

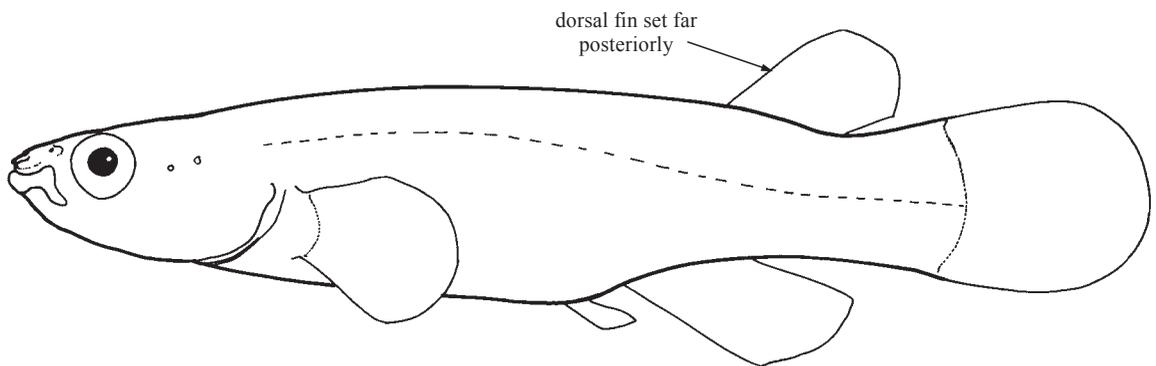
Order CYPRINODONTIFORMES

RIVULIDAE

New World rivulines (rivulid killifishes)

by M.J. Ghedotti, Regis University, Colorado, USA and E.O. Wiley, Museum of Natural History, Kansas, USA

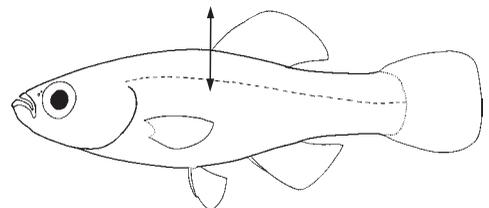
Diagnostic characters: Small fishes (2 to 11 cm standard length, 6 cm maximum in *Rivulus marmoratus*). Body elongate, cylindrical. Head flattened, **lateralis supraorbital sensory system on top of head with grooves and exposed sensory placodes rather than a series of tubes with pores**, mouth slightly up-turned, and terminal; teeth unicuspid. **No spines in fins but first rays may be unbranched; dorsal fin set far posteriorly on body, its origin over insertion of last 2 or 3 soft anal-fin rays** (brackish- and saltwater species only); dorsal fin with 8 to 11 soft rays; anal fin with 10 to 17 soft rays, anal-fin origin anterior to dorsal-fin origin; caudal fin rounded; pectoral fins short and rounded and inserted at or slightly below midbody, with 13 to 16 soft rays; pelvic fins abdominal in position, with 5 to 7 soft rays. Lateral line reduced to sensory pits along side of body. Body with cycloid scales. Sexes dimorphic with males having larger anal fins. **Colour:** body background of brown to green with hints of blue, body pattern variable, often mottled with spots and stripes. Sexually dichromatic, **females usually with a distinct ocellus on upper caudal peduncle** just anterior to caudal fin, males often with more distinct colour pattern seasonally. Hermaphroditic individuals of *Rivulus marmoratus* (most common species in area) also with a distinct ocellus on upper caudal peduncle just anterior to caudal fin.



Habitat, biology, and fisheries: Most rivulid killifish species occur in fresh water, some species are very adaptable to varying salinity and temperature. The most common species, the mangrove rivulus (*Rivulus marmoratus*), is hermaphroditic in the area and males are rare. Hermaphrodites are self-fertilizing and lay fertilized eggs. Some populations of *R. marmoratus* in Venezuela and Brazil are non-hermaphroditic. *Rivulus marmoratus* is found over marl substrates where aquatic vegetation is sparse and detritus is common, and in low oxygen environments in salt marshes and mangrove swamps with salinities of 0 to 32 ‰. Diet consists of small invertebrates. Of little importance as a forage fish and of no commercial importance except as aquarium fishes. (Both *R. marmoratus* and species of the *R. hartii/R. holmiae* complex are kept by aquarists but stock is usually raised in aquaria, not caught in the wild.)

Similar families occurring in the area

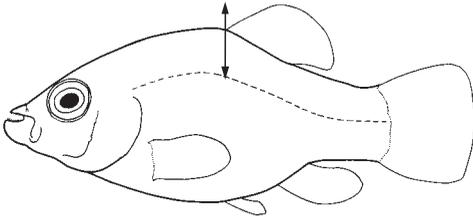
Fundulidae: dorsal fin positioned more anteriorly, dorsal-fin origin anterior to insertion of last 2 or 3 soft anal-fin rays, no ocellus on upper caudal peduncle just anterior to caudal fin, supraorbital sensory system in form of canals and pores in adults.



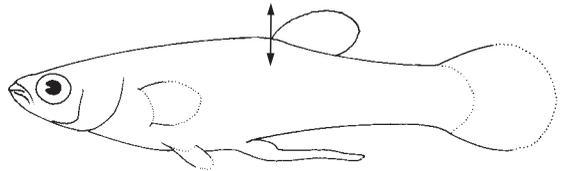
Fundulidae

Cyprinodontidae: generally stouter-bodied; dorsal fin positioned more anteriorly, dorsal-fin origin anterior to anal-fin origin, no ocellus on upper caudal peduncle just anterior to caudal fin, supraorbital sensory system in form of canals and pores in adults; jaw teeth tricuspid.

Poeciliidae: males with long anal fin modified into a non-tubular intromittent organ (gonopodium), no ocellus on upper caudal peduncle just anterior to caudal fin, third anal-fin ray unbranched; viviparous; supraorbital sensory system may be pores, placodes, or a combination.



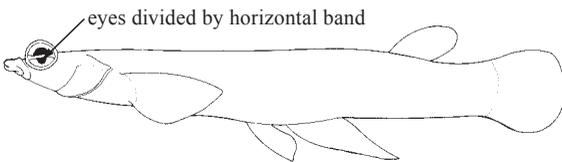
Cyprinodontidae



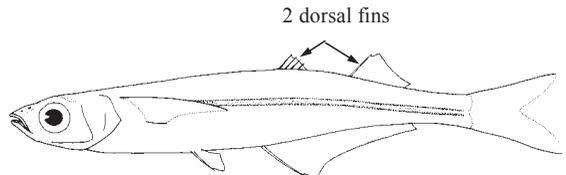
Poeciliidae

Anablepidae: eyes divided by horizontal band of opaque tissue into upper and lower halves; anal fin in males forms tubular intromittent organ; no ocellus on upper caudal peduncle anterior to caudal fin; viviparous.

Atherinidae: 2 dorsal fins, the first with 3 to 9 slender spines, the second with 1 anterior spine; anal and pelvic fins also with spines, pectoral fins set high on body, pelvic fins thoracic; no lateral line; most species with lateral silvery stripe; no ocellus on upper caudal peduncle just anterior to caudal fin; caudal fin forked.



Anablepidae



Atherinidae

Key to the species of Rivulidae occurring in the area

- 1a. Anal-fin with 13 or more soft rays; 6 to 8 rows of reddish spots on side; adult males with bright orange or yellow coloration on dorsal and ventral margins of caudal fin; adults often larger than 6 cm **Rivulus hartii / R. holmiae complex**
- 1b. Anal fin with fewer than 13 rays; mottled with irregularly distributed black spots on side; large males (very rarely encountered) with orange coloration on body and fins, dorsal and ventral margins of caudal fin not distinctly coloured; never larger than 6 cm . . . **Rivulus marmoratus**

List of species occurring in the area

Rivulus hartii (Boulenger, 1890)/*Rivulus holmiae* Eigenmann, 1909 complex. To 10 cm. Venezuela, Margarita Island, Trinidad, Guyana, and Suriname; salt tolerant, occurrence doubtful in bays and estuaries).
Rivulus marmoratus Poey, 1880. To 6 cm. Widely distributed; commonly occurring from S Florida and the Bahamas S in both the Greater and Lesser Antilles to Venezuela.

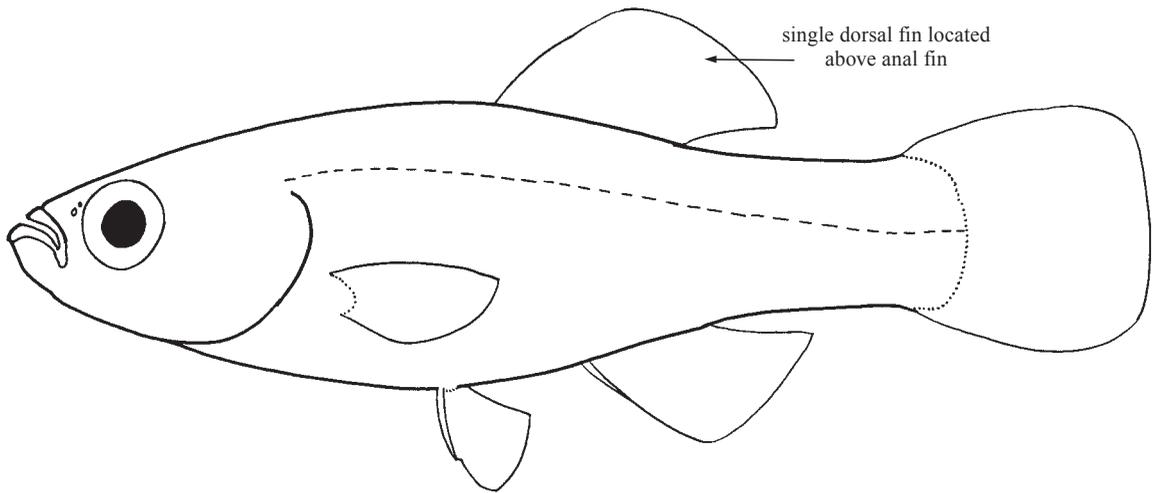
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 Lee, D. S. et al. 1980. *Atlas of North American Freshwater Fishes*. North Carolina State Museum of Natural History. Raleigh, NC. 867 p.

FUNDULIDAE**Fundulid killifishes**

by E.O. Wiley, Museum of Natural History, Kansas, USA and M.J. Ghedotti, Regis University, Colorado, USA

Diagnostic characters: Small fishes (5 to 30 cm). Body elongate to moderately deep. Head flattened, scaled; mouth wide, terminal, oblique, and protrusible. **Fine conical teeth present on edges of jaws. No spines in fins. Single dorsal fin set at approximately midbody above anal fin** and with 7 to 16 soft rays. Origin of dorsal fin slightly anterior to slightly posterior to origin of anal fin. Anal fin with 9 to 15 soft rays. Third anal-fin ray branched in males and females. Caudal fin rounded. Pectoral fins short, rounded, and inserted below the pit organs of lateral line. Pelvic fins abdominal in position and with 6 soft rays. Lateral line reduced to series of separate pit organs along side. Body with large cycloid scales. Sexes usually dimorphic, males having larger anal fins. **Colour:** Variable among and within species, ranging from plain grey (non-breeding *Lucania parva*) to combinations of spots, vertical bars, or stripes. Males frequently differ from females and juveniles in colour pattern, especially when breeding.

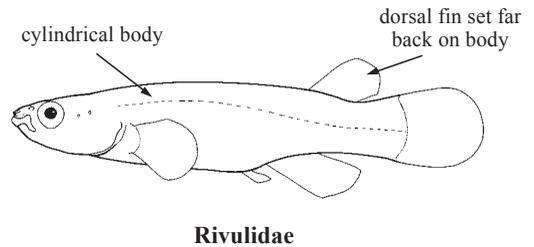
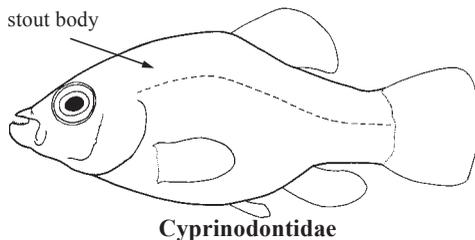


Habitat, biology, and fisheries: Highly adaptable to varying conditions of temperature and salinity. All are oviparous. Most species restricted to fresh water, but other species inhabit estuaries and salt marshes, and some are coastal marine and are even found in hypersaline waters. Diet includes aquatic vegetation, insects, other small invertebrates, and small fishes. Most live near surface or just off bottom in shallow waters. None of the fundulids occurring in Area 31 are of commercial importance, but some of the larger ones (*Fundulus grandis*, *Fundulus grandissimus*) might be consumed locally. Fundulid killifishes were classified with cyprinodontid pupfishes until recently.

Similar families occurring in the area

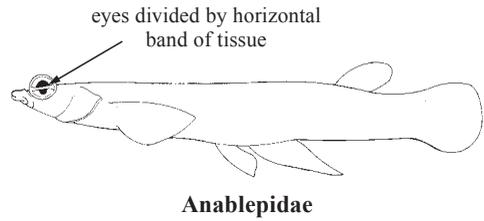
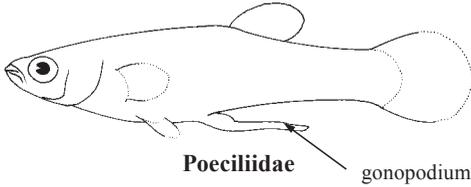
Cyprinodontidae: generally stouter bodied (the killifish *Adinia xenica* excepted); jaw teeth tricuspid.

Rivulidae: generally more cylindrical, supraorbital sensory canal open, without sensory pores, dorsal fin set far back on body, its origin over last 2 or 3 anal-fin rays (saltwater species only).

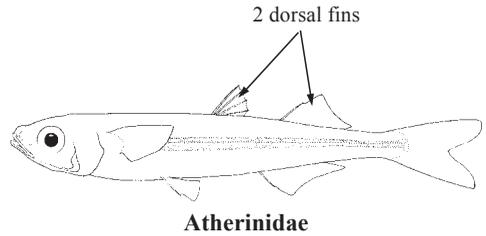


Poeciliidae: males with long anal fin modified into a non-tubular intromittent organ (gonopodium); third anal fin ray unbranched; viviparous.

Anablepidae: eyes divided by horizontal band of opaque tissue into upper and lower halves; anal fin in males forms tubular intromittent organ (gonopodium); dorsal fin set far back on body, approximately halfway between anal and caudal fins.



Atherinidae: 2 dorsal fins, the first with 3 to 9 slender spines, the second with 1 anterior spine; anal and pelvic fins also with spines, pectoral fins set high on body, pelvic fins thoracic; no lateral line; most species with lateral silvery stripe; caudal fin forked.



Key to the species of Fundulidae occurring in the area

This key is valid only for the species appearing in the checklist of species and not for all fundulid taxa, most of which are fresh water and occur only sporadically in brackish waters. Please note that many of the species are allopatric and that possible identification should be checked against geographic occurrence. The Florida Keys populations of *Fundulus similis* are distinctive and may be another species. *Fundulus grandis* and *F. saguanus* are treated as a single species by many authors.

- 1a. Jaw teeth in a single row; any teeth behind the row not organized into rows; 8 or fewer scale rows between origin of dorsal fin and origin of anal fin *Lucania parva*
- 1b. Jaw teeth in more than a single row; 9 or more scale rows between origin of dorsal fin and origin of anal fin. → 2

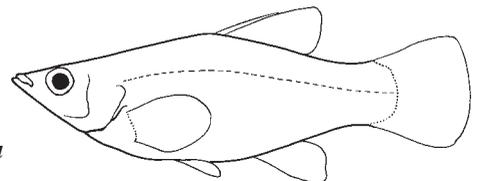


Fig. 1 *Adinia xenica*

- 2a. Body stout and trapezoidal in adults, body depth usually 2 to 3 times in standard length; scales large, fewer than 30 scales along midlateral scale row (Fig. 1). *Adinia xenica*
- 2b. Body slender, body depth more than 3 times in standard length; scales small, more than 30 scales along midlateral scale row. → 3
- 3a. Dorsal fin origin distinctly behind origin of anal fin; dorsal-fin soft rays 8 to 11. → 4
- 3b. Dorsal fin origin over or anterior to anal fin origin; dorsal-fin soft rays 10 to 15 → 5

- 4a. Males and females with 15 or more large dark spots on sides of body; males lacking dark ocellus on dorsal fin (Fig. 2) *Fundulus jenkensi*
- 4b. Males and females lacking dark spots on body, males with dark ocellus on dorsal fin (Fig. 3) *Fundulus luciae*

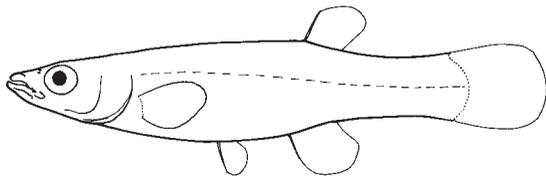


Fig. 2 *Fundulus jenkensi*

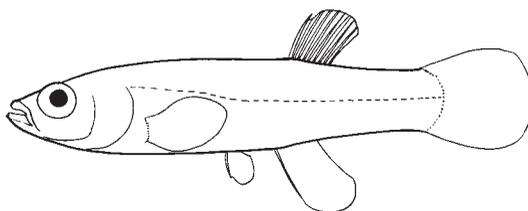


Fig. 3 *Fundulus luciae*

- 5a. Total mandibular pores in both jaws 8 (Fig. 4a) → 6
- 5b. Total mandibular pores in both jaws 10 to 12 (Fig. 4b). → 11
- 6a. Mouth distinctly below a horizontal line drawn through the middle of the eye (Figs 5, 6, 7) → 7
- 6b. Mouth level with, or slightly above, a horizontal line drawn through the middle of the eye (Fig. 8) → 9

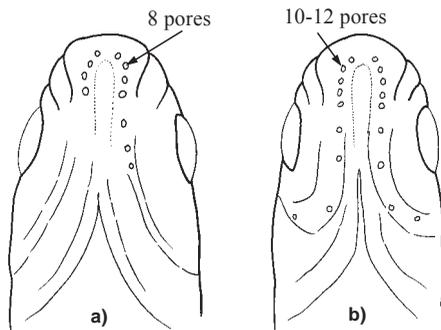


Fig. 4 mandibular pores

- 7a. Females with 2 or 3 dark horizontal stripes on side of body, males with about 12 vertical bars on side of body (Fig. 5) *Fundulus majalis*
- 7b. Females lacking horizontal stripes on side of body; males and females with vertical bars on side of body → 8

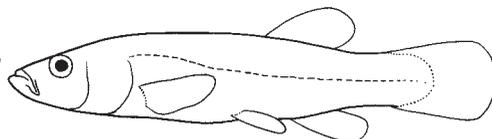


Fig. 5 *Fundulus majalis*

- 8a. Frequently with a dark spot on upper base of caudal peduncle (may be diffuse or missing in some individuals), dorsal-fin rays 10 to 14 (mode 12); anal-fin rays 9 to 12 (mode 10); ratio of head length to mouth width 3.15 to 3.75 (Fig. 6) *Fundulus similis*
- 8b. No dark spot on upper base of caudal peduncle; dorsal-fin rays 9 to 11 (mode 10); anal-fin rays 9 or 10 (mode 9); ratio of mouth width to head length 3.8 to 4.5 *Fundulus persimilis*
- 9a. Origin of dorsal fin distinctly anterior to origin of anal fin, more pronounced in males; males with dark and silvery vertical bars on side of body, silvery dots between bars (Fig. 7) *Fundulus heteroclitus*
- 9b. Origin of dorsal fin more or less over origin of anal fin; males with numerous dark vertical bars on side of the body but lacking silvery dots → 10

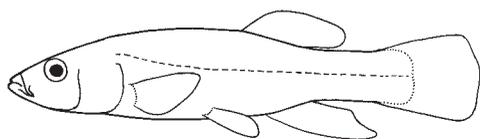


Fig. 6 *Fundulus similis*

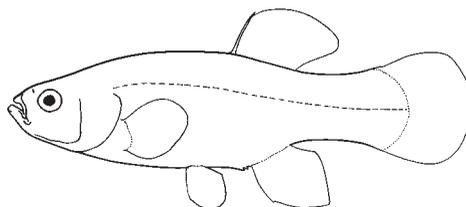


Fig. 7 *Fundulus heteroclitus*

- 10a. Females with large black spots on body, concentrated along lateral sensory pores and sometimes forming horizontal lines; males variably with dorsal fin ocellus (Fig. 8) *Fundulus pulverus*
- 10b. Females lacking dark spots but with vertical bars posteriorly; females with dorsal fin ocellus, males lacking ocellus (Fig. 9). *Fundulus confluentus*

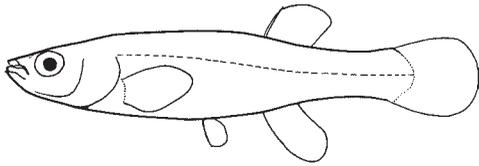


Fig. 8 *Fundulus pulverus*

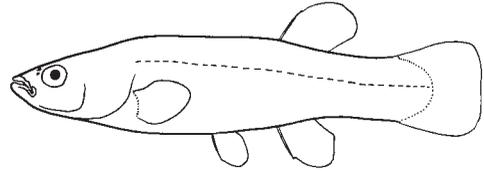


Fig. 9 *Fundulus confluentus*

- 11a. Total mandibular pores 10 in both jaws, (Figs 5, 10) *Fundulus grandis complex*
- 11b. Total mandibular pores 12 in both jaws *Fundulus grandissimus*

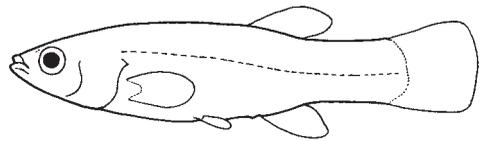


Fig. 10 *Fundulus grandis complex*

List of species occurring in the area

Only species occurring in brackish or sea water. The following species show some salt-tolerance, but probably do not occur in estuaries and rarely in salt marshes: *Fundulus chrysotus*, *Fundulus diaphanus*, *Fundulus nottii*, *Fundulus olivaceus*, *Fundulus seminolis*, *Lucania goodei*.

- Adinia xenica* (Jordan and Gilbert, 1882). N Gulf Coast from the tip of Florida to S Texas.
- Fundulus confluentus* Goode and Bean, 1879. From 35 N S along the Atlantic Coast of the USA and W on the N Gulf Coast to the vicinity of Mobile, Alabama.
- Fundulus grandis* Baird and Girard, 1853. St. Johns River, Florida, USA S and W to Laguna de Tamiahua, Veracruz, Mexico. Populations in Florida Keys and lower Florida Peninsula may be *F. saganus*.
- Fundulus grandissimus* Hubbs, 1936. Restricted to the N Yucatán Peninsula around Progreso.
- Fundulus heteroclitus* (Linnaeus, 1766). From 35 N to NE Florida, US.
- Fundulus jenkinsi* (Evermann, 1892). N Gulf Coast from Galveston Bay, Texas E to Escambia Bay, W Florida.
- Fundulus luciae* (Baird, 1855). From 35 N along the Atlantic Coast to Georgia.
- Fundulus majalis* (Walbaum, 1792). 35 N S to the Matanzas River, NE Florida.
- Fundulus persimilis* Miller, 1955. N Yucatán Peninsula in the vicinity of Rio Lagartos.
- Fundulus pulvereus* (Evermann, 1892). From the vicinity of Mobile Bay, Alabama W and S along the Gulf Coast to the vicinity of Corpus Christi, Texas. Reports of occurrence on the Atlantic Coast N of Florida are doubtful.
- Fundulus saganus* Rivas, 1948. Cuba and possibly the Florida Keys and S Florida Peninsula.
- Fundulus similis* (Baird and Girard, 1854). Matanzas River, NE Florida and S and W to just N of Tampico, Mexico. Populations in the Florida Keys and possibly the lower Florida Peninsula are distinctive and may represent another species.
- Lucania parva* (Baird and Girard, 1855). From 35 N, S, and W along the Atlantic and Gulf Coasts to NE Mexico.

References

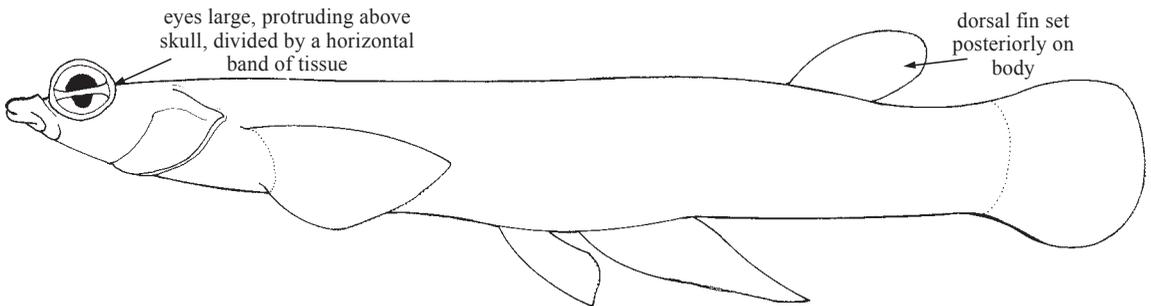
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- Wiley, E.O. 1986. A study of the evolutionary relationships of *Fundulus* topminnows (Teleostei: Fundulidae). *Amer. Zool.*, 26:121-130.

ANABLEPIDAE

Foureyed fishes

by M.J. Ghedotti, Regis University, Colorado, USA and E.O. Wiley, Museum of Natural History, Kansas, USA

Diagnostic characters: Small to medium-sized fishes (to about 35 cm total length). Body elongate, depressed anteriorly, laterally compressed posteriorly. Head flattened; mouth upturned and terminal; teeth unicuspid in adults and postembryonic juveniles. **Eyes large, protruding above skull and divided horizontally by band of opaque tissue into upper and lower halves**, retina similarly divided, this arrangement allowing for simultaneous aerial and aquatic vision. **No spines in fins; dorsal fin set far posteriorly on body with 7 to 10 soft rays; anal fin in adult males forms a scaled tubular intromittent organ (gonopodium) which encloses the sperm duct;** caudal fin rounded, often with an indistinct lower lobe; pectoral fins rounded and inserted at or slightly below midbody, with 20 to 26 soft rays; pelvic fins abdominal in position, with 6 soft rays. **Colour:** plain, lacking patterning, to ornamented with series of 1 or more longitudinal stripes along body. Males and females not strikingly different in colour pattern.



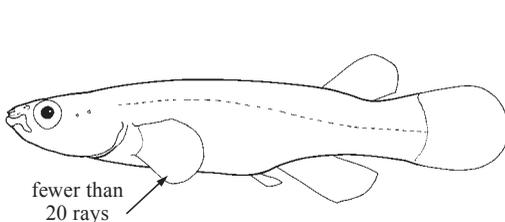
Habitat, biology, and fisheries: Occurring in western Central America and northern South America. Although all 3 species occur mostly in fresh water, they may also be found in very shallow coastal and estuarine waters. They live near the surface and may lurk out of the water on muddy or sandy banks. The divided eyes allow them to search for aerial predators. Diet consists of terrestrial and aquatic invertebrates and periphyton on exposed mudflats. Like the poeciliid live-bearing topminnows, foureyed fishes have internal fertilization and bear 'live' young, but this characteristic has evolved in both lineages independently. None of these species is commercially important as food, but they are locally consumed and are sometimes sold at local fish markets. They are occasionally marketed in the aquarium trade.

Similar families occurring in the area

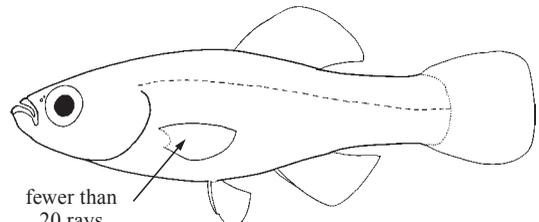
None of the similar families occurring in the area have the protruding and horizontally divided eyes characteristic of the foureyed fishes. Further distinguishing characters of these families are the following:

Rivulidae: males (when present) without gonopodium; fewer than 20 pectoral-fin rays; third anal-fin ray branched; small, not larger than 5 cm standard length.

Fundulidae: males without gonopodium; fewer than 20 pectoral-fin rays; dorsal-fin origin anterior to insertion of last 3 anal-fin rays; third anal-fin ray branched.



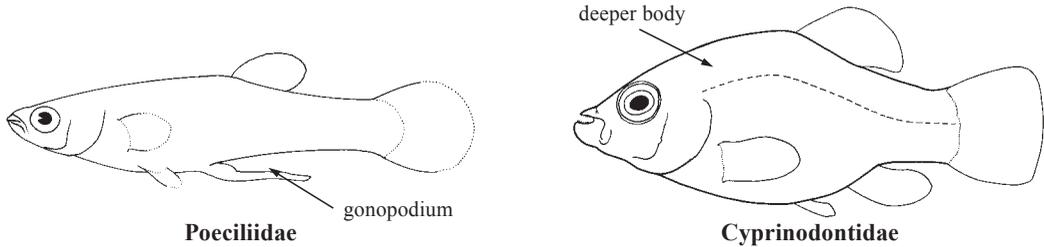
Rivulidae



Fundulidae

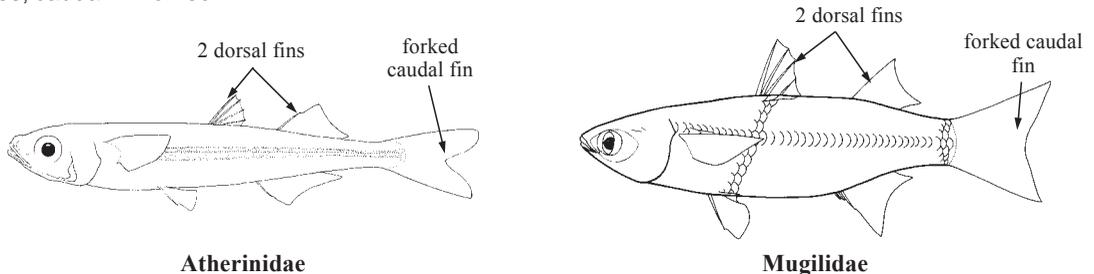
Poeciliidae: males with anal-fin modified as unscaled, non-tubular gonopodium supported by anal-fin rays 3, 4, and 5; pectoral fins inserted above midbody, fewer than 20 pectoral-fin rays.

Cyprinodontidae: males without gonopodium; dorsal-fin origin anterior to insertion of last 3 anal-fin rays; fewer than 20 pectoral-fin rays; third anal-fin ray branched; usually deeper-bodied.



Atherinidae: 2 dorsal fins, the first with 3 to 9 slender spines, second with 1 anterior spine; anal and pelvic fins also with spines, pectoral fins set high on body, pelvic fins thoracic; no lateral line; most species with lateral silvery stripe; caudal fin forked.

Mugilidae: 2 dorsal fins, the first with slender spines; males without gonopodium; anal and pelvic fins with spines; caudal fin forked.



Key to the species of Anablepidae occurring in the area

- 1a. Scales large, fewer than 64 scales in midlateral scale row *Anableps anableps*
- 1b. Scales small, greater than 75 scales in midlateral scale row *Anableps microlepis*

List of species occurring in the area

- Anableps anableps* (Linnaeus, 1758). Amazon River Delta, Brazil NW to Orinoco River Delta, Venezuela.
- Anableps microlepis* Müller and Troschel, 1844. Amazon River Delta, Brazil NW to Orinoco River Delta, Venezuela.

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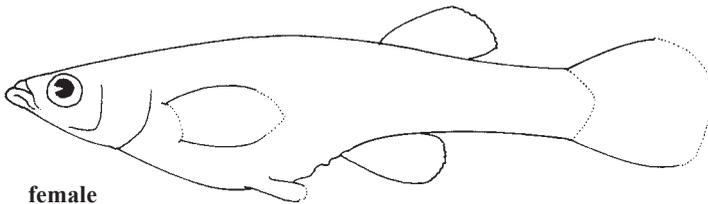
Miller, R.R. 1979. Ecology, habits, and relationships of the Middle American cuatro ojos, *Anableps dowi* (Pisces: Anablepidae). *Copeia*, 1979:82-91.

POECILIIDAE

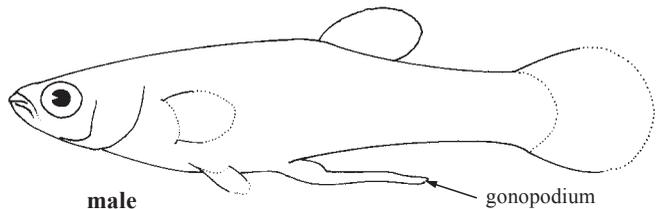
Poeciliids (livebearers)

by M.J. Ghedotti, Regis University, Colorado, USA and E.O. Wiley, University of Kansas, Kansas, USA

Diagnostic characters: Small fishes (4 to 20 cm total length). Body elongate to moderately deep. Head flattened, scaled. Snout short except in *Belonesox*. Mouth wide, terminal, oblique, and protrusible. **No spines in fins.** Single dorsal fin with 6 to 19 soft rays; its position relative to anal fin variable. **Anal fin of male modified into a thin, elongate intromittent organ (gonopodium)** which is not tubular, not scaled, and not enclosing an extension of the sperm duct. Anal fin with 9 soft rays. **Third anal-fin ray unbranched in males and females.** Caudal fin rounded or emarginate. Pectoral fins with 9 to 16 soft rays, short, rounded, and inserted high on side of body. Pelvic fins with 6 soft rays; subthoracic in position in females and thoracic in position in adult males. Body with large cycloid scales. Lateral line reduced to series of separate pit organs along sides. Sexes usually dimorphic, males usually smaller than females. Adult females often obviously pregnant with distended abdomen. **Colour:** highly variable among species. Males usually more colourful than females and juveniles. **Pregnant females often with dark spot (gravid spot) anterior and dorsal to anus.**



female



male

gonopodium

Habitat, biology, and fisheries: Found naturally in the Americas from the USA to Argentina. Most species occur in fresh water, but some have wide salinity tolerance and may be found in brackish or marine coastal waters. Common in the fresh waters of Central America and the

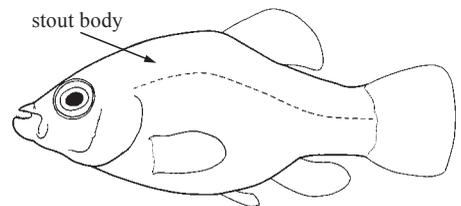
Greater Antilles. They feed chiefly on insects, other small invertebrates, and aquatic vegetation; some species (especially *Gambusia affinis*, *G. holbrooki*, and *Poecilia reticulata*) have been widely introduced to control insect-borne diseases. All are viviparous. The larger species may be consumed locally, but most species are too small to be of interest as food. Many have great commercial importance as aquarium fishes.

Similar families occurring in the area

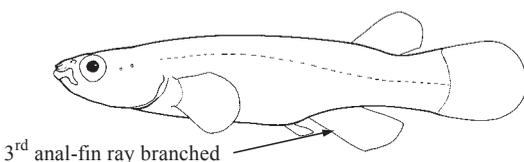
Cyprinodontidae: males without gonopodium; male and female anal fins approximately similar; oviparous; third anal-fin ray branched; usually stouter-bodied; jaw teeth tricuspid.

Rivulidae: males rare, without gonopodium, has larger anal fin than female; third anal-fin ray branched; oviparous; generally more cylindrical; pectoral fins set low on sides; dorsal fin set far back on body, its origin over last 2 or 3 anal-fin rays (saltwater species only).

Fundulidae: males without gonopodium, has larger anal fin than female; third anal-fin ray branched; oviparous; pectoral fin set low on sides.

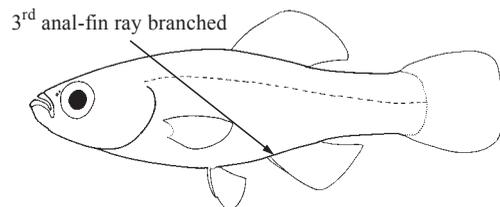


Cyprinodontidae



3rd anal-fin ray branched

Rivulidae

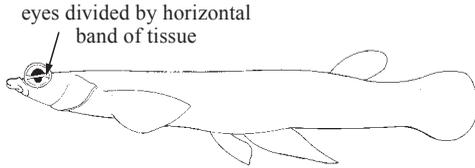


3rd anal-fin ray branched

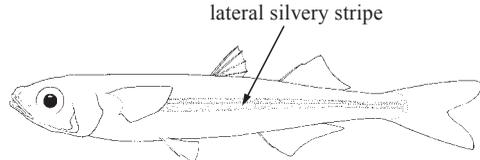
Fundulidae

Anablepidae: eyes divided by horizontal band of opaque tissue into upper and lower halves; anal fin in males forms scale-covered, tubular gonopodium enclosing an elongate sperm duct; dorsal fin set far back on body, approximately halfway between anal and caudal fins.

Atherinidae: 2 dorsal fins, the first with 3 to 9 slender spines, the second with 1 anterior spine; anal and pelvic fins also with spines, pectoral fins set high on body, pelvic fins thoracic; no lateral line; most species with lateral silvery stripe; caudal fin forked; males without gonopodium; oviparous.



Anablepidae



Atherinidae

Key to the genera of Poeciliidae occurring in the area

Note: No reliable key to females available. Distinguishing features of genera and species have traditionally been based on the male gonopodium and male pelvic-fin structure. When available, characters applicable to females are provided. Further, the key is designed for the brackish and marine members of each genus and hence does not work for representatives restricted to fresh water. Please note that many of the species are allopatric and that possible identification should be checked against geographic occurrence.

- 1a. Jaws elongate, forming a distinctive beak (Fig. 1) *Belonesox*
- 1b. Jaws of normal proportions not elongated into a beak → 2

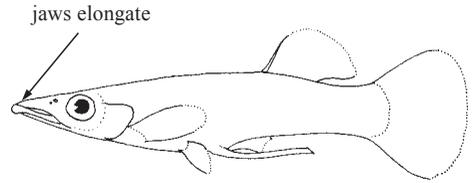


Fig. 1 *Belonesox*

- 2a. Tips of pelvic fins of adult males swollen, elongate, or both, due to elongation of the second fin ray (Fig. 2a,b); fleshy palp on gonopodial ray 3 → 3
- 2b. Tips of pelvic fins of adult males not swollen or elongate, third fin ray approximately as long as second fin ray (Fig. 2c); no fleshy palp on gonopodial ray 3 → 4

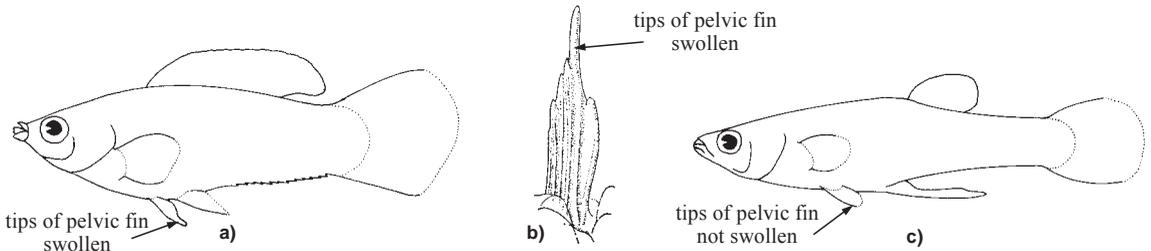


Fig. 2

- 3a. Subdistal segments of gonopodial ray 3 smooth, lacking spines and processes; gonopodial ray 5p distinctly shorter than 5a, extending distally only to within 10 to 15 segments of the tip of ray 5a (Fig. 3a) *Limia*
- 3b. Subdistal segments of gonopodial ray with spines and processes; gonopodial ray 5p not distinctly shorter than 5a, extending distally to within 2 to 6 segments of the tip of ray 5a (Fig. 3b) *Poecilia*

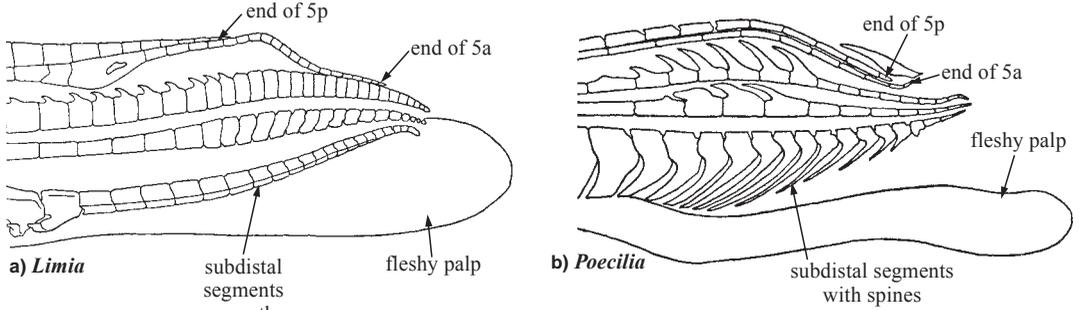


Fig. 3

- 4a. Tip of gonopodial ray 4a terminating in a decurved (downward curved) hook (Fig. 4a); distinct dark spot in anterior dorsal fin; jaw teeth compressed; females never larger than 3 cm total length *Heterandria (H. formosa only)*
- 4b. Tip of gonopodial ray 4a terminating in a slightly recurved (upward curved) hook (Fig. 4b); no distinct dark spot in anterior dorsal fin (except melanistic *Gambusia holbrooki*); jaw teeth conical; females often larger than 3 cm total length → 5

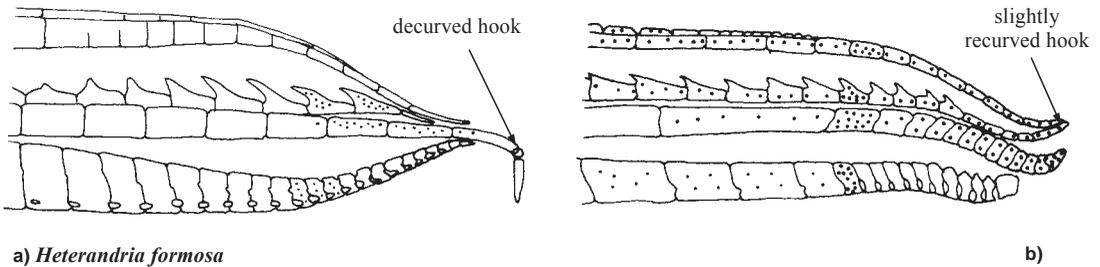


Fig. 4

- 5a. Distal tips of gonopodial rays 5a and 5p simple and slightly recurved, without distinct recurved hooks (Fig. 4b); posterior portion of male gonopodium distinctly black; distinct black spot or streak on female anal fin . . . *Brachyrhaphis (B. cascajalensis only)*
- 5b. Distal tips of gonopodial rays 5a and 5p slightly decurved and ornamented with distinct recurved hooks (Fig. 5); male gonopodium and female anal fin lack distinct black pigmentation *Gambusia*

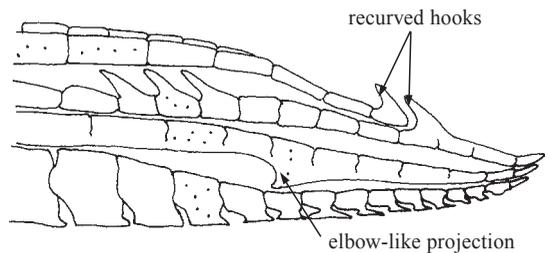


Fig. 5 *Gambusia*

List of species occurring in the area

Note: List restricted only to those species entering brackish or salt water and those species whose salinity tolerance and geographic location might permit them to be found in these habitats sporadically. There are numerous fresh water members of the family found on the mainlands and islands of Area 31.

Belonesox belizanus Kner, 1860. Veracruz, Mexico to Nicaragua.

Brachyrhaphis cascajalensis (Meek and Hildebrand, 1913). SE Costa Rica to N central Panama.

Gambusia affinis (Baird and Girard, 1853). S central USA and NE Mexico, introduced elsewhere.

Gambusia hispaniolae Fink, 1971. Central Haiti and SW Dominican Republic.

Gambusia holbrooki Girard, 1859. S New Jersey to S Alabama, introduced elsewhere.

Gambusia luma Rosen and Bailey, 1963. Guatemala and Honduras.

Gambusia manni Hubbs, 1927. N Bahamas.

Gambusia nicaraguensis Günther, 1866. Guatemala to Panama.

Gambusia puncticulata Poey, 1854. Cuba, Isle of Youth, Jamaica, Cayman Islands, and the Bahamas.

Gambusia rhizophorae Rivas, 1969. S Florida and N Cuba.

Gambusia xanthosoma Greenfield, 1983. West Bay, Grand Cayman Island.

Gambusia yucatanana Regan, 1914. E Veracruz, Mexico to the Yucatan Peninsula.

Heterandria formosa Girard, 1859. SE North Carolina to S Louisiana.

Limia caymanensis Rivas and Fink, 1970. Grand Cayman Island.

Limia rivasi Franz and Burgess, 1983. E La Gonave Island, Haiti.

Limia vittata (Guichenot, 1853). Cuba.

Poecilia latipinna (Lesueur, 1821). SE North Carolina to the W Yucatán Peninsula.

Poecilia mexicana Steindachner, 1863. S Texas to Colombia.

Poecilia orri Fowler, 1943. Belize and Honduras.

Poecilia petenensis (Günther, 1866). E Yucatán Peninsula, Guatemala, and Belize.

Poecilia reticulata Peters, 1859. S Mexico to Guyana and the Lesser Antilles including Trinidad and the Virgin Islands, introduced elsewhere.

Poecilia sphenops Valenciennes, 1846. S Texas to Colombia.

Poecilia velifera (Regan, 1914). N Yucatán Peninsula.

Poecilia vivipara Bloch and Schneider, 1801. W Venezuela to Argentina and the islands of Aruba, Bonaire, Curaçao, the Leeward Islands, and Trinidad.

References

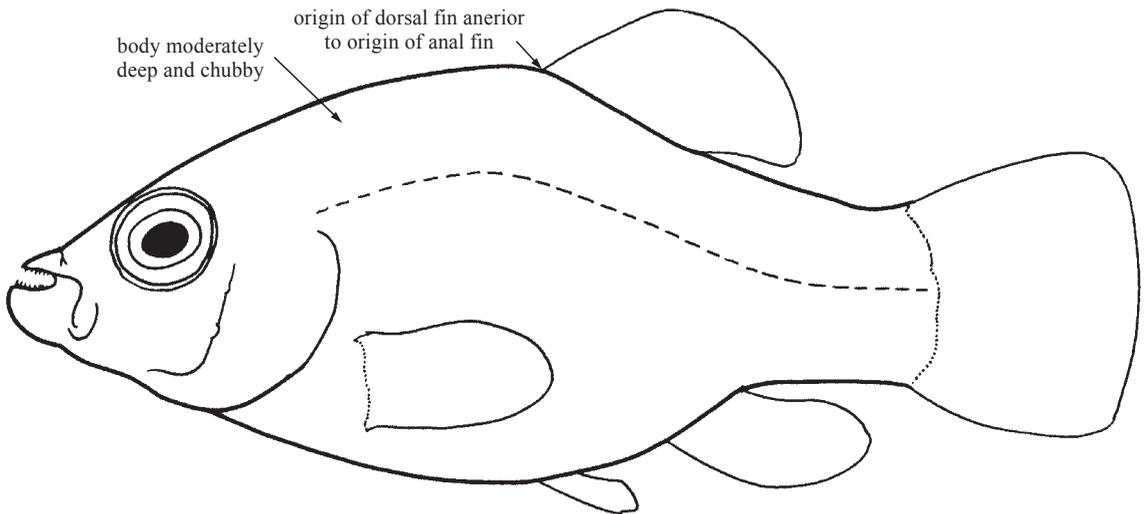
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CYPRINODONTIDAE

Pupfishes

By E.O. Wiley, Museum of Natural History, Kansas, USA and M.J. Ghedotti, Regis University, Colorado, USA

Diagnostic characters: Small fishes (2 to 8 cm standard length). **Body moderately deep and chubby.** Head flattened and scaled; supraorbital sensory canal with 7 or more pores; sensory placodes not exposed; mouth wide, terminal, oblique, and protrusible. **Teeth tricuspid in all genera except *Cubanichthys*.** Single dorsal fin with 10 to 18 rays with or without single spine, set at midbody. **Origin of dorsal fin anterior to origin of anal fin.** Anal fin spineless with 8 to 13 soft rays. **All anal-fin rays branched.** Caudal fin truncate to slightly rounded. Pectoral fins short with 13 to 20 soft rays, rounded and inserted below the pit organs of the lateral line. Pelvic fins small with 6 or 7 soft rays, spineless and abdominal. Lateral line reduced to a series of pit organs along the side of the body. Body with large cycloid scales. Sexes dimorphic, the males having larger anal fins (no gonopodium) and males and females with different colour patterns on the body and/or dorsal and anal fins, especially in the breeding season. **Colour:** highly variable in tone and colour, frequently with bars, stripes, or spots on body and fins.

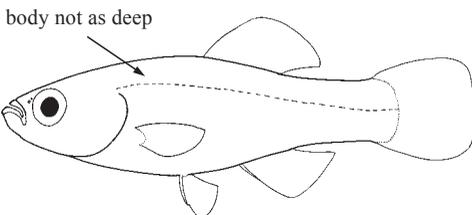


Habitat, biology, and fisheries: Highly adaptable to varying conditions of salinity and temperature. All are oviparous. Many species restricted to fresh water but others are common in salt marshes, mangroves, estuaries, and coastal marine environments. Diet consists of insects, other invertebrates, aquatic vegetation, and small fishes. Most live near the surface or just off bottom. None are commercially important in the Western Central Atlantic but at least 1 species, *Cyprinodon variegatus*, is marketed as a bait fish and another, *Jordanella floridae*, is valued as an aquarium fish.

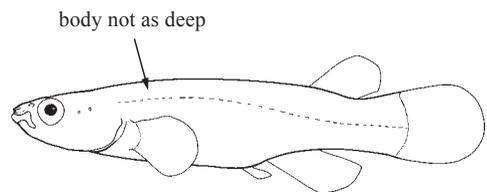
Similar families occurring in the area

Fundulidae: body not as deep, usually more elongate and cylindrical; jaw teeth conical.

Rivulidae: body not as deep, elongate, cylindrical; supraorbital sensory canal open, without sensory pores; dorsal fin set far back on body, its origin over last 2 or 3 anal-fin rays (saltwater species only); jaw teeth conical.



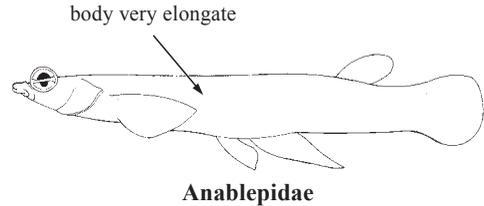
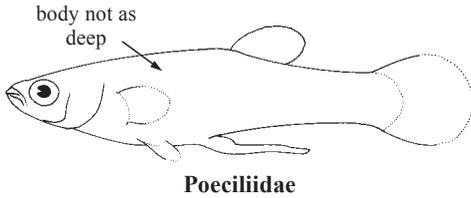
Fundulidae



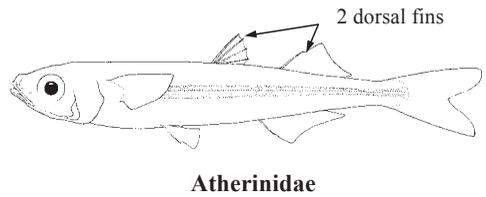
Rivulidae

Poeciliidae: body not as deep, more elongate; males with long anal fin modified into a non-tubular intromittent organ (gonopodium); third anal-fin ray unbranched; viviparous; jaw teeth conical or spatulate.

Anablepidae: body very elongate, eyes divided by horizontal band of opaque tissue into upper and lower halves; anal fin in males forms tubular intromittent organ (gonopodium); dorsal fin set far back on body, approximately halfway between anal and caudal fins; jaw teeth conical in adults.



Atherinidae: 2 dorsal fins, the first with 3 to 9 slender spines, the second with 1 anterior spine; anal and pelvic fins with spines; pelvic fins thoracic, no lateral line; most species with a single silvery lateral stripe on body; caudal fin forked.



Key to the species of Cyprinodontidae occurring in the area

Applies only to brackish- and salt-water representatives. The recognition of *Garmanella* as a valid genus as opposed to being a synonym of *Jordanella* is controversial. Recognition of *Garmanella* here follows Parker and Kornfield (1995) and Costa (1997).

- 1a. An enlarged humeral scale immediately behind gill cover and above pectoral fin (Fig. 1) → 2
- 1b. No enlarged humeral scale present → 3

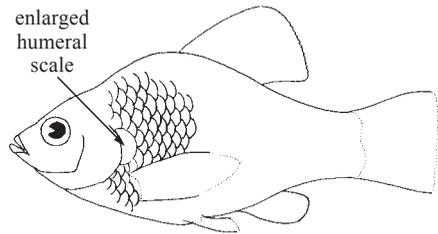


Fig. 1 *Cyprinodon*

- 2a. Cheek long, distance from posterior end of suborbital margin to preopercular angle is greater than twice length of the opercle (Fig. 2) ***Cyprinodon laciniatus***
- 2b. Cheek relatively short, distance from posterior end of suborbital margin to preopercular angle is less than length of the opercle (Fig. 3) ***Cyprinodon variegatus* species complex**

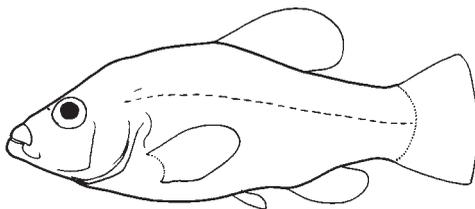


Fig. 2 *Cyprinodon laciniatus*

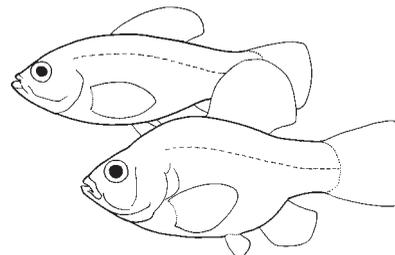


Fig. 3 *Cyprinodon variegatus* species complex

- 3a. Dorsal-fin soft rays 10 to 13, pectoral-fin soft rays 18 to 20 (rarely 17) → 4
- 3b. Dorsal-fin soft rays greater than 13, pectoral-fin soft rays less than 18 → 5

- 4a. Dark horizontal stripe from chin to top of operculum through eye; male with spots anteriorly which merge to form longitudinal stripes posteriorly, females with a single longitudinal stripe (Fig. 4) *Cubanichthys cubensis*
- 4b. No dark horizontal black stripe from chin to top of operculum through eye, males and females with vertical bars on sides of body posteriorly (Fig. 5) *Floridichthys carpio*

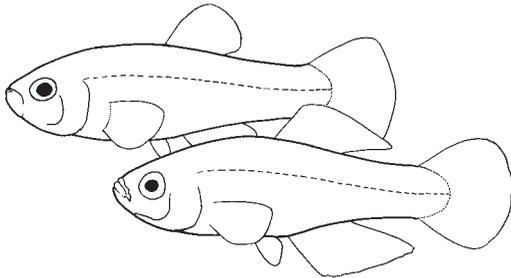


Fig. 4 *Cubanichthys cubensis*

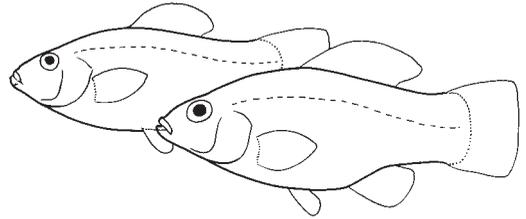


Fig. 5 *Floridichthys carpio*

- 5a. Anal-fin soft rays 11 to 13; first dorsal-fin ray of adults spine-like (Fig. 6) *Jordanella floridae*
- 5b. Anal-fin soft rays 8 to 10; first dorsal-fin ray of adults not spine-like or thickened (Fig. 7) *Garmanella pulchra*

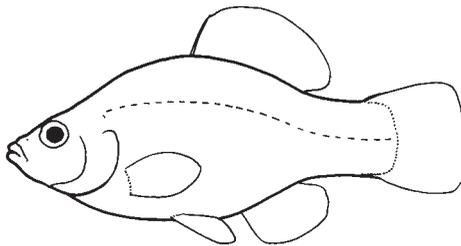


Fig. 6 *Jordanella floridae*

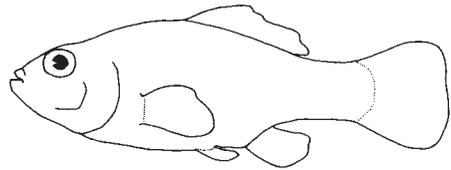


Fig. 7 *Garmanella pulchra*

List of species occurring in the area

- Cyprinodon laciniatus* Hubbs and Miller, 1942. Marl-limestone bottom lakes on New Providence Island, Grand Bahama Bank, Bahamas brackish water.
- Cyprinodon variegatus* complex includes 3 species that are largely allopatric. These species are listed below.
- Cyprinodon artifrons* Hubbs, 1936. N Yucatán peninsula to Belize.
- Cyprinodon dearborni* Meek, 1909. N coast of Venezuela and the Dutch Antilles.
- Cyprinodon variegatus*, Lacepède, 1803. From 35° N S along the Atlantic and W and S along the Gulf Coast to the W Yucatán Peninsula and in the Bahamas, Cuba, Hispaniola, Jamaica, and the Caymans; several subspecies recognized: Bahamian form recognized as *C. v. baconi* Breder, 1932 and Greater Antillean form recognized as *C. v. riverendi* Poey, 1860.
- Cubanichthys cubensis* (Eigenmann, 1903). W Cuba and the Isle of Youth.
- Floridichthys carpio* (Günther, 1866). Florida and the Yucatán Peninsula.
- Garmanella pulchra* Hubbs, 1936. Yucatán Peninsula S to Belize.
- Jordanella floridae* Goode and Bean, 1879. Florida; salt tolerant, but doubtful occurrence in bays and estuaries.

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