



SMITHSONIAN INSTITUTION,
UNITED STATES NATIONAL MUSEUM.

THE FISHES

OF

NORTH AND MIDDLE AMERICA:

A DESCRIPTIVE CATALOGUE

OF THE

SPECIES OF FISH-LIKE VERTEBRATES FOUND IN THE
WATERS OF NORTH AMERICA, NORTH OF
THE ISTHMUS OF PANAMA.

BY

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PART I.

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Dedicated to the Memory

OF

THOSE ICHTHYOLOGISTS OF THE PAST WHO HAVE STUDIED
AMERICAN FISHES IN AMERICA,

IN TOKEN OF

"THE ONLY REWARD THEY ASKED—A GRATEFUL
REMEMBRANCE OF THEIR WORK."

- | | |
|--|--------------------------------------|
| GEORG MARCGRAF, 1610-1644. | CLAUDE GAY, 1800-1863. |
| MAURICE OF NASSAU, 1604-1679. | JOHN RICHARDSON, 1787-1865. |
| CHARLES FLUMIER, 1646-1704. | ROBERT HERMANN SCHOMBURK, 1804-1863. |
| GEORGE WILHELM STELLER, 1709-1745. | FRANCIS DE CASTELNAU, 1808-1868. |
| MARK CALISKY, 1673-1743. | GEORGE SUCKLEY, 1830-1869. |
| HANS SLAATS, 1669-1752. | JOHN EDWARDS HOBBS, 1794-1871. |
| PATRICK BROWNE, 1729-1790. | LOUIS ANASSIS, 1807-1873. |
| ALEXANDER GARDNER, 1750-1791. | HERBERT EDSON COPLAND, 1849-1876. |
| ANTONIO PARRA, 1769-1800. | JARED POTTER KIRKLAND, 1798-1877. |
| JERHANS DAVID SCHÜFF, 1752-1800. | JAMES WILLIAM MIENER, 1841-1880. |
| STEPHAN KRASCHENINIKOW, 1768*. | SAMUEL STEPHAN HALDEMAN, 1813-1880. |
| PETROS-SIMON PALLAS, 1741-1811. | CHARLES ROBERT DARWIN, 1809-1882. |
| OTTO FABRICIUS, 1744-1822. | CHARLES LESLIE MURRAY, 1853-1883. |
| WILLIAM DANDRIDGE PECK, 1769-1822. | SPENCER FULLERTON HAIRD, 1823-1887. |
| JEAN BAPTISTE SPIX, 1781-1826. | JAMES CARSON BRYANT, 1818-1887. |
| SAMUEL LATHAM MITCHELL, 1764-1831. | PHILIP HENRY GOOSE, 1810-1888. |
| WILLIAM THOMAS* TILGNER, 1775*-
1835*. | SIGAS SCHARN, 1833-1888. |
| CHARLES ALEXANDRE LE SUEUR, 1789*-
1840*. | CHARLES HARVEY BOLLMAN, 1868-1889. |
| CONSTANTIN SAMBUC RAPINESCOU, 1734-
1812. | FELICE PREY Y ALDY, 1798-1891. |
| JAMES ELLSWORTH DE KAY, 1799-1861. | WILLIAM D. AYRES, 1817-1891. |
| ZADOCK THOMPSON, 1796-1866. | DAVID HUMPHREYS SIGLER, 1804-1831. |
| ALEXANDER VON HUMBOLDT, 1769-1829. | PHILIP ROSEMARY HOY, 1816*-1893. |
| HARMS DE LA SAGRA, 1810*-1863*. | CHARLES GIRARD, 1822-1870. |
| | JOHN ADAM HYDER, 1832-1895. |
| | MARSHALL McDONALD, 1826-1895. |

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THE FISHES

or

NORTH AND MIDDLE AMERICA.

BY DAVID STARR JORDAN AND LAETON WARREN EYENSMANN.

Ichthyology (*ἰχθυολογία*, fish; *λόγος*, a discourse) is the study of fishes. A "fish," in the popular sense, is a member of any one of the three classes of aquatic or fish-like vertebrates, the groups here designated as *Leptocardii*, *Marsipobranchii*, and *Pisces*. The *Tunicatu* and *Entropneusta* (*Balanoglossae*), now recognized as belonging to the CHORDATA and approximated to the VERTEBRATA, are excluded in this definition, as in their adult condition these creatures have undergone a retrograde metamorphosis and are by no means fish-like. For an opposite reason, the BATRACHIA, which develop jointed limbs in their adult condition, although closely allied to the true fishes, are not included in the popular idea of a fish.

Among the forms commonly called fishes we recognize three classes—*Leptocardii*, *Marsipobranchii*, and *Pisces*. We have preferred to leave the *Pisces* as a single class, including all fish-like vertebrates with paired fins, though there is much to be said in favor of regarding the Selachians and Dipnoans as each constituting a distinct class coordinate with the true fishes and the Batrachians. We see no warrant for separating the Ganoide as a class from the true fishes, still less for uniting the Ganoide and Selachians in one class, *Paleichthyes*, while the true fishes are placed in another.

ANALYSIS OF THE CLASSES OF FISH-LIKE VERTEBRATES.

- a. *Asomata*.—Anterior end of the central nervous axis not dilated into a brain and not surrounded by a protective capsule or skull.
- b. Notched perfect, persistent, extending throughout the body, included in a membranous sheath, as is the cord-like nervous axis above it; body elongate, taperate, not worm-like nor enveloped in a tunic; walls of the body with muscular myotomes; middle line of body with rudimentary fins; no protocoel; the mouth slit-like, fringed with cilia; heart a longitudinal tubular vessel which gives off branched tubes which unite in an aorta; gill slits inclosed externally by a fold in the integument which incloses a chamber (atrium) which opens below; vent vessels from mouth. LEPTOCARDII, 1.
- c. *Crossoi*.—Anterior end of the nervous axis dilated into a brain which is contained within a protective capsule, the skull; notched not continued forward beyond the pituitary body; heart developed and divided at base into two parts.
- d. Skull imperfectly developed and without jaws; shoulder girdle and pelvis obsolete; no paired fins; a single median nostril; gills purse-shaped; skin naked; skeleton cartilaginous. MARSIPBRANCHII, 2.
- e. Skull well developed, and with jaws; shoulder girdle and pelvis more or less developed; nostrils not median; gills not purse-shaped; limbs, if present, developed as rayed fins, never with digits and toes like those of the higher vertebrates; gills persistent throughout life. PISCES, 312.

Esox olivaceus,* GERRARD, Proc. Cleveland Academy Nat. Science, February 7, 1851, 83, Mahoning River.

Represented in the head waters of the Mississippi and its tributaries by

922b. *EUCIUS MASQUINONGY IMMACULATUS*† (Garrard).

(GREAT NORTHERN PIKE.)

Body unspotted, or with vague, dark cross shades; tail a little more slender and fins a little higher than in the spotted or lake muskallunge. Lakes and rivers of Wisconsin and Minnesota, locally abundant. (*immaculatus*, unspotted.)

Esox immaculatus, GARRARD MS; noticed in different fishing journals; Eagle Lake, northern Wisconsin.

Esox masquinongy immaculatus, JORDAN, Man. Vert., Ed. 3, 89, 1888.

Family XCII. PECILIIDÆ.†

(THE KILLIFISHES.)

Body oblong or moderately elongate, compressed behind, depressed forward, covered with rather large cycloid scales, which are adherent and

* We are indebted to Mr. Barton A. Bean for the following copy of Gerrard's description:

"IV. *Esox olivaceus*, GERRARD: From a very perfect stucco cast and a dissected head of a specimen taken in the Mahoning, a tributary of the Ohio River, it is evident that this species is distinct from any of the preceding. Its contour is more regular, oval, and elliptical than that of the *E. niger* and less regular than that of the *E. nubilus*. The head is rather small, fusiform and attenuated, and its vertical measurement through the eye proportionately less than in any other species. Caudal fin emarginate and falcate more acutely than the *E. niger*. The color of the back greenish brown; sides lighter, but shaded with brown; underneath white. Total length 50 inches; head $7\frac{1}{2}$; vertical line through the eye, from frontal surface to bottom of lower jaw $2\frac{1}{2}$ inches. This species sometimes attains $31\frac{1}{2}$ pounds weight."

† "This is the fish that has just claims to the name of The Great Northern Pike, as there is abundant and unquestionable testimony of enormous size, ranging from 40, 77, 84, and 110 pounds. The habitat of this fish is the waters of the Mississippi system, and it has been well known since the earliest settlement of the West under various local names, as Chaumunqua Lake Pike, Alleghany River Pike, Muskingum River Pike, Kentucky River Pike, Rock River (Illinois) Pike, and is now found in the greatest abundance and of the largest size, in the clear, cold lakes of the Wisconsin and Minnesota provinces, at the heads of the tributaries of the Mississippi. In early days, before the streams were rendered turbid by the washing of lands in cultivation, this fish was more abundant in Lake Pepin than it now is, but a few are taken occasionally. One of 75 pounds was taken in these early days by reputable citizens still living at Lake City. One of 40 pounds was taken two years ago by a man who fishes for the market, and numbers have been taken ranging from 2 pounds to 20 pounds. This fish is generally found either in these piny streams or near the mouth of them in the Mississippi River." (General Israel Garrard, in a letter dated June 1, 1850, Frentonan, Minnesota.)

‡ Concerning the name to be given to this family Dr. Gill remarks:

"In my 'Families and Subfamilies of Fishes' (1860, No. 133) I have adopted *Peciliidæ* instead of *Cyprinodontidæ* for the family at present generally known by the latter name.

"It is quite true that Professor Agassiz was the first to recognize the family so called, but he simply gave the plural form of *Cyprinodontes*, and not a name with the patronymic suffix now almost universally used to denote families, and he did not define it, but simply gave it to the residuum left after defining the *Cyprinæ*. Little later Bonaparte gave a regular family name (*Peciliidæ*) derived from the earliest established name of a genus of the family and that name was several times employed by him and others, while the name *Cyprinodontes* remained in abeyance; he also regularly defined it. The first regular use of the latter name with a patronymic suffix (*Cyprinodontidæ*) was by Sir John Richardson in 1826.

"Another objection to the name *Cyprinodontidæ* which may reconcile us to its abandonment is that it expresses a taxonomic falsehood and is even now constantly misleading persons. In the part of the great 'New English Dictionary,' lately published (v. 2, p. 1365), a '*Cyprinodont*' is defined as 'a male cyprinid fish of the family *Cyprinodontidæ*, of which the typical genus is *Cyprinodon*;' they differ from the *Cyprinidæ* in having the jaws more projecting and toothed. In the recent Manual of Marine (1892, p. 475), the '*Cyprinodontes*' and '*Cyprinidæ*' are approximated in an analytical table and simply contrasted on account of the presence of jaw teeth ('*mandibles dentées*') in the former and the absence ('*mandibles non dentées*') in the latter. It certainly is time for eminent ichthyologists to have learned that there is no affinity between the two types, and that they differ so radically in all essential features of organization that they should be referred to different orders. Yet Valenciennes, in the penultimate volume of his great work (Hist. Nat. Poiss., xxi, p. 456), attempted to justify the retention of the *Cyprinodontes* in the same family with the *Cyprinidæ* and their natural allies. The *Cyprinodontes* or *Peciliidæ* are really related to the *Esocidæ* and *Eubridæ*, and to them they should be approximated in the suborder *Esocoidæ*." (Gill, Proc. U. S. Nat. Mus., 1893, 116.)

regularly arranged. Lateral line wanting or represented by a few imperfect pores. Head scaly, at least above. Mouth terminal, small, the lower jaw usually projecting; margin of the upper jaw formed by the premaxillaries only; premaxillaries strong, extremely protractile. Teeth incisor-like or villiform, sometimes present on the vomer, but usually in the jaws only; lower pharyngeals separate, with cardiform or rarely molar teeth; third upper pharyngeal enlarged, the fourth wanting or united to the third. Gill membranes somewhat connected, free from isthmus; gill rakers very short, thick. Branchiostegals 4 to 6. Pseudobranchiae none. Dorsal fin single, inserted posteriorly, of soft rays only, rarely with a single spine or a rudimentary spinous dorsal; caudal fin not forked; ventral fins abdominal, rarely wanting; pectoral fins inserted low; no adipose fin. Stomach siphonal, without pyloric appendages. Air bladder simple, often wanting. Basis cranii simple (*vide* Cope). Sexes usually unlike, the fins being largest in the males, but in some species the females are much larger in size. Many of the species are ovoviviparous, the young well developed at time of birth. In these species the sexes are very unlike, the anal fin of the male being developed as an intromittent organ. Fresh-water fishes of Southern Europe, Asia, Africa, and America, some of them occurring in bays and arms of the sea. They are mostly of small size, and the species are very difficult of determination. Genera 30; species about 180. (*Pacificide*, Bonaparte *Nuovi Ann. Sci. Nat.*, II, 132, 1838.)

We begin the discussion of this group with the largest genus, which seems at the same time to be the most primitive and the least specialized.

- a. Intestinal canal comparatively short, little convoluted; teeth little movable; bones of the dentary firmly connected; the lower jaw strong and usually projecting beyond upper; species chiefly carnivorous.
- b. Anal fin of the male similar to that of the female and not modified into an intromittent organ. Species oviparous.
- c. Teeth all pointed, none of them compressed or bicuspid or tricuspid.

PERCINAE:

- d. Ventral fins well developed, pharyngeal bones and teeth not enlarged.
- e. Teeth in villiform bands or at least in more than one series.

f. Air bladder well developed (in all species examined); no caudal scellus.

g. Gill openings not restricted above, the opercular angle free from shoulder girdle; body oblong; dorsal various in size and insertion. PERCINAE, 562.

27. Gill openings restricted, the opercle from upper root of pectoral upward being adnate to shoulder girdle; body short and deep. AQUINAE, 564.

f. Air bladder wanting; a black scellus at root of caudal—at least in males. RIVULINAE, 562.

28. Teeth arranged in a single series; dorsal inserted in advance of anal; mouth oblique.

j. Dorsal and anal fins short, each of 9 to 13 rays. LEUCINAE, 565.

k. Dorsal and anal fins very long, each of more than 20 rays. GIMNARHINICORINAE, 564.

OSTEINAE:

24. Ventral fins wanting; body oblong.

i. Pharyngeal bones both above and below greatly enlarged, bearing coarsely molar teeth; scales normal, regularly imbricated, none of them largest. LEUCORHINICORINAE, 566.

CYPRINODONTINAE:

25. Teeth incisor-like, notched, bicuspid or tricuspid.

j. Ventral fins well developed (occasionally lost through atrophy); gill openings restricted; the opercle adnate above to the shoulder girdle.

- k. Incisors bicuspid, with a band of villiform teeth behind them; body rather deep, the vertical fins moderately developed. CHALACODON, 306.
 lx. Incisors tricuspid, in 1 row, with no villiform teeth behind them; body short and deep, compressed.
 l. Dorsal fin short, of 10 to 12 rays, the first ray slender and rudimentary. CYPRINODON, 307.
 ii. Dorsal fin very long, of 16 to 18 rays, the first ray developed as a stout, grooved spine. JORDANELLA, 308.
 lb. Anal fin in the males placed well forward and modified into a sword-shaped intromittent organ; teeth all pointed, arranged in bands. Species viviparous, the young of large size at birth.
 GAMBUSINA:
 m. Eye normal, the pupil not divided by a partition; dorsal inserted more or less behind front of anal.
 n. Jaws not produced into a beak, lower jaw prominent, longer than upper; male fish very much smaller than the female.
 o. Dorsal fin long, of 14 to 16 rays; anal short. PSEUDOKIRIHERONIA, 309.
 oo. Dorsal fin short, of 6 to 10 rays; anal short. GAMBUSA, 310.
 uu. Jaws produced into a moderate beak, much as in *Labiolabes*; dorsal and anal short. BELONOSOX, 311.
 ANABETINA:
 uum. Eye divided into 2 portions by a horizontal cross partition; vertical fins short; body elongate. ANABES, 312.
 Intestinal canal elongate, with numerous convolutions; dentary bones loosely joined; teeth movable; species chiefly mud-eating.
 GOBIINA:
 p. Teeth incisor-like, all tricuspid, in 1 series, with a series of villiform teeth behind them; sexual characters unknown, the sexes probably alike; lower jaw projecting.
 q. Fins small; scales large; form oblong. GOBIES, 313.
 PLEURINA:
 pp. Teeth all pointed; anal fin in the male advanced and modified into an intromittent organ; lower jaw short and weak. Species ovoviviparous.
 r. Teeth in a single series; dorsal and anal both short; scales large.
 s. Dorsal fin inserted in advance of anal. PLEUROCELES, 314.
 ss. Dorsal fin inserted more or less behind front of anal. HETERAXURIA, 315.
 rr. Teeth in more than one series.
 t. Dorsal inserted more or less behind anal; both fins very small. LEUCISTES, 316.
 u. Dorsal inserted over or in advance of anal, its rays much elevated in the male.
 u. Dorsal fin short, of less than 7 to 11 rays.
 v. Teeth of inner series in both jaws trident. ACRORECELIA, 317.
 vv. Teeth of inner series in both jaws entire. PORCELIA, 318.
 uu. Dorsal fin long, of 12 to 16 rays.
 w. Caudal fin normal, alike in both sexes, or with the lower angle merely sharp in the male. MOLTANISIA, 319.
 uuu. Caudal fin in the males with its lower lobe much produced and sword-shaped, in the adult as long as rest of body. XIPHOCELES, 320.

300. FUNDULUS, Lacépède.

(KILLIFISHES.)

Fundulus, Lacépède, Hist. Nat. Poiss., v, 37, 1803, (mudfish).

Hyliaugra, Lacépède, Hist. Nat. Poiss., v, 378, 1803, (sunfish).

? *Aphocheilus** McClelland, Ind. Cypri. As. Res., xix, 391, 1831, (*chryseostigmus* = paucibar).

* We question the reference of *Aphocheilus* and *Paucibar* to *Fundulus*, because the East Indian species, *Aphocheilus paucibar*, the type of both nominal genera, has a long, depressed snout, and a physiognomy unlike the American species. According to Günther, its vomerine teeth are minute and rudimentary. There are no vomerine teeth in the species of *Fundulus*.

of the abdomen silvery, the portion above the silvery part black. Streams of Jamaica; locally common. (*πόσειδον*, black; *πείσιπος*, side.)

Poecilichthys melanocephala, GÜNTHER, Naturalist's Journey in Jamaica, 84, 1851, Jamaica.

Haplachilichthys melanopleurus, GÜNTHER, Cat., vi, 317, 1860.

301. ADINIA, Girard.

Adinia, GILKCHR., Proc. Ac. Nat. Sci. Phila., 1859, 117, (*multifasciata*).

This genus contains species agreeing in general respects with *Fundulus*, but having the aspect of *Cyprinodon*. The gill openings, as in *Cyprinodon*, are restricted, the opercle being adnate to the shoulder girdle as far down as the upper edge of the base of the pectoral. The body is short, deep, and compressed. Besides the two species known to belong to this genus, *multifasciata* and *dugesii*, we provisionally place in it two others, which seem to agree in external characters, though the restriction of the gill openings has not been noticed. (*Adinia*, a coined name without meaning.)

a. Anal with 15 rays; body oblong, the depth $3\frac{1}{2}$ to 4; coloration plain or mottled, without dark cross-bands.

b. Head rather heavy, about 4 in length; depth of body about 4; eye rather shorter than snout, about 4 in head; scales 22 to 25-12; dorsal rays 12. GUATEMALENSIS, 369.

bb. Head very thick and heavy, about $3\frac{1}{2}$ in length; depth $3\frac{1}{2}$ to 3; eye shorter than snout; 4 in head; scales 23-12; dorsal rays 13 or 14. PACHYCEPHALA, 370.

aa. Anal with 11 or 12 rays; scales very large; body deep and compressed.

c. Dorsal rays 15; body crossed by 5 or 6 black cross-bands; depth 3 in length; head 5; scales 29-31. DUGESII, 371.

cc. Dorsal rays 9 or 10; body crossed by 10 to 14 narrow pearly bands; depth 2 to $2\frac{1}{2}$ in length; head 5; scales 23-16. ACUTIFASCIATA, 372.

369. ADINIA GUATEMALENSIS (Günther).

Head 4; depth 4. D. 12 (13); A. 14 or 15 (16); scales 32 to 35-12. Head thick and broad; interorbital space broad, slightly convex, its width being a little less than half length of head. Snout broad, obtuse; lower jaw slightly projecting beyond upper; mandible longer than eye; eye equal to or, in the larger specimens, less than length of snout, 4 in head, and 2 in interorbital space; origin of dorsal midway between tip of caudal and posterior margin of orbit, over nineteenth scale of the lateral series; first anal ray corresponding to second of dorsal. Dorsal and anal fins subquadrangular, rather low, longer than high in male, and as long as high in female; two-thirds of caudal covered with small scales. Brown above and on the sides, pale below; females with a very indistinct dark band along the side; fins immaculate; anal with a light margin. Sexual opening of the female not attached to the anterior anal rays. Rivers of Guatemala, and southward, to western Ecuador. (Günther.)

Fundulus guatemalensis, GÜNTHER, Cat., vi, 321, 1860, Lake of Duenas, Lake Amantlan, Rio Cuacalate; western Ecuador. (Coll. Salvin & Fraser.)

370. ADINIA PACHYCEPHALA (Günther).

Head $3\frac{1}{2}$; depth $3\frac{1}{2}$ to 3. D. 13 or 14; A. 15; V. 6; scales 25-12. Head very thick and broad; interorbital space very broad, slightly convex, its width being $\frac{1}{2}$ length of head; snout broad, obtuse; lower jaw slightly projecting beyond upper; mandible longer than eye. Eye less than

length of snout, 4 in head, and 2 in width of interorbital space. Origin of dorsal midway between tip of caudal and posterior margin of orbit, over sixteenth scale of lateral line; first anal ray under third of dorsal; dorsal and anal fins subquadrangular, of moderate height, the latter fin being scarcely higher than long; caudal fin subtruncate. Brownish above and on sides, each scale darker on tip; an indistinct dark band along middle of tail; fins immaculate, anal with the lower margin whitish. Guatemala. (Günther.) (*παχίς*, thick; *κεφαλή*, head.)

Pseudis pachycephalus, GÜNTHER, Cat., vi, 321, 1866, Lake Atitlan. (Coll. Salvin.)

971. *ADINIA DUGESII* (Bean).

Head 3; depth nearly 3; eye 4 in head, $\frac{1}{2}$ width of interorbital space. D. 15; A. 11; scales 30-11. Body short and deep, robust; head depressed above; snout short, shorter than eye; jaws short, the upper being freely protracile. Teeth slender, conical, in a double series, those of the outer enlarged. Opercle connected by membrane to the shoulder girdle, beginning at a point in line of lower margin of eye. Anal very short, its base half as long as dorsal base; insertion of dorsal very slightly in advance of anal at a distance from the front of the eye equaling about twice the length of the head, its rays slender, not very long, the longest somewhat shorter than base of fin and less than half head; base of dorsal 2 in head; anal inserted under third ray of dorsal, its longest ray $\frac{1}{2}$ to $\frac{2}{3}$ head; anal base very short, $\frac{1}{2}$ as long as the dorsal base, and very little longer than the eye; pectoral half head; caudal slightly rounded; ventral in middle of length of body, excluding caudal, its tip not reaching vent, 36 in head. Light brown; sides with 5 broad distinct bands or 6 dusky bands, the widest somewhat greater than eye; one of these bands placed under anterior half of the dorsal; sides and head with silver. Length 3 inches. Guanajuato, Mexico. (Bean.) Evidently a species of *Adinia*, as is shown by the form and by the restriction of the gill openings. (Named for its discoverer, Prof. Alfredo Duges, of Guanajuato.)

Pseudis dugesi, BEAN, Proc. U. S. Nat. Mus., 1887, 473, pl. 29, fig. 5, Guanajuato, Mexico. (Type, No. 37861. Coll. Professor Duges.)

972. *ADINIA MULTIFASCIATA*,* Girard.

Head 3; depth 2 ($2\frac{1}{2}$ to 2) in ♀; eye large, 3 in head, $1\frac{1}{2}$ in interorbital space. D. 9 or 10; A. 11 or 12; V. 6; P. 11; B. 5; scales 25-10. Body very deep, much compressed, much as in *Cyprinodon*; caudal peduncle very deep; head depressed, rapidly tapering to a sharp, conical snout; the anterior profile somewhat concave; females and young with the back less elevated. Teeth very small, in a villiform hamul, those of the outer series wide-set and considerably larger; opercle adnate to shoulder girdle above base of pectoral (as in *Cyprinodon* and *Jordanella*). Dorsal inserted in advance of anal, its origin midway between caudal and middle of eye, the longest rays in males reaching base of caudal, 14 in head; anal lower; ventrals 11 in head. Intestinal canal as long as body. Male

*If the genus *Adinia* is not recognized, this species should stand as *Pseudis zosterus*.

Adinia. Females larger than males; both sexes plump. Color in life: Males olive, with bluish reflections; edges of the scales darker; dorsal dusky orange, with a large black spot at the base in front, ocellated with orange; caudal orange yellow, tipped with black; ventrals and anal orange red, tipped with dusky; pectorals translucent. Females with the fins pale olive, without black spot or edgings. Length $1\frac{1}{2}$ to 2 inches. Atlantic Coast from Connecticut to Key West; very common at Key West, in shallow waters and tide pools close to the shore, especially where fresh waters soak in the sea: here described from Key West specimens; equally abundant about the mouth of the Potomac in brackish ponds and tide ditches. (H. M. Smith.) (*parvus*, small.)

Cyprinodon parvus, Baird & Girard, Ninth Smiths. Report, 1854 (1855), 345, Greenport, Long Island, (Coll. Baird); GÜNTHER, Cat., vi, 307, 1860.

Lacania parva, JORDAN & GRUNNIG, Synopsis, 593, 1863, JORDAN, Proc. U. S. Nat. Mus., 1884, 109; HENK M. SMITH, Bull. U. S. Fish Comm., x, 1890, 68.

304. GIRARDINICHTHYS, Bleeker.

Girardinichthys, BIRNBERG, Cyprin., 481, 1869, (*innominatus*).

Limonurus, GÜNTHER, Cat., vi, 309, 1860, (*variegatus*).

Body stout. Mouth small, its cleft nearly vertical; the upper jaw very protractile. Teeth small, pointed, in a single series in each jaw. Scales rather small. Dorsal and anal fins long, each with 20 or more rays, nearly opposite each other; anal fin not modified in the male. Intestinal canal short, about as long as body. Gill membranes partly united, free from isthmus. Very small fishes, differing from *Lacania* in the long dorsal and anal. Mexico. (*Girardinus*; 1266, fish; named for Dr. Charles Girard, 1822-1895, who studied the fishes of the Mexican Boundary Survey.)

979. GIRARDINICHTHYS INNOMINATUS, Bleeker.

Head 4; depth $2\frac{1}{2}$; eye 5 in head, 2 in interorbital width. D. 20; A. 22; scales 44. Head thick, the snout obtuse, the mandible being directed vertically upward; neck arched, so that the upper profile of the head is concave. Origin of dorsal midway between occiput and base of caudal. Olivaceous, with irregular dark-brown cross bands, which are sometimes confluent. Sexes similar. Length 2 $\frac{1}{2}$ inches. Vicinity of City of Mexico; not rare. Our specimens collected by Mr. Amos W. Butler. (*innominatus*, unnamed, Girard having omitted to attach a specific name when describing the species.)

Lacania, sp., Girard, Proc. Ac. Nat. Sci. Phila., 1859, 118, City of Mexico.

Girardinichthys innominatus, BIRNBERG, Cyprin., 481, 1869, after GIRARD; JORDAN & GRUNNIG, Synopsis, 513, 1863.

Limonurus variegatus, GÜNTHER, Cat., vi, 308, 1860; after GIRARD; the name given by BIRNBERG being regarded as barbarous.

305. EMPETRICHTHYS, Gilbert.

Empetrichthys, GRUNNIG, Death Valley Exped., Fishes, 233, 1893, (*americanus*).

Body rather elongate, the form approaching that of *Lacania*. Intestine short, $1\frac{1}{2}$ times length of body. Teeth conic, fixed, in each jaw arranged in a band consisting of two or three rows, the outer series

somewhat enlarged. Ventrals absent. Branchiostegals five. Both upper and lower pharyngeals greatly enlarged and bearing molar teeth, tubercular in shape; lower pharyngeals firmly attached to the ceratobranchials of the fourth arch, while the massive epibranchials of the same arch serve to connect them firmly at the sides with the pharyngobranchials above; fourth branchial arch bearing normal gills, its median portion produced anteriorly, forming a triangular extension of the lower pharyngeals in the middle line; on the oral surface this is indistinguishable from the pharyngeals proper, and like them bears molar teeth. Scales normal, large, regularly imbricated, nowhere tubercular or ridged. This genus seems to be allied to *Orestias*, a genus likewise devoid of ventral fins, inhabiting the mountain lakes of the Andes. It differs from *Orestias*, as from all other *Cyprinodonts*, in the singular development of the pharyngeals. (*τρ*, within; *πίρος*, rock; *ἰχθῆς*, fish, in allusion to the stony pharyngeals.)

980. *EMPETRICHTHYS MERRIAMI*, Gilbert.

Head $3\frac{1}{2}$; depth $3\frac{1}{2}$; eye 5. D. 11 or 12 (13 in one specimen); A. 14 (from 13 to 15). Scales 30 or 31, counted to base of caudal rays, 33 or 34 in all. Head compressed, its upper surface slightly convex. Mouth very oblique, with a distinct lateral cleft, the maxillary free at tip only, reaching slightly behind front of eye. Length of gape (measured from tip of snout to end of maxillary) $3\frac{1}{2}$ in head; interorbital width $2\frac{1}{2}$; length of snout (from front of orbit to middle of upper jaw) $3\frac{1}{2}$. Eye small, its greatest oblique diameter 5 to $5\frac{1}{2}$ in head. Distance from front of dorsal to middle of base of tail $\frac{1}{2}$ its distance from tip of snout. Dorsal beginning slightly in advance of anal, and ending above its posterior third, its greatest height equal to length of snout and eye; caudal truncate when spread; pectorals broadly rounded, reaching half way to vent. Color dark brown above, sides and below lighter, often irregularly blotched with brown and white; the belly often appears checkered, having centers of scales brown and margins white, or the reverse; fins all dusky, the basal portions of dorsal and caudal with elongated brown spots on the interradial membranes. In form and general appearance this singular fish much resembles the mud minnow (*Umbra limi*), though somewhat deeper and more compressed. Springs of the desert about Death Valley in eastern California, a depressed desert tract, intensely hot and almost rainless. (Named for Dr. C. Hart Merriam, the well-known mammalogist, in charge of the Death Valley explorations.)

Empetrichthys merriami. Gilbert, Death Valley Exped., Fishes, in North American Fauna, No. 7, 231, pt. 5, May 31, 1895, Ash Meadows, Amargosa Desert, on the boundary between California and Nevada. (Type, No. 46,161. Coll. Merriam & Bailey.)

306. *CHARACODON*, Günther.

Characodon, Günther, Cat., vi, 508, 1866, (*Characis*).

Body rather deep and compressed. Gill openings restricted, as in *Cyprinodon*.* Mouth small, the teeth small, fixed, bicuspid, or Y-shaped,

*This character not verified in *Characodon borealis* or *C. forsteri*.

in a single series, with a band of villiform teeth behind them. Scales moderate. Insertion of dorsal nearly opposite that of anal. Intestinal canal short; bones of jaws well united. Small fishes of the fresh waters of Mexico and Central America. (*Charac*, a sharp stake; *Moje*, tooth.)

a. Scales rather large, 32 to 35 in longitudinal series.

b. Dorsal fin small, of 10 or 11 rays; anal rays 13 to 16; scales 35-12; a dark lateral band, sometimes broken into spots. LATERALIS, 981.

16. Dorsal fin large, of 18 to 16 rays, depth 3 to 3½ in length.

a. Dorsal rays 16; anal 16; scales 32-11; body with two lateral stripes, the second beginning with front of anal. BILINEATUS, 982.

cc. Dorsal rays 18 or 14; anal 15 or 16; scales 23-15; males with a faint dark lateral strip made of dark blotches; female without stripe, irregularly blotched or spotted. VARIEATUS, 983.

iii. Scales rather small, about 50 in a longitudinal series; dorsal rays 16; anal 13; depth 3½ in length; sides mottled or barred, the fins with dark bars. REACINATUS, 964.

981. CHARACODON LATERALIS, Günther.

Head 3½; depth 3; eye 4. D. 10 or 11; A. 13 in female, 15 or 16 in male; scales 35-12. Body rather elevated, with the neck somewhat arched. Head thick and broad, with the snout obtuse, as long as the eye. Mandible ascending obliquely, longer than eye. About 20 smallish teeth in each jaw, their apex indistinctly notched. Interorbital space flat, its width being 2½ in head. Origin of dorsal fin a little nearer end of caudal than to occiput, a little behind that of the anal; both fins small and rounded; in the male the six anterior rays are of nearly equal length, but considerably shorter than the following, forming a very distinct portion of the fin; all these rays are very closely set; caudal fin small, truncate, or slightly convex; distance between dorsal and caudal somewhat more than least depth of tail, and equal to distance between eye and gill opening; pectoral obtuse, not quite reaching ventral; ventral small, not quite extending to the vent. Brownish olive (in spirits), with a darker band running from the eye to the root of the caudal; this band sometimes broken up into a more or less regular series of brownish-black spots. In general habits very similar to a *Cyprinodon*. Central America. (Günther); not seen by us. (*lateralis*, pertaining to the side.)

Characodon lateralis, GÜNTHER, Cat., vi, 308, 1860, Central America; (Coll. Dr. Seemann); GÜNTHER, Fishes Central Amer., 460, pl. 62, fig. 2, 1860.

982. CHARACODON BILINEATUS, Bon.

Head 3½; depth 3; eye 4. D. 16; A. 16; scales 32-11. Head broad and depressed, the interorbital space being nearly flat, the nape moderately arched. Snout short, rather shorter than eye; the lower jaw somewhat prominent; upper jaw moderately protracile. About 20 bicuspoid teeth in the outer series of each jaw; villiform teeth behind the incisors evident; mandible nearly vertical when the mouth is closed, nearly reaching eye. Eye scarcely more than ½ interorbital width. Scales on top of head somewhat enlarged. Opercle connected by membrane to the shoulder girdle, beginning at a point slightly above upper edge of pectoral. Insertion of the dorsal midway between the posterior margin of the eye

and end of the scales; longest dorsal ray $1\frac{1}{2}$ in head; base of dorsal 5 times in body; anal inserted under third ray of dorsal; pectoral 5 in length of body; length of head contained $3\frac{1}{2}$ times in the total without caudal, and much less than the depth at dorsal origin; ventral reaching about to vent, its length nearly $\frac{1}{2}$ head. Upper parts brown; lighter below, probably orange in life; the operculum silvery; a purple stripe along the middle of the body, its greatest width about equal to the length of the eye; abdomen silvery, this color extending up to the purple stripe; a purplish stripe on the edge of the caudal peduncle, from the end of the anal to the caudal. Length 2 inches. Rio Lerma, Guanajuato; one specimen known. (Beau.) (*bilineatus*, two-lined.)

Characodon bilineatus, BEAN, Proc. U. S. Nat. Mus., 1867, 371, pl. 20, fig. 2, Rio Lerma, Guanajuato, Mexico. (Type, No. 37932. Coll. Dugès.)

583. CHARACODON VARIATUS, Beau.

Head $3\frac{1}{2}$; depth $3\frac{1}{2}$; eye $3\frac{1}{2}$. D. 13 or 14; A. 15 or 16; scales 85-15. Head broad and depressed; the nape moderately arched. Snout short, the lower jaw strongly projecting. Thirteen or fourteen bicuspoid teeth in outer series of upper jaw and 16 to 18 in lower jaw; band of villiform teeth behind the incisors fully developed in both jaws; mandible not extending back to front of orbit, its length about equal to that of orbit. Jaws moderately protractile. Mandible almost vertical when mouth is closed. Snout shorter than eye, which is about $\frac{2}{3}$ interorbital space. Scales on top of head little enlarged. Opercle united by membrane to the shoulder girdle to slightly above the upper edge of the pectoral. Insertion of the dorsal about midway between the end of the scales and the hinder margin of the orbit; longest dorsal ray in male $1\frac{1}{2}$ in head; anal inserted under seventh or eighth ray of dorsal, its longest ray about $\frac{1}{2}$ head; pectoral $5\frac{1}{2}$ to 6 in length; ventral midway between tip of snout and end of scales. Head $\frac{1}{2}$ total length including caudal, and equaling depth of body at the dorsal origin. Male chestnut brown, with an indistinct dark lateral stripe made up of a series of interrupted dark blotches; opercle silvery; abdomen yellowish. Female olive brown above, lighter below; the opercle silvery, overlaid below with orange; the abdomen with a yellowish tinge; lips dusky; iris pale; scales of upper half of body dusky at base; lower half of body with numerous dark spots, the largest about as long as the pupil. Length 2 to 3 inches. Tributaries of Rio Lerma, about Guanajuato and City of Mexico; locally common. (*variatulus*, variegated.)

Characodon variatus, BEAN, Proc. U. S. Nat. Mus., 1867, 370, pl. 20, fig. 1, female, Guanajuato, Mexico. (Type, No. 37938. Coll. Dugès.)

Characodon ferrugineus, BEAN, Proc. U. S. Nat. Mus., 1867, 372, pl. 20, figs. 3 and 4, Guanajuato, Mexico. (Type, No. 37936. Coll. Dugès.)

Characodon variatus, BEAN, Proc. U. S. Nat. Mus., 1867, 285 according to Dr. Beau, *ferrugineus* is the male of *variatus*.

584. CHARACODON FERRENSIS, Jordan & Gilbert.

Head 4; depth $3\frac{1}{2}$; eye rather large, $3\frac{1}{2}$ in head. D. 15 to 17; A. 13; scales about 50-15. Body comparatively elongate, not greatly compressed, the head rather low and broad, depressed, the profile rising evenly from

tip of snout to the nape, the region thence to the dorsal gibbons, especially in the larger examples, the caudal peduncle comparatively long and slender, about as long as head. Anterior teeth large, firmly fixed, all bicuspid or Y-shaped, in a single series; a band of minute villiform teeth behind them, at least in upper jaw. Mandible not extending back to front of eye. Interorbital area wide, very nearly half head. Scales rather small, those on top of head not much longer than others; humeral scale not enlarged. Opercle connected by membrane to shoulder girdle from upper base of pectoral upward, as in *Cyprinodon*. Insertion of dorsal very far back, midway between base of caudal and base of pectoral; first ray of dorsal very slender and articulate, not at all spine-like; dorsal fin low, not so high as long, its base $1\frac{1}{2}$ in head; anal inserted below seventh ray of dorsal; pectorals $1\frac{1}{2}$ in head; ventrals 2 in head; caudal obliquely truncate, very slightly emarginate, the upper lobe about $\frac{1}{2}$ longer than the lower, $1\frac{1}{2}$ in head; upper lobe usually more or less sharply angular; lower lobe rounded. Males with the sides profusely mottled with darker, sometimes nearly plain; vertical fins each with several brownish bars and blotches and each with a dusky subterminal bar; a narrow dark line along middle of each row of scales on the back. Females with several short, dark bars on the posterior half of the body, the fins colored as in the male; some small, dark specks on caudal peduncle. About Cape San Lucas; locally abundant; and about Colima. (*farca*, fork; *dens*, tooth.)

Characodon finchleyi, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 334, near Cape San Lucas.* (Type, Nos. 9571 and 89971. Coll. Xantus.)

307. CYPRINODON, Lacépède.

(PURSY MINNOWS.)

Cyprinodon, LACÉPÈDE, Hist. Nat. Poiss., t. 486, 1803, (*variegatus*).

Prionodon,† RAVENSCRE, Analyses de la Nature, 1815, 88, (*variegatus*).

Bifasciis, POY, Memorias, 11, 306, 1861, (*riverandi*).

Body very short and stout, the back elevated. Mouth small, the bones of the jaws well formed. Snout short. Teeth moderate, incisor-like, tricuspid, in a single series. Scales very large. Dorsal fin moderate, inserted in advance of front of anal, its first ray not enlarged; anal smaller; ventral fins small, occasionally wanting in specimens from desert pools. Intestinal canal little longer than body. Gill membranes considerably united, free from the isthmus. Gill openings restricted, the opercle above adnate to the shoulder girdle. Chubby little fishes, inhabiting the brackish waters of Middle America;‡ sometimes living in warm salt springs, their colors generally brilliant. Oviparous, the sexes similar except in color. (*κύπρινος*, carp; *ὀδὸν*, tooth.)

* Probably from the lagoons at La Paz.

† This name was offered as a substitute for *Cyprinodon*, the latter being regarded as too long.

‡ The European and African species commonly referred to this genus seem to represent a distinct generic type, *Lebion*, Cuvier, (= *Miscoungil* = *Aphanis*), distinguished by the freedom of the opercle, and by the more elongate form, resembling *Leucobius*. Of these species, *Lebion calanillus* from the Mediterranean is the best known, and is the only one on which these characters have been verified.

1007. ANABLEPS BOTTI, Gil.

Head 4. D. 9; A. 10; scales 65 to 70, 49 before dorsal. Vertebrae 21+22. Flat portion of interorbital space as broad as a scale. Back and sides of the body blackish brown, with a well-defined, broad, golden band along sides from the axil of the pectoral to the base of the caudal; fins pale. Waters of Central America, from Chiapas to the Isthmus of Panama. (Günther.) (Named for Captain John M. Dew, discoverer of the species at Panama.)

Anableps botti, Gil., Proc. Ac. Nat. Sci. Phila., 1861, 4, Panama; GÜNTHER, Cat., vi, 338, 1860.

313. GOODEA, Jordan.

Goodea, Jordan, Proc. U. S. Nat. Mus., 1879, 299, (*atriguttata*).

Form of *Pundulus*, but with the intestinal canal elongate, the dentary bones loosely joined, and the teeth slender, movable, tricuspid, attached in a single series on the outer edge of the jaws, not closely set, a band of ydiform teeth behind them. Fins small, the dorsal and anal similar, the dorsal slightly in advance of anal. No spines. Scales moderate. Mud-eating, the intestinal canal elongate. Anal fin in male probably not modified as an intromittent organ. Mexico. (Named for Professor George Brown Goode, director of the United States National Museum, and one of the most scholarly of modern writers on fishes.)

1008. GOODEA ATRIFINNIS, Jordan.

Head 4; depth 4; eye $3\frac{1}{2}$. D. 12; A. 13; scales 37 to 40-13. Body oblong, compressed, the back nearly straight, the caudal peduncle deep. Head short, broad, depressed. Mouth small. Lower jaw projecting. Teeth loosely inserted, not close together. Eye moderate, directed partly downward, a little more than half width of interorbital space. Humeral scale somewhat enlarged. Fins small; dorsal slightly in advance of anal; caudal small. Intestinal canal elongate, convolute, (and filled with mud in the types). Bluish above, sides nearly plain; a silvery streak along each row of scales; vertical fins chiefly black, especially on the distal half. Length 4 inches. Guanajuato, Mexico, from a salt lake in a volcanic basin; a singular little fish, differing from all the other herbivorous Cyprinodonts in the tricuspid teeth, and apparently, also, in not having the anal fin modified. (*ater*, black; *pinna*, fin.)

Goodea atrifinis, Jordan, Proc. U. S. Nat. Mus., 1879, 299, Leon in Guanajuato, Mexico. (Type, No. 23137. Coll. Prof. Duges.) JOURNAL & GAZETTE, Synopsis, 518, 1883.

314. PLATYPÆCILUS, Günther.

Platypæcilus, GÜNTHER, Cat., vi, 350, 1860, (*annulatus*).

Small fishes, with the body deep, the origin of the anal fin distinctly behind that of the dorsal, both fins being short; otherwise essentially as in *Heterandria*. (*stria*, broad; *pediculus*, *Pæcilus* = *Pæcidia*.)

- a. Body deep, the depth $2\frac{1}{2}$ in length, side of body with a black spot. MEXICANUS, 1890.
- aa. Body moderately elongate, the depth $3\frac{1}{2}$ in length, chin with a black line; dorsal with black blotch at base. MEXICANUS, 1890.