

Summary Table of Red Grouper, (<u>Epinephelus morio</u>) life history for the Gulf of Mexico. Associations and interactions with environmental and habitat variables are listed with citations.												
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Eggs	Peaks in April-May	Offshore, over shelf	Hatch in 30 h at 24 C	Require at least 32 ppt for buoyancy; do not hatch at 25 ppt		Pelagic, planktonic						
Citation	11	11	17	17		10,11						
Larvae	Stage lasts 30-40 days after hatching	Offshore, over shelf	Optimum report at 27.4-28.5 C			Pelagic, planktonic	Zooplankton					
Citation	11,17	7,11	7			10,11	17					
Postlarvae (Pelagic Juveniles)	Stages lasts 35-50 days after hatching								Leave plankton to become benthic juveniles at about 20 mm SL			
Citation	17								1,17			
Early Juveniles (Benthic Juveniles)		Inshore	16.1-31.2	20-7-35.5 ppt	Low (3.9-4.7 mg/L) levels have caused mortality	Very shallow to about 15 m	Prey heavily upon demersal crustaceans	Larger fishes	Inshore seagrass beds and rock formations			
Citations		10,11	9	9	2	10,11	4,16	5	10,11			Red Grouper, (<u>Epinephelus morio</u>) cont.
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Late Juveniles		Move into deeper hard bottom areas as size increases				To about 50 m	Demersal crustaceans and fishes	Prey of larger demersal fishes	Inshore hard bottoms; seek shelter in crevices and other hiding places	Growth rate may be influenced by food availability and population density	Predation; catch and release mortality when caught from > 44 m	
Citation		10,11				10,11,20	10,16,19	5,10	10,11	8	5,8,20	

Adults	More abundant in fishery in summer months; move offshore in winter	Broad shelf areas of Gulf; centers of abundance are west Florida shelf and Campeche Bank	15-30 C; most common at 19-25			3-190 m; larger fish are found in deeper waters	Fishes, crustaceans and cephalopods. Proportion of fish in diet increases with size	Prey of top predators such as sharks and barracudas	Rocky outcrops, wrecks, reefs, ledges, crevices, and caverns of rocky bottom; "live bottom" areas	Growth rate may be influenced by fishing pressure, food availability and population density	Competition for food and shelter; predation; catch and release mortality when caught at deeper than 44 m; red tide; sudden decrease in temperature	
Citation	8,11,12	10,11,13	10,13			10,13	10,16	3,5,14	11,12,15	8	3,5,8,10,18	
Spawning Adults	Protogynous hermaphrodite; spawning occurs in April and May in Florida, Jan-Mar in southern Gulf	Offshore coastal waters	19-21 C	Eggs require at least 32 ppt for buoyancy		20-100						Population densities and environmental stress may influence sexual transition from female to male
Citation	6,7,11,19	6,11	10	17		6,10						8,11

Red Grouper Table References:

1. Beaumariage, D.S., and L.H. Bullock. 1976. Biological research on snappers and groupers as related to fishery management requirements. Fla. Sea Grant Program, Report no. 17:86-94.
2. Brule, T., D. Aldana Aranda, M. Sanchez Crespo, and T. Colas Marrufo. 1996. A preliminary study on the growth performance of juvenile red grouper reared in a recirculating-water system. *Prog. Fish. Cult.* 58:192-202.
3. Brule, T., and C. Deniel. 1994. Expose synoptique des donnees biologiques sur le merou rouge *Epinephelus morio* (Valenciennes, 1828) du Golfe du Mexique. *FAO Syn. Pech.* 155, 39 p.
4. Brule, T., and L.G. RodriguezCanche. 1993. Food habits of juvenile red grouper, *Epinephelus morio* (Valenciennes, 1828), from Campeche Bank, Yucatan, Mexico. *Bull. Mar. Sci.* 52(2):772-779.
5. Bullock, L.H., and G.B. Smith. 1991. Seabasses (Pisces: Serranidae). *Fla. Mar. Res. Inst. Mem. Hourglass Cruises* 8(2), 243 p.
6. Coleman, F.C., C.C. Koenig, and L.A. Collins. 1996. Reproductive styles of shallow-water groupers (Pisces: Serranidae) in the eastern Gulf of Mexico and the consequences of fishing spawning aggregations. *Environ. Biol. Fishes* 47:129-141.
7. Frias, M. del P. 1982. Distribucion larvaria de la cherna Americana *Epinephelus morio* (Valenciennes, 1828) (Pisces: Serranidae) en el Golfo de Mexico. *Rev. Cub. Inv. Pesq.* 7(4):26-39.
8. Goodyear, C.P., and M.J. Schirripa. 1991. The red grouper fishery of the Gulf of Mexico. *Natl. Mar. Fish. Serv., SEFC, Miami Lab. Contrib. no. MIA-90/91-86*, 80 p.
9. Hardy, J.D., Jr. 1978. Development of fishes of the Mid-Atlantic Bight: an atlas of egg, larval and juvenile stages. *U.S. Fish Wildl. Serv., Biol. Serv. Prog. FWS/OBS-78/12*, v. III:53-55.
10. Jory, D.E., and E.S. Iversen. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (south Florida): black, red, and nassau groupers. *U.S. Fish & Wildl. Serv., Biol. Rep.* 82(11.110), 21 p.
11. Moe, M.A., Jr. 1969. Biology of the red grouper, *Epinephelus morio* (Valenciennes) from the eastern Gulf of Mexico. *Fla. Dep. Nat. Resour., Mar. Res. Lab. Prof. Pap. Ser. no. 10*, 95 p.
12. Rivas, L.R. 1970. The red grouper of the Gulf of Mexico. *Comm. Fish. Rev.* 32(10):24-30.
13. Roe, R.B. 1976. Distribution of snappers and groupers in the Gulf of Mexico and Caribbean Sea as determined from exploratory fishing data. *Fla. Sea Grant Prog. Rep. no. 17:129-164*.
14. Springer, S. 1946. A collection of fishes from the stomachs of sharks taken off Salerno, Florida. *Copeia* 1946(3):174-175.
15. Stiles, T.C., and M.L. Burton. 1994. Age, growth, and mortality of red grouper, *Epinephelus morio*, from the southeastern United States. *Proc. Gulf Caribb. Fish. Inst.* 43:123-137.
16. Weaver, D.C. 1996. Feeding ecology and ecomorphology of three sea basses (Pisces: Serranidae) in the northeastern Gulf of Mexico. *M.S. Thesis, Univ. Florida, Gainesville*, 93 p.

17. Colin, P.L., C.C. Koenig, and W.A. Laroche. 1996. Development from egg to juvenile of the red grouper (*Epinephelus morio*) (Pisces: Serranidae) in the laboratory. p. 399-414 In: F. Arreguin-Sanchez, J.L. Munro, M.C. Balgos and D. Pauly (eds.), Biology, fisheries and culture of tropical groupers and snappers. ICLARM Conf. Proc. 48.
18. Wilson, R.R., Jr., and K.M. Burns. 1996. Potential survival of released groupers caught deeper than 40 m based on shipboard and in-situ observations, and tag-recapture data. Bull. Mar. Sci. 58(1):234-247.
19. Brule, T., and C. Deniel. 1996. Biological research on the red grouper (*Epinephelus morio*) from the southern Gulf of Mexico. p. 28-42 In: F. Arreguin-Sanchez, J.L. Munro, M.C. Balgos and D. Pauly (eds.), Biology, fisheries and culture of tropical groupers and snappers. ICLARM Conf. Proc. 48.
20. Johnson, A.G., M.S. Baker, Jr., and L.A. Collins. 1997. Preliminary examination of undersized grouper bycatch. Proc. Gulf Caribb. Fish. Inst. 49:161-172.