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THE FISHES OF THE CHOLUTECA DRAINAGE OF SOUTHERN HONDURAS[1]

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FOR at least a hundred years writers on Central American natural history have had occasion to remark the dearth of zoological information pertaining to Honduras. Even yet, except for a few recent faunal papers, very little is available. Although the territory embraces ranges assigned to several fishes in the basic ichthyological works of Jordan and Evermann (1896–1900) and Regan (1906–8) and in Jordan, Evermann, and Clark (1930), we have only two definite records for a fresh-water fish from the Pacific slope, one by Fowler (1932) and another by Rehn (1932) for *Anableps* in the Choluteca River at Cantarranas. The aim of the present paper is partly to fill this gap by means of data obtained during eighteen months' reconnaissance field work in central and southern Honduras.

Río Choluteca (Pl. I) and its tributaries constitute the greater part of the drainage of the southern projection of Honduras which lies between Nicaragua and El Salvador. Of the four master streams which drain this southern wedge and

[1] Contribution from the Department of Biology, University of Florida, and Escuela Agrícola Panamericana, Honduras.

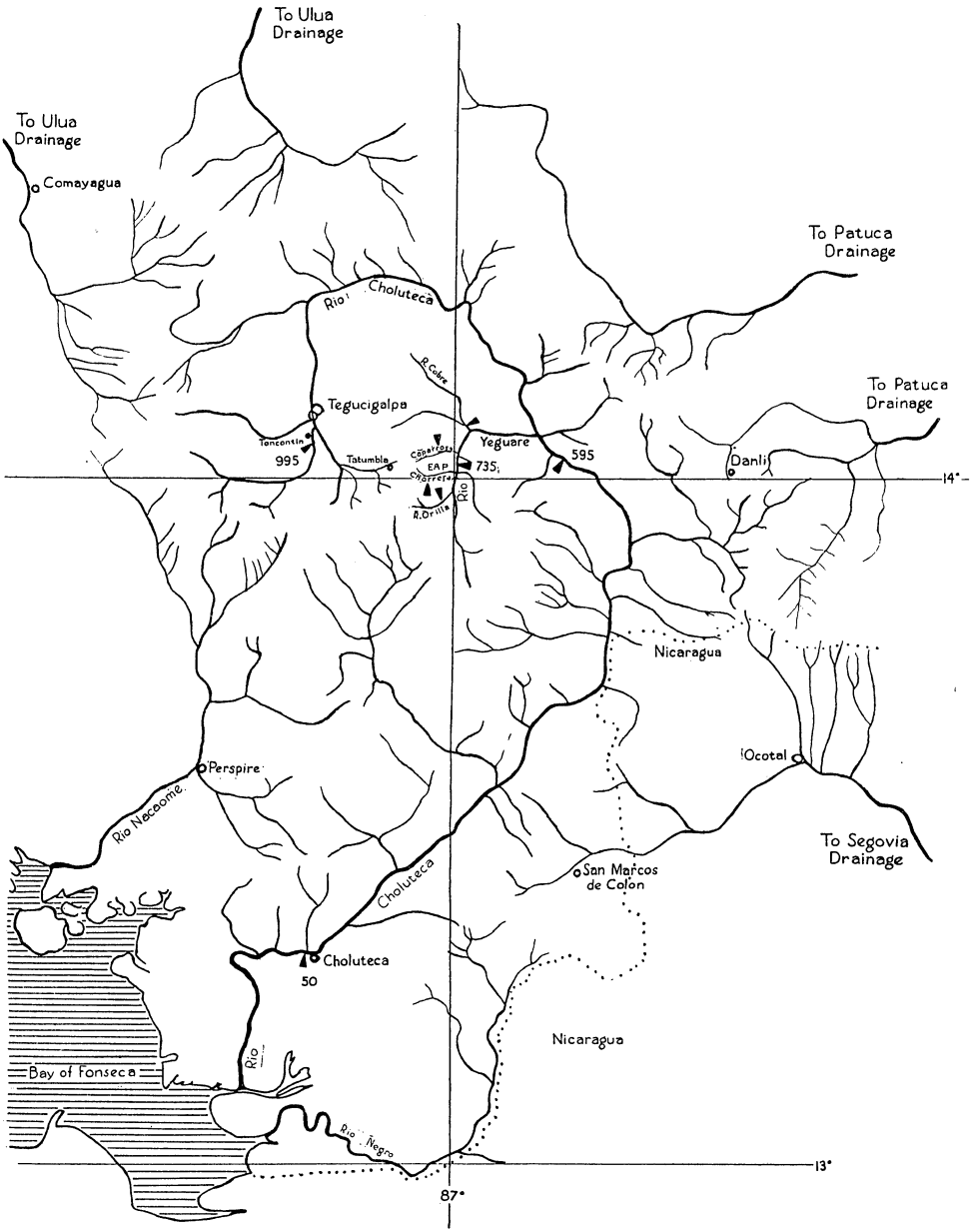
enter the Bay of Fonseca the Río Choluteca is easily the most important. Its basin involves about three-quarters of the whole area, or some 8600 square kilometers. As is shown by Map 1, the watershed is contiguous with those of five other stream systems, two of which drain to the Pacific Ocean and three to the Caribbean Sea.

The terrain is mostly underlain by volcanic rocks, chiefly tufas and acidic lavas, which frequently are deeply cut to form canyons and gorges. There are occasional layers of limy shales and poorly consolidated conglomerates and in places the stream beds are strewn with large boulders of red or yellowish quartzitic conglomerate.

The territory is mountainous except for a narrow coastal plain and the headwaters of several tributaries of the Choluteca drain the high slopes of the Southern Cordillera which have maximum elevations of nearly 2500 meters. The area is semiarid; average annual rainfall is 75 to 100 centimeters with nearly all the rain coming during the seven months from May to December. In June and July there may be very heavy rains which flood the streams violently and bring about marked changes in the river beds overnight. Such abrupt fluctuations in volume, velocity, and burden probably constitute the major limiting factors in the ecology of the fish fauna.

In periods of normal level the water of most of the Río Choluteca affluents is slightly acid or circumneutral and is either clear or has a milky, noncalcareous turbidity, the origin of which is not known to us. There is rarely any discoloration by organic acids, and it appears likely that a chronic deficiency in dissolved nitrogen compounds exists.

Vegetation of the region is principally open pine forest above 800 to 1000 meters, and thorn forest, xerophytic meadow-like savanna or steppe in the valleys and coastal plain. Mesophytic vegetation occurs as cloud forest on the highest peaks, as isolated galleries footed in seepage areas, and as narrow belts along most of the streams, where the water is usually shaded by large trees of wild fig, guanacaste (*Enterolobium*), ceiba, and willow (*Salix chilensis*).



MAP 1. The Choluteca River drainage, showing relationship to adjacent systems. The Ulua, Patuca, and Segovia rivers drain into the Caribbean. Elevations are given in meters and triangles mark collecting localities mentioned in the text. The abbreviation EAP stands for Escuela Agrícola Panamericana.

Aquatic vegetation is generally poorly established, its development presumably being retarded by annual silting and scouring by flood waters. During late dry seasons scattered small beds of *Jussiaea* and, rarely, of *Chara* may be found, but these are usually uprooted by the first floods and are perennial only in protected sloughs and backwaters, where also considerable areas may be covered by floating fern (*Azolla*). Perhaps the most important hydrophytes in the economy of the higher streams are the peculiarly mosslike podostemonaceous genera *Tristicha* and *Marathrum,* which often cap submerged rocks in swift water and harbor a surprisingly large and varied fauna of aquatic insects and larvae.

Except for these insects the invertebrate fauna is poor. There appear to be no bivalve mollusks and but a few species of snails, only occasionally present in any abundance. Three species of shrimps, a moderately common small crab, and a medium-sized ostracod were the only crustaceans which we observed.

The fish fauna is largely composed of stream-loving species, one part of which has definite rheotropic tendencies, while another part habitually lives beneath stones in running water. At one time or another, however, nearly all of them were noted seemingly prospering in the few bodies of impounded water which occur in the area. Thus, the guapote (*Cichlasoma motaguense*), which Hildebrand (1925) reported to be exclusively fluviatile in El Salvador, was seen several times flourishing and apparently breeding under pond conditions in the Choluteca basin.

The apparent absence of any anadromous or catadromous species of fish is worthy of mention. Moreover, the only invasion by species which also occur in salt water is that made by members of the genera *Galeichthys, Mugil,* and *Centropomus,* which are characteristically euryhaline forms throughout most of their ranges. Even these do no more than penetrate the coastal plain.

Zoogeographically, the Río Choluteca fauna shows no striking features. It is relatively a small, almost depauperate,

fauna with a disproportionately large number of genera represented, even when we group as congeneric all the local cichlids. The faunal composition is in a fundamental accord with expectations based upon previous work in areas to the north (El Salvador, Guatemala) and to the south (Nicaragua). Of the eighteen genera known from the Choluteca drainage system at least thirteen also occur in South America and several of them have their centers of abundance there. Six genera range northward to the United States. Three of these are forms of the marine littoral; two, *Astyanax* and *Poeciliopsis,* barely reach the border states; and only one, *Mollienesia,* goes far beyond the Río Grande.

Two new forms, which appear now to be somewhat disjunct endemics, are described in this paper. Adequate statistical treatment of the fauna will almost certainly disclose other populations which require taxonomic recognition and will probably clarify the status of the two supposed endemic species.

We wish to thank Dr. Reeve M. Bailey for his advice and criticism and for his generous co-operation in comparing our specimens with the extensive Central American collections in the Museum of Zoology, University of Michigan (U.M.M.Z.). We are also indebted to Dr. Wilson Popenoe, director, and to Mr. Henry Hogaboom, assistant director, Escuela Agrícola Panamericana, for their kindness in placing at our disposal transportation facilities and equipment. From Messrs. Hugh Popenoe and George and Peter Hogaboom we have had invaluable aid on collecting trips, and Mr. Vladimiro Castellanos has given us indispensable assistance both in the field and in the laboratory. To Dr. Paul Standley, who has assisted us with information concerning water plants, to Mrs. Marjorie Carr, who has collaborated at every turn, and to Mr. J. C. Dickinson, Jr., Department of Biology, University of Florida, for aid with the manuscript, we owe thanks.

KEY TO THE FISHES OF THE CHOLUTECA DRAINAGE

1	Body elongate, eel-shaped; pelvic fins lacking	2
1′	Body not eel-shaped; pelvic fins present	3

2(1)	Vent located below the gill openings, which are not confluent; Gymnotidae ..... *Gymnotus carapo*, p. 11
2′	Vent not near the head; gill openings confluent to form a ventral slit; Synbranchidae ..... *Synbranchus marmoratus*, p. 36
3(1′)	Body without scales; mouth with barbels 4
3′	Body with scales; barbels not present 6
4(3)	Nostrils close together; adipose fin short, tablike; palatine teeth present; Ariidae ..... *Galeichthys guatemalensis*, p. 12
4′	Nostrils not close together; adipose fin long; no teeth on palatine; Pimelodidae 5
5(4′)	Maxillary barbels extending well back of tip of pectoral fin; tip of dorsal fin reaching origin of adipose fin ..... *Rhamdia guatemalensis*, p. 13
5′	Maxillary barbels extending only to base of pectoral; tip of dorsal not nearly reaching origin of adipose ..... *Rhamdia brachycephala*, p. 14
6(3′)	Dorsal region with a small adipose fin; Characidae 7
6′	Dorsal region without adipose fin 9
7(6)	Teeth in upper jaw in two or three series 8
7′	Teeth in upper jaw in a single series..*Roeboides salvadoris*, p. 9
8(7)	Teeth in upper jaw in two series; rays of anal fin fewer than 30; scales about 36 ..... *Astyanax fasciatus aeneus*, p. 7
8′	Teeth in upper jaw in three series; rays of anal fin about 35; scales about 54 ..... *Brycon guatemalensis*, p. 10
9(6′)	Fins without spines 10
9′	Fins with spines 13
10(9)	Eye divided into an upper and a lower part by a broad partition on the cornea; Anablepidae ..... *Anableps dowei*, p. 18
10′	Eye normal, not divided; Poeciliidae 11
11(10′)	Dorsal fin of male very high; intromittent organ shorter than head and with a short hood anteriorly; color pattern not a lateral series of rounded spots or ventrical bars ..... *Mollienesia sphenops*, p. 16
11′	Dorsal fin of male not unusually elevated; intromittent organ longer than head; side with a series of vertical bars or rounded spots 12
12(11′)	Side with a series of vertical bars ..... *Poeciliopsis turrubarensis*, p. 15
12′	Side with a row of three to ten rounded spots ..... *Poecilistes pleurospilus*, p. 15
13(19′)	Dorsal fin single, a continuous series of spines and rays; body usually considerably compressed; Cichlidae 14
13′	Dorsal fins two; body elongate, not much compressed 17
14(13)	Fold of lower lip interrupted mesially 15
14′	Fold of lower lip not interrupted mesially 16

15(14) Dorsal rays, XVI, 8–10; anal rays, VII, 7–8 ..... *Cichlasoma popenoei*, new species, p. 31

15′ Dorsal rays, XVII–XIX, 7–9; anal rays, IX–X, 6–7 ..... *Cichlasoma nigrofasciatum*, p. 29

16(14′) Upper jaw with a median pair of enlarged teeth, one tooth frequently missing; lower jaw with one to two pairs of enlarged teeth on either side of a series of small median teeth ..... *Cichlasoma motaguense*, p. 23

16′ Upper and lower jaws with six to eight somewhat enlarged teeth anteriorly ..... *Cichlasoma hogaboomorum*, new species, p. 27

17(13′) Pelvic fins abdominal 18

17′ Pelvic fins thoracic 20

18(17) Spines of dorsal fin flexible; anal fin with a single weak spine; Atherinidae ..... *Thyrinops guija*, p. 20

18′ Spines of dorsal fin strong and stiff; anal fin with two to three strong spines; Mugilidae 19

19(18′) Anal fin with three spines except in very young, in which there may be two; stomach like a bird's gizzard; lower jaw forming an angle anteriorly ..... *Mugil curema*, p. 20

19′ Anal fin with two spines; stomach not gizzard-like; lower jaw rounded in front ..... *Agonostomus monticola*, p. 21

20(17′) Pelvic fins fused to form a sucking cup; Gobiidae 21

20′ Pelvic fins normal, not fused; Centropomidae ..... *Centropomus nigrescens*, p. 22

21(20) Each jaw with a series of many slender teeth; in the lower jaw these are partly horizontal and imbedded in the gum and behind these there is another series of a few erect conical teeth; no flaps projecting from pectoral arch into gill chamber ..... *Sicydium multipunctatum*, p. 35

21′ Each jaw with bands of pointed teeth not horizontally arranged and not imbedded; anterior edge of pectoral arch with two to three flaps which project into the gill chamber ..... *Awaous taiasica*, p. 34

CHARACIDAE

Astyanax fasciatus aeneus (Günther)
Sardina

Río Yeguare, above and below bridge on road between Danlí and Tegucigalpa; February 2, 1946, 21 specimens, 34 to 72 mm. in standard length; U.M.M.Z. Nos. 144616 and 144620.

Río de la Orilla, tributary to Río Yeguare; near Escuela Agrícola Panamericana; January 10, 1946; 38 specimens, 32 to 96 mm. in length; U.M.M.Z. No. 144619.

Quebrada la Chorrera, pasture at Escuela Agrícola Panamericana; numerous collections; specimens, 35 to 81 mm. in length; U.M.M.Z. No. 144621.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 9, 1946; 10 specimens, 35 to 81 mm. in length; U.M.M.Z. No. 144617.

Río Choluteca at Danlí-Tegucigalpa Road bridge; December 15, 1945; 35 specimens, 23 to 77 mm. in length; U.M.M.Z. No. 144618.

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 21 specimens, 54 to 91 mm. in length; U.M.M.Z. No. 144615.

We followed Hubbs (1935: 68) in accepting agreement in anal-ray count as the basis for assigning the local population to *Astyanax fasciatus aeneus*. The population appears to approach that subspecies more closely than any other, although certain discrepancies shown by the small series studied suggest that a detailed survey of the group might disclose at least 1 Honduran stock that required naming.

The following ratios are based on measurements of 10 specimens, 38 to 87 mm. in standard length, from Río de la Orilla, tributary to Río Yeguare, 2 kilometers south of Escuela Agrícola Panamericana.

Into the standard length the head length is contained 3.52–3.94, average 3.72[2] and the depth 2.53–2.90, average, 2.72. Horizontal diameter of eye in head length, 2.70–3.22, average, 2.92; snout, 3.95–4.88, average, 4.41; depth of caudal peduncle, 2.12–2.50, average, 2.28; interorbital width, 2.85–3.23, average, 3.14; pectoral fin, 1.07–1.29, average, 1.17. Scales 6 to 8–34 to 38–6 to 7 (usually 7–36–7); there are 11 or 12 rows of scales before the dorsal origin. Dorsal fin, 10 (or 11 if the last small pair be counted as 2); anal, 3, 21–26, usually 24–26.

Coloration of live material from Río Yeguare: back dark olive with steely blue luster; top of head almost black. Side with a vague pearly lateral band about as wide as eye; the band with a faint dark spot about an eye's diameter behind

[2] Ratios derived arithmetically.

head. Lower side, belly, cheek, and opercle white with golden sheen. Lower lip dusky. Iris white except for a reddish brown area above pupil. Dorsal fin with membrane clear and rays dusky; pectoral membrane mostly clear, the first two or three rays dusky, others more or less orange or red. Pelvic fins bright orange red, the color mostly on rays. First few soft rays of anal fin bright red; the rest of the fin dusky washed with orange. Adipose fin dusky orange yellow. Caudal lobes bright orange, the basal part of outer rays dark. A heavy black blotch a little wider than pupil begins on caudal peduncle and extends almost to ends of middle caudal rays.

This is probably the most abundant fish in the area. Although not so conspicuous as the top minnows, *Astyanax* is almost universally represented in the deeper pools of the large streams and in those of many of the small ones. In the Yeguare bread thrown on the surface of nearly any deep, slowly moving section of the river will usually attract dozens or even hundreds of characins which seem to appear out of nowhere to mill and thrash about in wild excitement over the bait. They are easily taken on small hooks. A charge of dynamite set off in an apparently uninhabited pool nearly always leaves the bottom strewn with the silvery remains of hosts of sardinas. A swimmer equipped with goggles sees more characins than any other fish. They are greatly interested in the intruder and have very little fear of him.

Sardinas are eaten locally; the little ones are prepared in much the same manner as whitebait, but with the intestine usually removed to avoid the bitter taste which it imparts.

Roeboides salvadoris Hildebrand
Plateado

Río Yeguare, at Danlí Road bridge; numerous collections; specimens, 43 to 58 mm. in standard length; U.M.M.Z. Nos. 144629, 144631, 144632, and 147183.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 3 specimens, 35 to 51 mm. in length; U.M.M.Z. No. 144633.

Río Choluteca, at Danlí Road bridge; December 15, 1945; 80 specimens, 30 to 91 mm. in length; U.M.M.Z. No. 144630.

Río Choluteca, 5 kilometers below Choluteca; May 13, 1946, 6 specimens, 31 to 32 mm. in length.

Eight specimens from Río Yeguare measuring from 46 to 86 mm. in standard length have the following characteristics: Ratios (to body length) : head, 3.66–4.52, average, 3.84; depth, 2.82–3.18, average, 2.92; eye, 10.35–14.30, average, 11.35; height of dorsal fin from origin to tip of longest rays, 3.54–4.08, average, 3.59; length of pelvic, 4.82–6.14, average, 5.13; length of pectoral, 4.60–5.73, average, 4.95. Ratios (to head length) : eye, 2.73–3.17, average, 2.93; bony interorbital, 3.38–4.00, average, 3.71; snout, 3.80–4.82, average, 4.44; pectoral length, 1.20–1.36, average, 1.28; depth of head, 1.28–1.42, average, 1.33. Fin rays: dorsal, 10–11; anal, 48–52; pectoral, 13; pelvic, 8. Scales, 19 (18 to 20)—78 to 82—19 to 21.

Our series agreed more closely with the published descriptions of *R. salvadoris* than with those of *R. guatemalensis* or with that of the form described as *R. bouchellei* from Nicaragua by Fowler (1923: 25). Reeve M. Bailey said (*in litt.*): "Of this species we have previously had only a few small specimens. We do have excellent series of *R. guatemalensis* from Panama and, as indicated by Hildebrand, the species are certainly different. It is possible that your lot may not be identical with *salvadoris,* but at the moment I see no grounds for such an interpretation."

This fish is apparently partial to the deeper pools in the larger streams. It does not ascend smaller tributaries as freely as does *Astyanax,* and is generally less abundant.

Brycon guatemalensis Regan

Pescado blanco; sábalo

Río Yeguare, numerous localities and dates; specimens, 27 to 274 mm. in standard length; U.M.M.Z. Nos. 144626 and 144628.

Río Cobre, about 1 kilometer below San Antonio-Morocelí ford; March 24, 1946; 16 specimens, 45 to 104 mm. in length; U.M.M.Z. No. 144623.

Río de la Orilla, tributary to Río Yeguare, Escuela Agrícola Panamericana; January 10, 1946; 5 specimens, 75 to 91 mm. in length; U.M.M.Z. No. 144625.

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 23 specimens, 2.5 to 32 mm. in length.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 17 specimens, 37 to 206 mm. in length; U.M.M.Z. No. 144622.

Young specimens of this species up to about 100 mm. in length are common in the deeper pools of all the larger rivers of Honduras. Mature individuals are somewhat rare. The two largest specimens that we collected were, respectively, 274 mm. long (February 6, 1946) and 233 mm. long (September 5, 1946). Both were taken in funnel-mouthed traps in Río Yeguare and both were mature males, the larger of the two having the testes considerably swollen. We have seen individuals almost certainly larger pursuing small fish in shallow water of the same river. Local residents generally agree that members of the species attain a length of about a meter and a weight of more than ten pounds.

The blanco is a spectacular game fish. It will take various kinds of baits, but apparently prefers a dry fly. When hooked this fish puts on an exhibition comparable to the antics of the tarpon, so that it is difficult to persuade local fishermen that it is not the true tarpon of the north coast.

This fish is regularly used for food but it is excessively bony and we think it has little to recommend it other than the relatively large size.

GYMNOTIDAE

Gymnotus carapo Linnaeus
Guabina

Río Yeguare, near Danlí Road bridge; March 22, 1946, 1 specimen, 115 mm. in total length; September 5, 1946; 1 taken by Castellanos in an overflow pool.

The specimen taken from the river proper was found under a rock in shallow, quiet water at the edge of rapids. It is

uniform brownish black above and only slightly lighter on the ventral surface and on the greatly distended belly. The other was stranded in a depression on a sand flat after a period of very high water.

One other individual was seen under a rock in the swift water of the rapids mentioned above. The form appears to be rare in the area, but it is recognized and eaten by inhabitants of the Yeguare Valley.

ARIIDAE

Galeichthys guatemalensis (Günther)
Bagre

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; U.M.M.Z. No. 144634.

This euryhaline form was common in both fresh and brackish water in the Bay of Fonseca and its affluents. At the station numerous individuals were taken in a seine in very shallow water having a soft mud bottom, near a large rock on which women washed clothes. Only four specimens were preserved; the rest were turned over to bystanders who seemed to be enthusiastic about this catfish.

Since the habit of oral gestation appears not to have been previously reported for this species the following notes were made:

Female: Right ovary with 10 large eggs, 8 by 12 mm., distorted by compression; left ovary with 19 similar eggs. Stomach with 12 dragonfly nymphs but no other food. Length, 303 mm.

Male: Throat and opercular region greatly expanded; mouth cavity with 6 eggs, 11 to 13 mm. in diameter, each with a well-formed embryo, 12–13 mm. in length. Part of the egg complement of this individual, and of the succeeding as well, was disgorged when the fish was preserved. A total of 17 eggs was recovered from the bottom of the collecting can, to be divided between this male and the one listed immediately below. Length, 280 mm. Stomach completely empty.

Male: Throat and opercular region greatly expanded; 17

eggs in mouth, 12 to 13 mm. in diameter, with embryos measuring 11 to 13 mm. Stomach empty. Length, 256 mm.

Male: Throat and opercular region not expanded. No eggs in mouth. Stomach empty. Length, 275 mm.

PIMELODIDAE

Rhamdia guatemalensis guatemalensis (Günther)
Filín; bagre; barbudo

Río Yeguare, many localities and dates; specimens, 50 to 229 mm. in length; U.M.M.Z. Nos. 144637, 147181, and 147184.

Quebrada la Chorrera, tributary to Río Yeguare; numerous specimens poisoned with derris or taken on hooks baited with liver; U.M.M.Z. Nos. 144640 and 147182.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 3 specimens, 117 to 150 mm. in length; U.M.M.Z. No. 144638.

Río Choluteca, near Danlí Road bridge; many specimens, 43.5 to 210 mm. in length; U.M.M.Z. Nos. 144636 and 144639.

This fish is uniformly gray above with the ventral surface and lower fins either white or light grayish. The occipital spine is equal in length to about half the distance from its base to the origin of the dorsal. The humeral spine is strong and extends beyond the mid-point of the adpressed and well-developed pectoral spine. The caudal is deeply forked, with its lobes somewhat pointed. Head, about 4; depth, about 6.2 in body.

This is the common catfish of the south-central highlands. Partial to quiet water, it is most abundant in holes in small fluctuating streams and on the muddy bottom of quiet coves in the larger rivers. It has also been taken in fairly swift water in the Yeguare, especially in deeper pools which are cluttered with logs. The young are frequently present under rocks in rapids in company with the young of *Synbranchus*, young guapotes and congos, and 2 species of large shrimps.

Females taken at Río Choluteca near the Danlí Road bridge, February 22, 1946, had mature roe.

Rhamdia brachycephala (Regan)

Río Cobre, just below San Antonio-Morocelí ford; April 4, 1946; 2 specimens, 125 mm. and 133 mm. in length, taken with dynamite; U.M.M.Z. No. 144635.

"Salty yellow stream tributary to Choluteca"; spring, 1937, collected by Albert Greenberg; 11 specimens, 34 to 81 mm. in length; U.M.M.Z. Nos. 11396–97.

In addition to these specimens an immature individual 40 mm. in length taken in Río Yeguare probably should be referred to *R. brachycephala,* although its characters are too poorly developed to indicate more than that it does not belong with the common Yeguare form, *R. guatemalensis.* All the specimens agree with descriptions of *brachycephala* in the short occipital, humeral, and pectoral spines, the short adipose fin, the more rounded caudal fin with the lower lobe the longer, the relatively short head, and other respects. However, the head in these specimens is slightly longer (4.60 to 4.65 mm. in length) and the coloration appears to be different. Our material probably represents an undescribed form, very likely a subspecies of *brachycephala,* but we are not inclined to name it until more specimens of the typical form are available.

The difficulty of collecting this fish is extreme. We discovered and observed it only through the use of water goggles. It inhabits the same deep, white-water holes in which we found *Sicydium multipunctatum* but that might be seen on every hand clinging to the rocks, whereas the rhamdias were exclusively cavernicolous and thigmotactic. They could be seen only by turning over large rocks on the bottom in current so swift that such maneuvers were extremely awkward. Even then, an individual thus flushed usually disappeared quickly under a near-by rock, or more annoyingly still, under the same rock. The two specimens collected were killed by dynamite and were the only individuals turned up by 2 days of blasting.

This does not constitute an extension of the range of *R. brachycephala.* Gosline (1945: 39) gave the range as only

Guatemala, but Meek (1907: 144) recorded it from Turrialba, Costa Rica.

POECILIIDAE

Poeciliopsis turrubarensis (Meek)
Babucha

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; U.M.M.Z. Nos. 144653 and 147185.

This species was abundant all along the shore and especially in shallow water in small coves and inlets. Of the several hundred specimens taken in the seine 177 were preserved; these range in standard length from 19 to 56 mm. The series comprises 156 females, most of them pregnant, and only 21 males. In 4 of the gravid females the anal fin is produced almost as markedly as in the breeding male.

Reeve M. Bailey wrote that specimens from this series agree with paratypes of *Priapichthys fosteri* Hildebrand, which was synonymized with the present species by Hubbs (1926: 67).

Poecilistes pleurospilus (Günther)
Babucha

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 6 female specimens, 20 to 39 mm. in standard length, and one male, 27 mm. long; U.M.M.Z. No. 144658.

Río Yeguare, above and below Danlí Road bridge; many collections including specimens 21 mm. to 46 mm. in length; U.M.M.Z. Nos. 144657, 144659, 144660, and 147186.

Regarding the status of *P. pleurospilus*, Reeve M. Bailey wrote us as follows: "The fish assigned to this genus are apparently referable to a single species, but this is subject to marked variation in color pattern, and a number of races or possibly species may eventually be recognized. A careful revision of all available material will be required to work out this point" (letter, June 14, 1946).

Our Río Yeguare specimens agree fairly well in superficial characters with large series from the lakes Amatitlán and Atitlán in Guatemala. The lower Choluteca series, however,

differs strikingly in coloration, having the lateral spots reduced to tiny indistinct dots and being much lighter in ground color. In discussing 2 nominal species of the genus, Hubbs (1926: 68) said: "Specimens of *Poecilistes* from various localities show much variation in the number and size of the lateral spots, but I am not now able on this (or any other) basis to distinguish. . . . species distinct from *pleurospilus.*"

There appears to be a remarkably unequal sex ratio in this form; a series of approximately 80 specimens taken during 2 months in the Río Yeguare included only 5 males. Part of this seeming disparity may have been due to selection by the size of the meshes of the net used. A large number of females smaller than the average adult size of males were taken, however, and it appears likely that an actual difference exists.

Mollienesia sphenops (Valenciennes)
Babucha

Río Yeguare and numerous small tributaries near Escuela Agrícola Panamericana; many collections including newly born specimens and individuals up to 62 mm. in length; U.M.M.Z. Nos. 144645, 144646, 144650, and 144652.

Río Cobre, between San Antonio de Oriente and Morocelí; March 4, 1946; 20 specimens, 21 to 60 mm. in length; U.M.M.Z. No. 144651.

Río Choluteca, at Danlí Road bridge; many collections; specimens 18 to 42 mm. in length; U.M.M.Z. No. 144644.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 5 specimens, 32 to 63 mm. in length; U.M.M.Z. No. 144642.

Río de la Orilla, tributary to Río Yeguare, near Escuela Agrícola Panamericana; January 10, 1946; 25 specimens, 30 to 42 mm. in length; U.M.M.Z. No. 144648.

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 1 immature male, 33 mm. in length; U.M.M.Z. No. 144647.

The Choluteca stock of *M. sphenops* may represent a geographic race distinguishable from other described forms. It clearly represents the *sphenops* complex, however, and makes

the need for a detailed zoogeographic study of this extremely variable and widely distributed group so evident that there is little value in proposing a name for the local population.

The following notes on variation in color pattern were made from live or newly preserved specimens taken in Río Yeguare, March 9, 1946.

Male, 52 mm. in standard length; top of head, snout, and upper sides dark olive; cheeks and lower operculum silvery with brassy reflections; lower lip dusky; throat, belly and lower sides silvery with bluish sheen. Each scale for about seven rows on upper sides with a large, dusky, golden-yellow spot, the lower row of spots thus formed not reaching the caudal fin. Area between golden spots dusky with blue iridescence. A faint, thin, black line from base of anal fin to caudal. A large, diffuse black spot, higher than wide, at base of caudal fin, its height about three-fourths of depth of caudal peduncle. Pectorals, pelvics, and anal colorless; dorsal and caudal yellow, both pale near margin, with dusky edging, and with numerous small dark spots on basal parts.

Female, 62 mm. in standard length: darker above than the male, all fins duskier except pelvics, which are clear. Caudal and dorsal very dark with yellowish tinge; only dorsal with spots. Six rows of scales on the sides with black spots instead of the yellow spots of the male described above. Caudal spot more rounded and with conspicuous blue iridescence.

Female, 51 mm. in standard length: more like the foregoing male specimen than like the female. Six rows of lateral scales with golden spots. Dorsal, anal, and caudal fins orange-yellow, last 2 to 3 rays and tip of anal colorless. Caudal without small spots. Rounded basal spot on caudal smaller than in either of the above specimens, being only about one-third depth of caudal peduncle.

Male, 53 mm. in standard length: top of snout, head and back dark olive; belly and underhead white, undersnout dusky. Lower sides and ventral surface from vent to caudal fin bluish. Most of body with bluish iridescence; cheek, operculum, and region in front of operculum with purple reflec-

tions. Iris blackish violet. Sides with about 5 rows of golden-orange blotches without definite outlines. Pectorals, pelvics, and anal colorless. Dorsal edged thinly with black, and with a large, somewhat semicircular black blotch on its basal part; this blotch sends out finger-like extensions on the membranes between the rays and some of these become detached to form spots. Black blotch margined by a colorless area; rest of fin orange. Caudal of about the same orange color as dorsal, narrowly edged with black and with 11 small black spots near middle of its basal half; no large basal dark spot.

Another male is similar to the above except that the dark spot on the dorsal fin is without pale margin, the caudal is paler orange, the leading part of the pelvics is yellow, and the anterior and basal part of the anal is orange which fades to colorless at tip.

In the highlands of the Pacific drainage of Honduras *M. sphenops* is ubiquitous and one of the most abundant fishes. It follows up the smaller affluents, invades irrigation ditches, and is carried by floods far away from permanent water; it manages to survive in the most inadequate-appearing situations. In the lower Choluteca River its place has been largely taken by *Poeciliopsis turrubarensis;* only a single specimen of *Mollienesia sphenops* was found in the lower reaches which we seined.

At Escuela Agrícola Panamericana we found this species useful for controlling the mosquito larvae in concrete water tanks in cattle pastures.

ANABLEPIDAE

Anableps dowei Gill

Cuatro-ojos

Río Choluteca, at Danlí Road bridge; many collections including specimens from 45 to 235 mm. in length; U.M.M.Z. No. 144643.

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 6 specimens, 57 to 180 mm. in length; U.M.M.Z. No. 144641. Observed in numerous small streams tributary to the Choluteca near both the above localities.

Río Choluteca at Cantarranas. Recorded by Rehn (1932) and by Fowler (1932).

Cuatro-ojos is abundant in the Choluteca (see Pl. I). The young individuals usually band together and cruise about in shallow water, occasionally chasing insects to the edge of the mud or sand of the shore and stranding themselves temporarily. This causes them no alarm and actually appears to be a part of their foraging system. Larger individuals are more solitary and seek deeper and usually moving water, in which they swim slowly about with the upper sections of their eyes exposed, as if waiting for whatever flotsam the current may bring.

It is extremely difficult to take *cuatro-ojos* of any size in seines. They appear to know exactly what the cork line is and where it is and not infrequently a surrounded school of 30 to 40 will jump out of the net. If suddenly startled, as by the abrupt appearance of an observer from behind a bush on the bank, the school usually makes off in a series of long jumps which keep the fish in the air during most of the flight. On such an aerial retreat they are particularly vulnerable to small shot from a shot gun and, in this way, may be most readily collected.

The diet appears to consist principally of insects, both aquatic and otherwise. In the stomach of 1 specimen, in addition to a large number of some sort of pelagic dipterous larvae, we found numerous medium-sized ostracods. Grasshoppers and other insects thrown from the bridge were taken freely. Carr once spent a day with Luis Marden in the attempt to take *cuatro-ojos* on fly tackle. Marden is a superb fly fisherman, but despite an abundance of fish, only 2 or 3 desultory strikes were forthcoming and no "four-eyes" were taken. The fish appeared to be fully aware of the course of events on the bank—as much so as many terrestrial animals would have been at the same distance.

A female specimen, 235 mm. long, taken at the Danlí Road bridge August 11, 1946, had 14 fully formed embryos, 29 to 31 mm. in standard length, nearly ready for birth. One of

these was born when the mother thrashed about in a pail of water, but it had an overly large remnant of the yolk sac and was not viable. Another female, 180 mm. in length, taken April 13, 1946, in the same river 5 kilometers below Choluteca, contained 8 young, which were 26 to 27 mm. in standard length. In these embryos and in the preceding the division of the eyes was plainly evident.

The largest male *cuatro-ojos* seen was 160 mm. long.

ATHERINIDAE

Thyrinops guija (Hildebrand)
Robalito

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 49 specimens, 22 to 88 mm. in length, taken by seining in moving shallow water over sandy bottom; U.M.M.Z. No. 144663.

These specimens agree well in their principal features with Hildebrand's (1925: 264, Fig. 18) description and figure, except that they have the longitudinal band black instead of silvery as described and shown for the El Salvador form. It seems likely that a detailed study may ascertain that the Choluteca population represents a local subspecies. The presence or absence of silvery pigment, however, is generally of little reliability as a taxonomic character in fishes; hence, it seems unwise to name the present form on the basis of an arresting but superficial difference. The deep-black lateral band is also present on the Guatemalan form *Thyrinops meeki* (Miller), and only slight differences in body shape and fin position separate it from the Cholutecan. The 3 forms are closely allied and perhaps represent a single species.

MUGILIDAE

Mugil curema (Valenciennes)
Liza

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 4 small specimens, 58 to 61 mm. in length, seined from shallow water off a sand bar in mid-stream.

Several other small schools of similar-sized individuals were seen. The characters of these fingerlings are not typical of *M. curema;* the pectoral length is excessive and there is no light blotch on the side of the head in life, but the present identification is the most satisfactory that can be made until mature specimens are taken. Residents of Choluteca assured us that large mullet ascend the river to the above station and much beyond, but we have as yet to see them at the Danlí Road bridge or in the Río Yeguare.

Agonostomus monticola (Bancroft)
Tepemechín

Río Cobre, above and below San Antonio-Morocelí ford; March 26, 1946, and numerous subsequent dates; specimens, 86 to 250 mm. in standard length; U.M.M.Z. No. 144662.

Río Yeguare, Monte Redondo, Escuela Agrícola Panamericana; March 28, 1946; 2 small individuals observed in swirling eddies in rapids.

Four specimens, 165 to 230 mm. long, have the following characters: Head in body, 3.61–4.12, average, 3.94; depth in body, 3.68–4.07, average, 3.96. Into the head length, the eye goes 4.12–4.95, average, 4.48; snout, 3.54–3.78, average, 3.67; interorbital, 2.83–2.95, average, 2.89; first dorsal spine, 1.84–2.14, average, 2.02; pectoral fin, 1.37–1.47, average, 1.42. Dorsals IV–I, 8. Anal III–9. Scales 40–42 in lateral series to end of body; about 12 in transverse series from origin of second dorsal to anal. Lateral line inconspicuous.

Ground color brownish black above, scales with dark outlines. Larger individuals with a silvery lateral band about scale rows 5 and 6 below the first dorsal; this may be scarcely 1 scale wide at its beginning near head and nearly 3 scales wide on caudal peduncle. Scales above approximately the third row from bottom on sides with a golden luster; ventral surface below this plain white. Scales below the silvery lateral band with heavy dark margins giving impression of dark lateral band; this is accentuated at base of caudal fin, where it forms a dark blotch. Iris golden, reddish above, dusky be-

fore and behind pupil. Cheeks, under side of head, and lower lip white. Fins yellowish; pectoral pale, usually with a black blotch at base; second dorsal and caudal dusky at outer edge; yellow in pelvics and anal especially bright and clear.

This is a definitely rheotropic and torrent-loving species and an exceptionally fast, strong swimmer. Although seen roving, in the characteristic restless and aimless fashion of the mullets, in all parts of the stream, it was numerous or at rest only in deeper pools which were in or below falls and rapids. The preferred situation seemed to be the eddy side of a large boulder in strong current. Although not generally exposing themselves to current as strong as that sought by *Sicydium,* individuals were able easily to ascend the strongest rapids and falls that the river affords.

Of all the local edible fishes this species is by far the favorite. It is extremely difficult to catch. Like most of its family it shuns the hook. Since it usually is found singly or in small groups in rather widely separated, small, deep holes in rapid, boulder-strewn water, the use of either nets or any form of poison is impractical. It is hunted only by those of the local inhabitants lucky enough to pick up a few sticks of dynamite from one of the mining companies. The accepted procedure is to set 2 charges, in separate but neighboring holes, one of these to enter the water and to explode 1 or 2 seconds before the other. The splash of the first charge striking the water and the subsequent explosion cause all the fishes in the area to dash wildly about seeking cover, and with luck some of these enter the hole where the second short fuse is burning.

CENTROPOMIDAE

Centropomus nigrescens Günther
Róbalo

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 5 young specimens 125 to 171 mm. in standard length; U.M.M.Z. No. 144661. These specimens agree with published

descriptions of *C. nigrescens* except for head and depth to length ratios, which change markedly from youth to maturity in the snook. This species is common in the Bay of Fonseca, whence it is frequently brought to the fish market in Tegucigalpa.

Snook are said to ascend the Choluteca at least as far as the junction with the Yeguare, but so far the above locality is the only record for the system.

CICHLIDAE

Cichlasoma motaguense (Günther)
Guapote

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 18 specimens, 26 to 134 mm. in standard length; U.M.M.Z. No. 144670.

Río Yeguare, many localities between Zamorano and Guinope; various dates; U.M.M.Z. Nos. 144666, 144667, and 144671.

Río de la Orilla, tributary of Río Yeguare; many collections; U.M.M.Z. Nos. 144673 and 147180.

Río Choluteca, near Danlí Road bridge; many collections on various dates; U.M.M.Z. Nos. 144668, 144669, and 144672.

Río Choluteca, near Toncontín, Tegucigalpa; November 10, 1946; 20 specimens, 98 to 165 mm. in length.

Río Cobre, above and below San Antonio-Morocelí ford; many specimens and various collecting dates; U.M.M.Z. No. 144674.

Ten specimens from Río Yeguare have the following characters. Into standard length: head, 2.54–2.61, average, 2.60; depth, 2.80–3.02, average, 2.91; eye, 9.56–13.40, average, 10.98. Into head length: eye, 3.91–6.45, average, 4.75; depth of caudal peduncle, 2.66–3.01, average, 2.89; snout, 2.55–3.66, average, 3.20; interorbital, 3.57–4.55, average, 4.23; pectoral, 1.50–1.71, average, 1.89; vent to pelvic distance, 1.83–1.97, average, 1.89. Fin rays: dorsal XVII–XIX, 10–11, usually XVIII, 10, anal VII, 8 or 9. Scale rows: 5–6, 29–32 (usually 30 or 31), 10–11. Other characters are given in Table I.

TABLE I

CHARACTERS OF CERTAIN SPECIES OF *Cichlasoma* OF THE *friedrichstahlii* GROUP

The letter X indicates agreement with the stated character. The Honduran specimens are tentatively referred to *C. motaguense* in this paper.

Characters	*motaguense* Data from Regan (p. 331)	*friedrichsthalii* Data from Regan (p. 336)	*multifasciatum* Data from Regan (p. 335)	4 Specimens from Lake Amatitlán*	5 Specimens from Lower Río Choluteca	10 Specimens from Río Yeguare, E. Agric. Panam.
Fins:						
Dorsal spines	17–18	18	18	18	18	17–18
Dorsal soft rays	10–12	9–10	10	9–10	9–10	10–11
Anal spines	7–8	7–8	7–8	7	7	6–7
Anal soft rays	8–9	8	8–9	8	8	8–9
Scale rows:						
Lateral series	32	30	31	31–32	31–32	29–32
Rows between lateral line and anterior rays of first dorsal	2½	2½	2½	2½	2½	2½
Teeth:						
Upper jaw with median pair strong canines	X	X	X	X	X	X
Lower jaw with 1 to 2 widely separated pairs enlarged teeth	X	X	X	X	X	X

Premaxillary spine: Extends to above posterior one-third of orbit	X	X	X	X	X	X
Length/head	2.75–3.0	2.60–2.67	2.60–2.80	2.6–2.7	2.6–2.9	2.5–2.6
Length/depth	2.40–2.67	2.50–2.60	2.25–2.33	2.6–2.8	2.5–2.7	2.8–3.0
Mouth: Relatively large for the genus	X	X	X	X	X	X
Color pattern: Of vertical bars; usually forming lateral stripe below lateral line; stripe from upper orbit to operculum; another from lower orbit to subopercular	X (bars 7–8)	X	X (Bars about 10; no lateral stripe mentioned)	X (Bars 6–8)	X (Bars 7–8 except in large diffusely mottled specimen)	X (But large specimens irregularly mottled)

* According to information received from Dr. Robert R. Miller, the guapote of Lake Amatitlán is not native, having been introduced from Lake Atescatempa.

There is little doubt that this form is part of a complex of which several forms will prove, as Hubbs (1935: 19) has pointed out, "to be synonymous or only subspecifically distinct." It seems likely that all the so-called guapotes with continuous lower lip fold, large mouth, few enlarged canines, rather elongate body, and a color pattern of vertical bars and a broken lateral band on the body and lateral bands on the operculum from the hind margin of the orbit, are much more closely related than their taxonomic arrangement would indicate. Hubbs (1935: 19) doubted the specific distinctness of *friedrichstahlii, motaguense,* and *multifasciatum,* all described from Guatemala, and grouped them under the first name, which is the oldest. Such a disposition receives support from data in Table I. Of *friedrichstahlii* Miller (1907: 1) said: "The females have been described as the species *Heros managuensis,* and the males as *Heros motaguensis.*" Both Hubbs (1935: 19) and Meek (1907*a:* 143) doubted that *managuensis,* described from the Great Lakes of Nicaragua, should be lumped with the rest. A collection of cichlids from Lake Managua, recently received through the kindness of Louis Williams, and a series of several hundred individuals examined by Carr in Managua demonstrate that there is at least 1 form of guapote there, and almost certainly 2, which, although closely allied to, are readily distinguishable from the guapotes of Guatemala and Honduras.

As Table I shows in part, there is great similarity between specimens from the highlands of Honduras and the 4 Guatemalan specimens, which are also from the highlands. The comparison between these 2 groups shows less difference than exists between specimens from the upper and lower sections of the Choluteca drainage. It seems likely, however, that a careful analysis of adequate material will define a subspecies in each of these 3 areas. All Choluteca and Yeguare guapotes appear to have the pectoral fin longer than in the Guatemalan specimens; the Guatemalan and the upper Cholutecan series agree in detail in color pattern, but the lower Cholutecan material diverges widely in this respect.

The guapote is easily the most important game fish in south-central Honduras. It is moderately abundant in a variety of situations, its chief habitat requirement apparently being a moderate depth of water. It may be taken on both live and artificial bait; it is a strong fighter, and its firm white meat is of excellent flavor. But for a natural scarceness in the higher reaches of the Pacific coastal rivers, perhaps augmented by the universal practice of dynamiting the deeper holes, the guapote would be of considerable importance in the economy of the area.

The largest specimen which we measured was 205 mm. in standard length. Individuals of about this size are common, however, and with goggles we have seen fish that were appreciably bigger. Locally, they are alleged to attain a weight of 5 pounds, but we are inclined to doubt this, at least as far as the upper Río Choluteca is concerned.

Well-developed roe was found in fish caught during the months from January to May, 1946. At Río Cobre, April 24, 1946, 3 pairs of guapotes were seen guarding swarms of young about 10 mm. long, over nests in clear moving water 6 to 10 feet deep. Each nest was a cleaned, irregularly shaped spot on or among rounded boulders. Even at this late stage both parents were still actively protecting the young but allowed a swimmer to approach within 2 feet without taking fright. The colors in both sexes were strong, the black pattern standing out vividly on a bright golden ground.

Cichlasoma hogaboomorum, new species

Guapotillo; congo

(Pl. II, Fig. 1)

Type locality. Río Choluteca, 5 kilometers below Choluteca; elevation 50 meters. A series of 48 specimens, 29 to 81 mm. in standard length, collected on April 13, 1946, by George and Peter Hogaboom, Hugh Popenoe, A. F. Carr, Jr., and Leonard Giovannoli; U.M.M.Z. Nos. 144665 and 147179. Not recorded from any other locality. Holotype, U.M.M.Z., No. 144664; standard length 81 mm.

Except for a somewhat aberrant dentition this species appears to belong with the cichlids of the *Parapetenia* section of Regan (1906–8). It perhaps most closely approaches forms of the *C. urophthalmus* complex, but differs markedly from the annectent *C. u. trispilum,* described from northern Guatemala by Hubbs (1935: 18), in dental characters, in having higher dorsal spine and scale-row counts, and in several other respects.

Scale rows: 5 (rarely 6)–30(rarely 29)–11. Fin rays: dorsal, XVII, 11–12; anal, VII, 8. Gill rakers on anterior arch of normal form, rather stout, the longest about equal in length to the interspace between rakers; in a single row on inner and one on outer face of arch; 2 or 3 + 9 to 11, usually 3 + 11. The 6 to 8 teeth of the front row of lower jaw are markedly enlarged, those of the second series less so, and all others of more or less equal small size. Teeth of the upper jaw in one row and increasing in size anteriorly, with the anteriormost 6 to 8 teeth somewhat abruptly enlarged. Lower lip not interrupted mesially.

Mouth small, the upper jaw not nearly reaching the anterior border of orbit. Premaxillary process extending to point over anterior half of orbit. Anterior profile of head straight in young, concave in adults. Head, 2.43–2.86, average, 2.71; depth, 2.02–2.26, average, 2.16; snout, 2.25–3.00, average, 2.54; eye, 3.34–5.00, average, 3.97; bony interorbital, 2.78–3.29, average, 3.03; least depth of caudal peduncle, 2.45–3.00, average, 2.70; length of caudal peduncle, 2.9–3.45, average, 3.22; last dorsal spine, 2.29–2.50, average, 2.39; base of anal in body length, 3.21–3.40, average, 3.32. Tips of pectoral fins usually extending back of anal opening; tips of pelvics reaching or passing second anal spine.

Ground color of sides grayish with 8 black vertical bars, the first of these on the head and indistinct; the last at base of caudal has its upper part accentuated to form a rounded deep-black spot; the lower part of this bar sometimes enlarged to form another spot confluent with the upper. In young individuals a rounded spot is usual on the midpart of the fourth

vertical band. Top of head dark. Fins generally grayish except pectorals, which are light. Belly and breast usually light with sparse pigmentation.

The species is named in honor of George and Peter Hogaboom, our companions on many profitable collecting trips.

Cichlasoma nigrofasciatum (Günther)
Congo

Río Choluteca, about 1 kilometer below bridge between Tegucigalpa and Danlí, Department of El Paraíso, Honduras, elevation 595 meters; many collections; specimens 25 to 56 mm. in standard length; U.M.M.Z. Nos. 144676 and 144679.

Río Cobre, at San Antonio-Morocelí ford; many specimens, fry stage to 55 mm. in length; U.M.M.Z. No. 144677.

Quebrada Caparrosa, Escuela Agrícola Panamericana; many specimens, larval stages to 67 mm. in length; U.M.M.Z. No. 144678.

Río Yeguare, several kilometers above and below Danlí Road bridge; specimens from larval stages to 66 mm. in length; U.M.M.Z. Nos. 144681 and 144682.

Río de la Orilla, tributary to Río Yeguare, at trail from El Zamorano to Chagüite; many collections; specimens from fry stage to 53 mm. in length; U.M.M.Z. No. 144680.

Río Choluteca, 5 kilometers below Choluteca; April 13, 1946; 1 specimen, 31 mm. long.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 14 specimens, 29 to 64 mm. in length; U.M.M.Z. No. 144675.

This small, banded, black and white cichlid is the most ubiquitous representative of the family in the area. In general its characters agree well with published descriptions of the Guatemalan *C. nigrofasciatum,* but comparison with an adequate series from the type locality (lakes Atitlán and Amatitlán, Guatemala) suggests that the Choluteca congo may be subspecifically recognizable. Additional comparative data, kindly furnished by Ralph Taylor, of the Museum of Zoology,

University of Michigan, support this view, but a proper diagnosis must await more exhaustive comparison.

The ground color is light, usually grayish white. There are nine vertical bands on the sides; the first and second of these, on the head and neck, respectively, converge with the third; pigmentation in the last, at the base of the caudal fin, is intensified, forming a spot. Other spotlike areas may appear in the central parts of bands 3, 4, and 5, respectively. There is a black spot on the operculum and another on the dorsal fin above the fifth lateral band; this last may be ocellated with orange. Belly, breast, lower preopercle, and pectoral fins light; other fins feebly spotted or suffused with dusky. A broad area of orange or bright terra cotta is frequently present on the lower sides.

The males of this form appear to be consistently larger than the females and to have the anterior profile steeper, especially in the larger individuals. A female 48 mm. long with mature roe was taken on February 17, 1946, and in 1945 nesting activity was observed from March 1 until about May 1. The nest is constructed in or near moving water among large rocks. An excavation 2 to 4 inches wide is made, and this frequently extends cavelike beneath an overhanging stone. Both sexes are usually at the nesting site, and they appear to be equally active in guarding the eggs and young. This protection may continue until after the fry leave the nest and attain a length of at least 12 mm.

A consistent and peculiar characteristic of this fish is a marked tendency toward malfunctioning of its hydrostatic apparatus. On numerous occasions and in widely separated localities, we have seen individuals skipping about on the surface, apparently unable to assume a vertical position in the water. We have observed this occurrence most frequently in fish which have been suddenly frightened while at rest beneath stones.

Although this species is too small to be of any great importance as a pan fish, it is nevertheless regularly caught and eaten by the poorer classes of people. A common method used

locally in catching congos and other small fishes with cavernicolous tendencies is of interest, and we employed it successfully in collecting specimens. The method is particularly effective in moving water in which numerous boulders of moderate size lie partly or barely submerged. The fisherman advances upstream. On finding a boulder of the proper size and submerged to a suitable extent he selects another stone of similar weight, lifts it, and throws or drops it against the first. If the weights of the stones are about equal the shock produced is usually sufficient to stun or kill such unfortunate creatures as are in hiding underneath. In this way we have collected, in addition to congos, eels, small guapotes, crabs, and 2 species of large shrimps.

Cichlasoma popenoei, new species
Machaca
(Pl. II, Fig. 2)

Type locality. Río Yeguare, about 1 kilometer below bridge on road between Tegucigalpa and Danlí, Department of Morazan, Honduras; elevation 735 meters; numerous collections, specimens 30 to 180 mm. in standard length; U.M.M.Z. Nos. 144683 and 144686.

Holotype, U.M.M.Z. No. 147178; standard length 102 mm.; collected March 20, 1946, by Carr and Giovannoli.

Río Choluteca, just below Danlí Road bridge; 26 specimens, 57 to 140 mm. in length, taken August 11, 1946; U.M.M.Z. No. 144685.

Río Choluteca, 5 kilometers below Choluteca; 1 specimen, 96 mm. in length, taken April 13, 1946.

Río Choluteca, 4 kilometers south of Toncontín, Tegucigalpa; November 10, 1946; 8 specimens, 25 to 101 mm. in length; U.M.M.Z. No. 144684.

This extremely colorful species appears to approach most closely *C. rostratum* of the Nicaraguan lakes. It is easily distinguished from *rostratum* however, in having a shorter snout, lower scale count, and more vertical bars on the sides. Other markings and coloration are also different, and *popenoei* lacks

the strongly developed nuchal hump of male specimens of *C. rostratum*. *C. popenoei* is referable to the section *Astatheros* (properly *Amphilophus*) of Regan (1906–8).

Scale rows: $5\frac{1}{2}$ (rarely $6\frac{1}{2}$)–27 to 28–$12\frac{1}{2}$. Fin rays: dorsal, XVI, 8–10 (usually 9); anal, VII, 7 (rarely 8). Gill rakers on anterior arch short and knoblike, in 2 rows on inner and on outer faces of arch; 2 or 3 + 13 or 14, usually 2 + 14. Teeth of the outer row in the upper jaw large and subequal but increasing somewhat anteriorly; these enlarged teeth are 20 to 25 in number and behind them there are 5 to 7 irregularly disposed series of very tiny teeth. In the lower jaw there is an outer row of teeth which is continuous from sides to front, increasing regularly in size anteriorly. Behind these there

TABLE II

BODY PROPORTIONS OF 16 SPECIMENS OF *Cichlasoma popenoei* FROM THREE LOCALITIES

In each group of ratios the first 2 are the extremes and the last is the average. Elevations at the localities given are 730, 595, and 50 meters, respectively.

	10 Specimens, Río Yeguare	5 Specimens, Río Choluteca at Danlí Road Bridge	1 Specimen, Río Choluteca near Choluteca
Standard length divided by:			
Head length	2.65–2.98, 2.81	2.62–2.98, 2.78	2.66
Body depth	1.96–2.26, 2.10	1.92–2.05, 1.97	1.92
Pectoral	2.75–3.18, 2.98		
Base of anal	3.28–3.50, 3.38	3.26–3.33, 3.32	2.66
Head length divided by:			
Eye	3.09–4.98, 3.99	3.38–4.00, 3.69	4.00
Caudal peduncle (least depth)	2.28–2.43, 2.35	2.10–2.31, 2.24	2.40
Last dorsal spine	1.94–2.36, 2.10	2.08–2.32, 2.20	2.40
Snout	1.95–2.84, 2.23	2.04–2.70, 2.31	2.25
Interorbital	2.81–3.00, 2.93	2.62–3.38, 3.00	3.60

is another row of somewhat smaller teeth and behind these several rows of small filiform teeth, the number of rows of which decreases posteriorly. The lower lip fold is interrupted mesially.

Mouth small, the maxillary not nearly reaching anterior margin of orbit. Pectorals very long, their tips usually extending slightly farther back than the tips of the pelvic fins which reach the base of the second to fourth anal spine. The anterior profile is steep and usually slightly concave, more so in adult than in young specimens.

In coloration specimens of this species are surprisingly constant. The upper sides and head are olive. Lower sides, particularly anteriorly, rosy or pinkish orange irregularly laced with brassy. Belly and area around base of pelvics almost black; throat paler. Body with 7 dusky vertical bars plus 2 short bars which incline forward on nape and upper head. The first complete bar starts at origin of dorsal and curves slightly to pass just behind pectoral. Second complete bar is the most conspicuous. It starts at side of head behind operculum near mid-line of body and extends backward as a broad, jagged, black band, which is formed by accentuation of contiguous areas in the vertical bands, and is more nearly continuous on the anterior half of the body than on the posterior half. Base of caudal has a black spot which is about twice as high as wide. Pectoral pale, the rays dusky; pelvics almost black. Membrane of dorsal from tip of first spine to tip of longest soft ray edged with scarlet. Spinous part of dorsal with black and pearly blotches which become more regular and rectangular on the soft dorsal, where they produce a checkered effect. Anal dusky, darker anteriorly, with a few pearly spots on membranes of soft part. Caudal with membranes pale and rays dusky yellowish olive; membranes of basal part vaguely spotted. Iris dark.

This fish is moderately abundant in the area and is large enough to constitute a food fish of some importance. It is eaten and esteemed locally and is occasionally seen for sale

on the streets of Tegucigalpa and of other towns. The flesh is slightly dark and oily and of excellent flavor.

With this new species we associate the name of our friend Hugh Popenoe, who introduced Carr to the fauna and who has furnished us both with enthusiastic assistance.

GOBIIDAE

Awaous taiasica (Lichtenstein)
Dormilón

Río Yeguare, below Danlí Road bridge; February 15, 1946; 1 specimen 160 mm. in standard length; U.M.M.Z. No. 144687. Several other individuals were observed at the same locality.

Río Choluteca, above Danlí Road bridge; August 12, 1946; 1 specimen 181 mm. in standard length.

Both specimens were taken by seining in moderately deep, quiet water with a smooth bottom of sandy mud. In Río Cobre, between San Antonio de Oriente and Morocelí, on April 4, 1946, and numerous subsequent occasions, we observed a goby almost certainly of this species. Here, as in the Río Yeguare, the preferred habitat seemed to be the deeper quiet holes with smooth sandy or muddy bottom; no individual was seen in the rapids or in the extensive reaches where the bottom is strewn with boulders or of solid rock. The fish fauna of the stream appears to be consistently divided between *Awaous* and *Sicydium*, the former occupying the pools and quiet eddies and the latter the white water of rocky rapids and sluicelike rock troughs. Individuals observed in Río Yeguare appear to burrow habitually in the sand or sandy mud of the bottom. On several occasions they have been taken by workmen digging sand for construction.

Neither of our specimens agrees exactly with the published descriptions for the species, and there are differences also between the 2 specimens, especially in size and form of head, snout, and operculum and in color pattern. Nevertheless, it appears probable that the 2 are of the same species, and that both should be referred to *A. taiasica*.

Sicydium multipunctatum (Regan)
Dormilón

Río Cobre, above and below ford between San Antonio de Oriente and Morocelí; 4 specimens, 2 collected by dynamiting, April 4, 1946, 2 taken with the aid of spear and water goggles by Vladimiro Castellanos on April 28, 1946; U.M.M.Z. Nos. 144688 and 147177.

It seems curious that this isolated goby colony does not show strong differentiation. Reeve M. Bailey called our attention to the agreement between the present form and the neglected *Sicydium multipunctatum* Regan, described from a single specimen collected by Gadow in Oaxaca. The very strong apparent preference for a special and limited type of habitat seems to indicate that the genetic contact between this population and its vicariant in Oaxaca must be slight or nonexistent. Although gobies are generally euryhaline, the Río Cobre colony appears to be breeding *in situ,* since individuals 60 mm. or less in length were seen with the adults. Furthermore, it may be inferred from the habits of the form that it is not present in the waters that separate it from the sea; this view is supported by observation.

Scales about 76 to 80, lacking on ventral surface from vent to lower jaw and on most of the dorsal surface from root of dorsal to tip of snout; elsewhere anteriorly, frequently obsolescent or imbedded; scales of sides and posterior part of body very strongly ctenoid. Horizontal teeth of lower jaw imbedded in the gums. Pelvics completely fused to form a sucking cup; basal membrane of this cup well developed, its edge rolled posteriorly and its proximal section very thin, transparent. One or more spines of first dorsal fin prolonged, extending to or beyond middle of second dorsal in some specimens. Upper surface of pectoral frayed to form long cilia of apparently sensory function. Dorsals VI, I, 10; anal I, 10–11.

The following ratios are those of 2 specimens, 120 mm. and 126 mm. in standard length, respectively, and are given in the same order as the foregoing lengths: (into length) depth,

5.23–5.05; width, 6.0–5.25; head, 4.45–4.58; length of pectoral, 3.75–4.42; (into head) eye, 6.75–6.12; snout, 2.08–2.29; depth of caudal peduncle, 1.80–1.83; fleshy interorbital width, 2.46–2.75.

Ground color light grayish brown above with 7 to 8 vertical bars of dark brown extending from middorsum to lower part of sides; these bars often are double or fused or become diffuse anteriorly and are better defined posteriorly. Top and sides of head, snout, and operculum uniform dark brown or black or slightly marbled with lighter. Caudal base and neighboring areas speckled, a black dot occupying each scale center; membranes and rays of both dorsals similarly speckled. Ventral surface, including chin and fused pelvics light brownish. Anal light, unmarked except for a broad, black band along outer edge. Pectorals dark.

This extremely interesting fish is moderately common in Río Cobre. It shows a marked predilection for clear swift water and rocky bottom. The greatest congregation of individuals was seen just above the San Antonio-Moroceli ford, where the entire volume of the river is funneled through a narrow deep canyon in solid rock. Wearing goggles and using a rope to hold ourselves against the racing current, we observed them here in some abundance, mostly hanging vertically, or even upside down, from the undercut rock walls or clinging to the smoothly corrugated bottom of the sluicelike channel. They were the only fishes to be seen in this most torrential section of the river.

SYNBRANCHIDAE

Synbranchus marmoratus Bloch
Anguila; anguilla

Quebrada la Chorrera, tributary to Río Yeguare, near Escuela Agrícola Panamericana; January 5, 1945; many small specimens, 45 to 70 mm. in standard length, under rocks in stream bed.

Same locality; February 23, 1946; large specimens, 450 to

630 mm. in length, taken on hooks baited with liver; U.M.M.Z. No. 144689.

Río Yeguare, east of Escuela Agrícola Panamericana; March, 1945; many specimens, 170 to 250 mm. in length, collected beneath rocks in or near shallow rapids; U.M.M.Z. No. 144690.

Individuals of this species frequently follow the irrigation ditches at Escuela Agrícola Panamericana and after heavy rains may sometimes be seen making short overland trips. The very small specimens collected were found under rocks, some of them resting upon or imbedded in mud several feet from the water, and few if any were actually taken in the stream.

This eel is highly regarded as food by the people in the Yeguare Valley at least, and even the young stages which are to be found under stones are hunted with enthusiasm.

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PLATE I

Río Choluteca looking upstream from Puente Guayaba, near Los Limones and Ojo de Agua, Department of El Paraíso, Honduras. The river here abounds with *cuatro-ojos* (*Anableps dowei*).

PLATE I

PLATE II

FIG. 1. *Cichlasoma hogaboomorum*, new species. Paratype; 67 mm. in standard length. U.M.M.Z. No. 147179. Photographed by Haven Spencer.

FIG. 2. *Cichlasoma popenoei*, new species. Holotype; 102 mm. in standard length. U.M.M.Z. No. 147178. Photographed by Haven Spencer.

PLATE II

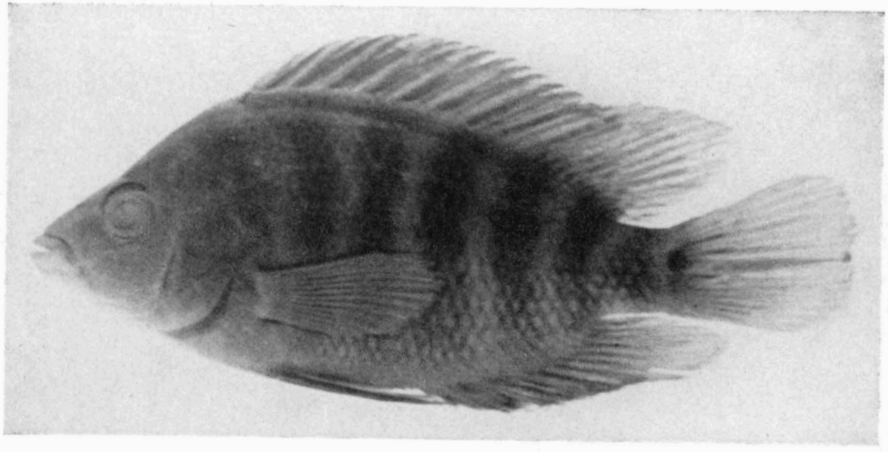

Fig. 1

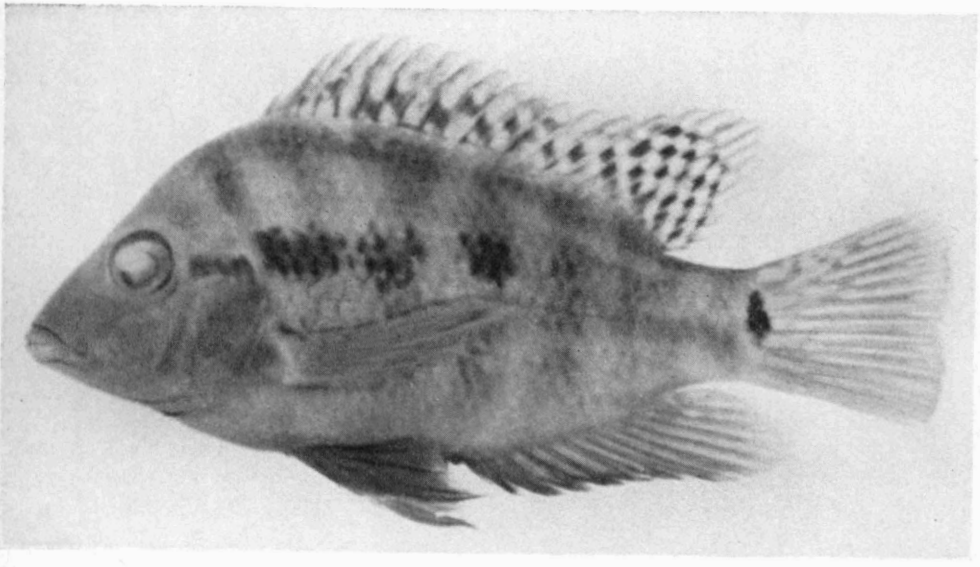

Fig. 2