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# THE FISHES OF BARRO COLORADO, GATUN LAKE, PANAMA.

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Various students, visiting at the Barro Colorado Research Station, have made small collections of the fishes inhabiting its waters and shores. Since it is useful to such students, who are not primarily ichthyologists, to have a regional list of these fishes, the following has been prepared together with a key and plate of figures intended to facilitate differentiation of the various species known to occur there.

As Barro Colorado has been transformed from a hilltop to a small island by the rising waters of the artificial Gatun Lake, it may be that ecological readjustments are still in progress. Consequently, a periodic examination of the fish fauna would not be without interest. This interest is enhanced by the fact that here the fauna of the Atlantic and Pacific drainages have an opportunity of mixing, due to the presence of the Panama Canal.

The species here listed have in part been collected by Dr. and Mrs. E. R. Dunn and in part by various other collectors who deposited their material with the Museum of Zoology of the University of Michigan. Dr. C. L. Hubbs kindly made these latter records available. Dunn's material is deposited at the Philadelphia Academy of Natural Sciences. In addition to his granting permission to use the material, I am indebted to Dr. Dunn for checking over the notes and making various suggestions.

The numbers following the records of Dunn give the range of standard lengths in mm. and the number of specimens. The latter are in parenthesis, as are those following other records which refer to number of specimens. Inquiry at the Philadelphia Academy of Sciences, The U. S. National Museum, and the Museum of Comparative Zoölogy, failed to reveal any further material from this locality. A single species was located in the American Museum of Natural History. The localities are the names used by Barro

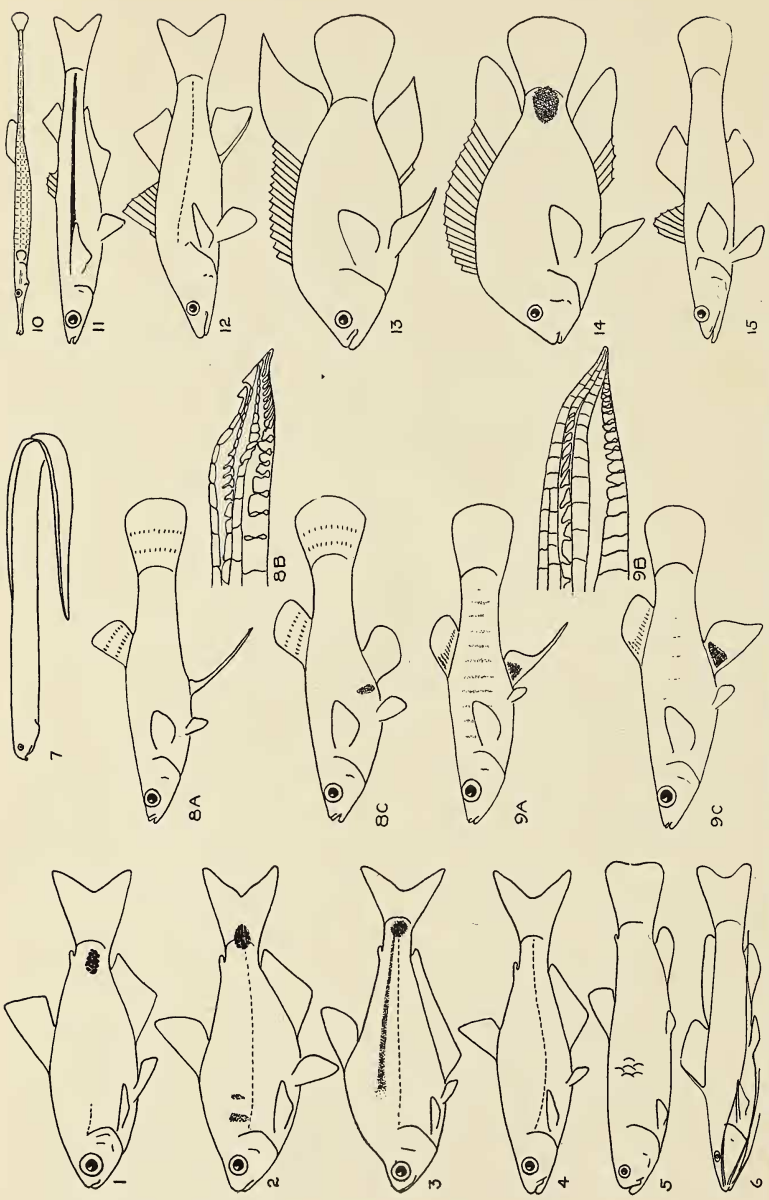


Fig. 385. 1. *Compsura gorgonae*; 2. *Astyanax ruberrimus*; 3. *Roeboides guatemalensis*; 4. *Brycon chagrensis*; 5. *Piabucina panamensis*; 6. *Rhamdia wagneri*; 7. *Synbranchus marmoratus*; 8. *Gambusia affinis speciosa*; A. male; B. enlarged tip of gonopodium; C. female. 9. *Brachyrhaphis episcopi*; A. male; B. enlarged tip of gonopodium; C. female. 10. *Oostethus lineatus*; 11. *Thyrina chagresi*; 12. *Centropomus parallelus*; 13. *Aequidens coeruleopunctata*; 14. *Cichlasoma maculicauda*; 15. *Gobiomorus dormitor*.

Colorado investigators. Numbers following the name of a trail indicate distance in hundred yards from the beginning of the trail.

"Flooded jungle around island" refers to the lake waters forming the shore line. The "House" localities all refer to specimens taken in the lake. "Allee Creek" is just west of the laboratory and "Lutz Creek" just east.

Family CHARACIDAE

*Astyanax ruberrimus* Eigenmann.

Flooded jungle around island, June 1926, Van Tyne (2). Asbestos House, Sept. 1929, Bangham (1). Laboratory Dock and Bang's House, 1932, Dunn 48–78 (4).

*Brycon chagrensis* (Kner).

Flooded jungle around island, June 1926, Van Tyne (3). Laboratory Dock, 1932, Dunn 155 (1). This species is frequently used for food on the island, although not especially well thought of in the Canal Zone generally.

*Roeboides guatemalensis* (Gunther).

Flooded jungle around island, June 1926, Van Tyne (30). Asbestos House, Sept. 1929, Bangham (1). Laboratory Dock, 1932, Dunn 83–89 (3).

*Piabucina panamensis* Gill.

Pools in dry creek bed, Mar.–Apr. 1926, Gaige (114). Lutz Creek, above several high and steep rock slopes; Armour Trail 9, in center of island; Barbour Lathrop 4; 1932, Dunn 124–157 (3).

*Compsura gorgonae* (Evermann and Goldsborough).

Asbestos House, Sept. 1929, Bangham (20).

Family SILURIDAE

*Rhamdia wagneri* (Gunther).

Pools in dry creek bed, Mar.–Apr. 1926 (21). Laboratory Dock, 1932, Dunn 130 (1).

Family SYNBRANCHIDAE

*Synbranchus marmoratus* Bloch.

Pools in creek bed, Mar.–Apr. 1926, Gaige (4). Flooded jungle around island, June 1926, Van Tyne (1). Allee Creek, above a quite steep and high rock slope, where it was fairly common, 1932, Dunn 376 (1).

Family POECILIIDAE

*Gambusia affinis speciosa* Girard.

Asbestos House, Sept. 1929, Bangham (7). Dock at Fuertes House and dock at Bang's House, 1932, Dunn 17–26 (6). This species is the *Gambusia nicaraguensis* from Panama of authors. Hubbs and Gordon MS. identifies this fish with the race *speciosa* of *G. affinis*, native to northeastern Mexico and central Texas. Consequently, the present species must be an introduction from early Canal building days for the purpose of mosquito control.

*Brachyrhaphis episcopi* (Steindachner).

Permanent pools in creek near laboratory, Jan.–Mar. 1924, Allee (3). Pools in dry creek bed, Mar.–Apr. 1926, Gaige (68). Seepage pools on Barbour Trail, Mar. 1926, Gaige (1). Brook on Pearson Trail, Sept. 1929, Bangham (17). Asbestos House, Sept. 1929, Bangham (5). Three of these from some unnamed locality. Allee Creek, 1932, Dunn 15–40 (25). Jan. 1927, Peterson, A.M.N.H. (20).

Family SYNGNATHIDAE

*Oostethus lineatus* (Kaup).

Inlet near Laboratory Dock, August 1928, Chickering. Recorded in Copeia with remarks on the possible movements of marine fishes through the Canal. Chickering, 1930.

Family ATHERINIDAE

*Thyrina chagresi* (Meek and Hildebrand).

At Laboratory Dock, 1932, Dunn 43–66 (20). Seen in large numbers at the surface, but only at night.

Family CENTROPOMIDAE

*Centropomus parallelus* Poey.

Flooded jungle around island, June 1926, Van Tyne (1).

Family CICHLIDAE

*Cichlasoma maculicauda* Regan.

Flooded jungle around island, June 1926, Van Tyne (62). Unnamed locality. Sept. 1929, Bangham (1). Laboratory Dock and Fuertes House, 1932, Dunn 92–110 (4). Mr. J. O'Reilly reports that a large pair with a brood of young were seen at the laboratory dock in August, 1932. This species is frequently used for food on the island, as elsewhere.

*Aequidens coeruleopunctata* (Kner and Steindachner).

Pools in dry creek bed, Mar.–Apr. 1926, Gaige (9). Flooded jungle around island, June 1926, Van Tyne (23). Fuertes House and Laboratory Dock, 1932, Dunn 52–70 (2).

Family GOBIIDAE

*Gobiomorus dormitor* Lacepede

Pools in dry creek bed, Mar.–Apr. 1926, Gaige (10). Flooded jungle around island, June 1926, Van Tyne (8). Fuertes House and Laboratory Dock, 1932, Dunn 69–138 (2).

The collection made by the Dunns shows remarkable agreement with those of others. They missed only three species previously collected on the island and obtained one not previously collected there. When it is considered that this list does not make up more than one half of the fishes known from the Chagres River, the island

fish fauna appears to be rather poor. Others are surely to be expected and it is strange that some have not been taken. The Chagres fishes not so far known from the island are listed below. Those marked with an asterisk would seem to be species that might most likely be expected.

Family CHARACIDAE

*Bryconamericus emperador* (Eigenmann and Ogle), *Brycon petrosus* Meek and Hildebrand, *Gephyrocharox atricaudata* (Meek and Hildebrand)*, *Creagrutus notropoides* Meek and Hildebrand, *Hyphessobrycon panamensis* Durbin, *Pseudocheirodon affinis* Meek and Hildebrand*, *Hoplias microlepis* (Gunther)*.

Family GYMNOTIDAE

*Hypopomus brevirostris* (Steindachner)*.

Family POECILIIDAE

*Brachyrhaphis cascajalensis* (Meek and Hildebrand), *Mollienisia sphenops cuneata* Garman.

Family CYPRINODONTIDAE

*Rivulus elegans* Steindachner.

Family MUGILIDAE

*Agonostomus monticola* (Bancroft)*, *A. macracanthus* Regan, *Joturus globiceps* (Gunther).

Family CICHLIDAE

*Neetroplus panamensis* Meek and Hildebrand, *Geophagus crassilabris* Steindachner.

Family GOBIIDAE

*Awaous taiasica* (Lichtenstein), *Dormitator maculatus* (Bloch)*, *Leptophilypnus fluviatilis* Meek and Hildebrand, *Microeleotris mindii* Meek and Hildebrand, *Eleotris pisonis* (Gmelin) *Guavina guavina* (Cuvier and Valenciennes), *Sicydium salvini* Grant.

Although it is true that some of the gobies are known only from below Gatun Spillway, they seem to be the most likely to be found above it. Other species from the lower Chagres (Breder, 1925) are mostly marine, although some of them might be expected above the dam.

Most of the fishes in the present list occur in Gatun Lake proper, inhabiting the shores of Barro Colorado. The only species so far recorded from the island streams and pools are *Piabucina, Rhamdia, Synbranchus, Brachyrhaphis, Aequidens* and *Gobiomorus.* As many

of the Chagres fishes, not known from the island, normally inhabit small streams and pools, it may be that the large expanse of Gatun Lake has acted as a barrier to a number of them.

The U. S. Bureau of Fisheries introduced large-mouthed bass, *Micropterus salmoides* (Lacepede), crappie, *Pomoxis annularis* Rafinesque, and sunfish, *Lepomis pallidus* Mitchill into Gatun Lake in 1924. (See Fisheries Service Bulletin 1925 and Breder 1925). The Fisheries Service Bulletin No. 182 reports that a single "13-inch crappie weighing about 1¼ pounds was caught below the spillway from Gatun Lake, and this is taken as evidence that the species have become established in these waters." It also reports "that the bass planted in Stilsons Lake, which is entirely cut off from Gatun Lake, are alive, flourishing, and plentiful. It is evident that Stilsons Lake may constitute a reservoir from which fish may now be planted in other waters of the Canal Zone." It is consequently possible that any of these forms may appear at Barro Colorado. Especial attention is called to this as such records are naturally of considerable interest and no existing catalogue of Panama fishes includes them. This latter fact might cause considerable confusion to visitors not familiar with North American fishes nor expecting centrarchids in Panama, especially as they have a considerable general resemblance to the abundant and diversified native cichlids.

Key to the Fishes of Barro Colorado

A. Dorsal fin single with one or no anterior spines, followed by an adipose or not; never preceded by a series of spines.
B. Dorsal fin followed by an adipose fin; first dorsal support a spine or not.
C. Body covered with normal scales; no long barbels about mouth; adipose fin small, a mere tab; no spine in dorsal fin.
D. Body compressed; dorsal, 10 or 11; anal, 16 to 52; depth of body less than 4.
E. Vertical fins reddish in life; body silvery; teeth in a single series in each jaw, or in 2 series in upper jaw, or with 2 teeth in each jaw projecting directly forward.
F. Teeth in a single series in each jaw; lateral line incomplete, present only on 5 to 13 scales; caudal peduncle with a prominent dark spot.
*Compsura gorgonae*
FF. Teeth not in a single series in each jaw; lateral line complete.
G. Dorsal profile convex; teeth in upper jaw in 2 series, those in lower jaw in a single series; no forward-pointing teeth; anal fin, 22 to 27; one or two dark spots on shoulder; base of caudal with a dark spot.
*Astyanax ruberrimus*

GG. Dorsal profile concave; teeth in upper jaw in more than 2 series; 2 conical teeth in each jaw pointing forward; anal fin, 47 to 52; a prominent lateral streak and base of caudal with a dark spot..... *Roeboides guatemalensis*

EE. Vertical fins not reddish; body silvery; teeth of upper jaw in 3 or 4 series; no teeth pointing directly forward; a dark spot at caudal base. *Brycon chagrensis*

DD. Body subcylindrical; dorsal, 8 or 9; anal, 10 or 11; depth of body, 4 to 5.4; fins reddish..... *Piabucina panamensis*

CC. Body naked; 6 long barbels about mouth; adipose fin long and low, longer than head; first dorsal support a strong, stout spine. *Rhamdia wagneri*

BB. No adipose fin; no spine in dorsal.

H. Gill openings united as a single median opening below; body naked; no pectorals or ventrals; dorsal and anal confluent with tail; body eel-like. *Synbranchus marmoratus*

HH. Gill openings separate and lateral; body not naked; pectorals at least present; dorsal and anal not confluent with tail; body elongate or not.

I. Gill openings large, not constricted; body with normal scales; ventrals present; body not elongate; viviparous; males small and with a prominent intromittent organ.

J. Anal fin without a dark spot at its base; dark dots on dorsal caudal fin forming transverse lines; intromittent organ with 2 strong, retrorse hooks at tip; anal fin of female not at all falcate..... *Gambusia affinis speciosa*

JJ. Anal fin with a dark spot at its base; no dark line forming dots on dorsal and caudal; intromittent organ with no retrorse hooks; anal fin of female falcate..... *Brachyrhaphis episcopi*

II. Gill openings small, restricted to upper angle of gill openings; body circled with angulated bony rings; body elongate; oviparous; males carry developing eggs and young in a ventral pouch..... *Oöstethus lineatus*

AA. Dorsal fins 2, the first composed only of sharp spines, or dorsal single with the first several, at least, sharp spines followed by flexible rays.

K. Ventral fins posterior to pectorals, caudal forked and dorsals separate; or ventral fins under pectorals, caudal convex, and dorsal fin single.

L. Ventral fins posterior to pectorals, caudal forked, dorsals separate.

M. First dorsal composed of 3 or 4 weak spines; anal I, 20 to 23; head flat above; body depth, 6.1 to 6.9..... *Thyrina chagresi*

MM. First dorsal composed of 7 or 8 stout spines; anal III, 6; head concave above; body depth, 3.5 to 4..... *Centropomus parallelus*

LL. Ventral fins under pectorals; caudal convex; dorsal fin single, first 14 supports, at least, are spines.

N. Dorsal XIV or XV, 9 to 11; anal III, 7 or 8; no prominent dark spot on peduncle..... *Aequidens coeruleopunctata*

NN. Dorsal XVII or XVIII, 11 or 12; anal VI, 9 or 10; a large dark spot on peduncle..... *Cichlasoma maculicauda*

KK. Ventral fins slightly in advance of pectorals; caudal convex; dorsal fins separate, the first with 6 or 7 spines..... *Gobiomorus dormitor*

## BIBLIOGRAPHY.

Breder, C. M., Jr.

1925. Notes on Fishes from Three Panama Localities; Gatun Spillway, Rio Tapia and Caledonia Bay. Zoologica, Vol. IV, No. 4, pp. 137–158, Sept. 18.

1927. The Fishes of the Rio Chucunaque Drainage, Eastern Panama. Bull, Amer. Mus. Nat. Host. Vol. LVII, Art. III, Dec. 8, pp. 91–176.

Chickering, A. M.

1930. An Atlantic Pipefish Caught in Transit Through the Panama Canal. Copeia No. 173, pp. 85–86, Oct.–Dec.

Fisheries Service Bulletin

1925. January 2, No. 116, U. S. Bur. Fishes, p. 116.

1930. July 1, No. 182, U. S. Bur. Fishes, p. 4.

Hubbs, C. L. and Gordon, M.

MS. Fresh water Fishes of Northeastern Mexico. Misc. Publ. Mus. Zool., Univ. Mich. In press.

Meek, S. E. and Hildebrand, S. F.

1916. The Fishes of the Fresh Waters of Panama. Field Mus. Nat. Hist. Pub. 101, Zool. Series X, No. 15, Dec. 28, pp. 217–374.

1923. The Marine Fishes of Panama. Idem, Pub. 215, XV, Dec. 20 pp. 1–330, Part I.

1925. Idem. Part II, April 15, pp. 331–707.

1928. Idem. Part III, Sept. 1, pp. 708–1045.