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PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF GERREID FISHES OF THE WESTERN CENTRAL ATLANTIC

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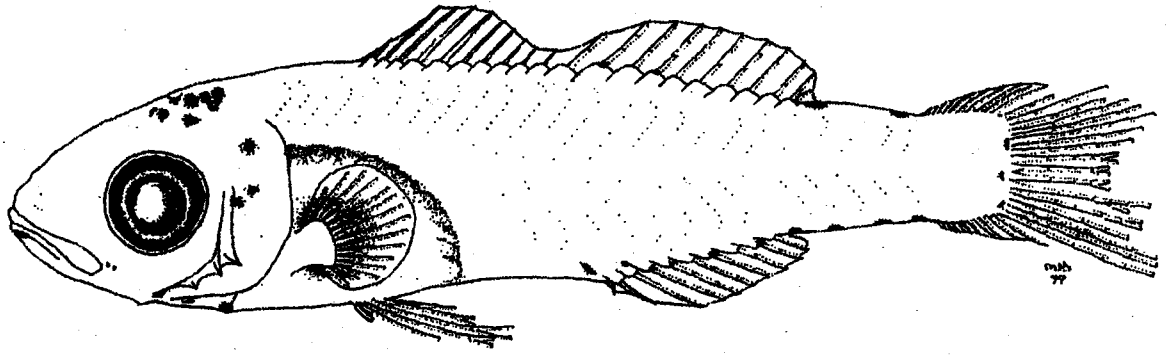

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Gerreidae: Mojarras

A.B. Powell & M. D. Greene

The family Gerreidae contains four genera and 13 species that occur in the western central North Atlantic. Adult gerreids are small to medium size fishes that are abundant in coastal waters, bays, and estuaries in tropical and warm temperate regions and sometimes occur in freshwaters. They are generally associated with grassy or open bottoms, but not with reefs. Gerreids are silvery fishes, with deeply forked tails, and extremely protrusible mouth that points downward when protracted. They apparently feed on bottom-dwelling organisms and at least one species (*Eucinostomus gula*) shows a distinct transition, during the juvenile period, from a planktivore (exclusively copepods) to a carnivore that includes a diet of almost solely polychaetes (Carr & Adams, 1973; Robins and Ray, 1987; Murdy et al., 1997)

Gerreids eggs are small and pelagic. *Gerres japonicus* (from Japanese waters) eggs are 0.60-0.63 mm in diameter with a single oil globule 0.18-0.20 mm in diameter (Mito, 1963). Larvae from this species hatches at 1.4 mm. Eggs from an Atlantic gerreid, *Diapterus rhombeus* measured 0.70-0.72 mm in diameter with a single oil globule 0.18-0.20 mm in diameter (Rass, 1972). Eggs from the genera *Eucinostomus* and *Eugerres* have not been described. Morphologically, larval gerreids are moderately deep bodied, have a pointed head in the postlexion stage, large eyes, short coiled gut, and a space between the anus and anal fin. Just prior to the flexion stage the prominent premaxillary process begins to form and by the early postflexion stage is well developed and the mouth becomes protractile. Head spination is not well developed. Small preopercular spines develop during the flexion stage, but are not conspicuous until the postflexion stage. Small supracleithral spines might form in some species (Leis & Rennis, 1983). Gerreid larval pigment typically occurs on the ventral midline, tip of notochord and eventually covers the base of the caudal fin, dorsal and anterior portions of the gut, hindgut, ventrum of the gut, anterior to the cleithral symphysis, and dorsal midline at the caudal peduncle that continues along the second dorsal fin ray with development (Leis & Rennis, 1983; Watson, 1996).

Gerreids can generally be distinguished from other percoid taxa by meristic characters , such as myomere and fin ray counts, and morphological characters such as the short preanal length, lack of preopercle spines prior to late flexion or early postflexion and weak spines thereafter, and pigment characters discussed above.

Descriptions of the early stages of gerreids in the western central North Atlantic are rare and counts of meristic characters are not useful to distinguish species of *Eucinostomus*, except *E. lefroyi*, which has two anal spines, nor to distinguish *Gerres* from *Eucinostomus* (Table Gerreidae 1). Descriptions of *Eucinostomus* sp (p). from the California Current region (Watson, 1996) indicate a hatching size of <2.1 mm and a flexion length of approximately 4.0-5.5 mm. Pigmentation of preflexion larvae consist of 18-20 melanophores on the ventral midline that decrease to 12-13 at beginning of flexion; dorsally on gas bladder and hindgut, and anterior gut pigment after 2.4 mm; one melanophore on the anterior and posterior of the hindgut; a pair over midbrain after 2.4 mm. Flexion larvae have 2-4 melanophores on hypural margin; ventral midline decreases to 6-8; posterior portion of dorsal midline at 4.6 mm; melanophore anterior to the cleithral symphysis; paired embedded hindbrain melanophores (4.7 mm) and an additional pair occurs on the midbrain surface (4.8 mm); 0-1 melanophore at dorsal area of preopercle. Melanophores on postflexion larvae increase over the brain, along the fin bases , and on gut and gas bladder (Watson, 1997). A 9.5 mm SL *Eucinostomus* tentatively identified as *E. lefroyi* appears to lack the intensity of pigment on the fin bases compared to the California *Eucinostomus*. *Gerres* larvae from Australian waters resemble *Eucinostomus* except they have less ventral midline melanophores during the preflexion stage, and head pigment does not develop till after postflexion. (Lies & Rennis, 1983). Furthermore , larger postflexion *Gerres* larvae exhibit lateral pigment in the caudal region. Australian *Gerres* hatch at <2.1 mm, and caudal flexiion occurs 3.5-5.0 mm (Leis & Rennis, 1983). In the species account, the life history and meristic data is for *Eucinostomus argenteus* and *E. gula* and 3 illustrations are provided of examples of *Eucinostomus* from our area.

Table Gerreidae 1. Meristic characters for the gerreid species that occur in the western central North Atlantic, All species have 10+14 vertebrae, 9+8 principal caudal fin rays, and I,5 pelvic fin rays. Meristic counts were obtained from Curran (1942), Dahlberg (1975), Hildago and Carrió (1983), Deckert and Greenfield (1987) and Murdy et al. (1987). Values given are the mode and, in parentheses, the range.

Species	Fin rays		GR
	D	A	
Diapterus auratus	IX,10 (VII,10-IX,11)	III,8 (III,8-III,9)	12-13 (12-15)
D. rhombeus	IX,10	II,9 (II,8-II,10)	16-18
Eucinostomus argenteus	IX,10	III,7	8
E. gula	IX,10	III,7	8
E. harengulas	IX,10	III,7	8
E.havana	IX,10	III,7	8
E. jonesi	IX,10	III,7	8
E. lefroyi	IX,10	II,8	8
E. melanopterus	IX,10	III,7	9
Eugerres brasilianus	IX,10 (IX,10-11)	III,7 (III,7-8)	11-12 (11-13)
E. mexicanus	IX,10 (VIII-X,9-11)	III,8 (III,7-8)	14-15 (13-16)
E. plumieri	IX,10 (VIII-IX,10-11)	III,8 (III,7-9)	14-16 (13-17)
Gerres cinereus	IX,10	III,7	8

Table Gerreidae 2. Distributions of gerreid species that occur in the western central North Atlantic. Distribution data were obtained from Robins and Ray (1986), Deckert and Greenfield (1987), Boschung (1992) and Murdy et al. (1997).

Species	Distribution
Diapterus auratus	Atlantic coast of US from NC south to Florida and through Gulf of Mexico; Central America coast south to Brazil; West Indies.
D. rhombeus	West Indies; Mexico south along Central American coast; northern South America to Brazil.
Eucinostomus argenteus	NJ, Bermuda, and n. Gulf of Mexico to se. Brazil. Always in shallow water; enters fresh water ; absent from reefs.
E. gula	Mass., Bermuda and n. Gulf of Mexico to Argentina. Shallow water, except coral reefs; enters fresh water in limestone regions.
E. harengulas	Northern and eastern Gulf of Mexico; enters fresh water.
E. havana	Most common in Bahamas and West Indies; Bermuda, FL, and Bahamas to Brazil. Inshore habitats but does not appear to enter brackish water.
E. jonesi	Bermuda and Florida to Brazil.
E. lefroyi	NC, Bermuda and n. Gulf of Mexico to Brazil.
E. melanopterus	Georgia to Brazil; Gulf of Mexico; West Indies; absent from Bahamas, favors continental lagoons and bays, and enters fresh water.
Eugerres brasilianus	West Indies and Atlantic coast from Belize to southern Brazil; enters rivers.
E. mexicanus	Atlantic slope of southern Mexico and northern Guatemala; resticted to fresh waters.
E. plumieri	Atlantic coast of US from SC to FL; west coast of FL; West Indies; Mexico, south along Central American coast to Columbia, entering rivers.
Gerres cinereus	Bermuda, FL and Gulf of Mexico to se. Brazil; common in coastal waters, seagrass beds, areas near reefs and mangrove channels.

Literature Cited

Boschung, H. T. 1992. Catalogue of freshwater and marine fishes of Alabama. Bull. Alabama Mus. Nat. Hist. (14): 266 p.

Carr and Adams, 1973. Food habits of juvenile marine fishes occupying seagrass beds in the estuarine zone near Crystal River, Florida. Trans. Amer. Fish. Soc. 102: 511-540.

Curran, H. W. 1942. A systematic revision of the gerrid fishes referred to the genus *Eucinostomus*, with a discussion of their distribution and speciation. Ph.D. Diss., Univ. Mich., Ann Arbor. Michigan. 183 p.

Dahlberg, M. D. 1975. Guide to the coastal fishes of Georgia and nearby states. Univ. Georgia Press, Athens, Georgia.187 p.

Deckert, G. D.and D.W. Greenfield.1987. A review of the western Atlantic species of the genera *Diapterus* and *Eugerres* (Pisces: Gerreidae). Copeia 1987: 182-194.

Hidalgo, M. B. and E. G. Carrió.1983. Estudio morfométrico de *Eugerres brasilianus* (Cuvier *in* Cuvier *et* Valenciennes, 1830). Rev. Invest. Mar. 4: 63-90. [In Spanish].

Leis, J. M. And D.S. Rennis. 1983. The larvae of Indo-Pacific coral reef fishes. New South Wales Univ. Press, Kensington. 269 p.

Mito, S. 1963. Pelagic fish eggs from Japanese waters--III. Percina. Jpn. J. Ichthol. 11: 39-64. [In Japanese].

Murdy, E. O., R. S. Birdsong and J. Musick. 1997. Fishes of Chesapeake Bay. Smithsonian Press, Washington, D.C. 324 p.

Rass, T. S. 1972. Ichthyoplankton from Cuban waters. Pelagic fish eggs. Tr. Inst. Okeanol. Akad. Nauk SSSR 93: 5-41. [In Russian].

Robins, C. R. and G. C. Ray, 1986. A field guide to Atlantic coast fishes of North America. Houghton Mifflin Co., Boston. 354 p.

Watson, W. 1996. Gerreidae: mojarras. Pages 998-1001 *in* H. G. Moser (ed.). The early stages of fishes in the California Current region. Calif. Coop. Ocean. Fish. Invest., Atlas No. 33. 1505 p.

FAMILY GERREIDAE

*Eucinostomus argenteus/gula**

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal	IX
Second Dorsal	10
Total	19
Anal	III, 7
Pectoral	
Pelvic	I,5
Caudal	
Dorsal Secondary	10
Principal	9+8
Ventral Secondary	9-10

LIFE HISTORY

Range: *E. argenteus* – NJ, Bermuda & n. Gulf of Mexico to se. Brazil. *E. gula* – Mass, Bermuda & n. Gulf of Mexico to Argentina
Habitat: Shallow water except reefs
ELH Pattern:
Spawning:
Season: postflexion larvae in June & November in NC
Mode: oviparous, planktonic eggs & larvae

LITERATURE

Johnson 1984; Murdy et al.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown

LARVAE:

Pigmentation: Large stellate in U-shaped pattern on mid-hind brain; embedded in hind brain; generally 2 melanophores behind eye; over gut & generally 1 anteriorly on gut; embedded pair on hyoidal musculature opposite anterior gut pigment; generally distinct embedded pigment on gut at base of pectoral fin; 1-3 at base of dorsal fin; mainly 2 post dorsal midline; 3-8 at base of anal fin; 3-6 post anal midline; hypural plate; 1-2 ventral gut; 2-3 on isthmus.

Diagnostic Characters: Myomeres 24; short preanal length; weak preopercle spines; pigmentation.

*All larvae used in this description were collected at Beaufort Inlet, NC in June and November. The species are either *E. argenteus* or *E. gula*.

ILLUSTRATIONS

Top: Postflexion larva 11.8 mm SL Beaufort Inlet, NC. Either *E. argenteus* or *E. gula* (original, M. D. Greene)
Middle: Postflexion larva 9.5 mm SL Gulf of Mexico. Tentatively *E. lefroyi* (original, J. Javech)
Bottom: Postflexion larva 10.9 mm SL Bahamas, (original, W. Laroche)

GERREIDAE ***Eucinostomus* spp.**