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SYNOPSIS OF THE FISHES OF
THE GREAT LAKES OF
NICARAGUA

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SYNOPSIS OF THE FISHES OF THE GREAT LAKES OF NICARAGUA.

BY SETH EUGENE MEEK.

The following synopsis is based on a collection of fishes made by the writer in March, 1906. As the collection contains quite large series of several species hitherto known from one or a very few individuals, it seems advisable to re-describe these and give a somewhat complete account of the other species. In the present paper are given keys and descriptions which will enable one to identify quite easily any or all species known to inhabit these lakes. Lake Nicaragua, the largest of the lakes in Nicaragua, is about 110 miles in length with an average width of about 40 miles, and a maximum depth of about 25 fathoms. Lake Managua is much smaller, having a length of about 40 miles, a maximum width of about 25 miles, and a maximum depth of about 15 fathoms. In the spring of 1906 the water in the lakes was much lower than usual for this time of year. Captain Tooth, who has been a sailor on Lake Managua for more than a decade, told me he never saw the lake so low as then. The shore of this lake near Managua, Momotomba, and San Francisco is rocky or sandy. Aquatic vegetation, which is reported to be very abundant along the shores in time of high water, had disappeared, the lake being at this time about 2 fathoms below high-water mark. The water in this lake was reddish in color and contained in suspension a considerable amount of fine silt. It was only with much difficulty that the water would pass through a net used for collecting plankton. The temperature of the lake, taken at several places at a depth of 2 fathoms, was 83° F. The temperature of a bucket of water drawn from a well in Managua from a depth of 100 feet was 83° F. This temperature was found at about 5 fathoms in Lake Tiscapa, a small volcanic lake near Managua, and at same altitude as Lake Managua. The same temperature was observed in Lake Nicaragua in 3 fathoms of water off the steamboat pier. Only the northern end of Lake Nicaragua was visited. Its shores, in the vicinity of Granada, are sandy and with a very limited quantity of aquatic vegetation in extreme low water.

The collections of fishes were made at the following places: Lake Managua, at Managua and Momotomba; Lagoon, at San Francisco; Lake Tiscapa, near Managua; Lake Managua, near Granada; Lagoon

Jenicero, between Lakes Managua and Nicaragua; and Lagoon Cisplaya, south of Granada. Lake Tiscapa appears to be in the basin of a volcanic crater. The lake is nearly circular, about one fourth of a mile in diameter. It is surrounded by a wall about 200 feet above the lake. It is reported to be very deep. Two species of fishes inhabit this lake in considerable numbers, *Cichlasoma citrinellum*, and *Poecilia sphenops*.

Not far from Lake Managua, and between La Paz and Masaya, are several of these small volcanic lakes. All except one, Nahapa, whose water is reported to be very alkaline, contain fishes. The Superintendent of the Nicaragua Railroad informed me that the two volcanic lakes near Masaya were about 135 fathoms in depth, and that these were the deepest of all. There are no boats on any of these lakes. The walls about them were so steep that collecting fishes in them was difficult, and so the short time at my command was devoted to collecting in more favorable localities.

Lagoon Jenicero was little more than the remnant of a partially dry swamp. The water was nowhere more than a foot deep, under which was a layer of partially decomposed vegetable matter about 3 feet thick, in which it was impossible to draw a seine. A 75-foot seine was placed in a semicircle, the natives drove the fish into this enclosure, then drew the ends of the net together, completing the circle. By stirring up the mud in the center, the fishes would swim against the net, where they were caught by the natives. Fishes in this lagoon were abundant. The scarcity of *Poecilia sphenops* and *Roeboides guatemalensis*, two species of mud-loving fishes, was noticeable; also the absence of the smaller fishes, except the *Cichlids*. The Tropical Gar was quite plentiful. The Guapote is caught here in considerable numbers. These fishes are taken with a cast net and a gill net. Three men form a triangle by standing about 25 feet apart. A cast net of about 10 feet in diameter is thrown in this triangle by one of the men. The three men then quickly force the lead line into the mud. They then run their hands over the surface of the net, catching hold of any large Guapotes, the lead line is then raised and the fishes taken out, placed in a dug-out and taken to a large basket-like box. The gill net is a crude affair about 30 or 40 feet long, and about two feet in depth. It is run out in a straight line and then the fishes are driven into it. Each setting would yield from 1 to 3 or 4 Guapotes. Only a few Mojarras large enough for the market are taken in this lagoon. Lagoon Cisplaya is simply an estuary of a small stream, and is thus connected with the lake. The great lakes of Nicaragua appear quite well stocked with large fishes, most of which are edible.

The Roballo and the large Mojarras are excellent food fishes. The smaller species, except the *Melaniris sardina*, known as Sardina, are not seen in the markets; this species is taken during the breeding season in large numbers. They are eaten fresh at this time, and many are dried and marketed in this way.

One of the peculiar Ichthic features of the lake is the red, or partially red, Cichlids or Mojarras. They are very abundant in the large lakes, and are reported to occur in some of the smaller ones. In Lake Tiscapa there are no red forms, nor any red on any of the fishes taken there. Red forms occur in Lakes Asososco, Masaya, and Apoyo. I did not find any red fishes in Lagoon Jenicero, and the fishermen there informed me that none were found in it. The cause of this rubrism* is not known. I have never seen it among fishes in any other body of water. Judging from the drawings of species from Lake Peten, Guatemala, it appears to be present in some of the Cichlids there. About 8 per cent of the fishes noticed in the markets of Managua were red, or partially so, and were sold as Mojarras Colorados. These red forms appeared to be the best sellers, but for this I could learn no reason. The dark color on the fishes only partially red was darker than on the fishes with normal coloration. There was a slight tinge of red on the breast of many specimens of apparently normal color. Rubrism was entirely absent in all the fishes taken from Lake Tiscapa and Lagoon Jenicero. The presence of salt-water fishes in Lake Nicaragua is interesting. These, no doubt, became stranded there at a time when the lake was more intimately connected with the sea than it is now. It is hardly probable that they have come up over the falls at the head of the Rio San Juan in late years, for they have not entered Lake Managua, and the falls between the lakes are not so difficult to pass, as those in the Rio San Juan. All of these salt-water genera represented in Lake Managua have representatives in brackish and fresh water, and are found in company with species of Cichlids. So few fishes are known from the eastern streams of Central America between the Rio Montagua in Guatemala and Panama, that it is impossible to discuss the relationship of the fish fauna of the lakes and that of the neighboring rivers with much degree of certainty.

I wish to acknowledge my indebtedness to Señor Don Dioclesiano Chaves, taxidermist of the National Museum in Managua, and his two assistants, also to Sr. Latino, student of the College in Managua, for assistance in making the collections in Lakes Tiscapa and Managua.

* Rubrism is known to occur in *Cichlasoma citrinellum*, *Cichlasoma erythræum* and *Cichlasoma labiatum*.

To U. S. Vice-Consul A. O. Wallace I am also much indebted for many courtesies. Through his efforts I was enabled to get my outfit into the country without duty or delay. His interest in the work and the many personal favors granted are certainly much appreciated.

The following notes and the accompanying figure are given to explain the terms used in the descriptions:

1. Head. 2. Snout. 3. Eye. 4. Premaxillary. 5. Maxillary. 6. Supplemental maxillary. 7. Mandible, or lower jaw. 8. Symphysis. 9. Cheek. 10. Preopercle. 11. Opercle. 12. Subopercle. 13. Spinous portion of dorsal fin. 14. Soft portion of dorsal fin. 15. Base of dorsal fin. 16. Pectoral fin. 17. Anal fin. 18. Ventral fin. 19. Base of caudal fin (last vertebra). 20. Caudal fin. 21. Lateral line. 22. Depth of the fish. 23. Depth of caudal peduncle. 24. Caudal peduncle.

The PROFILE of the fish, unless otherwise mentioned, is the curve from the highest point on the back to the tip of the snout. The ORIGIN of the DORSAL or ANAL FIN is the insertion of its first spine or ray.

Fishes in general, and especially those treated of in this paper, breathe by means of GILLS, which are fine, hair-like projections (BRANCHIÆ), usually supported on the outer curves of cartilaginous or bony arches known as GILL ARCHES; in the true fishes, the normal number on each side is four. The GILL RAKERS are a series of bony appendages variously formed along the inner edge of the anterior gill arch.

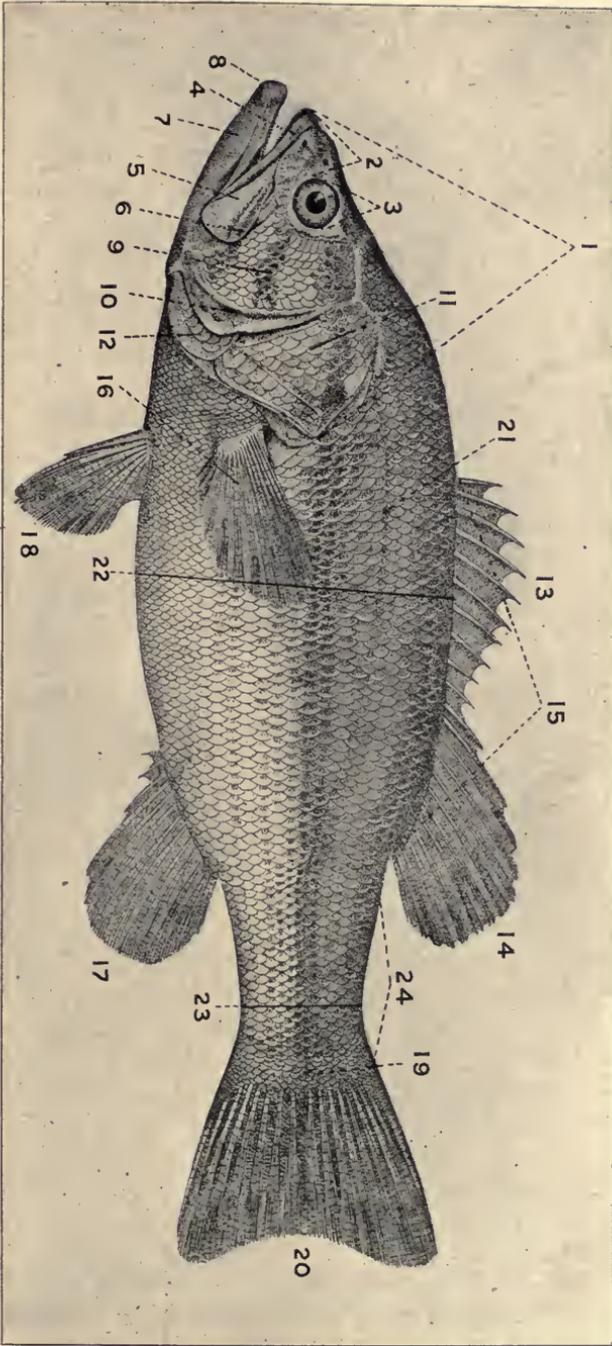
The GILL MEMBRANES usually serve to attach the GILL COVERS to the ISTHMUS, which is the thick, fleshy projection between the gill openings. The BRANCHIOSTEGAL MEMBRANES are attached to the lower posterior portions of the gill covers; the cartilaginous or bony supports of this membrane are the BRANCHIOSTEGAL RAYS.

The PHARYNGEAL BONES are behind the gills and at the beginning of the ŒSOPHAGUS; in true fishes, they represent a fifth gill arch.

The fins of fishes are composed of SPINES and RAYS, the former being stiff, bony structures usually connected by a thin membrane; the rays are rather weak, jointed, cartilaginous structures, and are also connected by a thin membrane.

A CYCLOID SCALE has its posterior margin smooth; such scales are usually found on soft-rayed fishes. A CTENOID SCALE has its posterior margin rough or toothed; such scales are characteristic of the spiny-rayed fishes.

The LENGTH of the BODY of the FISH is measured from the tip of the upper jaw to the base of the caudal fin or end of the last vertebra; the TOTAL LENGTH, from extreme ends of the fish. The LENGTH of the



HEAD is measured from tip or upper jaw to the posterior edge of the opercle; the LENGTH of the SNOUT, from tip of upper jaw to anterior margin of the orbit. The DEPTH of the BODY is measured at its deepest part, none of the fins being included; the DEPTH of CAUDAL PEDUNCLE is measured at its narrowest part, its length from base of last anal ray to end of last vertebra.

The SCALES in the LATERAL SERIES are counted from upper edge of opercle to base of caudal fin, the TRANSVERSE SERIES from the dorsal fin to ventrals or origin of anal, whichever is nearest the middle of the body. In making the transverse count the scale on the lateral line, when it is present, is counted with those on the upper part of the body. The LENGTH of the DORSAL and ANAL FINS is measured along their BASES; the HEIGHT is the length of their spines or rays. The length of the other fins is measured from attachment to the body to the tips of the longest rays.

In order to abbreviate, the following expressions are used: "HEAD 4" indicates that the head of the fish is contained 4 times in the distance from the tip of the snout to the end of the last caudal vertebra; "DEPTH 4" that the greatest depth (none of the fins being included) is contained 4 times in the same distance; "D. 8" indicates that the fish has a single dorsal fin which is composed of 8 soft rays; "D. iv, 9," that the dorsal fin is single and is composed of 4 spines and 9 soft rays; "D. iv-9," that there are two dorsal fins, the first one composed of 4 spines and the other of 9 soft rays. Spines are always indicated in roman letters, soft rays by figures. The abbreviations used in the count of other fin rays and spines are similarly explained. The diameter of the eye, the length of the snout, and many other short measurements are compared with the length of the head. "Eye 3 in head," "Snout 3 in head," indicate that each is contained 3 times in the length of the head. In these particular cases " $\frac{1}{3}$ of the length of head" would mean the same thing.

KEY TO THE FAMILIES OF FISHES OF THE GREAT LAKES
OF NICARAGUA.

- a. Gill openings slit-like, 5 in number, on each side.
- b. Gill openings lateral; no spiracles; snout not produced into a long flat blade. *Galeidæ* 103
- bb. Gill openings ventral; spiracles present; snout produced into a long, thin, flat blade, armed with teeth along each edge. *Pristidæ* 104

- aa. Gill openings, one on each side.
- c. Ventral fins present, abdominal, not composed of 1 spine and 5 soft rays.
- d. Tail heterocercal; scales rhomboïdal, very hard, ganoid.
Lepisosteidæ 104
- dd. Tail not heterocercal; scales absent or normal.
- e. Adipose fin on dorsal region present.
- f. Body without scales; mouth and chin with barbels; adipose fin long, longer than head.
Siluridæ 105
- ff. Body with scales; mouth and chin without barbels; adipose fin very small.
Characinidæ 107
- ee. No adipose fin on dorsal region.
- g. Gular plate present between branches of lower jaw; scales very large.
Elopidæ 111
- gg. No gular plate.
- h. Ventral region compressed, armed with bony serræ.
Dorosomidæ 112
- hh. Ventral region without bony serræ.
- i. Dorsal fin single, of soft rays only.
Poeciliidæ 112
- ii. Dorsal fins 2, the first of slender spines, the second of soft rays.
Atherinidæ 114
- cc. Ventral fins thoracic, each composed of 1 spine and 5 soft rays.
- j. Dorsal fin with more than 8 spines; anal spines 3 or more.
- k. Lateral line not interrupted; nostril double on each side; anal spines 3, the second very long and strong, longer than third.
Haemulidæ 116
- kk. Lateral line interrupted on each side; nostril single on each side; anal spines more than 3, the second shorter than the third.
Cichlidæ 117
- jj. Dorsal fin with less than 8 spines; anal spine single. *Gobiidæ* 131

Family **Galeidæ.**

Genus **Carcharhinus** Blainville.

Sharks with a robust body, broad depressed head, inferior mouth, strongly serrate teeth in both jaws and no spiracles; first dorsal fin large, second small.

Carcharhinus nicaraguensis (Gill & Bransford). TIGRONE.

Eulamia nicaraguensis Gill & Bransford, Proc. Acad. Nat. Sci.,

Phila., 1877, 190, Lake Nicaragua; Rio San Juan.

This species is reported to be very abundant in the lower end of Lake Nicaragua, and in the San Juan River, its outlet. It is reported to be very ferocious, and many incidents are mentioned of persons attacked by it. Either this or some other species is very abundant on the bar of the Colorado River, one of the outlets of the Rio San Juan. I did not secure any specimens of this species.

Family **Pristidae.**

Genus **Pristis** Latham.

Body elongate; snout produced into a long, thin, flat blade with a series of strong teeth on each edge; mouth inferior; teeth small, spiracle present; a fold along each side of tail.

Pristis antiquorum Latham.

Pristis antiquorum Günther, Cat., VIII, 438, 1870; Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 190, Granada.

In Granada I saw several saws of this shark, but was unable to secure any specimens. The identification of this species is doubtful.

Family **Lepisosteidae.**

Genus **Lepisosteus** Lacépède.

Body elongate, covered with hard rhombic scales; jaws long, beak-like, armed with pointed teeth; an accessory gill on inner side of the opercle; tail heterocercal.

Lepisosteus tropicus (Gill).

Atractosteus tropicus Gill, Proc. Acad. Nat. Sci., Phila., 1863, 172, Streams near Panama.

Head 3.1; depth 7.0 to 8.0; D. 8; A. 8; scales 52. Body elongate, snout short, broad, its length 1.7 to 1.8 in head; width of posterior end of snout 4.8 to 5.2; eye 9.0 to 14.0; least depth of caudal peduncle 4.3 to 4.9; upper jaw with two series of enlarged teeth, the lower with one.

This species occurs in both lakes. It is reported to grow to a length of 6 feet or more. The largest specimen collected by me is 800 mm. The jaws of a much larger specimen were found on the

beach of Lake Managua near Momotomba. This species is certainly not much different from *L. tristoechus* of Cuba and the Southern States, and a comparison of specimens of each of similar size should be made. I saw no specimens of this species in the markets, and do not know whether or not it is ever used for food by the inhabitants of the lake region. Specimens were taken in Lagoon Jenicero, at the north end of Lake Nicaragua, and in a small lagoon south of Granada, 350 to 800 mm.

Family **Siluridae**.

Genus **Rhamdia** Bleeker. BAGRES.

Body elongate; head rather narrow; occipital process small or wanting; adipose fin long, adnate to back for its entire length; barbels 6; posterior nostril without a barbel.

Three closely related species of this genus are known to occur in the lakes.

- a. Body slender, depth about 6; maxillary barbels short, not reaching past middle of base of dorsal fin; interorbital width, 3.3 to 3.4 in head. *managuensis* 105
- aa. Body robust, depth 4.1 to 4.6; maxillary barbels longer, reaching nearly to or beyond origin of adipose dorsal.
- b. Interorbital width 3.1 to 3.4; maxillary barbels reaching nearly to or slightly past origin of adipose fin. *nicaraguensis* 106
- bb. Interorbital width 2.4 to 2.6; maxillary barbels reaching past middle of adipose fin. *barbata* 106

Rhamdia managuensis (Günther). BAGRE; CHUCHIN.

Pimelodus managuensis Günther, Fishes Central Amer., 474, 1868, Lake Managua.

Head 4.5 to 4.7; depth 5.9 to 6; D. 1-6; A. 12. Body long, slender; head moderate, flattish, interorbital width 3.3 to 3.4 in head; snout 2.3 to 2.4 in head; diameter of eye 6 in head; upper jaw the longer; gill rakers 3+10; maxillary barbels not reaching to or slightly past origin of dorsal spine; outer mandibular barbels scarcely reaching base of pectoral spine; dorsal spine weak, its length 3.1 to 3.6 in head; length of dorsal 1.7 to 1.8 in head, its height 1.6 to 1.7; origin of dorsal to tip of snout 2.2 in length of body; adipose fin long, rather low, its length 2.4 to 2.5 in length of body, its height 6.8 to 7.1 in head; distance from last dorsal ray to origin of adipose fin

4.8 to 5 in head; length of pectoral fin 1.6 to 1.7 in head; pectoral spine 2.4 to 2.5 in head; humeral spine about half length of pectoral spine; ventral fin 1.8 in head; anal fin short, its length 1.6 in head, tips of anal rays not reaching end of adipose fin; caudal peduncle slender, its least depth 2.6 to 2.7 in head; caudal fin deeply forked, its lower lobe the larger.

Color light olivaceous, more or less silvery; no lateral shade or band; indistinct light dorsal band, tips of dorsal fin dark, all other fins plain.

Managua (2), 205 to 240 mm.

Rhamdia nicaraguensis (Günther). BAGRE; CHUCHIN.

Pimelodus nicaraguensis Günther, Cat., v. 125, 1864, Lake Nicaragua.

Rhamdia nicaraguensis Gill, Proc. Acad. Nat. Sci., Phila., 1877, 190.

Head 4.1 to 4.6; depth 4.4 to 4.9; D. 1.6; A. 11 to 13. Body rather slender; head flattish, interorbital width 3.1 to 3.4; snout 2.3 to 2.5 in head; diameter of eye 4.6 to 6 in head; upper jaw the longer; gill rakers 3+9; maxillary barbels reaching nearly to or slightly past origin of adipose fin, outer mandibular barbels to or slightly past base of pectoral spine; dorsal spine weak, its length 3.2 to 3.6 in head; length of dorsal fin 1.8 to 1.9 in head, its height 1.5 to 1.8; origin of dorsal to end of snout 2.7 to 2.9 in body; adipose fin long, its length 2.3 to 2.6 in body, its height 6.5 to 7 in head; distance from last dorsal ray to origin of adipose fin 3.6 to 4.7 in head; length of pectoral fin 1.6 to 1.7 in head, its spine 2.00 to 2.5; humeral spine about half length of pectoral spine; ventral fin 1.6 to 1.8 in head; anal fin moderate, its length 1.4 to 1.8 in head; tips of anal rays not reaching end of adipose fin, caudal peduncle slender, its least depth 2.6 in head; caudal fin deeply forked, its lower lobe the longer.

Color light olivaceous, with slight bluish tinge; no distinct lateral band; light band across dorsal very faint; tips of dorsal fin dark, other fins plain.

Managua (18), 150 to 250 mm.; San Francisco (1), 155 mm.

Rhamdia barbata sp. nov. BAGRE; CHUCHIN.

Type, No. 5906, F. M. N. H.; length, 200 mm.; San Francisco, Nicaragua.

Head 3.7 to 4; depth 4.3 to 4.6; D. 1-6; A. 10 or 11. Body robust; head large, broad; interorbital width 2.4 to 2.6 in head; top of head nearly flat; snout 2.6 to 2.8 in head; diameter of eye 5 to 6.7; upper jaw slightly the longer; gill rakers 3+6; maxillary barbels large and long, their tips reaching past middle of adipose fin;

outer mandibular barbels reaching to middle of pectoral; dorsal spine strong, its length 2.7 in head; length of dorsal, 1.9 in head, its height 1.7; origin of dorsal to tip of snout 2.7 to 2.9 in length of body; adipose fin long and high, its length 2.3 to 2.6 in body, its greatest height 4.3 to 5 in length of head; distance from last dorsal ray to adipose fin 5.7 to 6.8 in head; length of pectoral fin 1.6 to 1.7 in head; pectoral spine robust, its length 2.2 to 2.3 in head; humeral spine about half length of pectoral spine; ventral 1.8 to 1.9 in head; anal short, its length 2.0 to 2.3 in head; tips of anal rays not reaching end of adipose fin; caudal peduncle strong, its least depth 2.2 in head; caudal fin deeply forked, the lower lobe the longer.

Color dark olivaceous, more or less mottled with darker, being darkest on middle of sides; a light band on dorsal fin near its base; other fins rather dark, all plain.

San Francisco (8), 150 to 240; Managua (1), 240.

Family **Characinidæ.** THE CHARACINS.

This family is represented in the lake by five species, which are easily recognized by their thin cycloid scales, presence of a small posterior adipose fin, and the absence of scales on the head. These species belong to four genera, which are distinguished as follows:

- a. Teeth in upper jaw in two or three series.
- b. Teeth in upper jaw in two series; anal fin with less than 30 rays; scales 36. *Astyanax* 107
- bb. Teeth in upper jaw in 3 series; anal rays about 35; scales about 54. *Brycon* 109
- aa. Teeth in upper jaw in a single series.
- c. Scales large, less than 45 in the transverse series; anal rays less than 30. *Bramocharax* 110
- c. Scales small, about 80, in transverse series; anal rays more than 40. *Ræboides* 111

Genus **Astyanax** Baird & Girard.

- a. Snout long, its length 3.3 to 3.5 in head; maxillary 2 to 2.2 in head. *nasutus* 108
- aa. Snout short, its length 3.7 to 4.2 in head; maxillary 2.3 to 2.6 in head. *æneus* 108

Astyanax nasutus sp. nov.

Type, No. 5909, F. M. N. H.; length, 125 mm.; Lake Managua, Managua, Nicaragua.

Head 3.9 to 4.3; depth 2.7 to 2.9; D. 1.9; A. 25 or 26; scales 8-36-7. Body elongate, compressed; profile between nape and end of snout slightly concave; top of head quite flat; dorsal and ventral outlines about equally convex; snout long, its length 3.3 to 3.5 in head; maxillary slender, its tip reaching past vertical from front of orbit, its length 2 to 2.2 in head; chin very prominent; eye 2.9 to 3.1 in head; gill rakers slender, 8+11; origin of dorsal fin slightly behind that of ventrals, its distance from tip of snout 1.9 in length of body; base of dorsal 1.8 in its height, its height 1.1 in head; origin of anal fin slightly behind base of last dorsal ray, its distance from snout 1.5 to 1.6 in length of body; base of anal 3.6 in length of body; pectoral fins not reaching ventrals, length 1.2 to 1.3 in head; ventrals reaching to or slightly past vent, length 1.6 to 1.7 in head; lateral line complete, decurved.

Color light olivaceous, a broad plumbeous band from upper edge of opercle to base of caudal, broadening into a caudal blotch; humeral spot present.

Managua (12), 85 to 125 mm.; Cisplaya (1), 95 mm.

Astyanax æneus (Günther).

Head 3.9 to 4.4; depth 2.4 to 3.2; D. 1.9; A. 26 to 28; scales 8-38-6. Body compressed, more or less elongate; ventral outlines usually more curved than the dorsal; profile from nape to end of snout straight or concave; snout short, 3.7 to 4.2 in head; maxillary slender, its tip reaching vertical from orbit, length 2.3 to 2.6; jaws subequal; mandible 2 to 2.4 in head; eye 2.8 to 3.8; gill rakers slender, 7 to 9+10 or 11; origin of dorsal to tip of snout 1.9 to 2.1 in length of body; base of dorsal $\frac{2}{3}$ height of fin, its longest ray 1.0 to 1.3 in head; base of anal fin 3.1 to 3.5 in body, equalling or slightly longer than head; origin of anal fin behind vertical from base to last ray of dorsal, its distance from tip of snout 1.5 to 1.6 in body; pectoral fin in the deeper individuals reaching base of ventrals, in larger or slender individuals falling short at this point by one or two scale lengths; length of pectorals 1.1 to 1.3 in head; ventrals reaching to or slightly past vent; length of ventral 1.5 to 1.7 in head; lateral line decurved, complete.

Color light olive, silvery, a dark lateral band from upper edge of opercle to base of caudal; one or two dark humeral spots; an elongate caudal blotch. There is a considerable amount of variation in this

species. Some are quite slender, others deeper. The lateral band is more prominent on some individuals than on others. The two humeral spots may be present on one side, and but one present on the other. A comparison of the material listed below with a considerable number of specimens from Caballo Blanco, San Jose del Idolo, Lake Amatitlan and El Rancho, Guatemala, show no constant differences.

Tetragonopterus humilis Günther, Cat., v, 325, 1864, Lake Amatitlan, Guatemala, is evidently based upon a slender specimen of this species.

This species is very abundant in Lakes Managua and Nicaragua. It does not occur in Lake Tiscapa.

Momotomba (47), 55 to 115 mm.; Managua (165), 55 to 100 mm.; San Francisco (2), 60 and 65 mm.; Granada (25), 75 to 110 mm.; Cisplaza (6), 45 to 65 mm.

Genus **Brycon** Müller & Troschel.

Brycon dentex (Günther). SABALO.

Chalcinopsis dentex Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 188, Lake Nicaragua.

Head 4.1; depth 3.6; D. 10; A. 35; scales 17-54. Body elongate, compressed; dorsal and ventral outline about evenly convex; profile from nape to end of snout very slightly concave; upper jaw projecting, exposing two series of teeth; teeth of upper jaw with three series of tricuspid teeth, the two outer series small and in the portion of upper jaw usually projecting beyond the lower; the posterior series large and opposed to the single row of three to five cuspid teeth on edge of maxillary; gill rakers long and slender, 12 + 13; maxillary long and slender, extending to vertical from middle of eye, its length 2.1 in head; snout pointed, overhanging the mouth, its length 3.6 in head; adipose eyelid slightly developed; diameter of eye 3.1 to 3.6 in head; mandible strong, 2.2 in head; origin of dorsal over middle of space between origin of ventral and anal fins, its distance from end of snout 1.8 in body; origin of anal under last dorsal rays, its distance from snout 1.6 in body; base of dorsal 2.1 in head, its height 1.4; base of anal 3.2 to 3.3 in body; tip of pectoral nearly reaching ventrals; ventrals to vent; no lateral line.

Color silvery below, dark bluish above; fins all plain.

This species is said to grow to a length of a foot or more. It is considered a good food fish, and it is often dried and marketed in that

state. The Guapote and Roballo only are regarded as its superior.

Momotomba (1), 160 mm.; Managua (2), 130 and 160; Granada (3), 235 mm.

Genus **Bramocharax** Gill.

Two species of this genus occur in the lakes.

- a. Body robust, its depth 2.7 in length. *bransfordi* 110
 aa. Body slender, its depth 3.4 to 3.9 in length. *elongatus* 110

Bramocharax bransfordi Gill

Bramocharax bransfordi Gill, Proc. Acad. Nat. Sci., Phila., 1877,
 190, Lake Nicaragua.

I did not secure any specimens of this species.

Bramocharax elongatus sp. nov. SABALITO.

Type, No. 5922, F. M. N. H.; length, 130 mm.; Lake Managua,
 Managua, Nicaragua.

Head 3.1 to 3.3; depth 3.4 to 3.9; D. 10; A. 25 to 28; scales 8-41-6. Body elongated, compressed; snout slender, pointed, the upper jaw slightly the longer; snout 3.2 to 3.4 in head; maxillary long and slender, its tip reaching to vertical from middle of pupil, 2.1 to 2.2 in head; mandible 2 in head; diameter of eye 3.6 to 4.0 in head; teeth in each jaw in one series; two anterior teeth of each jaw enlarged and canine-like, the upper ones extending beyond tip of lower jaw; one or two lateral teeth in lower jaw enlarged; all the teeth more or less compressed, the smaller ones, especially those on edge of maxillary, with one or two basal cusps; gill rakers 9+11; origin of dorsal slightly behind ventrals, its distance from tip of snout 1.9 to 2.0 in body; base of dorsal fin 2.2 to 2.4 in head, its height 1.4; base of anal 3.6 to 3.8 in body; adipose fin opposite last anal rays; tips of pectorals reaching nearly to or slightly past base of ventrals, 1.6 to 1.8 in head; ventrals not reaching anal, 2.0 to 2.2 in head; least depth caudal peduncle 3.0 to 3.2 in head; lateral line decurved; caudal fin forked; air bladder in two parts, the posterior about twice the size of anterior; tube connecting air bladder with the œsophagus rising from anterior end of posterior lobe.

Color olivaceous, darker above; a dark humeral spot; a dark lateral band from upper edge of opercle to base of caudal, ending in a blotch; fins all plain.

Momotomba (4), 121 to 131 mm.; Managua (21), 111 to 150 mm.

Genus **Ræboides** Günther.

But one species of this genus is known to occur in Central America,

Ræboides guatemalensis Günther.

Head 3.9; depth 2.9 to 3; D. 10; A. 48; scales 18-80-19. Body elongate, much compressed; profile S-shaped; head small; mouth large, oblique; maxillary reaching vertical from middle of eye, its length 2 in head; upper jaw the longer; mandible strong, its length 1.9 in head; diameter of eye 2.9 to 3.2; interorbital width 2.9 to 3.2 in head; jaws subequal; gill rakers slender, 7+9; origin of dorsal behind that of anal, its distance from end of snout 1.8 to 1.9 in length of body; length of dorsal 2 in head, its height equaling head; anal fin very long, its base 1.9 in body; origin of anal to tip of snout 2.3 to 2.4 in body; pectorals 1.2 in head; ventrals 1.3; lateral line straight, complete.

Color olivaceous, a darkish band made up of small dark spots above lateral line; a faint humeral blotch; membrane of anal fin with many small dots, other fins usually plain, occasionally a black spot just below lateral line and above middle of pectoral fin. A single specimen of this species from San Geronimo, Oaxaca, Mexico, has the upper jaw decidedly longer than the lower; in all other respects like specimens from San Francisco, Nicaragua.

This species occurs in the waters of the Pacific Slope from San Geronimo, Oaxaca, in Mexico to Lake Nicaragua, and in the Rio Chagres. It was not taken by Miller in the Rio Montagua, and is not known from any Atlantic Coast stream north of the lakes in Nicaragua.

San Francisco (17), 65 to 125 mm.; Jenicero (1), 85 mm.

Family **Elopidae**.

The presence of a gular plate between the branches of the lower jaw at once distinguishes this family from all others represented in the lakes.

Tarpon atlanticus? (Cuvier & Valenciennes). SABALO.

Megalops ———, Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 187, Toro Rapids, Rio San Juan.

Head 4; depth 3.8; D. 12; A. 20; scales 42. Body compressed, little elevated; dorsal filament longer than head; mouth large, armed with pointed teeth.

Color uniform, bright silvery, back darker.

I did not see or secure any specimens of this species. So far as I could learn, it is not taken in Lake Managua, and is not abundant in Lake Nicaragua. This species is known as Sabalo. The same name is also used for *Brycon dentex*. This species is said by the natives to grow to a greater length than the height of a man.

Family **Dorosomidae.**

Genus **Dorosoma** Rafinesque.

Dorosoma chavesi sp. nov. SABALO.

Type, No. 5928, F. M. N. H.; length, 170 mm.; Lagoon Jenicero, Granada, Nicaragua.

Opisthonema libertatis Gill, Proc. Acad. Nat. Sci., Phila., 1877, 187, Lake Nicaragua (nec Günther).

Head 2.7 to 3.1; depth 2.8; D. 12 to 15; A. 26 to 30; scales 74 to 78; scutes 17 to 19—9 to 10. Body elongate, compressed, the ventral outline more curved than the dorsal; head large; mouth large, the jaws subequal; maxillary very long and slender, its tip reaching vertical from middle of eye, without distinct notch on its outer margin, its length 3 to 3.3 in head; supplemental maxillary bone slender; mandible strong, its length 2.1 in head; eye large, with well-developed adipose eyelid, its diameter 3. to 3.3 in head; origin of dorsal fin nearer base of caudal than tip of snout; last ray of dorsal slightly produced in most individuals but seldom reaching half-way to base of caudal fin; tips of ventrals reaching slightly past base of ventrals; base of anal shorter than head, its length 1.1 to 1.5 in length of head; scales persistent.

Color steel-blue above, silvery below; a black humeral spot; fins all plain.

This species differs from other known members of the genus in the larger head, longer and more slender maxillary and premaxillary, and having base of anal fin shorter than the head. Named for Señor Don Dioclesiano Chaves, of the National Museum of Nicaragua.

Momotomba (15), 47 to 80 mm.; Managua (35), 60 to 180 mm.; San Francisco (6), 145 to 165 mm.; Jenicero (20), 160 to 210 mm.

Family **Poeciliidae.**

Of this family there are but two genera so far known to occur in the lake.

- a. Intestinal canal comparatively short, usually about the length of the body; teeth not movable. *Paragambusia* 113
aa. Intestinal canal comparatively elongate, usually coiled on the ventral and right side; teeth movable. *Pœcilia* 113

Genus **Paragambusia** Meek.

Paragambusia nicaraguensis (Günther).

Gambusia nicaraguensis Günther, Cat., VI, 336, 1866, Lake Nicaragua: Günther, Fishes Cent. Amer., 483, Pl. LXXXII, fig. 3, 1869, Lake Nicaragua: Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 187.

Head 3.5; depth 2.5; D. 6; A. 10; scales 10-26. Body much compressed; head small, depressed; interorbital flat, 1.7 in head; snout 3.3; diameter of eye 3; origin of dorsal fin (♀) almost entirely behind anal, its distance from base of caudal 2 in its distance from tip of snout; anal fin of female with its first 3 or 4 rays produced and falciform, the longest ray equaling distance from tip of snout to base of pectoral fin; pectoral fin equaling length of head; ventral 2 in head, one of its rays slightly produced; peritoneum black; alimentary canal less than the length of the fish.

Color light brownish; dorsal and caudal fins spotted with black dots; in the larger females the produced anal rays are black; a dark bar downward and backward from eye. This fish reaches a length of about 25 mm.

This species is known from the Atlantic streams of the Isthmus of Tehuantepec, the Rio Montagua in Guatemala, and Lake Nicaragua. No individuals of this species were taken by me in Nicaragua.

Genus **Pœcilia** Bloch & Schneider.

One species of this genus occurs in the lake.

Pœcilia sphenops (Cuvier & Valenciennes). JULUMINA.

Pœcilia dovii Günther, Cat., v, 344, 1866, Lake of Nicaragua; Lake Amatitlan, Guatemala: Gill, Proc. Acad. Nat. Sci., Phila., 1877, 187, Lake Nicaragua.

Head 3.5 to 4.4; depth 2.8 to 3.4; D. 8 to 10; A. 8 or 9; scales 9 to 11-25 to 29. Body robust, compressed; back not much elevated; interorbital area nearly flat 1.7 to 1.8 in head; snout 2.2 to 4.5 in head;

diameter of eye 3.2 to 4.2; dorsal fin in advance of anal, midway between base of caudal and posterior margin of eye; dorsal fin in old males extremely high, its longest ray longer than head; least depth of caudal peduncle 1.1 to 1.6 in head; intestinal canal coiled on right side, very elongate.

Color variable, usually dusky brown above, lighter below; edges of scales usually light, forming more or less indistinct lateral stripes; males usually have light vertical bars.

This species is very abundant in Lakes Managua, Nicaragua and Tiscapa.

Momotomba (200), 55 to 115 mm.; Managua (12), 60 to 125 mm.; Tiscapa (90), 35 to 95 mm.; San Francisco (80), 80 to 120 mm.; Jenicero (25), 40 to 110 mm.; Cisplaya (30), 90 to 130 mm.

Family **Atherinidæ.**

Genus **Melaniris** Meek.

Melaniris sardina sp. nov.

SARDINA.

Chirostoma guatemalensis Gill, Proc. Acad. Nat. Sci., Phila., 1877, 187, Lake Nicaragua (nec Günther).

Type, No. 5937, F. M. N. H.; length, 65 mm.; Lake Managua, Managua, Nicaragua.

Head 4.25; depth 4.43; D. III or IV-9 or 10; A. 20 to 23; scales 9-37 to 39. Body elongate, moderately compressed; mouth small, very oblique; teeth well developed; snout short, 4.00 in head; mandible strong, its length 2.40 in head; eye large, its diameter 2.65 in head; interorbital width 2.40 in head; spinous dorsal low, its origin behind origin of anal, midway between base of caudal and the posterior margin of opercle; origin of anal fin midway between base of caudal and middle of eye, its base about $\frac{1}{4}$ longer than head; scales with margins smooth or slightly crenate; posterior portion of lateral line usually complete on the last 6 to 10 scales, its anterior portion represented by pores scattered on anterior scales on lower half of body.

Color silvery, dorsal region with dark punctulations; sides with a narrow plumbeous band, best developed on posterior half of body; iris black; soft dorsal slightly dusky, other fins plain.

This species differs from *Melaniris balsanus* Meek in having a larger eye, smaller and more oblique mouth. It is also a slightly larger fish.

This species was found to be very abundant along the shores of Lake Managua and northern end of Lake Nicaragua. It spawns in

March, evidently depositing its eggs, when possible, in shady places in shallow water. The natives capture these by placing small bushes along the shore about three feet apart in shallow water. These fishes come in large numbers into the shade of these bushes to deposit their eggs. The natives draw their hand nets around the bases of these bushes, catching from a few to a quart of these fishes at each dip. The fishes are thrown into holes scooped in the sand. They are then spread on the sand and left there until dry, after which they are ready for market. They are also eaten fresh as "white bait," and are very palatable.



FISHING FOR SARDINAS.

Squier thus describes the fisheries in Lake Managua: "At one point bushes were planted in the lake, like fish-wiers, between which women were stationed with scoop-nets, wherewith they ladled out myriads of little silvery fishes, from the size of a large needle to that of a shrimp, which they threw into kettle-shaped holes, scooped in the sand, where, in the evening light, leaping up in their dying throes, they looked like a shimmering mass of molten silver. These little fish are called Sardinas by the natives, and are cooked in omelets, constituting a very excellent dish." "The first travellers in Nicaragua mention this novel fishery as then practiced by the Aborigines, and it has remained unchanged to the present hour."

It is interesting to note that the writer has seen *Chirostoma jordani* Woolman, captured in the same way along the shore of Lago del Cuitzeo, Michoacan, Mexico. The dried fishes are packed in sacks and shipped to many places in Central Mexico.

Momotomba (8), 60 to 70 mm.; Managua (300), 55 to 70 mm.; Cisplaya (1), 60 mm.

Family **Hæmulidæ**. THE GRUNTERS.

Body oblong, compressed, covered with moderate-sized scales; lateral line concurrent with the back; head large; premaxillaries protractile; maxillary without a supplemental bone, and for the most of its length, slipping under the preorbital; no barbels; teeth in jaws, none on vomer or palatines; ventral fins thoracic, its rays 1.5. A large family of shore fishes, perch-like in form, a few entering fresh water.

Genus **Pomadasis** Lacépède. ROBALLO.

Mouth small, terminal low, maxillary scarcely to middle of eye; teeth small, on jaws only, in villiform bands; preopercle serrate.

Pomadasis grandis sp. nov. ROBALLO.

Type, No. 5939, F. M. N. H.; length, 345 mm.; Lake Nicaragua, Granada, Nicaragua.

Head 3.14; depth 3.47; D. XIII, 12; A. III, 7; scales 8-58-16. Body elongate, dorsal region not much elevated; profile nearly straight; mouth moderate, maxillary not quite reaching vertical from front of orbit, its length 2.96 in head; mandible 2.62; snout 2.70; diameter of eye 4.96; interorbital 4.27; top of head covered with small ctenoid scales; preopercle serrate, the serræ being larger just above angle; teeth in bands, the outer scarcely enlarged; gill rakers 6 + 12; origin of dorsal over base of pectoral, its distance from tip of snout 2.64 in body; fifth dorsal spine the longest, 2.11 in head; second anal spine very robust, its length 1.62 in head; tip of second anal reaching slightly beyond tips of soft rays; third anal spine much smaller than the second; pectoral fins short, 1.64 in head; ventral 1.65; caudal peduncle rather slender, its length 2.04 in head; depth 4.27; soft dorsal and soft anal with a small sheath of scales at their bases; scales above lateral line in rows parallel to lateral line; caudal fin lunate.

Color light olivaceous, each scale with a lighter center, forming rather indistinct lines along the rows of scales; fins all plain.

This species is apparently not abundant in the lake. I did not see a single fresh specimen in the markets. The only specimen taken was caught in my collecting seine. It is known as Roballo, and is regarded as an excellent food fish.

Family **Cichlidae**. THE CICHLIDS; "MOJARRAS."

Body compressed, deep or elongate, covered with rather large ctenoid scales; lateral line interrupted, usually ceasing near end of dorsal fin, then recommencing farther down on middle of caudal peduncle; mouth terminal; teeth in jaws conical, lobate or incisor-like; no teeth on vomer or palatines; nostril single on each side; dorsal fin single, the spinous portion usually longer than soft portion; anal fin with three or more spines; air bladder present; caudal fin rounded to slightly forked. The fishes which are known as Mojarras; and their allies, inhabiting the lakes and rivers of Nicaragua, belong to this family.

- | | | |
|-----|--------------------------------------|------------------------|
| a. | Teeth all conical or cylindrical. | <i>Cichlasoma</i> 117 |
| aa. | Anterior teeth compressed. | |
| b. | Anterior teeth with edges entire. | <i>Neetroplus</i> 130 |
| bb. | Anterior teeth with edges tricuspid. | <i>Herotilipia</i> 130 |

Genus **Cichlasoma** Swainson. "MOJARRAS," CICHLIDS.

To this genus belong the Cichlids or Mojarras with conical or cylindrical teeth. Those found in Nicaraguan lakes belong to four groups which may best be regarded as subgenera. In the following key are given the important features distinguishing these subgenera and the species.

- | | | |
|-----|--|-----------------------|
| a. | Mouth large, the mandible more than half the length of the head; two anterior teeth in upper jaw enlarged and canine-like; anterior teeth of lower jaw very small, these followed by two canine-like teeth, the posterior being the larger; fold of lower lip continuous (<i>Parapetenia</i>). | |
| b. | Preorbital narrow, its depth 8.1 to 9.5 in length of head; cheeks with about 6 rows of scales. | <i>managuense</i> 119 |
| bb. | Preorbital broad, its depth 4.5 to 5.0 in head; cheeks with about 10 rows of scales. | <i>dovii</i> 120 |

- aa. Mouth smaller, the mandible less than half the length of the head; teeth subequal, anterior occasionally slightly enlarged.
- c. Soft dorsal, anal and caudal fin scaly at base, the scales on interradial membranes; fold of the lower lip continuous.
- d. Base of anal fin shorter than the head; anal spines less than 9; lower margin of eye above a line from upper lip to upper edge of base of pectoral (*Erythrichthys*).
- e. Lips normal.
- f. Dorsal spines low, the last one 3.4 to 3.7 in length of head; pectoral fin short, 1.3 to 1.4 in head. *granadense* 121
- ff. Dorsal spines high, the last one 2.3 to 3.0 in length of head; pectoral fins longer, 1.0 to 1.2 in head. *citrinellum* 121
- ee. Lips very broad, slightly produced medianly.
- g. Snout short, 2.36 in head; depth, 2.14 in body; lips very broad, not thick; color not red. *dorsatum* 123
- gg. Snout longer, 2.10 in head; depth, 2.36 in body; lips broad and thick; color red, or nearly so. *erythræum* 124
- eee. Lips broad and thick, medianly produced into a long triangular flap.
- i. Red or yellowish to nearly black with red blotches, dark individuals with bars and lateral and caudal spots indefinite or absent. *labiatum* 124
- ii. Olivaceous with dark bars and prominent lateral and caudal spots. *lobochilus* 125
- dd. Base of anal fin longer than the head, its spines 9 or more; lower margin of eye on or below a line from upper lip to upper edge of base of pectoral (*Archocentrus*). *centrarchus* 126
- cc. Soft dorsal, anal and caudal fins not scaly at their bases; fold of the lower lip not continuous.
- k. Mouth moderate; snout pointed; pectoral fin long, reaching to or beyond last anal spine (*Thorichthys*).
- l. Interorbital narrow, 3.5 to 3.7 in length of the head; depth of body 2.1 to 2.2 in length; no dark lateral band; caudal fin profusely spotted or barred. *rostratum* 126
- ll. Interorbital broader, 2.8 to 2.9 in head; depth of body 1.9 to 2.0 in length; a dark lateral band from eye to lateral spot; caudal fin not spotted. *longimanus* 127
- kk. Mouth small; snout rounded or bluntish; pectoral fin shorter, not reaching middle of spinous portion of anal fin (*Theraps*).
- m. Body deep, 2.1 in head; profile moderately steep; vertical fins unspotted. *nigritum* 128
- mm. Body elongate, 2.4 to 2.7 in head; profile very steep.

- n. No dark lateral band; vertical fins profusely spotted. *nicaraguense* 129
 nn. A dark lateral band; vertical fins unspotted. *balteuum* 129

Parapetenia.

Cichlasoma managuense (Günther). GUAPOTE.

Heros managuensis Günther, Fishes Cent. Amer., 463, Pl. LXXVII, fig. 3, 1869, Lake Managua; Lake Nicaragua.

Head 2.6 to 2.8; depth 2.5 to 2.7; D. XVIII or XIX-10 to 12; A. VII or VIII-8 or 9; scales 6 or 7-36-11. Body elongate, robust, profile slightly concave in interorbital area, the rest convex; mouth large, the gape slightly oblique; end of maxillary reaching slightly past vertical from anterior margin of orbit, its length 2.1 to 2.5 in head; lower jaw the longer, mandible 1.6 to 1.8 in head; lips thick, the lower with free border; teeth in jaws in one series, the anterior two in upper jaw enlarged; two canine-like in lower jaw on each side; teeth conical; snout long, pointed, its length 3.2 to 3.5 in head; preorbital narrow, 8.1 to 9.5 in head; postorbital 1.8 to 2.1 in head; cheeks broad, covered by six rows of scales; eye 4.3 to 5.3 in head; gill rakers 3 to 10; dorsal and anal fins low, the spines weak; longest dorsal spine 2.6 to 3.5 in head; longest anal spine 2.6 to 3.3; middle rays of soft dorsal and anal longest, their tips reaching near middle of caudal fin; pectorals short, not reaching beyond ventrals, 1.4 to 1.6 in head; ventrals to first anal spine, length 1.4 to 1.7 in head; origin of first dorsal spine to tip of snout 2.5 to 2.6 in head; a line from lower margin of upper lip to base of last anal ray passes lower margin of orbit and upper margin of pectoral base, to middle of caudal passes through lower portion of eye.

Color dark olivaceous, much mottled; no distinct vertical bars; usually a dark lateral band broken into blotches; a dark band from eye to upper portion of opercle; a similar one from eye to base of pectoral; usually three rows of blotches parallel to this one and below it; a black spot on base of pectoral; vertical fins with large black blotches, sometimes arranged in rows; ventrals dark; pectorals plain. The coloration of the sexes in this species is the same.

This species is very abundant in Lake Nicaragua. It was also taken in considerable numbers in the Lagoon Jenicero, north of Lake Nicaragua. This lagoon at the time of my visit contained only a small amount of water. The mud in it was so thick that a seine could not be used. The temperature of the water was 83° F. One would

hardly suspect that fishes suitable for food could be found in such muddy, warm water. Yet the Guapote taken from here sold as readily in the market at Granada as did the best fishes from the Lake. Their flesh was firm, white and flaky, and of good flavor. The vitality of these fishes is remarkable. Those in the market are often found to be living after they have been taken from the water for some time. I purchased two of these fishes in the market at Granada one morning, carried them to the hotel, and left them while eating my breakfast and for some half an hour afterwards. I then put them in water, and in a short time they were as lively as ever. This species is certainly worthy of the attention of fish culturists. It grows to a length of about 500 mm. In shape it resembles our black bass. It is, however, a thicker fish.

Managua (15), 75 to 245 mm.; San Francisco (1), 150 mm.; Jencero (13), 50 to 225 mm.; Cisplaya (4), 90 to 110 mm.; Granada (6), 150 to 195 mm.

Cichlasoma dovii Günther. GUAPOTE.

Heros dovii Günther, Proc. Zool. Soc., Lond., 1864, 154, Lake Nicaragua; Gill and Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 183.

Head 2.5 to 2.6; depth 2.5 to 2.6; D. XVIII-12 or 13; A. VII or VIII-8 or 9; scales 7-35-11. Body elongate, not much compressed; dorsal region little elevated; profile slightly concave above eyes, the rest convex; mouth large, the gape oblique; end of maxillary reaching vertical from front of orbit, its length 2.1 to 2.3 in head; lower jaw the longer, mandible 1.6 to 1.8 in length of head; lips thick, the lower with free border; teeth in jaws in one series; anterior 2 of upper jaw enlarged, two teeth on each side of anterior portion of lower jaw enlarged; teeth all conical; snout long, pointed, its length 2.4 to 2.6 in head; preorbital broad, 4.5 to 5.0 in head; postorbital 2.2 to 2.3; gill rakers 3+9 or 10; cheek broad, covered by 10 rows of scales; premaxillary process to posterior part of orbit 1.5 to 1.7 in head; eye 5.2 to 5.7 in head; dorsal and anal fins low, the spines weak, longest dorsal spine about 3.7 in head; longest anal spine about 3.9; soft rays of dorsal reach middle of caudal in largest specimens, in smaller ones to base of caudal; pectoral short, its tip not reaching past tip of ventral, length 1.7 to 1.9 in head; tip of ventrals not reaching first anal spine, length of ventral 1.7 to 1.9 in head; origin of dorsal to tip of snout 2.4 to 2.5 in head; a line from margin of upper lip to base of last anal ray passes just above base of pectoral to middle of caudal, midway between lower margin of orbit to base of pectoral; male

develops the nuchal hump; least depth of caudal peduncle 2.5 in head; caudal fin rounded.

Color dark olivaceous; six or seven dark bands; lateral band more or less broken into blotches; body and head of males with numerous small, black spots, those on body forming longitudinal lines along rows of scales; vertical fins spotted; females without the small, black spots; a dark band downward and backward from the eye; a dark spot above base of pectoral and one on its base; vertical fins unspotted. The dark caudal spot is more prominent on the females.

This is the largest Cichlid in the lakes of Nicaragua. It grows to a length of about 50 cm.

Managua (11), 170 to 405 mm.; Granada (4), 145 to 150 mm.

Erythrichthus subgen. nov. (Type, *Heros citrinellus* Günther.)

Cichlasoma granadense sp. nov.

Type, No. 5951, F. M. N. H.; length, 155 mm.; Lake Nicaragua, Granada, Nicaragua.

Head 2.5 to 2.6; depth 2.1 to 2.2; D. XVIII, 11 or 12; A. VII, 7 to 9; scales 7-31-12. Body moderately robust; dorsal region slightly elevated; profile slightly concave above eyes; nuchal region but little developed; mouth small; maxillary reaching slightly more than half-way to front of orbits, its length 3.3 to 3.5 in head; mandible 2.7 to 2.8; snout 2.5 to 2.7 in head; preorbital 4.2 to 4.6; post-orbital 2.5 to 2.6; diameter of eye 3.8 to 4.0; eye to lower margin of subopercle 2.6 to 2.9; teeth small, pointed, the anterior ones slightly enlarged; lips moderately thick, the lower with its edge free; gill rakers short, 4+8; cheeks with 4 rows of scales; spinous dorsal very low, its last spine 3.4 to 3.7 in head; last anal spine 3.0 to 3.2 in head; soft rays of dorsal and anal not much produced, their tips seldom reaching middle of caudal; origin of dorsal fin to tip of snout 2.2 to 2.3 in body; base of anal 3.7 to 3.9 in body; pectoral fin reaching second or third anal spine, 1.3 to 1.4 in head; ventral fin 1.2 in head; caudal fin short, rounded.

Color very dark, sides with 7 dark bars, no distinct lateral spot; caudal spot present. This species differs from *C. citrinellum* in the smaller mouth, lower dorsal fin, the larger eye, and darker coloration.

Managua (2), 135 to 145 mm.; San Francisco (4), 100 to 150 mm.; Jenicero (1), 150 mm.; Granada (3), 140 to 150 mm.

Cichlasoma citrinellum Günther.

MOJARRA CONTARA.

Heros citrinellus Günther, Proc. Zoöl. Soc., Lond., 1864, 153. Lake

Nicaragua; Lake Managua: Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 182, Lake Nicaragua.

Heros basilaris Gill & Bransford, l. c. 182, Lake Nicaragua.

Head 2.5 to 2.7; depth 1.8 to 2.3; D. XVI to XVII, 11 to 13; A. VI to VIII, 7 to 9; scales 8-32-11. Body compressed, profile slightly concave at interorbital; dorsal region elevated; mouth moderate; its gape oblique; end of maxillary not reaching vertical from front of orbit, its length 2.8 to 3.2 in head; mandible strong, its length 2.3 to 2.6 in head; preorbital broad, 3.5 to 4.8 in head; postorbital 2.2 to 2.4; diameter of eye 3.9 to 4.6; distance from lower margin of orbit to lower edge of subopercle 2.3 to 2.8; distance from tip of snout to scales on nape 1.8 to 2.0 in head; gill rakers 3 + 10; cheeks with five rows of scales; lower lip with margin free; origin of dorsal fin above base of pectoral, its distance from end of snout 2.2 to 2.4 in body; dorsal spines increase in length rapidly to fifth spine, then gradually to last spine; length of last dorsal spine 2.3 to 3.0 in head; last anal spine 2.2 to 3.0 in head; base of anal fin 3.3 to 3.7 in body; middle rays of soft dorsal and anal attenuated, in some of the larger specimens (180 mm.) these filaments reaching nearly to end of caudal fin; pectoral fin short, its tip not reaching anal fin in some of the larger individuals, to fourth anal spine in some smaller ones (100 mm.); length of pectoral 1.0 to 1.2 in head; ventral with rays produced, length 1 to 1.2 in head; tips of ventrals reaching third to fifth anal spine; caudal peduncle deeper than long, its depth 2.5 to 2.8 in head, its length 3.1 to 3.8 in head; caudal fin rounded, its middle rays slightly emarginate.

Color variable, typical color dark olivaceous; sides with 7 dark bars; usually a dark spot on 4th bar just below the lateral band; on larger individuals (180 mm.) scarcely a trace of this spot, on smaller individuals (90 mm.) a spot on each bar, giving the appearance of an interrupted lateral band; a black caudal spot above lateral line; vertical fins plain or with a few faint dark spots.

This species is very abundant in Lake Tiscapa, Nicaragua. The above description is based on a number of individuals ranging from 100 to 187 mm. This species is also very abundant in Lake Managua and Lake Nicaragua. It is the only Cichlid inhabiting Lake Tiscapa, so far as known.

Of all the species fishes in these lakes, this one is by far the most variable. I made many repeated efforts to divide this material listed below in from two to a half-dozen or more species, but in all cases I was unable to find any tangible constant characters to define them. To

regard them as more than one species meant only to limit the number by the material at hand, and so I have lumped them all in one.

The fact that no red forms were found in Lake Tiscapa and Lagoon Jenicero led me to believe that there was possibly one form or species in which rubrism did not occur, but I found myself unable to discover any constant character or characters to separate it from the others, except on color alone. As to form, some individuals are very deep, others quite elongate. On some with normal color there are well defined lateral bars but no trace of a lateral spot, on other specimens of same size or larger, the lateral blotch is well defined. On some of the more elongate forms (of about 140 mm.) from Lake Nicaragua the nuchal hump is well developed, while on many of the larger individuals it is quite absent. There were no markings or peculiarities that I was able to correlate with sex or size. It is possible that more than one species should be recognized here, and no doubt such will some day be the case, especially if some enthusiastic student of fishes has at his command a far less amount of material than I have had the opportunity to examine.

Dark forms:—Momotomba (9), 65 to 195 mm.; Managua (77), 90 to 280 mm.; Tiscapa (21), 110 to 180 mm.; San Francisco (15), 65 to 155 mm.; Jenicero (11), 50 to 150 mm.; Granada (61), 130 to 250 mm.; Cisplaya (5), 40 to 120 mm.

Red forms:—Momotomba (1), 265; Managua (17), 160 to 260 mm.; Granada (29), 130 to 260.

***Cichlasoma dorsatum* sp. nov.**

Type, No. 5971, F. M. N. H.; length, 179 mm.; Lake Managua, Managua, Nicaragua.

Head 2.4 to 2.5; depth 2.1 to 2.2; D. xvii, 11; A. vii, 8; scales 7-32-11. Body deep, dorsal region elevated, profile slightly concave; nuchal region slightly gibbous; jaws subequal; lips very broad, the lower with free margin; anterior teeth enlarged, those of upper jaw the larger; snout moderately pointed, 2.4 to 2.7 in head; preorbital 4.3 to 4.5; postorbital 2.4 to 2.5; diameter of eye 3.6 to 4.11; eye to margin of subopercle 2.7 to 3.1; mouth moderate, slightly oblique; maxillary nearly reaching vertical from anterior of eye, its length 2.7 to 2.9 in head; mandible 2.3 to 2.4; interorbital 2.9 to 3.1; snout to scales on nape 1.9 to 2.0; cheeks with four rows of scales; dorsal fin rather low, its last spine 2.3 to 2.6 in head; middle rays of dorsal fin reaching to middle of caudal fin, those of anal shorter; origin of dorsal to tip of snout 2.1 to 2.2 in body; base of anal fin 3.7 to 3.8 in body, its last spine 2.4 to 2.7 in head; ventral fins reaching third anal spine,

1.2 to 1.4 in head; pectoral fin long, its tip reaching soft rays of anal, 1.1 to 1.2 in head; length of caudal peduncle 3.4 to 4.0 in head, its depth 2.6 to 2.7; soft dorsal, anal and caudal with scales extending on basal third.

Color dark olivaceous; sides with seven black cross bands, the fourth darkest, but without definite black lateral blotch; a black spot on upper half of base of caudal; fins unspotted.

The lips of this species are quite similar to those of the following species. The fish, however, is deeper, and with dorsal region more elevated. It also has a shorter snout.

Managua (3), 115, 179; Granada (1), 200 mm.; Jenicero (1), 95 mm.

Cichlasoma erythræum (Günther).

Heros erythræus Günther, Fishes Cent. Amer., 457, Pl. LXXV, fig. 2, 1869, Lake Managua.

Head 2.56; depth 2.36; D. XVII-11; A. VII, 9; scales, 7-32-11. Body rather elongate, dorsal region not much elevated; profile slightly concave in supraorbital region; nuchal region slightly gibbous; jaws subequal; lips thick, the lower with free margin; center of each lip with a slight prominence; anterior teeth of upper jaw enlarged, rather wide set; anterior teeth of lower jaw similar but smaller; snout rather pointed, its length 2.10 in head; preorbital 4.03 in head; postorbital 2.63 in head; diameter of eye 4.96; eye to margin of subopercle, 2.58; mouth moderate, slightly oblique; maxillary not reaching vertical from anterior margin of orbit, its length 2.74 in head; mandible 2.45; interorbital 2.91; snout to scales on nape 1.80; cheeks with four rows of scales; dorsal fin rather low, its last spine 2.68 in head; middle rays of dorsal fin produced, their tips reaching past middle of caudal fin; those of anal fin to first third of caudal; origin of dorsal to tip of snout 2.25 in body; base of anal fin 3.66 in body, its last spine 2.85 in head; ventrals reaching third anal spine, 1.24 in head; length of caudal peduncle, 3.60 in head, its depth 2.82.

Color red with a yellowish tinge; some scales on the body dark; tips of soft dorsal rays black; all other fins red.

The lips of this individual have each a slight triangular protuberance, suggesting the triangular flap of *C. lobocheilus* and *C. labiatum*. One individual taken in Lake Managua, near Granada, length 224 mm.

Cichlasoma labiatum (Günther).

Heros labiatus Günther, Proc. Zoöl. Soc., Lond., 1864, 27, Pl. IV, fig. 1, Lake Nicaragua: Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 182.

Head 2.4; depth 2.3 to 2.5; D. XVI to XVII 10 to 12; A. VII, 8; scales 7-32-11. Body elongate, in general form like the preceding; maxillary 2.8 to 2.9 in head; snout 2.2 to 2.4; mandible 2.2 to 2.4; interorbital 3.6 to 3.9; preorbital 4.3 to 4.6; postorbital 2.4 to 2.7; diameter of eye 4.4 to 4.6; eye to subopercle 2.8 to 3.0; lips and dentition as in the preceding species; last dorsal spine 2.7 to 3.0 in head; last anal spine 2.5 to 2.8; pectoral 1.3 to 1.4; ventral 1.3 to 1.5; length of caudal peduncle 3.8 to 4.2, its depth 2.8 to 3.1; origin of dorsal to snout 2.1 to 2.3 in body; base of anal 3.8 to 4.0; snout to scales on nape 1.8 to 1.9 in head; scales on cheeks usually in 3 rows, seldom in 4 rows; gill rakers 4 + 10 or 11.

Color red to nearly black; some individuals with only tips of caudal and dorsal fins with black; others with small patches of red on ventral region; darkest individuals with traces of black bars and spots on side, suggesting markings of the following species, with which this species may prove to be identical. The specimens seen and collected by me average smaller than those of following species, but the gradation in color and general appearance of the material examined by me is not sufficient to justify the uniting of these two species.

Granada (8), 125 to 195 mm.

Cichlasoma lobocheilus (Günther).

Heros lobocheilus Günther, Fishes Cent. Amer., 457, Pl. LXXV, fig. 1, 1869, Lake Managua.

Head 2.4; depth 2.3 to 2.4; D. XVI or XVII, 10 to 12; A. VII, 7 or 8; scales 8-32-11. Body elongate, dorsal region moderately elevated, declining gradually to the tail; profile straight to nape; the nape gibbous or not; head narrow, rather pointed; mouth oblique, the maxillary not reaching vertical from anterior margin of orbit, its length 2.6 to 2.8 in head; snout 2.2 to 2.4; mandible 2.2 to 2.4; preorbital 3.9 to 4.4, being deeper in the larger individuals; postorbital 2.6 to 2.8; diameter of eye 4.6 to 5.1; distance from eye to margin of subopercle 2.5 to 3.1; interorbital 3.1 to 3.8; tip of snout to scales of nape 1.7 to 1.9; lips thick, each with a long triangular flap; anterior teeth in each jaw somewhat enlarged and wide set; scales on cheek in four rows; dorsal spines increasing rapidly to 4" spines, then gradually to last spine; last dorsal spine 2.7 to 3.4 in head, the spines being shorter in the larger individuals; the last anal spine 2.8 to 3.4; the base of anal fin 4 to 4.1 in head; middle rays of soft dorsal and anal produced, their tips reaching nearly to or past middle of caudal; pectoral fins reaching from 2" to 4" anal spine, length 1.4 to 1.5 in head; ventrals reaching 2" to 5" anal spine, length 1.4 to 1.6; a line

drawn from meeting of jaws to base of last anal ray passes across upper third of base of pectoral; to middle of base of caudal passing nearly midway between eye and base of pectoral.

Color light olivaceous, sides with 7 dark bars; a black blotch on fourth bar under lateral line; a black spot on upper half of base of caudal; soft dorsal, anal and caudal fins, usually with small, dark spots; ventral dusky; middle of each scale lighter than the rest, giving more or less distinct lines along the rows of scales. The lateral and caudal spots as distinct on large as on small individuals.

Managua (19), 130 to 240 mm.; Granada (4), 125 to 135 mm.

Archocentrus.

Cichlasoma centrarchus (Gill & Bransford).

Heros centrarchus Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 185, Lake Nicaragua.

Head 2.6 to 2.8; depth 1.9 to 2.1; D. xv or xvi, 8 or 9; A. ix or x, 7 to 9; scales 6-28-11. Body deep, compressed; profile nearly evenly convex; mouth small, little oblique; fold of the lower lip continuous; snout 3.0 to 3.5 in head; maxillary 3.2 to 3.6; mandible 2.4 to 2.6; preorbital 6.0 to 7.0; postorbital 2.1 to 2.3; interorbital 2.4 to 2.5; diameter of eye 3.4 to 3.6; eye to subopercle 2.8 to 3.2; gill rakers 8+17; dorsal spines rather light, last dorsal spine 2.0 to 2.3 in head; last anal spine 2.0 to 2.2; origin of dorsal fin to snout 2.1 to 2.4 in body; base of anal 2.3 to 2.6; caudal peduncle short, its length 3.6 to 4.4 in head, its depth 2.1 to 2.3; soft dorsal and anal scaly at base on interradiial membranes; caudal fin rounded, its middle rays slightly emarginate.

Color olivaceous; sides with 7 dark vertical bars; a dark caudal spot; opercle with one or two black blotches; pectorals light; other fins dark or dusky, without spots.

Very abundant in sluggish water. Largest specimen taken 150 mm.

Momotomba (3), 90 to 100 mm.; San Francisco (1), 95 mm.; Jenicero (66), 27 to 150 mm.; Cisplaya (18), 45 to 120 mm.

Thorichthys.

Cichlasoma rostratum (Gill & Bransford).

Heros rostratus Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 181, Lake Nicaragua.

Head 2.3 to 2.4; depth 2.1 to 2.2; D. XVI or XVII, 10 or 11; A. VII; 7 or 18; scales 7-32-11. Body deep, compressed, profile nearly straight; snout long, pointed, 2.1 to 2.2 in head; mouth, nearly horizontal; maxillary not reaching vertical from eye, its length 3.2 to 3.4 in head; mandible 2.4 to 2.6; preorbital 3.7 to 4.0; postorbital 2.7 to 2.9; diameter of eye 3.5 to 3.7; interorbital 3.5 to 3.7; snout to scales on nape 1.6 to 1.7; lower lip with a frenum; eye to lower margin of subopercle 2.7 to 2.9; dorsal fin high, its last spine 2.3 to 2.7 in head; last anal spine 2.3 to 2.8; gill rakers 5 + 15; origin of dorsal fin to tip of snout 2.0 to 2.2 in body; base of anal 3.8 to 3.9; pectoral fin very long, reaching middle of soft portion of anal, its length 1.0 to 1.2 in head; ventral reaching third or fourth anal spine, 1.3 to 1.4 in head; scales on cheeks in 5 or 6 rows; length of caudal peduncle 3.4 to 3.6 in head, its depth 2.8 to 3.0; caudal fin slightly forked; nuchal hump developed on larger specimens (160 mm.).

Color light olivaceous, sides with six indistinct dark vertical bars; no dark band on the side; a dark lateral and a dark caudal spot; soft dorsal and anal with light spots; caudal profusely spotted or barred; upper and the lower jaws very dark or black. This species may possibly prove to be the males of the following:

Managua (3), 135 to 160 mm.; San Francisco (8), 110 to 145 mm.; Granada (18), 155 to 170; Jenicero (6), 100 to 170 mm.; Cisplaya (6), 160 to 170.

Cichlasoma longimanus (Günther).

Heros longimanus Günther, Fishes Cent. Amer., 453, Pl. LXXII, fig. 2, 1869, Lake Nicaragua: Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, 182, Lake Nicaragua.

Head 2.4 to 2.5; depth 1.9 to 2.0; D. XVI or XVII, 9 or 10; A. VII 7 or 8; scales 6-30-11. In form and general appearance this species resembles the preceding; snout 2.2 to 2.5 in head; maxillary 3.1 to 3.2; mandible 2.4 to 2.6; preorbital 3.5 to 3.8; postorbital 2.4 to 2.5; diameter of eye 3.1 to 3.8; eye to subopercle 2.4 to 2.6; interorbital 2.8 to 2.9; snout to scales on nape 1.8 to 1.9; last dorsal spine 2.2 to 2.6; last anal spine 2.1 to 2.5; pectoral 1.0; ventral 1.0 to 1.2; length of caudal peduncle 2.9 to 3.2; depth of caudal peduncle 2.4 to 2.5; origin of dorsal to tip of snout 2.1 to 2.2 in body; base of anal fin 3.2 to 3.4; lower lip with a frenum; caudal fin slightly forked; no nuchal hump on largest specimens (155 mm.).

Color dark olivaceous; sides with six or 7 indistinct vertical bars; a dark band from eye to lateral spot; no distinct caudal spot; posterior

portions of dorsal and anal fins with light spots; caudal fin plain or with very few light spots.

The individuals of this species in the collection range in length from 45 mm. to 165 mm. An examination of 6 of the larger ones to determine sex showed these to be females. I was unable to determine positively the sex of the younger individuals. I also examined a number of individuals of the preceding species, all of which proved to be males. It is quite probable that *C. rostratum* and *C. longimanus* are the same species, the former being males, the latter females. The material that I have examined is insufficient to positively determine this point, and so I have preferred to recognize the two species rather than substitute one doubt for another by combining them.

Momotomba (1), 100 mm.; Managua (5), 100 to 125 mm.; San Francisco (9), 90 to 125 mm.; Jenicero (55), 45 to 155 mm.; Cisplaya (12), 100 to 165 mm.

Theraps.

Cichlasoma nigratum sp. nov.

Type, No. 5979, F. M. N. H.; length, 142 mm.; Lake Nicaragua, Granada, Nicaragua.

Head 2.95; depth 2.09; D. XVII, 12; A. VII, 9; scales 8-32-12. Body deep, compressed, dorsal region elevated, profile steep, evenly convex, with slight interorbital depression; mouth small with conical teeth, the anterior ones slightly the larger; maxillary not reaching vertical from front of orbit, its length 3.62 in head; snout 2.41; mandible 2.89; preorbital 4.01; postorbital 2.58; diameter of eye 3.35; distance of eye to lower margin of subopercle 2.58; interorbital 2.68; tip of snout to scales of nape 2.76; lower lip with a broad frenum; scales on cheek in five rows; origin of dorsal fin over base of pectoral, its distance from tip of snout 2.27 in body; dorsal spines increase rapidly to fifth, then gradually to last one; last dorsal spine 1.90 in head; last anal spine 1.72; base of anal fin 3.68 in body; middle rays of dorsal and anal fins reaching past middle of caudal; pectoral short, 1.2 in head, its tips not reaching first anal spine; ventrals 1.05 in head, their tips reaching third anal spine; caudal fin rounded, its middle slightly marginate.

Color dark olivaceous, plain; middle of scales darkest, forming faint lateral stripes; no lateral or caudal blotch; no dark lateral band; soft dorsal with few dark spots; all of the fins except pectorals dark.

One specimen 142 mm. in length.

This species resembles the two preceding species. It has, however, a much less gibbous profile, a deeper body, and different coloration.

Cichlasoma nicaraguense (Günther).

Heros nicaraguensis Günther, Proc. Zool. Soc., Lond., 1864, 153,
Lake Nicaragua: Gill & Bransford, Proc. Acad. Nat. Sci.,
Phila., 1787, 184, Lake Nicaragua.

Head 2.8 to 3.0; depth 2.4 to 2.5; D. XVIII or XIX, 10 or 11; A. VIII or IX, 7 or 8; scales 7-33-12. Body elongate, compressed; profile very steep, in individuals with nuchal hump developed; profile nearly vertical; mouth small, nearly horizontal; snout 2.5 to 2.7; maxillary 3.0 to 3.6; mandible 2.6 to 2.7; preorbital 3.1 to 4.0; postorbital 2.4 to 2.6; interorbital 2.1 to 3.0; diameter of eye 3.0 to 3.07; eye to subopercle 2.0 to 2.6; last dorsal spine 2.0 to 2.2; last anal spine 1.9 to 2.1; soft dorsal and anal rays reaching nearly to middle of caudal; pectorals short, not reaching first anal spine, 1.1 to 1.2 in head; ventrals 0.9 to 1.0 in head, reaching from first to fourth anal spine; original of dorsal to tip of snout 2.4 to 2.5 in body; base of anal 3.4 to 3.5; length of caudal peduncle 2.1 to 2.4 in head, its depth 2.3 to 2.5; caudal fin slightly forked.

Color olivaceous, sides with six or seven faint vertical bars, most conspicuous in the young (95 mm.); no distinct longitudinal band; a prominent dark lateral spot; no caudal spot. In the larger individuals (190 mm.) the bars and lateral blotch inconspicuous; vertical fins with many dark spots. The nuchal hump is very prominent on the larger individuals I have examined, all of which are males.

Momotomba (5), 100. to 120 mm.; Managua (11), 80 to 135 mm.; Granada (13), 155 to 205 mm.

Cichlasoma balteatum (Gill & Bransford).

Heros balteatus Gill & Bransford, Proc. Acad. Nat. Sci., Phila.,
1877, 184, Lake Nicaragua.

Head 3.0 to 3.1; depth 2.5 to 2.7; D. XIX, 10; A. VIII, 7 or 8; scales 7-32-12. In general form this species somewhat resembles the preceding; snout 2.4 to 2.5 in head; maxillary 3.2 to 3.4; mandible 2.6 to 2.8; preorbital 3.3 to 3.9; postorbital 2.5 to 2.6; interorbital 2.4 to 2.6; diameter of eye 3.1 to 3.3; eye to subopercle 2.3 to 2.6; longest dorsal spine 2.1 to 2.2; longest anal spine 1.9 to 2.0; length of caudal peduncle 2.4 to 2.6; depth of caudal peduncle 2.4 to 2.6; pectoral 1.1 to 1.2; ventral 1.0 to 1.2; origin of dorsal to snout 2.4 to 2.5; base of anal, 3.4 to 3.5.

Color light olivaceous, a dark band from eye to base of caudal ending in a black caudal spot. The few dark blotches at base of dorsal indicate the possible presence of vertical bars in the young; vertical fins unspotted.

Three specimens, all males, from Lake Nicaragua near Granada. Length 154, 155 and 160 mm. respectively. One 97 mm. from Lake Managua at Momotomba. So far as I can determine, all specimens listed under the preceding species are females. It is very probable that these two species should be united, *C. nicaraguense* being based on females, *C. balteatum* on the males of the same species. The material examined by me is only sufficient to suggest this change, but hardly sufficient to warrant my making it.

Managua (6), 90 to 115 mm.; Granada (3), 155 to 165 mm.

Genus **Neetroplus** Günther.

Anterior teeth in each jaw truncate, incisor-like.

Neetroplus nematopsis (Günther).

Neetroplus nicaraguensis Gill & Bransford, Proc. Acad. Nat. Sci., Phila., 1877, Nicaragua.

Head 3.0 to 3.3; depth 2.3 to 2.4; D. XVIII or XIX, 9 or 10; A. VI or VII, 7 or 8; scales 7-33-11. Body elongate, compressed; profile steep; mouth small, nearly horizontal, the snout prominent, overhanging the lower jaw; lower lip with a frenum; snout 2.1 in head; maxillary 2.7 to 3.7; mandible 2.6 to 3.0; preorbital 3.3 to 3.7; postorbital 2.5 to 3.0; interorbital 2.1 to 2.4; diameter of eye 2.7 to 3.2; eye to subopercle 2.0 to 2.3; last dorsal spine 1.9 to 2.1; last anal spine 1.7 to 1.9; origin of dorsal to tip of snout 2.4 to 2.9 in body; base of anal 3.8 to 4.1; pectoral fin short, 1.1 to 1.3 in head; ventrals 8 or 9; gill rakers 2+8; caudal peduncle long, its length 2.4 to 2.5 in head, its depth 2.1 to 2.3; caudal fin subtruncate.

Color dark olivaceous; a dark bar downward and backward from base of 9th and 10th dorsal spines; fins all plain.

Momotomba (1), 97 mm.; Managua (33), 45 to 135 mm.

Genus **Herotilpia** Pellegrin.

Anterior teeth in each jaw incisor-like, tricuspid; occasionally a few of the anterior teeth of outer series truncate or slightly trilobed.

Herotilpia multispinosa (Günther). PICACULA.

Heros multispinosus Gunther, Fishes of Cent. Amer., 453, pl. LXXIV, fig. 2, 1869, Lake Managua.

Head 2.7 to 2.9; depth 1.9 to 2.0; D. XIX, 8; A. XI or XII, 7; scales 6-29-11. Body deep robust; profile evenly convex; mouth small, little oblique; snout 2.7 to 3.0 in head; maxillary 3.5 to 4.2; mandible 2.7 to 3.0; preorbital 4.9 to 5.3; postorbital 2.1 to 2.3; interorbital 2.0 to 2.3; diameter of eye 3.0 to 3.3; eye to subopercle 2.9 to 3.0; dorsal fin rather low, last spine 2.5 to 2.7 in head; longest anal spine 2.1 to 2.7; pectoral fins short, 1.1 to 1.2 in head; ventral fins 0.9 to 1.1; origin of dorsal to tip of snout 2.2 to 2.3 in body; base of anal 2.4 to 2.5; caudal peduncle short, its length 4.0 to 5.7 in head, its depth 1.8 to 2.1; caudal fin rounded.

Color olivaceous; sides with 7 broad dark bands; a dark band from eye to lateral spot; a dark caudal spot; fins dark, unspotted.

Momotomba (1), 75 mm.; Granada (1), 65 mm.; Jenicero (38), 45 to 110 mm.; Cisplaya (11), 60 to 115 mm.

Family **Gobiidae.**

Genus **Philypnus** Cuv. & Val.

Body elongate, terete anteriorly, compressed posteriorly; head elongate, depressed; mouth large, the lower jaw the longer; teeth in jaws small, slender, recurved, the outer scarcely enlarged; teeth on vomer villiform, in a broad crescent-shaped patch; gill openings extending forward to below posterior angle of mouth, the isthmus very narrow; scales ctenoid, covering most of the head; ventrals separate, the rays 1.5.

Philypnus dormitor Lacépède. GUAVINA.

Eleotris longiceps Günther, Proc. Zool. Soc., Lond., 1864, 151, Lake Nicaragua: Günther, Fishes Cent. Amer., 440, 1868, Lake Nicaragua.

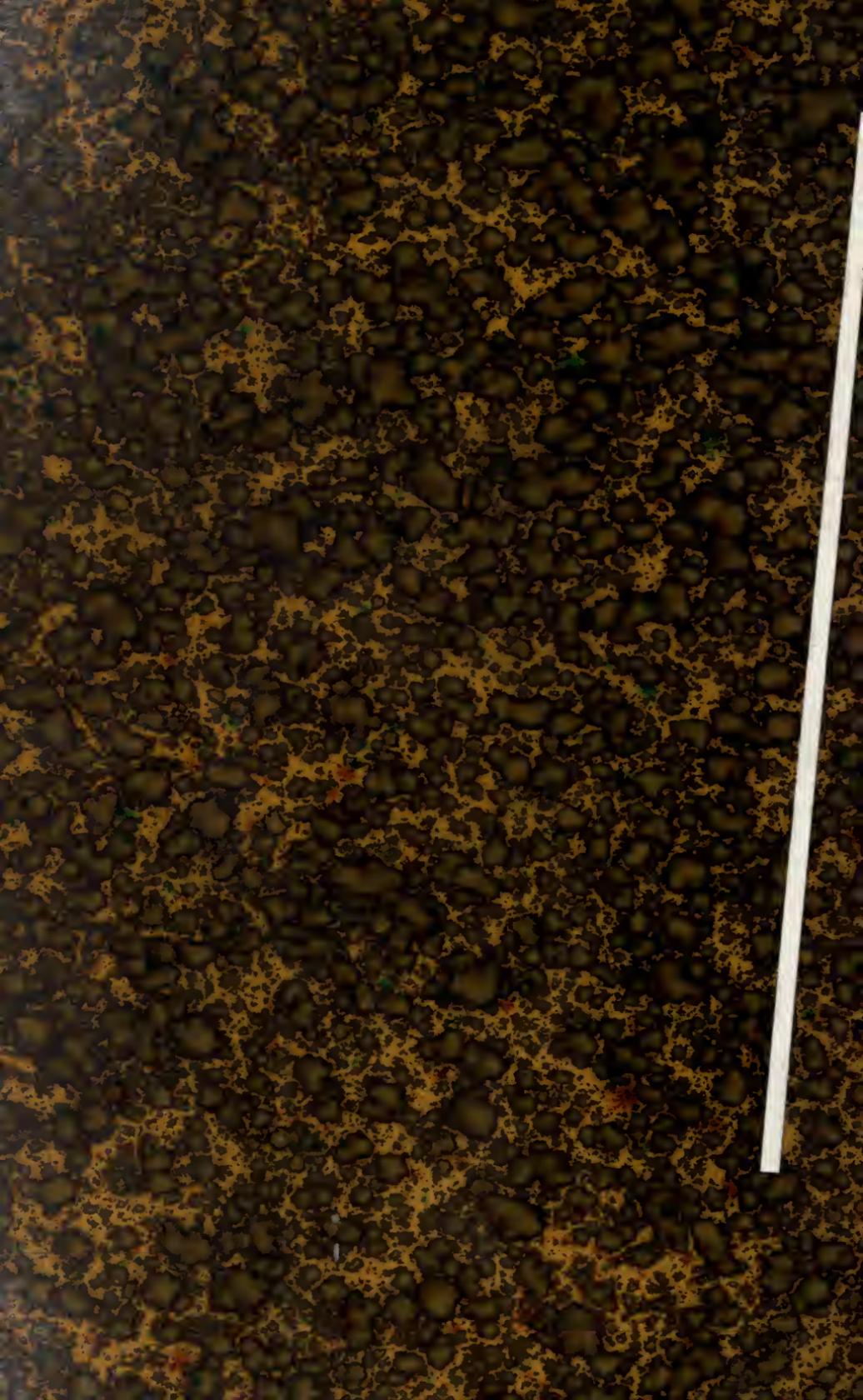
Philypnus longiceps Gill & Bransford, Proc. Acad. Nat. Sci. Phila., 1877, 181, Lake Nicaragua.

Head 2.7 to 3.0; depth 5.2 to 5.7; D. VI or VII, 1.9 or 1.10; A. 1.9 or 1.10; scales 52 to 63. Body elongate; lower jaw the longer; maxillary 1.8 to 2.4 in head; interorbital 4.5 to 4.9; diameter of eye 5.3 to 6.1.

Color dark olivaceous, much mottled with darker; young with a dark irregular band on sides, this band much broken and quite obsolete

in large individuals. The young (55 mm.) from the Nicaragua lakes have a less developed lateral band than specimens of same size from Tehuantepec and San Francisco in southern Mexico. The Nicaragua specimens are also darker. This species grows to a length of about 50 cm. and is regarded as a very good food fish. It is not very common in the markets.

Momotomba (5), 55 to 195 mm.; Granada (5), 150 to 235 mm.
Managua (14), 118 to 228 mm.





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