a distinct groove between them; no carina or spine situated in front of eyes.

Subfamily POIOCERINAE

Tribe POIOCERINI

Genus SCARALIS Stål

Scaralis STÅL, Ent. Zeit. Stettin, vol. 24, p. 241, 1863. (Genotype, *Lystra picta* Germar, designated by Distant, Ann. Mag. Nat. Hist., ser. 7, vol. 18, p. 197, 1906.)

Vertex very short, five or six times as broad as long, apical margin shallowly curved anteriorly, lateral margins parallel or slightly indented, posterior margin broadly excavated, disk of vertex impressed; frons subquadrate, lateral margins subparallel, somewhat sinuate in basal half, ampliate in apical half, basal margin carinate with a groove between this and apical transverse carina of vertex, median carina in-

complete, joined near middle of frons by a V-shaped ridge, sometimes incomplete, arising from basal and apical angles of frons on each side; frontoclypeal suture distinctly arcuate, deeply impressed; clypeus broadly triangular, with a tumid median area medially toward base; antennae with second segment globose; eyes not large, with a minute tooth posteriorly. Pronotum broad, slightly broader than head with eyes, approximately three times as long as vertex, anterior margin strongly convex, posterior margin shallowly excavate, median carina present, though usually not complete, sometimes joined by a transverse callus or ridge on each side; mesonotum broad, tricarinate, the lateral areas variously ornamented by calloused elevations or ridges; scutellum thickened. Tegmina with sides subparallel, obliquely truncate at apex, costal cell rather narrow, veins basad of nodal line prominent, with transverse veins irregular, numerous supernumerary longitudinal veins distad of nodal line with transverse veins in simple ladderlike series; clavus with veins uniting near their junction with commissural margin. Hind tibiae with four or five spines. Abdomen with last visible segment with tergite broadly rounded posteriorly, produced above anus.

SCARALIS SEMILIMPIDA (Walker)

PLATE 13, FIGURES 326-329

Poiocera semilimpida WALKER, List of specimens of homopterous insects in the collection of the British Museum, vol. 2, p. 300, 1851.

Head, pronotum, mesonotum, procoxae, and mesocoxae brown or dark testaceous; a small median spot anteriorly on vertex, an elongate spot on each side of frons basally, a large spot on each side of middle line at level of antennae, a median spot on clypeus at base black; pronotum with a median spot apically, a cloud behind eyes extending laterad into a spot, a round spot on each side of middle of disk, a round spot on lateral lobe below antennae piceous; mesonotum with two large spots touching middle line in middle of disk, two spots anterolaterally, two large spots posterolaterally, a small spot on each side at base of scutellum dark fuscous or piceous; a small dark cloud below insertion of tegmen, with a large dark spot on pleurite below it, and a spot near base of procoxae and mesocoxae; legs reddish, tarsi dark; abdomen red; tegmina with costal vein red, remainder mostly yellow, transverse veins red basally, pale in a median transverse band, distad of this pale reddish orange to nodal line, intervenal areas black, reddish in a median transverse band, four pale spots in costal cell, about six paler spots in pale transverse area, and about six pale spots on clavus, transverse veins narrowly pale at base of membrane, darker distally, longitudinal veins fuscous; wings vitreous with a large area of crimson-red and black at base, veins dark.

Lateral styles of ovipositor expanding distally, bluntly rounded apically, a short spine, directed posteriorly, on dorsal margin at apex, apical margin setose; first and second valvulae thin, membranous, rather narrow, with sides subparallel, the former consisting of two lobes, the dorsal pointed apically, the ventrolateral obliquely truncate, the second valvulae simple, rounded apically.

Described from two females taken by Dr. J. G. Myers on the Upper Essequibo River, British Guiana (Nov. 22, 1935). One specimen in B.M.N.H., the other in the collection of the Imperial College of Tropical Agriculture, Trinidad. W. E. China has indicated that the above differ from British Museum material in the presence of fuscous suffusions over the red area at the base of the wings, but states that *semilimpida* is a somewhat variable species.

7b. Cephalic process present, directed anteriorly.

Subfamily FULGORINAE

Genus LATERNARIA Linnaeus

Laternaria LINNAEUS, Museum Ludovicae Ulricaе Regiaе, p. 152, 1764. (Genotype, *Cicada laternaria* Linnaeus, Systema naturae, ed. 10, vol. 1, p. 434, 1758, fixed by tautonymy.)

Trinidad specimens examined by the writer fall into two species agreeing reasonably with *L. laternaria* Linnaeus, as interpreted by Da Fonseca and more doubtfully with *L. servillei* Spinola as interpreted by him. The writer feels constrained to leave these species unnamed for the present; figures are given of their male and female genitalia (pl. 12, figs. 316, 319, 320-325, respectively).

Genus CATHEDRA Kirkaldy

Cathedra KIRKALDY, Entomologist, vol. 36, p. 179, 1903. (Genotype, *Phrictus serrata* (Fabricius) Stoll, Natuurlyke en narr't Leeven Naauwkeurig . . . Cicaden, pl. 29, figs. 170 and A, 1788.)

Vertex produced anteriorly into a simple elongated cephalic process, hexagonal in section, directed anteriorly for most of its length, curved upward near apex, a short blunt spine above and below posterior half of eyes, a stout spine a short distance before eyes, a pair of spines dorsally about middle of cephalic process and a second pair, directed obliquely upward, near apex; frons with a row of eight or nine spines along each lateral margin, lateral carinae of frons with a similar row of nine spines, the anterior (basal) spine minute and the posterior five crowded, median carina distinct, lateral margins of frons excavated near antennae, a deep impression near frontoclypeal suture; clypeus rather small, slightly tumid with median carina percurrent and lateral margins raised; antennae set in a narrow rim, first segment

short, cylindrical, second globose. Pronotum with anterior and posterior margins nearly straight, an impression on each side of median carina on disk, an undulate carina on each side between eye and middle of tegula, lateral margins carinate between lower side of eye and of tegula; mesonotum with median carina distinct, three shallow indentations on each side separated by a series of calloused ridges. Hind tibiae with about six spines. Tegmina with Sc strong in basal half, a short R+M stalk as long as basal cell, apical half of tegmina with about 32 rows of horizontal veins, joined by numerous arcuate cross veins. Wings with apical half closely reticulate, a broad and fairly deep excavation at posterior end of apical margin.

CATHEDRA SERRATA (Fabricius)

PLATE 12, FIGURES 311-315

Fulgora serrata FABRICIUS, Species insectorum, vol. 2, p. 313, 1781.

Vertex, including dorsal surface of process, greenish brown, frons purplish brown near tip of process and between lateral carinae and lateral margins, pale yellowish brown medially near clypeus, clypeus pale yellowish brown, antennae pale at base, fuscous apically, eyes reddish brown. Pronotum pale tawny, fuscous laterally at level of antennae, pale mossy green between indentations of disk, and on posterior and ventrolateral margins, with a few dark spots near tegulae. Legs pale tawny banded with fuscous. Thorax and abdomen pale ventrally. Tegmina fawn brown, translucent, suffused pale green along Sc and across base of clavus, suffused pink over R, M, and Cu₁ as far as nodal line, and over apex of clavus, a delicate irregular mottling of brown over whole of corium and membrane, an obscure band of brown from middle of clavus to Sc just distad of middle. Wings very dark, piceous or purplish, narrowly pale on anterior margin near base, a large orange-brown circle occupying most of apex, sparsely flecked in anteroapical quadrant with short pallid lines, a line of sparse pale dashes along anteroapical margin, apical angle shaded piceous.

Anal segment of female tubular, the foramen directed upward, lower surface flattened near base with margins raised, tumid apically with margins obscure. First valvulae of ovipositor broad at base, with a strong spine at apex with a strongly sclerotized ridge ventrally at its base; second valvulae narrow at base, dorsal margin sclerotized, straight, apex membranous slightly decurved, ventrally a deep membranous lobe; lateral styles broad, expanding distally, apical margin truncate, a thin dorsal horizontal lobe lying mesad, attached at base.

Described from two females collected by A. P. Blair, in Maraval, Trinidad, B. W. I. (April 28, 1941), and by F. Melizan in forest, Northern Range, Trinidad (March 1942).

Family ACHILIDAE

9a. Vertex very short, much broader than long, anterior margin straight.

Subfamily APATESONINAE

Genus ATESON Metcalf

Ateson METCALF, Bull. Mus. Comp. Zool., vol. 82, p. 369, 1938. (Genotype, *Ateson marmoratum* Metcalf, *ibid.* p. 370.)

Vertex short, about five or six times as broad as long, anterior margin straight; frons longer than broad, lateral margins subparallel, scarcely wider at level of antennae than at base, raised, forming a percurrent flange with raised margins of clypeus, disk of frons between raised lateral portions flat, median carina present, rather feeble, percurrent; antennae with second segment short, cylindrical, expanded at apex. Pronotum short, with median and lateral carinae, the latter diverging posteriorly; mesonotum tricarinate, with disk ovate, tegulae large. Tegmina tectiform, costal and commissural margins subparallel, membrane expanded beyond apex of clavus, apical margin bluntly rounded. Sc weak, with several branches to margin at apex, R simple as far as transverse line of cross veins, M with six or seven branches before transverse veins, Cu_1 forking at level of junction of claval veins, claval veins uniting about three-quarters from base, and joining truncated apex of clavus. Posttibiae unispinose.

ATESON CONSIMILE, new species

PLATE 13, FIGURES 330-335

Female: Length, 4.8 mm.; tegmen, 7.1 mm. Length to apex of tegmen, 8.0 mm.

Vertex five times as broad as long in middle; frons with median carina distinct, strongly so apically, but very feeble, and transversely notched, at extreme base; clypeus broadly tumid in middle, devoid of median carina. Pronotum in middle as long as vertex on the same line, a small callosity present on each side, carinae distinct; mesonotum with disk exactly twice as long as wide, tricarinate, median carina raised into a vertical flange, shallowly curved in profile. Tegmina with two small cells at apex of Sc, with a small elongate triangular cell basad of them on costal margin, R simple to apex, M with seven branches reaching apex, both branches of Cu_1 simple to apex, subapical line of transverse veins complete to hind margin near anal angle, the vein joining R and M very short, reduced to a thick spot between the almost contiguous veins; tegmina finely rugulose between veins.

Vertex testaceous, fuscous near lateral margins, frons testaceous, lateral basal angles fuscous, a fuscous band at margins, narrowly bordered piceous on inner edge distad of level of antennae, clypeus

testaceous, fuscous laterally, rostrum fuscous, genae testaceous, sides above eyes fuscous; pronotum fuscous with a row of four ochraceous spots behind eyes and a few such spots on pronotum below eyes, mesonotum dark fuscous, a paler line near tegulae, a small ochraceous spot at base of lateral carinae and at tip of scutellum; legs fuscous; abdomen dark fuscous dorsally, pale ventrally, membrane pallid, genitalia fuscous; tegmina fuscous, darker on costal area and in a broad band across clavus just beyond middle, corium sprinkled with ochraceous spots, veins marked with spots throughout, a very pale rounded spot before stigma, membrane broadly and irregularly clouded with dark fuscous between stigma and apex of clavus, with sparse irregular ochraceous markings, subapical line, apical margin, and apical third of claval cells hyaline or pallid, a dark fuscous band traversing middle of apical cells parallel to margin, a darker fuscous spot in one cell at anterior apical angle; wings fuscous, veins dark except M-Cu₁ cross vein, and fork of Cu₁, which are hyaline.

Anal segment of female short, ringlike, telson thick, flattened, broadly semiovalately rounded. Lateral styles of ovipositor broad, subquadrate, membranous part of apical margin narrow, with its basal edge subparallel to margin, a pointed membranous filament dorsally at apex; first valvulae strongly curved downward distally, with a small tooth dorsally at apical third, and two large sickle-shaped teeth subapically. Pregenital segment with posterior margin straight.

Described from one female collected by F. W. Urich, Verdant Vale, Trinidad, B. W. I. (January 1912). This species is distinctly smaller than the others of the genus; it differs from *marmoratum* Metcalf in the proportions of the vertex and from both *marmoratum* and *fuscum* Metcalf in details of tegminal venation and in color, occupying in the latter respect an intermediate position between Metcalf's species. The ovipositor is of the characteristically achilid pattern. Type, U.S.N.M. No. 56700.

9b. *Vertex not very short, not more than three times as broad as long, anterior margin more or less convex.*

Subfamily ACHILINAE

Genus PLECTODERES Spinola

Plectoderes SPINOLA, Ann. Soc. Ent. France, ser. 1, vol. 8, p. 328, 1839. (Genotype, *Flata collaris* Fabricius.)

Vertex between basal angles three times length in middle, lateral margins slightly converging distally, anterior margin carinate, distinctly convex, posterior margin broadly excavated, vertex projecting in front of eyes for half its length, its base on middle line anterior to

middle of eyes, median carina present, obsolete apically; frons only a little longer than wide, strongly curved, lateral margins expanding to level of antennae, then incurved to suture, median carina percurrent, lateral margins produced above genae; clypeus with a median carina and lateral margins carinate. Pronotum very short, not more than half length of vertex; mesonotum large, tricarinate, lateral carinae diverging posteriorly, tegulae rather large. Hind tibiae with one spine two-fifths from base. Tegmina with costal margin slightly recurved, a short Sc+R+M stalk two-thirds as long as basal cell, Sc+R fork level with fork of Cu₁, both slightly distad of junction of claval veins, costal cell of almost same width throughout.

PLECTODERES COLLARIS (Fabricius)

PLATE 13, FIGURES 336-343

Flata collaris FABRICIUS, *Systema rhyngotorum*, p. 53, 1803.

Female: Length, 4.3 mm.; tegmen, 6.0 mm.

Vertex broader than long in middle (3 : 1); frons curved through 100°; head, with eyes, about as wide as pronotum. Pronotum with median carina short, lateral carinae diverging to reach posterior margin level with inner border of eyes. Tegmina with a row of six small cells, arising from Sc and R between stigma and apical angle, M with three branches reaching margin, Cu_{1a} and Cu_{1b} simple to apex, a series of six subapical cells, the first and sixth elongate, the third triangular, smaller than the remainder.

Piceous; a narrow line inside each lateral margin of vertex, a narrow border on basal margin of pronotum, a broad band across middle of clypeus, on genae below antennae, across lateral lobes of pronotum, covering base of procoxae, pleurites below tegmina, tegulae, inner margin of tegmina, veins of basal cell yellow, and posterolateral margins of mesonotum, where its inner edge is tinged with red; costal cell dull orange-yellow, brighter near stigma, wings smoky; legs fuscous, posttibiae narrowly margined yellow.

Anal segment of female ovate. Ovipositor with first valvulae bilobed; a ventral lobe sclerotized at base, obliquely truncate apically, with a setigerous margin, overlain by a transparent membranous triangular plate; a dorsal lobe with upper margin with three teeth three-quarters from base, and two large spines at apex, lower margin membranous curved upward to a hooked process apically; second valvulae narrow, with lower margin almost straight, upper produced into a vertical lobe subapically; lateral styles broad, lower margin sinuate, dorsal margin strongly decurved, apex blunt.

Described from two females collected on the Amakura River, Venezuela, by J. G. Myers (February 1931). One specimen sent to B.M.N.H.

Genus **KOLOPTERA** Metcalf

Koloptera METCALF, Bull. Mus. Comp. Zool., vol. 82, p. 371, 1938. (Genotype, *Koloptera callosa* Metcalf.)

Vertex strongly produced before eyes, about twice as long as wide at base, median carina distinct, lateral margins converging distally, rounded apically to middle, disk flat; frons more than one and a half times as long as wide, lateral margins somewhat amplify below level of antennae, median carina distinct; clypeus approximately half as long as frons, carinate medially and on margins, a short horizontal carina between eyes and lateral margins of frons, frons in profile very slightly concave, clypeus slightly tumid; antennae with second segment subglobose; eyes somewhat elongated anteroposteriorly. Pronotum short, anterior and posterior margins subparallel, median and lateral carina present on disk, three carinae between lateral carinae of disk and lateral margins, lateral margins carinate, with a subparallel carina ventrad. Mesonotum broader than long, tricarinate, median carina feeble posteriorly, lateral carina slightly diverging posteriorly. Tegmina rather narrow, anterior and posterior margins subparallel, a distinct fold on costal margin at node, with a callosity in apical cell on each side of it, Sc+R forking approximately level with junction of claval veins, M simple to nodal line, Cu₁ forking basad of apex clavus, transverse line of cross veins between Sc and Cu_{1b} very short, R with two branches at apical margin, M with three, Cu_{1a} and Cu_{1b} simple to apex, curving anteriorly just distad of apex of clavus. Hind tibiae unispinose submedially.

KOLOPTERA CALLOSA Metcalf

PLATE 13, FIGURES 344-351

Koloptera callosa METCALF, Bull. Mus. Comp. Zool., vol. 82, p. 372, 1938.

Male: Length, 4.0 mm.; tegmen, 4.3 mm. Female: Length, 4.2 mm.; tegmen, 4.6 mm.

Fuscous, speckled with ochraceous spots; two darker bands across vertex, a fuscous cloud across frons basally, apical part of frons pale yellow, clypeus, and ventral half of body sometimes pale, sometimes slightly infusate, legs tinged fuscous. Tegmina pale fuscous, speckled ochraceous; wings smoky.

Anal segment of male short, broad, truncate at apex. Pygofer short, a pair of elongated triangular plates on posterior margin medioventrally directed posteriorly. Aedeagus complex; periandrium in form of a narrow sclerotized ring basally, produced posteriorly on its ventral margin in a narrow stalk, widening distally and bearing at apex four spines, two directed anterolaterally on each side; arising from basal ring laterally and dorsally and connected with sclerotized ventral

plate a wide membranous tube, flattened and somewhat depressed dorsally, with dorsolateral margins curled upward and mesad, beset with a row of six strong teeth recurved anteriorly, a deep cleft on each side apically between ventral plate and lateral borders and a deeper cleft between lateral borders and dorsal median lobe; penis consisting of two apodemes, narrow, tubular, approximated at base, separating distally, each with an oblique spine terminally. Genital styles rather elongate-ovate, with a prominent lobe in middle of dorsal margin, slightly incurved, and bearing four short curved teeth; on inner face basally a long slender curved process, truncate apically.

Ovipositor with lateral styles broad, dorsal and ventral margins strongly and about equally curved to meet in a point at apex, apical membrane triangular, extending farther along ventral margin than along dorsal; first valvulae with two small spines on dorsal margin two-thirds from base, two long spines at apex, a large triangular lobe ventrally, underlain by a short thick triangular setigerous lobe.

Described from one male and one female collected by the writer in St. John's Valley, Trinidad, B. W. I. (June 12, 1942, July 3, 1943).

Genus CATONIA Uhler

Catonia UHLER, Proc. Zool. Soc. London, 1895, p. 61. (Genotype, *Catonia nava* Say, designated by Van Duzee, Check list of the Hemiptera of America north of Mexico, p. 79, 1916.)

Vertex rather short, approximately one and a quarter times as wide across basal angles as long in middle, more or less excavated dorsally, lateral margins between eyes subparallel or slightly converging, distally curving mesad, posterior margin shallowly but distinctly excavated, median carina present in basal half; frons scarcely longer than wide at widest part, lateral margins expanding to below level of antennae, then curved in to suture, slightly elevated, a transverse carina at base, which together with convergent lateral carinae of vertex bounds a triangular areolet on each side, frons in profile slightly curved, median carina distinct, percurrent; clypeus not so wide as frons at widest part, tricarinate, slightly tumid near middle, about as long as frons; antennae small, second segment globose. Pronotum short, less than half length of vertex, anterior margin convex, transverse across disk, posterior margin broadly excavate, disk tricarinate, lateral carinae diverging posteriorly, a series of five weakly bordered depressions on each side of disk, and a larger areolet between eye and tegula on each side; mesonotum tricarinate, lateral carinae diverging slightly posteriorly. Tegmina elongate, costal and commissural margins subparallel, slightly broader beyond apex of clavus, Sc+R fork at or near middle, basad of apex of clavus, M with three

branches before line of transverse veins, Cu_1 forking before middle. Hind tibiae with a single spine two-fifths from base.

CATONIA PALLIDA, new species

PLATE 13, FIGURES 352-361

Female: Length, 4.4 mm.; tegmen, 5.2 mm.

Head, with eyes, not quite so wide as pronotum, vertex produced for almost half its median length before eyes, wider across basal angles than long in middle (1.4:1), frons longer than broad (1.2 to 1). Tegmina with Sc+R fork approximately two-fifths from base, nine apical cells posterior to stigma, a subapical series of six cells, the first and sixth elongate, the third shortest, triangular.

Vertex fuscous, dappled thickly with minute pale spots, a larger pale spot near each end of lateral margins, areolets pale with a few minute dark specks; frons and clypeus sprinkled with pale spots, genae fuscous, pale near areolets of vertex, dappled with pale spots before eye, pale anteriorly below ocelli, antennae fuscous, apex of second joint pale, eyes dark red; pronotum dark fuscous on disk and sides, dappled with pale spots, areolar depressions fuscous with a pale spot in middle, bounded by pale interareolar ridges, mesonotum dark fuscous on disk, dappled with pale spots, markedly paler outside lateral carinae, tegulae pale dorsally, darker and mottled laterally; legs fuscous, profemora and mesofemora pale at base and apex, protibiae and mesotibiae pale at base, with a pale transverse band about one-third from base; abdomen fuscous, tinged with crimson laterally; tegmina pale testaceous, veins pale with a row of pale spots along each side, an oblique fuscous band, spotted pale, from costal margin to apex of basal cell, about nine dark patches on costal margin before stigma, a very broken band of fuscous from stigma to apex of clavus, a narrow dark area overlying Sc+R and Cu_1 and M near base, claval veins heavily and evenly barred with fuscous spots, membrane slightly smoky; wings smoky, veins dark.

Ovipositor with lateral styles subquadrate, apical margin rounded, somewhat indented near ventral angle, membranous area with inner edge subparallel to outer; ventrally a thin triangular membranous process, underlain by a sclerotized triangular setigerous lobe approximated to its counterpart along middle line; upper lobe of first valvulae with a sclerotized dorsal margin bearing a compact group of three teeth three-quarters from base, then curving downward and upward into a prominent curved apical spine with a smaller spine at its base; second valvulae converging toward middle line, in profile bulbous dorsally and ventrally at base, tapering to apex with a broad vertical membranous lobe dorsally on apical third.

Described from one female taken by the writer in St. John's Valley, Trinidad, B. W. I. (July 12, 1942). Type, U.S.N.M. No. 56701.

CATONIA PALLIDISTIGMA, new species

PLATE 13, FIGURES 362-368

Female: Length, 4.3 mm.; tegmen, 5.0 mm.

Head including eyes not quite so wide as pronotum; vertex produced about one-third of its median length before eyes, wider across basal angles than long in middle (1.4:1), hollowed out, median carina present on basal third; frons scarcely longer than wide. Tegmina with Sc+R fork about middle, a series of 11 apical cells distad of stigma, six subapical cells, the third smallest, triangular.

Vertex very pale, a fuscous mark basad of each areolet, a larger dark spot at each basal angle, areolets pallid, a pair of spots in depression of each; frons fuscous, a broad pale band transversely just basad of middle, extending on to genae to eyes, lateral margins regularly barred with fuscous and pale spots alternately; clypeus fuscous with a transverse pallid band across base, extending on to genae, and a smaller transverse band near apex; antennae with second segment pale fuscous, pallid at apex, eyes brown, mottled fuscous; pronotum with disk, carinae, and margins of areolets pale, depressions of areolets, and a small spot between carinae of disk fuscous; mesonotum dark fuscous, carinae paler, a pale linear spot at middle of median carina, two pale spots on each lateral carina, a distinct pale area just behind each tegula, a minute pale spot on each margin of scutellum near tip; profemora and mesofemora fuscous, pale at base and apex, with a pale spot two-thirds from base, postfemora fuscous, paler on inner surface, protibiae and mesotibiae fuscous, pale at base and apex, with a pale spot one-third from base, posttibiae pale fuscous externally, pallid apically and basad of spine, except for a narrow oblique fuscous bar, spine pale; abdomen fuscous, a series of testaceous spots lateroventrally, membrane red dorsally, pale ventrally; tegmina chiefly pale, with fuscous bars, costal margin evenly marked with oblique fuscous spots, a broad fuscous band from inner margin of clavus across to Sc+R, then distally between Sc+R and Cu₁ to join a diffuse dark area lying between node, apex of clavus, and sutural angle, veins pale, barred with fuscous dots, membrane suffused fuscous, speckled paler, veins on membrane very pale, transparent; wings smoky, veins concolorous.

Ovipositor with lateral styles subquadrate; first valvulae with a sclerotized dorsal margin bearing two, possibly three, small teeth three-quarters from base, then curving ventrally and finally upward into a prominent curved apical spine with a smaller spine at its base,

ventrally a thin flat lobe tapering distally, underlain by a short sclerotized subtriangular setigerous lobe pointed distally; second valvulae narrow, converging apically.

Described from one female collected by Dr. J. G. Myers, Trinidad, B. W. I. (January 1932). Type, U.S.N.M. No. 56702.

OPSIPLANON, new genus

Head, with eyes, not quite so wide as pronotum; vertex flat, not hollowed out, produced almost half its median length before eyes, twice as wide across basal angles as long in middle, lateral margins carinate, longer than middle line, strongly converging anteriorly in a straight line, or nearly so, median carinae strongly present throughout, posterior margin shallowly excavated; frons rather longer than wide at widest part, flat or scarcely tumid, somewhat curved in profile, lateral margins diverging to below level of antennae then curving inward to suture, median carina distinct, percurrent, lateral margins slightly elevated, a transverse carina at base, which with lateral carinae of vertex and margins of frons enclose a small triangular areolet on each side; clypeus about as long as frons, slightly tumid, with median and lateral carinae; antennae small, second segment subglobose. Pronotum short, anterior margin convex, posterior margin broadly excavated, disk with median and lateral carinae, anterior margin carinate behind eyes, with three carinae to posterior margin, lateral margins carinate, with a carina below them; mesonotum tricarinate, lateral carinae diverging posteriorly. Tegmina rather narrow, costal and commissural margins parallel to apex of clavus, membrane somewhat expanded distally, fork of Sc+R+M one-seventh from base, Sc+R fork at nodal line, or very near it, M forking at nodal line, with three branches reaching apical margin, Cu₁ forking level with apical quarter of clavus, claval veins joined distally by an oblique cross vein, a series of nine apical cells distad of apex of costal cell, a series of six subapical cells, the first small, trapezoidal, the third small, triangular. Wings with R simple to apex, six apical cells before Cu₁. Posttibiae with a single spine in basal half.

Genotype: *Opsiplanon ornatifrons*, new species.

OPSIPLANON ORNATIFRONS, new species

PLATE 13, FIGURES 369-374; PLATE 14, FIGURES 375, 376

Female: Length, 3.2 mm.; tegmen, 3.1 mm.

Vertex testaceous, median carina and lateral margins pale yellow, edged narrowly fuscous, a fuscous spot one-third from base along each lateral margin, areolets fuscous, margins pale, frons dark testaceous, narrowly fuscous at margins and across middle, basal margin

pallid, three small pallid spots on lateral margins in basal half, the lowest extending on gena to ocellus of each side, a short pallid bar transversely on middle of frons level with second lateral spot, not reaching to lateral margins, clypeus narrowly and interruptedly pale at suture, lateral margins pale, a pale spot at their distal end, and a short transverse bar across clypeus at this level, genae with margins pale below antennae, and transversely pale at level of suture, antennae with second segment fuscous; pronotum fuscous, disk much paler, carinae pale testaceous, edged fuscous, mesonotum yellowish brown, fuscous anteriorly, median and lateral carinae pale testaceous, edged with fuscous, a pale crescentic spot on each side of median carina near middle, a round pale spot, incomplete, with a fuscous inner ring and a pale center, near base of each lateral carina mesially, a narrow transverse fuscous bar before scutellum, which is palely margined; tegmina semitransparent, dull yellowish brown, veins concolorous, bordered with transparent round spots, an interrupted series of pale areas between node and apex of clavus, apex of membrane submarginally fuscous, veins of membrane and apical margin pale; wings clouded smoky, veins darker.

Ovipositor with lateral styles broad, in profile both margins convex, the dorsal margin strongly so, curved downward distally to bluntly pointed apex with narrow apical membrane, styles curved mesad distally, a horizontal dorsal lobe directed posteriorly lying mesad and attached at base; second valvulae narrow, rodlike, converging distally; first valvulae ventrally with a thin membranous tapering process directed caudad, underlain by a sclerotized rounded lobe, about half as long as membrane and toothed minutely on apical border, dorsally a process sclerotized on upper margin which is decurved apically and bears three teeth three-quarters from base and two large spines distally.

Described from two females taken by the writer in St. John's Valley, Trinidad, B. W. I. (Aug. 10, 15, 1942), resting on low branches of shrubs. Type, U. S. N. M. No. 56703.

This genus is distinguished by the flat and prominently carinated vertex, by the venation of tegmina and wings, and by the shape of the lobes of the lateral styles of the ovipositor; the species is distinguished by its size and by the color pattern.

OPSIPLANON NEMOROSUS, new species

PLATE 14, FIGURES 377-384

Female: Length, 3.0 mm.; tegmen, 2.8 cm.

Vertex dark fuscous, median carina and lateral margins testaceous, a large pale oval spot on each side of middle line, frons, clypeus, genae

and antennae fuscous, frons minutely speckled with testaceous spots in basal half, clypeus with a small testaceous spot on each side of middle line at suture, genae with a pale transverse line at this level, with a pale line from its inner end down posterior edge; pronotum fuscous, carinae pale, a pale spot on disk on each side of middle line; mesonotum fuscous, carinae pale, three testaceous spots on disk on each side of middle line, three pale spots on each side laterad of disk; tegmina fuscous, conspicuously marked with round pale transparent spots, veins fuscous, membrane smoky, veins paler, becoming pallid or white at apex; wings rather smoky, veins darker; profemora and mesofemora fuscous, suffused pale at base and apex, one or two pale spots dorsally, postfemora fuscous, protibiae and mesotibiae fuscous with a pale spot one-third from base, apical third pale, posttibiae fuscous with apical two-thirds paler on inner face, spines black, tarsal joints fuscous, pale apically, spines black; abdomen fuscous, membrane red.

Ovipositor with lateral styles subquadrate, ventral margin almost straight, dorsal margin convex near base, sharply decurved apically, apical margin truncate, sinuate, produced into a short blunt lobe at ventral angle, dorsally a thin horizontal lobe directed posteriorly lying mesad and attached at base; second valvulae narrow, sclerotized dorsally and ventrally at base, ventral margin produced into a shallow lobe apically; first valvulae ventrally with a thin bifid tapering lobe directed posteriorly, horizontal and underlain by a shorter sclerotized lobe obliquely truncate distally and minutely toothed, dorsal process of each valvula with upper margin decurved towards apex, with two small teeth subapically and a pair of larger curved spines at apex.

Described from one female taken by the writer in St. John's Valley, Trinidad, B. W. I. (July 20, 1942), resting on fiddlewood. This species is distinguished by its size and color pattern. Type, U.S.N.M. No. 56704.

Family TROPIDUCHIDAE

Subfamily TAMBINIINAE

10a. *Subcosta* giving off several furcate veins to costal margin.

Tribe ALCESTINI

Genus ALCESTIS Stål

Alcestis Stål, Svenska Vet.-Akad. Handl., vol. 3, No. 6, p. 11, 1862. (Genotype, *Alcestis pallescens* Stål, *ibid.*)

Vertex broader than long in middle, lateral margins parallel, apex rounded, posterior margin shallowly excavate, median carina usually present; frons longer than wide (about 1.5:1), medially carinate, mar-

gins subparallel, more ampliate in distal third; clypeus rather small, lateral margins not carinate; antennae short. Pronotum as long as vertex, tricarinate, lateral carinae diverging posteriorly, anterior border arcuately convex, posterior border emarginate, sometimes with a median notch; mesonotum broader than long, tricarinate, lateral carinae arcuate, joined to median carina anteriorly. Tegmina broad, costal margin strongly curved, sutural margin straight or nearly so, oblique, subcosta and radius giving off several branches, usually furcate, to costal margin. Posttibiae with three spines.

ALCESTIS VITREA, new species

PLATE 14, FIGURES 385-389

Male: Length, 6.0 mm.; tegmen, 6.4 mm. Female: Length, 6.4 mm.; tegmen, 7.0 mm.

Vertex broader than long in middle (2.4:1), median carina obsolete, frons longer than wide (1.4:1), median carina feebly present, rather broad. Tegmina with anterior vein (costa) reaching margin basad of middle, 13 oblique transverse veins attaining costal margin, Sc+R forking one-quarter from base, Sc giving off four branches, two or three of them bifurcate anteriorly, R with four branches apically, M with six, Cu₁ with seven reaching margin, apex of clavus distad of middle.

Pallid green; transverse veinlets near margin of tegmen and a spot near commissural margin at junction of claval veins fuscous.

Anal segment of male three times as long as broad, bifid at apex, widened distad of anus which is somewhat before middle. Aedeagus with periandrium short, comprising a ring basally with its ventral margin produced posteriorly, the ventral prolongation troughlike, with an oblique lobe on each side apically, that on right side fingerlike, the other twice as broad; penis tubular, upturned distally, a deeply bifurcate process arising on left near base, the dorsal limb sloping upward, then mesad across middle, then bent outward, the ventral limb with parallel sides, narrow, directed horizontally backward, sharply deflexed at apex where it is somewhat footlike in outline, distad of this process penis with two pointed flattened plates in middle apically, surrounded by a thick membrane.

Ovipositor with first valvulae narrow, elongate, bearing nine or ten small spines on distal half of dorsal margin, the apical pair larger than the others; lateral styles narrow, with eight or nine small teeth at apex, four large on apical margin, four or five small submarginally in an approximately parallel row.

Egg elongate-ovoid, with sides subparallel for most of their length, smooth, obliquely truncate at one pole with a minute process at apex, situated on a narrow hyaline rim, traversed by several wavy lines.

Described from eight males and nine females collected by the writer at Santa Margarita, Trinidad, B. W. I., on various dates in July and August 1942. This species is nearest to *A. surinamensis* Schmidt, from which it differs in the proportions of the vertex and in the venation of the costal area. Holotype male and allotype, U.S.N.M. No. 56705; paratype in B.M.N.H.

10b. *Subcosta not giving off furcate veins to costal margin, tegmina pellucid, with a line of transverse veins distad of middle.*

Tribe TAMBINIINI

ROESMA, new genus

Vertex much longer than broad, produced before eyes in a tapering process as long as pronotum and mesonotum combined, shallowly tectiform, slightly upturned distally, median carina narrowly furcate on basal third, simple on distal two-thirds, lateral margins parallel between eyes, gradually converging almost in a straight line distally, abruptly curved mesad at apex; frons much longer than broad, flattened, median carina distinct, lateral margins subparallel, slightly concave or sinuate basad of antennae, thence somewhat ampliate, curving inwardly to suture distally; clypeus short, with a weak median carina; rostrum scarcely reaching to mesocoxae; antennae with second segment three times as long as first, about three times as long as greatest width, expanding to apex, with sensoria in distal half. Pronotum about as long as eyes, convexly produced anteriorly, rather deeply emarginate posteriorly, disk tricarinate, two carinae on margin behind eye on each side; mesonotum tricarinate, lateral carinae meeting median carina anteriorly, scutellum transversely grooved at line of junction with disk. Hind tibiae with three spines. Tegmina with an extremely short Sc+R+M stalk, not exceeding one-third length of basal cell, Sc+R fork very close to nodal line of cross veins, M forking about middle of tegmen, with a second fork on posterior branch before cross veins, Cu₁ forking between first M fork and union of claval veins, claval veins uniting one-third from base, apex of clavus nearly three-quarters from base of tegmen. Ovipositor with third valvulae armed with fourteen teeth on apical margin. Egg subcylindrical, rounded at one pole, obliquely truncate and operculate at other, opercular rim thickened, slightly expanded anteriorly, surmounted laterally with a vertical membranous collar, joined anteriorly to a short knoblike vertical chorionic process.

This genus differs from *Athestia* Melichar in the shape of the vertex and of the tegmina, and in venation, and from *Remosa* Distant in the shape of the vertex, in the posteriorly forked median carina, in the number of teeth on the third valvulae and in the shape of the egg.

Genotype: *Roesma grandis*, new species.

ROESMA GRANDIS, new species

PLATE 14, FIGURES 390-396

Female: Length, 11.3 mm.; tegmen, 8.6 mm.

Vertex in middle two and a quarter times as long as broad; frons longer than broad (3.2:1), shallowly tectiform from base to level of eyes, then flattened to apex, median carina distinct except near apex, where it is feeble, lateral carinae distad of level of eyes. Tegmina with Sc with two veins at apex, R with four, M with eight, Cu_{1a} with three, Cu_{1b} with two, costal cell devoid of transverse veins.

Pale green; eyes red, posttibial spines piceous at tip, a pale yellowish band along costal margin, genitalia fuscous in sclerotized parts.

Anal segment short, rather narrow, produced laterally distad of anus into rounded lobes. Ovipositor with lateral styles elongate, dorsal margin almost straight and horizontal, apical margin curved, obliquely truncate, ventral margin deeply excavated near base, an irregular row of five teeth at apex passing into a regular row of nine teeth along ventral margin; second valvulae thin, narrow, bladelike; first valvulae narrow, very slightly upturned, dorsal margin straight, or very slightly concave, ventral margin convex, a row of five small teeth on dorsal margin, two larger teeth directed obliquely upwards at apex, two small teeth on ventral margin below the former.

Egg subcylindrical, rounded at one pole, obliquely truncate with a thickened opercular rim, a thick rounded semitransparent membranous layer above it, with a minute chorionic process on uppermost edge; 1.2 mm. long, 0.36 mm. broad.

Described from one female taken by the writer in St. John's Valley, Trinidad, B. W. I. (Aug. 18, 1942). Type, U.S.N.M. No. 56706.

Family NOGODINIDAE

Genus NOGODINA Stål

Nogodina STÅL, Svenska Vet.-Akad. Handl., vol. 3, No. 6, p. 70, 1862. (Genotype, *Flata reticulata* Fabricius, designated by Schmidt, Ent. Zeit. Stettin, vol. 80, p. 157, 1919.)

Frons longer than broad, lateral margins parallel to level of antennae, then curved mesad to suture, lateral margins slightly elevated, median carina present, lateral carinae present or absent; clypeus tricarinate; vertex short, fully three times as broad as long, anterior margin transverse, posterior margin broadly excavated. Pronotum short, slightly longer than vertex along middle line; mesonotum with lateral carinae present, median carina obsolete. Posttibiae with three spines. Tegmina large, hyaline, costal membrane traversed by numerous cross veins, costal margin slightly curved, Sc, R, M, and Cu₁ arising separately from basal cell, nodal line, apical line, and anterior half of subapical line of cross veins present.

NOGODINA RETICULATA (Fabricius)

PLATE 14, FIGURES 414-418

Flata reticulata FABRICIUS, Systema rhyngotorum, p. 47, 1803.

Female: Length, 6.2 mm.; tegmen, 7.8 mm.

Vertex with anterior margin straight, flattened; frons with median carina present, lateral carinae obsolete.

Fuscous; tegmina with costal membrane infuscate, with three hyaline spots, apical margin broadly infuscate, a narrow interrupted fuscous band from costa to commissural margin at basal third, and a similar band along nodal line; wings infuscate at apical margin.

Ovipositor with lateral styles broad, dorsal margin horizontal, slightly curved upward distally, ventral margin excavate basally, apical margin rounded; second valvulae narrow, dorsal and ventral margins converging to middle, then slightly diverging, continuing subparallel to rounded apex; first valvulae narrow, dorsal margin straight, ventral margin slightly convex, a row of eight teeth dorsally on distal half, a narrow bladelike lobe attached on inner face basally, directed posteriorly.

Egg ovoid, 2.4 times longer than broad, smooth, not operculate.

Described from one female specimen taken by Dr. J. G. Myers in Surinam (May 29, 1929).

Genus BLADINA Stål

Bladina STÅL, Berliner Ent. Zeitschr., vol. 3, p. 324, 1859. (Genotype, *Bladina fuscovenosa* Stål.)Head with eyes nearly as broad as pronotum; vertex short, about four times as broad as long in middle, lateral margins subparallel, anterior margin straight or very slightly curved, carinate, posterior margin broadly excavate; frons longer than broad, lateral margins nearly parallel to below level of antennae, then incurved to fronto-clypeal suture, median carina percurrent, lateral carinae absent, sometimes indicated basally, a row of pustules inside each lateral margin; clypeus tricarinate. Pronotum twice as long as vertex in middle, anterior margin convex, posterior margin broadly excavate, median carina present; mesonotum tricarinate, lateral carinae straight, sometimes meeting a curved transverse ridge anteriorly. Posttibiae with four spines. Tegmina with costal and commissural margins parallel, not diverging apically, costal membrane narrow, traversed by irregular veinlets, Sc+R united basally in a common stalk, M branching in basal third, Cu₁ simple, membrane with many supernumerary longitudinal veins, with numerous irregular transverse veinlets between them, usually no distinct transverse line on membrane or at most an irregular line.

BLADINA FUSCOVENOSA Stål

PLATE 14, FIGURES 397-399

Bladina fuscovenosa STÅL, Berliner Ent. Zeitschr., vol. 3, p. 324, 1859.

Male: Length, 5.0 mm.; tegmen, 7.2 mm.

Frons with lateral margins scarcely diverging to below level of antennae, median carina distinct, a row of pustules near lateral margin on each side.

Yellowish brown; posttibiae lined fuscous; tegmina very pale, transparent, veins brown, transverse veinlets on corium pale, wings hyaline, slightly clouded brown, veins brown; eyes sometimes barred with crescentic dark purplish bands.

Anal segment narrow, strongly deflexed ventrally distad of anus, telson long. Aedeagus complex, periandrium with a vertical, thin, tapering process medially on dorsal margin, with a short strutlike ridge transversely on each side at its base, a pair of long narrow flattened processes, directed vertically, arising ventrally at apex, each abruptly narrowed subapically into a slender point which is bent mesad; penis with a pair of long simple slender spines at apex, directed vertically. Genital styles broad, dorsal margin straight, with a slight elevation before apex, ventral margin distinctly convex, apical margin obliquely truncate.

Described from one male collected by Dr. J. G. Myers at San Fernando de Apure, Venezuela (Dec. 31, 1930). Specimen deposited in B.M.N.H.

BLADINA FUSCANA Stål

PLATE 14, FIGURES 400-405

Bladina fuscana STÅL, Svenska Vet.-Akad. Handl., vol. 3, No. 6, p. 13, 1862.

Male: Length, 5.4 mm.; tegmen, 7.8 mm. Female: Length, 5.4 mm.; tegmen, 7.9 mm.

Dark fuscous; tegmina somewhat darker along costal membrane, transverse veinlets dark, conspicuous, wings hyaline, bordered fuscous at hind margin, veins brown.

Anal segment strongly deflexed posteriorly distad of anus, telson long. Aedeagus complex, periandrium broad, ventral border strongly convex, curved upward distally, a laterally compressed tapering process in middle of dorsal margin directed vertically, distad of this a smaller and narrower vertical process, also medial, on each side at apex of dorsal margin a thin vertical lobe, rounded at tip, slightly curved anteriorly, a median spine ventrally at apex; penis tubular basally, bifid near apex, each lobe terminating in a long curved spine directed upward, lobes at base of these spines beset with numerous small teeth directed upward, the teeth of the upper inner margin of

each lobe, about eleven in number, much longer than the remainder, the most dorsal tooth bifurcate, a pair of curved spines ventrally, attached near middle line distally, each spine with a semicircular excavation at basal third on one margin with a short curved spine at the same level on other margin. Genital styles broad, with sides strongly curved, dorsal margin straight, upturned near apex, ventral margin slightly convex, upturned distally, apical angle obliquely truncate as seen in profile.

Described from six males and eight females collected by the writer on pineapple (February 1936), on *Bromelia pinguin* (April 1941), and on *Rhoeo discolor* (May 25, June 7, 1942) at St. Augustine, and in the Botanic Gardens, Port of Spain, Trinidad, B. W. I. Material in B.M.N.H.

BLADINA RUDIS (Walker)

PLATE 14, FIGURES 406-413

Flatoides rudis WALKER, List of specimens of homopterous insects in the collection of the British Museum, vol. 2, p. 421, 1851.

Male: Length, 6.0 mm., tegmen, 7.0 mm.

Frons with a series of rather transversely linear pustules inside each lateral margin; median carina distinct on vertex, posterior half of pronotum and on mesonotum; posttibiae with four spines, the basal spine minute.

Dark testaceous; eyes dark gray banded with fuscous arcs, ocelli bordered red, pronotum mostly pale, dark testaceous near anterior margin of disk and narrowly along posterior margin, with approximately 15 fuscous dots on each side, arranged in two rows, the first submarginal anteriorly, mesonotum fuscous, slightly paler on disk; tegmina fuscous between Sc and costal margin, and in posterior half of clavus, with an irregular reticulum of pale veinlets, corium otherwise testaceous-transparent, membrane more distinctly brown, vein R testaceous, remainder of veins on corium brown, a small fuscous spot on M at basal fork, a similar spot on Cu near basal cell, veins of membrane fuscous; wings transparent, somewhat clouded pale fuscous distally, veins brown.

Anal segment strongly deflexed distad of anus, telson long. Aedeagus complex; a laterally compressed broad tapering median process at middle of dorsal border, directed vertically, distad of this, on each side of aedeagus dorsally a pair of slender vertical spines, with their tips curved anteriorly, between the posterior of these and the apex a pair of slender vertical processes on each side, half as long as the anterior pair, the basad of this pair furcate, the distad simple; a curved, elongate, spinose process loosely attached near apex, giving off two parallel shorter spines at right angles about middle. Genital styles broad, dor-

sal margin almost straight, ventral margin strongly convex, truncate dorsoapically with a slight projection at dorsal angle.

Described from one male collected by D. Farrell, St. Augustine, Trinidad, B. W. I. (1920). Material in B. M. N. H. This species is distinguished by the venation of the tegmina and wings, by the structure of the aedeagus, and by the color.

Genus BIOLLEYANA Distant

Biolleyana DISTANT, Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 335, 1909. (Genotype, *Nogodina pictifrons* Stål, Ent. Zeit. Stettin, vol. 25, pp. 53, 369, 1864.)

Head with eyes about as broad as pronotum, vertex short, more than twice as broad as long, lateral margins parallel, raised, anterior margin carinate, angulately produced anteriorly, posterior margin roundly excavate; frons longer than broad, lateral margins almost parallel, diverging very slightly from base to apical three-quarters, then incurved to frontoclypeal suture, slightly raised, median carina distinct, lateral carinae feeble; clypeus tricarinate. Pronotum with anterior margin strongly convex, posterior margin broadly excavated; mesonotum with median carina distinct, lateral carinae present, curved mesad basally, subparallel along sides of disk, then curved mesad anteriorly to meet rather acutely at middle line. Posttibiae with four or five spines. Tegmina rather broad, expanding distally, vitreous, veins prominent, a series of transverse veins between costa and margin, Sc and R with a common basal stalk longer than basal cell, M fork, fork of Cu_1 and junction of claval veins at about same level, nodal line, subapical line and apical line of transverse veins present, a transverse vein in clavus between claval suture and anterior claval vein at basal third. Wings with a fairly even line of subapical areoles and an even row at apical margin.

BIOLLEYANA COSTALIS (Fowler)

PLATE 14, FIGURES 419-422; PLATE 15, FIGURES 423-432

Sassula costalis FOWLER, Biologia Centrali-Americana, Rhynch. Hom., vol. 1, p. 68, 1900.

Male: Length, 8.2 mm.; tegmen, 10.7 mm. Female: Length, 8.5 mm.; tegmen, 11.5 mm.

Vertex about three times as broad across base as long in middle; frons about one and a half times as long as wide, lateral carinae obsolete on apical third.

Fuscous, abdomen and legs paler; tegmina hyaline, usually a spot on costal membrane at basal third, a spot at basal M- Cu_1 cross vein, a short line from stigma along nodal line to M, and three or four diffuse patches distad of subapical line dark fuscous; wings with apical cells infuscate except for a clear spot in M.

Anal segment of male in profile expanding distally, deflexed beyond anus, dorsal margin almost straight, ventral margin sinuately convex, apex truncate, with a median channel to anal foramen. Aedeagus tubular, bent into a U shape, comprising dorsally a thin flat membrane concave at apex, its sides strongly deflexed and tapering to apical angles where they are produced into a point; below this membrane a pair of processes on each side, the outer in the form of a slender tapering rod, pointed at apex, the inner similarly curved, broader, rounded at apex, with a slender filament arising subapically on its ventral margin, enclosing a U-shaped hollow; ventrally a pair of processes on each side, the inner long, bladelike, semimembranous, tapering gradually to apex, the outer small, less than half length of preceding, sinuate, with the pointed apex directed dorsally. Genital styles fairly broad, dorsal and ventral margins convex, apical process vertical, somewhat peglike, slightly curved anteriorly, truncate at apex.

Anal segment of female short, in profile obliquely truncate distally, rather deflexed beyond anus, lateral angles not produced. Ovipositor with lateral styles broad, dorsal margin straight, ventral margin convex, curving strongly upward distally, devoid of an apical process; first valvulae elongate, narrow, dorsal margin straight with three single teeth, widely spaced, and distad of them two alternated rows of about three teeth each, apex pointed with a single tooth below it, ventral margin shallowly convex; a thinner lobe of same size as preceding adpressed against its inner face, attached at base.

Egg elongate-ovate, narrower at one pole, with a slight impression laterally near the more rounded pole, smooth, 1.2 mm. long, 0.5 mm. wide.

Described from one male and four females collected by W. Buthn at Hacienda Tenguel, Ecuador (Aug. 20, 1920), labeled "abundant on cacao."

Genus *VARCIOPSIS* Jacobi

Varciopsis JACOBI, Deutsche Ent. Zeitschr., 1915, p. 312. (Genotype, *Ricania trigutta* Walker, List of specimens of homopterous insects in the collection of the British Museum, Suppl., p. 104, 1858.)

Vertex short, more than four times as broad as long in middle, anterior border transverse, slightly angulately produced, carinate, lateral margins subparallel, strongly raised, posterior margin rather deeply roundly excavate, median carina obsolete; frons longer than broad, flat, lateral margins raised, subparallel, scarcely diverging to level of antennae then curved inward to frontoclypeal suture, median carina distinct, obsolete in apical seventh, lateral carinae distinct on basal half, obsolete on apical half; clypeus tricarinate; antennae with first segment very short, second segment cylindrical, slightly expanded dis-

tally. Pronotum in middle at least one and a half times as long as vertex on same line, anterior margin strongly convexly produced, posterior margin angularly excavate, median carina distinct, lateral carinae diverging parallel with hind margin of eyes; mesonotum with disk flat, tricarinate, carinae united anteriorly. Posttibiae with four spines. Tegmina with costal margin markedly rounded, costal membrane ample, Sc and R with a common stalk basally, M forking about level with union of claval veins, Cu₁ forking at same level or slightly more distad, nodal line, subapical line and apical line of transverse veins present, claval veins united about middle of clavus, anterior vein not connected with claval suture by a transverse vein, two or three transverse veins near apex of clavus.

VARCIOPSIS TENGUELANA, new species

PLATE 15, FIGURES 433-440

Male: Length, 8.5 mm.; tegmen, 11.0 mm.

Vertex about 4.5 times as broad as long in middle; frons 1.3 times longer than broad.

Testaceous or pale brown, carinae of mesonotum fuscous, legs testaceous, abdomen brown, tinged red at hind border of each segment; tegmina hyaline, veins brown, fuscous spot at stigma extending narrowly posteriorly to a round spot adjoining nodal line at R, apical areoles clouded brown near margin with a distinctly larger dark area in two or three apical areoles in M; wings hyaline, apical areoles clouded brown in distal quarter.

Anal segment of male narrow in profile, deflexed beyond arms, truncate at apex, apical lateral angles slightly pointed. Aedeagus tubular, a pair of broad, rather shallowly curved lobes ventrally tapering to a slender point distally, ventrolaterad, halfway from base of aedeagus, a short flattened distally sinuate spine directed posteriorly on each side, laterally on each side of aedeagus a thin simple spine, directed posteriorly, above this a long sclerotized rod, bifurcate distally and slightly curved mesad, attaining apex of aedeagus. Genital styles broad, dorsal margin in profile almost straight, ventral margin slightly convex, apical margin slightly sinuate, apical process long, peglike, directed upward and slightly curved anteriorly, truncate at apex.

Described from two males collected by W. Buthn on cacao at Hacienda Tenguel, Ecuador (Aug. 20, 1920). Type in B.M.N.H.; paratype, U.S.N.M. No. 56707. According to W. E. China, who compared this species with Walker's type of *Ricania trigutta*, it differs from the type in tegminal venation and genitalia. *V. trigutta* has a half line of transverse veins between the subapical line and the transverse fold; the color pattern is the same in both species.

Family FLATIDAE

11a. *Tegmina steeply tectiform.*

Subfamily FLATINAE

12a. *Tegmina broadly rounded apically, area distad of apex of clavus not very large, costal cell about twice width of costal membrane.*

Tribe FLATINI

Genus POEKILLOPTERA Latreille

Poekilloptera LATREILLE, Précis des caractères génériques des insectes . . . , Hémiptères, p. 90, 1796. (Genotype, *Cicada phalaenoides* Linnaeus, designated by Latreille, Histoire naturelle . . . , Cicadaïres, vol. 12, p. 315, 1804.)

Vertex very short, anterior margin transverse, carinate; frons with lateral margins arcuate, slightly raised, median carina present in part; pronotum short, anteriorly convex, elongate laterad and carinate; mesonotum inflated. Tegmina large, costal and apical margins broadly rounded, costal cell short, broader than costal membrane. Posttibiae unispinose.

POEKILLOPTERA PHALAENOIDES (Linnaeus)

PLATE 15, FIGURE 473; PLATE 16, FIGURE 474

Cicada phalaenoides LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 438, 1758.—JACOBI, Sitzb. Ges. Nat. Freunde Berlin, 1904, p. 9.

Head, thorax, legs, costal margin at base, and anal segment of female yellowish orange, heavily powdered white in life; tegmina pale, with round black spots, chiefly in basal half.

Anal segment of male rather short, apical margin truncate or shallowly indented at middle, apical angles rounded, anus situated at basal third, segment in profile very slightly decurved. Pygofer broad, lateral margins slightly curved, ventral margin sinuate, indented medially. Aedeagus with periandrium tubular, deeply cleft laterally at apex, median ventral process narrowing distally and passing into a sclerotized point, dorsal margin broad, truncate at apex; penis tubular, bifid in apical half, each limb curved upward distally into a spine, half as long as aedeagus, directed anteriorly above periandrium. Genital styles broad, expanding gradually apically, apical margin oblique, apical process a vertical spine, slightly curved anteriorly.

Anal segment of female large, broader than long, slightly tectiform, broadly rounded at margin, anus situated two-thirds from base. Ovipositor with lateral styles broad, thick, with a single even line of nine teeth on posterior margin directed mesad; second valvulae apposed medially, semimembranous, ventral margin very slightly convex, dorsal margin sinuate, a minute fleshy reflexed process, rather spatulate in shape, basally on ventral surface; first valvulae broad, somewhat

twisted at base, convex on both margins on basal two-thirds, then tapering with straight sides to a point, a small thin tapering lobe attached to inner face of each near base.

Egg ovoid, obliquely compressed on one side, with a narrow opercular surface not quite two-thirds length of egg; a series of about six shallow longitudinal grooves spaced across two-thirds of circumference. Length, 1.3 mm.; breadth, 0.6 mm.

The Trinidad form has the tegmen rather heavily speckled in two bands, one with about 44 spots in anterior half of tegmen between costa and media, the other with about 21 spots on each side of Cu_1 and between suture and anterior claval vein (var. *phalaenoides*). Numerous specimens are at hand collected during 1942 at St. Augustine, Trinidad, B. W. I., by the writer.

12b. *Tegmina truncate apically or narrowed in distal half.*

13a. *Tegmina not narrowed distally, apical margin truncate or very shallowly rounded.*

14a. *Tegmina much expanded distally, sutural angle produced, more or less acute.*

Tribe FLATISSINI

Genus *CARTHAEOMORPHA* Melichar

Carthaeomorpha MELICHAR, Ann. Nat. Hofmus. Wien, vol. 16, p. 198, 1901. (Genotype, *Carthaeomorpha rufipes* Melichar, designated by Oshanin, Katalog der paläarktischen Hemipteren, p. 125, 1912.)

Vertex short, about four times as broad as long in middle, lateral margins diverging anteriorly, anterior margin carinate, somewhat produced, posterior margin broadly excavate; frons as broad as long or longer, flattened, lateral margins slightly arcuate, incurved below level of antennae, median carina present basally, obsolete distally, lateral carinae present at base. Pronotum short, about twice as long as vertex, anterior margin convexly produced, posterior margin broadly excavated; mesonotum with disk almost flat. Posttibiae with two spines in distal half. Tegmina large, subtriangular, costal margin not amply rounded, apex truncate, sutural angle acutely pointed, costal margin narrower than costal cell, Sc simple to apex, R forking about middle, M and Cu_1 forking in basal third, M fork slightly basad of Cu_1 fork.

CARTHAEOMORPHA BREVICEPS Melichar

PLATE 15, FIGURES 441-446

Carthaeomorpha breviceps MELICHAR, Ann. Nat. Hofmus. Wien, vol. 17, p. 34, 1902.

Female: Length, 10 mm.; tegmen, 12 mm.

Yellowish green; costal margin of tegmina narrowly pale, apical margin narrowly bordered red, apical cells distally very pale fuscous, transverse veins of whole tegmen orange, the membranous areas be-

tween them with minute orange specks, wings milk white, veins at base pink, apex of anal segment of female pink, protibiae and mesotibiae reddish. Insect powdered very pale green.

Anal segment of female short, in dorsal view ovate, broad at base, tapering toward apex, apex rounded with a median notch, distal portion shallowly channeled, telson arising distad of middle. Ovipositor with lateral styles large, subtriangular, sinuate on dorsal margin, lower margin curved with a row of 21 teeth, in a single row distally, in pairs basally; second valvulae laterally compressed, with lower margin straight, an asymmetrical excavation at apex, dorsal margin convex at base, sinuately narrowing to apex; first valvulae broad basally, tapering to apex, dorsal margin slightly convex with ten small teeth, a submarginal ridge passing to apex bearing eight small teeth in basal two-thirds and five larger teeth distally, a thin tapering lobe, with minutely shagreen surface, adpressed on inner face, attached at base.

Egg approximately ovoid, obliquely truncate at one pole, with a short crease extending for one-quarter length of egg, bordered on each side by a thickening of the shell, reticulately patterned and traversed by numerous fine parallel lines; length, 1.0 mm., width, 0.4 mm.

Described from one female collected by F. W. Urich (1920), no locality being given. Melichar gives "Sudamerika, Brasilien, Bahia" as the locality for his material, and until confirmed Urich's specimen must be considered a doubtful Trinidad record.

14b. *Tegmina not much expanded distally, sutural angle not produced, or if so rounded, not acutely pointed.*

Tribe NEPHESINI

Genus EPORMENIS, new name

Ormenis METCALF, Bull. Mus. Comp. Zool., vol. 82, p. 394, 1938 (not *Ormenis* Stål, 1862). (Genotype, *Poeciloptera roscida* Germar by present designation.)

Vertex very short; frons as broad as long or broader, median carina present only on basal half, lateral margins curved; clypeus devoid of carinae. Pronotum convex anteriorly, concave posteriorly, smooth, with a small impression on each side of middle line; mesonotum devoid of carinae, or with median carina scarcely indicated at base or apex and lateral carinae at base. Hind tibiae with two spines before apex. Tegmina with anterior and posterior margins subparallel, costal margin not ampliate, costal membrane generally wider than costal cell, Sc strong, simple to apex, R forking about one-third from base, M forking level with R fork or slightly basad, Cu₁ forking rather basad of M fork, base of R and M granulate, apical and subapical lines of transverse veins even and distinct, a few irregular cross veins between node and apex of clavus, apical veins forked or simple in irregular sequence.

EPORMENIS ARIPENSIS, new species

PLATE 15, FIGURES 447-454

Male: Length, 6.0 mm.; tegmen, 6.3 mm. Female: Length, 5.7 mm.; tegmen, 6.3 mm.

Frons broader than long (1.4:1). Tegmina with costal membrane 1.8 times as wide as costal cell at level of R fork, apical areoles short, two-thirds length of subapical areoles, apical margin rounded, slightly oblique, apical angle more broadly rounded than sutural angle.

Pale green; dorsal surface of second antennal joint, tibial and tarsal spines black. Insect in life powdered greenish white.

Anal segment of male with apical portion deflexed through 45°, slightly longer than basal portion, a small broad lobe medioventrally at base. Aedeagus tubular, curved upward distally, with a pair of stout spines of half its length arising from middle line ventrally near apex, diverging and directed anteriorly. Genital styles broad, dorsal margin straight, ventral margin convex, upturned distally, apical process in form of a broad tooth tapering rather rapidly to an incurved point.

Anal segment of female short, rather broad, deflexed at apex. Ovipositor with lateral styles broad, thick, with stout teeth on posterior margin in two irregular rows; first valvulae with four blunt teeth apically.

Egg ovoid, distinctly compressed laterally, truncate obliquely at one pole, slightly crescentic in profile, with a long groove extending for three-quarters of length from one pole, with greatly thickened margins, minutely canaliculate; a pair of shallow longitudinal depressions weakly present on opposite side of egg; length, 0.9 mm., width, 0.3 mm.

Described from one male and one female taken in forest on Aripo, Northern Range, Trinidad, B. W. I., by Dr. J. G. Myers (Nov. 29, 1930), and one male and female taken by the writer on *Cordia* sp., St. John's Valley, Trinidad (Aug. 20, 1942). Holotype male, U. S. N. M. No. 56708; allotype female in B.M.N.H. This species differs from *O. unimaculata* Fennah in the venation of the tegmina, in the shape of the genitalia, in the absence of a black spot at the apex of the clavus, and in the presence of one on the antennae. It is possibly conspecific with *O. albula* Walker, but as the type of *albula* has the abdomen missing the relationship cannot be settled with certainty.

EPORMENIS UNIMACULATA (Fennah)

PLATE 15, FIGURE 464

Ormenis unimaculata FENNAH, Proc. Ent. Soc. Washington, vol. 43, p. 209, pl. 21, figs. 27, 28, 1941.

The anal segment of this species is asymmetrically cleft or deeply emarginate laterally near apex, and the aedeagus also is markedly

asymmetrical. Mr. China finds this very distinct from *O. nigrolimbata* Fowler in color pattern, size, structure of frons, and other details. The type of the latter is a female.

One male and one female collected by the writer on cacao, Santa Margarita, Trinidad, B. W. I. (July 16, 21, 1942), in addition to earlier records.

EPORMENIS FULIGINOSA (Fennah)

PLATE 16, FIGURES 476-478

Ormenis fuliginosa FENNAH, Proc. Ent. Soc. Washington, vol. 43, p. 204, pl. 21, figs. 23, 24, 1941.

The following data, based on a study of more material, will serve to amplify the original description of this species:

Angle between costal margin and middle of apical margin of tegmina 67° , angle between middle of apical margin and commissural margin 95° .

Anal segment of male of same length as aedeagus, apex remote from lower apical angle of genital styles, convex dorsally, scarcely deflexed distad of anus, not channeled distally in middle line, apical margin truncate, slightly sinuate, telson arising halfway between base and apex; ventral margin of segment in profile convex, rather shallowly curved.

Aedeagus with periandrium tubular, dorsal surface flattened, widened distally, obtusely angulate at apex, forming dorsal tip of aedeagus, a deep cleft laterally at apex, ventral surface narrowed distally into a vertical keel, pointed at apex; penis tubular, with a pair of spines on each side arising ventrally near apex, the shorter spines of each side of equal length, three-tenths as long as aedeagus (not one-sixth as previously given), the longer spines arising from a common base with the shorter and lying exterior to them, spine of left side very long and slender, nearly as long as aedeagus, spine of right side about half this length, shallowly curved. Genital styles with upper margin folded inward, expanded into a lobe in apical third.

Egg approximately ovoid, smooth, in front view with sides straight, narrowing slightly to one pole, one pole broadly rounded, the other bluntly angulate, one end of egg obliquely truncate in side view, a longitudinal groove for three-quarters of length, with margins thickened, a pair of shallow depressions, longitudinal and slightly curved, on opposite side of egg; length, 1.1 mm., width, 0.3 mm.

These additional data are based on four males and seven females taken by the writer on coffee and *Cordia* sp. at St. Augustine, Trinidad, B. W. I. (May 26 and Nov. 8, 1942).

Genus FLATORMENIS Melichar

Flatormenis MELICHAR, Genera insectorum, fasc. 182, p. 71, 1923. (Genotype, *Ormenis squamulosa* Fowler.)

Frons broader than long, lateral margins strongly curved, median carina present only in basal half; tegmina with apical and nodal line present, the former about equidistant between latter and apical margin; costal membrane distad of humeral elevation much broader than costal cell; several but not most of the veins distad of apical line forked. Hind tibiae with two spines. Anal segment of male only slightly deflexed in side view, ventrolateral margins convex, a shallow groove between anus and apex dorsally.

FLATORMENIS SQUAMULOSA (Fowler)

PLATE 15, FIGURES 455-463

Ormenis squamulosa FOWLER, Biologia Centrali-Americana, Rhynch. Hom., vol. 1, p. 57, 1900.

Male: Length, 6.0 mm.; tegmen, 6.2 mm. Female: Length, 6.0 mm.; tegmen, 7.0 mm.

Frons broader than long in middle (1.4:1), median carina present only on basal half. Tegmina with costal membrane twice as wide as costal cell at level of R fork, an impressed fold basad of subapical line.

Head, pronotum, pleurites, and legs pale yellow, sometimes clouded fuscous, mesonotum reddish brown, darker laterally, abdominal sclerites fuscous, membrane pallid or yellow, genitalia fuscous; tegmina piceous or very dark fuscous, costal margin, and sometimes area between costal veinlets, and scutellar margin of clavus narrowly pale yellow, Sc testaceous; wings smoky, veins darker. Insect in life powdered pinkish brown and gray, rather speckled.

Anal segment of male short and broad, not deflexed markedly in apical half, ventral margin in profile convex, apex bluntly rounded, telson arising basad of middle. Aedeagus with periandrium tubular, slightly upturned distally; a thin rounded lobe on each side of middle line apically, a short stout spine laterad of each directed anteriorly with a row of about eleven minute recurved teeth laterally near base; lateral margins cleft at apex; a pair of stout shallowly curved spines, three-quarters length of aedeagus, arising distally and directed forward ventrolaterally; ventral surface of periandrium tapering distally to an upturned point; basad of this point, ventrolaterally, a slight ridge on each side bearing about eight recurved teeth; penis a simple tube slightly upturned distally, apically bifid, the cleft extending for one-seventh from apex, each limb expanded distally, curved dorsally and anteriorly, scroll-like. Genital styles broad, expanding distally, dorsal margin slightly convex, apical margin

rounded, somewhat oblique, apical process a vertical spine, curving slightly anteriorly.

Anal segment of female short, broad, rounded at apex and scarcely deflexed. Ovipositor with lateral styles thick, broad, with a double row of seventeen strong teeth directed mesad on distal margin and a single tooth situated slightly basad on inner surface at dorsal end of row; second valvulae in profile tapering to a point, lower margin straight, oblique, upper margin straight with a round knob laterally halfway from base; medially in distal half a thin, vertical, broadly triangular plate with apex curved posteriorly; first valvulae broad, twisted at base, narrowed sharply to a point at apex, flanked on each side with a pair of short teeth; a thin tapering process attached mesally at base, directed posteriorly and adpressed to inner face of valvulae.

Egg ovoid, in anterior view slightly more narrowed toward one pole, in side view crescentic, obliquely truncate at one end, a longitudinal groove present for four-fifths of length, with its margins broadly thickened, traversed by numerous fine parallel lines; length, 0.9 mm.; width in side view, 0.45 mm.

Described from 24 males and 29 females taken by the writer at St. Augustine, Trinidad, B. W. I., on Liberian coffee and *Cordia* sp., *Lantana camara*, and *Hibiscus* between June 1942 and March 1943. This species is superficially similar to *Epormenis cestri* (Berg) but differs in color and in its smaller size.

Genus ORMENIS Stål

Ormenis STÅL, Svenska Vet.-Akad. Handl. vol. 3, no. 6, p. 68, 1862. (Genotype, *Poeciloptera perfecta* Walker, List of specimens of homopterous insects in the British Museum, vol. 2, p. 449, 1851 (= *Ormenis rufo-terminata* Stål), designated by Distant, Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 313, 1910.)

Ricanoyata MELICHAR, Genera insectorum, fasc. 182, p. 67, 1923.

Vertex short; frons as broad as long or broader, lateral margins arcuate, raised, a median carina present basally, clypeus ecarinate. Pronotum anteriorly convex, produced, posteriorly concave; mesonotum inflated, carinae obsolete. Tegmina subtriangular, markedly expanded distally, apical angle rounded, sutural angle rectangular, not produced, rounded at tip, costal membrane expanding distally, wider than costal cell; subapical line of transverse veins undulate, apical line parallel to apical margin, both incurved to reach costa anteriorly; clavus granulate. Wings larger than tegmina. Posttibiae bispinose.

ORMENIS ANTONIAE Melichar

PLATE 16, FIGURE 475

Ormenis antoniae MELICHAR, Ann. Nat. Hofmus. Wien, vol. 17, p. 94, pl. 5, fig. 11, 1902.

Ormenis rufa FENNAH, Proc. Ent. Soc. Washington, vol. 43, p. 206, 1941.

The following data are given to amplify the original description :

Ovipositor with lateral styles bearing 17 spines on apical margin in two rows, alternately arranged and directed mesad; second valvulae adpressed, with ventral surface slightly curved in profile, apex bluntly pointed, dorsal margin with a rounded eminence at base and a vertical sabot-shaped or clog-shaped lobe at middle, directed anteriorly and upward; first valvulae twisted at base, broad, tapering upward to a point at apex with two small teeth subapically on each margin, and a small rather isolated tooth basad of pair on dorsal margin, a thin semicrescentic lobe, with a thickened ridge attached at base of each valvula and adpressed to its inner face.

Five males and eight females, mostly of the pale form of this species, are to hand taken by the writer on Liberian coffee and mango at St. Augustine, Trinidad, B. W. I. (July 15, Sept. 29, 1942).

13b. *Tegmina narrowed distally, costal and apical margins sinuate.*

Tribe SELIZINI

LOCRONA, new genus

Vertex short, frons distinctly wider than long, lateral margins elevated, strongly incurved below level of antennae, median carina present in basal half, frontoclypeal suture impressed. Pronotum fully three times as long as vertex, smooth, devoid of carinae, anterior margin convex, posterior margin shallowly concave; mesonotum inflated anteriorly, carinae obsolete. Tegmina with margins expanding distally, costal margin not amply rounded, apical angle strongly curved, apical margin truncate, sutural angle markedly produced, rounded at tip, not acutely pointed, costal membrane much wider throughout than widest part of costal cell, Sc simple, joining costa at middle of tegmen, R forking basad of this point, M forking at about same level, Cu₁ forking basad of M fork, base of R and M, and posterior half of clavus granulate, apical line of transverse veins slightly irregular, distinct, subparallel to apical margin, subapical line fairly even, distinct and undulate, both lines meeting costa anteriorly, subapical and apical areoles of about equal length, apical veins mainly forked.

Anal segment of male with lower margin scarcely decurved, in dorsal view rounded at apex, shallowly channeled medially distad of anus, telson arising two-fifths from base.

Anal segment of female broadly ovate, rather longer than broad, apical margin roundly truncate, deflexed abruptly, with a short median channel distad of anus, telson arising at basal third. Ovipositor with lateral styles stout with about 20 teeth in two rows inside apical margin directed mesad.

This genus is apparently near *Leptodascalia* Melichar but differs in the frontal proportions, the proportionately much wider costal membrane, and the shape of the sutural angle of the tegmina.

Genotype: *Ormenis nigrospersa* Fennah.

LOCRONA NIGROSPERSA (Fennah)

PLATE 15, FIGURES 470-472

Ormenis nigrospersa FENNAH, Proc. Ent. Soc. Washington, vol. 43, p. 205, pl. 21, figs. 29, 30, 1941.

The examination of further material makes it possible to amplify the original description with the following data:

Aedeagus with periandrium tubular, slightly curved upward distally, dorsal margin with a minutely toothed ridge on each side at base, bluntly pointed at apex, where it is slightly impressed, not quite reaching to tip of aedeagus, a short cleft on each side laterally, below which is a process curved backward, ventrad and then anteriorly, bifurcate about middle into two spines of unequal length, the longer about half as long as aedeagus; penis tubular, bifid for a short distance at apex, the middle portion at base of cleft pointed, the sclerotized apicolateral armature consisting of a minute vertical spine anteriorly, a scroll-like curved ledge ventrally, and a rather large lateral pouch.

Ovipositor with first valvulae tapering upward to a point, a pair of minute teeth on each side at its base, a thin lobe on inner face attached at base tapering distally; second valvulae with lower margin obliquely tapering upward, dorsal margin curved downward at base, then raised in a long transparent domelike elevation, distad of which it is sinuately decurved to apex.

Egg ovoid, surface delicately reticulate, a longitudinal groove extending for four-fifths length, bordered laterally with minute hair-like processes.

A series of six males and four females is at hand taken by the writer at Santa Margarita, Trinidad, B. W. I., on various dates between July and September 1942. The type is in the U. S. National Museum.

Genus ANADASCALIA Melichar

Anadascalia MELICHAR, Genera insectorum, fasc. 182, p. 103, 1923. (Genotype, *Dascalia ornata* Melichar, Ann. Nat. Hofmus. Wien, vol. 17, p. 151, pl. 7, 1902.)

Vertex short, anterior margin straight or nearly so; frons a little longer than broad, lateral margins slightly curved and raised, median carina present only in basal half. Pronotum convex anteriorly, concave posteriorly, with an impression on each side of middle line; mesonotum inflated, devoid of carinae. Tegmina about twice as long as

wide, the margins subparallel, apical margin truncate, apical angle widely rounded, sutural angle rectangular, not produced, an apical and a subapical line present, subparallel, the former not reaching to costa, apical veins short and simple, apical and subapical areoles of equal length, numerous transverse veins basad of subapical line. Post-tibiae with two spines.

ANADASCALIA MERIDIONALIS, new species

PLATE 15, FIGURES 465-469

Female: Length, 8.0 mm.; tegmen, 9.1 mm.

Vertex short, a little more than half length of pronotum along middle line; width of head, with eyes, equal to width of thorax; frons as broad as long, lateral margins slightly curved, carinate, median carina present only in basal half, lateral carinae slightly indicated on tumescences at base; clypeus devoid of carinae. Pronotum convexly produced anteriorly, roundly excavated posteriorly, a median callus in anterior half with a depression on each side; mesonotum devoid of median carina, lateral carinae indicated in basal half. Hind tibiae with two spines. Tegmina 2.6 times longer than wide in middle, anterior and posterior margins subparallel; costal margin as wide as costal cell in middle, Sc simple to apex, reaching costa distad of apex of clavus, R forking about one-third from base, M forking slightly basad of R fork, Cu₁ forking basad of M fork, apical and subapical lines of transverse veins fairly even and distinct, a third row of areolets on inner side of subapical line, bounded basally by an irregular series of cross veins, basad of this cross veins numerous on corium. Wings with ten veins reaching apical margin before Cu₂.

Head pale testaceous, a small brown spot on vertex near each side anteriorly extending on to frons between base of lateral carinae and lateral margins, and on to anterodorsal angle of sides of head; pronotum pale testaceous, sparsely punctate with brown near anterior margin; mesonotum pale testaceous, a dark brown band around anterior margin of disk and extending two-thirds along its sides, a small dark spot inside each lateral carina at base; legs, abdomen, and genitalia pale testaceous. Tegmina translucent, pale, veins stramineous, irregularly sprinkled pale yellowish brown, darker in a distinct band from apical angle to middle of apical half of tegmen, apical and subapical lines outlined in yellowish brown, apical areolets yellowish brown to apex of clavus, interspersed with about seven hyaline rounded spots, each as wide as one apical areolet; clavus with transverse veins numerous and distinct, posterior claval vein narrowly fuscous; wings hyaline. Insect powdered pale buff.

Anal segment of female broadly rounded in dorsal view, only slightly deflexed apically. Ovipositor with lateral styles broad, nar-

rowing towards apex, apical margin somewhat rounded with five stout incurved spines, a deflexed spine subapically near dorsal margin; second valvulae wedge-shaped in lateral view, narrowing posteriorly with a thin dorsal cowl not quite overhanging apex; first valvulae narrow, rather flattened, upturned to a point apically, with four short longitudinal ridges, evenly spaced, each ending in a tooth on apical margin, the dorsal two ridges on each valvula with a few teeth subapically, a narrow wedge-shaped minutely setose process attached at base of valvula, adpressed to its inner face.

Described from two females collected by F. W. Urich in Trinidad, B. W. I. (1917). Type in British Museum mounted piecemeal on two microscope slides. Paratype, U. S. N. M. No. 57188. The quadrate vertex, the three series of areolets, the closely reticulate venation of the tegmina and the shape of the valvulae of the ovipositor readily distinguish this genus.

EUHYLOPTERA, new genus

Head with eyes about as wide as pronotum; vertex short, rounded into frons, apical margin in dorsal view slightly rounded, posterior margin shallowly concave, overlapped by pronotum; frons broader than long (about 1.2 to 1), flat basally, depressed near suture, median carina weakly present in basal half, absent in apical half, lateral carinae obsolete, lateral margins arcuate, not raised; clypeus devoid of carinae. Pronotum about as long as eyes, anteriorly convex, transverse in middle of margin, posterior margin angularly excavated, an impression on each side of middle line, a short ridge behind eyes; mesonotum with disk flattened, devoid of carinae. Hind tibiae with two spines before apex. Tegmina nearly 2.4 times as long as wide, costal margin strongly convex on basal two-thirds, thence slightly concave to apex, apical margin straight, obliquely truncate, forming an angle of 70° with the distal third of the costal margin, and one of 105° with the distal quarter of the commissural margin, apical margin nearly four-fifths as long as greatest width of tegmen; R forking at basal quarter, M forking just distad of R fork, Cu_1 fork-ink slightly basad of R fork, apical line irregular but distinct, subapical line irregular, short. Wings about as long as tegmina.

Anal segment of male narrow, rather broader apically, deflexed in apical third, apical margin rounded, deeply notched, with a channel medially to anus, telson arising halfway from base.

Anal segment of female long, about as long as posttibiae, ovate, tectiform, anus subterminal. Ovipositor with lateral styles, small, subtriangular. Egg bluntly ovoid, smooth, not operculate.

This genus recalls *Cyarda* Walker but differs in the shape of the tegmina, which are relatively shorter, not so narrowed, and without

a sinuate apical margin, and in the shape of the vertex, which is not produced anteriorly.

Genotype: *Euhyloptera corticalis*, new species.

EUHYLOPTERA CORTICALIS, new species

PLATE 16, FIGURES 479-486

Male: Length, 4.7 mm.; tegmen, 4.8 mm. Female: Length, 5.0 mm.; tegmen, 5.1 mm. Frons broader than long (1.2:1).

Testaceous or pale fuscous; genae and antennae pale yellow, mesonotum sometimes reddish brown, genitalia fuscous; tegmina brown, costal membrane, a line along Sc, R, M and Cu_1 about level of fork, a short band near apex of clavus, and membrane distad of node fuscous; veins pale testaceous; wings fuscous, veins dark. Insect in life powdered dull brown.

Pygofer of male with anal angles of each side produced into a blunt lobe, lateral margins straight. Genital styles broad, dorsal margin straight, excavated subapically, ventral margin strongly convex, apical process broad, truncate distally, with a minute point directed obliquely downward and backward. Aedeagus tubular, curved upward distally, periandrium tubular, a serrate ridge on each side dorsolaterally at base, posterior dorsal margin pointed, posterior ventral margin broadly rounded; a long spinose process arising on each side near apex, curved ventrally and anteriorly, angularly bent at middle, and giving off at this point a slender filament directed posteriorly; penis broadly tubular, cleft at apex, with a short spine directed anteriorly and outward on each side of apex.

Egg 0.8 mm. long, 0.4 mm. wide, bluntly ovoid, not operculate.

Described from 9 males and 13 females taken by the writer at Santa Margarita, Trinidad, B. W. I., on various dates between May and December 1942 feeding on *Lantana camara*, *Cordia* sp., and low bushes. Holotype male and allotype, U. S. N. M. No. 56709; paratype in B. M. N. H.

11b. Tegmina not steeply tectiform, nearly horizontal or gradually tectiform.

Subfamily FLATOIDINAE

Genus FLATOIDINUS Melichar

Flatoidinus MELICHAR, Genera insectorum, fasc. 182, p. 117, 1923. (Genotype, *Poeciloptera convivus* Stål, Svenska Vet.-Akad. Handl., vol. 3, No. 6, p. 13, 1862.)

Head with eyes narrower than the pronotum; vertex broader than long; frons rather longer than broad. Pronotum about as long as vertex; mesonotum broader than long. Tegmina with costal margin

not undulate, about twice as long as broad, costal margin about twice as broad as costal cell, apical line distinct, subapical line present, irregular. Posttibiae bispinose.

FLATOIDINUS CORDIAE, new species

PLATE 16, FIGURES 487-492

Male: Length, 7.8 mm., tegmen, 8.0 mm. Female: Length, 9.2 mm.; tegmen, 10.5 mm.

Vertex broader than long (1.5:1); frons in middle slightly longer than broad (1.1:1), devoid of carinae, or lateral carinae scarcely indicated basally, lateral margins carinate; clypeus without carinae. Pronotum overlapping vertex anteriorly to a slight extent, as long as vertex; mesonotum with median carina indicated at base, lateral carinae basally present. Tegmina with costal area granulate, margin scarcely undulate, costal area fully twice as wide as costal cell, Sc simple to apex, R forking near middle of tegmina, M forking basad of R fork, Cu₁ forking still farther basad, base of R and M, R at fork and near nodal area granulate, apical line of cross veins uneven but distinct, subapical line parallel to apical margin, rather feebly indicated by irregular cross veins, clavus granulate near base.

Stramineous; vertex with a short black stripe on each side of middle line, subparallel to it or slightly oblique, frons slightly infusate at base, genae with a small dark spot near ocellus, a black horizontal stripe before eye on each side, eyes red or gray, with concentric dark bands; pronotum with a black spot on each side of middle line, mesonotum testaceous with a dark spot on each side anteriorly, a dark spot on each side of middle line on disk, a pair of spots outside and a smaller pair inside lateral carinae at base; genitalia testaceous. Tegmina stramineous, costal area with about twelve spots occurring singly or in pairs, a spot or stripe on Sc one-third from base, a spot on M posterior to R fork, a larger spot at one-third and a linear spot at two-thirds from base on Cu₁, three small spots on M near subapical line, a spot at apex of Sc, a series of spots inside subapical areoles basally and apical areoles near margin, and a row of spots adjoining commissural margin in clavus fuscous or piceous; wings milk white, veins stramineous. Insect in life powdered grayish white.

Anal segment of male with posterior third only slightly deflexed, a large triangular median lobe ventrally. Aedeagus with two pairs of spinose processes at apex, the penial spines thick, directed anteriorly and obliquely upward for about half length of aedeagus, the periandrial spines slender, curved caudad from point of origin, then bending upward and forward in more than a semicircle, ventral margin of periandrium very deeply excavated, with each lateral prong pointed. Genital styles with dorsal and ventral margins parallel, apex obliquely

truncate, apical process spinose, directed obliquely upward and caudad, then bent angularly obliquely cephalad.

Anal segment of female broadly ovate, rounded at apex. Ovipositor with lateral styles large and broad with about twelve teeth set in two rows on apical margin, directed mesad; second valvulae joined in middle line, ventral margin straight, dorsal margin steeply de-curved from base, then more gradually tapering to pointed apex; first valvulae broad at base, tapering upward to apex, a few subapical teeth on each margin, a flat narrow tapering lobe on inner face attached at base.

Posterior margin of pregenital sternite with a short rectangular median excavation.

Egg ovoid, obliquely concave on two-thirds of one side, where the shell is thickened and minutely channeled, surface delicately reticulate; length, 1.0 mm.; width, 0.5 mm.

Described from one male and three females collected by the writer on black sage (*Cordia cylindrostachya*) and various shrubs (Nov. 3, 1936, April 4, 1941, Aug. 28, 1942) and one female collected by Miss B. L. Kerr from mango (July 14, 1943) at St. Augustine, Trinidad, B. W. I. Holotype male in B.M.N.H.; allotype, U.S.N.M. No. 56710. This species appears to be near *F. occidentalis* Walker but differs in the shape of the vertex, in tegminal markings, and in the genitalia.

Family ACANALONIIDAE

Genus ACANALONIA Spinola

Acanalonia SPINOLA, Ann. Soc. Ent. France, ser. 1, vol. 8, p. 447, 1839. (Genotype, *Acanalonia servillei* Spinola, *ibid.*, p. 448, pl. 16, fig. 2.)

Head, with eyes, as wide as pronotum; vertex short, more than twice as broad as long, not much produced in front of eyes, lateral margins subparallel, somewhat diverging distally, anterior margin transverse or convex, posterior margin broadly excavated; frons broader than long, median carina present, often feeble, lateral carinae present at base, usually obsolete on disk, lateral margins subparallel, curved inwards to frontoclypeal suture; clypeus devoid of carinae; antennae with second segment subglobular at apex, tapering basad, terminal segment with seta arising at apex on posteroventral side of rim. Pronotum short, approximately as long as vertex, impressed on each side of middle line, with median and lateral carinae feebly present or obsolete, anterior margin convex, posterior margin shallowly concave; mesonotum feebly carinate. Posttibiae unarmed. Tegmina with costal margin broadly rounded, apical margin rounded-truncate, commissural margin straight, basal stalk of M longer than basal cell, second fork of M level with middle of clavus.

ACANALONIA UMBELLICAUDA, new species

PLATE 16, FIGURES 493-502, 510

Male: Length, 8.0 mm.; tegmen, 8.5 mm. Female: Length, 7.9 mm.; tegmen, 9.7 mm.

Vertex 3.3 times as broad as long, anterior margin straight, carinae obsolete; frons broader than long (1.2:1), flattened, with median carina present throughout, lateral carinae present only at base.

Pale green; costa pallid, anterior margin of genae, protarsi and mesotarsi, and a row of short linear markings inside apical margin of tegmen fuscous, procoxae and mesocoxae fuscous speckled with whitish spots.

Anal segment of male large, narrow in dorsal view, produced on each side beyond anal opening into a large lobe, broadly triangular in side view and twice as long as preanal portion, with a notch near its base. Pygofer with lateral margins straight, ventral posterior border transverse, devoid of a process. Aedeagus tubular, a flattened bladeliike process arising on each side at middle, directed posteriorly and slightly upward, expanding distally and truncate at apex with a short spine at one angle; a pair of slender spines arising at apex, curving ventrad and directed anteriorly for nearly whole length of aedeagus. Genital styles broad, dorsal margin convex, ventral margin straight, rounded apically, a small peglike process with a sclerotized tip on dorsal margin near base.

Anal segment of female elongate, produced beyond anal opening in a grooved lamina notched at apex. Ovipositor with lateral styles large, concave on dorsal margin, ventral margin curving through a quarter circle, greatest width 1.4 times length; first valvulae with a dorsal outer row of six small teeth near apex, and a longer inner row of five broader teeth. Pre genital sternite with hind margin sinuate, slightly produced near middle line, with a V-shaped notch medially.

Described from one male and three females collected by the writer at St. Augustine, Trinidad, B. W. I., on various dates between April 1942 and March 1943 on *Caesalpinia* and *Asparagus*. Holotype male in B.M.N.H.; allotype, U.S.N.M. No. 56711. This species is distinguished by its flat frons, by the shape of the anal segment of the male and of the aedeagus, by the shape of the lateral styles of the ovipositor, and by the fuscous-speckled protibiae and mesotibiae. It is very near the female type of *A. complanata* Walker, described from an unknown locality.

ACANALONIA THEOBROMAE, new species

PLATE 16, FIGURES 503-509, 511-513

Male: Length, 8.2 mm.; tegmen, 7.5 mm. Female: Length, 8.5 mm.; tegmen, 8.6 mm.

Vertex short, 2.5 times as broad as long, anterior margin somewhat angularly produced, apex rounded; frons wider than long (1.2:1), inflated medially at base, flat near suture, median carina feebly present, lateral carinae obsolete on disk.

Pale green; costa pallid, a series of minute linear markings inside apical margin of tegmen fuscous, protarsi and mesotarsi pale fuscous, protibiae distally pale fuscous speckled with white.

Anal segment of male long, narrow, tubular, postanal portion slightly deflexed, shorter than preanal portion (1:1.3), a slight protuberance ventrally below anal opening. Pygofer with posterior lateral margins slightly convex, ventral margin very slightly concave, devoid of a median process. Aedeagus tubular, with a membranous flange, slightly incurved, arising on dorsal margin in distal half and tapering to apex, a somewhat folded eminence on each side ventrally at middle from which arises a bladelike spine directed in its basal half mesad and posteriorly, and bent outward in its distal half; in middle line ventrally a single process in form of a broad short spine directed caudad. Anal segment of female elongate, produced beyond anal opening in a flat and shallowly grooved lamina scarcely notched at apex. Ovipositor with lateral styles large, bluntly angularly pointed, dorsal margin concave, ventral margin curved through less than a quarter of a circle, greatest width 1.6 times length; first valvulae with a double row of four teeth on dorsal margin and five teeth crowded near apex. Pregenital sternite with hind margin sinuate, slightly produced caudad on each side of middle line with a rather broad shallow emargination medially.

Egg ovoid, with a chorionic process at one pole tightly coiled, when extended consisting of a filament forking into two rami distally; length, 1.1 mm., width, 0.5 mm.

Described from four males and six females collected at St. Augustine, Trinidad, B. W. I., by the writer (May 13, Aug. 10, 25, Oct. 2, 1942) on *Hibiscus*, coffee, and cacao, and three females collected by Dr. E. McC. Callan (May 18, 1939, Feb. 8, 1943) on cacao in the same locality. Holotype male and allotype, U.S.N.M. No. 56712; paratype in B.M.N.H. This species is distinguished by the tumid frons, the curved anterior margin of the vertex, the shape of the anal segment of the male, and of the aedeagus, by the broad excavation on the hind margin of the pregenital sternite, and the shape of the lateral styles, and by the fuscous color of the distal half of the protibiae. It differs from *A. decens* Stål, to which it appears most nearly allied, in the more rounded apical angle of the tegmina.

Family ISSIDAE
Subfamily ISSINAE

15a. *Wings with apical margin entire, without a deep cleft; anal area not very large.*

Tribe ISSINI

UGOA, new genus

Head, with eyes, as broad as pronotum; vertex hollowed out, more than twice as broad as long in middle, lateral margins approximately parallel, anterior margin straight, transverse, carinate, posterior margin shallowly excavated, median carina absent or obsolete; frons longer than broad, slightly curved in profile, lateral margins expanding to below level of antennae, thence curved rather sharply inwards to suture, median carina present, lateral margins carinate, slightly raised; clypeus short, scarcely half as long as frons, devoid of lateral carinae, median carina present with an eminence at basal quarter; antennae with second segment somewhat longer than broad, devoid of perisensorial granulations on ventral surface, seta arising on ventral margin at apex of third segment. Pronotum short, depressed on disk, anterior margin convex, produced into emargination of vertex, anterior border of disk transverse, posterior margin angularly excavated, anterior margin slightly raised, posterior margin less so, median carina present, lateral carinae following line of hind border of eyes; mesonotum slightly broader than long, median carina distinct except at apex, lateral carinae joined to median carina anteriorly, diverging laterally and curving posteriorly, becoming obsolete before middle, scutellum acutely triangular. Posttibiae unarmed. Tegmina elongate, slightly tapering apically, common stalk Sc + R scarcely as long as basal cell, M forking about middle, Cu₁ forking just basad of apex of clavus, clavus long, its apex three-quarters of length of tegmen from base.

This genus comes nearest to *Colpoptera* Burmeister but differs in not having the costal margin sinuate or markedly narrowed distally, in the broadly rounded sutural angle, and in the proportionately shorter membrane distad of apex of clavus.

Genotype: *Ugoa glauca*, new species.

UGOA GLAUCA, new species

PLATE 16, FIGURES 514–518; PLATE 17, FIGURES 519–526

Male: Length, 4.6 mm.; tegmen, 5.3 mm. Female: Length, 4.9 mm.; tegmen, 6.0 mm.

Vertex broader than long (2.4:1); frons longer than broad (1.3:1).

Pale green, abdomen pallid green; middle line of vertex, pronotum, mesonotum, and abdominal tergites sometimes broadly pale fuscous; tegmina green, commissural margin narrowly pale fuscous, veins concolorous; wings hyaline, faintly clouded fuscous, veins concolorous, Cu₂ and anal veins fuscous.

Anal segment of male tubular, in profile expanding distally, postanal portion deflexed, equal in length to preanal portion, telson fingerlike, three-quarters as long as postanal portion of segment. Pygofer with sides very slightly sinuate, devoid ventrally of a median process on hind margin. Aedeagus U-shaped in profile, a pair of rather long spines ventrally near base directed posteriorly and ventrad; a broad bifurcate spine, with the upper limb shorter, arising near apex on each side and directed anteriorly; apex of aedeagus curved anteriorly, beaklike in profile, thin, with two short sclerotized thickenings visible inside. Genital styles broad, ventral margin longer than dorsal, upper margin almost straight, apical margin oblique, apical process in form of a broad slightly curved spine directed vertically.

Anal segment of female tubular, deflexed, postanal portion rather longer than preanal, telson long. Ovipositor with lateral styles broad, dorsal margin oblique, almost straight, ventral margin curved, strongly convex, apex narrowly membranous; first valvulae broad, with four small teeth and two larger apical teeth on dorsal margin. Pregenital sternite produced on hind margin in middle third, median area with margin straight, transverse.

Egg narrowly ovoid, more flattened on one side, a short clavate process directed obliquely upward from one pole, and from its base two narrow ridges, subparallel and approximated, passing along egg to opposite pole; length, 1.1 mm.; width, 0.2 mm.

Described from 13 males and 29 females collected by the writer near Santa Margarita, Trinidad, B. W. I. (May 4, 11, June 8, 1942, and subsequent dates), on *Cordia*, *Erythrina*, and fiddlewood. Holotype male and allotype, U.S.N.M. No. 56751; paratype in B.M.N.H.

15b. *Wings with apical margin cleft; anal area very large.*

Tribe THIONIINI

Genus THIONIA Stål

Thionia STÅL, Berliner Ent. Zeitschr., vol. 3, p. 321, 1859. (Genotype, *Issus longipennis* Spinola, designated by Van Duzee, Check list of Hemiptera of America north of Mexico, p. 81, 1916.)

Form rather broadly oval. Vertex broad, anterior margin transverse, curved, or even somewhat produced; frons broad, median carina usually present, lateral carinae present or obsolete, a series of pustules inside lateral margins. Pronotum short, anterior margin distinctly convex, lateral margins very short, posterior margin transverse, with a median notch; mesonotum short, less than combined length along middle line of vertex and pronotum, lateral margins strongly oblique, slightly sinuate, scutellum pointed at apex. Tegmina rather broad, costal margin distinctly rounded, commissural margin straight, apical margin strongly rounded, veins simple, Sc and R

with a short common stalk at base, M branching before middle, a few transverse veins, especially distad of apex of clavus. Wings large, anal fold greatly dilated and separated from remainder of wing by a deep cleft in the apical margin.

THIONIA DRYAS, new species

PLATE 17, FIGURES 527-534

Male: Length, 5.1 mm.; tegmen, 5.3 mm. Female: Length, 5.3 mm.; tegmen, 5.5 mm.

Vertex depressed, broader than long in middle (2.3:1), anterior margin transverse, very slightly angulate medially, basal margin shallowly excavate; frons slightly broader than long (1.1:1), slightly tumid laterally at apex, median carina somewhat swollen in basal quarter, obsolete at apex. Pronotum with median carina obsolete; mesonotum feebly tricarinate. Hind tibiae with two spines in apical half. Abdomen without paired eminences ventrally.

Testaceous, suffused with reddish brown; middle and lateral margins of frons, clypeus, a small suffusion at base of antennae, two triangular spots at apex of vertex, a triangular spot on each side of middle line of pronotum, and a crescentic mark on each lateral lobe, medial portion of abdominal sclerites, and a band near base and a second band near apex of profemora fuscous; eyes red, with a pale spot; tegmina yellowish, hyaline, mottled with pale fuscous, darker at base of Sc and M and near stigma, a broad irregular pale fuscous band from costal to commissural margin basad of humeral protuberance, an irregular line of rather large pallid spots obliquely from anterior margin in basal third to union of claval veins, a small pale spot at stigma, a distinct pale spot at junction of claval veins, and a pale spot on each side of anterior claval vein near base, transverse veins rather pallid. Wings smoky, veins concolorous, with narrow darker edges.

Anal segment of male short, postanal portion longer than preanal, in profile porrect and narrow. Aedeagus tubular, curved distally upwards and bending caudad at apex assuming a spoutlike appearance, a long spine ventrally on each side, arising about two-thirds from base, about half as long as aedeagus, curving anteriorly, giving off a small spine near middle of upper edge. Genital styles with ventral margin straight, dorsal margin sinuate, strongly bent upward distally, apical margin oblique, apical process of styles broad and blunt, bearing three small teeth.

Anal segment of female short, postanal portion semiovalate. Ovipositor with lateral styles very broad basally, tapering rapidly to apex, which is subtriangular, rounded and incurved, membranous in texture; first valvulae broad at base, tapering distally, with four

teeth on dorsal margin near apex. Pregenital sternite with hind margin slightly excavated medially.

Described from one male and one female collected by the writer on the Lalaja road, Northern Range, Trinidad, B. W. I. (May 29, 1936), at 2,500 feet in forest. Holotype male in B.M.N.H.; allotype female, U.S.N.M. No. 56752. This species is distinguished by the shape of the male genitalia and by the color pattern.

THIONIA MAMMIFERA, new species

PLATE 17, FIGURES 535-543

Female: Length, 6.0 mm.; tegmen, 6.5 mm.

Vertex broader than long (2:1), depressed, median carina feebly present; frons as broad as long in middle, median carina present, weak apically, lateral carinae obsolete. Hind tibiae with two spines before apex. Abdomen with a pair of papillate protuberances near middle line ventrally on sixth segment.

Testaceous-fuscous; vertex testaceous, an oblique pale fuscous band from middle line at apex to each lateral basal angle, frons mottled fuscous, clypeus testaceous banded fuscous, genae testaceous, a fuscous spot between ocelli and antennae; pronotum testaceous, a fuscous suffusion in middle of lateral lobes, mesonotum fuscous to piceous, carinae paler; legs and abdomen testaceous; tegmina brownish yellow, a pallid spot between M and Cu_1 level with R fork, the transverse veins and the apex of the external claval vein broadly pallid, a few small pale spots between claval veins near base; eyes red, with a pale crescentic band horizontally.

Anal segment short, postanal portion in dorsal view tapering, truncate at apex. Ovipositor with lateral styles broad at base, both margins convex, tapering subequally to a membranous lip at truncate apex; first valvulae broad, with two small subapical teeth and one larger flattened tooth at apex dorsally. Pregenital sternite with posterior margin sinuate, shallowly excavated medially, with a slight median groove basad of hind margin.

Egg bluntly fusiform, 0.9 mm. long, 0.5 mm. wide, with the surface finely reticulate.

Described from two females collected in Trinidad, B. W. I., by F. W. Urich (1923). Type, U.S.N.M. No. 56713. The writer has described this species, although no males were available, on account of the distinguishing characters of the singly banded eyes and the abdominal ventral protuberances.

THIONIA BUFO, new species

PLATE 17, FIGURES 544-554

Male: Length, 6.5 mm.; tegmen, 5.6 mm. Female: Length, 7.1 mm.; tegmen, 5.9 mm.

Vertex broader than long in middle (3:1), devoid of median carina; frons slightly broader than long (1.1:1), very slightly rounded in profile, median carina present, lateral carinae obsolete. Pronotum and mesonotum without median carinae.

Pallid olive-testaceous; vertex mottled pale fuscous, a piceous spot at base of middle line, a distinct clear triangular area near each posterior lateral angle; frons sprinkled fuscous, clypeus pale basally, piceous at apex, rostrum pale; eyes red or mauve, with two faint vertical stripes anteriorly, genae pale, a dark spot between antennae and ocelli, antennae pale basally, second segment piceous; pronotum testaceous, a row of five small piceous spots on anterior margin at each side, lateral lobes sprinkled fuscous and with a piceous spot; mesonotum sprinkled with pale fuscous; legs pallid, slightly sprinkled fuscous; abdomen fuscous dorsally, sternites fuscous in middle, paler laterally; tegmina pale testaceous or pallid, a short irregular oblique fuscous band across humeral protuberance, a sparse fuscous mottling from stigma to middle of clavus, a second irregular band halfway between this and apical margin; wings smoky, veins broadly infuscate.

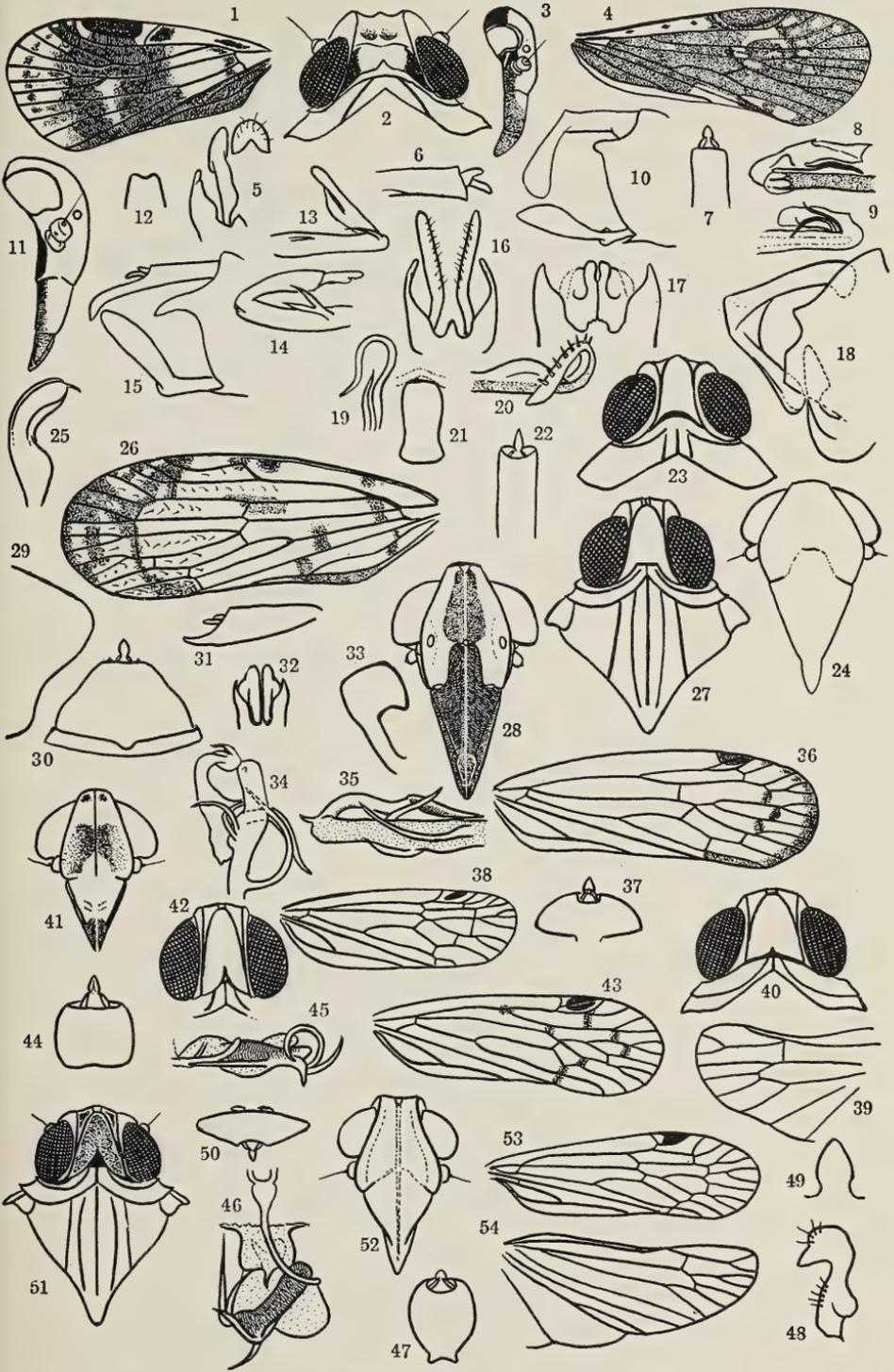
Anal segment of male shorter than genital styles, postanal portion slightly shorter than the preanal, apex sinuate. Aedeagus tubular, curved dorsad apically; a pair of flattened lobes, rounded at tip, arising at apex and directed anteriorly above aedeagus for two-thirds of its length, ventrolaterally two-thirds from base a pair of spines on each side, the outer spine filamentous, tapering, three-quarters as long as aedeagus, inner spine half length of former, flattened, narrowed, and sharply curved at tip, a folded membrane at apex of aedeagus. Genital styles in profile triangular, dorsal margin slightly curved, a short deflexed plate on dorsal margin near base, with two points distally, directed outward, and a thinner plate of equal length directed inward from margin. Pygofer with lateral margins sinuate, ventral posterior margin transverse, devoid of a median process.

Anal segment of female short, postanal portion twice as long as preanal, subovate. Ovipositor with lateral styles broad, subquadrate, with a membranous lip bordering the apical margin; first valvulae broad, ventral margin curved upward distally, dorsal margin straight with five small teeth and a larger tricuspidate tooth at apex, two small teeth ventrad of apex. Pregenital sternite with hind margin shallowly excavated.

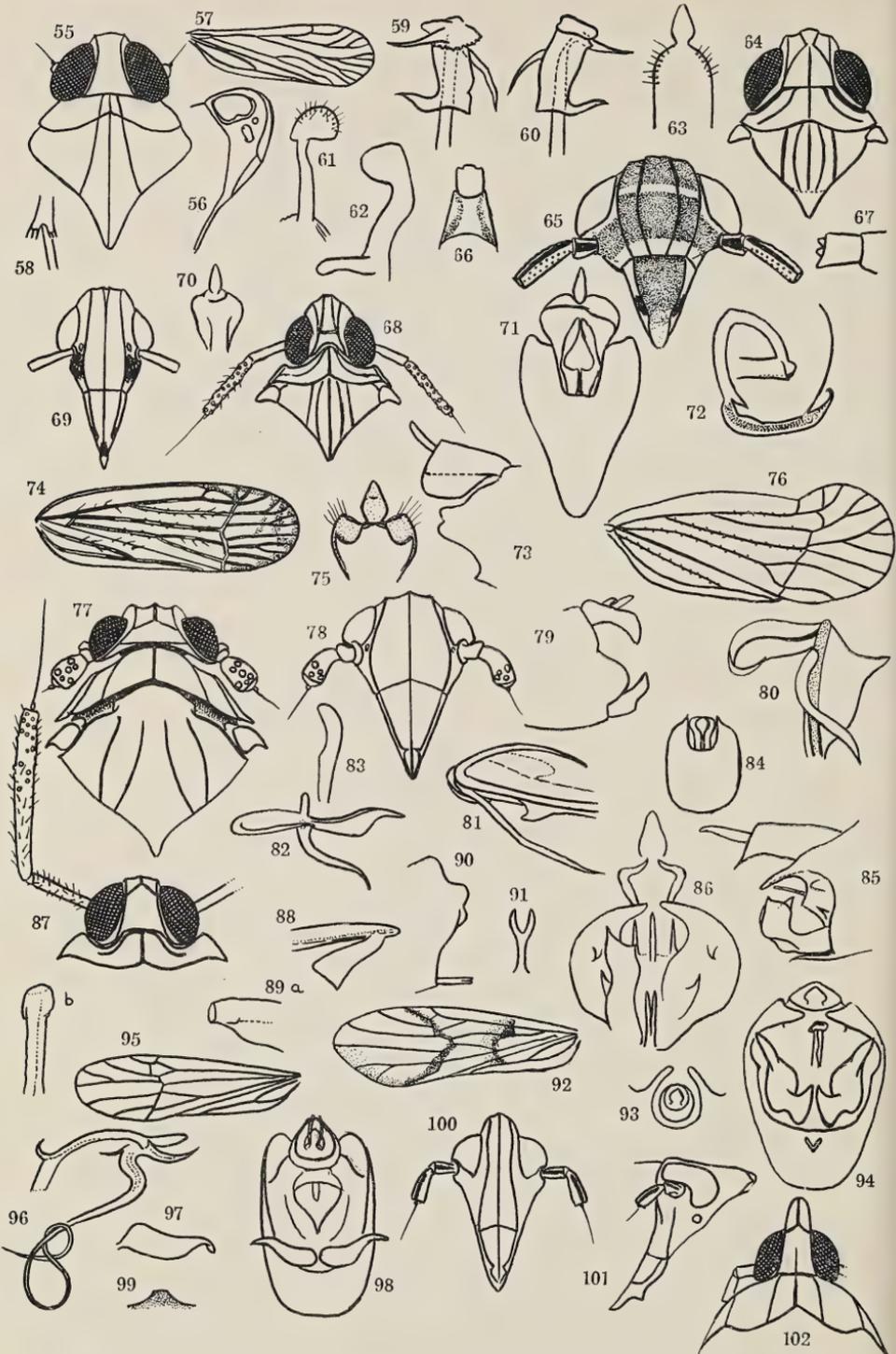
Described from two males and two females taken by the writer at Santa Margarita, Trinidad, B. W. I. (March 12, 14, 1943), on the woody stem of a leguminous vine. Holotype male and allotype, U.S.N.M. No. 56714. This species is distinguished by the proportions of the vertex and frons, the shape of the genitalia of both sexes, and by the color.

PLATE 7

1. *Bothriocera bicornis* (Fabricius): Tegmen.
- 2-10. *Pintalia albolineata* Muir: 2, Head and pronotum, dorsal view; 3, head in profile; 4, tegmen; 5, posterior view of anal segment and left genital style; 6, anal segment of female, side view; 7, same, dorsal view; 8, aedeagus, right side; 9, same, left side; 10, pygofer, genital style, and anal segment of male, side view.
- 11-16. *Pintalia straminea*, new species: 11, Head in profile; 12, apex of anal segment in male, dorsal view; 13, aedeagus, left side; 14, same, right side; 15, pygofer, genital style, and anal segment of male, side view; 16, pygofer and genital styles, ventral view.
- 17-26. *Mnemosyne arenae*, new species: 17, Pygofer and genital styles, ventral view; 18, pygofer, genital styles, and anal segment of male, side view; 19, aedeagus, ventral view; 20, same, left side; 21, anal segment of male, dorsal view; 22, anal segment of female, dorsal view; 23, head and pronotum, dorsal view; 24, head, frontal view; 25, aedeagus, right side; 26, tegmen.
- 27-36. *Oliarus biperforatus*, new species: 27, Head, pronotum, and mesonotum, dorsal view; 28, head, frontal view; 29, lateral margin of pygofer, left side; 30, anal segment of female, dorsal view; 31, anal segment of male, right side; 32, hind margin of pygofer and genital styles, ventral view; 33, genital style, right side; 34, aedeagus, ventral view; 35, same, right side; 36, tegmen.
- 37-41. *Oliarus opalinus*, new species: 37, Anal segment of female, dorsal view; 38, tegmen; 39, wing; 40, head and pronotum, dorsal view; 41, head, frontal view.
- 42-44. *Oliarus quadratus*, new species: 42, Head, dorsal view; 43, tegmen; 44, anal segment of female, dorsal view.
- 45-54. *Oliarus maidis*, new species: 45, Aedeagus, left side; 46, same, dorsal view; 47, anal segment of male, dorsal view; 48, genital style, side view; 49, medioventral process of pygofer, ventral view; 50, anal segment of female, dorsal view; 51, head, pronotum, and mesonotum, dorsal view; 52, head, frontal view; 53, tegmen; 54, wing.



FULGOROIDEA FROM TRINIDAD
SEE OPPOSITE PAGE FOR EXPLANATION



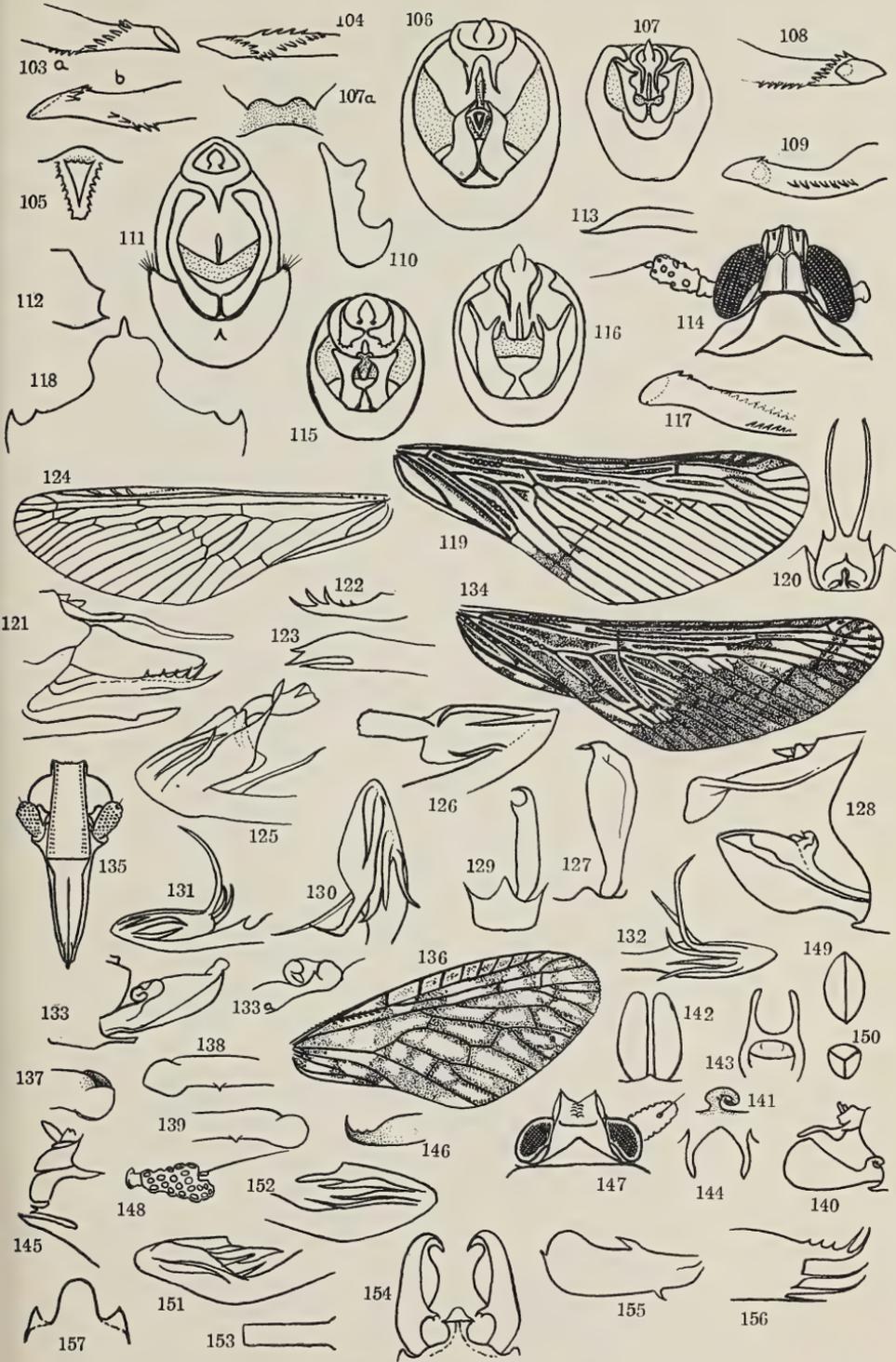
FULGOROIDEA FROM TRINIDAD
SEE OPPOSITE PAGE FOR EXPLANATION

PLATE 8

- 55-63. *Paramyndus cocois*, new species: 55, Head, pronotum, and mesonotum, dorsal view; 56, head in profile; 57, tegmen; 58, spines at apex of posttibia; 59, aedeagus, left side; 60, same, right side; 61, genital style, ventral view; 62, same, side view; 63, anal segment of male, dorsal view.
- 64-67. *Pentagramma bivittata* Crawford: 64, Head, pronotum, and mesonotum, dorsal view; 65, head, frontal view; 66, anal segment of female, dorsal view; 67, same, side view.
- 68-74. *Eucanyra flagellata*, new species: 68, Head, pronotum, and mesonotum, dorsal view; 69, head, frontal view; 70, anal segment of male, dorsal view; 71, pygofer, genital styles, and apex of anal segment of male, posteroventral view; 72, aedeagus, left side; 73, pygofer and anal segment of male, right side (left in transparency); 74, tegmen.
- 75-84. *Tetrasteira albitarsis*, new species: 75, Anal segment of male, posterior view; 76, tegmen; 77, head, pronotum, and mesonotum, dorsal view; 78, head, frontal view; 79, pygofer, anal segment of male, and genital style, left side; 80, aedeagus, ventral view; 81, same, right side; 82, same, posterior view; 83, genital style, ventral view; 84, pygofer and genital styles, posteroventral view.
- 85, 86. *Burnilia spinifera*, new species: 85, Pygofer, genital style, and anal segment of male, side view; 86, pygofer, left genital style, and anal segment, ventral view.
- 87-94. *Malaxa gracilis*, new species: 87, Head and pronotum, dorsal view (right antenna not shown); 88, penis, left side; 89, penis, right side (*a*) and ventral view (*b*); 90, pygofer, left side; 91, median ventral process of pygofer, ventral view; 92, tegmen; 93, anal segment of male, posterodorsal view; 94, pygofer, genital styles, and anal segment, posterior view.
- 95-102. *Saccharosydne saccharivora* (Westwood): 95, Tegmen; 96, penis, left side; 97, right genital style, posterior view; 98, pygofer, genital styles, and anal segment, posterior view; 99, middle of hind margin of pygofer, ventral view; 100, head, frontal view; 101, head in profile; 102, head and pronotum, dorsal view.

PLATE 9

- 103-106. *Delphacodes pallidivitta*, new species: 103, Penis, left side (*a*) and right side (*b*); 104, penis, ventral view (posterior spines in transparency); 105, armature of diaphragm; 106, pygofer, genital styles, and anal segment, posterior view.
- 107-110. *Delphacodes axonopi*, new species: 107, Pygofer, genital styles, and anal segment, posterior view; 108, penis, left side; 109, penis, right side; 110, genital style, side view.
- 111-114. *Delphacodes spinigera*, new species: 111, Pygofer, genital styles, and anal segment, posterior view; 112, lateral margin of pygofer, left side; 113, penis, right side; 114, head and pronotum, dorsal view.
115. *Delphacodes teapae* (Fowler): Pygofer, genital styles, and anal segment, posterior view.
- 116, 117. *Sogata furcifera* (Horváth): 116, Pygofer, genital styles, and anal segment, posterior view; 117, penis, right side.
- 118-123. *Derbe uliginosa*, new species: 118, Pregenital sternite of female, ventral view; 119, tegmen; 120, anal segment of female, dorsal view; 121, ovipositor and anal segment, left side; 122, first valvula of ovipositor, upper lobe; 123, same, ventral lobe.
- 124-128. *Derbe boletophila*, new species: 124, Tegmen; 125, aedeagus, right side; 126, same, left side; 127, right genital style, ventral view; 128, anal segment of male, lateral margin of pygofer, and genital style, side view.
- 129-135. *Derbe semifusca*, new species: 129, Right genital style and ventral margin of pygofer, ventral view; 130, aedeagus, dorsal view; 131, same, right side; 132, same, left side; 133, genital style, left side (*a*) ornamentation of dorsal margin, side view; 134, tegmen; 135, head, frontal view.
- 136-150. *Mysidia cinerea*, new species: 136, Tegmen; 137, apex of aedeagus, left side; 138, aedeagus, right side; 139, same, left side; 140, anal segment of male and right genital style, side view; 141, ornamentation on dorsal border of genital style, side view; 142, genital style and medial portion of pygofer, ventral view; 143, anal segment of male, dorsal view; 144, posterior ventral process on pregenital sternite of female, ventral view; 145, anal segment of female, ovipositor, and pregenital plate, side view; 146, first valvula of ovipositor, right side, side view; 147, head, dorsal view (left antenna not shown); 148, antenna, frontal view; 149, egg, side view; 150, egg, end view.
- 151-157. *Omolicna proxima*, new species: 151, Aedeagus, right side; 152, same, left side; 153, same, ventral view; 154, genital styles and medioventral process of pygofer, ventral view; 155, right lateral style, side view; 156, first valvula of ovipositor, left side, side view; 157, posterior margin of pregenital sternite of female.



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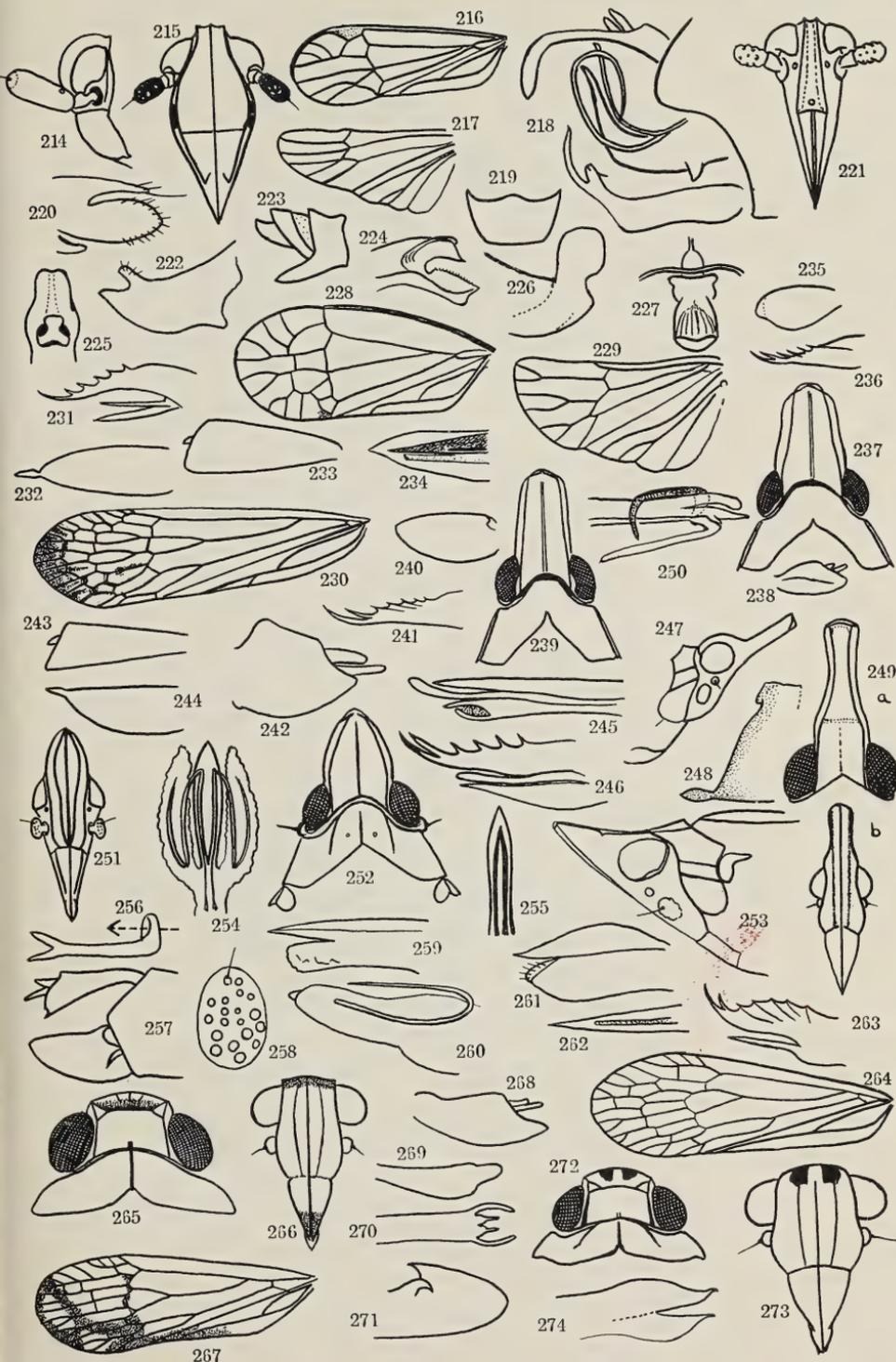
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PLATE 10

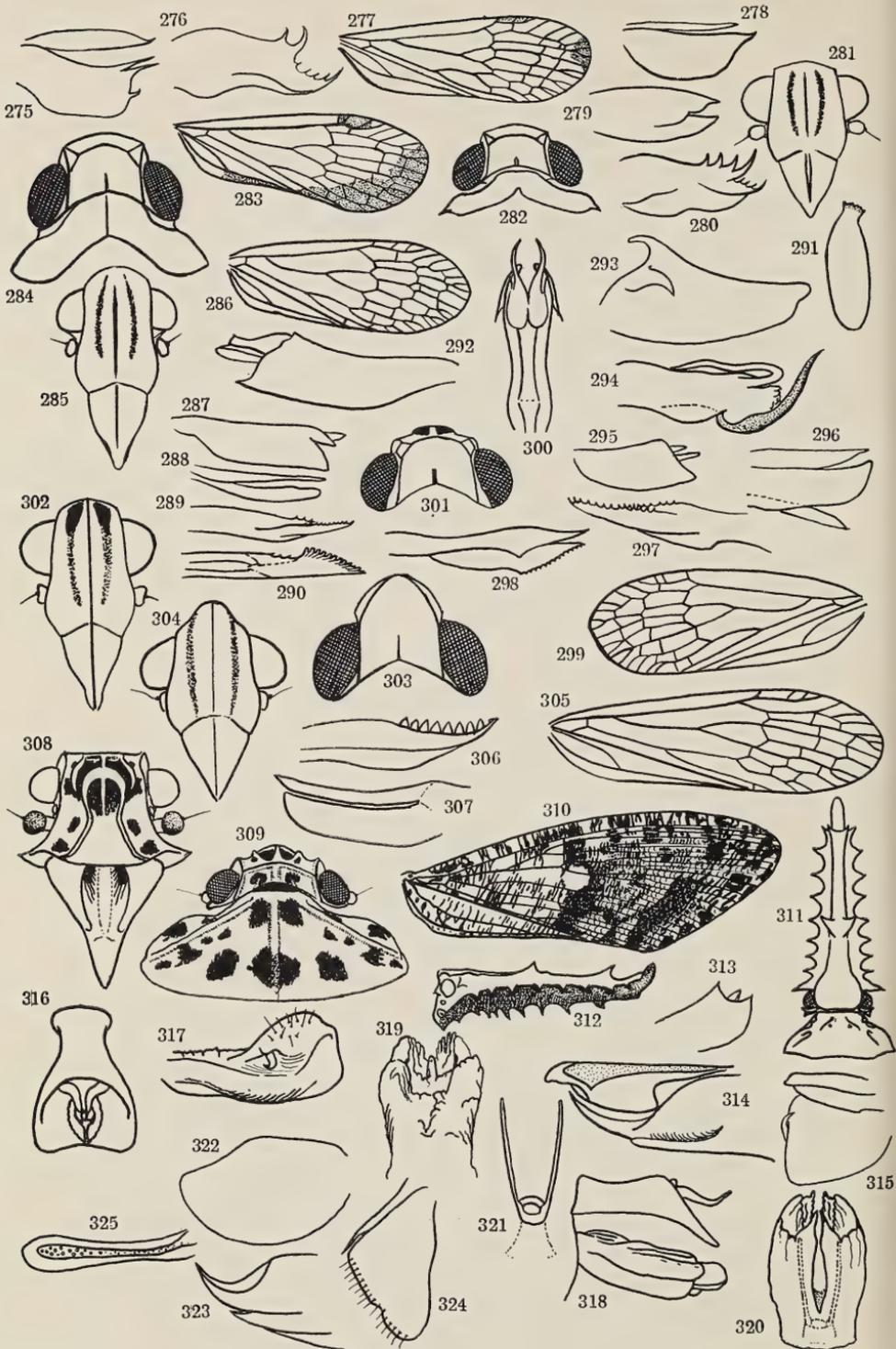
- 158-160. *Omolicna proxima*, new species: 158, Head, dorsal view; 159, head frontal view; 160, anal segment of male, side view.
- 161-168. *Omolicna rubrimarginata*, new species: 161, Head, dorsal view; 162, pygofer, ventral view; 163, lateral style of ovipositor, side view; 164, aedeagus, left side; 165, left genital style, side view; 166, anal segment of male, side view; 167, posterior lobe of pregenital sternite of female, ventral view; 168, right genital style of male, ventral view.
- 169-181. *Neocenchrea gregaria*, new species: 169, Aedeagus, ventral view; 170, same, right side, posterior lobe extended caudad; 171, posterior margin of pygofer and right genital style, ventral view; 172, anal segment of male and right genital style, side view; 173, lateral styles of ovipositor, ventral view; 174, anal segment of female, lateral style, and first valvula of right side, side view; 175, lateral styles, posterior view; 176, first valvula, left side, side view; 177, posterior margin of pregenital sternite of female, ventral view; 178, egg, side view; 179, head, pronotum, and mesonotum, dorsal view; 180, tegmen; 181, head in profile.
- 182-190. *Cedusa cyanea*, new species: 182, Anal segment of male and right genital style, side view; 183, aedeagus, right side; 184, same, left side; 185, anal segment of female, dorsal view; 186, same, first valvula of left side, side view; 187, lateral style of ovipositor, lateroventral view; 188, head, anterolateral view; 189, tegmen; 190, head and pronotum, dorsal view.
- 191-194. *Cedusa rubriventris*, new species: 191, Aedeagus, right side; 192, same, left side; 193, left genital style of male, ventral view; 194, anal segment of male, dorsal view.
- 195-201. *Patara trigona*, new species: 195, Head, frontal view; 196, second joint of antenna, dorsal view; 197, aedeagus, dorsal view; 198, same, left side; 199, same, posterior view; 200, anal segment of male, dorsal view; 201, left genital style, left half of pygofer, and aedeagus, ventral view.
- 202-207. *Patara vittatipennis*, new species: 202, Tegmen; 203, antenna, dorsal view; 204, left genital style, side view; 205, same, left half of pygofer, ventral view; 206, aedeagus, right side; 207, same, left side.
- 208-213. *Patara poeciloptera*, new species: 208, Tegmen; 209, head, frontal view; 210, right genital style, side view; 211, aedeagus, left side; 212, right genital style, right side of pygofer, and aedeagus, ventral view; 213, anal segment of male and posterolateral margin of pygofer, side view.

PLATE 11

214. *Patara poeciloptera*, new species: Head in profile.
- 215-220. *Eparmenoides ripalis*, new species: 215, Head, frontal view; 216, tegmen; 217, wing; 218, anal segment of male, aedeagus, and right genital style, side view; 219, pregenital sternite of female, ventral view; 220, lateral style of ovipositor, left side.
- 221-229. *Bytrosis nemoralis*, new species: 221, Head, frontal view; 222, right genital style of male, side view; 223, anal segment of female, side view; 224, aedeagus, left side; 225, anal segment of male, dorsal view; 226, lateral style of ovipositor, left side; 227, aedeagus, dorsal view; 228, tegmen; 229, wing.
- 230-234. *Lappida* sp. (?): 230, Tegmen; 231, first valvula of ovipositor, right side; 232, lateral style of ovipositor, right side; 233, anal segment of female, side view; 234, second valvula of ovipositor, right side.
- 235-238. *Hyalodictyon truncatum* (Walker): 235, Lateral style of ovipositor, right side, side view; 236, first valvula of ovipositor, right side; 237, head and pronotum, dorsal view; 238, anal segment of female, side view.
- 239-242. *Hyalodictyon fallax*, new species: 239, Head and pronotum, dorsal view; 240, right lateral style of ovipositor, side view; 241, right first valvula of ovipositor, side view; 242, anal segment of female, side view.
- 243-250. *Toropa ferrifera* (Walker): 243, Anal segment of female, side view; 244, right lateral style of ovipositor, side view; 245, second valvula of ovipositor, right side; 246, right valvula of ovipositor, side view; 247, head in profile; 248, pregenital sternite of female, side view; 249, head, dorsal (*a*) and side (*b*) views; 250, aedeagus, left side.
- 251-264. *Retiala viridis*, new species: 251, Head, frontal view; 252, head and pronotum, dorsal view; 253, head in profile; 254, aedeagus, with ventral lobe removed, ventral view; 255, ventral lobe of perianthrium; 256, basal collar and ventral lobe of part of aedeagus; 257, anal segment of male, posterior margin of pygofer, and right genital style; 258, second segment of antenna, lateroventral view; 259, penis, right side; 260, perianthrium, side view of right side; 261, lateral style of ovipositor, side view; 262, second valvula of ovipositor, side view; 263, first valvula of ovipositor, side view; 264, tegmen.
- 265-271. *Taosa vitrata* (Fabricius): 265, Head and pronotum, dorsal view; 266, head, frontal view; 267, tegmen; 268, anal segment of female, side view; 269, aedeagus, left side; 270, same, ventral view; 271, left genital style, side view.
- 272-274. *Taosa bimaculifrons* Muir: 272, Head and pronotum, dorsal view; 273, head, frontal view; 274, second valvula, left side.



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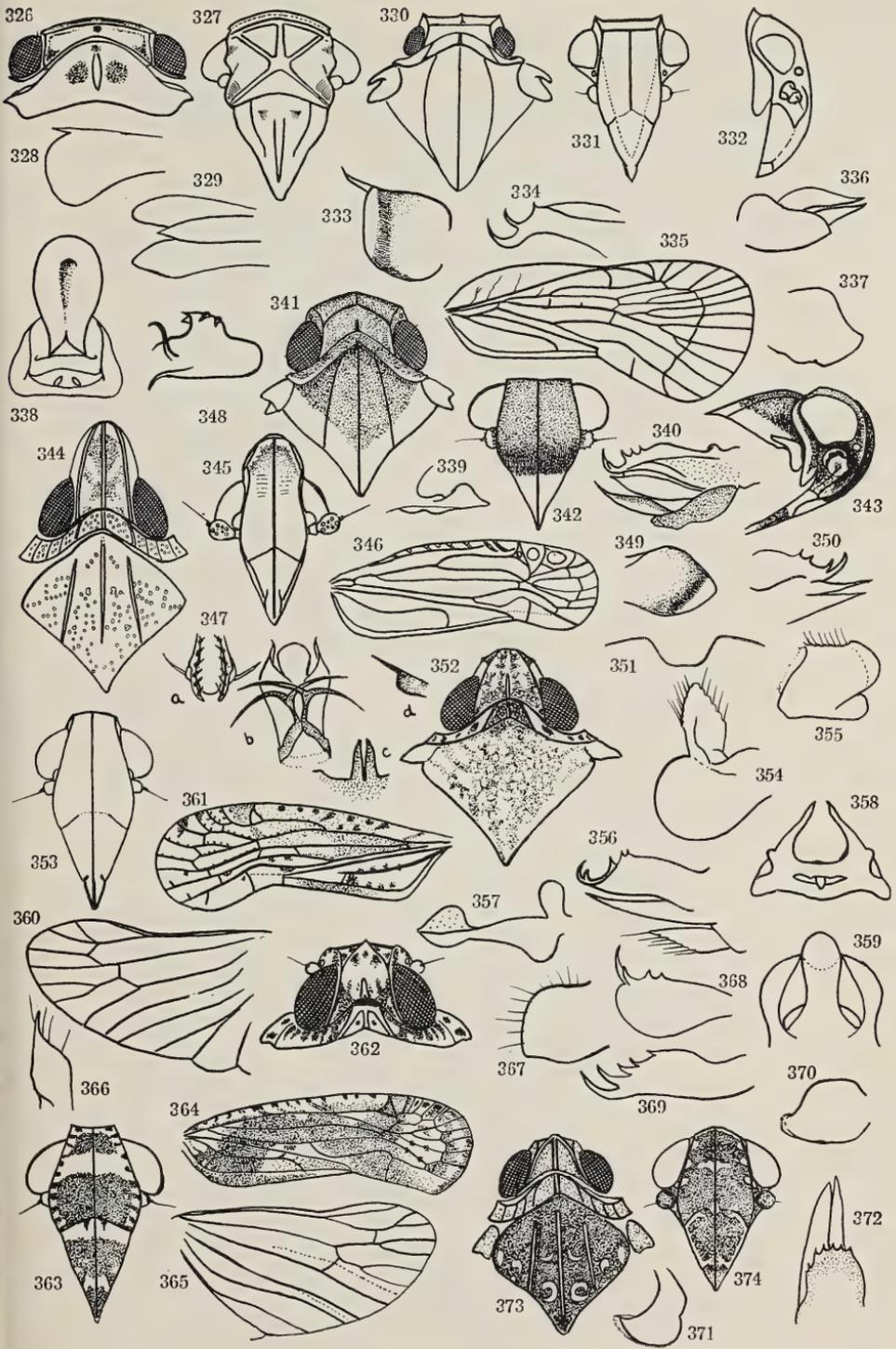
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PLATE 12

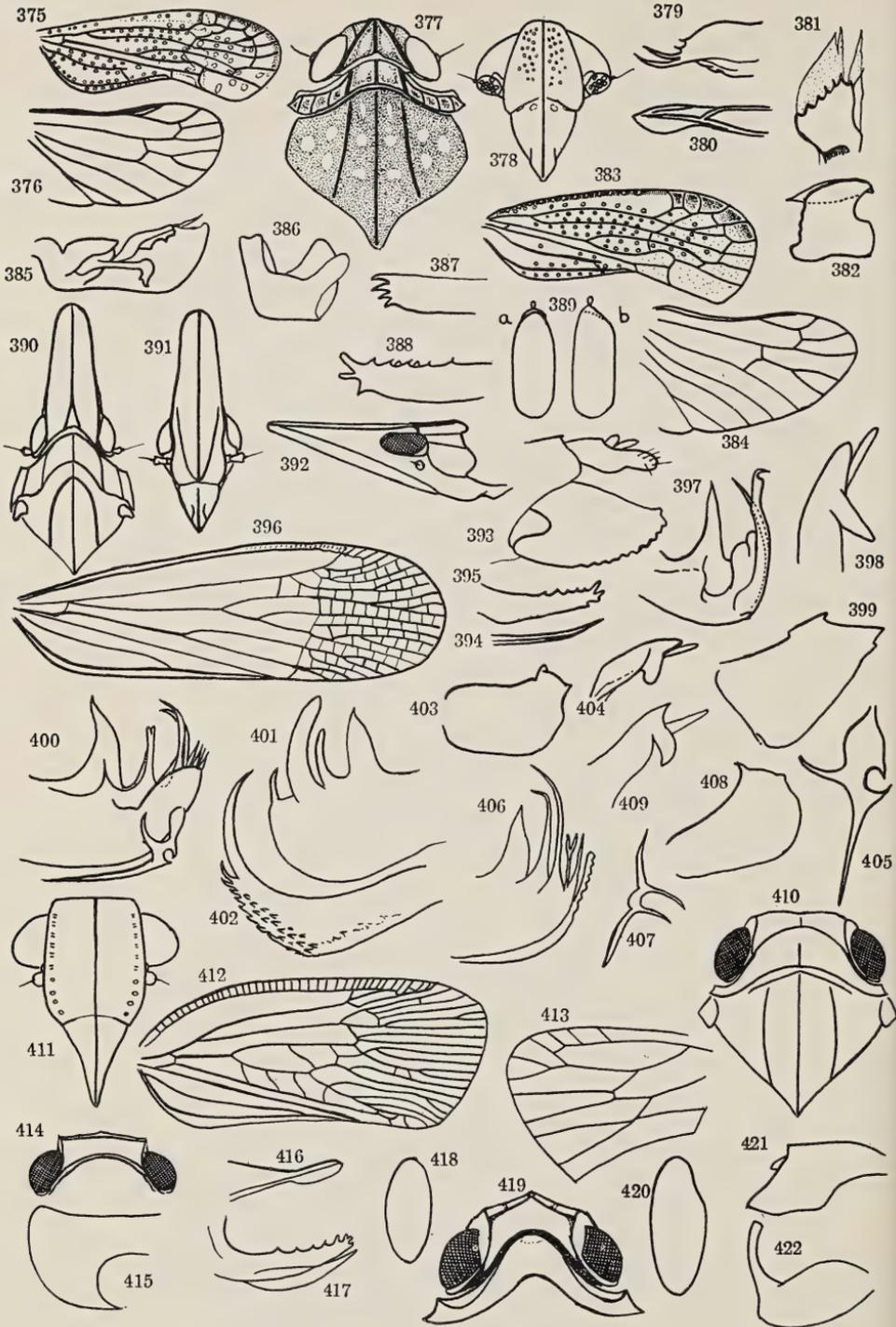
- 275-277. *Taosa bimaculifrons* Muir: 275, Left lateral style, side view; 276, first valvula of left side, side view; 277, tegmen.
- 278-283. *Taosa muliebris* (Walker): 278, Left lateral style of ovipositor, side view; 279, second valvula, left side; 280, first valvula of ovipositor, left side, side view; 281, head, frontal view; 282, head and pronotum, dorsal view; 283, tegmen.
- 284-291. *Taosa amazonica*, new species: 284, Head and pronotum, dorsal view; 285, head, frontal view; 286, tegmen (this is proportionately longer than shown in the figure); 287, anal segment of female, side view; 288, second valvula of ovipositor, left side view; 289, first valvula of ovipositor, left side view; 290, same, ventral view; 291, egg, side view.
- 292-302. *Taosa herbida* (Walker): 292, Anal segment of male, side view; 293, left genital style, side view; 294, aedeagus, left side; 295, anal segment of female, side view; 296, left lateral style of ovipositor, side view; 297, right first valvula of ovipositor, side view; 298, left second valvula of ovipositor, side view; 299, tegmen (this is proportionately longer than shown in figure); 300, aedeagus, ventral view; 301, head, dorsal view; 302, head, frontal view.
- 303-307. *Taosa paraherbida* Muir: 303, Head, dorsal view; 304, head, frontal view; 305, tegmen; 306, left first valvula of ovipositor, side view; 307, right lateral style, side view.
- 308-310. *Phenax variegata* (Olivier): 308, Head, frontal view; 309, head and pronotum, dorsal view; 310, tegmen.
- 311-315. *Cathedra serrata* (Fabricius): 311, Head and pronotum, dorsal view; 312, head in profile; 313, anal segment of female, ventrolateral view; 314, first and second valvulae of ovipositor, right side, side view; 315, lateral style of ovipositor, right side, with tip of first valvula projecting.
- 316-325. *Laternaria* spp.: 316, Anal segment of male, dorsal view; 317, left genital style, side view; 318, anal segment of male and left side of aedeagus, side view; 319, periandrium, dorsal view; 320, aedeagus, ventral view (penis in transparency); 321, penis, posteroventral view; 322, anal segment of female, side view; 323, first valvula of ovipositor, right side, side view; 324, right lateral style of ovipositor, side view; 325, second valvula of ovipositor, right side.

PLATE 13

- 326-329. *Scaralis semilimpida* (Walker): 326, Head and pronotum, dorsal view; 327, head, frontal view; 328, right lateral style of ovipositor, side view; 329, first and second valvulae of ovipositor, right side, side view (displaced).
- 330-335. *Ateson consimile*, new species: 330, Head and pronotum, dorsal view; 331, head, frontal view; 332, head in profile; 333, right lateral style of ovipositor, side view; 334, dorsal lobe of right first valvula of ovipositor, side view; 335, tegmen.
- 336-343. *Plectoderes collaris* (Fabricius): 336 Ventral lobe below first valvula of ovipositor, ventral view; 337, left lateral style of ovipositor, side view; 338, anal segment of female, dorsal view; 339, left second valvula of ovipositor, side view; 340, right first valvula of ovipositor, with ventral lobe, side view; 341, head, pronotum, and mesonotum, dorsal view; 342, head, frontal view; 343, head in profile.
- 344-351. *Koloptera callosa* Metcalf: 344, Head, pronotum, and mesonotum, dorsal view; 345, head, frontal view; 346, tegmen; 347, aedeagus: *a*, perianthrium, dorsal view; *b*, perianthrium, ventral view; *c*, medioventral process of pygofer; *d*, apex of one of penial arms, side view; 348, right genital style, viewed laterally on inner face; 349, left lateral style of ovipositor, side view; 350, left first valvula of ovipositor, side view; 351, posterior margin of pregenital sternite of female, ventral view.
- 352-361. *Catonia pallida*, new species: 352, Head, pronotum, and mesonotum, dorsal view; 353, head, frontal view; 354, ventral lobe lying below first valvula of ovipositor, ventral view; 355, left lateral style of ovipositor, side view; 356, right first valvula of ovipositor and ventral lobe, side view; 357, right second valvula of ovipositor, side view; 358, second valvulae of ovipositor, dorsal view; 359, anal segment of female, dorsal view; 360, wing; 361, tegmen.
- 362-368. *Catonia pallidistigma*, new species: 362, Head and pronotum, dorsal view; 363, head, frontal view; 364, tegmen; 365, wing; 366, ventral lobe lying below first valvula of ovipositor, ventral view; 367, right lateral style of ovipositor, side view; 368, right first valvula of ovipositor, side view.
- 369-374. *Opsiplanon ornatifrons*, new species: 369, Right first valvula of ovipositor, side view; 370, right lateral style of ovipositor, side view; 371, same, posterior view; 372, ventral lobe lying below first valvula of ovipositor, ventral view, 373, head, pronotum, and mesonotum, dorsal view; 374, head, frontal view.



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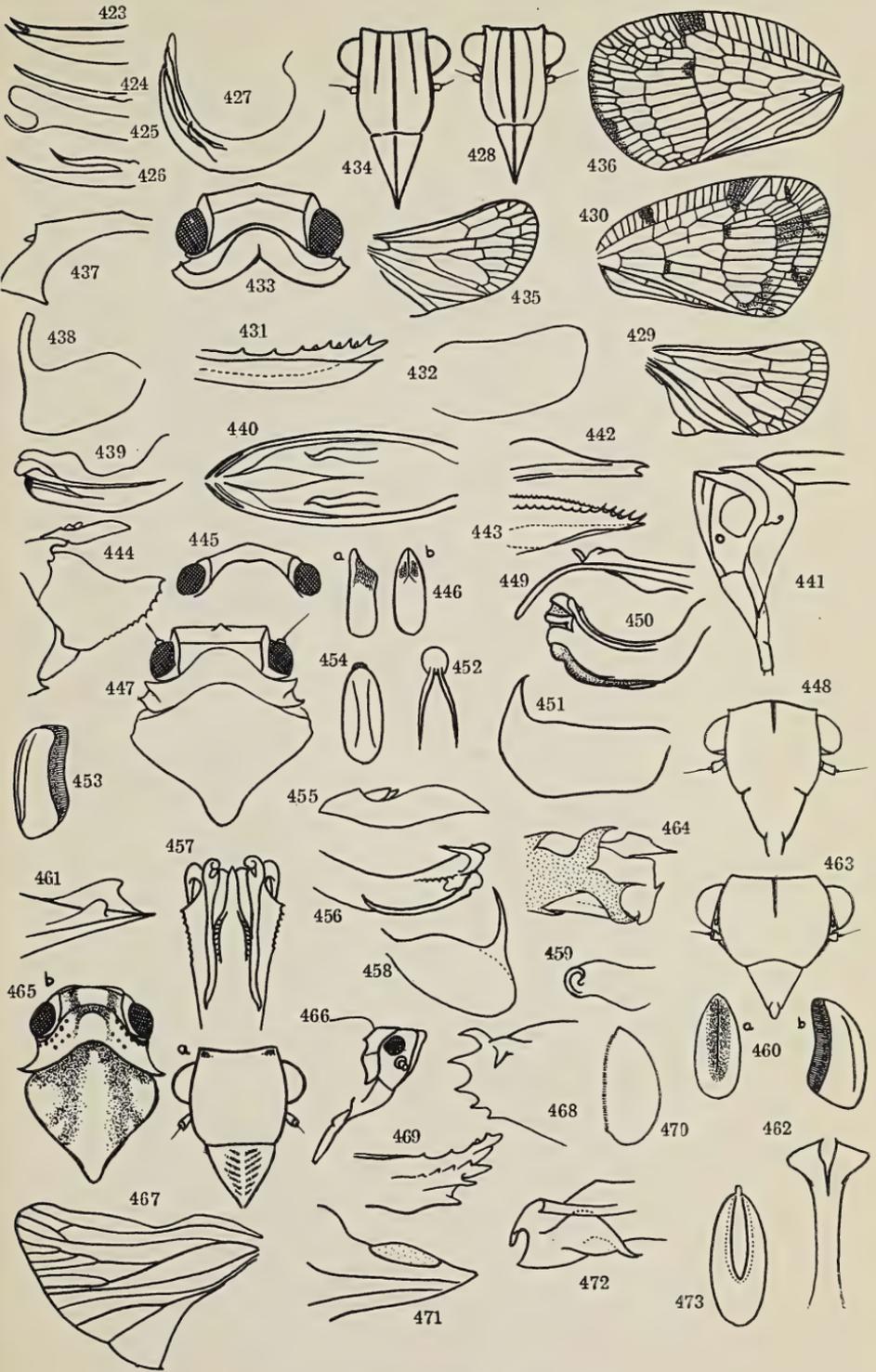
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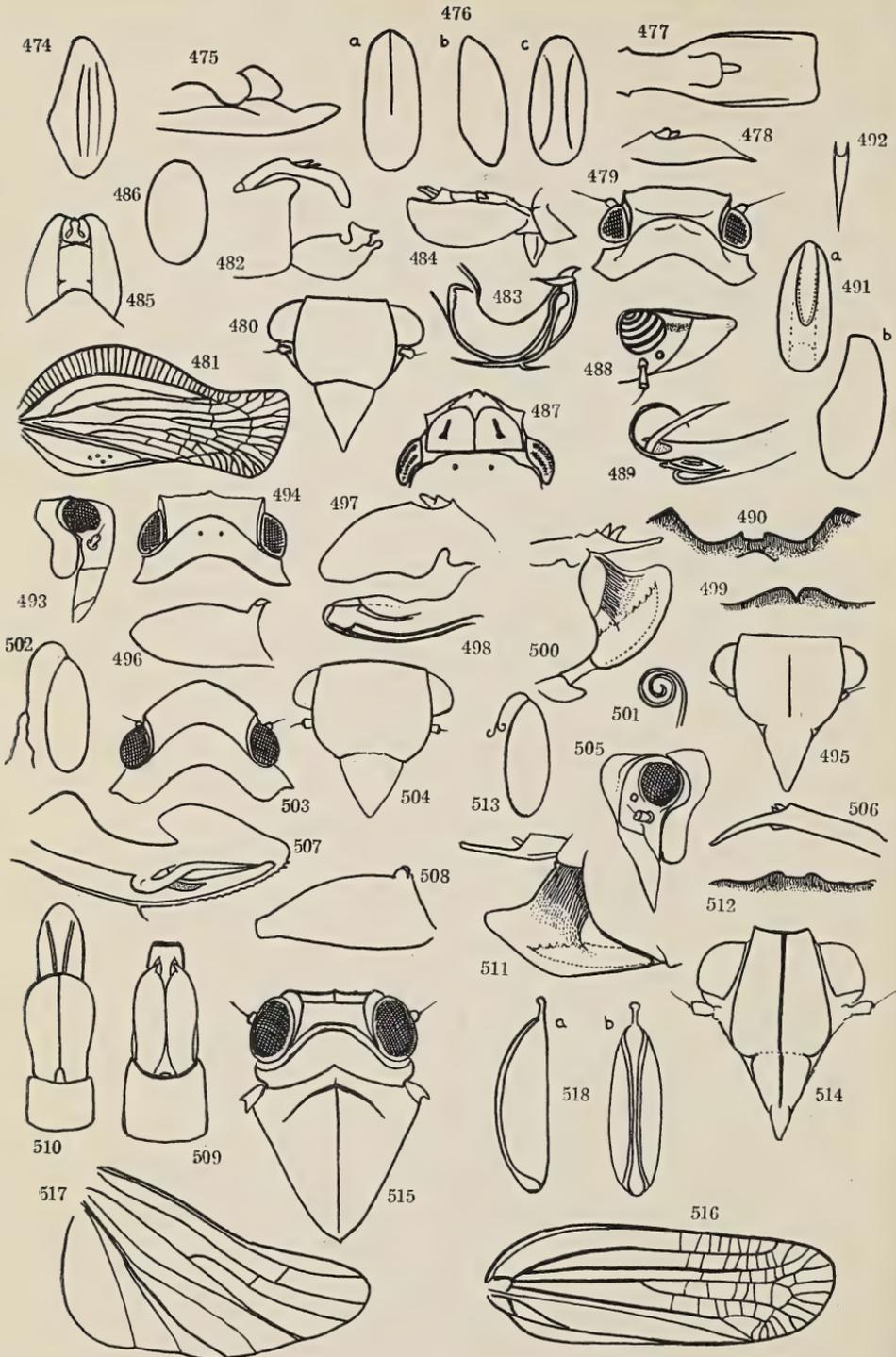
- 375, 376. *Opsiplanon ornatifrons*, new species: 375, Tegmen; 376, wing.
- 377-384. *Opsiplanon nemorosus*, new species: 377, Head, pronotum, and mesonotum, dorsal view; 378, head, frontal view; 379, dorsal lobe of right first valvula of ovipositor, side view; 380, right second valvula of ovipositor, side view; 381, left ventral lobe lying below first valvula of ovipositor, ventral view; 382, right lateral style of ovipositor, side view; 383, tegmen; 384, wing.
- 385-389. *Alcestis vitrea*, new species: 385, Aedeagus, left side; 386, left side of perianthrium, side view; 387, right lateral style of ovipositor, side view; 388, right first valvula of ovipositor, side view; 389, egg, frontal (*a*) and side (*b*) views.
- 390-396. *Roesma grandis*, new species: 390, Head, pronotum, and mesonotum, dorsal view; 391, head, frontal view; 392, head in profile; 393, anal segment of female and left lateral style of ovipositor, side view; 394, left second valvula of ovipositor, side view; 395, left first valvula of ovipositor, side view; 396, tegmen.
- 397-399. *Bladina fuscovenosa* Stål: 397, Left side of aedeagus, side view; 398, anal segment of male, side view; 399, left genital style, side view.
- 400-405. *Bladina fusca* Stål: 400, Left side of aedeagus, side view; 401, right side of perianthrium, side view; 402, right side of penis, side view; 403, left genital style, side view; 404, anal segment of male, side view; 405, pendent spine of aedeagus, posterior view.
- 406-413. *Bladina rudis* (Walker): 406, Left side of aedeagus, side view; 407, pendent spine of aedeagus, posterior view; 408, left genital style, side view; 409, anal segment of male, side view; 410, head, pronotum, and mesonotum, dorsal view; 411, head, frontal view; 412, tegmen (distal cross veins omitted); 413, wing (anteroapical portion only).
- 414-418. *Nogodina reticulata* (Fabricius): 414, Head, dorsal view; 415, right lateral style, side view; 416, left second valvula of ovipositor, side view; 417, left first valvula of ovipositor, side view; 418, egg, side view.
- 419-422. *Biolleyana costalis* (Fowler): 419, Head and pronotum, dorsal view; 420, egg, side view; 421, anal segment of male, side view; 422, right genital style, side view.

PLATE 15

- 423-432. *Biolleyana costalis* (Fowler): 423, Dorsal process of aedeagus, right side, dorsolateral view; 424, lateral outer process of aedeagus, side view; 425, lateral inner process of aedeagus, side view; 426, lateroventral process of aedeagus, side view; 427, aedeagus, right side, side view; 428, head, frontal view; 429, wing; 430, tegmen; 431, first valvula of ovipositor, right side, viewed on inner face; 432, left lateral style of ovipositor, side view.
- 433-440. *Varciopsis tenguelana*, new species: 433, Head and pronotum, dorsal view; 434, head, frontal view; 435, wing; 436, tegmen; 437, anal segment of male, side view; 438, genital style of right side, side view; 439, aedeagus, right side, side view; 440, aedeagus, ventral view.
- 441-446. *Carthaeomorpha breviceps* Melichar: 441, Head in profile; 442, left second valvula of ovipositor, side view; 443, left first valvula of ovipositor, side view; 444, anal segment of female, left lateral style, side view; 445, head, dorsal view; 446, egg, side (a) and frontal (b) views.
- 447-454. *Epormenis aripensis*, new species: 447, Head, pronotum, and mesonotum, dorsal view; 448, head, frontal view; 449, anal segment of male, side view; 450, right side of aedeagus, side view; 451, right genital style, side view; 452, ventral processes of aedeagus, ventral view; 453, egg, side view; 454, egg, frontal view.
- 455-463. *Flatormenis squamulosa* (Fowler): 455, Anal segment of male, side view; 456, left side of aedeagus, side view; 457, aedeagus, ventral view; 458, left genital style, side view; 459, apex of right apical limb of penis, side view; 460, egg, frontal (a) and side (b) views; 461, left second valvula of ovipositor, side view; 462, penis, ventral view; 463, head, frontal view.
464. *Epormenis unimaculata* (Fennah): Aedeagus, ventral view.
- 465-469. *Anadascalina meridionalis*, new species: 465, Head, frontal (a) and dorsal (b) views; 466, head and pronotum in profile; 467, wing; 468, left lateral style of ovipositor, viewed laterally on inner face; 469, left first valvula of ovipositor, side view.
- 470-472. *Locrona nigrospersa* (Fennah): 470, Egg, side view; 471, left second valvula of ovipositor, side view; 472, apex of left limb of penis, side view (shown inverted).
473. *Poekilloptera phalaenoides* (Linnaeus): Egg, frontal view.



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474. *Poekilloptera phalaenoides* (Linnaeus): Egg, side view.

475. *Ormenis antoniae* Melichar: Left second valvula of ovipositor, side view.

476-478. *Epormenis fuliginosa* (Fennah): 476, Egg, frontal (*a*), side (*b*), and posterior (*c*) views; 477, anal segment of male, dorsal view; 478, same, side view.

479-486. *Euhyloptera corticalis*, new species: 479, Head and pronotum, dorsal view; 480, head, frontal view; 481, tegmen; 482, anal segment of male, left genital style, and hind margin of pygofer, side view; 483, left side of aedeagus, side view; 484, anal segment of female and right lateral style of ovipositor, side view; 485, anal segment of female, dorsal view; 486, egg, side view.

487-492. *Flatoidinus cordiae*, new species: 487, Head, dorsal view; 488, head, anterior portion in profile; 489, right side of aedeagus, side view; 490, posterior margin of pregenital sternite of female; 491, egg, frontal (*a*) and side (*b*) views; 492, ventral median part of periandrium, ventral view.

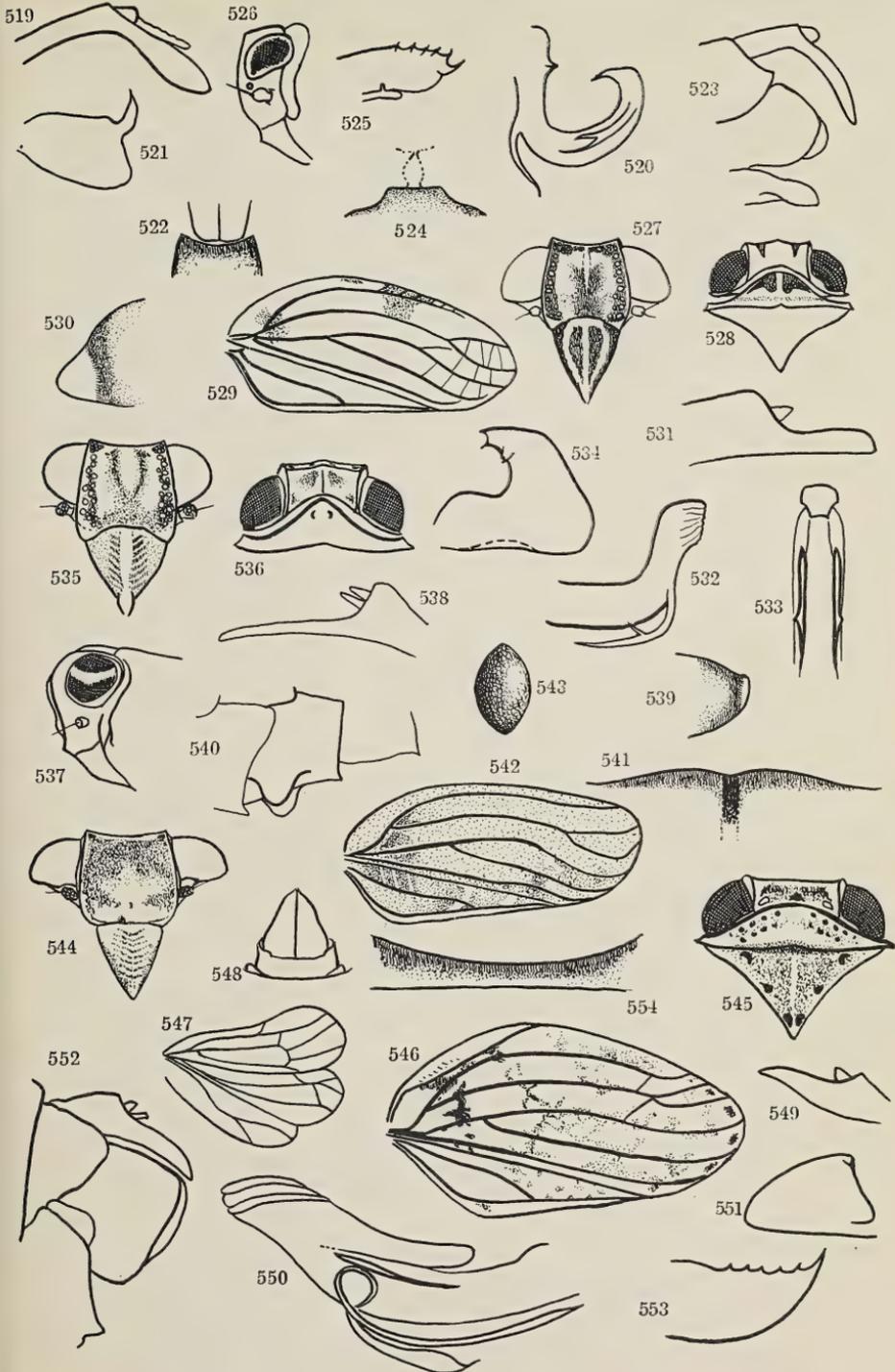
493-502, 510. *Acanalonia umbellicauda*, new species: 493, Head and pronotum in profile; 494, same, dorsal view; 495, head, frontal view; 496, right genital style, side view; 497, anal segment of male, side view; 498, right side of aedeagus, side view; 499, median portion of posterior margin of pregenital segment of female, ventral view; 500, anal segment of female and left lateral style of ovipositor, side view; 501, chorionic polar process of egg, slightly uncoiled, side view; 502, egg with chorionic process artificially uncoiled, side view; 510, pygofer, genital styles, and apex of anal segment, ventral view.

503-509, 511-513. *Acanalonia theobromae*, new species: 503, Head and pronotum, dorsal view; 504, head, frontal view; 505, head in profile; 506, anal segment of male, side view; 507, left side of aedeagus, side view; 508, right genital style, side view; 509, pygofer, genital styles, and apical part of anal segment, ventral view; 511, anal segment of female and right lateral style, side view; 512, posterior margin of pregenital segment of female, ventral view; 513, egg, side view.

514-518. *Ugoa glauca*, new species: 514, Head, frontal view; 515, head, pronotum, and mesonotum, dorsal view; 516, tegmen; 517, wing; 518, egg, side (*a*) and frontal (*b*) views.

PLATE 17

- 519-526. *Ugoa glauca*, new species: 519, Anal segment of male, side view; 520, aedeagus, left side; 521, left genital style, side view; 522, posterior margin of pygofer, ventral view; 523, anal segment of female and left lateral style, side view; 524, posterior margin of pregenital sternite, ventral view; 525, left first valvula of ovipositor, side view; 526, head in profile.
- 527-534. *Thionia dryas*, new species: 527, Head, frontal view; 528, head, pronotum, and mesonotum, dorsal view; 529, tegmen; 530, apex of right lateral style of ovipositor, showing extent of membranous area; 531, anal segment of male, side view; 532, left side of aedeagus, side view; 533, aedeagus, ventral view; 534, left genital style, viewed slightly dorsolaterally.
- 535-543. *Thionia mammifera*, new species: 535, Head, frontal view; 536, head and pronotum, dorsal view; 537, head in profile; 538, anal segment of female, side view; 539, left lateral style of ovipositor, side view; 540, ventral portion of sixth abdominal segment, viewed slightly ventrolaterally; 541, posterior margin of pregenital sternite of female, ventral view; 542, tegmen; 543, egg, side view.
- 544-554. *Thionia bufo*, new species: 544, Head, frontal view; 545, head, pronotum, and mesonotum, dorsal view; 546, tegmen; 547, wing; 548, pygofer and genital styles, ventral view; 549, anal segment of male, side view; 550, right side of aedeagus, side view; 551, right genital style, side view; 552, anal segment of female and left lateral style of ovipositor, side view; 553, left first valvula of ovipositor, side view; 554, posterior margin of pregenital sternite of female, ventral view.



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SUMMARY OF THE COLLECTIONS OF AMPHIBIANS MADE
IN MÉXICO UNDER THE WALTER RATHBONE BACON
TRAVELING SCHOLARSHIP

By EDWARD H. TAYLOR and HOBART M. SMITH

INTRODUCTION

By tenure of the Walter Rathbone Bacon Traveling Scholarship from 1938 to 1940, the junior author was enabled to continue field studies that had been under way several years on the herpetofauna of México. Aided by his wife, he accumulated a collection of reptiles and amphibians the study of which still continues. A brief summary of the snakes and crocodiles has appeared previously (Smith, 1943). With the aid of the senior author a summary of the amphibians has been completed and forms the basis of the present paper. The lizards are being studied as time permits, and a summary of them is contemplated. No survey of the turtles is envisioned. The itinerary and list of localities visited by the collectors will accompany a later report.

The amphibians comprise 10,370 specimens, or about half the total number of herpetological specimens obtained. They represent 27 genera and 146 forms. Thirty-three of the species were undescribed at the time of collecting; the specimens of them secured have formed the basis at least in part for their subsequent descriptions. Eleven of the 33 are represented only by paratypes, while 22 are represented by holotypes. Of the latter, eight are described in the present paper, while all others were described by Taylor (1940c, 1941b, d, e, 1942a-d, 1943a, b) or Smith (1939). Another 33 species, represented by neither holotypes nor paratypes, are exemplified by topo-

types. Eighty-four species are new to the Mexican collections of the United States National Museum, where all specimens collected during tenure of the Scholarship have been deposited.

Most of the specimens have been incorporated in the permanent collections of the United States National Museum, whose numbers are cited herein with the abbreviation U.S.N.M. A few duplicates have been transferred to the E. H. Taylor-H. M. Smith collection; the numbers for these are cited with the symbol E.H.T.-H.M.S. The other duplicates are not regularly listed for all species, but where reference to particular specimens has been necessary the field numbers for them are cited following the initials H.M.S.

Salamanders and anurans are nearly equally represented in number of specimens, the former including 5,096, the anurans 5,258 specimens. Of caecilians only six specimens are cataloged.

Although reptile species far exceed amphibian species in México numerically, the abundance of individuals and ease of collection of the latter—at least at particular times in certain places—account in part for the proportional preponderance of number of specimens of amphibians over reptiles in the collection. Furthermore, about three-fourths of the amphibian species known from México are represented, while of the snakes only about half the species were collected. Undoubtedly the abundance and ease of collection of amphibians have contributed greatly to the relatively large percentage of representation of the Mexican fauna in this collection, yet there definitely is a technique peculiar even to the collection of these creatures. Equally as important as other factors in our favor was the aid afforded by Dr. E. H. Taylor, who during a month's time escorted the junior author and wife on a flying and unbelievably productive visit to many localities previously discovered by him as ideal for the collection of various restricted species. Without this assistance, and without much other information gleaned from the same source—both in previous collecting trips and in written or oral instruction—surely much less would have been taken.

Chief among others contributing to our efforts are Mr. and Mrs. Dyfrig McH. Forbes, of Potrero Viejo, Veracruz, whose hospitality, charm, and zeal for collecting have left an indelible stamp upon the fruits of our years in México and upon our memories as well.

To Dr. Doris M. Cochran we owe a debt of gratitude for patient and prompt attendance to our numerous requests for a checking of data and specimen numbers, and for ready cooperation in many other respects as well. Finally, Dr. Alexander Wetmore has the deepest appreciation of us who have benefited directly or indirectly from his kindly and sympathetic supervision and encouragement during tenure of the Scholarship, both in the field and at the U. S. National Museum.

A preliminary examination of the amphibians was completed by Smith while at the U. S. National Museum in 1941 and 1942. More attractive studies and other duties assumed subsequently interfered with the undertaking of a careful study, however, for a considerable period. Then, since further delay would unduly hinder the completion of our projected summary of the amphibians of México, at the junior author's request Taylor undertook the final study of the amphibians. Most of the descriptive work of the completed summary is his, although of course each author has studied the specimens and agreed upon the proper treatment for them.

Our purpose in presenting this paper is to summarize briefly the Bacon collection alone. The treatment is complete except for *Ambystoma* sp. and a new genus of hylid frogs, description of which will appear elsewhere. Since a summary of wider scope is being compiled at present, we have included here but few extraneous notes; those included chiefly concern U. S. National Museum specimens.

The synonymies are so constructed as to give references at least to (1) the original description and (2) the first appearance of the combination we adopt. For many species the synonymy requires but one reference to satisfy these two demands. In certain cases we have included other references we believe quite important, particularly if they concern synonymic names. Citations of other references, where necessary, are given parenthetically in the species discussions. All papers referred to are listed in the "Literature Cited."

The photographs were taken by the University of Kansas photographer, Miss Burch Brown, and the drawings are the work of Robert Nabours, of the same institution.—H. M. SMITH.

Order APODA Gray, 1825

Family CAECILIIDAE Gray, 1825

Genus GYMNOPIS Peters, 1874

GYMNOPSIS MULTIPLICATA OAXACAE Mertens

Gymnopsis multiplicata oaxacae MERTENS, Abh. Ber. Mus. Magdeburg, vol. 6, 1930, pp. 153-155, fig. 14 (Cafetal Concordia, 600 m., between Puerto Ángel and Salina Cruz, Oaxaca).

Six specimens are in the collection: One from Xaltianguis, Guerrero (U.S.N.M. No. 115057), collected by E. H. Taylor, September 2, 1939; and the other five from La Esperanza, Chiapas, April 5, 1940 (U.S.N.M. Nos. 115058-115062).

The specimen from Guerrero was found under leaves in a shallow, open arroyo in a field. An adult female was found in a rotten log on April 5, 1940, at La Esperanza, Chiapas. It was drowned in alcohol, and when the abdomen was cut open, four live, wriggling, young

caecilians separated themselves from their enveloping membranes and crawled about in a dry pan. They probably would have been born the same or the next day.

The eye spot is visible in all specimens. Measurements are as follows:

U.S.N.M. No.	Primaries	Rings without secondaries	Complete secondaries	Total length (mm.)	Diameter (mm.)	1/d
115058.....	121	23	15	280	7	40
115059.....	120	16	48	99	4	24.75
115060.....	119	15	41	98	4	24.5
115061.....	122	24	21	98	4	24.5
115062.....	119	17	20	96	4	24
115057.....	135	13	10	151	4.5	33.6

The primary rings are less numerous in Chiapas specimens than in most from Oaxaca and Guerrero. Recorded counts from seven Chiapas caecilians show a range of variation from 119 to 122; in 12 Guerrero and Oaxaca individuals the range of variation is from 124 to 135, with the exception of one specimen, which has 121.

It is extraordinary that the number of complete secondaries should be so greatly increased over the normal complement of adults and subadults in the newly born young. The maximum known in adults is 16, while all the four young have over 19, and two have over 40. It appears that the number of complete secondaries decreases shortly after birth, and not impossibly over a longer period. If such is the case it might be expected that the number of incomplete secondaries should be increased in the young, over the normal number in adults, and thus result in the presence of fewer spaces between primary rings lacking secondary rings, but this does not occur.

The foregoing table suggests that an increase in the 1/d ratio may be correlated with the increase in age (length). That this is not so is indicated by Dunn's table (1942, p. 469), in which large specimens with 1/d ratios both small (26, at 390 mm. length) and large (39, at 275 mm. length) occur in the Oaxaca-Guerrero area. Another possibility suggested, however, is that females have slenderer bodies than males; specimens with ratios from 24 to 29 may be males, those with 33 to 40 females (intermediate ratios are not recorded). The slenderest specimen recorded is one that had just given birth to its young; very probably it represents an exaggerated condition, yet it appeared but very little more robust just before giving birth to its young. A nearly equally slender condition (38, 39) is reached in other specimens collected in August, long after the season when the young are born.

Order CAUDATA Opperl, 1811

Family AMBYSTOMIDAE Hallowell, 1858

Genus SIREDON Wagler, 1830

SIREDON MEXICANUS (Shaw)

Gyrinus mexicanus SHAW, Naturalist's Miscellany, vol. 9, 1798, pls. 343, 344 (México, restricted to Lake Xochimilco).

Siredon mexicanum BAIRD, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 1, 1849, p. 292.

A series of 47 specimens was obtained. Cataloged are U.S.N.M. Nos. 116585-116594 from Lake Xochimilco, D. F., January 25 and September 7, 1939. Another specimen (H.M.S. No. 11336) was purchased September 29, 1939, from a resident of San Andrés Mixcoac, México (near Chalco), in the vicinity of which the specimen was said to have been collected, in a small lake.

A specimen of *Rhyacosiredon altamirani* was given to one of us (Smith) by Dr. Manuel Maldonado K. It purports to have been taken at Lake Xochimilco. If this species occurs there, it may form the basis of oral reports that *Siredon mexicanus* occasionally transforms in nature.

SIREDON LERMAENSIS Taylor

Siredon lermaensis TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 427-430, pl. 48 (Lake Lerma, east of Toluca, México).

A series of 107 specimens was acquired at the village of Lerma on the edge of Lake Lerma, March 4 and September 30, 1939. These consist of young, neotenic larvae and transformed adults. The adults are present only in the March series. Fifteen specimens (U.S.N.M. Nos. 116570-116584, all topotypes) are cataloged.

The two youngest larvae examined measure 51 mm. from snout to vent; the tail of one measures 41 mm., while that of the other is partly missing. At this age the maxillary-premaxillary teeth are 35-35, well developed, and very unequal in size. The pterygoid teeth, somewhat separated from the vomerine series, reach to the posterior level of the choanae and consist of four short diagonal rows of four teeth, each with one or two rows of two (or one) teeth. The vomerine groups are widened, and each consists of 11 rows of three to six teeth (or if counted in another direction six rows of a varying length with 3 to 11 teeth). The groups are separated by a diastema, medially. The splenial series have about 40 teeth, arranged in short transverse rows of two or three teeth each. The mandibular teeth are similar to the maxillary-premaxillary series in number. They are arranged rather irregularly in the jaw.

In color these young are brownish gray (under the lens the pigment shows as a reticulation, with circular skin glands evident as

cream spots). The chin and venter are much lighter, but some pigmentation is evident under a lens.

A specimen of 62 mm. is dark grayish black above, the belly and limbs a little lighter, but in turn much darker than the chin. The teeth are much the same as in the preceding larva, except that there are more rows of splenial teeth and each of these may have four or five teeth. The palatal pit, indicated in the youngest as a deep, very narrow pit, is larger, but still deep and slitlike. The fold at the corner of the mouth is more ample.

In the largest larvae, 118-125 mm. from snout to vent, the vomerine and pterygoid (palatine) series are arranged in a single more or less continuous row on each side, tending to form a curved arch, broken medially. The splenial series, now with 40 to 45 teeth, are in a single somewhat irregular row.

The smallest transformed specimen measures 78 mm. from snout to vent; the tail, 68 mm. The splenial teeth have disappeared; the vomeropalatine series form an angular arch; however, the two series are narrowly separated medially. The palatal pit is circular, deep, and much larger than the choanae. The tongue has developed.

Another specimen, transforming but with a trace of the gills, measures 108 mm. from snout to vent; tail, 76 mm. It is possible that the last mentioned transformed from a neotenic female, while the first mentioned adult transformed from an immature larva.

Genus RHYACOSIREDON Dunn, 1928

RHYACOSIREDON ALTAMIRANI (Dugès)

Amblystoma altamirani DUGÈS, Description d'un axolotl des montagnes de Las Cruces (*Amblystoma altamirani* A. Dugès), Imprimerie du Ministère de "Fomento," 1895, pp. 1-6, 1 pl. ("Manantial de los Axolotes en la Serranía de las Cruces perteneciente al Valle de México").

Rhyacosiredon altamirani DUNN, Proc. New England Zool. Club, vol. 10, 1928, pp. 85-86.

A series of 17 specimens comes from the Ajusco range southwest of México (City), chiefly in the vicinity of the Lakes of Zempoala (Cempoala) in Morelos and México. The following are cataloged: Zempoala Lakes, July 25, 1939, and August 28, 1940 (U.S.N.M. Nos. 116599-116612); Desierto de los Leones, D. F., June 9, 1940 (U.S.N.M. Nos. 116597-116598); and Cañada de Contreras, D. F., January 16, 1938 (U.S.N.M. No. 116613). Those from the last two localities were presented to Smith by Dr. Rafael Martín del Campo, of the Instituto de Biología in México (City). One other specimen (H.M.S. No. 12836) is labeled Lake Xochimilco, D. F., 1939 (see discussion of *Siredon mexicanus*).

RHYACOSIREDON LEORAE Taylor

Rhyacosiredon leorae TAYLOR, Univ. Kansas Sci. Bull., vol. 29, pt. 2, 1943b, pp. 345-347, pl. 26, fig. 3 (type locality, mountain stream near Río Frío, México, in the state of Puebla almost on the border between the two states).

Four paratype specimens are in the collection (U.S.N.M. Nos. 116629-116632). These were obtained by Dyfrig McHattie Forbes at the type locality on October 7, 1939.

The adults are extremely shy, hiding under the cut-in edges of the stream at the least disturbance. We visited this stream several times, but its turbulent condition prevented our securing further specimens.

RHYACOSIREDON RIVULARIS Taylor

Rhyacosiredon rivularis TAYLOR, Herpetologica, vol. 1, No. 7, Jan. 29, 1940a, pp. 171-176, pl. 17, fig. 1 (13 km. west of Villa Victoria, México).

Two specimens were obtained at the exact type locality (U.S.N.M. Nos. 116595, 116596) about 13 km. west of Villa Victoria in the recently established Bosencheve National Forest (Kilometer 129), on September 11, 1939. They agree with the type in all essential details.

RHYACOSIREDON ZEMPOALAENSIS, new species

Type.—U.S.N.M. No. 116617, adult larva, collected at the Lakes of Zempoala, Morelos, México, in a nearly dry lake bed, elevation about 10,000 feet, February 24, 1939, by Hobart M. Smith.

Paratypes.—U.S.N.M. Nos. 116614-116616, 116618-116628, February 21-24, 1939, H. M. Smith, collector; E.H.T.-H.M.S. Nos. 22172-22190, August 25, 1939, 24630-24634, June 18, 1940, E. H. Taylor and Richard C. Taylor, collectors.

Diagnosis.—Somewhat similar to *Rhyacosiredon altamirani* but with slenderer limbs and digits and a somewhat more elongate body; the hindleg brought forward, the toes fail to reach the elbow by about one to three costal folds; the head is slenderer and the tail is much shorter than head and body. The adult is purplish slate to gray-slate above, with chin dark and light; abdomen purplish; the lips, tips of fingers, and narrow subcaudal fin are whitish.

Description of type.—Head elongate, rather slender, moderately elevated, the length 19 mm., the greatest width 15 mm.; from tip of snout to nuchal fold, 15 mm.; gills very short, the basal portion about 2.5 mm. long; width between nostrils about equal to the interorbital distance; eye small, its length about two-thirds the distance to nostril; mouth very narrow, the labial fold visible, the upper lip somewhat notched behind the fold; neck fold free for 8 mm. on median longitudinal line, notched medially.

Maxillary-premaxillary series of teeth 20-20, counting absent teeth; the series reaches back to near the anterior level of choanae;

pterygoid series 6-6, separated slightly from the vomerine series, which consists of 14-15 teeth separated medially by a rather wide diastema; a narrow, deep palatine pit. Choanae elongate, the inner edge with a slight outward projection; mandibular teeth about 22-20; the splenial teeth are almost gone, there being but two on one side and four on the other.

Limbs slender, the digits but little flattened; order of lengths of the fingers is 1, 4, 2=3, although the difference in one and four is not great; leg scarcely heavier than arm; in toes the order of length is 1, 5, 2, 4, 3 (on the left foot; right foot abnormal in having the second and third toes very short). Adpressed limbs have toes separated from elbow by $1\frac{1}{4}$ folds (male) (to $2\frac{1}{2}$ in females); an inner tubercle at base of palm and sole, outer tubercle absent (present in part of the paratypes).

Tail greatly compressed, slender, the ventral fin reduced to a trace. The dorsal fin low, beginning behind level of insertion of hindlimbs and nowhere reaching an elevation of more than one-fourth of the depth of the tail. Total depth at base of tail (18 mm.) a little more than greatest depth of body (14.6 mm.).

The cloaca (male) is considerably inflated and possesses numerous papillae, which are widened at their bases and somewhat flattened.

Color.—Dorsal and lateral surfaces generally uniform purplish black, the color not intense; limbs similarly colored, but of a slightly lighter shade; chin and lower surfaces of limbs partly clouded with light lavender; abdomen purplish lavender (brownish in preserved specimens). The edges of the lips, tips of the digits, and a narrow ventral fin on tail dirty whitish or cream.

Measurements in mm.—Snout to posterior end of vent 64; tail 49; width of head 15; length of head 19; axilla to groin 28; arm 20; leg 22.

Variation.—The youngest larva measures 40 mm. from snout to vent; tail, 37 mm. The specimen is dark, with numerous light spots, which are more or less connected laterally. The ventral parts are cream. The maxillary-premaxillary teeth are 19-18; the pterygoid 7-9; vomerine about 13-13, these in an irregular row but the pterygoid teeth probably in two rows; splenial teeth about 14-14. The dorsal fin can scarcely be traced as a low flattened ridge to head, but there is appreciable elevation to about middle of back. The neuromast system appears on the head as a series of openings from nostril to above the orbit, another series below the orbit, and one on the lower jaw; the openings are stoma-like. The three lateral trunk systems are probably undeveloped although a few pores can be discerned; in specimens somewhat larger, only occasionally can a pore be discerned, even with proper magnification. Digits of the younger larvae are much more flattened than in the type. Under water a few of the specimens show traces of cloudiness in the coloration; the largest

female has a distinctly mottled tail. Several specimens show abnormalities in the digits.

Remarks.—We cannot be certain, but we presume that at least a part of the neotenic population transforms since the three other known forms do. However, in the collections of the other forms secured at the same time of the year, transformed specimens are perhaps more frequently found than the larvae, yet none are present in our series of *zempoalaensis*. In the entire material before us, 37 specimens, there are several sexually mature specimens as attested by the greatly inflated cloacal region in the males, and the presence of large pigmented ovarian eggs in the females. It is, of course, possible that the adults are more terrestrial, although the three other species ordinarily remain in the water after transforming. However, two recently transformed specimens of *Rhyacosiredon altamirani* were found on land under small logs lying partly in water and partly out of the water. The salamanders were only a distance of inches from the water.

The type locality is a spring at the bottom of an old lake, and except for a very small bog area the bottom is a meadow. The spring forms a sluggish stream about 40 feet long, which disappears under some rocks. It seems likely that this species could easily have access to other waters by means of underground connections, regardless of whether they transform and migrate overland.

We do not overlook the possibility that this larval form may not belong to the genus to which we have assigned it, since the "generic" character is to be ascertained only after the loss of the gills.

Although *Rhyacosiredon altamirani* occurs in streams not over a quarter of a mile away, we found none in the lake bed occupied by *zempoalaensis*. The habitats of the two are strikingly different.

Genus AMBYSTOMA Tschudi, 1838

AMBYSTOMA ORDINARIA Taylor

Ambystoma ordinaria TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 422-424 (4 miles west of El Mirador, near Puerto Hondo, Michoacán).

A series of 41 topotypic larvae comes from the exact type locality, collected September 12, 1939. U.S.N.M. Nos. 116721-116735 have been cataloged. These agree with the type series completely.

This species is at least partially neotenic. Certain of the larval males have the cloacal region inflated equally as much as transformed males, while some larval females contained large pigmented ovarian eggs.

Live specimens placed in alcohol exude a very large quantity of mucus, which forms a thick, fibrous, cheeselike substance. It was especially noticeable on the under surface of the hands and the feet and on the tip of the snout.

AMBYSTOMA SUBSALSUM Taylor

Ambystoma subsalsum TAYLOR, Copeia, 1943a, No. 3, pp. 152-155 (Lake Alchichica, Puebla).

Three paratypic larval specimens are in the collection, from Lake Alchichica, Puebla (U.S.N.M. Nos. 116702-116704). These were collected by Dyfrig McH. Forbes and the authors on March 21, August 14 and 15, 1940.

In life the larvae are golden-yellow and black-spotted. The yellow color fades quickly when they are taken from the water. The adult has a greatly shortened tail, and is black and yellow spotted.

AMBYSTOMA AMBLYCEPHALA Taylor

Ambystoma amblycephala TAYLOR, Univ. Kansas Sci. Bull. vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 420-421, pl. 45, fig. 2 (15 km. west of Morelia [Taciéuaro], Michoacán).

A series of 137 larvae and transforming young were collected at Taciéuaro, Michoacán, the type locality, October 1, 1939; U.S.N.M. Nos. 116705-116720 have been cataloged.

The larvae resemble somewhat those of *Ambystoma velasci*, and like them are not usually neotenic. They are, however, colored differently. The length of the larvae above 60 mm. averages 66.3. Only eight reach 70 mm., the five largest being 72, 72, 75, 75, 77 mm. The length of the transforming young varies, and it is possible that a few larvae may become neotenic. The smallest transforming specimen measured 52 mm., the tail 41 mm.; average size of transforming young about 65 mm., the tail 51.6 mm. The smallest transformed specimen measured 58 mm., tail 44 mm.; the largest 92 mm., tail 71 mm., which approximates the measurements of the type (90 mm. and 71 mm., for the same measurements). All these possess remnants of the gills.

The dentition of the young larvae (50 mm., tail 41 mm.) follows: Vomerine teeth about 52-52, arranged in 8 rows, 3 to 15 teeth in each; pterygoid teeth 25-25, arranged rather irregularly, separated from the vomerine teeth; maxillary-premaxillary teeth about 36-36, rather irregular, perhaps two rows in front part of mouth; splenial teeth about 54-54, arranged in three or four long irregular rows; mandibular teeth 36-36. At this size the body is yellowish fawn, the dorsal and ventral caudal fins blackish.

In a larva of 70 mm. the dentition is: (about) maxillary-premaxillary, 45-45; vomerine, 56-58; pterygoid, 43-43; splenial, 72-72; mandibular, 46-46.

In the transforming specimens the pterygoid (palatine) series is greatly reduced, as is also the vomerine series. In some only a few teeth remain. Many of the maxillary teeth are apparently lost and the entire splenial series is lost. It is presumed that the adult dentition is partially, if not wholly, acquired during or after trans-

formation. The maxillary teeth are increased by additions to the posterior end of the series.

The transforming specimens have a dark gray to blackish venter, with irregular, ventrolateral cream lines, which may be broken up into cream spots. The body may be gray, grayish black, or blackish, with few or many cream spots on the sides and tail.

A reexamination of one rather desiccated paratype (E.H.T.-H.M.S. No. 16442) discloses the presence on one side of five phalanges in the fourth toe, and four in the third finger, instead of the normal number of four and three, respectively; the phalangeal formulae of the hands are 2-2-4-2, 2-2-3-2, and of the toes 2-2-3-5-3, 2-2-3-4-3. We regard this as an anomaly; however, larger series of fully adult specimens may show that we have confused two species.

AMBYSTOMA VELASCI Dugès

PLATE 18, FIGURES 3, 4

Siredon tigrina VELASCO, La Naturaleza, vol. 4, 1879, p. 216 (Laguna Santa Isabel, Guadalupe Hidalgo, Distrito Federal).

Ambystoma velasci DUGÈS, La Naturaleza, ser. 2, vol. 1, 1888, p. 142 (type locality that of *Siredon tigrina* Velasco).

Ambystoma tigrinum velascoi WOLTERSTORFF, Abh. Ber. Mus. Magdeburg, vol. 6, No. 2, 1930, p. 132, fig. 3, pl. 2, figs. 2-3, pl. 3, fig. 3 (part).

It is with considerable hesitancy that we are referring to *Ambystoma velasci* two series of specimens, the first constituting a series of 121 larvae, with a few transforming young, from La Virgin, Puebla (about Kilometer 224, 28 km. north of Tehuacán), and the second consisting of 189 specimens of larvae and transforming young from the region about Lake Texcoco in the Valle de México. Of the entire series, the following specimens have been cataloged: PUEBLA: U.S.N.M. Nos. 116692-116701, La Virgin, August 21, 1939 (all larvae), and March 24, 1940 (numerous transforming). MÉXICO: U.S.N.M. Nos. 116654-116667, Santa Magdalena, near Lake Texcoco, in roadside pools, August 23, 1939; U.S.N.M. Nos. 116608-116690, San Diego, March 2 and August 23, 1939. DISTRITO FEDERAL: U.S.N.M. No. 116691, Atzacualco, October 6, 1939.

We do not follow Wolterstorff (*loc. cit.*) in regarding this species as having a subspecific relationship with *Ambystoma tigrinum*. We believe that in the assemblage of specimens referred by Dunn (1940, p. 157) to this form other species are probably involved.

From the pond at San Diego two giant specimens presumably of this species were taken (E.H.T.-H.M.S. Nos. 22210-22211). These apparently are sexually mature. The size of the largest is 144 mm. from snout to vent; tail, 108 mm. No other neotenic specimens were encountered. No adequate series of fully transformed specimens are available for studies in variation. The Puebla larvae are lighter, with less marking than those from the Valley of México.

We were unable to obtain material from the type locality at Santa Isabel. However, the figures of the species given by Velasco (*loc. cit.*) show a larger, highly colored animal and larger transformed specimens that appear different from the transformed young in this collection. It may be that we err in thus associating these forms. The matter cannot be settled at this time.

We are of the opinion that the cause for specific differentiation of the species of ambystomid salamanders from the ancestral stock is largely the varied salt and acid content in the different *permanent* bodies of water occurring in the Valley of México.

AMBYSTOMA LACUSTRIS, new species

PLATE 18, FIGURES 1, 2

Type.—U.S.N.M. No. 117410, collected at Lake Zumpango, México, by Dr. and Mrs. Hobart M. Smith, March 3, 1939; recently transformed young.

Paratypes.—U.S.N.M. Nos. 116736–116755, collected at Lake Zumpango, by Dr. and Mrs. Hobart Smith; E.H.T.–H.M.S. Nos. 22894–22910, Hobart M. Smith and E. H. Taylor, same locality.

Diagnosis.—A neotenic salamander of large size capable of transformation. Limbs relatively short in proportion to body length, the fingers of adults overlapping about length of second finger when limbs are adpressed; caudal fin small and part may be retained in old adults. Tail elongate, rather slender, a little less than snout to vent length; vomerine teeth arched, with a median diastema; choanae very large; elongate; body not elevated in the middle; tail widest at base.

Description of type.—A large, recently transformed young (107 mm. from snout to vent; total length 198 mm.); gill slits closed, but three small beadlike remnants of the gills still visible on each side. Head thick posteriorly, the depth 20 mm. at angle of jaw; greatest width of the head (25 mm.) less than length to base of gills (28 mm.); eyes elevated somewhat, the interorbital width (9 mm.) a little less than length of snout (10 mm.); eye to nostril, 5.5 mm.; distance between nostrils, 10 mm.; gular fold prominent, the skin of chin folded longitudinally; vomerine teeth in two series beginning behind anterior level of choanae and running forward, tending to form an arch; however, there is a distinct diastema which is at a point bordering edge of the palatal pit; about 17 teeth in each series; palatine teeth diagonally placed, about 11 on each side, and practically continuous with the vomerine series. Choanae very large, elongate-oval, lying somewhat diagonally; tongue beginning to develop but still very small; maxillary-premaxillary teeth about 55–55, the series continued to a point posterior to the posterior level of the choanae; mandibular teeth about 58–58. Many of the teeth have not yet pierced the gums; splenial teeth have disappeared; there is a remnant of an upper larval flap at the poste-

rior corner of mouth on upper jaw; and on lower, a part of the larval fold which is present in larvae joined to the upper; an indistinct groove from eye to angle of the mouth.

Arms relatively short, the fingers moderately elongate; terminal third of metacarpals free on two middle fingers, and somewhat more on two outer fingers; order of size 1, 4, 2, 3; tubercles on palm small, distinct, the digits somewhat flattened and pointed but the points rounded; limbs adpressed, the leg reaches to the base of third finger; metatarsals of three middle toes involved in web; the extreme anterior part of metatarsals free on two outer toes; order of size of toes 1, 5, 2, 4=3; toes flattened, pointed; a ridge bordering outer toe continued onto the tarsus for a little distance; two tubercles on posterior part of sole, elevated, rounded; 12 costal grooves evident high on sides and continued across abdomen; a distinct, median dorsal, longitudinal groove or depression from occiput to base of tail. Skin of head smooth, with traces of pits bordering inner edge of orbit; apparently no trace of the lateral-line organs. Outer part of walls of cloaca with a few vertical folds; deeper parts with more numerous folds. Dorsal caudal fin very low, not rising to a greater elevation than base of tail; ventral caudal fin wanting. Glands of the skin are of two visible sorts, a larger cream-colored type of gland, and a smaller type of a gray color. Both appear somewhat circular and give the skin a characteristic pattern.

Color in alcohol.—Above dull brownish olive, with the cream and grayish glands appearing as very minute dots; on venter and half way up on sides the color is a dirty cream; arms lighter olive than body. A few dark flecks or spots on head and on back, while the sides of the compressed tail are mottled with olive-black. The lower part of the tail lighter olive than upper part; lips somewhat lighter than snout.

Measurements in mm.—Snout to vent 107; tail 82; head length 28; head width 25; head depth 20; axilla to groin 51; snout to arm 32; leg 34.

Larvae.—The largest larva, U.S.N.M. No. 116741, measures 133 mm. from snout to vent; tail, 108 mm.; head width, 35 mm.; depth of head, 25 mm.; length of head (to base of last gill), 44 mm.; snout to median notch of gular fold, 36 mm.; arm, 36 mm.; leg, 38 mm.; axilla to groin, 63 mm.; 12 costal grooves. Dorsal fin can be traced to a point about 25 mm. behind level of arm insertion. At base of tail the dorsal fin is about 5 mm. high; the greatest elevation about midway of the tail is 7.5 mm; greatest depth of subcaudal fin 8.5 mm.; greatest depth of tail, 23 mm.; greatest depth of body, 34 mm.; the limbs adpressed, the longest toe reaches the wrist; digits webbed as in adults, except there is a lateral fold evident along some of the digits and the toes are wider, and the fourth toe is longer than the third.

Vomerine and palatine series of teeth nearly continuous except for a median diastema; choanae elongate longitudinally; about 20–22 palatine teeth; about 43–43 vomerine teeth, both series irregular; maxillary-premaxillary teeth about 70–70; mandibular series about same, but many teeth hidden by gums; no tongue.

The specimen is a female with nearly mature ovarian eggs; the cloacal region is folded, with some papillae or papillate folds. U. S. N. M. No. 116755 has numerous black ocelli on head and back and on dorsal fin. A few other adult larval specimens show the same ocelli; some of the younger specimens show traces of the upper dorsal series of neuromast organs.

In a young specimen the vomerine series are widened, the teeth tending to form six or seven diagonal series; the pterygopalatine teeth are likewise arranged in several irregular series; length 85 mm. snout to vent.

Remarks.—The neotenic and other larvae occurring in Zumpango are referred to this form although there is no absolute proof of conspecificity. All the larvae, despite certain apparent differences, seem to belong to a single species. The species must be regarded as one apart from *Ambystoma velasci*. The coloration and markings of both young and adult are different; the shape of the body and head, the longer, slenderer tail, and the very different character of the transformed adults confirm the fact that two different animals are involved. Differences between this species and *A. ordinaria* and *A. amblycephala* are such that there is no opportunity for confusing them. There may be a relationship with *A. bombypella*, but differences in color markings and the character of skin and tail amply distinguish them.

Family PLETHODONTIDAE Gray, 1850

Genus THORIUS Cope, 1869

THORIUS PENNATULUS Cope

Thorius pennatulus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, pp. 111–112 (Orizaba, probably near the city).

An extraordinary series of 723 specimens was collected on the side of a peak in the valley near Cuautlapan, Veracruz, in January, February, July, and August 1940. These specimens were found under débris of various types, and very frequently around the edges of boulders under living plants, which often formed a thick mat about the boulders.

Cataloged in the collection are U.S.N.M. Nos. 111012–111037, 111039–111067. U.S.N.M. No. 111017 is designated a neotype, since no authentic types are known to exist.

This is the most diminutive salamander yet discovered in México. There are 13 well-defined costal grooves, strongly pendant swellings on

the lips below nostrils in males, and a large single median curving tooth piercing the upper lip. A large female, measuring 21 mm. snout to vent, contained six eggs, three in each ovary.

Of the three species of this genus occurring in the mountains in this part of Veracruz all have the chin more or less speckled with small cream spots. Only *pennatulus* has the underside of the body, and to some extent the sides, so marked.

THORIUS NARISOVALIS Taylor

Thorius narisovalis TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 416-418, pl. 47, fig. 3 (Cerro San Felipe, Oaxaca).

Two topotypic specimens from the Cerro San Felipe, Oaxaca, collected July 10-20, 1940, are U.S.N.M. Nos. 116454, 116455. This form occurs on Cerro San Felipe at a considerably higher elevation than *Thorius pulmonaris*. The latter species is terrestrial, invariably found in masses of wet leaves; *T. narisovalis* on the other hand was almost invariably found under logs or the loosened bark of logs. When uncovered they usually made prodigious leaps.

The specimen in the National Museum from Cerro San Felipe, Oaxaca (U.S.N.M. No. 47608), referred by Dunn (1926, p. 376) to *Oedipus pennatulus*, belongs to *T. narisovalis*.

THORIUS PULMONARIS Taylor

Thorius pulmonaris TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 411-414, figs. 3-4 (Cerro San Felipe, Oaxaca).

Three topotypic specimens, U.S.N.M. Nos. 116451-116453, are in the collection from Cerro San Felipe, near Oaxaca, Oaxaca, collected July 10-20, 1940. The elongate-oval nostril, diagonally placed, easily distinguishes this form from other members of the genus.

The specimen (U.S.N.M. No. 47797) from Reyes, Oaxaca, referred by Dunn (1926, p. 376) to *Oedipus pennatulus*, belongs to *T. pulmonaris*.

THORIUS TROGLODYTES Taylor

PLATE 19

Thorius troglodytes TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, pp. 110-112, pl. 3, fig. 4 (Acultzingo, Veracruz).

Thirty-three specimens were collected. Cataloged are 16 topotypic paratypes, from near Acultzingo (U.S.N.M. Nos. 110969-110983, 110992), collected January 15-18 and August 19, 1939; 9 others are practically topotypes, but were collected a kilometer or two (straight line) away, within the boundary of the state of Puebla, near a spot named Pájaro Verde (U.S.N.M. Nos. 110960-8), in January and December 1939. They were obtained from under rocks, chip piles, and moist leaves.

THORIUS DUBITUS Taylor

Thorius dubitus TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, pp. 108-110, pl. 3, fig. 3 (Acultzingo, Veracruz).

A series of 54 topotypic specimens was collected on August 19, 1939. Of these 27 were in Taylor's hands when the species was described and are paratypes. These alone are cataloged and bear U.S.N.M. Nos. 110984-110991, 110993-111011. These specimens were collected in moss and among the roots of plants growing on the surface and forming a heavy mat. They are from very near the top of the ridge to the southwest of Acultzingo, Veracruz. One of the series (U.S.N.M. No. 111011) was collected within the boundary of the state of Puebla near Pájaro Verde.

The curious habit of this form, of coiling its body in a watch-spring spiral, was observed in almost every specimen encountered.

Genus *BOLITOGLOSSA* Duméril and Bibron, 1854*BOLITOGLOSSA LEPROSA* (Cope)

Spelerpes leprosus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, pp. 105-106 ("Orizaba," probably Mount Orizaba).

Bolitoglossa leprosa TAYLOR, Univ. Kansas Sci. Bull., vol. 27, 1941e, p. 143.

In all, 320 specimens were secured from the following localities (only a part of the series has been cataloged and now bears the following numbers): **DISTRITO FEDERAL:** Valle Alegre, July 23, 1939 (U.S.N.M. No. 117397); Desierto de los Leones, June 16, 1940 (U.S.N.M. No. 117398). **MÉXICO:** Lake Zempoala, February 21-22 and August 25, 1939, July 28, 1940 (U.S.N.M. Nos. 116267-116277); Llano Grande, August 21, 1939 (U.S.N.M. Nos. 116252-116261); Mount Popocatepetl, September 7 and October 8, 1939 (U.S.N.M. Nos. 116237-116251). **PUEBLA:** 2 miles east of Río Frío, México, August 26, 1939 (U.S.N.M. Nos. 116262-116266). **VERACRUZ:** Cruz Blanca, March 24, 1940 (U.S.N.M. Nos. 117390-117396); 17 km. northeast of El Limón, Totalco, March 23, 1940 (U.S.N.M. Nos. 117383-117389).

One of us (Taylor, 1939a, pp. 280-283) formerly regarded *orizabensis* as a species separable from *leprosa*. Examination of large series of specimens (E. H. T.-H. M. S. collection) shows that the presumed specific characters originally observed break down in large series and were perhaps chiefly due to age and sex. We now regard it a synonym of *leprosa*.

This species and *B. chiroptera* are the two commonest salamanders of the high plateau region of México. They are found in identical habitats.

BOLITOGLOSSA NIGROMACULATA Taylor

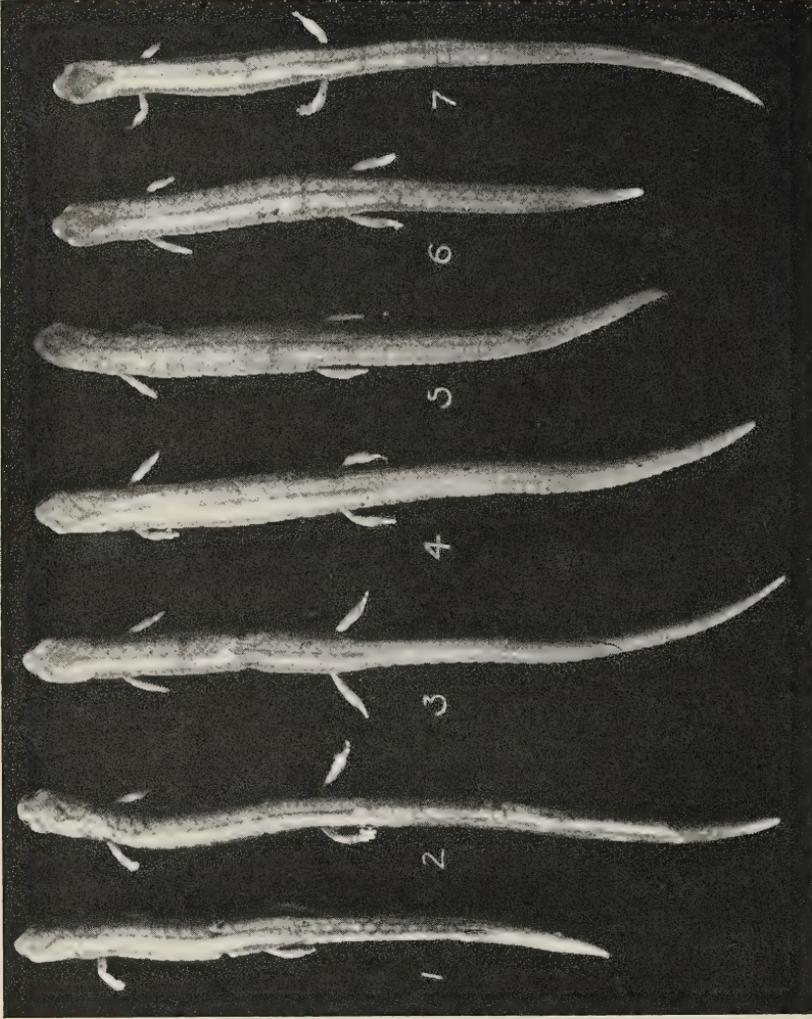
Bolitoglossa nigromaculata TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, Nov. 1, 1941e (actual mailing date, Dec. 1941), pp. 141-145, fig. 1, A, B (Cuautlapan, Veracruz).



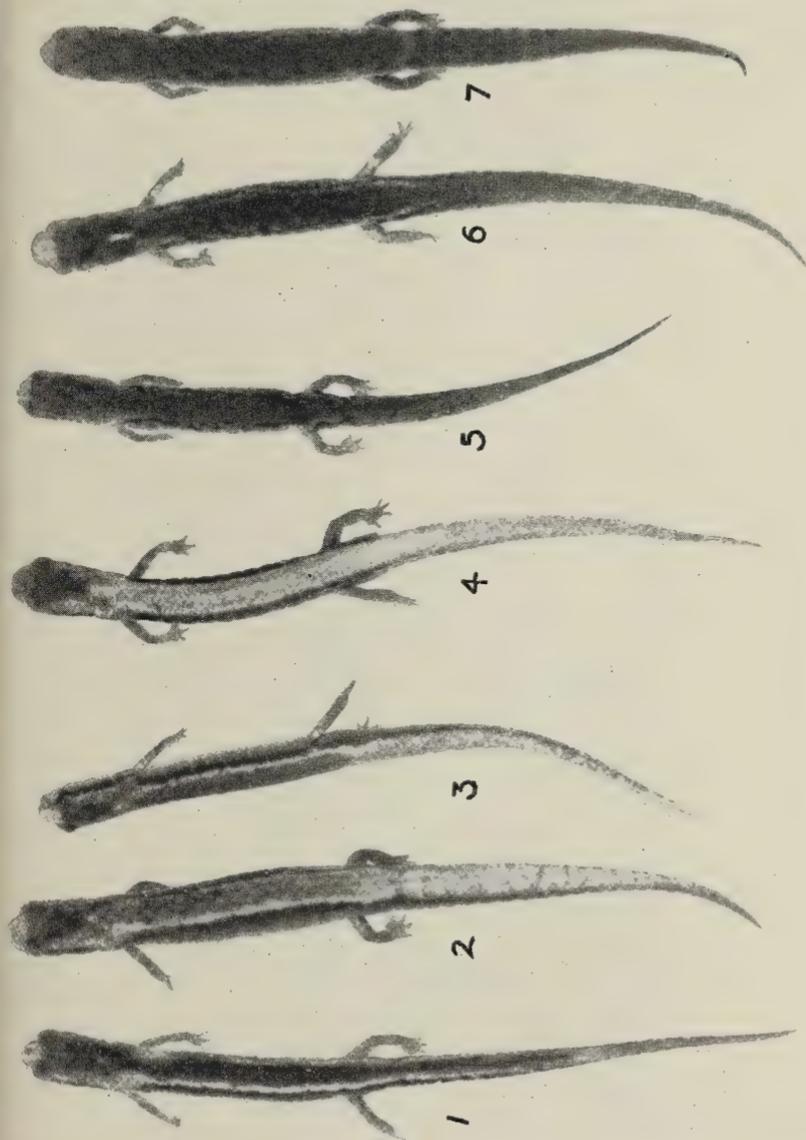
1, 2, *Ambystoma lacustris*, new species: 1, U.S.N.M. No. 117410, type, from Lake Zumpango, México, México, total length 198 mm.;

2, U.S.N.M. No. 116738, larva, from same locality, total length 238 mm.

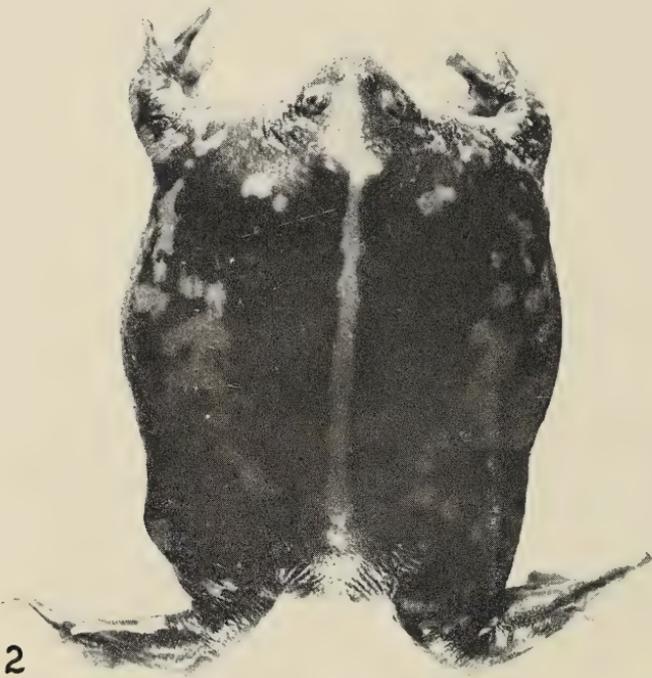
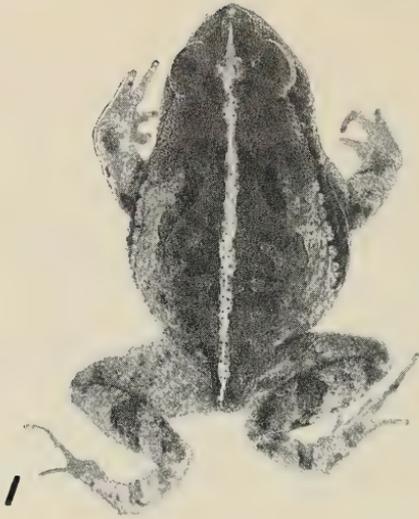
3, 4, *Ambystoma velasci* Dugès: 3, U.S.N.M. No. 116683, from fresh-water pond near San Diego, D. F., total length 110 mm.; 4, U.S.N.M. No. 116689, from same locality, total length 125 mm.



Paratypes of *Thorius troglodytes* Taylor from crest of mountains near Acultzingo, Veracruz: 1, U.S.N.M. No. 110977; 2, H.M.S. No. 11791; 3, U.S.N.M. No. 110969; 4, U.S.N.M. No. 110999, actual total length 53 mm.; 5, U.S.N.M. No. 110970; 6, U.S.N.M. No. 110978; 7, U.S.N.M. No. 110968.



Bolitoglossa terrestris (Taylor): 1, E.H.T.-H.M.S. No. 17708, from 4-5 miles south of Zacualtipán, Hidalgo; 2, E.H.T.-H.M.S. No. 23374, from 4-10 miles south of Tianguistengo, Hidalgo; 3, E.H.T.-H.M.S. No. 23232, same locality; 4, E.H.T.-H.M.S. No. 23261, from 4-5 miles south of Zacualtipán, Hidalgo; 5, E.H.T.-H.M.S. No. 23336, from 4-10 miles south of Tianguistengo, Hidalgo; 6, E.H.T.-H.M.S. No. 23367, same locality; 7, E.H.T.-H.M.S. No. 17721, from 4-5 miles south of Zacualtipán, Hidalgo.



- 1, *Bufo canaliferus* Cope: E.H.T.-H.M.S. No. 156, from Tonalá, Chiapas, snout-to-vent length 47.5 mm.
2, *Rhinophrynus dorsalis* Duméril and Bibron: E.H.T.-H.M.S. No. 10, from Rodríguez Clara, Veracruz, snout-to-vent length 70 mm.

Of an original series of 11 specimens, the type and paratypes, U.S.N.M. Nos. 110635 (type) and 110631–110634, 110636–110639, are in the collection from Cuautlapan, Veracruz, taken in January and February 1940. The specimens are from the nearby mountain tops rather than from the narrow valley in which the village of Cuautlapan lies, and from an elevation possibly a thousand feet higher.

Two of the cotypes of *Spelerpes leprosus* Cope (1869a, pp. 105–106), which are now U.S.N.M. No. 6340, belong to this species.

BOLITOGLOSSA ROBERTSI (Taylor)

Oedipus robertsi TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 287–289, pl. 26, fig. 2 (Nevado de Toluca, 10,000 to 11,000 feet elevation).

The six specimens of this series (U.S.N.M. Nos. 116231–116236) are topotypes, collected October 2, 1939. The broad dorsal stripe varies from dull orange to orange-brown, but much of this color is lost by preservation. These specimens were found under rocks and logs, usually directly on the ground.

BOLITOGLOSSA COCHRANAE Taylor

Bolitoglossa cochranae TAYLOR, Univ. Kansas Sci. Bull., vol. 29, pt. 2, No. 8, 1943b, pp. 343–345 (Cerro San Felipe, Oaxaca, Oaxaca).

U.S.N.M. No. 116386 is a paratopotype, collected July 10–20, 1940.

BOLITOGLOSSA BELLII (Gray)

Spelerpes bellii GRAY, Catalogue of the Batrachia Gradientia in the British Museum, 1850, p. 46 (México).

Bolitoglossa bellii TAYLOR, Proc. Biol. Soc. Washington, vol. 54, 1941f, p. 77.

The collection has U.S.N.M. No. 116227 from 12 miles west of Villa Victoria, México, March 6, 1939; U.S.N.M. No. 116228 from Nevado de Toluca, México, October 2, 1939; U.S.N.M. No. 116229 from 4 miles east of Carapa, Michoacán, September 12, 1939; and U.S.N.M. No. 116230 from Omilteme, Guerrero, August 2–4, 1940.

This species is distinguished by a pair of red spots on the head; the body is elongated so that the adpressed limbs are separated by three or four costal folds; and it probably attains as large a size as *B. gigantea*.

The specimens were usually found under clumps of dead grass pulled up by local workmen to obtain the roots.

We have examined one specimen from Mount Zempoaltepec, Oaxaca (U.S.N.M. No. 46924), which has a large red spot laterally on the shoulder above the arm as well as a pair of occipital spots. The body is crossed by transverse, somewhat chevron-shaped, red bars, which continue some distance on the tail. This same form occurs also on the Cerro San Felipe, as exemplified by a very young

specimen in the E.H.T.-H.M.S. collection (No. 29986). A series of specimens may show that these belong to a separable form.

BOLITOGLOSSA GIGANTEA (Taylor)

Oedipus giganteus TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 266-269, pl. 27, figs. 3, 4 (Jalapa, Veracruz).

B[olitoglossa] gigantea TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d, p. 112.

This species is represented by 28 specimens: HIDALGO: U.S.N.M. Nos. 116349-116366, 6 km. south of Santa Anita, October 10 and December 13, 1939. VERACRUZ: U.S.N.M. Nos. 116347-116348, 17 km. northeast of El Limón (Totalco), March 23, 1940; U.S.N.M. Nos. 116339-116345, Pan de Olla, March 22, 1940; and U.S.N.M. No. 116346, Tequeyutepec, March 23, 1940.

This species, readily distinguishable from *B. bellii* by the shorter body and the absence of red spots on the head, appears to be confined to the states of Hidalgo, northern Veracruz, and Puebla. Only one of the 28 specimens has any trace of spots on the head, and that is a juvenile from northern Hidalgo. In all males the adpressed limbs are in contact; in females they usually touch; but in old or gravid females they may be separated by one or two folds.

The largest specimen seen, a female (U.S.N.M. No. 116347), measures 161 mm. from snout to the posterior end of the vent, the tail 115 mm.; the head width is 28 mm. The vomerine teeth (35-40) are in very irregular rows; the maxillary-premaxillary teeth, 70-71; mandibular teeth 65(+)-70. The adpressed limbs are separated by about two costal folds.

Field notes record that the dorsal spots are orange instead of red as in *bellii*.

BOLITOGLOSSA CEPHALICA CEPHALICA (Cope)

Spelerpes cephalicus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865a, p. 196 (Mexican Tableland).

Thirty specimens, the following cataloged: DISTRITO FEDERAL: Valle Alegre, Ajusco, July 23, 1939 (U.S.N.M. No. 116115). MÉXICO: 10 miles west of Villa Victoria, September 11, 1939 (U.S.N.M. Nos. 116106-116107); Mount Popocatepetl, October 8, 1939 (U.S.N.M. Nos. 116101-116102); Lake Zempoala, August 25, 1939 (U.S.N.M. Nos. 116099-116100). PUEBLA: 2 miles east of Río Frío, México, October 21, 1939 (U.S.N.M. Nos. 116103-116105). VERACRUZ: 2 km. west of Acultzingo, August 28 and December 19, 1939 (U.S.N.M. Nos. 116116-116118); Cruz Blanca, March 24, 1940 (U.S.N.M. No. 116109); Pan de Olla, March 22, 1940 (U.S.N.M. Nos. 116108, 116119-116126); 17 km. northeast of El Limón (Totalco), March 23, 1940 (U.S.N.M. Nos. 116110-116112); Tequeyutepec, March 23, 1940 (U.S.N.M. Nos. 116113-116114).

The species has been found chiefly in or under rotten logs, under stones, and under clumps of dead grass.

One of the cotypes (now U.S.N.M. No. 103591) of *Spelerpes leprosus* Cope (1869a, pp. 105–106) belongs to this species.

BOLITOGLOSSA CEPHALICA RUBRIMEMBRIS, new subspecies

Type.—U.S.N.M. No. 110661, female, collected 6 km. south of Santa Anita, Hidalgo, elevation about 4,500 feet, October 10, 1939, by Dr. and Mrs. Hobart M. Smith.

Paratypes.—U.S.N.M. Nos. 110659–110660, collected with the type; E.H.T.-H.M.S. Nos. 25411–25413, topotypes; E.H.T.-H.M.S. No. 12495, Minas Viejas, Hidalgo, July 1, 1940; E.H.T.-H.M.S. No. 23007, 6 miles south of Santa Anita, Hidalgo, September, 1939; E.H.T.-H.M.S. No. 29831 near Zacualtipán, Hidalgo, July 2, 1940.

Diagnosis.—A medium-sized salamander similar to *B. cephalica cephalica*, but with the greater portion of limbs and posterior third or fourth of the tail red. The adpressed limbs touch or overlap a distance equal to the width of a costal fold.

Description of the type.—Body short, the maximum known length being 53 mm.; tail 38 mm.; head short, the eye (3 mm.) greater than length of mouth; nostrils small, the groove running from the posterior part down to the indistinct subnarial swelling; head broad, its width 9 mm.; length of head to the neck groove, 12 mm.; posterior part of eyelids inserted under a diagonal fold; interorbital width, about one and one-half times the width of a single eyelid; a strongly defined groove begins on side of head behind eye and runs down, crossing jaw angle, thence across the chin; the groove emerging from nuchal fold runs up and somewhat forward to the median line; an indistinct irregular groove runs back from near eye to the lateral edge of nuchal fold; the posterior extension of the hyoid forms a ridge, visible as far back as the first intercostal fold behind the arm; 11 well-defined costal grooves, those in axilla and groin apparently lacking; skin between grooves on sides folded longitudinally; sides of cloaca with diagonal folds; a small gland behind insertion of femur.

Maxillary-premaxillary teeth about 40–40; mandibular teeth about 40–44; vomerine teeth 16–? (series partly destroyed on one side), the outer teeth extending beyond outer level of choanae; the parasphenoid teeth in two series, widened posteriorly, narrowed anteriorly, separated from each other by a narrow space; a total of about 95 teeth.

Limbs rather long, when adpressed to the body the toes and fingers touch; length of fingers in following order of size 1, 4, 2, 3; the toes 1, 5, 2, 4, 3; digits broad, rounded at tips, the basal web involving all but tip of first finger and toe, and part of the proximal phalanx of the other digits; it includes nearly two-thirds of that of the fourth toe; a constriction about base of tail; about 22 grooves on tail; skin of

head very distinctly pitted, as is the lateral region of body; pits on dorsal surface of back dim, while the skin of the abdomen is shiny, smooth; small pits on skin on underside of tail.

Variation.—The young of this form (and related forms of the *B. cephalica* group of the genus) have the vomerine teeth in two to four series, running somewhat diagonally, and often more numerous than in the adult. As the specimens grow older the teeth tend to form a single, often somewhat irregular, series.

Adult males have the typical narrow head of the group, the snout sharply truncate, with prominent subnarial swellings. The submental gland is well defined, and the cloacal walls are papillate. The limbs are somewhat longer and overlap the width of a costal fold in the largest specimen.

The red color of limbs and tail fades in preservative; however, there usually remains a lighter tail termination and cream spots on the underside of the leg.

Data on type and paratypes of B. c. rubrimembris

Character	U.S.N.M. No.					
	110661	23007	12495	29831	110659	110660
Sex.....	♂	♂	♂	♂	♂	♂
Snout to vent length (mm.).....	53	50	47	45.5	39.5	37
Tail length (mm.).....	38	43	38	37	35	35
Snout to nuchal fold (mm.).....	12	14	12	11.1	9.9	10
Snout to foreleg (mm.).....	15.6	17	14	14	12	12.1
Length of snout (mm.).....	2.5	3.4	2.8	2.4	2.3	2.3
Width of head (mm.).....	9	8	8.8	8.6	7.5	7.1
Interorbital width (mm.).....	3	3	2.6	2.7	2.1	2.3
Eyelid (mm.).....	1.8	1.9	1.8	2	1.7	1.8
Arm (mm.).....	13.5	15	12.2	11	9.8	10.5
Leg (mm.).....	15.8	16	13.2	13.2	11.2	11
Axilla to groin (mm.).....	29	26.2	28	24	22	21
Head width in length.....	5.72	6.2	5.32	5.3	4.7	5.2
Head length in length.....	4.5	3.5	3.9	4.1	4	3.7
Maxillary-premaxillary teeth.....	44	41	33	33	36	41
Vomerine teeth.....	16	14	15	15	19	23
Mandibular teeth.....	44	42	33	39	40	38
Parasphenoid teeth in two groups.....	Yes	Yes	Yes	Yes	Yes	Yes
Limbs touch.....	Yes	Yes	Yes	Yes	Yes	Yes
Costal grooves.....	11	11	11	11	11	11
Tail grooves.....	22+	26+	19+	21+	23+	23+
Vomerine teeth in series.....	1	1	2	1	2	2

Certain specimens from near Durango, Hidalgo, seem to show characters that point to *B. cephalica cephalica*, as well as to the form here described. In consequence we suspect intergradation with this form occurring in Querétaro and México.

The three specimens in the National Museum collection were found under stones in a grassy, unforested ravine at 4,500 feet elevation, in company with *Bolitoglossa gigantea*. The form has a very peculiar

mode of locomotion, which was also observed in *B. galeanae*. The tip of the tail is narrowed and somewhat attenuated and is differently colored from the remainder of the tail. The tip of the tail and perhaps the coloration appear to be linked with a special locomotor adaptation. As the animal moves forward in normal, unmolested walking, the tail is held straight back except for the terminal half inch or so, which is flipped forward with each step made by one particular leg. Upon being swung forward into position, the tip is placed on the ground, and then by straightening and pivoting on the tip the tail pushes the body forward as another step is taken. Unfortunately we did not observe whether the pushing movement of the tail is synchronized with one of the forelegs or with one of the hindlegs, but we suspect with the former, since the forelegs are somewhat weaker than the hindlegs.

BOLITOGLOSSA GALEANAE Taylor

Bolitoglossa galaenae TAYLOR, Proc. Biol. Soc. Washington, vol. 54, July 31, 1941b, pp. 83-85 (Galeana, Nuevo León). (Specific name misspelled by typographical error; should read *galeanae*.)

Nineteen paratypes were collected 15 miles southeast of Galeana, Nuevo León, October 13-14, 1939 (U.S.N.M. Nos. 119642-119658 cataloged). These were found in a semiarid region of little vegetation, rocky, barren soil, small bushy shrubs, and cactus. The area is so completely unlike salamander country that the discovery of the salamanders came as a complete surprise. The specimens were found under stones in company with *Tantilla wilcoxi rubricata*, *Salvadora lineata*, and *Syrrhophus smithi*. The collecting was done during and shortly after a rainstorm in the middle of a week of continued cloudiness and intermittent, drizzling showers. Most of the year the soil is obviously very dry. Since there are no bromelias about, it would be very interesting to know how the salamanders manage to survive the unfavorable climate.

This form belongs to the *B. cephalica* subgroup and is probably the largest species.

BOLITOGLOSSA GADOVII (Dunn)

Oedipus gadovii DUNN, The salamanders of the family Plethodontidae, 1926, pp. 437-439 (Xometla, 8,500 feet on Mount Orizaba).

[*Bolitoglossa*] *gadovii* TAYLOR, Herpetologica, vol. 2, No. 3, 1941a, p. 58.

Two specimens from Sierra Negra, Mount Orizaba, Puebla, July 22, 1938 (U.S.N.M. Nos. 116384, 116385), are in the collection. They were collected by Taylor.

BOLITOGLOSSA SMITHI (Taylor)

Oedipus smithi TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 269-272, pl. 25, figs. 5-6 (Cerro San Luis, Oaxaca, Oaxaca).

Bolitoglossa smithi TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), p. 418.

A single specimen of this species, U.S.N.M. No. 116382, is from Cerro San Felipe, Oaxaca, collected July 10–20, 1940, by E. H. Taylor. *B. smithi* superficially resembles *B. unguidentis* but may readily be separated by the character of the premaxillary teeth, and the longer body and shorter legs, which fail to touch by four costal grooves. There is also less webbing on the toes. The frontal bones bordering the frontoprefrontal fontanelle bend down and form sutures with the prevomers.

To this species belong two specimens (U.S.N.M. Nos. 47606, 47607) from Cerro San Felipe, Oaxaca, previously referred (Dunn, 1926, pp. 364–366) to *Oedipus sulcatus*.

BOLITOGLOSSA MELANOMOLGA Taylor

Bolitoglossa melanomolga TAYLOR, Proc. Biol. Soc. Washington, vol. 54, July 31, 1941b, pp. 81–83 (20 km. north of San Antonio Limón [Totalco], Veracruz).

Two paratypes, one a topotype from near Teziutlán (June 25, 1940) and one taken at a point 17 km. north of San Antonio Limón (March 24, 1940), are in the collection. These bear U.S.N.M. Nos. 110641 and 110640, respectively.

BOLITOGLOSSA UNGUIDENTIS Taylor

Bolitoglossa unguidentis TAYLOR, Herpetologica, vol. 2, No. 3, March 25, 1941a, pp. 57–62, figs. 1–3 (Cerro San Felipe, Oaxaca, Oaxaca).

One topotypic specimen, U.S.N.M. No. 116383, from Cerro San Felipe, Oaxaca, July 10–20, 1940, is in the collection. It is entirely typical. The curious bifid or hooked character of the premaxillary teeth of *unguidentis*, *melanomolga*, *smithi*, and *gadovii* shows their very close relationship.

BOLITOGLOSSA CHIROPTERA (Cope)

Spelerpes chiropterus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 54 (Mirador, Veracruz).

[*Bolitoglossa*] *chiroptera* TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), pp. 410–411.

In all, 245 specimens, from the following localities: MÉXICO: Llano Grande, 5 miles west of Río Frío, August 21, 1939 (U.S.N.M. Nos. 116177–116188); Lake Zempoala, August 25, 1939, and July 28, 1940 (U.S.N.M. Nos. 116189–116196) (part from Morelos); Mount Popocatepetl, September 7 and October 8, 1939 (U.S.N.M. Nos. 116197–116211). PUEBLA: 2 miles east of Río Frío, México, August 21, 1939 (U.S.N.M. Nos. 116167–116176). VERACRUZ: Cruz Blanca, March 24, 1940 (U.S.N.M. No. 116212); 17 km. northeast of El Limón (Totalco), March 23, 1940 (U.S.N.M. Nos. 117372–117377); Toxtlaucaya, March 24, 1940 (U.S.N.M. Nos. 117378–117379).

This species is found under clumps of dead grass, under and in rotten logs, and under loose bark. At Cruz Blanca they were once

obtained in considerable numbers in stump holes that had filled with pine needles and loose earth.

The distribution of this species is puzzling. It is known in the Ajusco range, Mount Popocatepetl, Mount Ixtaccihuatl, and the adjoining short range to the north. It is present, after a presumed hiatus, on the mountains of northeastern Puebla (north of Limón) and on Cofre de Perote. It appears to be absent on Mount Malinche (Malintzin). It has been taken on Mount Orizaba but not about the Cumbres of Acultzingo. It is apparently absent in the mountains to the north, in Hidalgo. Of course, its absence from the collections made in these localities is not conclusive evidence that it does not occur. However, where it is known to occur it is usually extremely common, and its habitat makes it especially easy to discover. In Hidalgo it is replaced by *B. multidentata*. We hold as surely incorrect the locality data "Tehuantepec" borne by U.S.N.M. No. 30347.

BOLITOGLOSSA MULTIDENTATA (Taylor)

Oedipus multidentata TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 14, 1938 (July 10, 1939a), pp. 289-291, pl. 29, fig. 1 (Alvarez, San Luis Potosí).

Bolitoglossa multidentata TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (1940f), p. 407.

A large series of 108 specimens was collected in El Chico National Park, Hidalgo, on September 17, 1939, a part of which series bears U.S.N.M. Nos. 106324 to 106338. These were found under bark, under logs and rocks, as well as in bromelias growing on the trunks of the fir and pine trees. One female examined contains 11 large ovarian eggs, 5 on one side, 6 on the other.

In gravid females the adpressed limbs may merely touch or fail to touch by the width of a costal fold, while in males they usually overlap the width of a fold.

BOLITOGLOSSA TERRESTRIS Taylor

PLATE 20

Bolitoglossa terrestris TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, Nov. 1, 1941d, pp. 115-117 (6 miles south of Tianguistengo, Hidalgo, México).

U.S.N.M. Nos. 116319 to 116321 from 5 to 6 miles north of Zacualtipán (August 10-11, 1938), and U.S.N.M. Nos. 116322 and 116323 from 4 to 10 miles south of Tianguistengo, Hidalgo (July 1-2, 1940), are paratypes. The figures show variation in markings.

BOLITOGLOSSA DIMIDIATA Taylor

Bolitoglossa dimidiata TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 12, 1939 (Nov. 27, 1940f), pp. 408-411, figs. 1-2 (Guerrero, near Mineral del Monte, Hidalgo).

This diminutive species is represented by 14 specimens, U.S.N.M. Nos. 116213-116226, collected September 17, 1939. They are from

a point in the El Chico National Park probably less than 2 miles from the exact type locality, but at a somewhat higher elevation. They were found under piles of chips and under rotting leaves, usually in well-shaded places.

BOLITOGLOSSA XOLOCALCAE Taylor

Bolitoglossa xolocalcae TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e (December), pp. 148-150, pls. 7, 9, figs. 7-8 (Cerro Ovando, Chiapas, México, 6,800 to 7,100 feet elevation).

The type series, U.S.N.M. No. 111371 (type) and U.S.N.M. Nos. 111372-111470 (paratypes), are in the collection, secured April 16-17, 1940.

A total of 345 specimens of *Bolitoglossa xolocalcae* was collected, all on Mount Ovando, Chiapas. Occurring on the same mountain is a second, larger salamander, *Bolitoglossa nigroflavescens*. Both forms were found exclusively in bromelias during the dry season (April 15, 1940). The smaller form, *B. xolocalcae*, ranged from about 5,400 feet to the summit (7,100 feet), the greatest concentration occurring at about 6,800 feet. Here they were exceedingly numerous, occurring in practically all bromelias. In one plant 34 were found. At 6,000 feet the two species occurred with about equal frequency, but *B. nigroflavescens* was not taken above 6,800 feet or below 5,700 feet. Only a few *B. xolocalcae* were found below 5,700 feet; a single specimen was taken as low as at 5,400 feet.

The distribution of these species is to some extent dependent upon the distribution of bromelias. Three general types of bromelias occur in the salamander area of Mount Ovando—a small, a medium-sized, and a large form. *B. nigroflavescens* was found almost exclusively in the largest bromelias, rarely in the medium-sized form, never in the small. *B. xolocalcae* occurred in the large and medium-sized bromelias, but only a single specimen came from the small species. Its preference, however, was marked for the medium-sized plant.

The distribution of the two larger plant species corresponds with that of the two salamanders. The small bromelia occurred from 3,500 feet to the peak, but was a smooth, soft-leaved species. While offering ample room, it held very little water, and perhaps for this reason it was not frequented by the salamanders.

BOLITOGLOSSA NIGROFLAVESCENS Taylor

Bolitoglossa nigroflavescens TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e (December), pp. 150-152, pls. 8, 9, figs. 9-10 (Cerro Ovando, Chiapas).

The following numbers are cataloged: U.S.N.M. Nos. 111169 (type); 111153-111168, 111170-111192 (paratypes).

A total of 58 specimens was collected on April 16-17, 1940, all on Mount Ovando, Chiapas, between 5,700 feet and 6,800 feet elevation, a zone that corresponds to the distributional zone of a large bromelia. The vertical distribution of this species is discussed under *B. xolocalcae*.

BOLITOGLOSSA PLATYDACTYLA (Cuvier)

Sal.[amandra] platyductylus CUVIER, in Gray, in Griffith's Cuvier's Animal Kingdom, vol. 9, 1831 (A synopsis of the species of the class Reptilia), p. 107 (in synonymy of *Salamandra variegata*) (type locality, México).

The collection contains 202 specimens, collected in eastern México from San Luis Potosí south to southern Veracruz. The following are cataloged: SAN LUIS POTOSÍ: U.S.N.M. Nos. 117380–117381, Huichihuayán, December 7, 1938, and December 12, 1939. HIDALGO: U.S.N.M. No. 117382, 5 km. south of Chapulhuacán, December 13, 1939. VERACRUZ: U.S.N.M. Nos. 116278–116286, Cuautlapan, December 20, 1939, January, February, and July 1940; U.S.N.M. Nos. 116287–116297, Potrero Viejo, December 13, 1938 to January 9, 1939; U.S.N.M. Nos. 116298–116307, Cerro Gordo, March 24, 1940; U.S.N.M. Nos. 116308–116311, Mata de Caña, 25 miles southeast of Jalapa, March 24, 1940; U.S.N.M. No. 116312, Tezonapa, January 11, 1939; U.S.N.M. No. 116313, Presidio, January 10, 1939; U.S.N.M. Nos. 116314–116318, San Juan de la Punta, December 28, 1938.

In the southern part of México and to some extent in Central America the species is replaced by *Bolitoglossa mexicana*.

The Hidalgo specimen was found under a stone on the ground in a small grassy meadow at an elevation of about 3,000 feet, probably at nearly the maximum elevation attained by the species in that area. All San Luis Potosí specimens were found in bromelias, at a much lower elevation (about 300 feet above sea level). For other comments on habitat see the discussion of *B. rufescens*.

BOLITOGLOSSA MEXICANA Duméril and Bibron

FIGURE 58

Bolitoglossa mexicana DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 9, 1854, p. 93, atlas, pl. 104, fig. 1 (Dolores, Petén, Guatemala).

Seventy-four specimens were secured; the following are numbered in the Museum collection: U.S.N.M. No. 116070 from Piedras Negras, Guatemala, May 24, 1939; U.S.N.M. Nos. 116071–116098 from San Juanito (near Palenque), Chiapas, July 7 to 23, 1939. All were found in large arboreal bromelias.

Variation in color and pattern is considerable. The belly is nearly black in some specimens, dark brown in others, but in four it is light gray. Intermediate shades are present. In all specimens there are observable at least a few white flecks or short streaks on the ventral surfaces; in some the flecks are very few, in others they are numerous. The dorsal light color varies from orange to pale yellow; many specimens show some reddish tinge.

The sides of the body are black or dark brown, even in the lighter-bellied specimens. The dark lateral color terminates in the dorso-lateral region, on a line extending from the upper eyelid along the sides of the body above arm and hindleg onto tail. At this line the dorsal color begins, sharply defined from the lateral dark color. The

line is not straight but serrate or with narrow extensions toward the middorsal area.

In the simpler patterns, two dark stripes extend from the occipital region, where they are united posteriorly to the base of the tail, terminating there more or less abruptly. Between them is enclosed a median light stripe. In some cases the dark stripes are discontinu-

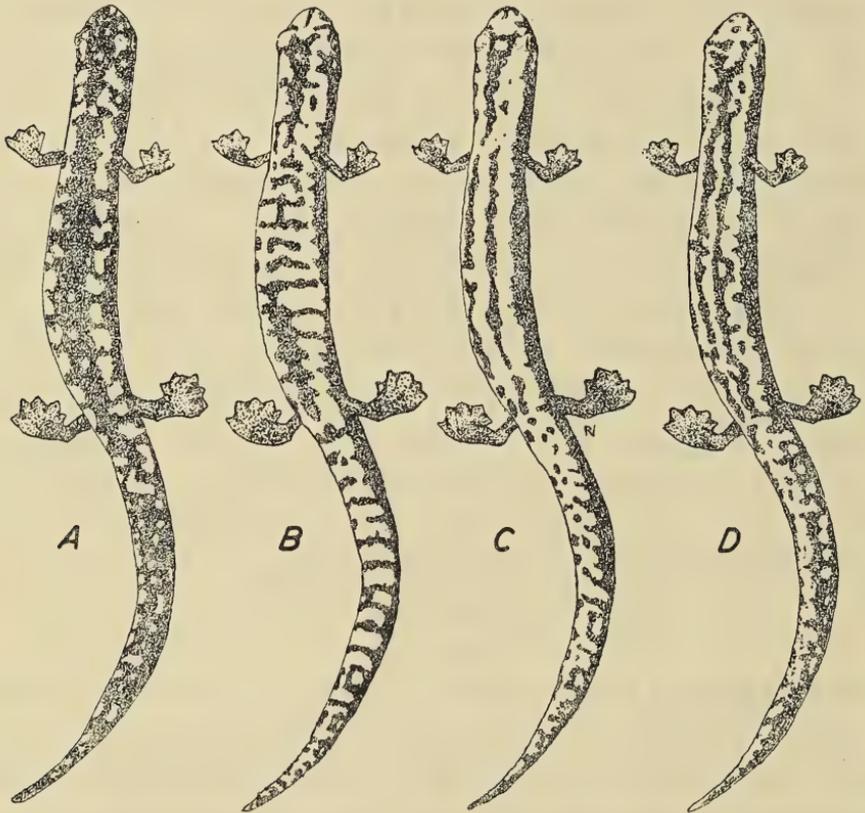


FIGURE 58.—*Bolitoglossa mexicana* Duméril and Bibron: A, U.S.N.M. No. 116077; B, U.S.N.M. No. 116074; C, U.S.N.M. No. 116079; D, U.S.N.M. No. 116082. All from near Palenque, Chiapas.

ous or enclose within them light spots sometimes arranged in a linear fashion.

A further type of variation is seen in those in which the two dark stripes are fused to form a single broad, median, dark stripe, which is modified either by being broken into irregular spots or by having extensions, along the costal grooves, which meet the dark lateral color.

Finally, certain specimens are simply cross-banded, the bars sometimes broken, sometimes fused medially or on each side in the position of the hypothetical two dark stripes.

A single specimen shows a pattern similar to that of the figure given by Duméril and Bibron (1854, pl. 104, fig. 1). On the lines of contact of dark and light color on the back, there is a fine white (or lighter) edge.

The dorsal surface of the tail may be nearly uniform light, with few dark spots, or strongly cross-barred, or heavily reticulated or even stippled with black, but is seldom lined.

BOLITOGLOSSA FLAVIVENTRIS (Schmidt)

Oedipus flaviventris SCHMIDT, Publ. Field Mus. Nat. Hist., zool. ser., vol. 20, 1936, pp. 148–150, fig. 17 (Chicharras, Chiapas).

Seventy-two specimens were collected from April 5 to June 3, 1940, at La Esperanza, Chiapas, of which U.S.N.M. Nos. 116367–116381 are cataloged.

All but two of this series were caught at night. One of the exceptions was a large female found deep in a rotten log. The specimen seemed to have been there some time, although it was in good condition, for it was somewhat stiff and moreover well caked with particles of rotten wood. Since the season was extremely dry (May), seven months having passed without rain, this example may have been estivating.

The other specimens had obviously been forced to the moist places during the dry season. They were found crawling about at night on the vegetation at the very edges of a small stream. They preferred the large-leaved plants of the genus *Calladium*, since they apparently hid in the axils of the leaves during the day, as evidenced by one specimen found in such a place. They were not disturbed by lantern light, and were easily picked up.

Of two females examined, one had 39 ovarian eggs, 17 on one side, 22 on the other; the second female, somewhat larger, had 58 eggs, 26 on one side, 32 on the other.

BOLITOGLOSSA RUFESCENS (Cope)

Oedipus rufescens COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 21, 1869a, p. 104 (Orizaba).

Bolitoglossa rufescens TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1941e, p. 145.

A very large series, 1,449 specimens, of this species was obtained. The following have been cataloged in the collection of the U. S. National Museum: VERACRUZ: U.S.N.M. No. 117408, Mata de Caña, March 24, 1940; U.S.N.M. Nos. 116148–116166, Potrero Viejo, December 14, 1938 to January 9, 1939; U.S.N.M. Nos. 116137–116147, Cuautlapan, January 1–16, 1939, December 20, 1939, January, February and July 1940; U.S.N.M. Nos. 116132–116134, Peñuela, December 19, 1939; U.S.N.M. No. 116135, Presidio, January 10, 1939; and U.S.N.M. Nos. 116127–116131, Tezonapa, January 11–12, 1939. CHIAPAS: U.S.N.M. No. 117407, Palenque, July 6, 1939.

GUATEMALA: U.S.N.M. Nos. 117399-117406, Piedras Negras, Petén, June 24, 1939 to June 2, 1939.

By far the greatest number of these were found in banana trunks, seeking refuge in the axils of the thick, loose outer sheaths of the trunk. The red-trunked banana seems to be the only type that affords such protection. Other varieties for the most part have thin, dry sheaths, which adhere closely to the trunk and afford no protection for animals.

All the specimens from Piedras Negras, and the single one from Palenque, were found in bromelias. Although our observations are not extensive enough to warrant a definite statement, it appears that *B. rufescens* does not occur in the large, vase-shaped bromelias but is restricted to the large varieties having many leaves curving directly out from the base. Near Palenque we looked in many of the vase-shaped bromelias but found only *Bolitoglossa mexicana* in them; the few bromelias found of the other type contained no *B. mexicana* and but one *B. rufescens*. This seeming preference for the spread-leaf variety may depend more truly upon preference for more humid conditions, since that type of bromelia is generally confined to the vicinity of streams and to moist hillsides, while the urn-shaped variety is found on trees wherever they occur on the plains. The plains trees, furthermore, are almost entirely oaks, since these are the only ones which seem to resist the ravages of grass fires that burn unhindered during the dry seasons. Along the streams and on moist hillsides, other types of trees are predominant.

In the region of Potrero Viejo, Veracruz, the predominant large bromelia is the spread-leaf type, and in these we found *B. rufescens* almost exclusively, with rare examples of *Bolitoglossa platydactyla*. Potrero Viejo is situated, it may be remarked, in a very humid area. It is further noteworthy that this humidity does not restrict the abundance of *B. platydactyla*, even though specimens are rarely found in bromelias. They are very common in banana plants. Twenty or thirty miles to the east toward the coast a dry plains region is encountered. Trees are low and scattered, or occur in small groups. Here the vase-shaped bromelia is predominant, and in them we have never found *B. rufescens*, although *B. platydactyla* is abundant. In this region also the edges of streams and hillsides are more heavily wooded, and in such places the spread-leaf bromelia occurs. Very likely these harbor *B. rufescens*, but unfortunately we did not search in many of these plants, since this labor was very poorly repaid in general quality and quantity of specimens, at least compared with the results of work on the urn-shaped variety.

From our observations it is accordingly impossible to state whether humidity is the controlling factor in the apparent restriction of *B. rufescens* to the spread-leaf bromelia, or whether the construction of

the bromelia itself is the important factor. It is quite obvious why *B. platydactyla*, since it is large, does not occur in the spread-leaf bromelias, the leaves of which are so closely placed and narrow that the protection afforded is inadequate. But why *B. rufescens* does not occur in the urn-shaped bromelias, which certainly hold sufficient water, is not so apparent. A possibility is that its thigmotropic sense is involved. Both *B. platydactyla* and *B. rufescens* are positively thigmotropic, as shown by their abundance in banana sheaths. This sense is satisfied for *B. platydactyla* in the urn-shaped bromelia, but perhaps not so satisfactorily for *B. rufescens*. It would be submerged in water if it crawled toward the base far enough to be wedged between the sides of adjacent leaves, while its situation would be precarious if it remained elsewhere, for the leaves are not closely approximated, except toward the top and at the base.

A group of about 30 eggs taken in a bromelia at a point 3 miles north of Huichihuayán, San Luis Potosí, December 12, 1939, contains embryos which are certainly of this or a very closely related species. No adults of this species have been obtained so far north.

BOLITOGLOSSA OCCIDENTALIS Taylor

Bolitoglossa occidentalis TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, Nov. 1, 1941e (Dec.), pp. 145-147, fig. 1c, pl. 9, figs. 1, 2 (La Esperanza, Chiapas).

This form is represented by 33 specimens, including the type, U.S.N.M. No. 111085, from La Esperanza, Chiapas, April 7, 1940, to May 13, 1940; and paratypes, U.S.N.M. Nos. 111068-111084, 111086-111093, topotypes.

This species, with a toothed maxilla, appears to be confined to the Pacific drainage at relatively low elevations. On the Atlantic drainage it appears to be replaced by *B. rufescens*, a form with the maxillary teeth lacking.

All the specimens from La Esperanza were captured at night, crawling on the grass or on *Calladium* leaves at the edge of a small stream. One from Finca Juárez was found crawling along the retaining wall of an irrigation ditch at night.

BOLITOGLOSSA TOWNSENDI (Dunn)

Oedipus townsendi DUNN (part), Proc. Biol. Soc. Washington, vol. 35, 1922, p. 5 (Cerro de los Estropajos, near Jalapa, Veracruz) (the type series includes a specimen [M. C. Z. No. 8018] of *B. dimidiata*).

Bolitoglossa townsendi TAYLOR, Univ. Kansas Sci. Bull., vol. 27, 1941d, p. 107.

Three specimens, U.S.N.M. Nos. 111013-111015, as well as an unnumbered lot containing 10 very young specimens that we believe are of this species, are in the collection from Cuautlapan, Veracruz, secured in July 1940.

Genus **OEDIPINA** Keferstejn, 1868**OEDIPINA LINEOLA** (Cope)

Spelerpes lineolus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 17, 1865a, p. 197 ("Mexican Tableland").

Oedipina lineola COPE, U. S. Nat. Mus. Bull. 32, 1887, p. 8.

A series of 84 specimens was collected. The following are cataloged in the National Museum collection: VERACRUZ: U.S.N.M. Nos. 116387-116396 from Cuautlapan (January, February, and July, 1940), and U.S.N.M. No. 116397 from Metlac, February 9, 1939.

These were found under stones, logs, and in chip piles, in moist situations on hillsides at an elevation of about 2,500 feet.

The locality data "Tehuantepec," borne by U.S.N.M. No. 30353, we regard as highly improbable.

Tails of this form continue growth at least during a considerable part of the life of the animal. The number of caudal vertebrae may reach 60 in very large specimens, while in the half-grown 35 or 40 only may be present.

The type locality suggests that this form is from the plateau, but it is far more probable that the type came from the eastern slope of the plateau at an elevation probably not above 3,500 feet. A specimen at Harvard (M.C.Z. No. 8381) is said to be from Jalapa, which has an elevation of 4,200 feet.

Order **SALIENTIA** Laurenti, 1768Family **RHINOPHRYNIDAE** Günther, 1858Genus **RHINOPHRYNUS** Duméril and Bibron, 1841**RHINOPHRYNUS DORSALIS** Duméril and Bibron

PLATE 21, FIGURE 2

Rhinophrynus dorsalis DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 8, 1841, p. 758, pl. 91, figs. 2, 2a (Veracruz, Veracruz).

Ninety-seven specimens were collected, of which the following are catalogued: CHIAPAS: La Esperanza, May 25, 1940, U.S.N.M. No. 114039; Cruz de Piedra, May 10-11, 1940, U.S.N.M. Nos. 114013-114037; Colonia Soconusco, May 9, 1940, U.S.N.M. No. 114038. OAXACA: Tehuantepec, January 8-11 and March, 1940, U.S.N.M. Nos. 114041-114043. VERACRUZ: Potrero Viejo, June 8, 1939, U.S.N.M. No. 114040.

Most of the specimens were measured, but all bore the characters of *dorsalis*; none of them were of the *rostratus* type, described by Brocchi from Tehuantepec, as having a much longer snout, the eyes closer together, and the nostril midway between eyes and the tip of the snout.

There are, however, remarkable differences in the appearance of the tongue in various specimens. In one, at least, it fills the cavity of the mouth, while in others it appears to be reduced to an organ only a fourth or a fifth of the size of that mentioned. This species has the tongue free anteriorly.

Family PELOBATIDAE Lataste, 1879

Genus SCAPHIOPUS Holbrook, 1836

SCAPHIOPUS COUCHII Baird

Scaphiopus couchii BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 62 (Río Nazas, Coahuila, and Matamoros, Tamaulipas).

Eighteen specimens are from the following localities: CHIHUAHUA: 1 mile south of Ahumada, October 9, 1938 (U.S.N.M. No. 105176); Río Santa María, near Progreso, October 12–14, 1938 (U.S.N.M. Nos. 105162–105175). TAMAULIPAS: Hacienda La Clementina, 4 miles west of Forlón, November 22, 1938 (U.S.N.M. Nos. 105251–106253).

SCAPHIOPUS MULTIPLICATUS Cope

Scaphiopus multiplicatus COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 52 (Valley of Mexico).

Nine specimens were picked up as they hopped along the road at night during a shower, about 13 km. north of Venta del Carpio, México, May 1, 1939 (U.S.N.M. Nos. 114044–114052). These specimens may be regarded as topotypic, since the type locality is not specific, but includes the locality mentioned, which lies about 30 km. north of México (City).

Family BUFONIDAE Hogg, 1841

Genus BUFO Laurenti, 1768

BUFO HORRIBILIS Wiegmann

Bufo horribilis WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 654–655 (vicinity of Veracruz, México).

Bufo marinus KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 53–57, fig. 11.

We are quite convinced that *Bufo marinus* Linnaeus, as generally accepted, comprises species or/and subspecies and is in fact of almost generic significance. However, certain difficulties are involved in properly delineating and naming these forms. In the first place the type localities of *Bufo marinus* and *B. aqua* are unknown except that they are from the Western Hemisphere. *Bufo maculiventris* and *B. lazarus* of Spix are Brazilian, but lack exact localities; *B. ictericus* Spix, however, is cited with Rio de Janeiro as type locality. *B. humeralis* Daudin "existe dans diverses contrées meridional du nouveau continent." He mentions one in the Muséum d'Histoire Naturelle

from Cayenne (French Guiana). This may be presumed to be the type locality for this species.

A second difficulty is that seldom are good series of these great toads collected; and the age, sex, and environmental variations are known for only a few localities.

Wiegmann described *Bufo horribilis* from a series of cotypes from the state of Veracruz, and we are reviving this designation for most of the toads of this group in México aware that there are probably variant populations even here, that may warrant subspecific designations.

A total of 27 specimens was collected, of which the following are cataloged: MICHOACÁN: U.S.N.M. No. 116512, 4 km. north of Apatzingán, March 18, 1939. MORELOS: U.S.N.M. No. 116517, Puente de Ixtla, April 25, 1940. OAXACA: U.S.N.M. Nos. 116536–116537, Tehuantepec, January 1, 1940. TABASCO: U.S.N.M. No. 116523, Tenosique, June 30, 1939. CHIAPAS: U.S.N.M. Nos. 116514–116516, Cruz de Piedra, April 25, 1940; U.S.N.M. Nos. 116518–116522, San Juanito, July 7–19, 1939. GUATEMALA: U.S.N.M. Nos. 116524–116535, Piedras Negras, May 21 to June 22, 1939.

It is possible that more than a single race of this toad is represented, although some of the differences are probably due to age and sex. The most significant differences are in U.S.N.M. No. 116514, a half-grown (110 mm.) specimen from Cruz de Piedra, near Acacoyagua, Chiapas. In this the cranial crests are very low (or perhaps the interorbital region is elevated to near the level of the crest). The interorbital and postorbital crests form continuous curves. No occipital crest; the profile of the snout is curving to the top of head, and is not truncate; the parotoid glands are rather small, and colored like the body. The specimen is a male and the skin is very rough; two other specimens from this locality are juveniles. However, specimens in the E. H. Taylor–H. M. Smith collection from Chiapas show these same unusual head structures.

The Michoacán specimen is very large (139 mm. snout to vent). The rusty-brown parotoid glands are extremely large, triangular, the apex pointing backward. Their greatest length is 48 mm., their width, measured on the curve, 44 mm. The specimen is a male, and the skin is very rough. The snout is sharply truncate, the ridges high and covered with black horn. The interorbital crests are rather angular, and an occipital crest is indicated.

It is of interest to record here four specimens added to the National Museum collections since the publication of Kellogg's summary (1932, p. 57): U.S.N.M. No. 84398, Veracruz, Veracruz; U.S.N.M. No. 84414, Motzorongo, Veracruz; U.S.N.M. No. 84416, Tetecala, Morelos; and U.S.N.M. No. 84418, "Chiapas."

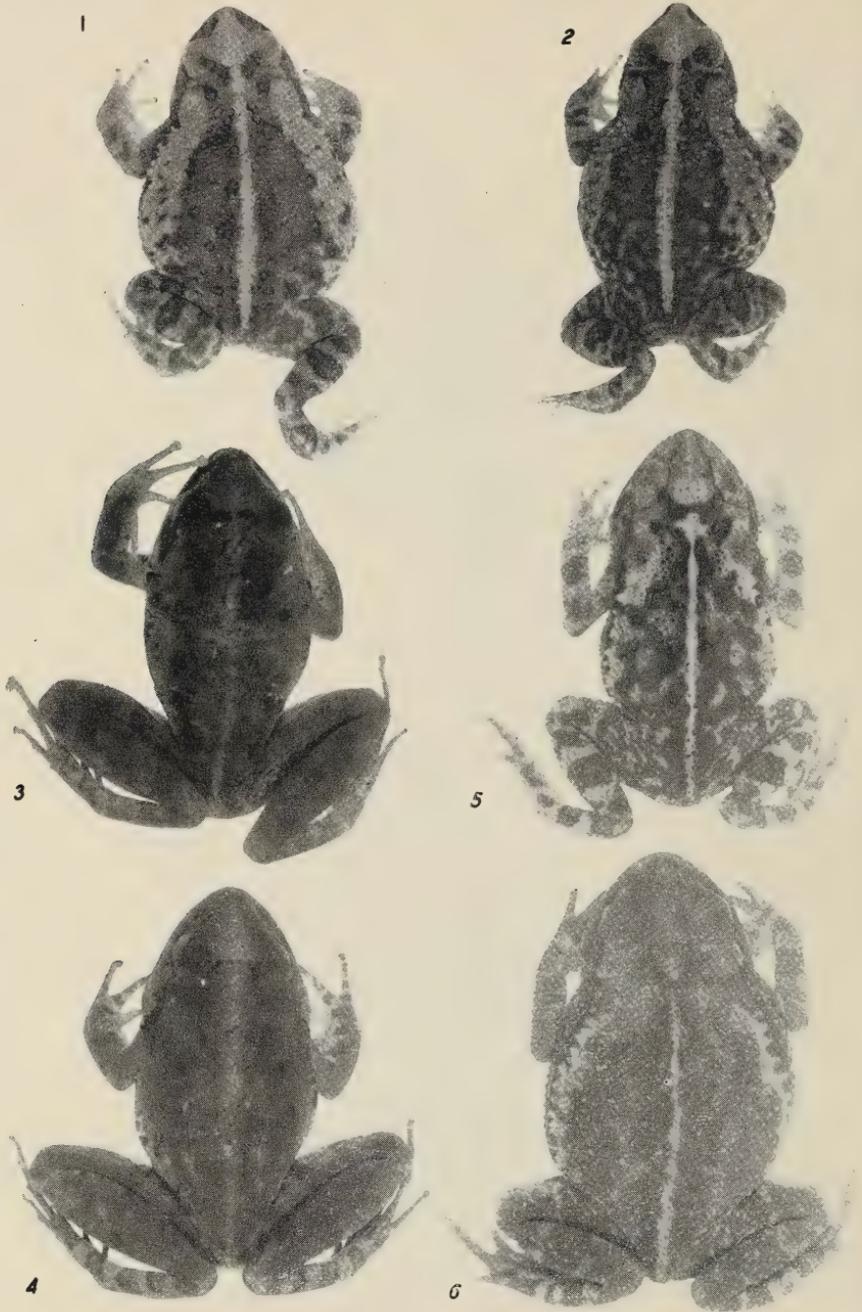


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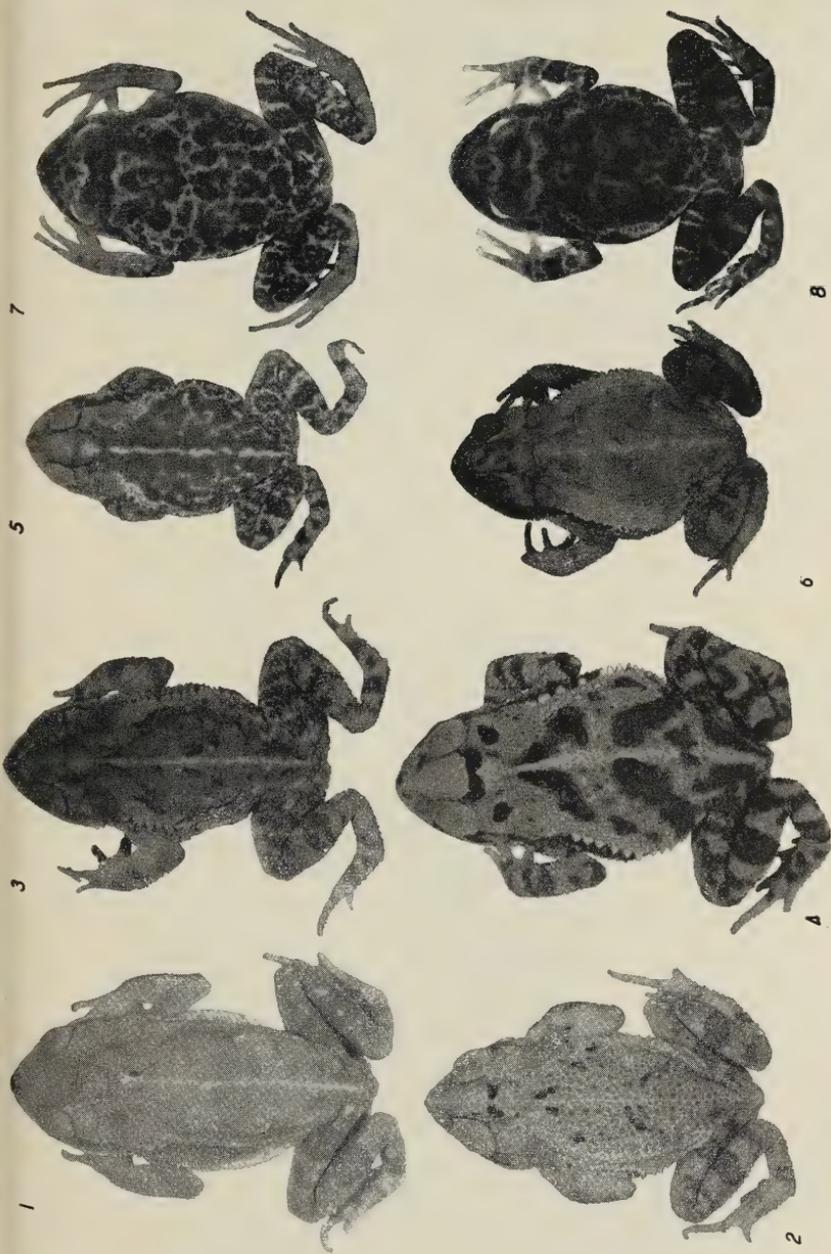


2

Bufo coccifer Cope: 1, E.H.T.-H.M.S. No. 6203, male, from Agua del Obispo, Guerrero, snout-to-vent length 53 mm.; 2, E.H.T.-H.M.S. No. 6197, female, same locality.



- 1, 2, *Bufo marmoreus* Wiegmann: 1, E.H.T.-H.M.S. No. 29834, from 3 miles east of Autlán, Jalisco, snout-to-vent length 88 mm.; 2, E.H.T.-H.M.S. No. 29832, same locality, length 68 mm.
- 3, 4, *Eleutherodactylus rugulosus* (Cope): 3, H.M.S. No. 14677, from Las Nubes, Chiapas, snout-to-vent length 63 mm.; 4, H.M.S. No. 14680, same locality, length 65 mm.
- 5, 6, *Bufo cristatus* Wiegmann: 5, U.S.N.M. No. 117004, from Salto de Agua, Chiapas, snout-to-vent length 58 mm.; 6, U.S.N.M. No. 116998, from Cruz de Piedra, Chiapas.



1-6, *Bufo vaticiceps* Wiegmann: 1, H.M.S. No. 7751, from Piedras Negras, Guatemala, snout-to-vent length 77 mm.; 2, H.M.S. No. 8773, from San Juanito, Chiapas, length 57 mm.; 3, H.M.S. No. 7746, from Piedras Negras, Guatemala, length 67 mm.; 4, H.M.S. No. 7748, same locality, length 65 mm.; 5, E.H.T.-H.M.S. No. 557, from La Clementina, near Forión, Tamaulipas, length 70 mm.; 6, H.M.S. No. 7841, from Piedras Negras, Guatemala.

7, 8, *Eleutherodactylus augusti* (Duges): 7, U.S.N.M. No. 116421, from Agua del Obispo, Guerrero, snout-to-vent length 68 mm.; 8, U.S.N.M. No. 116420, same locality, length 66 mm.



Hyla pachyderma Taylor: 1, U.S.N.M. No. 115028, paratype from Pan de Olla, Veracruz, snout-to-vent length 39 mm.; 2, U.S.N.M. No. 115029, type, same locality, length 49 mm.

BUFO ANGUSTIPES, new species

FIGURE 59

Type.—U.S.N.M. No. 116513, female, collected at La Esperanza, Chiapas, April 7, 1940, by Dr. and Mrs. Hobart M. Smith.

Diagnosis.—A large toad of the *Bufo marinus* group, characterized by having slender limbs; the tibiotarsal articulation reaching the tympanum; the foot elongate, slender; tubercles on body low, indistinct, belly nearly smooth except for indistinct, smooth-surfaced granules; tarsal fold present; tympanum large, subcircular, not encroached upon by the parotoid. Area surrounding tympanum entirely smooth; diameter of tympanum four-fifths of eye; parotoid roughly triangular, moderately large, reddish (see fig.).

Description of type.—Head broad, its width (49 mm.) greater than its length (38 mm. to posterior end of jaw). The longitudinal diameter of the orbit, measured on inner edge of the crests, 16.8 mm.; diameter of eye 11 mm.; diameter of tympanum 8 mm.; length of snout 12 mm.; width of an eyelid (9 mm.) twice in interorbital distance; snout truncate; choanae large, the palatal glands opening by two outlets near the inner edge of choanae; palatine with dentate rugosities; tongue narrow, elongate, subquadrangular.

Parotoid smooth, moderate, its length (34 mm.) slightly less than length of head; its width measured on the curve, 32 mm.; skin over body smooth, with a few smooth tubercles; hindlimbs with low, indistinct, smooth tubercles; ventral surfaces smooth, with slight indication of fine granulation in posterior abdominal region.

Limbs slender; digits likewise slender; first finger longer than second; second slightly shorter than fourth; inner palmar tubercle moderate, outer (medial) very large, nearly as wide as long; outer tubercle on third finger not distinctly bifid; toes about one-third webbed, the subarticular tubercles indistinct; inner metatarsal tubercle small, flat; outer small, rather indistinct.

Measurements.—For purposes of comparison, after the measurements (in mm.) of the type of *B. angustipes* we give those for a specimen of comparable size of *B. horribilis* from Chiapas (E.H.T.-H.M.S. No. 3880). Both specimens are females. Snout to vent, 127, 133; width of head, 47, 45; length of head, 31, 33; width between supratympanic crests, 43, 40; length of bony orbit (inside crests), 18, 15.5; height of tympanum, 7, 8; length of same, 5.5, 6.5; length of parotoid, 34, 38; arm, 76, 68; leg, 162, 147; femur, 50, 47; foot, 79, 67; elevation of snout at front of eye, 13.5, 15.8.

Remarks.—That this is a very different form from *Bufo horribilis* of Veracruz, or the variety occurring in Chiapas, is evident. It likewise differs from more southern "*Bufo marinus*." We suspect it to be a much smaller species than either *horribilis* or "*marinus*."

A single young specimen of this species, from Chiapas, was discovered in the E.H.T.-H.M.S. collection but was inadvertently lost

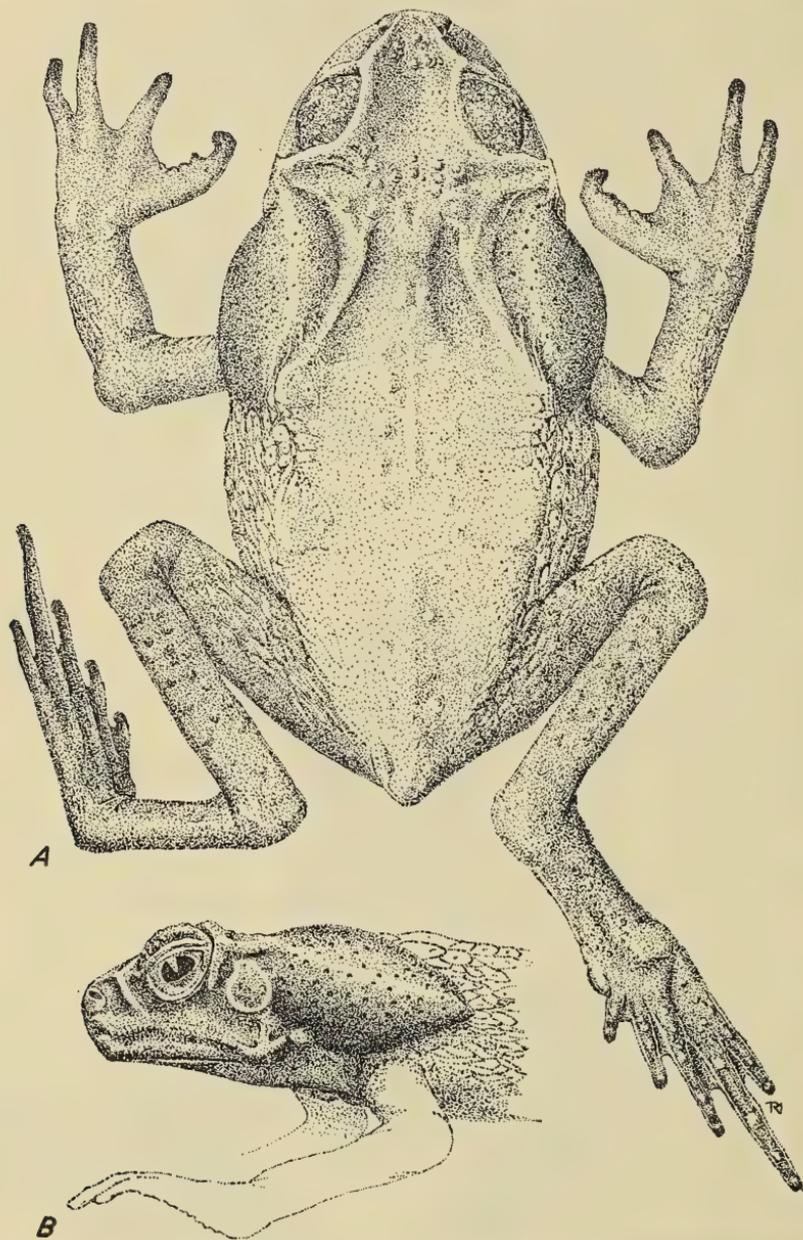


FIGURE 59.—*Bufo angustipes*, new species: Type, U.S.N.M. No. 116513, female, La Esperanza, Chiapas; snout to vent length, 127 mm. A, Dorsal view; B, side of head.

when being taken to be photographed. The specific differences were marked. Even the head was distinctly larger than that of the young

of the Chiapas form of *horribilis*; and the large tympanum with elevated border was evident.

The type was found at night walking (not hopping) about on the ground deep in a newly cut cafetal. No other specimens of this group were seen under similar conditions, although in more open areas, as around human habitations and in cleared fields, they (*horribilis*) were common.

BUFO PERPLEXUS Taylor

Bufo perplexus TAYLOR, Univ. Kansas Sci. Bull., vol. 29, 1943b, pp. 347-349, pl. 27, figs. 1, 2 (Balsas River near Mexcala, Guerrero).

The following specimens in the collection are paratypes: U.S.N.M. No. 116564, Puente de Ixtla, Morelos, September 5, 1939; U.S.N.M. Nos. 116565-116568, Tehuantepec, Oaxaca, May, 1940.

In this form there is a strong color pattern dimorphism between the sexes. The species is smaller than *B. marmoreus*, with which it is sometimes confused. Its distribution as known at present is Morelos, Guerrero (northern and central parts), Oaxaca, and Chiapas—all on the Pacific drainage.

BUFO PUNCTATUS Baird and Girard

Bufo punctatus BAIRD and GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, 1852, p. 173 (Río San Pedro, tributary of the Río Grande del Norte, Texas).

The following specimens, 13 in number, are in the collection: U.S.N.M. No. 106144, 31 miles south of Chihuahua, Chihuahua, October 26, 1938; U.S.N.M. No. 115487, Sabinas Hidalgo, Nuevo León, April 29, 1939; and U.S.N.M. Nos. 115488-115498, 15 miles west of Galeana, Nuevo León, October 13-14, 1939.

All the specimens show black punctations on chin, breast, and anterior part of abdomen. They usually lack the reddish spots present in western American specimens. The single male has the vocal slit sinistral.

BUFO MARMOREUS Wiegmann

PLATE 23, FIGS. 1, 2

Bufo marmoreus WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, p. 661 (Veracruz, México).

The collection contains five specimens. Four young individuals are from Guerrero, México: U.S.N.M. Nos. 116560-116561, Tierra Colorada, August 31, 1939; and U.S.N.M. Nos. 116562-116563, Acapulco, September 3, 1939. These are females having the typical coloration. A single specimen, U.S.N.M. No. 116569, is from Escurana, Oaxaca (15 km. west of Tehuantepec), May, 1940.

The sexual dimorphism in this species is especially great. In a series we have examined, in the E.H.T.-H.M.S. collection, we find that the females have a median, rather broad dorsal stripe, with a

series of paired dark spots (often with lighter edges) more or less symmetrically arranged along the back. The spots of the first pair cross the upper eyelid and are closely approximated in the interorbital region, but rarely meet to break the continuity of the median light stripe or line. The other dark spots are variable in size, there being, usually, three pairs on the back. The anterior of these is largest and posterior ones vary in distinctness and size. There is usually a more or less distinct, broad, irregular stripe on the side running somewhat diagonally, while bordering this below or laterally, the side is variously marbled or mottled.

Males, on the other hand, are more or less uniform gray-green or gray-olive on the head and back. The limbs are very strongly striped with light and dark (which in the females is usually not so pronounced). In consequence of the uniform background the pustules of the back stand out strongly. These bear dark brown tubercles or spines. The latter are confined to the back, while the pustules on the sides are as smooth as those of the female. The sides are usually mottled with dark and lighter markings, the dark sometimes almost black, as are the dark stripes on the limbs on occasion.

This form in the past has been confused with the recently described *Bufo perplexus* Taylor.

BUFO WOODHOUSII WOODHOUSII Girard

Bufo woodhousii GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 86 ("New Mexico" = San Francisco Mountain, Coconino County, Ariz.).

Bufo woodhousii woodhousii SMITH, Amer. Midl. Nat., vol. 15, 1934, pp. 449-457, pls. 17, 22B, 23B.

Two young specimens (U.S.N.M. Nos. 105158) are from Río Santa María, Chihuahua, October 13, 1938.

BUFO COMPACTILIS Wiegmann

Bufo compactilis WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 661-662 (México [probably from the region about México (City)]).

The following localities are represented, by seven specimens: U.S.N.M. No. 116416, Mamulique Pass, Nuevo León, April 29, 1939; U.S.N.M. Nos. 116417-116419, La Palma, Michoacán, March 23, 1939; U.S.N.M. Nos. 116413-116414, 40 km. north of México (City), in the state of México, May 1, 1939; and U.S.N.M. No. 116415, Santa Magdalena, near Texcoco, México, August 23, 1939.

The northern specimen is young and cannot be compared well with the southern specimens. The three from Michoacán have the pustules and intervening skin somewhat less rough than those from the environs of México (city). In the largest of these latter specimens, U.S.N.M. No. 116413 (female, 78 mm.), the crests are distinct and provided with spots of horn along their surface. In most of the other specimens the crests are indistinct or not discernible.

Since Kellogg's list (1932, pp. 44-48) appeared, one other specimen of interest has been added to the National Museum's collection, from San Juanito, Chihuahua (U.S.N.M. No. 95603).

BUFO CANALIFERUS Cope

PLATE 21, FIGURE 1

Bufo canaliferus COPE, Proc. Amer. Philos. Soc., vol. 17, No. 100, July 20, 1877, p. 85 (Tehuantepec, Oaxaca, México).

A large series, 129 specimens, of this species was obtained in the state of Chiapas; the following are cataloged: U.S.N.M. Nos. 115983-115992, Cruz de Piedra, April 21 to May 11, 1940; U.S.N.M. Nos. 115993-116002, Colonia Soconusco, April 14 and May 9, 1940; U.S.N.M. Nos. 116003-116022, La Esperanza, April 14 to June 3, 1940; U.S.N.M. No. 116923, Rancho Las Gradass, 3 km. northeast of La Esperanza, May 20, 1940; and U.S.N.M. No. 116924, Tonalá, Chiapas, January 26-30, 1940.

This small species seems to be confined to the southern part of México (for the most part south and east of the Isthmus of Tehuantepec) and northern Central America (Guatemala). We regard the Orizaba, Veracruz, record given by Kellogg (1932, p. 40) as doubtful.

The more obvious pattern variations do not seem sex-linked. Usually large dark spots are present on each side of the middorsal line, but some specimens have the dorsal surfaces unspotted and nearly uniform saffron-yellow. The largest male is 44 mm. Eight males have the vocal slit sinistral, six dextral. The largest female is 55 mm. snout to vent.

In Chiapas the species is extremely common during the rainy season. It occurs in dense forest as well as on open plains.

Five young specimens from Tapaná, Oaxaca (U.S.N.M. No. 10036), referred by Kellogg (1932, p. 41) to this species, actually are *marmoratus*.

BUFO SIMUS Schmidt

Bufo simus SCHMIDT, Denkschr. Akad. Wiss. math.-naturw. Classe Wien, vol. 14, 1858, pt. 2, pp. 254-255, pl. 3, fig. 22 (Chiriquí River, in the vicinity of Bocas del Toro, Panamá).

Of seven specimens, six (U.S.N.M. Nos. 116538-116543) are from Tecamachalco, September 16, 1939, and one (U.S.N.M. No. 116544) from San Diego, Puebla, December 17, 1939.

Two of the males have the vocal slit dextral; two have them present on both sides. In four of the specimens the skin, while pustulous, is very soft and smooth to the touch. Of these, two are males, two females; two others of the series from the same locality are rough with horny spines on the pustules. The tympanum is distinct but varies somewhat; in some it is more elongate oval than in others.

Added to the National Museum since the appearance of Kellogg's list (1932) are U.S.N.M. No. 63868 from "Colima" and U.S.N.M. Nos. 84399-84402 from Oaxaca, Oaxaca.

BUFO INSIDIOR Girard

Bufo insidiosus GIRARD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 88 (Chihuahua, México).

A large series (55 specimens) of this common species was obtained in Chihuahua: U.S.N.M. Nos. 105102-105108, 1 mile south of Villa Ahumada, October 9, 1938; and U.S.N.M. Nos. 105109-105156, Río Santa María, near Progreso, October 13, 1938

Of 14 males examined the vocal slit is sinistral in four, dextral in nine, and both sinistral and dextral in one specimen.

Rugosities ("teeth") are present on the palatine bone, appearing above the gum in adult specimens.

BUFO COCCIFER Cope

PLATE 22

Bufo coccifer COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, 1866b, p. 130 (Arriba, Costa Rica).

Five specimens, U.S.N.M. Nos. 115482-115486, were secured at Agua del Obispo (Kilometer 351), Guerrero. Some were calling at night (August 31, 1939), and others were taken from under stones in the daytime.

One is a female, four are males. The latter show dim spotting on the venter, and there is a transverse dark area on the neck. The vocal slit is sinistral in three males, dextral in one. The female measures 62 mm., the largest male 57 mm., from snout to vent.

BUFO COGNATUS Say

Bufo cognatus SAY, in James, Account of an expedition from Pittsburgh to the Rocky Mountains, vol. 2, 1823, p. 190 (Arkansas River, Prowers County, Colo.).

In all, 127 specimens, from the following localities: CHIHUAHUA: Río Santa María near Progreso, October 13-14, 1938 (U.S.N.M. Nos. 105056-105081); 1 mile south of Villa Ahumada, October 9, 1938 (U.S.N.M. Nos. 105082-105101); 3 miles east of Carmen, October 22, 1938 (U.S.N.M. No. 106143). COAHUILA: 13 miles west of San Pedro, November 5-9, 1938 (U.S.N.M. Nos. 106164-106226). DURANGO: 10 miles south of Escalón, Chihuahua, November 29, 1938 (U.S.N.M. No 106145); 10 miles north of Gómez Palacio, October 29, 1938 (U.S.N.M. No. 106146-106161).

BUFO CRISTATUS Wiegmann

PLATE 23, FIGURES 5, 6

Bufo cristatus WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 660-661 (Jalapa, Veracruz).

The following specimens, 30 in number, were collected: VERACRUZ: Cuautlapan, January 1-16 and September 25, 1938, and January to February, 1940 (U.S.N.M. Nos. 116545-116558); San José de Gracia September 26, 1940 (U.S.N.M. No. 116559); Potrero Viejo, December 13, 1938 and June 17, 1939 (U.S.N.M. Nos. 116990-116992). CHIAPAS: Cruz de Piedra, April 25 to May 15, 1940 (U.S.N.M. Nos. 116994-117003); Salto de Agua, May 19, 1940 (U.S.N.M. No. 117004); Colonia Soconusco, May 23, 1940 (U.S.N.M. No. 117005).

The species is not at all rare in the region about Cuautlapan. Specimens were taken (August 19) in the village street and in a pool a few hundred yards south of town and at an elevation about 300 feet higher. *Bufo horribilis*, *Bufo valliceps*, *Agalychnis moreletii*, *Hyla rickardsi*, *Hyla staufferi*, *Hyla baudinii*, *Hylella picta*, and *Microhyla usta* were taken in the same pool (Taylor). Claspings pairs of *cristatus* were taken but no eggs were found.

The color of the males is variable above, some dark olive to greenish yellow with dark markings, occasionally reddish brown; parotoids the same color as the body; chin yellowish with a bluish or blackish area on the vocal sac; venter dirty flesh to white, with olive reticulations on the breast and anterior part of abdomen; occasionally a wash of yellow over the ventral surfaces; upper lip cream.

Females often show indefinite patterns above with dark spots along the sides of the median line. Two are very dark above so that the dark spots are seen with difficulty.

The young are of two types; one very dark above, with the chin, throat, and abdomen also dark. The underside of the thigh is lighter flesh. The ventral tubercles are tipped with yellow, and there are a few tiny yellow spots on the back part of the abdomen. The others are lighter, uniform or variegated brown, light gray or brownish gray. An interorbital bar and a few more or less symmetrically placed spots of dark (the largest usually on the rump) are present. These are usually yellow below, with dark reticulation.

The two largest specimens measure 90 mm. from snout to vent. One is light variegated brownish olive above, the other is nearly black. Both are females.

BUFO VALLICEPS Wiegmann

PLATE 24, FIGURES 1-6

Bufo valliceps WIEGMANN, Isis von Oken, vol. 26, pt. 7, 1833, pp. 657-659 (México).

Eighty-four specimens were secured; the following are cataloged in the Museum collection: CHIAPAS: U.S.N.M. Nos. 116960-116965,

116972, San Juanito, near Palenque, July 7-23, 1939; U.S.N.M. Nos. 116967-116971, ruins of Palenque, near Palenque, July 10, 1939. TABASCO: U.S.N.M. No. 116986, Tenosique, June 30, 1939; U.S.N.M. Nos. 116987-116989, Santo Tomás. HIDALGO: U.S.N.M. Nos. 116984-116985, 6 km. south of Santa Anita, October 10, 1939. TAM-AULIPAS: U.S.N.M. No. 106254, Hacienda La Clementina, 4 miles west of Forlón, November 22, 1938; U.S.N.M. No. 106255, Villagrán, December 17, 1938. GUATEMALA: U.S.N.M. Nos. 116981-116982, Pozo de la Jicotea, 5 miles south of Piedras Negras, June 3, 1939; U.S.N.M. Nos. 116973-116980, 116983, Piedras Negras, May 21 to June 2, 1939.

The series from the northern part of the range differs rather considerably from those in the southern part of the range. One of those from Hidalgo (northern) is by far the largest specimen, having a snout-to-vent length of 100 mm. It likewise is from an elevation probably higher than any other specimen (4,500 feet). The fringe on the toes is greater than obtains in the southern specimens (Tabasco, Campeche, Guatemala, etc.), and the outline of the anterior part of the head is distinctly rounded.

Of the southern specimens the largest measured 80 mm. In these there is less dorsal marking, many of the specimens being largely amber or clay-colored above, with slight interorbital dark spots or a narrow bar and with a few dark flecks on back somewhat symmetrically arranged; the bars on the legs are dim.

The series from the Palenque ruins is composed entirely of young, 20.5 mm. to 27.5 mm. in length; all have the skin of the venter smoother and with much more dark pigment than occurs in other specimens.

When the young of a northern specimen is compared with the southern there are noticeable differences in the character of tubercles, especially the dorsolateral row, in the shape of the snout, the elevation, and size of the tympanum. The crests appear at an earlier age (smaller size) in southern specimens.

Though this southern form is probably separable from the northern, the matter cannot be decided now. Moreover, granted that it is separable, the types would need to be examined to ascertain whether the name *valliceps* should apply to the northern or southern form. If to the latter the name *nebulifer* Girard would be available for the northern form.

Acquisitions to the National Museum since Kellogg's list appeared (1932, p. 71) include No. 83394, Matamoros, Tamaulipas; No. 84418, Motzorongo, Veracruz; and No. 84417, Puebla, Puebla (probably an erroneous locality as the species is unknown on the high plateau). Since *valliceps* does not occur north of the Isthmus of Tehuantepec on Pacific

slopes, we suggest that U.S.N.M. Nos. 46948–46949 from Acapona, Nayarit, belong to the recently described *Bufo mazatlanensis* Taylor (1940g, pp. 492–492, pl. 53, fig. 1, pl. 54).

Family LEPTODACTYLIDAE Berg, 1896

Genus ENGYSTOMOPS Jiménez de la Espada, 1872

ENGYSTOMOPS PUSTULOSUS (Cope)

Paludicola pustulosa COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 16, Aug. 1864, p. 180 (New Granada on the River Truando, Colombia).

Engystomops pustulosus BOULENGER, Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, ed. 2, 1882, p. 275.

Seven specimens of this diminutive toadlike species were acquired, U.S.N.M. Nos. 116482 and 116483 at Tenosique, Tabasco, June 30, 1939; U.S.N.M. No. 116486 at Potrero Viejo, Veracruz, July 3, 1939; U.S.N.M. Nos. 116484, and 116486–7 at Tehuantepec, Oaxaca, January 6 and March, 1940; and U.S.N.M. No. 116485 at Tonalá, Chiapas, January 26–30, 1940.

Specimens we have examined from the more northern localities about Potrero and to the east of Jalapa (E.H.T.–H.M.S. collection) are a little smaller on the average, but this is due to the larger number of males. There are apparently no constant differences worthy of nomenclatorial recognition in the various Mexican specimens. We have not examined a series from the type locality and it may well be that the Mexican form is not identical with that from Colombia.

Genus LEPTODACTYLUS Fitzinger, 1826

LEPTODACTYLUS MELANONOTUS (Hallowell)

Cystignathus melanonotus HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia, vol. 12, 1860, p. 485 (Nicaragua).

Leptodactylus melanonotus BROCCHI, Mission scientifique au Mexique et dans l'Amérique centrale, Batrachia, 1881, p. 20.

In all, 317 specimens were collected, from the following localities: CHIAPAS: Various localities in the vicinity of La Esperanza (Acacoyagua, Colonia Hidalgo, Colonia Soconusco, Cruz de Piedra, Rancho las Gradass) and La Esperanza, April 14 to May 23, 1940 (U.S.N.M. Nos. 114326–114337; 114345–114390); Tonalá, January 26–30, 1940 (U.S.N.M. Nos. 114338–114344). GUERRERO: 5 km. north of Acapulco, February 9–10, 1939 (U.S.N.M. Nos. 114235–114239); Tierra Colorada, February 12–13, 1939, and August 31, 1939 (U.S.N.M. Nos. 114240–114245); 8 km. east of Coyuca, February 7, 1939 (U.S.N.M. Nos. 114232–114234). MICHOACÁN: 4 km. north of Apatzingán, March 14–18, 1939 (U.S.N.M. Nos. 114246–114263). OAXACA: Various localities in the vicinity of Tehuantepec (Cerro Arenal, Cerro Guengola, Cerro de Huamelula) and Tehuantepec, January 2–May,

1940 (U.S.N.M. Nos. 114272-114325). TABASCO: Tenosique, June 30 to August 25, 1939 (U.S.N.M. Nos. 114264-114271). GUATEMALA: Pozo de la Jicotea, near Piedras Negras, June 3, 1939 (U.S.N.M. No. 114391).

LEPTODACTYLUS LABIALIS (Cope)

Cystignathus labialis COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 90 (México).
Leptodactylus labialis BROCCHI, Mission scientifique au Mexique et dans l'Amérique centrale, Batrachia, 1881, p. 20, pl. 5, fig. 1.

Twenty-two specimens are from the following localities: CHIAPAS: Palenque, July 10-23, 1939 (U.S.N.M. Nos. 114219-114224); vicinity of La Esperanza, April 25 to June 4, 1940 (U.S.N.M. Nos. 114225-114228). OAXACA: Matías Romero, January 25, 1940 (U.S.N.M. No. 114231); Tehuantepec, January 14 and 25, 1940 (U.S.N.M. Nos. 114229-114230). TABASCO: Tenosique, June 30, 1939 (U.S.N.M. Nos. 114217-114218). VERACRUZ: Potrero Viejo, December 27, 1938, January 1 and September 26, 1939 (U.S.N.M. Nos. 114210-114216).

Genus MICROBATRACHYLUS Taylor, 1940

MICROBATRACHYLUS HOBARTSMITHI (Taylor)

Eleutherodactylus hobartsmithi TAYLOR, Trans. Kansas Acad. Sci., vol. 39, 1936 (July 2, 1937a), pp. 355-357, pl. 1, figs. 5-6 (Uruapan, Michoacán).
Microbatrachylus hobartsmithi TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (1940g), pp. 501-502.

The collection contains a single specimen from 10 miles west of Villa Victoria, México, México, March 6, 1939 (U.S.N.M. No. 115481). Field notes record that the concealed surfaces of the thigh, shank, and foot, as well as the ventral surfaces of the hindlegs, are pink; dorsal surface of head and areas on back and dorsal surfaces of legs are green.

MICROBATRACHYLUS IMITATOR Taylor

Microbatrachylus imitator TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 70-71, pl. 6,¹ figs. 1, 1a, 1b, 1c (La Esperanza, Chiapas).

The type and one paratype, U.S.N.M. No. 115508 from La Esperanza, Chiapas, May 15, 1940, and U.S.N.M. No. 115700 from Colonia Hidalgo, 8 km. north of La Esperanza, Chiapas, April 14, 1940, are the only known specimens. The species is diminutive; the type measures 14.2 mm., the paratype only 10 mm. The coloration mimics that of *Eleutherodactylus dorsoconcolor* Taylor.

MICROBATRACHYLUS MINIMUS Taylor

Microbatrachylus minimus TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (1940g), pp. 507-508, pl. 56, figs. C and D (Agua del Obispo, Guerrero).

This species is represented in the collection by a series of 17; of these 13 are from Potrero Viejo, Veracruz (December 13-21, 1938), three

¹ The figure of the type purports to be U.S.N.M. No. 17137. This is a field number, and is now No. 115508 of the permanent series.

specimens are from Cuautlapan (January to February, 1940), and a topotypic specimen is from Agua del Obispo, Guerrero, August 31, 1939.

The Potrero specimens (U.S.N.M. Nos. 115446–115458) seem to agree very well with the type from Guerrero. The dark markings on the occiput are more clearly a pair of stripes which begin on the inner edge of the orbits and tend to meet shortly on the median line, forming a V. In certain topotypic specimens this may be represented by a black spot. A few other differences may be due to preservation. The dorsal coloration is usually nearly uniform, varying from clay to light brown in different specimens. A hair-fine median dorsal line is present or indicated in most of the specimens. The sides are variegated, darker than the back. The dorsal coloration is frequently limited by a black, discontinuous line. The inguinal gland is larger than that in *pygmaeus*, which occurs in the same locality.

The two specimens from Cuautlapan (U.S.N.M. Nos. 115459–115460) show the ridges, folds, and tubercles rather strongly, probably due to having been preserved in formalin. U.S.N.M. No. 115446, from Agua del Obispo, Guerrero, is a topotype.

MICROBATRACHYLUS ALBOLABRIS Taylor

Microbatrachylus albolabris TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g, first mailing), pp. 502–504, pl. 56, figs. A, B (2 miles west of Córdoba, Veracruz).

The collection contains 18 specimens from Potrero Viejo (December 14–21, 1938), and Cuautlapan, Veracruz (January to February 1940); La Esperanza, Colonia Hidalgo, and Salto de Agua (Mount Ovando) (April 11–18, 1940), Chiapas.

The southern specimens differ somewhat from the northern ones but perhaps no more than the northern specimens differ among themselves, except that the digital disks of fingers and toes are very slightly narrower. The present known distribution includes southern Veracruz, southern Guerrero, and southern Chiapas. They occur usually in low mountains or foothills. The specimen from Salto de Agua is from an elevation of 1,200 feet, those from Cuautlapan from about 2,500 feet.

Potrero Viejo: U.S.N.M. Nos. 115462–115466. These are preserved in weak alcohol and have absorbed too much liquid. They have in consequence an overstuffed appearance and the tubercles and ridges are nearly obsolete. In spite of having been collected in the daytime, the specimens are very light colored.

Cuautlapan: U.S.N.M. Nos. 115467–115476. These were taken in daytime also and preserved in formalin; in consequence, the ridges and tubercles stand out very strongly. They are darker but the essential pattern is evident, and several have the median hair-fine line and the trifoliate or quadrifoliate light mark on the head.

Salto de Agua: U.S.N.M. No. 115479. This specimen is very close to the Potrero Viejo specimens. The head is darker, but under water the variation between the black lines and the somewhat lighter color of the interorbital region is evident. The venter is cream and the white labial line continues back on the arm. The labial light line is bordered below by a black line. Collected at night.

La Esperanza: U.S.N.M. No. 115477. Similar to the above. The pigment under the tibia is a little thicker, and encroaches more on underside of the femora. The skin is rather smooth as in the previous specimen, probably due to manner of preservation. There is scarcely a trace of a dark line below the labial light line.

Colonia Hidalgo: U.S.N.M. No. 115478. This specimen seems to differ from the typical more than any of the others. There is a dark interorbital bar, and there is more pigment everywhere save on the median dorsal line, which normally is darker than the sides. The specimen was dead when preserved, and the toes are somewhat shriveled. The dorsal folds are typical. The cream labial line is bordered below by a black line.

MICROBATRACHYLUS MONTANUS Taylor

Microbatrachylus montanus TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 67-69, pl. 6,² figs. 2, 2a, 2b, 2c (Mount Ovando, Chiapas).

The type, U.S.N.M. No. 115507, a large female, was obtained at about 6,000 feet elevation on Mount Ovando, April 15, 1940. Four paratypes, U.S.N.M. Nos. 115701 and 115480, La Esperanza, April 11, 1940; U.S.N.M. No. 115702, Las Nubes, April 15, 1940; and E.H.T.-H.M.S. No. 27846, Salto de Agua, April 18, 1940, were also collected in Chiapas.

This species is the largest one known of the genus, the female type measuring 27 mm. from snout to vent.

MICROBATRACHYLUS OAXACAE Taylor

Microbatrachylus oaxacae TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g, mailing date), pp. 504-507 (Cerro San Felipe, Oaxaca, Oaxaca).

Two topotypic specimens from Cerro San Felipe, Oaxaca, July 10-20, 1940, U.S.N.M. Nos. 115444 and 115445, and a third specimen, U.S.N.M. No. 115443, from Lachiguirí, Oaxaca, January 20, 1940, are in the collection.

The feature by which this form may be most readily distinguished is the presence of an outer palmar tubercle. The limb is longer, and the tibiotarsal joint reaches beyond the snout.

² The National Museum number published for this type specimen is 14772. This is a field number. The permanent number is U.S.N.M. No. 115507.

MICROBATRACHYLUS PYGMAEUS (Taylor)

Eleutherodactylus pygmaeus TAYLOR, Trans. Kansas Acad. Sci., vol. 39, 1936 (July 2, 1937a), pp. 352-354, pl. 1, figs. 3, 4 (Rodríguez Clara, Veracruz).
Microbatrachylus pygmaeus TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1940g, pp. 500-501.

Two large series were taken, one from the north in the regions about Potrero Viejo and Cuautlapan, Veracruz, the other from the south, in Chiapas. A smaller series, somewhat less typical, was collected in Guerrero. In all, 237 specimens were secured.

Potrero Viejo specimens (U.S.N.M. Nos. 116840-116842; 116864-116870), collected from December 13, 1938, to January 9, 1939, are relatively uniform in character. There is the merest trace of a web between the toes; the digits are moderately dilated at the tip; and the skin is slightly pustular and corrugated. There is usually a single indistinct supernumerary tubercle on the sole in advance of the outer metatarsal tubercle.

In specimens from Cuautlapan, collected from January 4 to 16, 1939, and in January and February, 1940 (U.S.N.M. Nos. 116871-116875) the skin appears very much rougher, presumably because of its long preservation in strong formalin.

The southern specimens are from the following localities: OAXACA: U.S.N.M. No. 116826, Matías Romero, January 25, 1940. CHIAPAS: U.S.N.M. Nos. 116831-116833, La Esperanza, April 11 and May 18, 1940; U.S.N.M. Nos. 116834-116837, Colonia Hidalgo, April 14, 1940; U.S.N.M. Nos. 116838-116839, Colonia Soconusco, April 14 and May 10, 1940; U.S.N.M. Nos. 116843-116854, Las Nubes, Cerro Ovando, April 15, 1940; U.S.N.M. Nos. 116828-116830, Finca Juárez, May 8-10, 1940; U.S.N.M. No. 116827, La Magnolia, May 23, 1940; U.S.N.M. Nos. 116855-116863, Salto de Agua, Mount Ovando, April 18 to May 19, 1940.

These latter specimens vary more among themselves than the northern forms, perhaps because they are from a greater variety of elevations.

The skin is apparently less pustular and less corrugated than in those from the northern part of its range, but this may be due to method of preservation. A few specimens have an irregular, diagonal, black-edged whitish stripe on the side. The single supernumerary tubercle on the sole is absent and there is usually a little more pigment on the venter.

The series from Guerrero, U.S.N.M. Nos. 116817-116825, August 31, 1939, resembles the specimens from Veracruz more than those from Chiapas. The skin is usually pustulate and corrugated, and the pigment on the venter is not dense. One specimen has a broad median light stripe. This same character has been observed in two Cuautlapan, Veracruz, specimens, but it is of rare occurrence.

Genus **ELEUTHERODACTYLUS** Duméril and Bibron, 1841**ELEUTHERODACTYLUS ALFREDI** (Boulenger)

Hylodes alfredi BOULENGER, Proc. Zool. Soc. London, 1898, pp. 480-481, pl. 39, fig. 1 (Atoyac, Veracruz, México).

Eleutherodactylus alfredi KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, p. 99.

This species has been found to be relatively common in the general region about Córdoba. Our series of 76 specimens was acquired at Cuautlapan, Veracruz, January 2-16, 1939, January to February and August 7-14, 1940, a few hundred feet higher than the type locality of Atoyac, which lies to the northeast about 30 km. Specimens here were taken below the sheaths of banana leaves. U.S.N.M. Nos. 116491-116505 are cataloged.

The species attains a known maximum size of 45 mm., there being one female of this length; the largest known male is 30.2 mm. The width of the toe disks is greater than the tympanum in the females, smaller in the males. Measurements of a large female and a large male show the following: Tympanum, in female, 2.45 mm., about half the length of eye (5.1 mm.); largest finger disk, 2.8 mm. Of the male, the tympanum, 3.1 mm., about three-fourths of eye (4 mm.); largest finger disk, 2 mm.

The variation in color is not great. In life the specimens are olive, gray, or olive-brown, rarely somewhat greenish. Young males show some dorsal pattern that is more or less symmetrically placed; but it is almost entirely lost in adults. In these the pigment is rather evenly distributed with a faint suggestion of a dark interorbital region. While young specimens show some bars on the legs, they are obsolete in adults; some of the larger females show some scattered cream flecks.

The inner tarsal fold is present, extending nearly half the distal length of tarsus. It is distinctly lateral and not conspicuous. There is no evidence of the inguinolumbar gland or the axillary gland, nor is there a parotoid. If these glands are present they are diffused. The vomerine teeth are well developed, and the tongue is subcircular and somewhat emarginate behind. The dorsum lacks ridges and tubercles except that a trace of a dorsolateral ridge is often evident; however, the back is minutely tubercular seen under the lens. The ventral disk is absent or barely indicated, and only the edges of the venter show any areolation.

Preserved specimens may be light gray to dark brown; the underside of the hindlimbs and the posterior part of the femur are rather heavily pigmented; only the median abdominal region may lack pigment. One character seemingly invariable and usually evident in preserved specimens is the grayish center of the tympanum. This in turn is surrounded by a brownish ring, while the edge of the tympanum is grayish.

ELEUTHERODACTYLUS CONSPICUUS, new species

FIGURE 60, A

Type.—U.S.N.M. No. 116509, collected at Piedras Negras, Guatemala, near the México-Guatemala border, by Dr. and Mrs. Hobart M. Smith, May 29, 1939.

Paratypes.—U.S.N.M. Nos. 116506–116508, 116510–116511, and E.H.T.-H.M.S.No. 29807. Topotypes. Same collectors, May 24 to June 10, 1939.

Diagnosis.—Related to *Eleutherodactylus alfredi* and, like that form, lacking a vocal sac and having the tips of the digits strongly dilated. Differing from *alfredi* in lacking a tarsal fold, in having shorter hindlegs with the tibiotarsal articulation reaching only to the nostril instead of beyond the snout tip; the vomerine teeth barely reach the posterior level of the choanae, instead of to the middle of the choanae. The color and markings are different.

Description of the type.—Adult female. Head length (18 mm.) a little greater than width (16.5 mm.); width of an eyelid a little less than the interorbital width, which is in turn one-fourth greater than the distance between the nostrils, and about two-thirds the distance between eye and nostril; diameter of the tympanum (2.8 mm.) a little more than half the diameter of eye (5 mm.); canthus rostralis rounded but more or less distinct, the lores concave, then sloping very obliquely to the edge of lip; areas about nostrils slightly elevated, with a visible depression between them on top of snout. Choanae large, but smaller than area of a group of vomerine teeth, which barely reach the posterior level of choanae, anteriorly; tooth groups separated by a distance equal to about half width of a single group; tongue subcircular, free posteriorly for about one-fourth its length, not emarginate behind. (Vocal sac absent in males.)

Arm moderate in length; the first finger shorter than the second; the disks unequal, with strong transverse grooves; the disks of at least the two outer fingers emarginate (somewhat bilobed) medially; diameter of disk on third finger (2.4 mm.) a little less than the diameter of tympanum; no trace of a web, but lateral edges of fingers with a trace of a ridge; three palmar tubercles, the outer partly confluent with the very large median tubercle; a few supernumerary tubercles on the palm; heels overlap about 1.5 mm.; the tibiotarsal joint reaches to the nostril; toe disks dilated, smaller than those of the fingers, the three outer disks somewhat emarginate; a large, elongate, somewhat compressed inner metatarsal tubercle; outer metatarsal tubercle small, round; three supernumerary tubercles on the sole; tarsal fold absent (a fairly strong tarsal fold in *alfredi*); third and fifth toes equal; fourth relatively short.

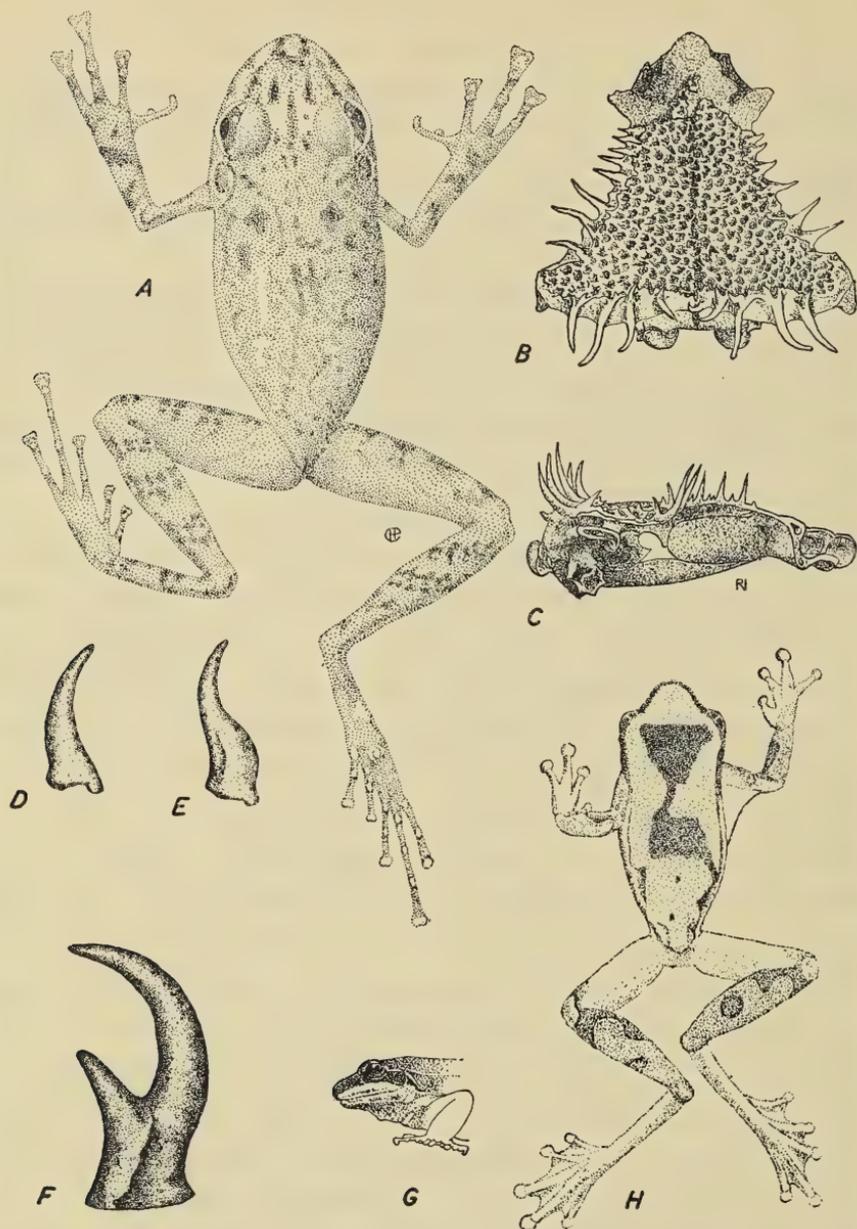


FIGURE 60.—*A*, *Eleutherodactylus conspicuus*, new species, E.H.T.-H.M.S. No. 29853, paratype, Piedras Negras, Guatemala; snout-to-vent length 41 mm. *B*, *Anothecha coronata* (Stejneger), E.H.T.-H.M.S. No. 29985, Cautlapan, Veracruz; dorsal view of brain case, enlarged. *C*, Same; lateral view, enlarged. *D*, *Plectrohyla maudai* Hartweg, E.H.T.-H.M.S. No. 27050, Cerro Ovando, Chiapas; spur from pollex, enlarged. *E*, *Plectrohyla sagorum* Hartweg, E.H.T.-H.M.S. No. 26629, Cerro Ovando, Chiapas; spur from pollex, enlarged. *F*, *Plectrohyla guatemalensis* Brocchi, M. C. Z. No. 11150, Panajachel, Guatemala; spur from pollex, enlarged. *G*, *Eleutherodactylus beatae* (Boulenger), E.H.T.-H.M.S. No. 29813, Tequeyutepec, Veracruz; lateral view of head. *H*, *Hyla ebraccata* Cope, U.S.N.M. No. 111150, Piedras Negras, Guatemala.

Skin more or less rough above when examined under a lens; sides distinctly granular; venter completely smooth; inguinolumbar gland absent or concealed; no discernible axillary gland; the greater part of the under surface of femur, and part of the posterior face, granular; loreal region with small pustules, and the snout likewise; a faint median ridge the length of the body.

Color.—Ground color cream with numerous small brown spots or irregular flecks, more or less equally distributed on head, body, and sides; spots sometimes confluent; venter light but lightly pigmented except for a narrow medial area on abdomen; arms and legs barred, but the bars broken up into small spots; the upper lips barred.

Measurements in mm.—U.S.N.M. No. 116509 (type), E.H.T.—H.M.S. No. 29807, U.S.N.M. No. 116511. Sex, ♀, ♀, ♂; snout to vent, 42.5, 40, 33; width of head 16.5, 15, 12.5; length of head, 18, 16.8, 13; arm, 29, 26.2, 24; leg, 68, 61, 53.5; tibia, 23.5, 21.8, 19.5; foot, 28.2; 26.5, 23.6.

Variation.—The tympanum (2.3 mm.) in the largest male is a little more than the half of the eye diameter (4.2 mm). There is a little difference in the relative size of the vomerine tooth groups and the choanae, or their position with relation to each other. One or two of the specimens have the series a little closer together than in the type.

The toes show practically no trace of web at their bases and the lateral edges have only a very faint trace of a lateral ridge. (In *alfredi* there is a small remnant of a web between the bases of the toes, and the edges of the digits have strong lateral ridges or narrow fringes to the disk.) The males are very much smaller than the females.

The recently described *Eleutherodactylus xucanebi* Stuart, from Alta Verapaz, Guatemala, is related. The species have totally different color patterns, and the present one is considerably larger since the type of *xucanebi* is a fully adult female and is only of the size of the male in this species. *E. xucanebi* is a mountain form, coming from an elevation above 4,000 feet, while the present species is a foot-hills form (500 feet).

Remarks.—Specimens of the type series were found at night sitting on vegetation a few feet above the ground.

ELEUTHERODACTYLUS HIDALGOENSIS Taylor

Eleutherodactylus hidalgoensis. TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 2, No. 14, Nov. 15, 1942d, pp. 299–301, pl. 25, figs. 5–8, pl. 27, fig. 10 (4 miles north of Tianguistengo, Hidalgo).

A single specimen is in the collection from Tequeyutepec, Veracruz (U.S.N.M. No. 116490), collected March 23, 1940. It is a male with greatly elongated vocal slits.

The specimen measures 29 mm. from snout to vent, which is approximately the size of the type. On the occiput are two small black

tubercles and somewhat behind these a second similar pair, a little farther apart. There is indication of a W-shaped dark mark on the shoulders, touching the anterior pair. The tibiotarsal articulation reaches $3\frac{1}{2}$ to 4 mm. beyond the tip of the snout and the heels overlap a similar distance.

The palmar pads and the metatarsal tubercles are a trifle larger than in the type.

The specimen was found at night during a drizzling shower by following the call. After fully half an hour of waiting, as the frog croaked only at long intervals, it was finally found perched in the crotch of a limb on a small tree, at an elevation of 6 feet above ground. The call is a short nasal "croak" repeated in quick succession two or three times. This call sounds more like the call of a *Rana*, and is very unlike the known calls of other members of this genus.

ELEUTHERODACTYLUS SPATULATUS Smith

Eleutherodactylus spatulatus SMITH, Proc. Biol. Soc. Washington, vol. 52, Dec. 15, 1939, pp. 187-190, pl. 2, figs. 4-5 (Cuautlapan, Veracruz).

The type series, field Nos. 3787 (type), 3788, 4391, 4411, 4467, 4470, and 4488 (paratypes), now bear U.S.N.M. Nos. 116926-116932.

ELEUTHERODACTYLUS DUNNII Barbour

FIGURE 61, *E-H*

Eleutherodactylus dunnii BARBOUR, Proc. Biol. Soc. Washington, vol. 35, Oct. 17, 1922, pp. 111-112 (Cerro de los Estropajos, near Jalapa, Veracruz).

Two large series, totaling 215 specimens, were collected at two localities in Veracruz. Of these 129 were from Tequeyutepec, east of Jalapa (March 3, 1940) and the remainder from Cuautlapan (January 5-16, 1939, January to February and August 7-14, 1940). The following specimens are cataloged: U.S.N.M. Nos. 116771-116778, 117414-117428 from Tequeyutepec and U.S.N.M. Nos. 117429-117447 from Cuautlapan.

Eleutherodactylus dunnii is one of the small group of species that includes *E. dorsoconcolor*, *E. beatae*, and *E. venustus*. It is remarkable that four species so similar in general body configuration should occur in the same limited region in central Veracruz. All attain approxi-

FIGURE 61.—Diagrammatic representation of color patterns of four forms of *Eleutherodactylus*. Since the general body form is similar in all a single outline has been used. *A*, *Eleutherodactylus beatae* (Boulenger), E.H.T.—H.M.S. No. 29813, Tequeyutepec, Veracruz. *B*, *Eleutherodactylus dorsoconcolor* Taylor, E.H.T.—H.M.S. No. 28727, same locality. *C*, *Eleutherodactylus venustus* (Günther), U.S.N.M. No. 116780, same locality. *D*, Same, U.S.N.M. No. 116805, La Esperanza, Chiapas. *E*, *Eleutherodactylus dunnii* Barbour, U.S.N.M. No. 116772, Tequeyutepec, Veracruz. *F*, Same, U.S.N.M. No. 116777, same locality. *G*, Same, H.M.S. No. 13318, same locality. *H*, Same (?), E.H.T.—H.M.S. No. 28763, same locality; this is possibly a distinct species since the pattern of ridges seems to be different from that of more typical *dunnii*.

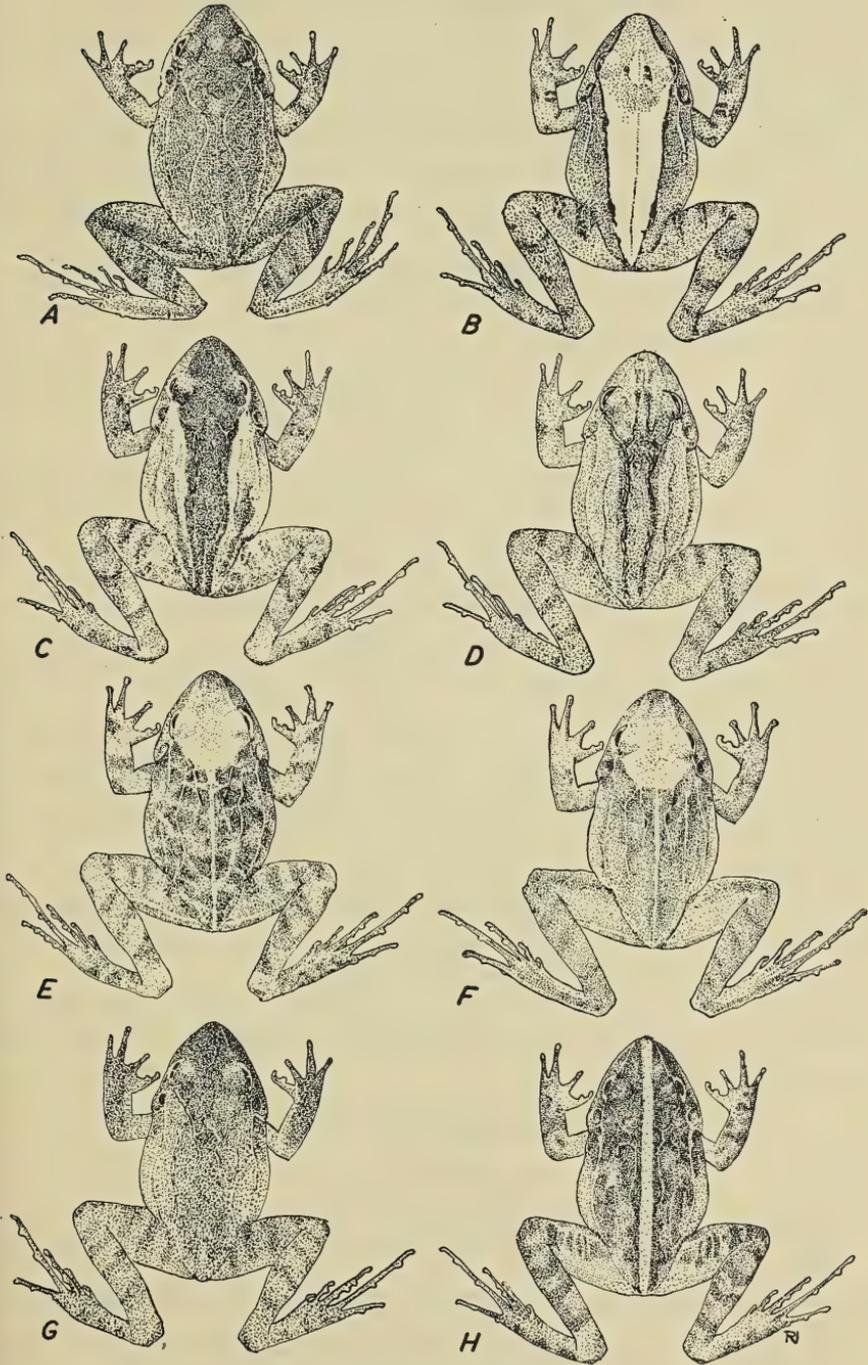


FIGURE 61.—(See opposite page for legend.)

mately the same size and have numerous characters in common. However, they seem to be distinguishable on the basis of color pattern and arrangement of ridges on the back. The latter, however, are often dim, or occasionally absent; in such cases color and markings alone will serve to distinguish the species.

There is, of course, a possibility that all are of the same species and that the dermal ridges and color patterns are linked; hence, when a given color pattern appears it is accompanied by a certain pattern of dermal ridges.

All these forms have been taken in the same locality under the same circumstances, together with two other *Eleutherodactylus* species, *rhodopis* and *hidalgoensis*.

However, in the collection from Chiapas *E. venustus* has been taken in quantity, but no trace of the other three species appears. A form related to *dunni*, however, does occur.

Two major varieties of *dunni* have been examined. The typical form is variegated olive, or olive with some darker spots, indistinctly barred lips and with the limbs more or less distinctly barred. The axillary gland is larger than that in the inguinal region. The tibio-tarsal articulation reaches beyond the tip of the snout.

In the younger specimens there are interorbital darker markings and a broad, inverted, V-shaped, dark mark on the shoulder. The upper edge of the tympanum is black.

In the second variety (U.S.N.M. Nos. 116771-116777) the head is lighter, sometimes much lighter, than the body. The interorbital dark spot is present and if conspicuous the light color behind it forms a lunate spot. In these there is no inverted V-shaped spot.

Behind the light occipital region there is a hair-fine, light line, which reaches below anus where it joins a transverse cream line extending behind the femora onto the tibia as far as the heel.

The hairline on back is absent in one specimen.

A single specimen (U.S.N.M. No. 116778), olive-brown with a broad median stripe from snout to vent, is referred to *E. dunni* with some hesitation.

ELEUTHERODACTYLUS BEATAE (Boulenger)

FIGURES 60, G; 61, A

Hylodes beatae BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 12, No. 71, Nov. 1903, pp. 552-553 (La Perla, near Orizaba [6,000 feet elev.], Veracruz, México).

Eleutherodactylus beatae KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 104-105.

A total of 25 specimens was collected; the following have been cataloged: U.S.N.M. Nos. 116756-116757, Cuautlapan, January 16, 1939, January to February, 1940; U.S.N.M. Nos. 116758-116770,

Tequeyutepec, Veracruz, March 23, 1940; and U.S.N.M. Nos. 117411-117413, La Esperanza, Chiapas, April 6-30, 1940.

The series from Veracruz agrees very well with the type description. The white stripe on the lip is constant and invariable; many of the specimens are blackish or purplish black on the anterior part of the body; others are lavender to brown with the anterior part of head and body darker. There is a small indistinct inguinolumbar gland and a small postaxillary gland.

Specimens examined from Cuautlapan have the skin somewhat rougher than those from Tequeyutepec, but we suspect the method of preservation is largely responsible for the difference.³

ELEUTHERODACTYLUS VENUSTUS (Günther)

FIGURE 61, C, D

Hylodes venustus GÜNTHER, *Biologia Centrali-Americana*, Rept. Batr., August 1900, p. 234, pl. 68, fig. c (Jalapa, Veracruz).

Eleutherodactylus venustus KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 96-97, 117-118.

This variable species is represented by 42 specimens, 37 of which have been cataloged: VERACRUZ: Tequeyutepec, U.S.N.M. Nos. 116780-116800, 116802, March 23, 1940. CHIAPAS: U.S.N.M. Nos. 116803-116813, La Esperanza, April 5 to May 15, 1940; U.S.N.M. Nos. 116815-116816, Salto de Agua, Mount Ovando, April 18, 1940; and U.S.N.M. No. 116814, Colonia Soconusco, May 10, 1940.

Specimens from Tequeyutepec are of several varieties. U.S.N.M. Nos. 116780-116785 are typical, that is, resemble Günther's figure (*loc. cit.*) of the type. They have the broad purplish stripe on the dorsum, flanked by lighter color. U.S.N.M. No. 116799 agrees with these save that there is a broad, light, labial stripe (such as occurs in *Eleutherodactylus beatae*). U.S.N.M. Nos. 116786-116800, 116802 lack the median broad band, but the dorsal ridges usually have narrow darker lines. There is usually a pair of cranial ridges beginning on the occiput and terminating at the tip of the snout. These are frequently indicated also in the typical *E. venustus*.

While only one of these specimens has a labial stripe, several specimens examined in the E.H.T.-H.M.S. collection show such markings.

The median pair of dorsal ridges begin on the top of the eyelid and run back diagonally to the shoulder, then continue a greater or lesser distance on the back, separated by a narrow space. When the stripe is present it usually is a little wider than the area enclosed by the ridges. There is usually a more or less distinct ridge along the side, from behind the supratympanic ridge, and a more or less distinct dorsolateral ridge beginning on the shoulder. Rarely a pair of head ridges is indicated.

³ Specimens preserved in weak solutions often absorb the liquid until the skin is somewhat distended, in which case the ridges and pustules on the back may be somewhat obscured.

In the specimens with the less distinct or no dorsal stripe, the various ridges are followed by darker lines. The head ridges are present and join the dorsal ridges on the occiput.

In the Chiapas specimens, some have the broad dorsal stripe, tending in one case to be broken medially. In these the bordering lighter areas suggest the appearance of a lateral stripe. The greater portion, however, lack the broad median stripe, but the various ridges are followed by more or less distinct darker lines. None show a white labial stripe. The vomerine teeth are larger and more prominent in these than in the northern specimens.

Though there are certain differences between the northern and southern specimens, we believe only a single variable species is involved.

ELEUTHERODACTYLUS DORSOCONCOLOR Taylor

FIGURE 61, B

Eleutherodactylus dorsoconcolor TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 8, 1943a (December), pp. 152-154, pl. 10 (Tequeyutepec, Veracruz).

The type, U.S.N.M. No. 110619, and paratypes, U.S.N.M. Nos. 110615-110618, are in the collection, found March 23, 1940.

The strongly defined dorsolateral ridges, and absence of paired median ridges, together with the distinctive coloration, seem to set this species off from the related *E. beatae*, *E. dunni*, and *E. venustus*.

ELEUTHERODACTYLUS CACTORUM Taylor

Eleutherodactylus cactorum TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b), pp. 391-394, fig. 2 (Kilometer 226, about 20 miles northwest of Tehuacán, Puebla).

A single, very light colored specimen was acquired at the exact type locality, northwest of Tehuacán, Puebla, September 21, 1939 (U.S.N.M. No. 116489).

One of us (Taylor) observed here on one occasion a group of four very young specimens of this species moving along early in the morning. They kept together and moved perhaps 10 yards during the several minutes they were watched. Their path was rather devious, but at no time were they separated by more than three or four inches. They behaved very much as a flock of chickens, and it seemed a normal, rather than chance, behavior.

ELEUTHERODACTYLUS AUGUSTI (Dugès)

PLATE 24, FIGURES 7, 8

Hylodes augusti DUGÈS, in Brocchi, Bull. Soc. Philom. Paris, ser. 7, vol. 3, 1879, p. 21 (Guanajuato, Guanajuato).

Eleutherodactylus augusti KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, p. 100.

Two specimens, U.S.N.M. Nos. 116420 and 116421, are from Agua del Obispo, Guerrero. They were found hopping on the ground in open pine forest at night, September 31, 1939.

The two specimens differ somewhat, one having the head slightly flatter than the other, with the jaws flaring out more. Both are females containing ovarian eggs. The chin is heavily mottled with brown in one, and light in the other.

ELEUTHERODACTYLUS MEXICANUS (Brocchi)

Leuiperus [sic] *mexicanus* BROCCHI, Bull. Soc. Philom. Paris, ser. 7, vol. 1, No. 4, 1877, p. 184 (México, probably southeastern México).
Eleutherodactylus mexicanus (part) KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 108–112.—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 73, pl. 8, figs. 2, 2a–c.

A series of 20 specimens was obtained by Thomas MacDougall on Cerro de las Flores, Lachiguiri, Oaxaca, January 20, 1940 (U.S.N.M. Nos. 116462–116479 cataloged), at an elevation of 7,100 feet. The specimen figured by Taylor (*loc. cit.*) under the field number S. 12752 is now U.S.N.M. No. 116475.

One other specimen, collected at Pan de Olla, near Teziutlán, Puebla, U.S.N.M. No. 116480, is referred to this species. It differs somewhat in having the femora shorter, so that the heels overlap a little, while in the adults of the southern specimens the femora are longer and the heels barely touch. Some other slight differences are in evidence, but a series must necessarily be available before it is certain that we are not dealing with an individual variation.

The inner metatarsal tubercle of *Eleutherodactylus mexicanus*, while well developed, is smaller than that of either *E. calcitrans* or *E. occidentalis*.

ELEUTHERODACTYLUS MATUDAI Taylor

Eleutherodactylus matudai TAYLOR, Univ. Kansas Sci. Bull. vol. 27, pt. 1, No. 8, 1941e (December), pp. 154–157, pl. 11 (Cerro Ovando, Chiapas.)

Eleven specimens, comprising the type and paratype, U.S.N.M. Nos. 110626 (type), 110620–110625, 110627–110630, are in the collection. The specimens were obtained at night as they were sitting on stones and gravel in and near a small, steep rivulet, at an elevation of about 6,000 feet, on April 16, 1940. The habitat and general habitus strongly suggested *E. rugulosus* in the field, with which they were confounded at first sight. That species, however, common from about 500 feet to at least 3,500 feet, was not taken at elevations above 5,000 feet, where it is replaced by *matudai*.

ELEUTHERODACTYLUS CALCITRANS (Günther)

Hylodes calcitrans GÜNTHER (part), Biologia Centrali-Americana, Rept. Batr., August 1900, p. 230, pl. 67, fig. B ("Omilteme, Guerrero, and Jalisco"; here restricted to Omilteme, Guerrero).

Eleutherodactylus calcitrans TAYLOR, Proc. Biol. Soc. Washington, vol. 54, 1941c, p. 93.

A single topotypic specimen (U.S.N.M. No. 116481) is in the collection from Omilteme, Guerrero, July 10–20, 1940. It exhibits the

short limbs and the very large inner metatarsal tubercle, which is not compressed as in *Eleutherodactylus occidentalis* Taylor.⁴

ELEUTHERODACTYLUS RHODOPIS (Cope)

Lithodytes rhodopis COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, 1866c, p. 323 (Orizaba and Córdoba).

Eleutherodactylus rhodopis KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 97-98, 112-115.

On Atlantic slopes 215 specimens of this species were collected, of which the following specimens are cataloged in the collection: GUATEMALA: U.S.N.M. Nos. 116899-116900, Piedras Negras, May 21 to June 21, 1939. CHIAPAS: U.S.N.M. No. 116901, San Juanito, near Palenque, July 16, 1939. OAXACA: U.S.N.M. No. 116902, Matías Romero, January 25, 1940. VERACRUZ: U.S.N.M. No. 116903, 116906, Potrero Viejo, December 13, 1938 to January 9, 1939; U.S. N. M. No. 116907, Cuautlapan, January 16, 1939.

In specimens from Potrero Viejo, Veracruz, not far from the type locality, the ground color is light clay, fawn, brownish, or pinkish. A black stripe begins on the tip of the snout and runs on the upper part of the lores to the eye; behind the eye the stripe is continued as an elongate black spot bending about the tympanum. The tip of the snout is whitish. The lips are not barred with black but there is some suggestion of mottling and indistinct lighter dots in some specimens. Black spots in front of knee; in two specimens there is a hair-fine light median line. There is a black triangular anal spot, and paired black spots on the shoulder. The supratympanic fold is moderate, not closely approximated to the tympanum posteriorly; and the snout in front of nostrils is relatively short. They differ very little in structural characters from the Guatemala specimens.

None of the specimens from central Veracruz are from elevations above 2,500 feet.

The Guatemala specimens from Piedras Negras form a series that is more definitely marked and colored, containing many pinkish or reddish individuals. However, some of these are grayish, clay-colored, or brownish. Of 25 females all except one appear to contain large ovarian eggs. Ten of these have a hair-fine, more or less distinct, median cream or white line, and white lines running lengthwise on the posterior face of the femur, in one case extending the length of the tibia to the heel. Two black shoulder spots, rather closely approximated, are distinct in all save two specimens. Three are more or less brown mottled on the dorsal surfaces. The distinctness of the brown transverse bars on the femora varies greatly.

The side of the head has a black stripe bending down behind the tympanum and widening; in front of the eye it reaches almost to the edge of the lip anteriorly; the lower part of the loreal region is blackish,

⁴ Formerly *Borborocoetes mexicanus* Boulenger (1898, p. 481), preoccupied by *Leuiperus mexicanus* Brocchi (1877, p. 184) (see original designation, Taylor, 1941c, pp. 91-92).

but lighter specimens may show spotting; the tympanum is brownish. The chin may be more or less brownish, with irregular cream spots on the lower jaw. In some specimens these markings are scarcely discernible. The underside of the outer part of the femur is brownish, with some black spotting at the knee. The underside of the foot is dark. The anal region has a triangular dark area or a black arched line.

The inguinolumbar gland is greatly reduced, diffuse, and concealed by the pigment so that it is rarely evident. A small, flat axillary (or postaxillary) gland is evident in all. First finger longer than second; outer palmar tubercle present, sometimes apparently free, sometimes partly fused to the medial; several supernumerary tubercles on the soles and palms. The tibiotarsal articulation reaches to the anterior edge of eye or a slight distance beyond save in a young female (without eggs) in which the heel reaches near to nostril. The tarsal fold (tubercle) is situated on tarsus back of the inner metatarsal tubercle a distance less than the length of the tubercle, and terminates at its highest point before the middle of the tarsus is reached. The tubercle is narrow and somewhat elongated.

Most of the venter is smooth, but the back part of the ventral disk and its sides are usually granular; vomerine teeth large; males with a vocal sac.

On the Pacific drainage of Chiapas occurs a variable species, identical or at least closely related to the preceding. Individuals vary in color much as do the northern ones, some being pinkish, others fawn; occasional specimens have a hair-fine median light line. In general the measurements, character of the skin folds, metatarsus, and hand and foot markings agree very well with those of northern specimens, save that some specimens have a larger external metatarsal tubercle. However, in the Chiapas series are individuals or groups of individuals that, at least in the adult, vary in having a larger eye, a slightly longer snout in front of nostrils, and a heavier supratympanic fold folding down closer to the tympanum. There is less pigmentation on lower jaw, the loreal black stripe is dim or lacking, and the lip may show dark bars.

While the shoulder ridges in the typical form run from the paired black shoulder spots direct to the corner of eye, in these the ridge may make a bend at two widely spaced occipital (or shoulder) spots and then direct themselves to a point on the eyelid somewhat more medial than the corner of eye. Often there is a pair of dark spots at the beginning of the two dorsolateral ridges. Sometimes the back may be somewhat checkered with darker, or there may be an indistinct, somewhat geometric pattern on the front part of the back. The underside of arm and foot and the tarsus are usually lighter than in the typical form.

The vomerine tooth series of the adults are heavier and bear more teeth than the average typical specimen. The tympanum is (in females) somewhat more circular than in the typical form where it is usually a little higher than wide, and the inner metatarsal tubercle is larger.

The following have been cataloged from a series of 219 collected: CHIAPAS: U.S.N.M. Nos. 116908-116913, Colonia Soconusco, May 10, 1940; U.S.N.M. Nos. 116914-116920, Tonalá, January 26-30, 1940; U.S.N.M. No. 116921, Las Nubes, April 15, 1940; U.S.N.M. Nos. 116922-116927, Finca Juárez, May 8-10, 1940; U.S.N.M. Nos. 116928-116937, Cruz de Piedra, April 25, 1940; U.S.N.M. Nos. 116938-116944, Las Gradadas, May 20, 1940; U.S.N.M. Nos. 116945-116953, Salto de Agua, April 18 to May 19, 1940; U.S.N.M. Nos. 116954-116959, La Esperanza, April 4-5 and June 4, 1940.

Cope has described three related eleutherodactylid forms from Central America as distinct species: *Lithodytes podiciferus*, *muricinus*, and *habenatus* (1876, pp. 107-108). He later (1879, p. 268) identified certain Oaxaca specimens as belonging to *podiciferus*; and in a still later paper (1893, p. 338) these three presumed species were thrown back into the synonymy of *rhodopis*. It seems probable that some of these names may be referable to the variants here recorded.

ELEUTHERODACTYLUS NATATOR Taylor

Eleutherodactylus natator TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b, first mailing), pp. 394-397, pl. 39, fig. 2, pl. 40 (Tlilapan [=Cuautlapan], Veracruz).

The collection contains six specimens including five topotypes (U.S.N.M. Nos. 116034-116038) from Cuautlapan, January 4-16, 1939, and January to February, 1940, and No. 116039 from Metlac, Veracruz, January 5, 1939.

This form, apparently a derivative of *Eleutherodactylus rugulosus*, differs in reaching a considerably larger size, having longer limbs, slightly larger disks on the toes, and the heels overlapping several millimeters when the limbs are placed at right angles to the body.

There is an extraordinary sex difference in size. The largest known male measures only 43 mm., while the type, a female, measures 93 mm. The largest female *E. rugulosus* examined (in 735 specimens) measures only 72 mm. and is about one-half the bulk of the female type of *E. natator*.

ELEUTHERODACTYLUS RUGULOSUS (Cope)

PLATE 23, FIGURES 3, 4

Liyla rugulosa COPE, Proc. Amer. Philos. Soc., vol. 11, No. 82, July 16, 1869b, p. 160-161 (Pacific region of the Isthmus of Tehuantepec, México).

Eleutherodactylus rugulosus KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 116-117 (possibly only part).

The collection contains 735 specimens from Chiapas, the following of which are cataloged: U.S.N.M. Nos. 117448–117453 from Colonia Hidalgo, April 14, 1940; U.S.N.M. Nos. 117026–117031, from Tonalá, January 26–30, 1940; U.S.N.M. Nos. 117050–117056, from Finca Juárez, May 8–10, 1940; U.S.N.M. Nos. 117057–117062, from La Magnolia, May 23, 1940; U.S.N.M. Nos. 117063–117067, from Rancho Las Gradass, May 20, 1940; U.S.N.M. Nos. 117068–117071, Cruz de Piedra, April 25 to May 11, 1940; U.S.N.M. Nos. 117044–117049 from Colonia Soconusco, April 14 and May 10, 1940; U.S.N.M. Nos. 117038–117043, La Esperanza, April 15 to May 25, 1940; U.S.N.M. Nos. 117079–117086, Salto de Agua, April 18 to May 19, 1940; U.S.N.M. Nos. 117032–117037, San Juanito, July 6 to 17, 1939; U.S.N.M. Nos. 117072–117078, Las Nubes, April 15, 1940.

Specimens from Salto de Agua for the most part have a broad, brownish, median stripe or a hair-fine, brownish or whitish line. The largest specimen taken in the entire series of 403 was 72 mm. in length and had a head width of 32 mm. The usual, large-sized specimens were between 65 and 67 mm., with the head 30 to 33 mm. in width. The three largest males measured 44, 42, and 41 mm., with head widths of 18, 18, and 17, respectively. Diameter of the tympani of three largest females 4.2, 4.4, and 4.4 mm., respectively; of the three largest males, 5.3, 5.5, and 5.2 mm. The tibiotarsal articulation reaches the nostril. The skin is finely granular on the sides, back part of body, and above the femur. Heels touch or overlap about 1 mm.

In a smaller series from Las Nubes (98 specimens) the two largest females measured 68 and 71 mm.; the largest male 42 mm.; the width of the heads of those three specimens is 32, 33, and 18 mm., respectively.

The fewer specimens from Tonalá, Colonia Hidalgo, Las Gradass, and La Esperanza differ in no important way; none of the males or females are as large as those mentioned above.

ELEUTHERODACTYLUS RUGULOSUS var.

A series of 37 specimens, collected on February 4 and August 31, 1939, at Agua del Obispo, Guerrero, of which 20 are cataloged (U.S.N.M. Nos. 117006–117025), differ from those listed above in having a shorter shank (the heels not touching when the legs are folded at right angles to the body); and the tibiotarsal articulation reaching to nostril or to a little beyond the tip of snout. The skin is somewhat less granular and pustulous, the pustules on the legs being pearl color. The vomerine teeth are in somewhat smaller groups and the canthal region is more rounded.

The largest female measures 67 mm., the largest male 34. There is no vocal sac.

A single specimen of this form has been examined from near Cuautlapan, Veracruz (E.H.T.—H.M.S. Coll.). It has all the general characters of this form, except that a median cream stripe is present. It differs markedly from the related *Eleutherodactylus natator* from the same immediate region.

ELEUTHERODACTYLUS AVOCALIS, new species

Type.—U.S.N.M. No. 116885, collected at Tres Cruces, near Tehuantepec, Oaxaca, by Dr. and Mrs. Hobart M. Smith, March, 1940.

Paratypes.—U.S.N.M. Nos. 116876–116884, 116886, Tres Cruces, near Tehuantepec; U.S.N.M. Nos. 116887–116888, Cerro Arenal, Oaxaca. Same collectors, January 2–19, 1940.

Diagnosis.—A medium-sized species belonging to the *rugulosus* group, probably most closely related to *Eleutherodactylus vocalis*. It differs from that form in that the males lack a vocal sac; the tarsal fold extends three-fourths or more of the length of the tarsus, and is more elevated, forming a free flap; the extent of webbing on the toes is somewhat greater; the first finger is longer than the second; the leg is longer, the tibiotarsal articulation reaching beyond the tip of the snout. An M-shaped pattern is apparently present but indistinct.

Description of the type.—The type, an adult female, is the largest specimen, having a snout-to-vent length of 51 mm.; snout rounding in profile, the nostril much nearer the median point of upper lip than eye; eyelid about equal to the interorbital width; length of eye (5.9 mm.) shorter than snout (7.5 mm.), but equal to its distance from anterior edge of nostril; canthus rostralis not or but indistinctly indicated; loreal region with a broad concavity; tympanum subcircular, small, its greatest diameter (3.1 mm.) very little more than half diameter of eye (5.9 mm.), separated from the eye by a distance about equal to the diameter.

Tongue broadly cordiform, notched behind; vomerine teeth in two elevated areas between but considerably behind the choanae, extending even to the level of the palatines, separated from each other by less than one-third the width of one group, separated from choanae by a distance greater than width of a group; choanae large, directed backward as much as downward; immediately behind choanae is a depression and a slitlike pit which lies close to the prevomer ridge; palatal mucous glands opening by a series of slitlike pores in the middle of the palate.

Skin thick, with small smooth pustules; a heavy supratympanic fold, which curves down behind tympanum; two posttympanic tubercles; a pair of folds begin at corners of eyes and run back to the shoulders; indication of a second fold, tending to run parallel to the first; an irregular lateral fold with numerous short folds and tubercles; chin strongly areolate; abdomen areolate and wrinkled; ventral disk not indicated.

Arms short, the digits dilated to a little more than half the diameter of tympanum, and with transverse terminal grooves; first finger distinctly shorter than second; practically no trace of a web except between the bases of first two fingers, but distinct lateral fringes on the distal part of outer side of first finger, medial sides of second and third, and on both sides of fourth, to their bases.

A large, median, semidivided palmar tubercle, and a narrow, elongate, inner palmar tubercle at base of first finger; subarticular tubercles large; supernumerary tubercles variable in size; a tubercular ridge under arm. Legs long, the tibiotarsal articulation reaching beyond tip of snout; toes between one-third and one-half webbed, the webs extending as fringes to the dilated tips; a strongly elevated, inner metatarsal tubercle; a small indistinct outer; a broad, almost flaplike tarsal fold extending four fifths the length of tarsus (or more); subarticular tubercles normal; no trace of supernumerary tubercles; heels overlap two or three millimeters when legs are folded at right angles to body.

Color and markings.—Generally olive-gray to brownish gray. A broad, light brown, interorbital bar, bordered behind with darker color and with two dim median light spots on occiput, one behind the other; sides lighter, showing dark spotting or marbling; barring on legs almost obsolete; below creamy white, with some indistinct pigmentation on chin and anterior part of thigh.

Measurements in mm.—Snout to vent, 51; length of head, 21; width of head, 22; arm, 30; leg, 85; tibia, 28; foot, 37.

Variation.—Some of the younger paratypes show the color pattern more strongly. These have the upper lip, to some extent the lower also, with three or four dark bars or spots. The tympanum in the males is about two-thirds the diameter of the eye.

Relationships.—The species is apparently most closely related to *Eleutherodactylus vocalis*, occurring on the edge of the plateau in Michoacán. It differs chiefly in the absence of the vocal sac (and vocal slits); greater amount of webbing on feet; smaller pads in proportion to the tympanum; smaller eye in proportion to snout length; the longer tarsal fold, and its much greater development; the longer hind-legs, with overlapping heels; and the choanae directed more backward owing to the elevation of the anterior rim. Other differences obtain. Three other Mexican forms of this section of the genus are known in México: *Eleutherodactylus rugulosus* in Oaxaca and Chiapas, *E. natator* in Veracruz, and *E. vocalis* in Michoacán.

Genus SYRRHOPHUS Cope, 1878

SYRRHOPHUS PIPILANS Taylor

Syrrhophus pipilans TAYLOR, Proc. Biol. Soc. Washington, vol. 53, Oct. 7, 1940d, pp. 95–98, pl. 1 (9 miles south of Mazatlán, Guerrero).

Two specimens were collected at Agua del Obispo, Guerrero, August 31, 1939 (U.S.N.M. Nos. 114078-114079). One other specimen was obtained from Cerro Arenal, near Tehuantepec, Oaxaca, January 19, 1940 (U.S.N.M. No. 114077).

The Cerro Arenal specimen was caught at night hopping in leaves among boulders in a small, rocky, dry arroyo. In life the colors were: "lighter parts of dorsal surfaces of body and limbs metallic gold-green; dark areas on body translucent, dark brown; dark areas on limbs a little lighter, of a somewhat amber color."

SYRRHOPHUS SMITHI Taylor

Syrrhophus smithi TAYLOR, Proc. U. S. Nat. Mus., vol. 89, 1940c, pp. 43-45, pl. 1 (15 miles southeast of Galeana, Nuevo León).

Two specimens (U.S.N.M. No. 108594, type, and E. H. T.-H. M. S. No. 23067, paratype) were collected at the type locality, 15 miles southeast of Galeana, Nuevo León, October 13, 1939.

SYRRHOPHUS LEPRUS Cope

Syrrhophus leprus COPE, Proc. Amer. Philos. Soc., vol. 18, No. 104, 1879, pp. 268-269 (Santa Efigenia, Tehuantepec, Oaxaca).

A series of 14 specimens is present in the collection. These are U.S.N.M. Nos. 114080-114084 from Potrero Viejo, Veracruz, December 13, 1938; U.S.N.M. No. 114093, La Gloria, Oaxaca, January 26-30, 1940; and U.S.N.M. Nos. 114085-114092, Piedras Negras, Guatemala, May 21 to June 15, 1939.

The two groups of specimens differ in that those from Guatemala are darker, with the light areas contrasting more. In life the light areas are yellow, and the dark almost purple.

Cope gives so few details that it is impossible to say whether these specimens agree in all details with the type. When the legs are placed at right angles, the heels overlap a trifle. The inguinal gland is obsolete, but the parotoid is prominent above the arm insertion. The heel reaches the anterior part of the eye. The largest specimen is a female from Guatemala, having a length of 28 mm. The largest specimen from Veracruz is only 24 mm. The tympanum, in all, is more than one-third of the eye, in some equaling two-fifths of the eye diameter. The specimen from La Gloria, Oaxaca, has the dorsal surface somewhat granular or pustular.

SYRRHOPHUS CYSTIGNATHOIDES (Cope)

Phyllobates cystignathoides COPE, Proc. Amer. Philos. Soc., vol. 17, No. 100, 1877, pp. 89-90 (Potrero, near Córdoba, Veracruz).

Syrrhophus cystignathoides COPE, Proc. Amer. Philos. Soc., vol. 18, 1879, p. 268.

Four specimens were collected: U.S.N.M. Nos. 114074-114075 at Metlac, near Córdoba, January 21, 1940; U.S.N.M. No. 114076 at Cuautlapan, near Orizaba, Veracruz, August 7-14, 1940; and

U.S.N.M. No. 114053, Huichihuayán, San Luis Potosí, December 12, 1939.

Some of the characteristics of these specimens differ from those recorded for the type. The back is somewhat pustular or tubercular, but the pustules may be small, giving the skin a very smooth appearance. The type description mentions the spots on the back as being large. In these the spots are small and not especially distinct. The tympanum is somewhat less than half of the diameter of the eye. The ventral disk is evident and its posterior part is indistinctly granular.

The largest specimen is a female containing large ovarian eggs. It measures 22.4 mm. in length. The specimen from San Luis Potosí is referred here tentatively. It may actually belong to another species, but is small and may not show all the adult characters. It was found 5 km. north of Huichihuayán in a rotten log, in a field overgrown with shrubs and weeds.

Potrero Viejo specimens were found under stones in a pasture. Those from Piedras Negras were found hopping on the ground at night but certain ones were found under stones during the day. Color notes (Smith) state "light areas on the dorsum are yellow-green in color." Two of the Piedras Negras specimens were taken from the stomach of a snake (*Drymobius m. margaritiferus*).

SYRRHOPHUS RUBRIMACULATUS, new species

Type.—U.S.N.M. No. 114070, collected at La Esperanza, Chiapas, May 13, 1940, by Dr. and Mrs. Hobart M. Smith.

Paratypes.—U.S.N.M. Nos. 114054–114069, 114071, 114072, topotypes, collected between April 5 and May 25, 1940; U.S.N.M. No. 114073, Rancho Las Gradass, Oaxaca, May 20, 1940.

Diagnosis.—A small species with a known maximum size of 22.5 mm. length, having a dark purplish or purplish-brown coloration, beset with small reddish spots on head and back. The tympanum a little less than one-third of the eye; first finger shorter than second, the outer palmar tubercle wanting; length of the free part of the fifth toe contained in the length of the fourth, three times; tibiotarsal articulation to middle of eye; choanae not concealed by the overhanging maxillary shelf when seen from below.

Description of type.—Adult male. Head oval, wider than the body, the width (8 mm.) slightly less than the length (8.2 mm.); tympanum a little higher than wide, the upper part of the rim indistinct, its longitudinal diameter contained in the length of eye three times; snout (3.2 mm.) a little longer than eye (3.15 mm.); width of an eyelid (2 mm.) about equal to the narrowest interorbital distance (2.13 mm.); nostrils slightly removed from the tip of the snout, the distance between them being 1.9 mm., their distance from the eye 2.73 mm.;

tongue narrowed in front, then widened behind, with a slight notch (most of the specimens with the tongue contracted do not show the notch), and free for about two-thirds of its length. Vocal sac present, the openings well defined; no vomerine teeth; choanae large, rather lateral, not concealed when seen from below.

On the dorsal surface of the head the skin is relatively smooth; the back studded with irregular granules or pustules, and with a hair-fine line or ridge along the middle of back; sides granular, and the entire ventral surface of body smooth; the more medial parts of the ventral surface of the femur and some of the posterior face granular; except for some roughness on the upper surface of femur the limbs are smooth; a moderately well-defined parotoid above the insertion of the arm, and a small, rather indistinct inguinal gland.

Arm long, slender, brought forward about a half of the forearm extends beyond the snout; first finger shorter than the second; tips of the fingers slightly flattened, perceptibly wider than the middle of the finger, with only an indistinct groove at tips of the outer fingers (visible if digit is slightly desiccated). Two palmar tubercles, the median very large, the inner normal; outer tubercle missing; palm with four supernumerary tubercles; subarticular tubercles strong; a few granules scattered on palm and between the bases of the fingers; a few intercalary tubercles.

Leg moderate, the tibiotarsal articulation reaching to the middle of the eye; subarticular tubercles strong, with intercalary and supernumerary tubercles; two small metatarsal tubercles, the outer about half the size of the inner; no tarsal fold or ridge; tips of the digits perceptibly wider than the middle of the toe, with trace of the transverse groove; fifth toe small, slender, the length of its free part one-third the length of the free part of the fourth; no trace of a web.

Color.—The dorsal surface of head, body, and limbs purplish brown with scattered irregular light spots; a pair of lines begin on the tip of the snout and run back to eye; legs and arms barred dimly, with the intervening areas light. A dark stripe on the side of the snout, more or less continued behind eye; upper lip spotted; venter light brownish or dirty brownish white; underside of hand and foot purplish. According to field notes, in life the light areas on the back are iridescent gold in color, while those on the limbs and sides tend to be more whitish; all the light areas on the head are bright burnt sienna, and those on neck region are intermediate in color between the red and gold of head and body. In some specimens the red extended more widely over the anterior light areas.

Measurements of type in mm.—Snout to vent, 21; width of head, 8; length of head, 8.2; arm, 14; leg, 31; tibia, 9.2; foot, 15.

Variation.—There is very little difference in the size of the males and females in this series. Measurements of the entire series vary

between 19 and 22.5 mm., the average for both sexes being 21, for the males alone 20.6 mm.

The amount of the light spotting differs in different specimens. In some the spots may be smaller and more numerous, in others larger as if some of them had become confluent. The lines on the snout vary in distinctness but, if specimens are placed under clear water, the pattern can usually be discerned. There is but very slight difference in the size of the tympanum in the two sexes.

Syrrhophus leprus, which occurs in the northeastern part of Chiapas, can be distinguished by the more reticulated, cream-colored pattern on a purplish background, the larger size, and the presence of the outer palmar tubercle. This form probably averages (for females) 30 mm. in length. From the recently described *Syrrhophus nebulosus* which occurs in the same locality (generally), it may be distinguished by its smaller size, darker venter, narrower interorbital width and the different color pattern. The latter species, however, lacks the outer palmar tubercle also.

These specimens were found at night hopping on the ground in coffee groves or in uncleared forest. Others were encountered during the day in or about rotting logs.

Genus TOMODACTYLUS Günther, 1900

TOMODACTYLUS NITIDUS (Peters)

Liuperus [sic] nitidus PETERS, Monatsb. Akad. Wiss. Berlin, 1869, p. 878 (state of Puebla).

Tomodactylus nitidus KELLOGG, U. S. Nat. Mus. Bull. 160, 1932, pp. 120-123.

Six specimens were secured, one from the mountainside west of Acultzingo, Veracruz, April 30, 1939 (U.S.N.M. No. 114099), and five (U.S.N.M. Nos. 114094-114098) from a locality 8 km. west of Cuernavaca, Morelos, August 6, 1939. They were found under stones.

TOMODACTYLUS ANGUSTIDIGITORUM Taylor

Tomodactylus angustidigitorum TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1940g, pp. 494-496, pl. 55, fig. 1 (Quiroga, Michoacán).

A small specimen (U.S.N.M. No. 114100) is from a locality 6 km. east of Carapa, Michoacán, August 12, 1939. It was found under a rotten log.

TOMODACTYLUS AMULAE Günther

Tomodactylus amulae GÜNTHER, Biologia Centrali-Americana, Rept. Batr., Apr. 1900, p. 219, pl. 64, fig. c (Amula, state of Guerrero).

A single specimen (U.S.N.M. No. 114101), obtained by Taylor under the bark of a rotting log at Omilteme, Guerrero, August 2-4, 1940, is referred to this species.

Family HYLIDAE Günther, 1858

Genus *HYLA* Laurenti, 1768

We realize that in the great heterogeneous assemblage of nearly 300 species which is the genus *Hyla* (*sensu lato*), several generic groups are usually included. Certain of these groups long associated with *Hyla* can be placed in their proper genera with little difficulty; among these may be mentioned *Boana* Gray, *Plectrohyla* Brocchi, *Acrodytes* Fitzinger, and perhaps *Trachycephalus* Tschudi. Representatives of *Plectrohyla* and *Acrodytes* occur in México and are recognized under their proper generic names.

HYLA ROBERTMERTENSI Taylor

Hyla robertmertensi TAYLOR, Proc. Biol. Soc. Washington, vol. 50, 1937b, pp. 43-45, pl. 2, figs. 3-7 (Tapachula, Chiapas).

Twenty-five specimens were secured at La Esperanza, April 5 to 28, 1940 (U.S.N.M. Nos. 114737-114753) and Cruz de Piedra, April 25 and May 15, 1940 (U.S.N.M. Nos. 114754-114761), Chiapas. They were found on vegetation in or beside small streams.

HYLA SMITHII Boulenger

Hyla smithii BOULENGER, Zool. Rec., vol. 38, 1902, Rept. Batr., p. 33 (Cuernavaca, Morelos).

In all, 331 specimens of this frog were secured. The following specimens have been placed in the Museum collection: MORELOS: 5 km. south of Cuernavaca, January 24, 1939 (U.S.N.M. No. 114788); Puente de Ixtla, January 26-27, 1939 (U.S.N.M. Nos. 114789-114813). GUERRERO: Agua del Obispo, February 4 and August 31, 1939 (U.S.N.M. Nos. 114814-114829); Tierra Colorada, February 12 and August 31, 1939 (U.S.N.M. Nos. 114830-114836). MICHOACÁN: 4 km. north of Apatzingán, March 14-18, 1939 (U.S.N.M. Nos. 114836-114861).

Near Apatzingán males were calling from vegetation in a stream under a large, old, constantly dripping, overhead aqueduct. In Morelos they were found in banana plants. At Agua del Obispo and Tierra Colorada they were found in the axils of *Calladium* leaves growing in or very near small streams.

HYLA UNDERWOODI Boulenger

Hyla underwoodi BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 3, 1899, p. 277 (Costa Rica).

Twenty-eight specimens were secured, from the vicinity of Palenque, Chiapas, July 6-9, 1939 (U.S.N.M. Nos. 114973-114978), and from Pozo de la Jicotea, near Piedras Negras, Guatemala, June 3-10, 1939 (U.S.N.M. Nos. 114951-114972).

HYLA EBRACCATA Cope

FIGURE 60, H

Hyla ebraccata COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 26, 1874, p. 69 (Nicaragua).

Hyla leucophyllata TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 80.

A series of five specimens was collected at Piedras Negras, Petén, Guatemala, June 3–10, 1939 (U.S.N.M. Nos. 111148–111152). These were reported by Taylor (*loc. cit.*) as belonging to *Hyla leucophyllata*. We believe they are more correctly referable to *Hyla ebraccata* Cope, originally described merely as a "color variety" of *Hyla leucophyllata*, but apparently meriting a specific designation.

HYLA RICKARDSI Taylor

Hyla rickardsi TAYLOR, Univ. Kansas Sci. Bull., vol. 25, No. 17, 1938 (July 10, 1939b), pp. 385–388, pl. 41, figs. 1–8 (Potrero Viejo, Veracruz).

Of 40 specimens, a series of topotypes, U.S.N.M. Nos. 108675, 114731–114736, is from Potrero Viejo, September 26, 1939, and U.S.N.M. Nos. 114711–114730 are from Palma Sola, Veracruz, January 8, 1939. The two series agree and are in every way typical.

HYLA LOQUAX Gaige and Stuart

Hyla loquax GAIGE and STUART, Occ. Papers Mus. Zool. Univ. Michigan, No. 281, 1934, pp. 1–3 (Ixpué Aguada, north of La Libertad, El Petén, Guatemala).

A series of 33 specimens is from the vicinity of Piedras Negras, Guatemala, June 3–10, 1939 (U.S.N.M. Nos. 114609–114641). Most of the specimens were found at the edge of a small lake, locally known as Pozo de la Jicotea. The bright reddish coloration of the post femoral region is typical.

HYLA ROZELLAE Taylor

Hyla rozellae TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 78–79 (Salto de Agua, Chiapas).

The type and paratype series, U.S.N.M. Nos. 115039 (type), 115030–115038, 115040–115055, are the only known specimens. This form, a species perhaps related to *Hyla loquax* and *rickardsi*, has a reduced axillary web and the vocal sac is absent.

Specimens were taken at Finca Juárez, May 8–10, 1940 (U.S.N.M. Nos. 115052–115055), at Salto de Agua, 1,200 feet, April 18, 1940 (U.S.N.M. Nos. 115038–115051), and Las Nubes, 2,900 feet, April 18, 1940 (U.S.N.M. Nos. 115038–115051), on Mount Ovando near Escuintla, Chiapas. All were found sitting on vegetation at the edge of small, steeply inclined streams. None was heard calling and, in fact, only a single adult, the type, was found. All the other specimens are recently transformed or half grown.

HYLA ARBORICOLA Taylor

Hyla arboricola TAYLOR, Univ. Kansas Sci. Bull., vol. 27, pt. 1, No. 7, 1941d (December), pp. 118-119, pl. 5, fig. 1 (6 miles east of Omilteme, Guerrero, 7,000 feet).

Four specimens, two paratypes (U.S.N.M. Nos. 114593-114594) and two additional topotypes (actually paratypes but not so mentioned in the type description), are numbered, U.S.N.M. Nos. 114392-114393. They were collected on August 2-6, 1940, by Taylor.

HYLA EUPHORBIAECEA Günther

Hyla euphorbiacea GÜNTHER, Catalogue of the Batrachia Salientia in the collection of the British Museum, 1858 (1859), p. 109, pl. 10, fig. C (Córdoba, Veracruz; Cordilleras [of] México).

Twelve specimens were secured in bromelias at the crest of the mountain ridge a few miles southwest of Acultzingo, Veracruz, March 17 and August 11, 1940 (U.S.N.M. Nos. 114552-114563). Notes taken in the field state: "In life most specimens are green above, but a few are brownish; the light areas on the concealed surfaces of the thighs are light yellowish orange and the groin is of the same tint."

This form is quite distinct from *Hyla eximia*, with which it has been confused in the literature.

HYLA LAFRENTZI Mertens and Wolterstorff

Hyla lafrentzi MERTENS and WOLTERSTORFF, Zool. Anz., vol. 84, pts. 9, 10, 1929, pp. 235-241 (Desierto de los Leones, Distrito Federal).

Thirty-one specimens are from the following localities: HIDALGO: El Chico National Park, September 17, 1939 (U.S.N.M. Nos. 114606-114608). MÉXICO: Llano Grande, 8 km. west of Río Frío, August 2, 1939 (U.S.N.M. Nos. 114581-114605). MORELOS: Zempoala, February 21, 1939 (U.S.N.M. Nos. 114578-114580).

These specimens are in every way typical.

HYLA PACHYDERMA Taylor

PLATE 25

Hyla pachyderma TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 2, No. 4, Nov. 14, 1942d, pp. 308-310 (Pan de Olla [south of Teziutlán, Puebla], Veracruz).

The type and paratype series, the only specimens known, are U.S.N.M. Nos. 115029 and 115026-115028, collected on March 22, 1940.

These specimens came from approximately 4,000 feet elevation. They were found sitting on bushes and weeds beside a small, bounding stream near Pan de Olla, Veracruz. The actual locality is but a few kilometers from Teziutlán, Puebla. None of this species was heard calling, although *H. arborescendens* was calling on all sides.

HYLA ROBERTSORUM Taylor

Hyla robertsorum TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (Nov. 27, 1940e), pp. 393-396, figs. 5-6 (El Chico National Park, Hidalgo).

A fine series of 59 topotypic specimens was secured by the two of us on September 17, 1939 (U.S.N.M. Nos. 114762-114786). These, like the original type series, were found on plants at the edge of a stream. There were many young specimens, some bright green in life. Frequently the young were found basking in the sun on leaves overhanging the stream.

HYLA BISTINCTA Cope

Hyla bistincta COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 87 (probably Veracruz).

Fifteen specimens were secured at the following localities: MÉXICO: 20 km. west of Villa Victoria, March 6, 1939, U.S.N.M. No. 114513. MICHOACÁN: Uruapan, March 11-12, 1939, U.S.N.M. Nos. 114514-114524. VERACRUZ: Mountain southwest of Acultzingo, March 17, 1940, U.S.N.M. No. 114525. The first specimen listed (a juvenile) was found under a stone in a grassy flood plain of a small stream. At Uruapan they were found in banana plants, protected by the thick outer sheaths of the trunk. Above Acultzingo, Veracruz, a single specimen was found in a bromelia. The latter is much more distinctly marked than the others. In life the colors were described as follows (Smith, field notes): "General dorsal ground color a rich, creamy-slate; marking on side of head dark purplish brown; light areas on sides of abdomen creamy white, except a pale green tint in axilla and groin; latter color dimly visible along lower portion of sides of body; anterior surfaces of entire hind leg somewhat greenish, less so on anterior surface of arms; light areas of concealed surfaces of thigh, greenish."

The tarsal fold is more distinct in the eastern specimens than in the western; and the elongated anal flap, although having the median vertical groove, is somewhat less crenelated on the posterior border.

HYLA PHAEOTA Cope

PLATE 26

Hyla phaeota COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, 1862, pp. 358-359 (Turbo, Colombia).—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, pp. 80-81, pl. 8, figs. 1, 1a, 1b, 1c.

A series of 11 specimens of this species was collected at Piedras Negras, Petén, Guatemala, May 28-29, 1939. The cataloged specimens are U.S.N.M. Nos. 111139-111147. These were reported by Taylor (*loc. cit.*).

Specimens were captured at night on the ground at the edge of small, temporary pools. As the locality is very close to the Mexican border this species must be reckoned as a member of the fauna of México.

HYLA BAUDINII Duméril and Bibron

Hyla baudinii DUMÉRIL and BIBRON, *Erpétologie générale*, vol. 8, 1841, pp. 564-565 (México).

In all, 133 specimens were secured at the following localities: CHIAPAS: U.S.N.M. Nos. 114487-114494, Cruz de Piedra, April 25 and May 10, 1940; U.S.N.M. Nos. 114498-114504, vicinity of La Esperanza, June 3-5, 1940; U.S.N.M. Nos. 114495-114497, Colonia Soconusco, May 9 and 23, 1940; U.S.N.M. Nos. 114473-114486, Palenque, July 6-22, 1939. GUERRERO: U.S.N.M. No. 114508, El Treinte, September 4, 1939. OAXACA: U.S.N.M. No. 114512, Coyul, May, 1940. PUEBLA: U.S.N.M. No. 114509, San Diego, near Tehuacán, August 21, 1939. SAN LUIS POTOSÍ: U.S.N.M. No. 114468, Tamazunchale, May 1, 1939. TABASCO: U.S.N.M. Nos. 114505-114507, Tenosique, June 25-30, 1939. TAMAULIPAS: U.S.N.M. No. 106244, Hacienda La Clementina, November 22, 1938. VERACRUZ: U.S.N.M. Nos. 114433-114457, Cuautlapan, December 20, 1939, January to February, July and August 7-14, 1940; U.S.N.M. Nos. 114458-114467, Potrero Viejo, December 15, 1938 to January 16, 1939. GUATEMALA: U.S.N.M. Nos. 114469-114472, near Piedras Negras, Petén, May 29 to June 10, 1939.

HYLA ARENICOLOR Cope

Hyla arenicolor COPE, *Journ. Acad. Nat. Sci. Philadelphia*, ser. 2, vol. 6, 1866a, p. 84 (northern Sonora).

Two specimens were obtained, one near Cuernavaca, Morelos, September 6, 1939 (U.S.N.M. No. 114432), the other 11 km. east of Chilpancingo, Guerrero, August 29, 1939 (U.S.N.M. 114431).

Southern specimens of this species are somewhat heavier and the dark spotting on the body is less distinct than in more typical northern specimens.

HYLA STAUFFERI Cope

Hyla staufferi COPE, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 17, 1865a, p. 195 (Orizaba, Veracruz).

In all, 103 specimens were secured at the following localities: CHIAPAS: Palenque, July 7-16, 1939, U.S.N.M. Nos. 114902-114925; Cruz de Piedra, near Acacoyagua, April 25, 1940, U.S.N.M. Nos. 114925-114931. OAXACA: Tehuantepec, January 1-4, 1940, U.S.N.M. Nos. 114932-114949. TABASCO: Tenosique, June 30, 1939, U.S.N.M. No. 114950. VERACRUZ: Cuautlapan, January 1, 1939, U.S.N.M. No. 114862; Palma Sola, January 8, 1939, U.S.N.M. No. 114863; Presidio, January 10, 1939, U.S.N.M. Nos. 114864-114865; Potrero Viejo, December 15, 1938, to January 9, 1939, and September 16, 1939, U.S.N.M. Nos. 114866-114886; 16 km. east of San Juan de la Punta, December 28, 1938, U.S.N.M. Nos. 114887-114901.

At Tehuantepec and Cuautlapan specimens were found in banana plants, protected by the outer sheaths. At Palma Sola, San Juan de la Punta, and Palenque they were found commonly in bromelias.



Hyla phaeota Cope: 1, U.S.N.M. No. 111145, from Piedras Negras, Guatemala, snout-to-vent length 54 mm.; 2, U.S.N.M. No. 111143, same locality, length 56 mm.



1



2

1, *Acrodytes spilomma* (Cope): U.S.N.M. No. 114979, from Río Coy, near Pujal, San Luis Potosí, snout-to-vent length about 65 mm.

2, *Acrodytes modesta*, new species: U.S.N.M. No. 115013, type, from Cruz de Piedra, near Acacoyagua, Chiapas, snout-to-vent length 70 mm.

HYLA EXIMIA Baird

Hyla eximia BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 61 (México: Distrito Federal).

Eight specimens were secured as follows: DISTRITO FEDERAL: Atzacualco, October 6, 1939 (U.S.N.M. No. 114568). MICHOACÁN: Sahuayo, September 14, 1939 (U.S.N.M. Nos. 114569–114571). MÉXICO: 20 km. west of Villa Victoria, March 6, 1939 (U.S.N.M. Nos. 114564–114567).

Kellogg (1932, p. 167) inadvertently included U.S.N.M. Nos. 32396–32398 in his list of *H. eximia*. These are actually *H. staufferi* and are properly so listed on page 174. The specimen listed as B. M. 1901.12 from Cuernavaca, Morelos, is *Hyla smithii* Boulenger.

HYLA MIOTYMPANUM Cope

Hyla miotympanum COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 15, 1863, p. 47 (near Jalapa and Mirador, Veracruz).

In all, 302 specimens were secured at the following localities: VERACRUZ: 2 km. west of Acultzingo, December 19, 1939 (U.S.N.M. Nos. 114692–114706); 8 km. east of Acultzingo, January 18, 1939 (U.S.N.M. Nos. 114677–114691); Cuautlapan, January of 1939 and 1940, and August 7–14, 1940 (U.S.N.M. Nos. 114647–114661); 5 km. west of Fortín, December 14–15, 1938 (U.S.N.M. Nos. 114662–114676). PUEBLA: San Diego, August 25, 1939 (U.S.N.M. Nos. 114707–114710).

The specimens from west of Acultzingo were found in a protected, shady pocket at the head of a very small arroyo, on a steep mountainside, December 19, 1939. They were calling during the day and were not at all wary. Most were caught merely by reaching out and grasping them, without the necessity of grabbing. They jumped only when practically stepped upon. Some were in water, and others were on bushes. A clasping pair was taken, and the eggs and larvae, presumably of the same species, were seen in the water.

On January 18, 1939, calling males were collected on vegetation by the side of a river east of Acultzingo.

On December 15, 1938, many calling males were collected at Fortín in or near a roadside gutter which is constantly supplied with water by seeping springs. At this locality calling males can be heard at practically any time of the year.

HYLA MELANOMMA Taylor

Hyla melanomma TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (Nov. 27, 1940g), pp. 508–510, pl. 57 (7 miles east of Chilpancingo, Guerrero).

On August 29, 1939, we secured five specimens, U.S.N.M. Nos. 114642–114646, within a few hundred feet of the place where the type was captured.

HYLA HAZELAE Taylor

Hyla hazelae TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (Nov. 27, 1940e), pp. 385-389, figs. 1-2 (Cerro San Felipe, 10 miles north of Oaxaca, Oaxaca).

Two topotypes, U.S.N.M. Nos. 114576-114577, collected only a few hundred feet from the exact type locality on Cerro San Felipe, Oaxaca, July 10-20, 1940, are in the collection.

HYLA DENDROSCARTA Taylor

Hyla dendroscarta TAYLOR, Proc. U. S. Nat. Mus., vol. 89, 1940c, pp. 45-47, pls. 2-3 (Cuautlapan, Veracruz).

A total of 159 specimens was secured at Cuautlapan, Veracruz, the type locality, January 16, 1939, January to February and August 7-14, 1940. The following specimens have been numbered in the collection: U.S.N.M. No. 108679, type; U.S.N.M. Nos. 108676, 108680-108686, paratopotypes; U.S.N.M. Nos. 114526-114550, topotypes.

HYLA FORBESI Taylor

Hyla forbesi TAYLOR, Univ. Kansas Sci. Bull., vol. 26, 1939 (1940g), pp. 513-515, pl. 58 (mountain slope 3 miles southwest of Acultzingo, Veracruz).

Four topotypes were obtained August 11, 1940 (U.S.N.M. Nos. 114572-114575). They were secured by a local mountaineer. The normal habitat of the species remains unknown. We presume it to be a bromeliculous form.

HYLA ARBORESCANDENS Taylor

Hyla arborescandens TAYLOR, Univ. Kansas Sci. Bull., vol. 25, 1939b, pp. 388-391, fig. 1 (mountainside about 3 km. southwest of Acultzingo, Veracruz).

Seventy-four specimens were secured at the following localities: OAXACA: Cerro San Felipe, July 10-20, 1940 (U.S.N.M. No. 114403). PUEBLA: Pájaro Verde, August 20, 1939 (U.S.N.M. Nos. 114396-114402). TLAXCALA: Apizaco, August 22, 1939 (U.S.N.M. No. 108671). VERACRUZ: Above Acultzingo, August 11, 1940 (U.S.N.M. Nos. 114404-114405, 108672-108674); Pan de Olla, March 22, 1940 (U.S.N.M. Nos. 114406-114430).

The specimens from Pájaro Verde and the mountain slopes southwest of Acultzingo were found only in bromelias, where they could frequently be heard calling during the day as well as at night. Near Pan de Olla, however, large numbers were found sitting on the ground, on rocks, and on low bushes beside a small, boisterous stream in a rugged mountain ravine.

HYLA SMARAGDINA Taylor

Hyla smaragdina TAYLOR, Copeia, 1940b, No. 1, March 30, pp. 18-20, fig. 1 (mountain 6 km. east of Cojumatlán, Michoacán).

A single topotype was secured on September 14, 1939 (U.S.N.M. No. 114787). This was a year to a day after the type series was col-

lected. At that time they were plentiful in the bromelias. On the occasion of this visit only the single specimen was found in a day's collecting.

HYLA species

A specimen of *Hyla* taken on the mountain above Acultzingo on August 11, 1940, was cataloged in the Museum collection (U.S.N.M. No. 115056), but this has since been misplaced and cannot be found at the present time.

The field notes of Smith on this specimen read: "Green form, probably new, about the size of *Hyla arborescendens* Taylor but with the fingers half webbed."

Genus ACRODYTES Fitzinger, 1843

The tree frogs having the vocal sacs set back behind the angle of the jaw seem to form a natural hylid group. Moreover, as pointed out by Cope, there is a parotoid gland covering much of the dorsal surface of head and shoulders. The skin secretions, which have a quality irritating to mucous membranes, are apparently different from those produced by other species of tree frogs. This combination of characters appears to set this group completely off from *Hyla*.

In 1862 Cope (1862, p. 354) proposed the genus *Scytopsis* for *Scytopsis hebes*, which is (*vide* Boulenger, 1882, p. 365) a synonym of *Rana venulosa* Laurenti=*Hyla venulosa* Daudin. Since *Acrodytes* was proposed in 1843 (Fitzinger, 1843, p. 30), having as genotype *Hyla venulosa* Daudin=*Rana venulosa* Laurenti (1768, p. 31 "Indiis"), this name must take precedence over Cope's *Scytopsis* for this group.

ACRODYTES SPILOMMA (Cope)

PLATE 27, FIGURE 1

Hyla spilomma COPE, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 86 (Cosamalapan, Veracruz).

A series of 31 specimens was acquired from the following localities in México: SAN LUIS POTOSÍ: U.S.N.M. No. 114979, Río Coy, near Pujal, December 8, 1938. VERACRUZ: U.S.N.M. Nos. 114980-114990, Potrero Viejo, December 21-29, 1938; U.S.N.M. No. 114991, 10 miles east of San Juan de la Punta, December 28, 1938; U.S.N.M. Nos. 114992-115000, 115004-115008, Cuautlapan, January 4-16, 1939, and August 7-14, 1940; U.S.N.M. Nos. 115001-115003, Tezonapa, January 11, 1939. CHIAPAS: U.S.N.M. No. 115020, Cruz de Piedra, near Acacoyagua, April 25, 1940.

This series shows very little structural variation, and the color and pattern variation is likewise small. The dorsal pattern consists of a black or brownish-black stripe on each side, in the dorsolateral region sometimes broad enough to cover the back, and widening pos-

teriorly; these are bordered laterally by two lighter brown or reddish-brown stripes, which continue back two-thirds the length of the side and are occasionally connected by a light irregular stripe across the rump. The limbs are barred, the bars sometimes merely stippled lines or stripes. A well-defined, elongate, irregular, black spot from eye above tympanum to behind axilla. It is variable in color on the venter and under limbs, sometimes clouded, rarely nearly cream white, but oftener speckled or stippled black on a light or clouded surface.

The maximum size in mm., as shown by this representative series, is 77 in females, while 10 measured from 70-74. The maximum in males is 71, while three others measured from 65 to 70. It is known to reach a length of 83 mm.

The distribution from San Luis Potosí to southern Chiapas gives this form a rather large known range. In Chiapas it is largely replaced by another species of the genus which is here described. A third, much larger form, being described elsewhere, occurs in Guerrero.

During the dry season specimens were frequently encountered in bromelias and on banana plants; at Pujal the single specimen was ensconced in a rotten log.

The specimens from Veracruz when captured secreted copiously a white viscous substance, which dried quickly and adhered to any object touching it. In contact with the mucous membranes of the nose the secretion caused violent sneezing, and other symptoms of a severe cold, lasting two to three hours. Occasionally such symptoms appeared before there was any possible chance of direct transference of the secretion to the nostril. The secretions that adhered to collecting sacks produced an effect as long as two or three days later as the sacks were used for other specimens.

ACRODYTES MODESTA, new species

PLATE 27, FIGURE 2; PLATE 28, FIGURES 2, 3

Type.—U.S.N.M. No. 115013, collected at Cruz de Piedra, near Acacoyagua, Chiapas, México, April 21, 1940, by Dr. and Mrs. Hobart M. Smith.

Paratypes.—U.S.N.M. Nos. 115010-115012, La Esperanza, Chiapas, April 7 to June 3, 1940; U.S.N.M. Nos. 115014-115019, 115021-115023, Cruz de Piedra, Chiapas, April 21 and May 10, 1940; U.S.N.M. Nos. 115024-115025, Colonia Soconusco, Chiapas, May 4-9, 1940.

Diagnosis.—A small member of the genus, the known maximum size (15 specimens) 70 mm. Related to *nigropunctata* but lacking distinctive markings, having larger terminal pads on tips of digits, narrower head, the eye larger, its diameter greater than its distance from the nostril, and with a widened, bifid, subarticular tubercle

on the fourth finger. The skin is not so strongly thickened by the "parotoid" gland as in *nigropunctata*.

Description of type.—Adult male. Head rather flattened, the eyes elevated; canthus rostralis rounded, the lores somewhat concave; eye large, the diameter (8 mm.), greater than the distance from eye to nostril (5.5 mm.); length of snout, 7 mm.; interorbital distance (8 mm.) greater than the width of an eyelid (6.9 mm.); snout extending about 2 mm. beyond lower lip; tympanum strongly overhung by a thick fold, concealing its upper edge; diameter of tympanum, about 4.2 mm., a little more than half the diameter of eye; a pair of black, elongate, vocal sacs, permanently extruded, behind angles of jaws. Tongue broader than long, somewhat cordiform, notched behind, very slightly free behind; vomerine teeth in two transverse, raised groups narrowly separated medially, the tips of the teeth transversely grooved, appearing bifid in profile; openings of the mucous glands of palate in a transverse sinuous groove; choanae moderate in size.

Fingers rather short, the diameters of the terminal pads of outer toes 5 mm., somewhat larger than the diameter of the tympanum; outer toes less than one-third webbed, with only a trace between first and second, but continued as a narrow fringe to the pads; palmar tubercles rather ill defined, the median somewhat bifid, the inner large, its dorsal portion covered with minute, brown, horny spinules or tubercles, subarticular tubercles moderate except distal one on outer finger, which is much larger than the others, nearly as wide as toe and more or less bifid; a few distinct supernumerary tubercles. Toes about three-fifths webbed; subarticular tubercles moderate; inner metatarsal tubercle of moderate size, rather flattened; outer smaller, distinct; supernumerary tubercles distinct; a thickened ridge of skin present suggesting a very weak tarsal fold. When limbs are folded, the heels overlap somewhat; tibiotarsal articulation reaches to middle of eye.

Skin above with numerous small, equal-sized pustules, scattered equally over the dorsal surface, more numerous on sides; venter, including chin and underside of arm and thigh, strongly areolate; anal flap short, fluted, followed behind by a groove.

Color in alcohol.—Above nearly uniform lavender-brown to purplish brown, the pustules darker on back and blackish on sides; a few small black spots on the dorsal surface of femur, tibia, and foot, but no trace of bars; belly dirty white with numerous small black flecks or spots; tympanum light brown.

Measurements in mm.—Snout to vent, 69; width of head, 25; length of head, 23; arm, 42; leg, 108; tibia, 34; foot, 45.

Variation.—Many of the specimens are of a lighter, lavender-brown color, while a few are darker, more purplish brown. None,

however, shows any trace of a black dorsal pattern. Many show no trace of the black flecks or spots on the top of femur and tibia; one very light, fawn-colored specimen from the Gulf drainage of Tabasco (Tenosique, U.S.N.M. No. 115009) is tentatively referred to this species.

Remarks.—During the wet season in Chiapas specimens were found calling at night in a tree about 12 feet above the ground. The call is a loud, raucous, grinding noise that lasts for perhaps a second. It is sometimes repeated twice or thrice, and then follows a long period of silence.

The skin secretion was very meager, perhaps owing to the season. No irritating effect on the skin or nasal membranes was noticed; however, none of it was placed directly on the membranes.

Genus PLECTROHYLA Brocchi, 1877

The fortunate revival of the generic name *Plectrohyla* demands the allocation of another generic name which like *Plectrohyla* is based upon a species with a more or less conspicuous pollex. This is the genus *Boana* Gray (1825, p. 214), which proves even more strongly differentiated from *Hyla* (*sensu lato*) than *Plectrohyla*, and certainly is not congeneric with the latter, despite superficial similarities. *Plectrohyla* differs from the older *Boana* in the character of the vomerine teeth (which approach those of *Hyla*); the pollex bones do not pierce the flesh, and there are perhaps other less obvious characters.

The genus *Boana*⁵ may be defined as a group having a pollex rudiment more or less developed, a single subgular vocal sac; and vomerine teeth which form curved or angular series (rarely diagonal) tending to converge anteriorly. Perhaps some 20 species, all South American, are referable to the genus. To the Central American and Mexican genus *Plectrohyla* belong six forms described at present:

<i>Plectrohyla miliaria</i> (Cope)	<i>Plectrohyla guatemalensis</i> Brocchi
<i>Plectrohyla ixil</i> Stuart	<i>Plectrohyla matudai</i> Hartweg
<i>Plectrohyla quecchi</i> Stuart	<i>Plectrohyla sagorum</i> Hartweg

PLECTROHYLA MATUDAI Hartweg

FIGURE 60, D; PLATE 29

Plectrohyla matudai HARTWEG, Occ. Papers Mus. Zool. Univ. Michigan, No. 437, June 30, 1941, pp. 5–9, pl. 1 (Mount Ovando, District of Soconusco, Chiapas).—TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 3, May 15, 1942a, pp. 39–40.

A series of 28 topotypes (U.S.N.M. Nos. 111094–111121), including both adults and larvae, was collected April 15–16, 1940, on Mount

⁵ Genotype [*Rana*] *boans* Linnaeus (1758, p. 213) from "America" (= *Hyla boans* Daudin, 1803, p. 21, pl. 11, from "Surinam"). The name *Hypsiboas* Wagler (1830, p. 200) (genotype, *Hyla palmata*) was chosen by Cope for this genus. Apparently he was unaware of Gray's name.

Ovando at an elevation of 2,800 to 6,000 feet. The tadpoles were taken in small streams and the adults were found in the same general region. The tadpoles may be distinguished by having a serrated edge on the upper beak, the posterior serrations being fanglike.

The adults may be distinguished by the very blunt snout; the nostrils at the extreme anterior end of snout; the areas surrounding them somewhat elevated; tarsal fold forming a long, free, flexible flap; toes webbed to the terminal disks, except on fourth toe, which has distal joint free (but with a fringe); tympanum almost hidden by thick pustulate skin; males *with* a vocal sac (not *without* as stated in the type description). The maximum known size of the female is 45 mm.

Most of the 36 specimens are young. One young specimen was obtained at Finca Juárez; several young and one adult are from Las Nubes, 2,900 feet, on Mount Ovando, Chiapas. Seven adults were collected on Mount Ovando at 6,000 feet.

All were taken in small streams, sitting on vegetation, on boulders, or, in one case, in the water. The single adult from Las Nubes is a male, which was calling from the water. Other males, as well as females, were collected at 6,000 feet, but here no young were seen. Young were very numerous at Las Nubes, where they were observed sitting on the leaves of low plants at the edge of the water. A single young specimen from Finca Juárez was found under similar conditions.

The voice of the male of this species is much different from that of *P. sagorum*, being a single, sharp note that sounds very much like two pebbles struck together under water. The note is repeated at intervals of about two minutes.

It appears that this species lays the eggs near streams. Certainly the young pass through their larval stages in the streams. Some transforming young were obtained and one tadpole of the species is at hand.

PLECTROHYLA SAGORUM Hartweg

FIGURE 60, E; PLATE 30

Plectrohyla sagorum HARTWEG, Occ. Papers Mus. Zool. Univ. Michigan, No. 437, June 30, 1941, pp. 2-5, pl. 1, figs. 1-3 (Mount Ovando, District of Soconusco, Chiapas, Mexico).—HARTWEG and ORTON, Occ. Papers Mus. Zool. Univ. Michigan, No. 438, July 1, 1941, pp. 5-6.

This series of 18 topotypic specimens, U.S.N.M. Nos. 111122-111138, was obtained April 15-16, 1940, on Mount Ovando at an elevation of 5,000 to about 7,000 feet. The specimens, adult and young transformed, were collected exclusively from bromelias, which grow in profusion at this elevation on the mountain. The eggs, however, are probably laid in water on the ground, as tadpoles presumably of this species, were obtained by Hartweg (*loc. cit.*).

This species, closely related to *Plectrohyla matudai*, may be distinguished by the sharp point on the snout, the canthus rostralis distinct; skin moderately rough in males; the web on toes nowhere reaching pads, but leaving two joints on fourth toe and the terminal parts of other toes free, except for a narrow fringe; vocal sac in male; tympanum more or less visible; maximum size known, 45 mm. (female).

Males were heard calling in the daytime from bromelias, and the call was positively traced to this species on one occasion. The call is a slightly drawn out, coarsely trilled, nasal *quaaack*.

The spurs on the pollex differ in the two Chiapas forms of the genus. Figure 60, *D-F*, illustrates spurs of both species, and that of *P. guatemalensis*.

Genus HYLELLA Reinhardt and Lütken, 1861

HYLELLA PICTA Günther

Hylella picta GÜNTHER, Biologia Centrali-Americana, Rept. Batr., 1901, pp. 286-287, pl. 73, fig. C (Jalapa, Veracruz).

Forty-four specimens are from Potrero Viejo, December 21-26, 1938, June 13 and 26, and August 12, 1939 (U.S.N.M. Nos. 114102-114126), and Cuautlapan, January 16, January, February, and August 7-14, 1940 (U.S.N.M. Nos. 114127-114132), Veracruz, where the species is common about permanent ponds.

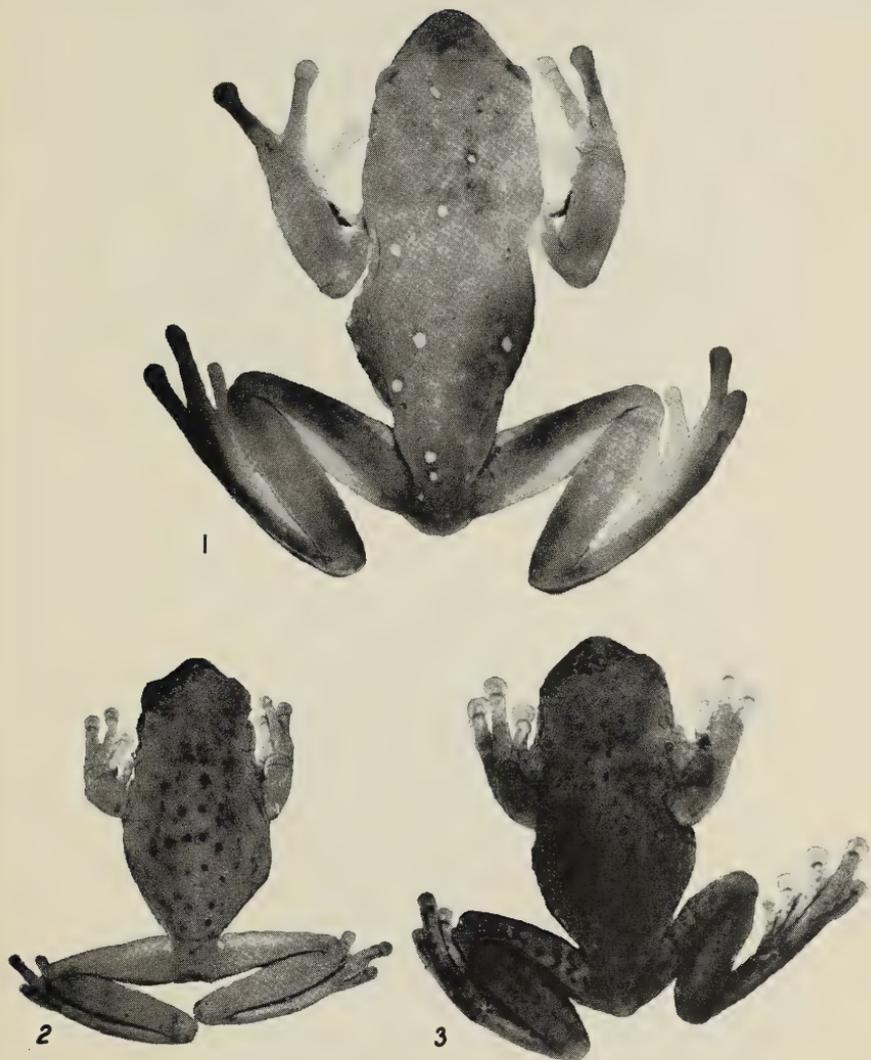
HYLELLA SUMICHRASTI (Brocchi)

Ezerodonta sumichrasti BROCCHI, Bull. Soc. Philom. Paris, ser. 7, vol. 3, No. 1, 1879, p. 20 (Santa Efígenia, Oaxaca).

Hylella sumichrasti BOULENGER, Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, 1882, pp. 420-421.

A series of 77 specimens was obtained at several localities within a radius of 50 miles of Tehuantepec, Oaxaca. The localities are Cerro Arenal, January 2, 1940 (U.S.N.M. Nos. 114133-114137); Tres Cruces, January 4, 1940 (U.S.N.M. Nos. 114138-114148); Lachiguiri, 7,100 feet, January 20, 1940 (U.S.N.M. No. 114149); Portillo Los Nanches, near El Limón, 7 leagues northwest of Tehuantepec, March 1940 (U.S.N.M. Nos. 114150-114155); "Tehuantepec," March 1940 (U.S.N.M. Nos. 114156-114163); La Concepción, May 1940 (U.S.N.M. Nos. 114164-114206); Río Grande, 12½ miles north of Niltepec, Oaxaca, January 26-30, 1940 (U.S.N.M. Nos. 114207-114209). All were found in bromelias in the hills and mountains surrounding the Tehuantepec plains; none was found on the plain itself, although bromelias occasionally are present.

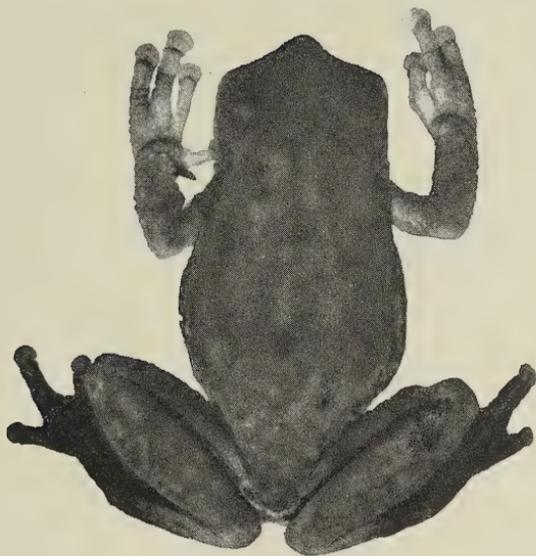
The vocal sac is absent. Occasional specimens may show a slight elevation on the prevomers and teeth may occasionally occur on them.



1, *Agalychnis dacnicolor* (Cope): U.S.N.M. No. 116040, from Tierra Colorada, Guerrero.
2, 3, *Acrodytes modesta*, new species: 2, U.S.N.M. No. 115021, paratype, from Cruz de Piedra, Chiapas, snout-to-vent length 61 mm.; 3, U.S.N.M. No. 115013, type, same locality, length 70 mm.



Plectrohyla matudai Hartweg: 1, E.H.T.-H.M.S. No. 26628, male topotype from Cerro Ovando, Chiapas, snout-to-vent length 38 mm.; 2, U.S.N.M. No. 111120, same locality, length 39 mm.



1



2

Plectrohyla sagorum Hartweg: 1, U.S.N.M. No. 111138, topotype from Cerro Ovando, Chiapas, snout-to-vent length 41.8 mm.; 2, U.S.N.M. No. 111127, same locality, length 45 mm.



Agalychnis moreletii (Duméril): 1, U.S.N.M. No. 116043, male, from Cuautlapan, Veracruz;
2, U.S.N.M. No. 116044, same locality. Both about natural size.

Genus **DIAGLENA** Cope, 1887**DIAGLENA RETICULATA** Taylor

Diaglena reticulata TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 4, May 15, 1942b, pp. 60-61, pl. 4, figs. 1, 1a, 1b, 1c, pl. 5, fig. 1 (Cerro Arenal, Oaxaca).

The type, U.S.N.M. No. 115500, was discovered on January 2, 1938, by Thomas MacDougall at Cerro Arenal, 30 km. northwest of Tehuantepec, Oaxaca.

Both forms of this genus appear to be terrestrial. The type of *reticulata* was captured in a terrestrial bromelia, while *Diaglena spatulata* has usually been found on the ground.

Genus **AGALYCHNIS** Cope, 1864**AGALYCHNIS CALLIDRYAS** (Cope)

Hyla callidryas COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 14, 1862, p. 359 (Panamá).

Agalychnis callidryas COPE, Nat. Hist. Rev., 1865b, p. 110.

A single specimen, U.S.N.M. No. 116042, taken at Santo Tomás, Tabasco, June 24, 1939, is referred to this species. The presumed distinctions between this species and *Agalychnis helenae* Cope are not great. This latter species has a purplish lateral stripe that is crossed by five diagonal cream lines, which touch a longitudinal cream line bordering the purple stripe above. *A. callidryas* lacks the longitudinal cream line but does have the diagonal lines. There is a green stripe of varying width on the dorsal surface of the femur in *callidryas* and it is also present in the type of *helenae*. Whether these forms are actually specifically distinct may be questioned. This specimen was taken from a bunch of orchids high in a large tree.

AGALYCHNIS DACNICOLOR (Cope)

PLATE 28, FIGURE 1

Phyllomedusa dacnicolor COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 16, Aug. 1864, p. 181 (near Colima, Colima, México).

Agalychnis dacnicolor COPE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 6, 1866a, p. 86.

A typical specimen, U.S.N.M. No. 116040, was taken on August 31, 1939, at night, at Tierra Colorada, Guerrero, by following its call. U.S.N.M. No. 116041 is from Tehuantepec, Oaxaca, taken in March 1940, and is the first record for that state. The latter specimen has the tips of the digits narrowed, as in all other juveniles.

AGALYCHNIS MORELETHI (Duméril)

PLATE 31

Hyla moreletii DUMÉRIL, Ann. Sci. Nat., Paris, ser. 3, Zool., vol. 19, 1853, p. 169 (Cobán, Verapaz, Guatemala).

Agalychnis moreletii COPE, Nat. Hist. Rev., 1865b, p. 110.

A total of 71 specimens was taken. Two series are numbered in the collection: U.S.N.M. Nos. 116043-116053 from Cuautlapan, Veracruz, January, 1939 and 1940, and August 7-14, 1940, and U.S.N.M. Nos. 116054-116069 from Finca Juárez, Chiapas, May 8-10, 1940. There are no constant differences between the two series. The southern specimens occasionally have the green stripe continued along the entire dorsal surface of the femur. In the northern specimens it is usually terminated some distance from the pelvis (body).

The transparent area of the lower eyelid has a network of silver rather than the vertical lines of *dacnicolor* and *callidryas*. In males a vocal sac is present and a horny nuptial area on the base of the first finger. One specimen has a strangely curved spine ("humped back"), not, apparently, due to external injury.

The 60 specimens from Finca Juárez were collected by Smith on a single night. They were congregated about a short, erratic rivulet some 250 feet long, which led across an old and gravelly river channel to the river itself. A portion of the rivulet passed between two large boulders, between which a narrow but very deep pool of water, covered with duckweed, had collected. Bushes and trees well concealed the rivulet.

Field notes on the capture read, "The frogs were discovered quite by accident. Although they were singing occasionally no attention was given the voices as we passed the rivulet on the nearby trail, for I firmly believed the voices to be of the common *Leptodactylus melanonotus* and thought no further of them. Fortunately, I hesitated slightly at the point where the trail crossed the rivulet, and happened to observe a clasping pair of these big green hylids, clinging to the side of a boulder. Search subsequently revealed that specimens were scattered all over the bushes and trees, on rocks near the water and even in the water. Several clasping pairs were collected, and the voices of singing males were positively traced.

"Egg-laying was well under way and apparently nearly completed. Masses of eggs were hanging from bush stems, from leaves and on the sides of boulders, invariably over the water. Especially numerous were the masses on the boulders bordering the deep pool mentioned above and hanging from tree limbs which extended over this pool.

"The most interesting discovery of all was that unusual numbers of *Leptodeira a. polysticta* had also collected here to feast on the frog eggs. Ten specimens were collected, and nearly all were either gorged with eggs, had started feeding on them, or were observed edging out on limbs to reach egg masses. Several were caught with the telltale eggs still adhering to their lips. One snake was observed while it rather hastily crawled out on a limb, found an egg mass, and started eating it. This egg mass was about ten feet above the surface of the water and was the highest observed.

"While no doubt the local population of *Agalychnis* was depleted by collecting all the adults that could be found, at the same time probably many times that number of eggs was saved, for the snakes would certainly have eaten many hundreds of eggs before they fell into the water."

Genus CENTROLENELLA Noble, 1920

CENTROLENELLA FLEISCHMANNI (Boettger)

Hylella fleischmanni BOETTGER, Ber. Senck. Nat. Ges., 1893, p. 251 (San José Costa Rica).

Centrolenella fleishmanni (sic) TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 1, No. 5, May 15, 1942c, p. 74.

A single specimen, U.S.N.M. No. 115499, is referred to this species. It was taken at night during the dry season (April 19, 1940) at Salto de Agua, Chiapas, sitting on the leaves of a plant near the edge of a small rocky stream. In life it was pale green above, translucent below. The bones, visible through the flesh, were white.

Genus ANOTHECA Smith, 1939

ANOTHECA CORONATA (Stejneger)

FIGURE 60, B, C

Gastrotheca coronata STEJNEGER, Proc. U. S. Nat. Mus., vol. 41, Aug. 14, 1911, pp. 287-288 (Palomo, Valle de Orosi, Cartago, Costa Rica).

Anotheca coronata SMITH, Proc. Biol. Soc. Washington, vol. 52, Dec. 15, 1939, pp. 190-191, pl. 1, figs. 1, 2, 3, pl. 2, fig. 6.

In all, 138 specimens were secured, of which U.S.N.M. Nos. 116398-116412 are cataloged. All are from Cuautlapan, Veracruz, collected January 1-16, 1939, December 20, 1939, and August 7-14, 1940. This series has been discussed earlier (Smith, *loc. cit.*).

A row of high spines crosses the back edge of the skull, above the tympanum, and decreases somewhat in size on the borders of the orbit, while those along the canthus are very short. Each is surrounded by a fleshy glandular apophysis, which appears to be some specialized type of gland, perhaps for poison. A substance is exuded when the live specimens are placed in alcohol and forms a thick yellow cream mat about the bases of the apophyses. The spines are fixed projections from certain bones of the head, curved forward or inward, and are fanglike in character. Ordinarily, when the glands surrounding the spines are full, the spines are almost completely hidden. When they are discharged the sharp top part of the spines is exposed. The spines vary greatly in length, the largest being something over 4 mm. in length. These objects are developed in both sexes, but their size is distinctly smaller in the females (see fig. 60, B, C).

Specimens were obtained from under the petioles of the banana leaves. These outer sheaths loosen and form cavities which may be

entered from above. These places were also favorite hiding quarters of *Bolitoglossa rufescens* and *B. platydactyla*. Most of the series was secured during the dry season, but others were obtained during the rains (August). Included in the latter specimens are a number of females, none of which show evidence of a dorsal pouch.

Family MICROHYLIDAE Parker, 1934

Genus MICROHYLA Tschudi, 1838

MICROHYLA OLIVACEA (Hallowell)

Engystoma olivaceum HALLOWELL, Proc. Acad. Nat. Sci. Philadelphia, vol. 8, 1856 (1857), p. 252 (type locality not definite, but presumed to be Kansas).
Microhyla olivacea PARKER, A monograph of the frogs of the family Microhylidae, 1934, p. 201.

One specimen, U.S.N.M. No. 105161, was collected at Río Santa María, Chihuahua, August 13, 1938. This form has a range extending from Coahuila and Durango, México, to Nebraska. The specimens reported by Taylor (1940g) from Sinaloa have recently been described (Taylor, 1943b), as *Microhyla mazatlanensis*.

MICROHYLA USTA USTA (Cope)

PLATE 32, FIGURES 1-4

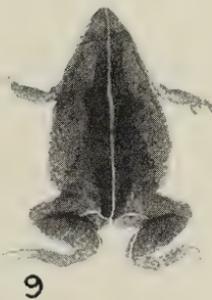
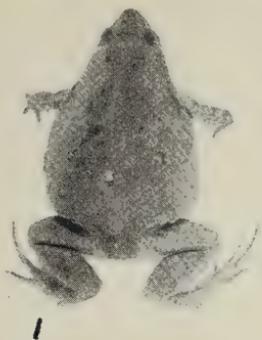
Engystoma ustum COPE, Proc. Acad. Nat. Sci. Philadelphia, vol. 18, May 1866b, p. 131 (Guadalajara, Jalisco).

Engystoma mexicanum PETERS, Monatsb. Preuss. Akad. Wiss. Berlin, Dec. 1869, p. 881 (state of Puebla [probably Matamoros]).

Five specimens from the state of Veracruz are referred to this form as follows: Palma Sola, January 8, 1939, U.S.N.M. No. 116422; Potrero Viejo, February 28, June 13-18 and September 26, 1939, U.S.N.M. Nos. 116423-116426.

Whether there is more than one recognizable form north of the Tehuantepec region cannot be stated at this time. No adequate series of specimens from the type locality are available in any museum. The type itself is in a deteriorated condition. It is possible that specimens from the plateau (Guadalajara and Guanajuato) are not the same as those from the lowlands of Guerrero, and Veracruz. The western specimens are larger than those obtained elsewhere. A male from Colima measures 27 mm. from snout to vent, while three females measure 29, 29, and 30 mm. The Guerrero collections examined (E.H.T.-H.M.S. Coll.) have small males and large females. Some variation in the relative size of the two tubercles of the metatarsus is evident but the inner is always equal or very nearly equal to the length of the first toe.

The specimen from Palma Sola was found in a clump of dead bromelias on the ground.



1-4, *Microhyla usta usta* (Cope): 1, E.H.T.-H.M.S. No. 1123, from Xaltianguis, Guerrero, snout-to-vent length 31 mm.; 2, E.H.T.-H.M.S. No. 1151, Tierra Colorada, Guerrero, length 27 mm.; 3, E.H.T.-H.M.S. No. 6547, Cautlapan, Veracruz, length 26 mm.; 4, E.H.T.-H.M.S. No. 1150, Tierra Colorada, Guerrero, length 28 mm.
 5-10, *Microhyla usta gadovii* (Boulenger): 5, E.H.T.-H.M.S. No. 1180, from Tonalá, Chiapas, snout-to-vent length 21.5; 6, E.H.T.-H.M.S. No. 1176, same locality, length 22 mm.; 7, E.H.T.-H.M.S. No. 1183, same locality; 8, E.H.T.-H.M.S. No. 1182, same locality; 9, E.H.T.-H.M.S. No. 1169, from Tapachula, Chiapas; 10, E.H.T.-H.M.S. No. 1170, from Tonalá, Chiapas. Figs. 7-10 all 25 mm. from snout to vent.

U.S.N.M. No. 46916 reported by Kellogg (1932, p. 188) from Valles, San Luis Potosí, is a juvenile *Hypopachus cuneus cuneus*.

MICROHYLA USTA GADOVII (Boulenger)

PLATE 32, FIGURES 5-10

Eupemphix gadovii BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 12, No. 71, Nov. 1903, p. 552 (San Mateo del Mar, Oaxaca).

This form, recognized as a subspecies of *M. usta*, is represented by a group of 31 specimens, of which the following are cataloged: OAXACA: Tehuantepec, January 20, 1940, U.S.N.M. No. 116427. CHIAPAS: La Esperanza, April 7 to June 3, 1940, U.S.N.M. Nos. 116428-116442; Acacoyagua, April 25 and May 10, 1940, U.S.N.M. Nos. 116443-116446; Colonia Soconusco, May 9, 1940, U.S.N.M. Nos. 116447-116448; Salto de Agua, May 19, 1940, U.S.N.M. No. 116449; Las Gradass, May 20, 1940, U.S.N.M. No. 116450.

This series of 31 specimens and a second series in the E. H. Taylor-H. M. Smith collection of 23 specimens from Tonalá and Tapachula, Chiapas, differ from the typical form. These have a hair-fine line from the tip of the snout to the anus, usually cream or white in color. A somewhat arched transverse line crosses this line slightly in front of the anus, follows along the posterior face of the femur, the underside of the tibia, and the posterior part of the foot, to the outer metatarsal tubercle. A line begins at the tip of the chin and runs onto the breast. Many of the specimens also have a line on the underside of the arm which crosses the breast and contacts the median ventral line. A more or less continuous cream stripe, narrower than in the more typical form, runs from the eye to near the insertion of the forelimb. The inner metatarsal tubercle is at least a third less than the length of the first toe and the size is smaller than the more typical specimens.

We have never found any trace of this pattern, in some 80 specimens of *Microhyla usta usta* examined.

The measurements of 21 fully adult males vary between 20 and 23 mm., the average being 21.3 mm. Five adult females (gravid) vary between 24.5 and 27.4 mm., the average being 25.7 mm. Of the entire series of 53 specimens only two lack the markings. One of these is more or less desiccated, the leg is longer, the tibiotarsal articulation reaching almost to the eye. It is from a higher elevation than the other specimens.

Specimens were found hopping on the ground near moist places or small pools of water.

A specimen (U.S.N.M. No. 47530), reported by Kellogg (1932, p. 188) to be from Minatitlán, Veracruz, actually is from Pinabete, Chiapas (8,500 feet), according to a field tag tied to the specimen.

MICROHYLA ELEGANS (Boulenger)

Engystoma elegans BOULENGER, Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, ed. 2, 1882, p. 162 (type locality, Córdoba, Veracruz, México).

Microhyla elegans PARKER, A monograph of the frogs of the family Microhylidae, 1934, p. 144.

A single specimen, U.S.N.M. No. 116025, was collected at Pozo de la Jicotea, 5 miles southwest of Piedras Negras, Guatemala, near the border of Chiapas, México, on June 3, 1939.

The chief differences between *Microhyla elegans* and *Microhyla usta* are the absence of an outer metatarsal tubercle; the very strong reduction of the inner tubercle; the elongation of the subarticular tubercles, especially of the fourth toe; the narrower, more elongated sole; and the flattened tips of the toes, slightly but distinctly wider than the proximal part of the digits.

A median vocal pouch is present, evidenced by two elongate slits in the floor of the mouth at the side of the tongue. The anterior of the two palatal ridges is somewhat more elongate and narrower; perhaps these ridges are a little farther apart than in *usta*. Beyond the second fold the membrane is arranged in numerous, very narrow, longitudinal folds or lamellae. The tongue is apparently unnotched behind.

This species still is extremely rare in collections, six being the number of known specimens. The type and two others are known from México (Veracruz and Campeche). Stuart (1934, pp. 7-8) has reported it from Petén, Guatemala.

In the male the toes and fingers have sharp-edged lateral fringes which bear minute spicules.

Genus HYPOPACHUS Keferstein, 1867

HYPOPACHUS CUNEUS CUNEUS Cope

Hypopachus cuneus COPE, U. S. Nat. Mus. Bull. 34, 1889, pp. 388-389, fig. 98 (San Diego, Tex.).

Hypopachus cuneus cuneus TAYLOR, Univ. Kansas Sci. Bull., vol. 26, No. 15, 1939 (1940g), pp. 516-518, pl. 67, fig. A; pl. 68, figs. 7, 7a.

Six specimens are from Hacienda La Clementina, 4 miles west of Forlón, Tamaulipas (U.S.N.M. Nos. 106245-106250). They were found on September 22, 1938, hidden in earth at the bottom of a cement vat, the top of which was flush with the surface of the ground.

Family RANIDAE Bonaparte, 1831

Genus RANA Linnaeus, 1758

RANA SIERRAMADRENSIS Taylor

Rana sierramadrensis TAYLOR, Univ. Kansas Sci. Bull., vol. 25, 1938 (July 10, 1939b), pp. 387-389, pl. 39, fig. 1 (Agua del Obispo, Guerrero).

Four perfect topotypes (U.S.N.M. Nos. 114009-114012) were

secured on February 4, 1939, in and near the headwaters of Agua del Obispo.

The specimens of this species, during the day, are ensconced in rocks along the edges of mountain rivulets and are rarely seen. At night they are occasionally found hopping among vegetation at some distance from the streams and are especially difficult to capture, owing to the rapidity of their movements.

RANA PALMIPES Spix

Rana palmipes SPIX, Animalia nova . . . Brasiliam, 1824, p. 5, pl. 5, fig. 1 (Amazon River, Brazil).

In all, 117 specimens were found at the following localities: CHIAPAS: Mount Ovando, 1,200 to 6,000 feet, April 15 to May 19, 1940 (U.S.N.M. Nos. 113762–113777); Finca Juárez, May 8–10, 1940 (U.S.N.M. Nos. 112778–113792); Palenque, July 11–23, 1939 (U.S.N.M. Nos. 113760–113761). TABASCO: Tenosique, June 29–30, 1939 (U.S.N.M. Nos. 113752–113759). VERACRUZ: Matacabresto, February 25, 1939 (U.S.N.M. No. 113751); Potrero Viejo, December 21, 1938 (U.S.N.M. Nos. 113736–113750). GUATEMALA: Piedras Negras, Petén, June 3–20, 1939 (U.S.N.M. Nos. 113793–113795).

The specimens have a brilliant-green to yellowish-green head and a more or less brownish body. A single specimen is an exception, in that it is almost black. We believe this is an abnormal condition, due to an infestation of parasitic mites in the skin. It is not a discoloration as the black color was observed immediately in life.

In some small rivulets this species appears in considerable numbers. Occasional specimens have been taken in ponds.

RANA MONTEZUMAE Baird

Rana montezumae BAIRD, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, 1854, p. 61 (México, D. F.).

Thirty-four specimens are from the following localities: DISTRITO FEDERAL: Xochimilco, January 25, 1939 (U.S.N.M. Nos. 113710–113712). MÉXICO: Lerma, December 15 and 30, 1939 (U.S.N.M. Nos. 113733–113734); Santa Magdalena, near Texcoco, August 23, 1939 (U.S.N.M. Nos. 113730–113732); 15 km. west of Toluca, March 5 and September 11, 1939 (U.S.N.M. Nos. 113713–113727); Zumpango, March 3, 1939 (U.S.N.M. Nos. 113728–113729). MICHOACÁN: Sahuayo, September 14, 1939 (U.S.N.M. No. 113735).

RANA PUSTULOSA Boulenger

Rana pustulosa BOULENGER, Ann. Mag. Nat. Hist., ser. 5, vol. 11, 1883, p. 343 (Ventanas, Durango).

Three specimens (U.S.N.M. Nos. 114006–114008) are from arroyos about 10 km. east of Chilpancingo, Guerrero, collected August 29, 1939.

RANA MEGAPODA Taylor

Rana megapoda TAYLOR, Univ. Kansas Sci. Bull., vol. 28, pt. 2, No. 14, Nov. 15, 1942d, pp. 310-313, pl. 28, figs. 1, 2 (near Chapala, Jalisco).

A series of eight specimens (U.S.N.M. Nos. 113998-114005) was collected on February 24, 1939, at La Palma, Lake Chapala, Jalisco. These have been made paratypes.

This is one of the largest species of *Rana*. Our largest female specimen measures 152 mm. from snout to vent; the largest male, 117 mm. In the past this species has been confused with *Rana montezumae*, which occurs in the same general region.

The specimens were found at night in Lake Chapala near a pier of loose rocks, into which several others took refuge and escaped.

RANA PIPIENS Schreber

Rana pipiens SCHREBER, Der Naturforscher, vol. 18, 1782, pp. 185-186, pl. 4 (New York).

In all, 254 specimens were collected in the following localities: CHIHUAHUA: Río Santa María, near Progreso, October, 13, 1938 (U.S.N.M. Nos. 105159-105160). CHIAPAS: Belén, May 23, 1940 (U.S.N.M. 113981); Cruz de Piedra, near La Esperanza, April 25 and May 10, 1940 (U.S.N.M. Nos. 113961-113965); Colonia Soconusco, May 4, 1940 (U.S.N.M. Nos. 113966-113980); Palenque, July 11, 1939 (U.S.N.M. No. 113983); Tonalá, January 26-30, 1940 (U.S.N.M. No. 113982). COAHUILA: Arteaga, November 16, 1938 (U.S.N.M. No. 106242); 13 miles west of San Pedro, November 9, 1938 (U.S.N.M. Nos. 106227-106231); 21 miles north of Saltillo, November 12, 1938 (U.S.N.M. Nos. 106232-106241). DISTRITO FEDERAL: Xochimilco, January 25, 1939 (U.S.N.M. Nos. 113796-113799). DURANGO: Between Lerdo and La Goma, October 31, 1938 (U.S.N.M. Nos. 106162-106163). GUERRERO: Agua del Obispo, February 4 and August 31, 1939 (U.S.N.M. Nos. 113818-113826); Chilpancingo, August 29, 1939 (U.S.N.M. Nos. 113827-113829); Tierra Colorada, August 31, 1939 (U.S.N.M. Nos. 113830-113832). HIDALGO: El Chico National Park, September 17, 1939 (U.S.N.M. Nos. 113833-113838). MÉXICO: 15 km. west of Toluca, March 5 and September 11, 1939 (U.S.N.M. Nos. 113800-113807); 19 km. west of Villa Victoria, March 6, 1939 (U.S.N.M. No. 113808). MICHOACÁN: 4 km. north of Apatzingán, March 16, 1939 (U.S.N.M. No. 113809); La Palma, March 23, 1939 (U.S.N.M. Nos. 113812-113815); Tacicúaro, October 1, 1939 (U.S.N.M. No. 113816); Uruapan, March 9, 1939 (U.S.N.M. Nos. 113810-113811). MORELOS: 5 km. south of Cuernavaca, January 22, 1939 (U.S.N.M. No. 113855); Puente de Ixtla, September 5, 1939 (U.S.N.M. No. 113856); Zempoala, January 24-28, and August 25, 1939 (U.S.N.M. Nos. 113840-113854). NUEVO LEÓN: Sabinas Hidalgo, April 29, 1939 (U.S.N.M. No. 113818). OAXACA:

Cerro Arenal, near Tehuantepec, January 2 and 16, 1940 (U.S.N.M. Nos. 113802-113907); Tehuantepec, January 6, March and May, 1940 (U.S.N.M. Nos. 113910-113923); Tres Cruces, near Tehuantepec, January 14, 1940 (U.S.N.M. Nos. 113898-113899); Cerro de las Flores, near Lachiguirí, 7,100 feet, January 20, 1940 (U.S.N.M. No. 113900); Matías Romero, January 25, 1940 (U.S.N.M. No. 113910); Cerro de Huamelula, March 1940 (U.S.N.M. No. 113908); 10 km. south of Tehuantepec, March 1940 (U.S.N.M. No. 113909); Escurana, near Tehuantepec, May, 1940 (U.S.N.M. Nos. 113924-113938); Cerro Guengola, May 1940 (U.S.N.M. Nos. 113939-113953); La Palmar, May 1940 (U.S.N.M. Nos. 113954-113960). SAN LUIS POTOSÍ: Río Coy, near Pujal, December 7, 1938 (U.S.N.M. No. 113889). TABASCO: Tenosique, June 25-30, 1939 (U.S.N.M. Nos. 113857-113861). TAMAULIPAS: Hacienda La Clementina, 4 miles west of Forlón, November 19, 1938 (U.S.N.M. No. 106243). VERACRUZ: 8 km. northeast Acultzingo, January 18, 1939 (U.S.N.M. Nos. 113890-113896); Cuautlapan, January 1-16, 1939 and August 7-14, 1940 (U.S.N.M. Nos. 113877-113889); Pan de Olla, March 22, 1940 (U.S.N.M. No. 113897); Potrero Viejo, December 19-21, 1938 (U.S.N.M. Nos. 113862-113876). GUATEMALA: Vicinity of Piedras Negras, Petén, May 29-June 20, 1939 (U.S.N.M. Nos. 113984-113997).

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