

Final Environmental Impact Statement

for the

Generic Essential Fish Habitat Amendment to the following fishery management plans of the Gulf of Mexico (GOM):

**SHRIMP FISHERY OF THE GULF OF MEXICO
RED DRUM FISHERY OF THE GULF OF MEXICO
REEF FISH FISHERY OF THE GULF OF MEXICO
STONE CRAB FISHERY OF THE GULF OF MEXICO
CORAL AND CORAL REEF FISHERY OF THE GULF OF MEXICO
SPINY LOBSTER FISHERY OF THE GULF OF MEXICO AND SOUTH ATLANTIC
COASTAL MIGRATORY PELAGIC RESOURCES OF THE GULF OF MEXICO AND
SOUTH ATLANTIC**



APPENDIX C

INFORMATION ON SPECIES DISTRIBUTION AND HABITAT ASSOCIATIONS

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Appendix C: Information on species distribution and habitat associations

This appendix contains all available information on species distributions and habitat associations in a series of tables provided by NOAA Fisheries South East Fisheries Science Center. Each table is followed by a list of scientific references specific to the information in the table. 21 of these tables were provided in the 1998 Generic Amendment. These and an additional 27 tables are provided here making a total of 48 species in six FMPs.

At the end of the tables, there is a list of the distribution and density maps available for these species from the 1998 Generic Amendment and as electronic files in pdf (portable document format), downloadable from the NMFS Galveston EFH web site at

http://galveston.ssp.nmfs.gov/efh/changes/default_new.htm#Abundance_maps

Red Drum FMP

Red Drum, (*Sciaenops ocellatus*) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Late summer thru early fall peak between late August and mid-October	Outside estuaries (carried into estuary on tides & currents)	20-30°C 25°C optimal	25-34ppt hatchery spawned eggs developed at salinities of 10-40ppt 25°C							Mortality may be high early in spawning season	
Citation	7,14,17,18,19,20	7,10,14,18,19,20	5,7,16,17,18	5,7,16,17,18,20							6,19	
Larvae	Mid-August thru late November	Open bays vegetated or unvegetated bottoms in estuaries, tidal flats, open bays	25°C optimal 18.3°C-31.0°C	16-36ppt 30ppt optimal less important after two weeks collected at 8-36.4 ppt in wild			Copepods (86% by vol.) nauplii	Spot and Atlantic Croaker (possible) Any larger piscivorous fish	Prefer vegetated muddy bottom when avail or soft or hard bottom un-vegetated with little or no current protected waters	0.5mm per day. Grow faster at 25-30°C than 20-24°C 3-6mm in 2 weeks	Higher mortality at 20-24°C than 25-30°C	
Citation	18,19	5,7,18,19	5,7,17,18,20	5,7,17,18,19,20			5,18,19	6,18	5	5,10,18,19	10	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Post Larvae	August-October	Shallow water, tidal flats and seagrass beds	25°C optimal up to 30°C 18.3°C-31.0°C	Collected in wild at 8-36.4ppt			Copepods	Any larger piscivorous fish	Sea grasses, wetlands, hard sand, mud bottoms with no current	Increase with increase in salinity (up to 30ppt) up to 25°C		
Citation	17	18,20	18,20	18			18	18	18,20	18,20		
Early Juveniles	Most abundant during early winter	Backwater, protected waters, tidal flats, primary and secondary bays, open water mud bottom	12.5-32.2°C, 2-33°C if change in temperature is gradual 2.0-34.9 °C prefer 10-30	Collected from 0-45ppt prefer 20-40ppt	Fry cannot survive in ponds with less than 0.6-1.8ppm dissolved oxygen	Depths up to 3.05m	Copepods Mysids Amphipods shrimp polychaetes insects fish Isopods bivalves decapod crabs	Any larger piscivorous fish	Grassy clumps or muddy bottoms avoid currents or shallow un-vegetated, bays.	Growth rates higher in backwater than in seagrass beds 15-20mm/month 18.8mm/month (average)	Rapid decline in water temp can cause mortality	
Citation	18,19	5,7,9,18,19,20	7,18,19	7,18,19	17	18	3,5,16,18,19	18	5	3,18,19	5	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Late Juveniles	Numerous in offshore waters in early to mid September and/or early October, least numerous in late August and late October to early November	Continental shelf and inshore waters	Temperatures within the upper 10-13m range from 27-29°C in August and September. October, 24-26°C early November 22-23°C prefer 10-30	Salinity within upper 10-13m range from 25-34ppt in August and September 28-34ppt in October. 32-35ppt in early November Collected 0-45ppt Prefer 20-40ppt	Reported from O ₂ concentrations of 5.2-8.4ppm	Slightly deeper waters than early juveniles	Mysids Amphipods shrimp polychaetes insects, crabs, fish	Amberjacks, Sharks and any larger piscivorous fish	Vegetated areas, shallow non-current inshore bays and bayous. Move into Gulf waters during cold winters	15mm-20mm/month	Any change in environment, disease, parasites	
Citation	3,5,7,11,12,16	9,12,16	7,18,19	7,18,19	18	18	3,4,16	17	15,16,17	1,3	12,17	
Adults		Continental shelf and inshore waters	Observed in 2 to 33°C. Moves into deep water when extreme temperatures occur	Abundant in 30 to 35ppt. Can tolerate up to 50ppt collected 0-45ppt prefer 20-40ppt		Commonly reported in depth from 40-70m. Typically in littoral and shallow nearshore waters	Crab, shrimp and fishes	Sharks	Bayous, bays near barrier islands, inshore marsh habitats. In habitats also occupied by Black Drum, Blue Runner and Little Tuna			
Citation		9,12	7,17	7,17		18	4,16,17	17,20	15,16,17			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	Spawning from about September through November peaks in Sept-Oct	Nearshore areas, close to channels, and passes. Spawning may occur over the nearshore continental shelf and nearshore gulf.	20-30°C. May continue spawning for 90 days or more	25-34ppt. Prefers 30ppt Spawning occurred in 1 study at 14.7-18.5ppt			Crab, shrimp and fishes	Sharks	Seagrass muddy or hard bottom areas. No current, protected areas	Growth occurs continuously		
Citation	2,15,20	2,9,10,16	7,10,16,17	7,16,17			17,20	17,20	15,17	1,3		

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Reef Fish FMP

Gray Triggerfish (*Balistes capriscus*) life history for the Gulf of Mexico.

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Late spring and summer	Pelagic or demersal: eggs in a nest prepared and guarded by the female and/or male. In sand near a natural or artificial reef head					Yolk sac	Wrasses; red snapper (<i>Lutjanus campechanus</i>)		Hatch in 48-55 hours	Wrasses (on video) take eggs from a gray triggerfish nest and from nests of other species of triggerfish. Red snapper (on video) take eggs from nests	
Citation	27	2,10,17,19,21						24,28		4,19	17,24,28	
Larvae							Initially yolk-sac		Pelagic plankton			
Citation							11		21			
Post Larvae						Upper water column		Tunas	Pelagic larvae associated with <i>Sargassum</i> spp. and other flotsam		Predation on the pelagic life stages by the above mentioned predators	
Citation								1	1,5,18		1	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Early Juveniles						Upper water column	Rely on the <i>Sargassum</i> complex for food (i.e., algae, hydroids, barnacles and polychaetes)	Tunas, blue marlin, dolphinfish, sailfish, and sharks	1st year; planktonic and associated with <i>Sargassum</i> spp. and other flotsam or found in mangrove estuaries		Predation on the pelagic life stages by the above mentioned predators	
Citation							5	1,6,7	1,5,18		1	
Late Juveniles						Upper water column	Rely on the <i>Sargassum</i> complex for food (i.e., algae, hydroids, barnacles and polychaetes)	Tunas, blue marlin, dolphinfish, sailfish, and sharks	Gray triggerfish up to 10 cm associated with <i>Sargassum</i> spp. and other flotsam or found in mangrove estuaries		Predation on the pelagic life stages by the above mentioned predators	
Citation							5	1,6,7	1,5,18		1	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults		Both natural and artificial reefs in waters greater than 10 m in depth on the continental shelf				Waters greater than 10 m	Natural reefs: bivalves dominant prey. Artificial reefs: barnacles dominant prey. Also polychaetes, decapod crabs, gastropods, sea stars, sea cucumbers, brittle stars, sea urchins, sand dollars	Greater amberjack, sharks, grouper	At 16-17 cm SL, colonize either natural or artificial hard bottom habitat in waters greater than 10 m	Rapid for the first year of life, then slows; relatively long lived	Predation by the above mentioned predators. Fully recruited into the recreational fishery by age 3 and into the commercial fishery by age 4	Reach sexual maturity at 2 years, but may mature at 1 year, 1.5 years or up to 3 yrs. (30 cm at first spawning). No evidence of sex change.
Citation		15,23				15,23	1,8,9,16,25,26	3,6,7	15,23,26		3,6,7	20,27
Spawning Adults	Late spring and summer	Both natural and artificial reefs in waters greater than 10 m on the continental shelf as adults				Greater than 10 m	Natural reefs: bivalves dominant prey. Artificial reefs: barnacles dominant prey. Also polychaetes, decapod crabs, gastropods, sea stars, sea cucumbers, brittle stars, sea urchins, sand dollars.	Greater amberjack, sharks, grouper	Both natural and artificial reefs in waters greater than 10 m as adults	See Growth for Adults	See Mortality for Adults	Fecundity estimates: 49,000 eggs for a 30 cm triggerfish, 66,000 eggs for a 41 cm triggerfish, and greater than 90,000 for a 56 cm fish
Citation	27	15,23					1,8,9,16,25,26	3,6,7	15,23			20

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Greater Amberjack (*Seriola dumerili*) life history for the Gulf of Mexico.

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs				Open Gulf Salinity: 30-35ppt						Hatching in 2 days		
Citation										16		
Larvae	Year-round for all <i>Seriola</i> spp. (not ID to species).	Assumed in offshore open waters	Most likely warm, summer temperatures	Open Gulf salinity 30-35ppt								
Citation	1,16	17	22	22								
Post Larvae	Summer	Pelagic, Offshore		Open Gulf salinity 30-35ppt								
Citation	22	15		22								
Juveniles	Summer-Fall	Often associated with "rip" lines and floating structures. Pelagic, offshore nearshore records		Open Gulf salinity (30+)		Pelagic, but no measurements	Invertebrates		Will seek out rip lines only floating plants. FL specimens found w/ <i>Sargassum</i> .			
Citation	22	16,22		22			22		14,18,20,22		2,8	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	Year round, not as common in colder seasons, suggestion of migration to warmer parts of GOM	Widespread over much of GOM	Becomes more scarce in N. GOM under 18-20°C in fall	Open Gulf Salinity (30+)		Widespread surface to several hundred m (few obs. suggest may go much deeper)	Top level predator - variety of fishes, crustaceans and cephalopods		Off Louisiana strongly associated with rig structures		Males shorter lifespan (to 7 yrs) than females (to 15yrs) GOM. Males shorter lifespan (to 8 than females (to 10) in S. GOM.	
Citation	5,22	4	22	22		19	4,22		22		5,22	
Spawning Adults	Little data. N. GOM spawning from May to July, may be as early as April based on histology	Offshore waters		Probably open Gulf Salinity 30-35ppt		Same as adults			Probably same as adults			
Citation	22	17,22							22			

No data available for environmental factors (Temp, Sal, Oxygen) predators, growth, mortality and production. Little or no data on spawning adults

Citations for the genus, Seriola (greater and lesser amberjack, almaco jack and banded rudderfish).

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16. Sanzo, L. 1933. Uova, larve e stadi giovanili di *Seriola dumerilli* Risso [in italian]. Mem. R. Com. Talassogr. Ital. 205. 12 pp.
17. Fahay, M.P. 1975. An annotated list of larval and juvenile fishes captured with surface-towed meter net in the South Atlantic Bight during four *RV Dolphin* cruises between May 1967 and February 1968. NOAA Tech. Rept. NMFS SSRF-685. 39 pp.
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Lesser Amberjack (*Seriola fasciata*) life history for the Gulf of Mexico.
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs												
Citation												
Larvae												
Citation												
Post Larvae												
Citation												
Juveniles	July N. GOM. Late summer-fall	Offshore							Small juveniles associated with floating <i>Sargassum</i>			
Citations	17,22	17,18,22							18			
Adults	Year round in N. GOM	Offshore				Near bottom to about 130m	Squid		Associated with rigs and irregular bottom in N. GOM	Females average slightly larger than males (408.8 vs 396.2m FL).	Longevity to 8yrs, few older than 6, males average slightly older than females	
Citations	22	s22				4	4		22	22	22	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	Sep-Dec Feb-Mar based on histology of ovaries	Offshore	Appears to be a cessation of spawning during coldest month (Dec-Jan) in N. GOM			Probably same as adults	Probably same as adults		Probably same as adults			
Citation	22	22	22			22	22		22			

No data available for environmental factors predators, growth, mortality (some for adults) or production.

References presented for lesser amberjack, of the genus *Seriola*, are identical for those listed after greater amberjack.

Almaco Jack (*Seriola rivoliana*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Spawning, perhaps spring through fall			Open Gulf Salinity 30-35ppt								
Citations	14,17			22								
Larvae												
Citations												
Post Larvae												
Citations												
Juveniles	Aug-Jan Jul-Oct	Open waters and barrier islands.							Use <i>Sargassum</i> as refuge			
Citations	17,22	22							5			
Adults	Warm seasons in N. Gulf but year-round in S. Gulf	Offshore rare in shallow waters, far offshore waters (further than other LA <i>Seriola</i>)					Fish		Often associated with rigs in N. GOM			
Citations	20,4,22	5,22					4		22			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	Possible spring-fall	N. GOM probably not an important spawning area										
Citations	14,17	22										

No data available for environmental factors (Temp, Sal, Oxygen) predators, growth, mortality, or production.

References presented for almaco jack, of the genus *Seriola*, are identical for those listed after greater amberjack.

Banded Rudderfish (*Seriola zonata*) 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												
Citations												
Larvae	All months except February, April, September, December	Gulf stream off FL, Biscayne Bay-FL, S&E GOM, Yucatan Channel										
Citations	1	1										
Post Larvae	Probably same as larvae											
Citations												
Juveniles	Nearly all year in GOM, small juveniles taken in April	Offshore waters							Also associated with jellyfish and drifting weeds w/ <i>Sargassum</i> and <i>Physalia</i>			
Citations	1,22	1							18,19			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	Present all year in E. GOM	Pelagic, but confined to coastal waters, not common in central N. GOM.				Pelagic to epibenthic	Fish and shrimp					
Citations	22	10,4,22				4	4					
Spawning Adults	Possibly continuous or two seasons: Winter-Spring and Fall	Offshore water in E. GOM: Yucatan Channel, Straits of Florida										
Citations	1	1										

No data available for environmental factors (Temp, Sal, Oxygen) predators, growth, mortality or production.

References presented for banded rudderfish, of the genus *Seriola*, are identical for those listed after greater amberjack.

Queen Snapper (*Etelis oculatus*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic, offshore										
Citations		3										
Larvae		Pelagic, offshore										
Citations		3										
Early Juveniles						May be found near surface						
Citations						1						
Late Juveniles												
Citations												
Adults		In Gulf, found in southern portion. More common in Caribbean, esp. in Antilles	Taken from waters of 16 to 18 °C			Generally found at 135 to 450 m; taken from 95 to 680 m	Small fishes, squid and crustaceans		Rocky bottoms and ledges	May reach 100 cm TL; longevity at least 30 yr.		
Citations		1, 4	2			1, 2	1		1, 3	5		

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	In St. Lucia, two spawning peaks occur, in March and August											
Citations	5, 6											

Queen Snapper References

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2. Roe, R. 1976. Distribution of snappers and groupers in the Gulf of Mexico and Caribbean Sea as determined from exploratory fishing data. Fla. Sea Grant Rep. 17:129-164.
3. Richards, W.J. 1999. Preliminary guide to the identification of the early life history stages of serranid fishes of the western central Atlantic. NOAA Tech. Memo. NMFS-SEFSC-419:29.
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Mutton Snapper (*Lutjanus analis*) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships			Habitat Associations and Interactions		
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Spaw ned in late spring or summer.	Presumably expelled at spawning aggregations on steep dropoffs near reef areas.										
Citations:	1,9	1										
Larvae	Presumably found in the plankton in early summer.	In shallow continental shelf waters.										
Citations:	6	6,7										
Post Larvae:	Presumably most abundant in early or mid-summer.	In shallow continental shelf waters										
Citations:	6	6,7										
Early Juveniles:	Recruit in summer	Shallow seagrass beds.							Recruit to shallow seagrass beds in late summer.			
Citations:	6,7	6,7							6,7			
Late Juveniles	Recruit in late summer	Shallow seagrass beds							Select shallow seagrass beds. Recruit in late summer			
Citations:	6,7	6,7							6,7			

Adults	Presumably are year round residents of their range - tag returns show little or no movement in Florida tagging	Occur in shallow grass beds, patch reefs, and deep barrier reefs and are most abundant off south Florida and in the Caribbean					Feeds on crustaceans, fishes and some gastropods. Dominance in the diet depends on local relative abundance.		Found in a variety of habitats from shallow grassbeds and patch reefs to deep barrier reefs.	Grow to at least 860 mm TL and 14 years of age. They are a relatively long-lived reef fish.		
Citations:	3,5	1,2					4		1	8		
Spawning Adults:	Found in late spring in south Florida and the Bahamas.	Reef areas with steep dropoffs especially in the Florida Keys and the Bahama Islands.							Spawn at steep dropoffs near reef areas that are visited repeatedly year after year by spawning aggregations.	Heavy fishing pressures exert much mortality while fish are aggregated for spawning.	Spawning aggregations were heavily fished and populations depleted.	
Citations:	1	1							1	1	1	

Mutton Snapper References

1. Domeier, M.L., C. Koenig and F. Coleman. 1996. Reproductive biology of the gray snapper (*Lutjanus griseus*) with notes on spawning for other Western Atlantic snappers (*Lutjanidae*). p. 189-201 In F. Arreguin-Sanchez, J.L. Munro, M.C. Balgos, and D. Pauly (eds.) *Biology and culture of tropical groupers and snappers*. ICLARM Conf. Proc. 48, 449 p.
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7. Springer, V.G. and A.J. McEarlen. 1962. A study of the behaviour of some tagged South Florida reef fishes. *Amer. Wildl. Nat.* 67: 386-397.
8. Mason, D.L. and C.S. Manooch, III. 1985. Age and growth of mutton snapper along the east coast of Florida. *Fisheries Research* 3 (1985) 93-104.

Schoolmaster Snapper (*Lutjanus apodus*) 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	
Egg		Pelagic										
Citations		3										
Larvae		Pelagic										
Citations		3										
Early Juveniles						Shallow habitats	Crustaceans		Shallow seagrass beds and mangrove habitats, and around jetties			
Citations						5, 8	10		8, 10, 12			
Late Juveniles						Shallow and offshore habitats. Move to deeper offshore habitat with growth.	Primarily fishes; also crustaceans		Shallow coastal waters; grass flats; may enter estuaries and mangrove habitats. Inshore and offshore rocky and coral reefs	In Puerto Rico, transition from mangrove to coral reef habitat occurred at 100-190 mm TL		

Citations						8, 10	10		1, 4, 5, 8, 10	10		
Adults		In Gulf, occur throughout in coastal waters; very common in Caribbean.	Taken at 21 to 28 °C; kept at 28.8 to 30 °C in culture experiments	Can tolerate estuarine conditions, very low salinities; kept at 35 to 36 ppt in culture experiments	Kept at 5.7 to 7 mg/L in culture experiments	Occur from shallow waters to about 90 m	Fishes, crustaceans and other invertebrates	Presumably sharks, groupers and barracuda	Found over various substrates; rock, vegetated sand, inshore and offshore reefs, esp. elkhorn coral, and mud; may enter mangrove swamps and tidal creeks.	Slow - growing; may reach 60 cm TL		
Citations		1	2, 11	5, 11, 12	11	2	1, 6, 10	12	1, 4, 5	11, 12		
Spawning Adults	Spawning peaks in April and August in Puerto Rico; spring and winter in Jamaica								Offshore reefs			
Citations	7, 9, 12								8			

Schoolmaster Snapper

1. Fischer, W. 1978. FAO species identification sheets, fishing area 31 (W. Cent. Atlantic), no. LUT Lut 14. FAO, Rome.
2. Roe, R. 1976. Distribution of snappers and groupers in the Gulf of Mexico and Caribbean Sea as determined from exploratory fishing data. Fla. Sea Grant Rep. 17:129-164.
3. Richards, W.J. 1999. Preliminary guide to the identification of the early life history stages of serranid fishes of the western central Atlantic. NOAA Tech. Memo. NMFS-SEFSC-419:29.
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5. 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. 3:129-131
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10. Rooker, J.R. 1995. Feeding ecology of the schoolmaster snapper, *Lutjanus apodus* (Walbaum), from southwestern Puerto Rico. Bull. Mar. Sci. 56(3):881-894.
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12. Thompson, R., and J.L. Munro. 1983. The biology, ecology and bionomics of the snappers, Lutjanidae. ICLARM Stud. Rev. 7:94-109.

Blackfin Snapper (*Lutjanus bucanella*) 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				
							Food	Predators	Selection	Growth	Mortality	Production	
Eggs	Present year round, especially after spring and fall spawning peaks.	In shelf edge waters over spawning areas.											
Citations:	3,4												
Larvae													
Citations:													
Post Larvae:													
Citations:													
Early Juveniles:	Abundant in spring in Virgin Islands, suggesting a seasonal migration in that area.	Inhabit hard bottom areas at shallower depths than adults.				Usually found at 12-40 m.			Select shallower hard bottom areas at 12-40 m.				
Citations:	6	2				2			2				
Late Juveniles	Abundant in spring in Virgin Islands, suggesting a seasonal migration in that area.	Inhabit hard bottom areas at shallower depths than adults.				Usually at 12-40 m.			Select shallower hard bottom areas at 12-40 m.				
Citations:	6	2				2			2				
Adults	No known migrations present year round.	Occupy shelf edge habitats from Hatteras to Caribbean and in the Gulf of Mexico.				Adults usually occur at from 40-300 m depths.	Feed on fish and crustaceans.			Select shelf edge habitats at from 40-300 m depths.			Never reported in significant numbers by commercial or recreational fishery.

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions				
							Food	Predators	Selection	Growth	Mortality	Production	
Citations:	6	1				2	2				1,2		5
Spawning Adults:	Spawn year round, with spring and fall peaks.	Presumably spawn in same shelf edge habitats normally occupied.				Adults usually occur at from 40-300 m depths.							
Citations:	3,4					2							

Blackfin Snapper References

1. Bohlke, J.E. and Chaplin, C.C.G. 1968. Fishes of the Bahamas and Adjacent Tropical Waters. Livingstone Publ. Co., Wynnewood, Penna., 771 p.
2. Nagelkerken, W.P. 1981. Distribution and ecology of the grouper (Serranidae) and snapper (Lutjanidae) of the Netherlands Antilles. *Found. Sci. Res. Surinam Neth. Antill.* 107, 71 p.
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6. Sylvester, J.R. 1974. A preliminary study of the length composition, distribution, and relative abundance of three species of deepwater snappers from the Virgin Islands. *J. Fish. Biol.* 6, 43-49.

Red Snapper, (*Lutjanus campechanus*) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Eggs are found after spawning in summer and fall in the Gulf of Mexico	Found offshore away from reefs				Eggs produced after spawning at depths of 18-37 m			Spawmed over firm sand bottom with little relief			
Citation	2,6	2				1			1			
Larvae	Collected July through November off Texas	Continental shelf waters	Taken at temperatures ranging from 17.3-29.7° C	Taken at salinities ranging from 32.8 to 37.5ppt		Taken at depths ranging from 17 to 183 m	Feed on alga and rotifers in captivity					
Citation	5	5	5	5		5	13					
Post Larvae	Collected July through November off Texas	Continental shelf waters	taken at temperatures ranging from 17.3 to 29.7° C	Taken at salinities ranging from 32.8 to 37.5ppt		Taken at depths ranging from 17 to 183 m						
Citation	5	5	5	5		5						

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Early Juveniles	Collected July through November off Texas	Continental shelf waters	Taken at temperatures ranging from 17.3 to 29.7° C	Taken at salinities ranging from 32.8 to 37.5ppt		Taken at depths ranging from 17 to 183 m	Small zooplanktons were the common prey of juveniles up to 150 mm FL		Most observed associated with structures, objects or small burrows, but some observed over barren bottom		Shrimp trawl bycatch is a significant source of mortality	
Citation	5	5	5	5		5	2		16		2,8	Red Snapper, (<u>Lutjanus campechanus</u>) cont.
Late Juveniles	Taken year round	Found on shrimp grounds off Texas in shallower water than adults				Found at 20-46 m depth	These fish are carnivorous, with most stomachs containing shrimp		Most observed associated with structures, objects or small burrows, but some observed over barren bottom		Shrimp trawl bycatch is a significant source of mortality	
Citation	12	2				10	3		16		2,8	

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	Taken year round	Larger concentration off Yucatan and Texas and Louisiana coast. Concentrated in relatively confined areas of hard limestone bottoms and irregular bottom formations	Taken from areas with bottom temps. ranging from 14 to 30° C	Taken at salinities ranging from 33 to 37ppt		Caught at depths from 7-146 m, and abundant at depths from 40-110 m	Carnivorous eating a large variety of prey including fish, shrimp, squid, octopus, crabs, etc	sharks are known to prey on red snapper	Common in submarine gullies and depressions, and over coral reefs, rock outcrops and gravel bottoms	Red snapper grow to 16 yrs of age and to a size of least 1,025 mm TL	Fishing mortality rates are greatly in excess of those consistent with a healthy spawning stock	Commercial harvest has declined from around 7 mil lbs. in the 1960s and 1970s to 2 to 3 million lbs. in the early 1990's.
Citation	12	3	10	10		10,4,14	2,3	2	9,15	11	7	7
Spawning Adults	Spawning occurs in summer and fall in the Gulf	Spawn offshore, away from reefs				Spawning reported at depths of 18-37 m			Spawning in reported over firm sand bottom with little relief			
Citation	2,6	2				1			1			

Red Snapper References

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Cubera Snapper (*Lutjanus cyanopterus*) life history for the Gulf of Mexico.

Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Presumably found in June and July as a result of spawning aggregations.	In open water off reefs and wrecks where spawning occurs.				Presumably found in the water column above spawning aggregations at 67-85 m depths off the Florida Keys.						
Citations:	1	1				1						
Larvae												
Citations:												
Post Larvae:												
Citations:												
Early Juveniles:		Found in shallow rivers, streams, canals, and seagrass beds.	Reported from temperature range of 24.5-31.0o C.	Reported from salinity range of 3.7-37 ppt.					Select shallow estuarine areas, mangrove, seagrass and lagoon habitats.			
Citations:		4,5,6,7	5	5					4,5,6,7			
Late Juveniles		Found in streams, canals, seagrass beds, mangrove areas, and lagoons.	Reported from temperature range of 24.5-31.0o C.	Reported from salinity range of 3.7-37 ppt.					Select shallow estuarine areas, mangrove, seagrass and lagoon habitats.			
Citations:		4,5,6,7	5	5					4,5,6,7			

Adults	Occurrence is very infrequent in Gulf of Mexico. First recorded in 1966.	Found on both shallow and deep reefs and in mangroves.		Occur in salinities down to nearly fresh water - one of few snappers that does this.		Range from shallow mangrove depths to offshore waters at least 85 m deep.	Feeds on fishes, shrimps, and crabs, and notably spiny lobster.	Probably few, would include sharks and man.	Select a wide range of habitats from mangroves to deep reefs and wrecks.			
Citations:	4	1		1		1	2,3		1			
Spawning Adults:	Found in spawning aggregations in the months of June and July.	Found off the Florida Keys on reefs and wrecks, and on reefs off Belize.				Spawning aggregations occur at 67-85 m depths off the Keys, and 10-30 m depths off Belize.			Spawning adults select wrecks and reefs where spawning aggregations have historically occurred.			
Citations:	1	1				1			1			

Cubera Snapper References

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Gray Snapper (*Lutjanus griseus*) life history for the Gulf of Mexico.

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Present after summer spawning, June thru September	Offshore shelf waters and near coral reefs		Hatched in vitro in salinity range of 32 to 36ppt								
Citation	5,23	23,18,13		16								
Larvae	Present April thru November, abundance peak June thru August	Offshore shelf waters and near coral reefs from Florida to Texas	Occur in temp. ranging from 15.6° C to 27.2° C				In vitro, fed on zooplankton in 73-110 mm range	Preyed upon by carnivorous fishes				
Citation	4	13	6				16	12				
Post Larvae		Move into estuarine habitats and seagrass beds					Copepods and amphipods are important food items	Preyed upon by carnivorous fishes	Found especially over dense seagrass beds of <i>Halodule</i> and <i>Syringodium</i>			
Citation		23,15,6					23	12	24,28,19			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Producti on
Early Juveniles		Found in estuarine habitats and seagrass beds	Found in temperatures ranging from 12.8° C to 36.0° C	In salinities ranging from 0-66.6ppt			Very small juveniles prey primarily on amphipods	Preyed upon by carnivorous fishes	Prefer <u>Thalassia</u> grass flats, marl bottoms, seagrass meadows and mangrove roots			
Citation		23,16,6	19,6,24	1,24,18,19			23	12	24,18,19			Gray Snapper, (<u>Lutjanus griseus</u>) cont.
Late Juveniles		Found in estuaries, channels, bayous, ponds, coastal marshes, mangrove swamps and freshwater creeks. Also may move to offshore habitats	Found in temps. ranging from 12.8° C to 36.0° C	In salinities ranging from 0-66.6ppt			Prey on crustaceans especially penaeid shrimp, crabs, fish, mollusks, and polychaetes	Preyed upon by carnivorous fishes	Prefer <u>Thalassia</u> grass flats, marl bottoms, seagrass meadows, and mangrove roots			
Citation		21,3	19,6,23	1,23,18,25			18,22	12	23,18,19			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults		They are marine, estuarine and riverine, occurring up to 32 km offshore and inshore as far as coastal plain freshwater creeks and rivers	Occur in water temps. from 13.4° C to 32.5° C	In salinities ranging from 0-47.7ppt		Reported from depths ranging from 0-180 m	Typically nocturnal predators on fish, shrimp and crabs		Occur on hard bottoms, soft bottoms, wharves & pilings, sand, rubble, rock, coral reefs and mud bottoms			
Citation		1,9,10,2	20,25	6,25		1,9,10,2	17,14,20,21,23,22,18,7,8		20,21,22,11			
Spawning Adults	Summer. Year round in S. Florida (Dec-Oct)	Offshore around reefs or shoals							Found offshore around reefs and shoals			
Citation	5,23,26	5,23							5,23			

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Dog Snapper (*Lutjanus jocu*) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic										
Citations		3										
Larvae		Pelagic										
Citations		3										
Early Juveniles		Coastal waters, estuaries; may enter rivers							Shallow water seagrass beds			
Citations		1							8			
Late Juveniles						Move to deeper waters with growth			Shallow water seagrass beds, in mangrove roots and around jetties and pilings			
Citations						10			10			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults		Throughout in coastal waters over continental and island shelves; esp. in Antilles				Taken in surveys from 9 to 151 m	Mostly fishes; also crustaceans and other invertebrates		Shallow vegetated areas to deep reefs; most commonly found on coral reefs; occupy a home range.	May reach 74 cm TL; common to 60 cm TL; may reach 21 yrs		
Citations		1				2	1, 6		1, 3, 4, 9	1, 3		
Spawning Adults	Spring; Feb - Mar in Jamaica; peaks in May in Puerto Rico					15 to 30 m			Reefs; form spawning aggregations	Mature at 30 to 40 cm TL		
Citations	3, 7, 10					5, 8			5, 8	3, 4		

Dog Snapper References

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Mahogany snapper (*Lutjanus mahogoni*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic										
Citations		3										
Larvae		Pelagic										
Citations		3										
Early Juveniles												
Citations												
Late Juveniles									Juveniles school with grunts			
Citations									2, 9			
Adults		Throughout Gulf, esp. around islands and in reef areas.		Relatively high salinities		Shallow, clear waters; 2 to 30 m	Primarily fishes, also crustaceans, and invertebrates. Feeds at night.		Most commonly found over rocky bottoms and reefs; less frequently on sandy and vegetated bottoms.	May reach 48 cm TL; common max size 26 to 38 cm TL		

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Citations		1		1		1, 5	2, 4, 6		1, 4, 8, 10	1, 9		
Spawning Adults	Spring and fall; multiple spawnings											
Citations	3											

Mahogany Snapper References

1. Fischer, W. 1978. FAO species identification sheets, fishing area 31 (W. Cent. Atlantic), no. LUT Lut 20. FAO, Rome.
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Lane Snapper, (*Lutjanus synagris*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Present after spawning between March to September with peak in July and August	Offshore on shelf										
Citation	9,3	9										
Larvae			Reared in captivity at 28°C				Have been reared on wild plankton and rotifers			Larvae fed a diet of wild plankton achieved the fastest growth. Growth at 25° C was slower than at 28° C.	At 25° C in captivity, all larvae were dead by Day 10	
Citation			2				2			2	2	
Post Larvae												
Citation												

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Early Juveniles	Observed in late summer or early fall	Found inshore		Often found in low (<15ppt) salinities		0-20 m	Feed on copepods, grass shrimp and other small invertebrates		Found in grass flats, back reefs and soft bottoms			
Citation	5	5		4		5,8	5		5			Lane Snapper, (<u><i>Lutjanus synagris</i></u>) cont.
							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Late Juveniles	Observed in late summer or early fall	Found inshore		Often found in low (<15ppt) salinities		0-20 m	Feed on copepods, grass shrimp and other small invertebrates		Found in grass flats, back reefs and soft bottoms			
Citation	5	5		4		5,8	5		5			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults		Found offshore	Collected at water temps. between 16° C and 29° C	Always found in high (>30ppt) salinities		Taken at depths of 4 to 132 m	Feed on fish, crustaceans, annelids, mollusks, and algae		Found on offshore sand bottoms, natural channels, banks and manmade reefs and structures	Grow to 17 yrs. of age and 673 mm TL. Males grow faster and were larger at age than females	Instantaneous total mortality ranged from 0.3750 to 0.5767. Natural mortality ranged from 0.1125 to 0.23888	
Citation		1	1	4		9	9		1	6	6	
Spawning Adults	Midsummer spawning period in Gulf of Mexico	Spawning evidently takes place some distance offshore										
Citation	5	7										

Lane Snapper References

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Silk Snapper (*Lutjanus vivanus*) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships			Habitat Associations and Interactions		
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Presumably occur throughout the year, with highest abundance in July-August.											
Citations:	1,2											
Larvae	Presumably occur throughout the year, with highest abundance in late summer.											
Citations:	1,2											
Post Larvae:	Presumably occur throughout the year.											
Citations:	1,2											
Early Juveniles:	Presumably occur throughout the year.	Found in shallower waters than adults in the Caribbean.				Taken in 30-40m depths in the Caribbean.			Select shallower water than adults.			
Citations:	1,2	4				4			4			
Late Juveniles		Specimens caught in shallower waters than adults in the Caribbean.				Taken in 30-40m depths in the Caribbean.	Feed on fishes, shrimps, and crabs.	Sharks, groupers, and barracuda are probably most important predators.	Select shallower waters than adults.			
Citations:		4				4	4	4	4			

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production
Adults		Near the edge of continental and island shelves, also in deep waters, usually ascending to shallower waters at night.				Common between 90 and 140m, also found in deeper waters over 200m.	Feed on fishes, shrimps, and crabs.	Sharks, groupers, and barracuda are probably most important predators.	Select habitats at edge of continental and island shelves, between 90 and 140 m.			
Citations:		3				3	4	4	3			
Spawning Adults:	Some spawning occurs throughout the year, with a spawning peak from July to August.						Feed on fishes, shrimps, and crabs.	Sharks, groupers, and barracuda are probably most important predators.				
Citations:	1,2						4	4				

Silk Snapper References

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3. Allen, G.R. 1985. FAO species catalog. Vol. 6. Snappers of the world. An annotated and illustrated catalog of lutjanid species known to date. *FAO Fish. Synop.*, (125) Vol. 6:208 p.
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Yellowtail Snapper, (*Ocyurus chrysurus*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Probably occur during reproductively active season from Feb to October- with 2 peaks Feb-Apr and Sept-Oct	Spawning takes place away from inshore areas										
Citation	1,7	1										
Larvae												
Post Larvae												
Early Juveniles		Found in shallow grass beds, around mangrove roots and amongst jetties and pilings	Preferred temperature is 24-30° C				Generally planktivorous, feeding primarily on zooplankton		Apparently select <u>Thalassia</u> grass beds and mangrove roots as preferred habitats			
Citation		7	8				1,7		7			
Late Juveniles		Inhabit shallow reef areas	Preferred temperature is 24-30° C				Generally planktivorous, feeding primarily on zooplankton		Apparently select shallow reef areas as primary habitat			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Citation		7	8				1,7		7			
Adults		Found on deeper reefs, considered a semi-pelagic wandered over the reef habitat	Taken between lower temperature limit of 18° C and maximum temperature of 34° C			Found from very shallow water to depths of less than 183 m. Generally taken in depths less than 50 m	Feed predominately on benthic and pelagic reef fishes, crustaceans and mollusks		Selects deeper reefs for its semi-pelagic lifestyle	Grow to 14 years of age in south Florida waters, and to 17 years of age in the Caribbean		
Citation		7,6	1,5			1,5	1,4		7,6	2,3		
Spawning Adults	Found from February to October, with 2 spawning peaks - Feb-Apr, and Sept-Oct	Spawning takes place away from inshore areas										Females with hydrated oocytes found May-Sept
Citation	1	1										9

Yellowtail Snapper References

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Wenchman (*Pristipomoides aquilonaris*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships			Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production	
Eggs	Presumably present in warmer months.	Mid to outer shelf waters.	Presumably at optimal temperature of 20o C.										
Citations:	1	4	3										
Larvae	Presumably warmer months.	Over shelf waters.											
Citations:	1	4											
Post Larvae:	Presumably warmer months.												
Citations:	1												
Early Juveniles:													
Citations:													
Late Juveniles													
Citations:													
Adults	Occurs year round, but highest densities occur in winter off Texas.	Hard bottom habitats of the mid to outer shelf	Bottom temperatures ranged from 13-28oC, but 20oC seemed to be optimal.			Found from 19 to 378m, but most abundant between 80 and 200m.	Feeds mainly on small fishes.		Selects hard bottom habitat of mid to outer shelf.				Species is of little economic importance to U.S. fisheries.
Citations:	4	4	3			3	2		4				3
Spawning Adults:	Warmer months presumably.	Deep slopes.	Presumably at optimal range of 20oC.			Presumably between 80 and 200m.							
Citations:	1	1	3			3							

Wenchman References

1. Richards, W.J., K.C. Lindeman, J.L.-Shultz, J.M. Leis, A. Ropke, M.E. Clarke and B.H. Comyns. 1994. Preliminary guide to the identification of the early life history stages of Lutjanid fishes of the western central Atlantic. NOAA Tech. Memo., SEFSC, 345.
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Blueline tilefish, *Caulolatilus microps*, life history for the Gulf of Mexico

Inference to goldface tilefish *Caulolatilus chrysops*, blackline tilefish, *Caulolatilus cyanops*, and anchor tilefish, *Caulolatilus intermedius* as members of the same guild, with similar life history and distribution. Information given is for *C. microps*, unless otherwise indicated.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp °C	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic, offshore										
Citations		7										
Larvae		Pelagic, offshore										
Citations		2, 7										
Early Juveniles												
Citations												
Late Juveniles												
Citations												
Adults		Found mainly on the eastern/south-eastern Gulf of Mexico and Campeche - Yucatan outer continental shelf, shelf edge and upper slope. <i>C. intermedius</i> most common in the northern and western gulf.	Most burrows found at 13.8 – 18°C			60 to 256 m; most burrows occur at 91-150 m.	Epibenthic browser; feeds primarily upon benthic invertebrates; also some demersal fishes. Fishes become a more important component of diet of larger <i>C. microps</i> .		Found over irregular bottom, troughs and terraces, sand, mud and rubble, shell hash. May be found associated with <i>C. cyanops</i> and <i>C. chrysops</i> ; and in the same habitat/ fish assemblage as <i>Epinephelus niveatus</i> , <i>E. nigritus</i> , <i>E. flavolimbatus</i> , <i>Pagrus pagrus</i> , <i>Lutjanus vivanus</i> and <i>Rhomboplites aurorubens</i> .	To 78 cm TL, 15 yr; males attain greater size and longevity than females. Growth most rapid in first 2 yrs of life.	Susceptible to fishing mortality. Overfishing may cause changes in stock structure	Populations susceptible to overfishing.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp °C	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
									Construct burrows in soft sediments; may also utilize existing holes and crevices.			
Citations		1, 2, 4	8			1, 2, 3, 8	1, 2, 3, 11		1, 3, 5, 8, 9, 10	1, 2, 4, 6	6, 11	6, 9
Spawning Adults	April–Oct off the Carolinas, peaking in May–June and Sept–Oct.									Females mature at 42 - 45 cm TL (ages IV–V); males at 50 cm TL, age V.		
Citations	7									7, 11		

Blueline Tilefish References

1. Fischer, W., (ed). FAO species identification sheets, fishing area 31 (W. Cent. Atlantic), BRAN Caulo. FAO, Rome.
2. Dooley, J.K. 1978. Systematics and biology of the tilefishes (Perciformes: Branchiostegidae and Malacanthidae), with descriptions of two new species. U.S. Dep. Commer. NOAA Tech. Rep. NMFS Circ 411, 78 p.
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Tilefish, (*Lopholatilus chamaeleonticeps*) 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	Late spring-summer	Near edge of continental shelf	Hatched in 40 h at 22.0-24.6 C in laboratory			Pelagic						
Citation	5,7,10	6,7	7			6						
Larvae	Summer	Offshore				Pelagic						
	7	7				6,7,13						
Early Juveniles (Pelagic Juveniles)						Pelagic to benthic; settle to bottom at 9.0-15.5mm SL						
						6						
Late Juveniles (Benthic Juveniles)							Larger tilefish and other fish species	Burrow and occupy simple vertical shafts in the substrate				
Citation							8	1				Tilefish, (<i>Lopholatilus chamaeleonticeps</i>) cont.
Adults		Outer continen	Usually found at			80-450m;	Predominately	Sharks and other	Dig and occupy		Due to long life, slow	Abundance strongly

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
		tal shelf	9-14.4C; may occur up to 18 C; high catches have been reported at 13.0-14.4C			more common at >110 in Atlantic and >250 in Gulf Mexico	crustaceans; also fishes and other benthic organisms	tilefish; also compete for food and habitat with other demersal fishes	burrows along Outer Continental Shelf and on flanks of submarine canyons in malleable clay substrate		growth, complex breeding system, and habitat specificity, are vulnerable to over-exploitation. Susceptible to mass mortality events due to cold water intrusion	correlated with presence of silt-clay substrate. Fishery experiences cycles of abundance and depletions. Burrow areas are sites of local abundances of crustaceans and fishes
Citation		13	2,3,8,13			1,2,4,8,9	4,8	1,8	1,2,9,13		3,8,12,13	1,2,4,8,9,11,13
Spawning Adults	Spawn from March to November; peak spawning from May to September in Mid-Atlantic Bight, April to June in South Atlantic Bight									Males grow faster and reach larger size than females; fishing pressure may cause males to spawn at smaller sizes		
Citation	5,8,10									10,13		

Tilefish References

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Rock Hind (*Epinephelus adscensionis*) 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	
Egg		Pelagic, offshore										
Citations		8										
Larvae		Pelagic, offshore										
Citations		8, 13										
Early Juveniles						Very shallow waters						
Citations						13						
Late Juveniles												
Citations												
Adults		Through-out western central Atlantic in shallow hard bottom habitats.	Very few observations; recorded from 13 to 23 °C			2 to 100 m ; large adults more common in deeper waters (50-100 m); usually captured in waters >30 m off W. Florida Shelf	Crustaceans, esp. crabs; fishes		Shallow rocky reefs; rock piles, oil well rigs. High profileBst eep crevices and ledges	May attain length of 60 cm. Grow faster and are shorter-lived than most other groupers	Vulnerable to fishing pressure	A minor component of the grouper fishery. Production affected by fishing pressure.
Citations		2, 10	7			2, 3, 9	1, 2		2, 4	2, 5, 12	6, 11	3, 5, 6
Spawning	Jan. to									Protogy	Form	Vulnerable

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	June in Florida Middle Grounds									nous hermaphrodites; females mature at 25 cm SL	spawning aggregations which are heavily fished.	to fishing pressure.
Citations	3									2, 5	5	5, 6, 11

Rock Hind References

1. Randall, J.E. 1967. Food habits of reef fishes of the West Indies. *Stud. Trop. Oceanogr. Miami* 5: 665-847.
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Speckled Hind (*Epinephelus drummondhayi*) 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	
Egg		Pelagic, offshore										
Citations		8										
Larvae		Pelagic, offshore										
Citations		8										
Early Juveniles						Young more commonly found in shallower portion of depth range						
Citations						1						
Late Juveniles						Young more commonly found in shallower portion of depth range						
Citations						1						
Adults		North and eastern Gulf of Mexico, offshore hard bottom habitats.	Few records; taken from waters 17 to 24 ? C			25 to 183 m; most common at 60-120 m	Feed on a variety of fishes, invertebrates and cephalopods. Considered to be an apex predator on midshelf reefs.		Offshore rocky bottoms; both high and low profile hard bottoms	Maximum size attained slowly; recruitment age 6-7 yrs.	Fishing pressure causes rapid and marked changes in age structure. Vulnerable to overfishing.	Low productivity; Populations impacted by fishing pressure. Steady and drastic decline in abundance

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
											Official status: Candidate list, U.S.; Status by DPS*: Endangered	
Citations		2, 3, 8, 11	7			1, 2, 3	2, 3, 9		2, 10	6	6, 9, 11	2, 9, 11
Spawning Adults	April-May; July to September					Spawning occurs in deeper portion of depth range (>146 m); shelf edge habitat				Females mature at 45-60 cm TL, 4-5 yrs; protogynous hermaphrodites Bfemales transition into males at ages 7-14.	Fishing mortality affects sex ratio and spawning biomass; males rare.	A large female may produce up to 2 million eggs in one spawning
Citations	2, 4					4, 5				2, 4	6, 9, 11	2

* Distinct Population Segments, as defined by the U.S. Fish & Wildlife Service and the National Marine Fisheries Service

Speckled Hind References

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Yellowedge grouper, (*Epinephelus flavolimbatus*) 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	
Egg		pelagic, offshore										
Citations		9										
Larvae		pelagic, offshore										
Citations		9										
Early Juveniles						Occur in the shallower portions of depth range						
Citations						3, 11						
Late Juveniles						Occur in the shallower portions of depth range			Rocky bottoms; 30-50 cm TL individuals observed utilizing burrows			
Citations						3, 11			12			
Adults		Through-out Gulf continental shelf. Areas of abundance off of Texas and W. Florida		Taken from waters of 11 to 25 ? C; 12 to 13 ? common in deepwater habitat		Occur from 35 to 370 m; adults most common at >180 m depths	Major diet component brachyuran crabs; also fishes and other invertebrates		Outer continental shelf; high relief hard bottoms; rocky outcroppings; often found co-occur with snowy grouper	Long-lived(over 20 yrs); slow - growing.	Susceptible to overfishing. Status by DPS*: Endangered in U.S. Atlantic; status in Gulf uncertain	May be limited by availability of rocky outcrop bottom habitat; probable low productivity

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
									and tilefish; known to inhabit burrows			
Citations		1, 5, 6		4, 12		1, 3, 4	6, 13		2, 8, 12	8, 9, 10, 11, 13	8, 10, 11, 14	6, 13, 14
Spawning Adults	Peaks May - Sept.									Protogynous hermaphrodites; females mature at 52-60 cm TL; transition to males occurs at 75- 82 cm TL		Form local spawning aggregations
Citations	7, 11									7, 9, 11		14

* Distinct Population Segments, as defined by the U.S. Fish & Wildlife Service and the National Marine Fisheries Service

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Red hind (*Epinephelus guttatus*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic	Hatch in lab in 27 h at 26.5 °C; 31 h at 25.5 °C									
Citations		16, 18	12									
Larvae		Pelagic; settle and develop in shallow inshore areas.										
Citations		6, 16, 18										
Early Juvenile		Inshore				2 to 10 m			Patch reefs; coral and limestone rock; cryptic			
Citations		1, 18				1, 19			1, 19			
Late Juveniles						Move to greater depths with growth			Patch reefs; coral and limestone rock; cryptic			
Citations						1			1, 19			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults		In Gulf, most abundant in south-eastern reef areas.	19 to 29 ? C			18 to 110 m; inshore populations mostly female	Crustaceans, esp. brachyuran crabs; fishes and other invertebrates	Preyed upon by larger reef fishes such as groupers, snappers and sharks.	Reefs; stony coral; seek holes and crevices; sandy bottoms with isolated coral patches; low-relief habitats	Maximum size ~70 cm; common to 40 cm. Faster growing and shorter-lived than most serranids in Gulf of Mexico..	Vulnerable to fishing pressure. Overfishing has negative effect upon size and structure of stocks.	Limited by available habitat and food. Dependent upon high rate of adult survivorship.
Citations		1, 2				1, 10, 14	1, 7, 15, 20	1	1, 3, 8, 21	2, 9, 13	9, 17, 18	1, 18
Spawning Adults	May - July in Bermuda; Jan-Feb. in Puerto Rico; late spring and summer in Florida Middle Grounds		20 - 28 ? C in Bermuda			18 to 27 m			Seaward side of submerged ridges. Form spawning aggregations. Known to return to same spawning site.	Protogynous hermaphrodite; age at sexual maturity 3 yrs.; 50% are mature at 21.5 cm; sex change to male may occur at 28 cm	Aggregations vulnerable to overfishing .	Seasonal closures of spawning sites and the use of marine protected areas may improve production and sex ratio.
Citations	1, 11, 12, 14	1	1			1			1, 5	1, 11, 13, 20	5, 11, 17	5, 17

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Goliath grouper, (*Epinephelus itajara*) 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	Late summer, early fall	Offshore				Pelagic						
Citation	1	2				13						
Larvae	Late summer, early fall					Pelagic						
Citation	1					13						
Post Larvae	Sept	Puerto Rico							Mangroves			
Citation	5	5										
Early Juveniles	Nov-Jan	Bays (Tampa Bay)		Usually found >25ppt. occasionally in low - salinity waters			Crustaceans		In bays and estuaries, inshore grassbeds, canals, mangrove, swamps			
Citation	2	1,2		7,8,11			2,8		2,6,16			Jewfish, (<i>Epinephelus itajara</i>) cont.
Late Juveniles		Gulf of Mexico, Caribbean, SW FL				2-3m	Bluecrabs, Crustacean		Inshore around ledges, seagrass beds, mangrove, swamps, shallower reefs and holes			

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation	2	2				2,15			1,2,15,16			
Adults		Gulf of Mexico especially SW Florida and Campeche Banks	Taken from 20-25 C Cultured at 24.7 C sensitive to low temp.	>25ppt	Tolerates relatively low oxygen. Cultured at 4.8-9.3 mg/L	Shallow waters to 95m mainly at 2-55m	Mainly crustaceans ; (especially lobsters). Fish, and mollusks (cephalopods)		Inshore around docks, bridges and jetties, reef crevices. Large adults prefer offshore ledges and wrecks	L = 200cm K = 0.13/yr t ₀ = 0.49 Growth rate is slow. Reach maximum biomass at older ages	Z = 0.85 F = 0.70 M = 0.15 Highly vulnerable to overfishing due to slow growth rate and spawning aggregations	
Citation		2,11	10,16,18	11	2,18	1,3,10	2,6,14,18		1,2,12,14	1	1,2,12,17	
Spawning Adults Possibly protogynous hermaphrodites	June-Dec with peaks during Jul-Sept	Gulf of Mexico SE & SW FL. Form spawning aggregations of 10-150 individuals	25-26°C	Seawater = 30-35ppt	Seawater	Spawning aggregations reported 36-46m			Offshore structures; wrecks, patch reefs			
Citation	1,4,16	1,4	1,4	1,4	1,4	1,2,4			2,4			

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Red Grouper, (*Epinephelus morio*) 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					
Post larvae (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, (<i>Epinephelus morio</i>) cont.
Late Juveniles		Move into deeper				To about 50 m	Demersal crustaceans	Prey of larger	Inshore hard bottoms;	Growth rate may	Predation; catch and	

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
		hard bottom areas is size increases					and fishes	dermsal fishes	seek shelter in crevices and other hiding places	be influenced by food availability and population density	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	Proto-gynous 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

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Warsaw Grouper (*Epinephelus nigritus*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic, offshore										
Citations		4, 6										
Larvae		Pelagic, offshore										
Citations		4, 6										
Early Juveniles				Recorded at 29 ppt		Shallow; nearshore, may enter bays						
Citations				9		8, 9, 11						
Late Juveniles						Move offshore with growth; 20-30 m			Shallow water reefs and jetties			
Citations						9			2			
Adults	Through-out Gulf of Mexico, in deep waters of shelf.		Collected at 12 to 25 ? C			Occur from 40 to 525 m; more common to 250 m	Crabs, shrimp, lobsters, and fish		Rough, rocky bottoms; high profile--steep cliffs and rocky ledges	Long-lived, slow growing; may reach 41 yr; 230 cm; 200 kg; over-fishing affects size structure	Vulnerable to overfishing; Official Status: Candidate List, US. Status by DPS*: endangered, rare	Very low productivity
Citations	1		3, 9			1, 2, 6, 9, 10, 11, 13	2		2, 5, 6, 10	2, 6, 7, 10	7, 12	7, 12

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	Probably late summer									Protogynous hermaphrodite; age at maturity, 9 yr		
Citations	5									6, 7		

* DPS= Distinct Population Segments (US Fish & Wildlife; Natl. Mar. Fish. Serv.)

Warsaw Grouper References

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Snowy Grouper (*Epinephelus niveatus*), 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg		Pelagic, offshore										
Citations		4										
Larvae	Taken in June and October off west coast of Florida	Pelagic, offshore; currents believed to transport over long distances	Taken at 28 ? C off west coast of Florida	Taken at 37 ppt off west coast of Florida								
Citations	6	4, 9	6	6								
Early Juveniles		Inshore				Near shoreline; as shallow as 1 m			Benthic, shallow - water inshore reefs			
Citations		2, 4				7			9			
Late Juveniles		Inshore; move offshore with growth	15 to 29 ? C off of Carolinas			Captured from 17 - 60 m; move to deeper waters with growth	Fishes, gastropods, cephalopods and other invertebrates.				Trawls operating at 25-45 m may impact juvenile survival	
Citations		2, 4	10			7, 10	5				9	
Adults	In Gulf, found in largest numbers in deep		Samples taken from 12 to 26 ? C			Occur from 30 to 525 m; most common	Fishes, crabs and other crustaceans, cephalopods and		Rocky bottoms, well offshore; boulders	Max. age 27 yr; max size 120 cm, 30 kg.	Long-lived, slow - growing; vulner-able to fishing	Over-fishing causes marked impacts to

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
	waters off of South Florida and north-western coast of Cuba					at 100 to 200 m	gastropods.		and ridges; relief up to 10 m, interspersed with sand, shell, and rock fragments; common on Florida Oculina reefs; often found with yellowedge grouper and tilefishes;	Recruit to fishery at 8 yr.	pressure. Status by DPS*: Vulnerable; U.S. populations severely depleted.	size/ age structure and exploitable biomass
Citations	1, 2		3, 8			2	2, 5		2, 7, 8, 10	2, 9	9, 11, 12, 14	11, 12, 13
Spawning Adults	April - July off Florida Keys; May - Aug. off of west Florida;									Protogynous hermaphrodites; females mature at 4 - 5 yr, 40 - 50 cm; 40% of fish aged 8 yr and older (70 cm) are male.	Overfishing causes sex ratio imbalance B decrease in number of males in population	
Citations	4, 7, 9									2, 4, 9	13, 14	

* Distinct Population Segments

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Nassau Grouper (*Epinephelus striatus*) 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			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Eggs	December-January		25°C 28°C				Yolk Sac			Hatch 23-40hrs after fertilization		
Citation	27,33,34		19							19,2		
Larvae	January-February	Not Offshore 0.8 - 16km off islands planktonic	23°C	36 ppt		2-50m	Yolk sac. Begin feeding @ 60hr.			Eggs to larvae transition @ 6-7 weeks @ 1.7-1.8mm NL		Duration: 42 days (Bahamas)
Citation	9,27,33	8,2,9,19	34	34		9	21,19			20,19		34
Post Larvae	January-March		23°	336 ppt			Copepods (Calanoid and poecilostomatoid). Decapod larvae					
Citation	27,33		34	34			31,32					
Early Juveniles (35mm-150mm TL).	February-August	See selection	22-33°	34-40 ppt		Shallow	Dino-flagelates, fish larvae, mysids. Gammaride an amphipods harpacticoid		Seagrass beds Macro-algal mats (early). Tilefish mounds,	Mean daily growth = 0.25mm (Bahamas) (60-70mm TL).		

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
							copepods		small coral clumps.			
Citation	29		32,34	32,34		10,29	23,32		10,28,29,32	34		Nassau Grouper, (<u>Epinephelus striatus</u>) cont.
Late Juveniles (15-30cm TL)	Aug		22-33	34-40ppt			Crustaceans (lobster, crabs). At 20-25cm TL are piscivorous		Grass beds and move to offshore reefs (30-35cm TL)			
Citation	29		32,34	32,34			17,30,32		10,30,32			
Adults						Larger fish deeper than smaller fish 0-100m	Not specialized. Forage over reefs Crustaceans and fish	Sharks, barracuda	Reefs and crevice caves	Max size: 25kg 120cm TL 9-16yrs Lt=97.4. Rapid growth until sexual maturity, then slower	Z=0.55 F=0.37	Sexual maturity @ 400-450mm. Maybe protogynous hermaphrodites
Citation						14,15	22,17	7	11,12,13,29,30	13,14,7,25,26	26,27	6,16,2
Spawning Adults	Dec - Feb Full moon	Aggregations	25-26°C			Bahamas: 18-38m Belize: 27-40m Bermuda 33-37m Cayman			Soft corals, sponges, stony, corals, sand			4-5 eggs/mg ripe ovary

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
						Islands: 25-30m Virgin Islands: 20-50m						
Citation	2,18,13	1,2,3,4,5,6,7	18,13, 2			1,2,3,4,5, 6,7			1,2,4			13,18,7

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Black Grouper (*Mycteroperca bonaci*) 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	
Egg		Pelagic, offshore										
Citations		4										
Larvae		Pelagic, offshore										
Citations		4										
Early Juveniles		May enter estuaries	Taken at Jupiter inlet, FL at 31 ? C	Taken at Jupiter Inlet, FL at 35.5 ppt		Shallow waters	Primarily crustaceans		May inhabit shallow grass flats.			
Citations		5	12	12		5, 11	5		13			
Late Juveniles						Individuals smaller than 65 cm usually found in shallow waters; move to deeper waters with growth	Primarily crustaceans		Shallow water reefs and rocky bottoms; patch reefs; may also be found over muddy bottoms of mangrove lagoons			
Citations						1, 11, 13	2, 5		5, 13, 16			
Adults		In Gulf of Mexico, primarily	Taken from 16 to 28 ?			10 to 150 m; usually found at	Primarily fishes	Presumably preyed upon by sharks	Rocky bottoms coral	Growth rapid in first 3-4	Populations vulnerable to	Populations at risk due to low

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
		found in the Florida Keys, west Florida shelf, and Campeche Bank.	C			depths > 20 m		and larger groupers	reefs; irregular bottoms, ledges; high-to-moderate relief habitat.	yr; females may reach 135 cm; males 152 cm TL; max age >30.	overfishing. Status by DPS*: Vulnerable; now uncommon in areas where once abundant.	productivity
Citations		1, 2, 3, 13	3			1, 2, 3	2, 5, 9	13	2, 5, 11	2, 5, 7, 10	6	6
Spawning Adults	Ripe females were found in May on Campeche Banks;					Spawning aggregation in Florida Keys observed at 18 to 28 m				Protogynous; 50% of females mature at 83 cm and 5 yr; 50% of	Spawning aggregations vulnerable to overfishing; fishing may cause	
Citations	5, 8, 10, 15					14				10	6, 10, 14	

* DPS= Distinct Population Segments (US Fish & Wildlife; Natl. Mar. Fish. Serv.)

Black Grouper References

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Yellowmouth Grouper (*Mycteroperca interstitialis*) 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	
Egg		Pelagic, offshore										
Citations		3										
Larvae		Pelagic, offshore										
Citations		3, 13										
Early Juveniles						Shallow water			Commonly occur in mangrove-lined lagoons			
Citations						5			1			
Late Juveniles						Shallow water, 18 to 24 m	Primarily fishes		Commonly occur in mangrove-lined lagoons			
Citations						13	7		1			
Adults	In the Gulf of Mexico occur off of Campeche Banks, west coast of Florida, Texas Flower Garden Banks, and northwest coast of Cuba.		19 to 24 ? C			20 to 189 m; generally taken inshore (<100m) along with red and gag grouper	Primarily fishes; also crustaceans and other invertebrates	Sharks and other large fishes	Rocky bottoms and coral reefs.	Relatively long-lived and slow growing; fastest growth takes place in first 2 yr.; may reach 41 yr, 83 cm TL	Vulnerable to overfishing; Status by DPS*: Vulnerable	Uncommon; low productivity

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Citations	1, 4		2			2, 3, 12	4, 7, 9	11	1, 2, 4	7, 10	5, 7	5
Spawning Adults	Primarily spring and summer; throughout year, with peak in April and May off of west coast of Florida									Protogynous; females mature at 400-450 mmTL, age 2-4. Transition to male at 505-643 mm, age 5-14		
Citations	4, 7, 8									7		

* DPS= Distinct Population Segments (US Fish & Wildlife; Natl. Mar. Fish. Serv.)

Yellowmouth Grouper References

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Gag (*Mycteroperca microlepis*) 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	
Egg	Dec-Apr	Offshore; area of abundance: west Florida shelf	Hatch in 45h at 21.0 C			Pelagic						
Citation	4,5,9,13	13,24	19			7						
Larvae	Early Spring; stage lasts 40-50 days	Larvae move inshore				Pelagic						
Citation	13,24	21				13,19						
Post larvae (Pelagic Juveniles)	Recruit to seagrass beds in April-May	Move through inlets into coastal lagoons and high-salinity estuaries							Move into estuaries, settling into seagrass beds			Successful larval transport into estuaries dependent upon oceanographic conditions
Citation	21	10,21							10,13,21			10
Early Juveniles (Benthic Juveniles)	Late spring to early fall	Spend 3-5 months inshore and estuarine habitats	Collected at 22-32 C	Collected at 25.9 - 35.5 ppt		Very shallow to 12 m; most common <5m	Pre-dominately crustaceans, such as amphipods, copepods, and grass shrimp	Survival near 100% in seagrass beds	Seagrass beds in sheltered bays, lagoons, coastal grass flats and oyster beds. Move to offshore in fall to shallow	Grow rapidly during association with seagrass beds		Availability of estuarine habitat critical to survival and growth

Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation	1,2,13,21,2,4	13,21,24	13,21	3,13		6,7,24	2,13,21,23	28	reef habitat 1,6,13,21,24	21		10Gag (<u>Mycteroperca microlepis</u>) cont.
Late Juveniles	Recruit to offshore reefs in fall		22-32C	28.8-37.6ppt		1-50m	Primarily decapod crustaceans and fishes	Cannibalistic; also larger fishes. Survival near 100% in seagrass beds	Inshore seagrass beds and rock piles; move into deeper hard bottom habitats as size increases		Small gag vulnerable to recreational fishery; also are part of shrimp fishery bycatch	
Citation	13,21		3,13	3,11,13		2,26	2,15,21,23	24, 28	2,7,21		2,26	
Adults	More common in fishery in northeast gulf in summer; winter in southeast	Most common eastern Gulf of Mexico, especially west Florida shelf	14-24 C		A mean DO of 6.6 mg/L was used in culture experiments	20-100 m; larger fish occur at greater depths	Mainly fishes; also crustaceans and cephalopods	Top predators such as sharks	Hard bottom; offshore reefs and wrecks; coral and live bottoms; depressions and ledges	Growth rate greater in 1991 than in 1979-1980	Vulnerable to sudden low temperatures; fishing mortality	
Citation	22,24	20,24	20		18	2,9,13,20	2,6,15,16,23	2	2,6,13	29	2	
Spawning Adults	Protogynous hermaphrodites; spawn Dec-Apr with peak in early spring (Mar-Apr) on west	Offshore; major spawning area on west Florida shelf	Spawning induced at 21-30C in culture experiments	Min. of 30 ppt was used in culture experiments		50-120m			Major spawning habitat on west Florida shelf. Form spawning aggregations		Spawning aggregations vulnerable to fishery; fishing may cause reduction of proportion of males in population and a	Annual fecundity estimated at 0.065 to 61.4 million

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
	Florida shelf										decrease in size at transition from female to male	
Citation	4,5,9,13,14,25	2,4,25	18,19	18		4,8,25			25		4,25	27

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Scamp, (*Mycteroperca phenax*) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection.	Growth	Mortality	Production
Eggs	Spring	Offshore				Pelagic						
Citation	1	1				9						
Larvae	Spring	Offshore				Pelagic						
Citation	1	1				9						
Early and Late Juveniles						About 12 to 33 m			Inshore hard bottoms and reefs			
Citation						11			5,11			
Adults		Widely distributed on shelf areas of Gulf, especially off of Florida	14-28 C			12-189m; most are captured at 40-80 m	Predominately fishes; also crustaceans and cephalopods	Sharks and other large fishes	Ledges and high-relief hard bottoms; prefer complex structures such as <i>Oculina</i> coral reefs	Reach maximum size slowly	Catch and release mortality reported for scamp taken from depths greater than 44 m. Repopulation of overfished sites is slow	
Citation		1,3,5	8			1,8	1,7	5	1,4,5	7	6,10	Scamp, (<i>Mycteroperca phenax</i>) cont.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection.	Growth	Mortality	Production
Spawning Adults	Protogynous hermaphrodite; spawn from late Feb. to early June in Gulf; April-Aug. in South Atlantic Bight		Absent from spawning grounds below 8.6 C; most spawning activity occurs above 16.4 C			60-100 m			Prefer to spawn at shelf edge habitat of maximum complexity; <u>Oculina</u> formations a key spawning habitat		Fishing pressure may reduce proportion of males in population	Availability of shelf edge, especially <u>Oculina</u> , habitat may be important factor
Citation	1,2,7		4			2,4			4		2	4

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Yellowfin Grouper (*Mycteroperca venenosa*) 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	
Egg												
Citations												
Larvae												
Citations												
Early Juveniles						Shoreline, 2 to 4 m			Shallow seagrass beds			
Citations						5, 7			2, 5, 7			
Late Juveniles									Shallow seagrass beds; move to deeper rocky bottoms with growth			
Citations									2, 5, 6, 7			
Adults		Not common in gulf; occurs primarily in the southern Gulf and West Indies	Taken from waters 15 to 26? C			Shoreline to mid-shelf depths; 2 to 137 m; may occur as deep as 214 m; occur at >30 m in eastern	Primarily fishes; also squid and shrimp; able to capture swift-moving fishes	Presumably sharks	Rocky bottoms and coral reefs; prefer reef ridge and high-relief spur and groove reef	May reach 90 cm TL	Vulnerable to fishing pressure	Vulnerable to fishing pressure

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
						Gulf						
Citations		1, 2, 4, 5, 10	3			1, 2, 3, 5	4, 5	5, 7	2, 6	7	8	11
Spawning Adults	March to August in eastern Gulf; Feb. to April in Jamaica ; winter and spring off of Cuba									Protogynous; Sex change may occur at 65 c. Females mature at 51 cm; smallest males found at 54 cm.	Fishing mortality may affect sex ratios.	Fishing spawning aggregations may affect production.
Citations	2, 5, 7, 9									2, 5, 7, 9	11	12

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Coastal Migratory Pelagic FMP

King Mackerel, (*Scomberomorus cavalla*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Egg	Spring and Summer	Offshore	Hatch in 18-21h at 27C			Pelagic; over depths of 35-180m						
Citations	4,9,18	17,18	17			17,18						
Larvae	May through October	Middle and outer continental shelf area of abundance north-central and north-western Gulf of Mexico	20-31C	27-37ppt		35-180m; may descend to mid-depths during day	Larval fish, especially carangids, clupeids and engraulids	Source of food for young pelagic fishes such as tunas and dolphin		Enhanced growth in northcentral and northwestern Gulf associated with Mississippi River plume	Vulnerable to predation and starvation	Area of Abundance in northcentral and northwestern Gulf has been associated with the Mississippi River plume
Citations	4,9,18	4,13,18	9,18	9,18		9,18	11	12		8,13	14	13

Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Early Juveniles	May through October, peaking in July and October	Inshore to middle shelf; area of abundance north-central and northwestern Gulf of Mexico				Often taken by shrimp trawlers in < 9m.	Pre-dominately fish; some squid	Larger pelagic fishes	Inshore waters	Enhanced growth in northcentral and northwestern Gulf associated with Mississippi River plume	Bycatch in shrimp fishery; vulnerable to sport fishery	Area of abundance in northcentral and northwestern Gulf has been associated with the Mississippi River plume
Citations	13	13				5	11,20	12	5	8,13	5	13
Late Juveniles		Inshore and inner shelf; area of abundance off of Louisiana and Mississippi					Pre-dominately fish, especially engraulids and clupeids; also squid	Larger pelagic fishes	While not estuarine-dependent, prey upon estuarine-dependent fishes		Bycatch in shrimp fishery; vulnerable to recreational fishery before reaching maturity	Area of abundance linked to nutrient-rich Mississippi River plume area
Citations		13					20	12	20		1,5,16	13King Mackerel, (<u>Scomberomorus cavalla</u>) cont.

Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	Migrate to northern Gulf in spring; return to south Florida in eastern gulf, and to Mexico in western gulf in fall	Coastal and offshore, center of abundance in Florida waters	>20 C; temperature considered the main trigger for seasonal migration	General-ly oceanic , 32-36ppt		To edge of continental shelf (200 m); most commonly found in < 80 m	Fishes, especially clupeids and carangids; also squid and shrimp	Larger fish, such as sharks and tunas; also bottlenose dolphin	Coastal pelagic. Seldom enters estuaries, but feeds upon estuarine-dependent species. Caught from small boats, charter boats, piers, bridges and from the surf	Highest rate of growth occurs in eastern Gulf	Vulnerable to fishing mortality due to school formations. Impacted by the harvest of bait fish prey	Migratory habit enables the utilization of season abundances of bait fishes. Influenced by availability of estuarine-dependent prey species
Citations	19,22	17,23	16,15	12		15,16	1,6,16,21	12	2,15,16,21	7	3,15,16	15,16
Spawning Adults	May to October	Outer continental shelf; northwestern and northeastern Gulf of Mexico considered important spawning areas	>20 C	Oceanic		35-180 m						
Citations	1,10,18	16,18	16,18	12		5,18						

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Spanish Mackerel (*Scomberomorus maculatus*) 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	Spring and Summer	Inner continental shelf, northern Gulf of Mexico	Hatch in 25 h at 26 C			Pelagic, over depths of < 50 m						
Citation	3,5,14	3,14	21			1,14,20						
Larvae	May to October	Inner continental shelf; abundant in northern Gulf of Mexico	Collected at 20-32 C	Collected at 28 to 37 ppt in Florida		9-84; most occur at <50m	Larval fish, especially carangids, clupeids and engraulids; also some crustaceans	Other immature fishes, such as dolphin and tunas				
Citation	3,5,14	3,5,14,24	5,14,20	5,14		14,20	7	8				
Early Juveniles		Estuarine and coastal; abundant in northern Gulf of Mexico	Most collected at > 25 C	Tolerate wide range of salinity; most collected at > 10 ppt.			Mostly fish; some crustaceans, gastropods and squid	Other pelagic fishes, such as dolphin and tunas	Juveniles may enter and use estuaries as nurseries		Bycatch in shrimp trawl fishery	
Citation		20,24	20	8,20			7	8	8,16		4	
Late Juveniles		Estuarine and coastal		Tolerate wide range; collected at 13-34 ppt.			Fish, especially engraulids and clupeids; also squid	Other pelagic fishes, such as dolphin and tunas	Some juveniles use estuaries as nurseries		Bycatch in shrimp trawl fishery; vulnerable to recreational fishery	

Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation		20		8			13,17	8	8,16		4,10	Spanish Mackerel, (<u>Scomberomorus maculatus</u>) cont.
Adults	Move to northern Gulf in spring; return to south Florida in eastern gulf, and to Mexico in western gulf in fall	Inshore coastal; also enter estuaries; Florida considered center of abundance	>20 C; usually taken at 21-27 C	Generally oceanic		Out to 75 m	Fishes, especially clupeids, engraulids and carangids; also crustaceans and squid	Larger pelagic fishes, such as sharks and tunas, and also the bottlenose dolphin	Prevalent in inshore coastal waters; caught from beaches, piers, jetties, small boats, and charter boats; may enter estuaries in pursuit of baitfish	Females grow faster and live longer than males	Fishing mortality may affect population size structure and sex ratio; impacted by harvest of baitfish	Influenced by availability of estuarine-dependent prey species
Citation	15,20,22	1,2,20,23	2,20	9		20	12,13,19	8	1,23	10	9,10	9
Spawning Adults	May through September	Inner continental shelf; north-eastern and north central Gulf of Mexico considered important spawning areas	>25 C	Oceanic, 35.5-36.5ppt.		<50 m						
Citation	6,14,18	5,14	11,20	11		3,14						

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Cobia (Rachycentron canadum) life history for the Gulf of Mexico
 Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs Fertilized (1.2-1.5mm diameter); pelagic	Summer. Hatch within 36 hours from fertilization	Crystal R, FL (estuary). Chesapeake Bay and contiguous waters of the Atlantic Ocean; off Hatteras, N.C. (along the edge of the Gulf Stream); Newport R., N.C. (estuary)	28.1-29.7°C. Highest hatchery rates (lab) occurred at 26.5°C	30.5-34.1ppt 23ppt minimum (field). Highest hatching rates (lab) 33-35ppt		Top meter of water column drifting with current			Estuarine edge of Gulf stream. Upper strata			
Citations	1,2,25,26,27,28	2,27,28,35	2,28	2,9,28		2,9,26			2,27,28,35			
Larvae 2.6-2.0mm SL	Summer: May-Sept	Crystal R. FL (estuary). Typically in offshore shelf waters of N. GOM	24.2-32.0°C. High: 36.7°C.	18.9-37.7ppt. 27.8-37.7ppt. Laboratory rearing as low as 19ppt		3.1-300m and surface waters	Lab: Wild zooplankton, dominated by copepods		Estuarine, offshore shelf waters	Attained SL of 20mm in 22 days (lab)		
Citation	1,2,3,4,9,28	1,2,3,4,29	2	2,28,9		2,9	1,28		1,2,3,4	28		
Pre-Juvenile (20-25mm SL)	Summer: May-July	Coastal waters offshore shelf of N. GOM. Jupiter Inlet, FL (22mm SL)	25.9-30.3°C 19.6-25.2>30.0°C	28.9-30.2ppt 22.5-36.4ppt		11-53m. In or near surface waters (S. Atl)	Lab: Wild zooplankton, dominated by copepods		Coastal waters, offshore shelf	Attained SL of 25mm in 25 days(lab)		

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Citation	1,2,4	1,2,4,30,31	1,2,30,31	1,2,30,31		2,4,9	1,28		1,2,4,30,31	28		
Early Juvenile (27-55mm SL)	April-July. Summer	Coastal waters, offshore shelf of N. GOM. Off NJ, NC-FL	16.8-25.2°C (S. Atl)	30.0-36.4ppt (S. Atl)		5-300m. In or near surface waters (S. Atl)	Lab: <u>Gambusia</u> shrimp and fish parts		Coastal waters, offshore shelf	Attained ~55mm SL by 50 days (lab)		
	1,4,28,31	1,4,32,30	1,30,32	1,30,32		1,4,9	28		1,4,30,32	28		
Late Juvenile	May-Oct. Summer-Fall	Coastal waters, offshore shelf. Off Virginia				6-9m	Lab: Shrimp, fish parts. Wild: Carnivorous fish, shrimp, squid.	<u>Cory-phaena hippurus</u>	Coastal waters, offshore shelf	Attained 231mm SL by 130 days (lab)		
Citations	4,5,6,7,8,9,10,14,26	4,5,6,7,8,9,10,11,26				4,12,13	13,28	1,24,37	4,5,6,7,8,9,10,11	28		
Adults	<u>N. Gulf:</u> Mar-Oct Seasonal Migration. <u>S. Gulf:</u> S. FL: Nov-Mar Uncommon in summer <u>Ches. Bay:</u> May-Oct Seasonal Mig.: N->S, Spg/Fall	Coastal waters and offshore waters.	23.0-28.0°C 19.6-25.2°C (S. Atl)	24.6-30.0ppt 32-36.4ppt (S. Atl)		1-70m. Shallow coastal waters (bays and inlets) to continental shelf.	Crustaceans and fishes (primarily crabs)		Seasonal migration. Some over-wintering.			
Citation	1-22,24,26,34	1,2,4-11,25-28,34,36	1,12,18,22,29	1,3,7,22		1,5,11-13,24	1,14,19-22,23		1,2,11,13,15,16			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Spawning Adults	<u>N. Gulf:</u> Apr-Sept (Ches. Bay region): Summer <u>N. and S. Carolina:</u> Spring-Summer. Females highly fecund. Batch spawners.	N. Gulf: Nearshore/overshelf. Near ocean inlets/offshore (S. Atl)	23.0-28.0°C	24.6-30.0 + ppt		Continental shelf-coastal waters			N. Gulf (LA, MS, AL, NW FL): Nearshore and shelf S. Atl: inlets, overshelf	N. Gulf: Males: mature at 2yrs longevity : 9-14 yrs. Females: Mature at 2-3 yrs. Longevity: 10-13 yrs. Both: Rapid growth for 1st 2yrs		
Citation	1,10,16-18,26-28,35	1,10,16-18,26,27,35	1,18	1,18		26,28,35			1,10,16-18,26-28,35	1,10,11,27,28,35		

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Cero (Scomberomorus regalis) life history for the Gulf of Mexico

Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships			Habitat Associations and Interactions		
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Can be present throughout the year, but most spawning occurs in April and May in south Florida.	Probably occur over inner continental shelf.	Spawned at temperatures exceeding 27o C.			Pelagic eggs, over depths of <50 m as do other scomberomorus spp.			Probably occur over inner continental shelf.			
Citations:	1	1	5			6			1			
Larvae	Presumably late spring and summer					Most probably occur at <50 m	nauplii larvae	Preyed on by young pelagic fishes such as tunas and dolphin.				
Citations:	1					7	5	8				
Post Larvae:	Presumably late spring and summer						Predominantly copepods - the naupliar stages	Preyed on by young pelagic fishes				
Citations:	1						5	8				
Early Juveniles:	Probably summer	Probably around coral reefs					Smaller schooling fishes	Larger pelagic fishes	Primarily associated with coral reefs			
Citations:	1	3					2	8	5			
Late Juveniles	Probably summer in the Gulf of Mexico	Probably around coral reefs					Smaller schooling clupeid and atherinid fishes	Larger pelagic fishes	Primarily associated with coral reefs			
Citations:	1	3					2	8	9			

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions				
							Food	Predators	Selection	Growth	Mortality	Production	
Adults	Probably found year around in south Florida as it is off Jamaica	Most abundant in clear waters around coral reefs in south Florida, the Bahamas and West Indies					Mostly fishes, especially small schooling clupeids and atherinids, but also including squids and shrimp	Larger fishes	Primarily associated with coral reefs				
Citations:	4	3					2	8	9				
Spawning Adults:	In south Florida have prolonged spawning period that may extend throughout most of the year. Most spawning occurred in April and May.	Spawning probably occurs over the inner continental shelf	Spawning at temperatures exceeding 27o C					Larger fishes	Selects relatively shallow water for spawning				
Citations:	1	1	5					8	5				

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Dolphin (*Coryphaena hippurus*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Nearly year-round; peaks in spring or summer, depending on location	Pelagic	Hatch in 40 h at 26 C; 38 h at 25 C	Oceanic	Near saturation (6 mg/L)							
Citation	1,4,11,18	6	9,18	9	9							
Larvae	Throughout year; peak in early summer	Pelagic; offshore. Particularly abundant around Mississippi River delta	Most abundant at 24 C and above. Reared at 25-29 in hatchery	Most abundant at 33 ppt and above. Reared at 30-35 in hatchery	Prefer 6 mg/L; sensitive to low DO	Usually found at >50 m depths; most abundant over 180 m contour	Mainly planktonic crustaceans; fish larvae appear in stomachs of dolphins >20 mm SL	Considered to be a significant food source for young billfish	Abundant in <i>Sargassum</i> communities		Very high in first 15 days of hatching; sensitive to environmental conditions and food availability	Mississippi River delta an important area of larval abundance
Citation	4,11	12,18	9,12,18	9,12,18	9	12,18	11,15	11	18		5	18
Early Juveniles	Throughout year, peaking in summer		26-29 C in culture experiments		5.8 mg/l or higher; show signs of distress at <5.5 mg/L			Larger fish, including larger dolphin	Associated with <i>Sargassum</i> communities			
Citation	11		9		7,9			14	13			
Late Juveniles		Inshore and Offshore					Fish, including larger dolphin; squid and crustaceans	Larger pelagic fishes.	Closely associated with <i>Sargassum</i> communities and drifting objects			

Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation	4,6						8	11,14	6,13			Dolphin, (<i>Coryphaena hippurus</i>) cont.
Adults	Highest catches are reported in summer; makes seasonal north-south migrations	Oceanic pelagic; both offshore and coastal inshore	20 C isotherm considered northern distributional limitation; more numerous at 25-28 C	Oceanic; 32-35ppt used in culture experiments	Poor tolerance for low oxygen conditions ; ideally 6 mg/L	Out to 1800 m depths; most common at 40-200 m	Pelagic fishes, such as carangids, scombrids and flying fishes; also crustaceans and cephalopods	Larger pelagic fishes, such as billfish	Closely associated with <i>Sargassum</i> communities and drifting objects	Grow rapidly through out life cycle; grow fastest at temperatures of 23.9-29.4 C	Have a short life span (2-4 yrs). Have high natural mortality due to predation. Small dolphin vulnerable to fishing pressure due to formation of close-knit schools	
Citation	10,11,13	4,11	1,4,9,11	9	9,17	4,16	4,8,13,14	3,11	11	1,11	1,2,11,13	
Spawning Adults	Multiple spawning occurs nearly throughout year, peaking at various times of year depending on location: Jan-Mar in the Florida current; spring and early fall in Gulf	Offshore; continental shelf and upper slope waters	Usually at >24 C; successfully spawned at 24-29C in culture experiments.	Oceanic								

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Citation	1,2,11,13,18	12,13	9,18	9								

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Bluefish (*Pomatomus saltatrix*) 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		
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Spawning in the northern Gulf of Mexico may be bimodal, occurring in both spring and fall.	Found in continental shelf waters, usually over depths <100 m.	Occur in the wild from 18 to 26.3o C	Occur in the wild from 26.6 to 34.9 ppt, but are found most often in 30 ppt or greater.		Eggs are spawned in offshore shelf waters usually over depths greater than 100 m.				Mass hatching occurs between 44 and 46 hours after fertilization at 18.5 to 22.2o C.		
Citations:	2,7	26	19	19		26				4		
Larvae	Reach peak abundance in northern Gulf of Mexico in April, and November-December.	In the northern Gulf of Mexico, occur primarily between 88o and 93o longitude, and are relatively uncommon in the eastern Gulf off the Florida Coast.	Collected in northern Gulf of Mexico at a mean temperature of 24.6o C with a range of 22.4 to 26.9o C.	Collected in the Gulf of Mexico over a salinity range of 26.7 ppt to 36.6 ppt.		Larvae found in continental shelf waters, usually over depths <100 m.	Copepods are most common prey.			Newly hatched larvae are 2.0-2.4 mm TL and grow to 2.9 mm TL during their first day.		
Citations:	6	5	5	2,5		20	15			4,12,19		
Post Larvae:		Same as larvae	Same as larvae	Same as larvae		Move inshore from shelf waters, and occasionally found in mouth of bays.	Copepods are most common prey.					
Citations:		5	5	2,5		20	15					

Life Stage	Season	Location	Temp (°C)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Selection	Habitat Associations and Interactions		
							Food	Predators		Growth	Mortality	Production
Early Juveniles:	Known to arrive in Texas coastal waters during late November.	Known to enter estuaries but can be found as far as 96 km offshore.	Juveniles have been recorded in temperatures from 14.8 to 31.2o C in the Gulf of Mexico.	Recorded over a salinity range of 8.0 to 36.2‰ in the Gulf of Mexico.		Juveniles reported from both inshore and offshore waters.	Copepods are most common prey in fish <60 mm TL. Crab larvae also consumed by fish <40 mm TL.					
Citations:	11	20	8,9,10,21,22,25	8,9,10,21,22,25		20	15					
Late Juveniles		Reported from both inshore and offshore areas and are known to enter estuaries.	Juveniles have been recorded in temperatures from 14.8 to 31.2o C in the Gulf of Mexico.	Recorded over a salinity range of 8.0 to 36.2 ppt in the Gulf of Mexico.		Known to enter estuaries and remain there for months at a time.	Copepods are most common prey of fish <60 mm TL. But as fish grow, their feeding shifts to fish and crab larvae.					
Citations:		20	8,9,10,21,22,25	8,9,10,21,22,25		20	15					
Adults	Generally move north in spring and summer, and south in fall and winter. They remain offshore much of the year in the Gulf of Mexico.	Found in temperate coastal waters of the Atlantic and throughout the Gulf of Mexico from Florida to Mexico.	Range between 18.0 and 21.0o C, but can survive temperatures as low as 7.5o C temporarily.	Salinity preference is 26.6 to 34.9 ppt but they range from 7.0 to 36.5 ppt.		Prefer shallow water but may occur in waters as deep as 100 m.	Food includes, shrimp, crabs, squid, eels, clupeids, sciaenids, jacks, mackerels, mullets, etc.	Only large predators such as sharks, tunas, swordfish, and wahoos threaten bluefish.		In the Gulf of Mexico, initial growth is rapid, and bluefish have been aged up to 8 years old, and up to 767 mm FL.		
Citations:	18,20,26	20	4,8,14,19	4,8,10,24		8,10,13	3,17,23	16		1		
Spawning Adults:	Spawning in the northern Gulf of Mexico may occur in both spring and fall.	Spawning occurs offshore over the continental shelf in the Gulf of Mexico.	Optimal temperature for spawning in Gulf of Mexico was 25.6o C.	Optimum salinity for spawning in Gulf of Mexico was 31 ppt.		Reported in deep water up to 148 km offshore in mid-Atlantic bight.		Only large predators eg, sharks, tunas, swordfish, and wahoos threaten bluefish.				
Citations:	2,7	2,12,18,19	20	20		19		16				

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Shrimp FMP

Brown shrimp (*Penaeus aztecus*) life history information 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				
							Food	Predators	Selection	Growth	Mortality	Production	
Non-spawning adults (females > 140 mm TL)	Most abundant in summer and fall	Offshore-over shelf; concentrated off TX, LA, and MS	Survival is good between 10–37 C in ponds; natural variability in temperature is less	Survival is good between 2–35 ppt in ponds; natural variability in salinity is less	Less than 2 ppm causes stress	From about 14 m to 110 m	Omnivorous; feed at night	Few trawl caught fish appear to eat brown shrimp, major predators may be larger fish	Select soft bottom sediments such as mud and sand; correlation between turbidity and shrimp abundance				Trophic models developed for bycatch management indicate that reducing discards from the fishery can affect shrimp productivity.
Citations:	1	1, 3, 13, 26, 104	2	2	2	1, 3, 12	1	4, 38, 39, 40	1, 13, 24, 101				39, 111, 112, 113
Spawning adults	Mainly fall and spring but throughout the year in water deeper than 64 m	Offshore-over shelf				Spawning occurs in water deeper than 18 m, generally between 46-91 m; in water 64-110 m, spawning appears continuous throughout the year	Omnivorous; feed at night	Few trawl caught fish appear to eat brown shrimp, major predators may be larger fish					
Citations:	5, 12, 13	12				5, 12, 13, 24	1	4, 38, 39, 40					
Fertilized eggs (0.26 mm diameter)	Mainly fall and spring; assumed similar to spawning adults above	Offshore-over shelf	Eggs do not hatch below 24 C			Distribution assumed similar to spawning adults above; eggs are demersal and hatch within 24 hrs after spawning							
Citations:	5, 12, 13	12	1, 13			1, 5, 12, 13, 24							

Larvae and pre-settlement and postlarval developmental stages include 5 naupliar, 3 protozoel, 3 mysis, and postlarval (< 14 mm) stage	Present offshore year-around; most abundant in fall through spring. Peak recruitment of postlarvae into estuaries occurs in spring; minor peak in fall.	Offshore-over shelf and in passes to estuaries	Optimal temperature for larval development between 28–30 C	Larvae tolerate 24–36 ppt; postlarvae have broader tolerance range		Collected from shore out to 82 m	Phytoplankton and zooplankton; feeding begins at first protozoel stage	Fish and perhaps some zooplankton	Postlarvae migrate through passes mainly from Feb-April with minor peak in fall; recruitment through passes appears to occur on flood tides at night			
Citations:	1, 13, 24, 25, 84, 109	1, 25, 93	13, 24, 63	13		25	5, 24, 63		13, 24, 84, 90, 91, 93, 109			
Late postlarvae and juveniles (after settlement; 14-80 mm)	Present spring through fall; most abundant in spring and early summer	Found in estuaries; concentrated in TX, LA, and MS	Survival is good between 7–35 C, this temperature tolerance decreases at low salinities; growth increases up to about 30 C; postlarvae burrow at low temperatures; catastrophic kills have occurred after cold fronts in shallow water	Collected over wide range (0–70 ppt); good growth at 2–40 ppt	Juveniles avoid 1.5 and 2.0 ppm water; not lethal until below 1.0 ppm	Generally occur in shallow water habitats (< 1 m)	Benthic algae, polychaete worms, and peracarid crustaceans; detritus is common in guts, but detrital diets provide little growth	Fishes; especially southern flounder, spotted seatrout, red drum, and inshore lizardfish; secondary predators include Atlantic croaker, pinfish, and sea catfish	Densities highest in marsh edge habitat and submerged aquatic vegetation followed by tidal creeks, inner marsh, shallow open water, and oyster reef; on nonveg bottom, muddy substrates selected; on a larger scale, abundances are highest in turbid estuaries	Growth rates shown to be higher in salt marsh than on nonvegetated bottom; assimilation and growth higher on animal diet than plant diet; growth positively related to temperature up to about 30 C	Predation is major cause of mortality; habitat characteristics that reduce mortality include vegetative structure and an appropriate substrate for burrowing; turbidity also affects predation in a species-specific manner	Coastal wetland area, the amount of marsh edge, and elevation of the marsh surface appear related to production; mechanistic production models have identified the importance of temp, sal, tidal flooding, vegetation, and predators.

Citations:	18, 33, 42, 44, 45, 54, 56, 58, 110	3	2, 6, 10, 11, 13, 24, 34, 47, 86,	1, 2, 6, 13, 24, 47, 82, 83	2, 34, 85, 96-98	33, 44, 57, 64	9, 14, 15, 16, 21, 22, 27, 95	34, 37, 65-81	8, 9, 13, 18, 23, 24, 28, 29, 30, 33, 41-46, 50, 54-61, 64, 77, 110	2, 13, 21, 22, 33, 82, 83, 94	32-37, 106	
Sub-adults	Present spring through fall; most abundant in late spring and early summer	Found in open water of bays and nearshore over shelf; concentrated in TX, LA, and MS	Cold fronts with air temperatures between 18-22°C have been documented to cause mass mortality	Abundant from 0.9 to 30.8 ppt; salinity has little effect on distribution	Large juveniles avoid 1.5 and 2.0 ppm water; not lethal until below 1.0 ppm in lab; persistent hypoxia (<2 ppm) in summer has caused mass mortality; oxygen requirement increases with temperature	Generally greater than 1 m and out to 18 m on the shelf	Polychaetes, amphipods, and other benthic infauna; some evidence for scavenging	Fishes are predators in estuaries; especially southern flounder, spotted seatrout, red drum, and inshore lizardfish; secondary predators include Atlantic croaker, pinfish, and sea catfish; predation appears lower after leaving estuary	Select sandy mud substrate over sand and shell; migration from estuaries occurs at night, on full and new moon, and ebb tide, may also be stimulated by freshwater flows; abundance offshore correlated positively with turbidity and negatively with hypoxia			Correlations between abundance of subadults and landings offshore suggest that annual production is fixed by this life stage. Impoundments of estuarine areas have been shown to reduce production.
Citations:	13, 52, 62, 107	3	10	107	2, 34, 87, 88, 89, 96-98, 102	24	27, 95	4, 34, 37-40, 65-81	1, 8, 9, 13, 41, 52, 98, 101, 103			

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White shrimp (*Penaeus setiferus*) life history information 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 (ppm)	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production
Non-spawning adults (females ≥165 mm TL; males ≥119 mm TL)	Most abundant in late summer and fall	Nearshore waters - overwinter offshore, then move inshore in spring; concentrated off LA, TX, and Tabasco; greatest densities occur off LA coast	Tolerant of temperatures between 7 and 38 C	Survival is good between 2–35 ppt in ponds; adults usually exposed to less variability in nature	2 ppm or less causes stress	Usually inhabit nearshore waters <27 m deep; abundant at a depth of 14 m	Omnivorous	Few trawl caught fish appear to eat white shrimp, major predators may be larger fish	Prefer soft bottom sediments with high organic matter content			Trophic models developed for bycatch management indicate that reducing discards from the fishery can affect shrimp productivity.
Citations: 101	1, 52	1, 3, 26, 27, 36, 52, 57	35, 83, 87	2	2	1, 3, 12, 52, 88	1	38, 39, 40	1			39, 78, 80, 99
Spawning adults	Mainly spring to late fall, but peaks in the summer (June-July)	Offshore; limited spawning also may occur within estuaries and bays		Prefer salinities for spawning of at least 27 ppt		Spawning occurs offshore over shelf in water 9 to 34 m deep, but mostly < 27 m deep; limited spawning may occur within estuaries and bays	Omnivorous	Few trawl caught fish appear to eat white shrimp, major predators may be larger fish				
Citations: 32	17, 47, 52	3, 52		6		5, 12, 92	1	38, 39, 40				

Fertilized eggs (0.28 mm diameter)	Spring to fall; assumed similar to spawning adults above	Offshore-over shelf; also may occur within estuaries				Distribution assumed similar to spawning adults above; eggs are demersal and hatch 10-12 hrs after spawning						
Citations:	12, 52	12, 52				26						
Larvae and pre-settlement postlarvae; developmental stages include 5 naupliar, 3 protozoel, 3 mysis, and postlarval (< 8 mm) stage	Present offshore spring through fall. Peak recruitment of postlarvae into estuaries occurs in June and September	Mainly offshore-over shelf and in passes to estuaries; also within estuaries	<i>Penaeus</i> naupliar stages occurred in offshore waters 17.0 to 28.5 C			Collected from shore out to 82 m deep	Phytoplankton and zooplankton; feeding begins at first protozoel stage	Fish and perhaps some zooplankton (e.g., Chaetognatha)	Postlarvae migrate through passes (upper 2m of water column at night and middepths during day) mainly from May-November with a peak in June and a second peak in September			
Citations:	1, 26, 52, 102, 84, 111	1, 25, 26, 52, 84	25			25	1, 52	52	1, 26, 84, 90, 91			

Late postlarvae and juveniles (after settlement; 8-90 mm)	Present late spring through fall; most abundant in late summer and early fall	Found in estuaries; concentrated in LA, TX, and MS	Postlarvae collected 13-31 C; juveniles collected between 9 and 33 C, and most abundant 15-33 C; In laboratory, juveniles grow and survive at constant 35 C; catastrophic kills have occurred in shallow water after cold fronts	Postlarvae collected between 0.4 and 37 ppt and survive at 40 ppt for 30 days, but growth less at 35 than 25 ppt; juveniles prefer <10 ppt and growth in laboratory is retarded at 35-40 ppt	Juveniles avoid 1.0 and 1.5 ppm water; not lethal until below 1.0 ppm	Generally occur in shallow water habitats (< 1 m)	Omnivorous; detritus is common in guts, but may be of little nutritional value; prey items include annelid worms, pericarid crustaceans, caridean shrimp, diatoms; lab reared grow and survive best on combination animal-vegetal diet	Fishes, including spot, killifish, silverperch, blackdrum, sand seatrout, southern flounder, spotted seatrout, red drum, inshore lizardfish, Atlantic croaker, and pinfish; blue crabs and seabirds	Densities usually highest in marsh edge and submerged aquatic vegetation followed by marsh ponds and channels, inner marsh, shallow subtidal, and oyster reefs; on nonvegetated bottom, muddy substrates with high organic content selected; turbid estuaries	Growth rates of postlarvae increase with temperature between 18 and 32.5 o C, decrease at 35 o C; juvenile growth slower <18 o C; growth similar in salt marsh and on nonvegetated bottom; shrimp fed combination animal-vegetal diet in lab grew fastest	As for brown shrimp, predation is likely a major cause of mortality; because white shrimp burrow shallower and less frequently than brown shrimp, they may be more vulnerable to predation	No mechanistic production model available, but variables identified as important in brown shrimp models may also be important for white shrimp; coastal wetland area, amount of marsh edge, and elevation of the marsh surface appear related to production
Citations: 1 0 5	1, 52, ,	3	2, 10, 11, 37, 47, 52, 53, 63, 83	2, 1, 52, 83, 86, 106	2, 96, 97, 98, 106	14, 33, 44, 56, 64, 75, 79	5, 7, 20-22, 24, 33, 52, 74, 92, 94, 95		1, 8, 9, 18, 19, 23, 28-31, 33, 34, 41, 42, 44-46, 50, 52, 54, 55, 58-61, 64, 75	1, 2, 21, 22	32, 33, 80	31, 43, 45, 48, 49, 51, 54, 56

Sub-adults	Present summer through fall; most abundant in August and September	Found in open water of bays and nearshore over shelf; concentrated in LA, TX, and MS	Cold fronts can cause mass mortality; in South Carolina, survival requires minimum temperature of > 6 C	Abundant from 1 to 21 ppt; salinity has little effect on distribution		Generally greater than 1 m and <30 m on the shelf	Omnivorous, scavengers; consume annelids, insects, detritus, gastropods, copepods, bryozoans, sponges, corals, fish, filamentous algae, vascular plant stems and roots	Fishes (same species listed above that juveniles) are predators in estuaries; predation may be lower after leaving estuary	Select soft mud or silt substrate over sand and shell; migration from estuaries occurs in late August and September and appears related to shrimp size and environmental conditions in the estuary (e.g., sharp drops in temperature during fall and winter)			
Citations:	1, 52	1, 3	10, 37, 47, 52, 53, 63, 70	2	2	1, 16, 52, 63, 82, 92	1, 67, 82, 92	5, 15, 21, 22, 40, 52, 65-73, 76, 77, 85, 89	13, 16, 26, 47, 52, 57, 63, 92, 93			62

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Pink shrimp (*Penaeus duorarum*) life history information for the Gulf of Mexico and Southeastern United States.

Associations and interactions with environmental and habitat variables are listed with citations. EFL = east coast of Florida, WFL = west coast of Florida.

Life Stage	Season	Location	Temperature	Salinity	Diss. Oxygen	Depth	Trophic Relationships		Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production
Non-spawning adults (> 75 mm TL)	Present all year; most abundant in spring for NC-EFL, fall-spring for WFL, and fall and spring in TX	Offshore shelf of NC-TX; most abundant in WFL and TX	16-31 C, most abundant above 25	25-45 ppt		1-110 m, most abundant at 16-50 m in WFL and TX	Carnivores	Few; presume larger fishes or sharks	Usually found over coarser sand + shell; < 1% organics; nocturnal		Low predation offshore	WFL production correlated with freshwater; no apparent effect of seagrass mortality inshore; NC production inhibited by cold winter; overfishing not indicated
Citations	50, 61, 70	39, 64, 70	11, 14, 41	67		11, 32, 38, 50, 54		15	19, 22, 34, 71		15, 66	5, 26, 27, 61
Spawning adults (capable at 65-75 mm TL)	Present all year in WFL, spring-fall in TX; most abundant in spring-summer in WFL, summer in NC	Offshore over shelf	16-31 C; most abundant above 25 C			9-48 m; most abundant at 10-30 m in WFL and TX	As above	As above	Coarse sand + shell or sandy silt; < 1% organics (EFL, WFL)		As above	As above
Citations	8, 11, 14, 34, 37, 43, 50, 72	11, 14, 34, 50	11, 14, 41			14, 32, 33, 41		15	22, 34			

Fertilized eggs (0.31-0.33 mm diameter)	Present all year in WFL; most abundant: presumed Spring + Summer with spawning adults	Range: Offshore over shelf; demersal eggs	Optimum: All hatch when > 27 C			Range: Presumed same as spawning adults (demersal eggs)						
Citations:	16	18	16			16						
Larvae and pre-settlement postlarvae (< 15 mm) Developmental stages: 5 nauplius 3 protozoa 3-4 mysis 1-2 postlarvae	All year (WFL); Most abundant in the Summer-Fall (SC), Spring-Summer (WFL), Summer-Fall (TX)	Inshore and up to 40 km offshore of WFL; Most abundant on Southwest FL shelf (WFL)	15-35 C; Optimum at 30-35 C @ 28-32 ppt, 21-26 C @ 35 ppt, Mortality higher at 35 C	0-43 ppt; Optimum at 10-22 ppt		1-50 m (WFL); Most abundant at < 28 m	Phytoplankton, Zooplankton	Presume fishes and invertebrates (planktivores + epibenthos)	Recruitment through passes or open shorelines, Spring - Fall (WFL, TX); primarily on flood tides and at night			Wind speed affects larval transport.
Citations:	1, 9, 11, 13, 18, 33, 67	13, 33	18, 28, 33, 67, 68	28, 67, 69		13, 16	18		1, 5, 9			77

Late postlarvae (5-14 mm TL) and juveniles (> 15 mm TL) after settlement	Present Summer-Fall in NC, SC; Present all year in WFL; Present Fall-Spring in TX; most abundant in Summer in NC, Summer-Fall in WFL, and Fall + Spring in TX	Coastlines and Estuaries from NC to TX; most abundant in southern TX, EFL, and WFL; Rare elsewhere	6-38 C; Optimum at > 24 C (SC) > 28 C (WFL); 18-25 C (TX); Burrow at low Temperatures; no recorded kills from Cold fronts (migrate)	0-65 ppt; Optimum at > 30 ppt (SC); 80% survival @ 17-50 ppt and 22-24 C	2.5-6.0 ml/l Tolerates diurnal lows of 0.2 ppm for several hr (WFL)	< 1-3 m; Most abundant at < 2 m (SC, WFL)	Seagrass, annelids, small crustaceans, shrimp, bivalves	Fishes such as spotted seatrout, Red drum, toadfish, Inshore lizardfish, Gray snapper, silver perch, snook, Atlantic croaker, Pigfish, black drum, hard head catfish, Gafftopsail catfish	Densities highest in or near Seagrasses, low in mangroves, near zero or absent from marshes or low salinity SAV; may prefer Halodule over Thalassia when small, but densities similar among seagrass, algae, + mud in patchy habitats; may prefer coarse sand/shell mud; nocturnal; Found in marsh edge in Mobile Bay.			Production (WFL) linked positively with freshwater input; areas with high production associated with inshore seagrass beds (NC, EFL, WFL, TX)
Citations:	1, 6, 9, 12, 21, 29, 42, 53, 55, 62, 65, 67, 69, 72, 75	2, 4, 42, 51, 67, 69, 75	6, 12, 51, 55, 65, 67, 69, 72	1, 6, 7, 12, 21, 55, 65, 67, 69, 74	6, 63, 65, 69	63, 69	35, 45, 58	11, 23, 25, 47, 59, 60, 67	12, 24, 28, 30, 36, 40, 42, 48, 49, 56, 62, 63, 65, 69, 73, 87, 79, 80, 82, 83			5, 26, 27, 34, 61, 64

Sub-adults	Fall-Spring in NC; all year in WFL; Fall-Spring in TX; Most abundant in Fall in NC, Summer-Fall in WFL, Fall + Spring in TX; May overwinter in estuaries (NC, TX)	NC to TX, in open water or seagrass beds in estuaries or along coastlines, and nearshore shelf; Most abundant in WFL and south TX	6-38 C; Optimum at 14-30 C; Most burrow < 15 C; All burrow < 10 C; do not burrow but remain inactive on surface > 32 C	10-45 ppt; Most abundant at 25-45 ppt	2.5-5.0 ml/l Tolerates diurnal lows of 0.2 ppm for several hr (WFL)	1-65 m; Most abundant at 16-50 m (WFL, TX)	Annelids, small Crustaceans, shrimp, bivalves	Fishes such as spotted seatrout, sand seatrout, gray snapper, mackerels, red drum and groupers; possibly Atlantic croaker and inshore lizardfish off TX	Densities highest in or near seagrasses, low in mangroves, near zero or absent from marshes or low salinity SAV; densities similar among seagrass, algae, and mud in patchy habitats; may prefer coarse sand/shell/mud; nocturnal; Found in marsh edge in Mobile		Avoid cold stunning by migration to deeper water; low predation offshore	Catch and effort offshore late in fishing season correlated with subsequent landings; Recruitment was low after protracted periods of drought.
Citations	6, 29, 31, 42, 50, 62, 72,75	17, 39, 64	6, 20, 67, 72	6, 67, 74	6, 63	38, 50, 54	35, 45, 46, 58	10, 15, 23, 25, 47, 58, 59	6, 19, 20, 22, 34, 36, 42, 57, 62, 63, 82		15, 66, 67	5,63,78,81

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Royal Red Shrimp (*Pleoticus robustus*) life history for the Gulf of Mexico.

Associations and interactions with environmental and habitat variables are listed with citations.

Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Selection	Growth	Mortality	Production
Eggs	Produced throughout the year, but predominantly between January and May.	Upper regions of continental slope.	Probably found mostly between 9-12oC.			Probably produced between depths of 250 to 550m.						
Citations:	1	3	4,5			1,3						
Larvae	Larvae are unknown for this species.											
Citations:	1											
Post Larvae:												
Citations:												
Early Juveniles:												
Citations:												
Late Juveniles												
Citations:												
Adults	Year round.	Upper regions of continental slope, especially off Dry Tortugas and the Mississippi River delta.	Found at temperatures from 5-15oC, but abundant between 9-12oC.			Range from 140 to 730m, but usually between 250 and 550m.	Feeds on small bottom living organisms.		Selects blue/black mud, sand, muddy sand, or white calcareous mud bottoms at depths of 250 to 475m.			
Citations:	1	3	4,5			1,3	2		3			

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp (oC)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Selection	Growth	Mortality	Production
Spawning Adults:	Spawning probably occurs throughout the year, but peaks between January and May.	Upper regions of continental slope.				Probably choose depths between 250 and 550m.						
Citations:	1	3				1,3						

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Stone Crab FMP

Stone Crab (*Menippe mercenaria*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs	Spring - fall; ovigerous females year-round in south Florida, but frequency is low in winter months and spawning females are smaller	Eggs brooded externally beneath female abdomen (160,000-1,000,000 per egg mass) ovigerous females subtidal to shallow shelf across distributional range	Lower limit for spawning: 20-22°C; optimum ovarian develop: 28°C; ovigerous females collected in wild between 19°-33°C	Ovigerous females found in wild from 28-36 ppt.; ovigerous females used in larval development studies held at salinities from 30-32 ppt		Subtidal to shallow shelf				Embryogenesis variable, 9-14 days		
Citation	2,3,13	4,5,6,9,27	2,30,14	7,8,14,31		4,27				9,10		
Larvae (5 zoeal stages)	Spring-fall; year-round in south Florida; based on seasonal abundance of ovigerous females expected frequency low in winter months	Nearshore marine environments	Highest survival in lab studies from 28 to 30°C	Highest survival in lab studies in salinities at or above 30ppt.		Planktonic	Smaller zoo-plankton; lab reared specimens thrive on <i>Artemia</i>	Primary plankton-feeding carnivores including adult filter-feeding fish, larval fish, other zoo-plankton		Growth through 5 zoeal stages from 14-27 days in lab; duration of zoeal stages strongly dependent on temperature	Presumed to be high in the wild; high in first and fifth zoeal stages in lab reared larvae	
Citation	2,3,31	7	7,8,31	7,8,31		5,12	7,8,10,11,12,31	5,11,12		7,8,10,31	3,7	
Post	Spring-fall;		Highest	Highest			Lab reared			Duration	Presume	

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Larvae (1) megalopal stage	year-round in south Florida; based on seasonal abundance of ovigerous females expected frequency low in winter months		survival in lab studies from 28 to 30°C	survival in lab studies in salinities at or above 30ppt			specimens fed <i>Artemia</i> and minced conch			of megalopal stage 1-2 weeks	d to be high in the wild; high in laboratory reared larvae	
Citation	2,3,13		7,8,31	7,8,31			7,8,10,31			7,8	3,7	
Postsettlement Juveniles (under 10 mm CW)	Year-round, peak settlement in fall	Nearshore shallow waters over range of adult occurrence in Gulf of Mexico; nearshore marine waters off the Ten Thousand Islands and Cedar Key are high frequency settlement areas	Broad temperature tolerance, 8-38°C in wild; in laboratory studies lower-limit threshold for survival between 5 and 10°C	Broad salinity tolerance, 5-40ppt. In laboratory studies lower-limit threshold for survival between 10 and 15ppt.		Nearshore marine waters	Opportunistic carnivore, some herbivory noted	Other xanthids; grouper, black sea bass and other large fish	Seagrass beds, emergent live rock, sponges, gorgonians, deep channels; areas with high densities of postsettlement juveniles (recruitment areas) include Cedar Key and nearshore marine waters off the Ten Thousand Islands	In lab studies mean growth per molt of 18%, molt increment and intermolt period increasing with size, developmental time from first crab to 10 mm CW about 12 months; in field studies estimates of time from first crab to 10 mm CW from 6-12	Natural mortality thought to be high due to predation	

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation	13,18	13	7,15,16	7,13,17		13	3,5,18	*1,3,12,19	13,20	21,22	3	
Late Juveniles	Year-round	Nearshore shallow waters over range of adult occurrence in Gulf of Mexico; marine waters off Everglades Bay and Cedar Key are high frequency settlement areas	Broad temperature tolerance, 8 to 38°C in wild; in laboratory studies lowest survival at temperature extremes (5 and 35°C) in low salinity (5ppt). Optimum survival at 25°C over range of salinity from 5 to 35%	Broad salinity tolerance, 5 to 40ppt in wild; in lab studies lowest survival at 5ppt at extremes of temperature (5 and 35°C), optimum survival at and above 15ppt at temperatures from 15 to 35°C		Nearshore marine waters	Opportunistic carnivore, some herbivory noted	Other xanthids; grouper, black sea bass and other large fish	Seagrass beds, emergent live rock, sponges, gorgonians, deep channels; areas with high densities of postsettlement juveniles (recruitment areas) include Cedar Key and marine waters off Everglades City	Intermolt period approximately 40 days but increases with size; in lab studies growth per molt under 15ppt in juveniles above 10 mm CW; size at age one approximately 30-40 mm; transition from juvenile to adult form occurs at 35 mm CW	Natural mortality thought to be high due to predation	
Citations	13,18	13	15,16,32	13,17,32		1,3	3,5,18	1,3,12,19	13,20	13,18,23	3	
Adults	Year-round	Greatest abundance in Gulf of Mexico on continental shelf from Naples to Key West, FL; northward range in Gulf	Eurythermal, from 8-32°C; in laboratory studies lowest survival at 5°C, highest survival	Euryhaline, most abundant in salinities approaching full seawater; in laboratory studies no survival at 5	Tolerant of reduced dissolved oxygen; can remain alive from 17-	Subtidal to shallow shelf, occasionally intertidal	Opportunistic carnivore	Octopus, horse conchs, sea turtle, cobia, grouper	Inhabit burrows in <i>Thalassia</i> flats, rocky or shell bottom, sand, mud, artificial reef rubble	Growth in males is greater and more variable than in females; males develop legal	Instantaneous fishing and natural mortality rates are thought to be high; estimated	Highest fishery production from the Everglades -Florida Bay region; fishery in the Big Bend

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth(m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
		to Homosassa, FL	from 15 to 35°C	and 15ppt at low temperature (5°C), highest survival at and above 15ppt from 15 to 35°C	21 hours in hypoxic conditions; oxygen consumption averages 0.51 cm ³ O ₂ /g/hr.					claws and enter fishery at smaller CW than do females; growth influenced by temperature and by ovarian development/embryogenesis in females; males live to about 6 years old and females to about 7 years old	total mortality rates (Z) of 1.47 yr ⁻¹ for males greater than 118 mm CW and 0.70 yr ⁻¹ for females above 104 mm CW	region prosecuted in zone of hybridization. Production dependent on maintenance of coastal nursery grounds, seagrass beds, and mangrove forests
Citation	3,5,13,18	3,9,20	*1,32	12,32	24,25	3,26,27	*1,3	3,5	3	13,28,29,30	13,33	3,13

*Study conducted in zone of hybridization between *Menippe adina* and *M. mercenaria*.

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Spiny Lobster FMP

Spiny Lobster, (*Panulirus argus*) 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			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
Phyllosome Larvae	Year-round off Florida Keys and the SE coast of Florida; Jun-Nov in the NE Gulf of Mexico	Offshore	Have not been collected below 24°C	Phyllosomes of other paliurids cultured at 33.5ppt to 35.5ppt		Usually collected between 0-50m but have been caught as deep as 175m	Plankton	Phyllosomes have been collected in the stomachs of pelagic fishes		Estimated to molt approximately 11 times over an estimated 9-12 month larval cycle. Size: 0.5-12mm carapace length		Genetic evidence suggests a pan-Caribbean stock. Occurrence in Gulf of Mexico may be associated with the Loop current
Citation	1,13,33,34	2,12,13,14	2,13			2,13	8,51	7		12,37,51		7,35,36
Puerulus Postlarvae	Recruit year-round to south Florida. Peak recruitment in spring; secondary peak in autumn	Offshore to nearshore	Tolerates 18° to 33°C at 35ppt salinity	Does not generally tolerate non-oceanic salinities			Apparently non-feeding	Primarily nocturnally active, water column feeding fishes	Settle in shallow nearshore waters and bays, principal settlement habitat in south Florida is macroalgae, especially <u>Laurencia</u> spp.; sea grasses probably also function as settlement habitat	Metamorphose into first benthic instar in 7-21 days post-settlement	Predation by nocturnally-active fishes; physiological stress from temperature and salinity extremes	Postlarval abundance in south Florida somewhat associated with wind-forcing and presumably by the dynamics of oceanic gyres and by Caribbean-wide spawning activity

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			Production
							Food	Predators	Habitat Selection	Growth	Mortality	
Citation	3,4,9,16,17,18,19	3,4,9,14,16,17,18,19	10	10			11,14	24,25	9,19,20-23	10,24	10,24	3,24
Juveniles	Year round	Nearshore; bays larger juveniles on offshore reefs		Generally stenohaline; 32-36ppt is optimum based on oxygen consumption rates			Invertebrates, especially mollusc and crustaceans	Elasmobranchs, boney fishes, octopods, portunid crabs	Macroalgae to approximately 15-20mm CL, then sponges, solution holes, coral heads and octocorals to 45mm CL. Larger juveniles (>45mm CL) also on offshore reefs	South Florida; 3-4mm CL/month during the first year. Post-settlement growth influenced by temperature, diet and injuries	Mortality of newly-settled juveniles estimated to be 95%. Predation by fishes presumed to be the major cause of mortality. Larger juveniles experience mortality from the commercial fishery stemming from exposure and confinement in traps	Abundance of juveniles in S. FL dependant on larval influx and the availability of suitable settlement (eg., macroalgae and sea grass) and post-settlement habitat (eg., sponges, solution holes)
Citation	9,19,20-22,27,30	9,19,20-22,27,30		56			19,22	15,52	19-22,36,42,43	17,25,27-29	15,20,31,32,48	37,41,49,50
Adults	Year round. Off	Offshore reefs.		Same as juveniles		1-100m. Common	Primarily molluscs	Elasmobranchs,	Primarily reefs.	South FL: Estimated	FLorida fishery	Stock assessment

Life Stage	Season	Location	Temp(°C)	Salinity(ppt)	Oxygen	Depth (m)	Trophic relationships		Habitat Associations and Interactions			
							Food	Predators	Habitat Selection	Growth	Mortality	Production
	Florida Keys and the SE coast of Florida; June-November in the N.E. Gulf of Mexico	Also nearshore and in bays in S. FL				2-45m. Usually >20 in Gulf of Mexico	and arthropods	boney fishes, dolphins, loggerhead turtles	Rocky habitat in S. FL also common in shallow, hardbottom and seagrass habitats. Reproduction in S. FL occurs on seaward reefs	at 0.6mm CL/month; growth affected by temperature and injuries	exploitation estimate d to be 90%	using age-structured analysis indicates that fishing mortality has decreased as the number of lobster traps in the Florida fishery have been reduced
Citation	30,43,55,57	30,43,53,55		56		8,30,38,53,55	38-40	45-47	30,43,53,55	28	54	58

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Slipper Lobster (*Scyllarides nodifer*) 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	
Egg		Females carry eggs for at least 30 da										
Citations		8										
Larvae	Prolonged larval period, ~ 9 mo to 1 yr	Pelagic, offshore; may drift as far north as Cape Cod										
Citations	4	3										
Early Juveniles												
Citations												
Late Juveniles						Collected to 71 m						
Citations						4						
Adults	Year-round; may move to warmer, shallower waters for spawning.	Occurs in Gulf continental shelf waters, Florida to Yucatan	Observed or collected at 16 to 22 B C; kept in aquaria at 20 to 26 B C	Kept in aquaria at 30 to 35 ppt		From 2 to 100 m; most common at 30 to 42 m.	In culture studies, consumed bivalves, fish and crabs, but showed preference for bivalves; forage at night	Fishes	Occurs on sandy substrate, or sand mixed with mud, shells or coral, coralline algae, sponge. May bury into sediment.	Females attain greater size than males; may reach 127 mm CL; 35 cm TL. Grow from post larvae to full size in		Not very abundant; support small seasonal fisheries. May be caught incidentally with spiny lobster.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(°C)	Salinity (ppt)	Oxygen	Depth (m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
									Cryptic on limestone ledges and rocky outcroppings; also found on artificial reefs	16 to 18 mo. Maturity reached at the 6 th instar.		
Citations	8	1	6, 7	6		1, 2, 4	6, 7	4	2, 4, 7, 8	2, 4, 5, 6		1, 2, 8, 9
Spawning Adults	Off west coast of Florida, April through August, peaking in July								May migrate to warmer, shallower waters for spawning season.			
Citations	4, 8								8			

Slipper Lobster References

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2. Holthius, L.B. 1991. FAO Species catalogue: Marine lobsters of the world. FAO Fish. Syn. 125, v. 13:192.
3. Williams, A.B. 1984. Shrimps, lobsters, and crabs of the Atlantic coast of the eastern United States, Maine to Florida. Smithsonian Inst. Pr., Wash. DC, 550 p.
4. Lyons, W.G. 1970. Scyllarid lobsters (Crustacea, Decapoda). Fla. Mar. Res. Lab. Mem. Hourglass Cruises 1(4):74 p.
5. Williams, A.B. 1965. Marine decapod crustaceans of the Carolinas. Fish. Bull. (U.S.) 65(1):1-298.
6. Rudloe, A. 1983. Preliminary studies of the mariculture potential of the slipper lobster, *Scyllarides nodifer*. Aquaculture 34:165-169.
7. Ogren, L.H. 1977. Concealment behavior of the Spanish lobster, *Scyllarides nodifer* (Stimpson), with observations on its diel activity. Northeast Gulf Sci. 1(2):115-116.
8. Hardwick, C.W., Jr., and G.B. Cline. 1990. Reproductive status, sex ratios and morphometrics of the slipper lobster *Scyllarides nodifer* (Stimpson) (Decapoda: Scyllaridae) in the northeastern Gulf of Mexico. Northeast Gulf Sci. 11(2):131-136.
9. Anonymous. 1991. Slipper lobster. Seafood Leader 11(2):217-224.
- 10.

List of species distribution and density maps for the Gulf of Mexico from NOAA Fisheries

This is a list of the distribution and density maps available for these species from the 1998 Generic Amendment and as electronic files in pdf (portable document format), downloadable from the NMFS Galveston EFH web site at http://galveston.ssp.nmfs.gov/efh/changes/default_new.htm#Abundance_maps

Common name	Specific name	Map source
Red Drum FMP		
Red drum	<i>Sciaenops ocellatus</i>	(Adults) Gulfwide\GOMRdrumAd.PDF (Juveniles) Gulfwide\GOMRdDrmJv.PDF Florida Adults Fall FL\flrdafa.PDF Florida Adults Spring FL\flrdasp.PDF Florida Adults Summer FL\flrdasu.PDF Florida Adults Winter FL\flrdawi.PDF Florida Juveniles Fall FL\jflrdfa.PDF Florida Juveniles Spring FL\jflrdsp.PDF Florida Juveniles Summer FL\jflrdsu.PDF Florida Juveniles Winter FL\jflrdwi.PDF La-Ms-Al Adults Fall LA-MS-AL\lmardafa.PDF La-Ms-Al Adults Spring LA-MS-AL\lmardasp.PDF La-Ms-Al Adults Summer LA-MS-AL\lmardasu.PDF La-Ms-Al Adults Winter LA-MS-AL\lmardawi.PDF La-Ms-Al Juveniles Fall LA-MS-AL\rdjfala.PDF La-Ms-Al Juveniles Spring LA-MS-AL\rdjspla.PDF La-Ms-Al Juveniles Summer LA-MS-AL\rdjsula.PDF La-Ms-Al Juveniles Winter LA-MS-AL\rdjwila.PDF Texas Adults Fall TX\txrrdfa.pdf Texas Adults Spring TX\txrrdsp.pdf Texas Adults Summer TX\txrrdsu.pdf Texas Adults Winter TX\txrrdwi.pdf Texas Juveniles Fall TX\txrdjfa.pdf Texas Juveniles Spring TX\txrdjsp.pdf Texas Juveniles Summer TX\txrdjsu.pdf Texas Juveniles Winter TX\txrdjwi.pdf (Adults) Gulfwide\GOMRdrumAd.PDF (Juveniles) Gulfwide\GOMRdDrmJv.PDF

Common name	Specific name	Map source
		<p>Florida Adults Florida\Apalache\Apalrda.PDF Florida Juveniles Florida\Apalache\Apalrdj.PDF Florida Adults Florida\Apalcola\Acolarda.PDF Florida Juveniles Florida\Apalcola\Acolardj.PDF Texas Adults Texas\AranBay\aranrda.PDF Texas Juveniles Texas\AranBay\aranrdj.PDF Louisiana Adults Louisiana\VermAtch\atchrda.PDF Louisiana Juveniles Louisiana\VermAtch\atchrdj.PDF Texas Adults Texas\BaffBay\baffrda.PDF Texas Juveniles Texas\BaffBay\baffrdj.PDF Louisiana Adults Louisiana\Baratar\bararda.PDF Louisiana Juveniles Louisiana\Baratar\barardj.PDF Louisiana Adults Texas\BrazosRv\brazrda.PDF Louisiana Juveniles Texas\BrazosRv\brazrdj.PDF Louisiana Adults Louisiana\Breton\bretrda.PDF Louisiana Juveniles Louisiana\Breton\bretrdj.PDF Louisiana Adults Louisiana\Calcas\calcrda.PDF Louisiana Juveniles Louisiana\Calcas\calcrdj.PDF Florida Adults Florida\CalooRiv\Caloordrda.PDF Florida Juveniles Florida\CalooRiv\Caloordj.PDF Florida Adults Florida\Chatlott\CharHrda.PDF Florida Juveniles Florida\Chatlott\CharHrdj.PDF Florida Adults Florida\Choctaw\chctrda.PDF Florida Juveniles Florida\Choctaw\chctrdj.PDF Texas Adults Texas\CorpCrBay\ccbrda.PDF Texas Juveniles Texas\CorpCrBay\ccbrdj.PDF Florida Adults Florida\FIBay\FIbayrda.PDF Florida Juveniles Florida\FIBay\FIbayrdj.PDF Texas Adults Texas\GalvBay\Galvrda.PDF Texas Juveniles Texas\GalvBay\Galvrdj.PDF Louisiana Adults Louisiana\Potborg\pontrda.PDF Louisiana Juveniles Louisiana\Potborg\pontrdj.PDF Texas Adults Texas\LagunaMd\llmrda.PDF Texas Juveniles Texas\LagunaMd\llmrdj.PDF Texas Adults Texas\MatagBay\matarda.PDF Texas Juveniles Texas\MatagBay\matardj.PDF Louisiana Adults Louisiana\Merment\mermrda.PDF Louisiana Juveniles Louisiana\Merment\mermrj.PDF</p>

Common name	Specific name	Map source
		Louisiana Adults Louisiana\MissRiv\msrvrda.PDF Louisiana Juveniles Louisiana\MissRiv\msrvrdj.PDF Mississippi Adults Mississippi\MissSd\mssdrda.PDF Mississippi Juveniles Mississippi\MissSd\mssdrdj.PDF Alabama Adults Alabama\Mobile Bay\mbrda.PDF Alabama Juveniles Alabama\Mobile Bay\mobrdj.PDF Florida Adults Florida\PensaBay\Penbrda.PDF Florida Juveniles Florida\PensaBay\Penbrdj.PDF Florida Adults Florida\PerdidoBay\Perdrda.PDF Florida Juveniles Florida\PerdidoBay\Perdrdj.PDF Texas Adults Texas\SabineLk\sblkrda.PDF Texas Juveniles Texas\SabineLk\sblkrdj.PDF Texas Adults Texas\SanAnBay\sabrda.PDF Texas Juveniles Texas\SanAnBay\sabrdj.PDF Florida Adults Florida\Suwanee\Suwanrda.PDF Florida Juveniles Florida\Suwanee\Suwanrdj.PDF Florida Adults Florida\Tampa\Tamprda.PDF Florida Juveniles Florida\Tampa\Tamprdj.PDF Florida Adults Florida\TenThous\TenKrda.PDF Florida Juveniles Florida\TenThous\TenKrdj.PDF Louisiana Adults Louisiana\TerrTimb\terrda.PDF Louisiana Juveniles Louisiana\TerrTimb\terrdj.PDF Figure 14 from the Generic Amendment All Gulf States, all seasons, juveniles
Reef Fish FMP		
Gray triggerfish	<i>Balistes capriscus</i>	G of M: Offshore Figure 30 from The Generic Amendment
Greater amberjack	<i>Seriola dumerili</i>	Adults and juveniles file GOMGagAd[1].pdf, GOMGrtAmbr.pdf
Lesser amberjack	<i>Seriola fasciata</i>	G of M: Offshore Figure 28 from the Generic Amendment
Red snapper	<i>Lutjanus campechanus</i>	(juveniles) GOMRdSnprJv[1].pdf (adults) GOMRdSnprAd[1].pdf
Gray (mangrove) snapper	<i>Lutjanus griseus</i>	Florida Adult Fall FL\flgsafa.PDF Florida Adult Spring FL\flgsasp.PDF Florida Adult Summer FL\flgsasu.PDF Florida Adult Winter FL\flgsawi.PDF Florida Juvenile Fall FL\jflgsfa.PDF

Common name	Specific name	Map source
		Florida Juvenile Spring FL\jflgssp.PDF Florida Juvenile Summer FL\jflgssu.PDF Florida Juvenile Winter FL\jflgswi.PDF La-Ms-Al Adult Fall LA-MS-AL\lmagsafa.PDF La-Ms-Al Adult Spring LA-MS-AL\lmagsasp.PDF La-Ms-Al Adult Summer LA-MS-AL\lmagsasu.PDF La-Ms-Al Adult Winter LA-MS-AL\lmagsawi.PDF La-Ms-Al Juvenile Fall LA-MS-AL\gsjfala.PDF La-Ms-Al Juvenile Spring LA-MS-AL\gsjspla.PDF La-Ms-Al Juvenile Summer LA-MS-AL\gsjsula.PDF La-Ms-Al Juvenile Winter LA-MS-AL\gsjwila.PDF Texas Adult Fall TX\txrgsfa.pdf Texas Adult Spring TX\txrgssp.pdf Texas Adult Summer TX\txrgssu.pdf Texas Adult Winter TX\txrgswi.pdf Texas Juvenile Fall TX\txgsjfa.pdf Texas Juvenile Spring TX\txgsjsp.pdf Texas Juvenile Summer TX\txgsjsu.pdf Texas Juvenile Winter TX\txgsjwi.pdf Figure 22 from the Generic Amendment
Lane snapper	<i>Lutjanus synagris</i>	Figure 25 from the Generic Amendment-Florida Juveniles Winter (Dec-Feb) Figure 26 from the Generic Amendment-G of M: Offshore (Adults) GOMLnSnapr[1].pdf (Juveniles) GOMLnSnapr[2].pdf
Yellowtail snapper	<i>Ocyurus chrysurus</i>	Figure 23 from the Generic Amendment Florida: All seasons G of M: Offshore, Figure 24 from the Generic Amendment (Adults) GOMYltSnprAd[1].pdf (Juveniles) GOMYltSnprJv[1].pdf
(Golden) Tilefish	<i>Lopholatilus chamaeleonticeps</i>	Figure 29 from the Generic Amendment G of M: Offshore (Adults) GOMTileAd[1].pdf (Juveniles) GOMTileJv[1].pdf
Red grouper	<i>Epinephelus morio</i>	Figure 16 from the Generic Amendment G of M: Offshore

Common name	Specific name	Map source
		(Adults) GOMRdgrpAd[1].pdf (Juveniles) GOMRdGrpJv[1].pdf
Gag	<i>Mycteroperca microlepis</i>	Figure 17 from the Generic Amendment Juveniles: All seasons Figure 18 from the Generic Amendment G of M: Offshore (Adults) GOMGagAd[1].pdf
Scamp	<i>Mycteroperca phenax</i>	Figure 19 from the Generic Amendment G of M: Offshore (Adults) GOMScampAd[1].pdf
Coastal Migratory Pelagics FMP		
King Mackerel	<i>Scomberomorus cavalla</i>	(Adults) Gulfwide\GOMKgMackr.PDF (Juveniles) Gulfwide\GOMKgMackr.PDF Figure 31 from the Generic Amendment G of M: Offshore
Spanish Mackerel	<i>Scomberomorus maculatus</i>	Florida Adult Fall FL/flsmafa.pdf Florida Adult Spring FL/flsmasp.pdf Florida Adult Summer FL/flsmasu.pdf Florida Adult Winter FL/flsmawi.pdf Florida Juvenile Fall FL/flsmfa.pdf Florida Juvenile Spring FL/flsmasp.pdf Florida Juvenile Summer FL/flsmasu.pdf Florida Juvenile Winter FL/flsmwi.pdf La-Ms-Al Adult Fall LA-MS-AL/lmasmafa.pdf La-Ms-Al Adult Spring LA-MS-AL/lmasmasp.pdf La-Ms-Al Adult Summer LA-MS-AL/lmasmasu.pdf La-Ms-Al Adult Winter LA-MS-AL/lmasmawi.pdf La-Ms-Al Juvenile Fall LA-MS-AL/smjfala.pdf La-Ms-Al Juvenile Spring LA-MS-AL\smjspla.pdf La-Ms-Al Juvenile Summer LA-MS-AL\smjsula.pdf La-Ms-Al Juvenile Winter LA-MS-AL\smjwila.pdf Texas Adult Fall TX\txrsmafa.PDF Texas Adult Spring TX\txrsmasp.pdf Texas Adult Summer TX\txrsmasu.pdf Texas Adult Winter TX\txrsmawi.pdf Texas Juvenile Fall TX\txrsmjfa.pdf Texas Juvenile Spring TX\txrsmjsp.pdf Texas Juvenile Summer TX\txrsmjsu.pdf

Common name	Specific name	Map source
		<p>Texas Juvenile Winter TX\txrsmjwi.pdf Figure 32 from the Generic Amendment: Texas Juveniles, all seasons, LA,MS, and AL juveniles, and Florida juveniles all seasons (Adults) Gulfwide\GOMSpMckAd.pdf (Juveniles) Gulfwide\GOMSpMckJv.pdf Florida Adult Florida\Apalache\Apalsma.PDF Florida Juvenile Florida\Apalache\Apalsmj.PDF Florida Adult Florida\Apalcola\Acolasma.PDF Florida Juvenile Florida\Apalcola\Acolasmj.PDF Texas Adult Texas\AranBay\aransma.PDF Texas Juvenile Texas\AranBay\aransmj.PDF Louisiana Adult Louisiana\VermaTch\atchsma.PDF Louisiana Juvenile Louisiana\VermaTch\atchsmj.PDF Texas Adult Texas\BaffBay\baffsma.PDF Texas Juvenile Texas\BaffBay\baffsmj.PDF Louisiana Adult Louisiana\Baratar\barasma.PDF Louisiana Juvenile Louisiana\Baratar\barasmj.PDF Texas Adult Texas\BrazosRv\brazsma.PDF Texas Juvenile Texas\BrazosRv\brazsmj.PDF Louisiana Adult Louisiana\Breton\bretsma.PDF Louisiana Juvenile Louisiana\Breton\bretsmj.PDF Louisiana Adult Louisiana\Calcas\calcsma.PDF Louisiana Juvenile Louisiana\Calcas\calcsmj.PDF Florida Adult Florida\CalooRiv\Caloosma.PDF Florida Juvenile Florida\CalooRiv\Caloosmj.PDF Florida Adult Florida\Chatlott\CharHsma.PDF Florida Juvenile Florida\Chatlott\CharHsmj.PDF Florida Adult Florida\Choctaw\chctsma.PDF Florida Juvenile Florida\Choctaw\chctsmj.PDF Texas Adult Texas\CorpCrBay\ccbsma.PDF Texas Juvenile Texas\CorpCrBay\ccbsmj.PDF Florida Adult Florida\FIBay\FIbaysma.PDF Florida Juvenile Florida\FIBay\FIbaysmj.PDF Texas Adult Texas\GalvBay\Galvsma.PDF Texas Juvenile Texas\GalvBay\Galvsmj.PDF Louisiana Adult Louisiana\Potborg\pontsma.PDF Louisiana Juvenile Louisiana\Potborg\pontsmj.PDF Texas Adult Texas\LagunaMd\llmsma.PDF Texas Juvenile Texas\LagunaMd\llmsmj.PDF</p>

Common name	Specific name	Map source
		Texas Adult Texas\MatagBay\matasma.PDF Texas Juvenile Texas\MatagBay\matasmj.PDF Louisiana Adult Louisiana\Merment\mermsma.PDF Louisiana Adult Louisiana\Merment\mermsma.PDF Louisiana Adult Louisiana\MissRiv\msrvsma.PDF Louisiana Juvenile Louisiana\MissRiv\msrvsmj.PDF Mississippi Adult Mississippi\MissSd\mssdsma.PDF Mississippi Juvenile Mississippi\MissSd\mssdsmj.PDF Alabama Adult Alabama\Mobile Bay\mbsma.PDF Alabama Juvenile Alabama\Mobile Bay\mobsmj.PDF Florida Adult Florida\PensaBay\Penbsma.PDF Florida Juvenile Florida\PensaBay\Penbsmj.PDF Florida Adult Florida\PerdidoBay\Perdsma.PDF Florida Juvenile Florida\PerdidoBay\Perdsmj.PDF Florida Adult Texas\SabineLk\sblksma.PDF Texas Juvenile Texas\SabineLk\sblksmj.PDF Texas Adult Texas\SanAnBay\sabsma.PDF Texas Juvenile Texas\SanAnBay\sabsmj.PDF Florida Adult Florida\Suwanee\Suwansma.PDF Florida Juvenile Florida\Suwanee\Suwansmj.PDF Florida Adult Florida\Tampa\Tampsma.PDF Florida Juvenile Florida\Tampa\Tampsmj.PDF Florida Adult Florida\TenThous\TenKsma.PDF Florida Juvenile Florida\TenThous\TenKsmj.PDF Louisiana Adult Louisiana\TerrTimb\terrsmj.PDF Louisiana Juvenile Louisiana\TerrTimb\terrsmj.PDF
Cobia	<i>Rachycentron canadum</i>	(Adult) Gulfwide\GOMBrnShrpAd3.pdf (Juvenile) Gulfwide\GOMCobiaJv.pdf Figure 34 from the Generic Amendment G of M: Offshore
Shrimp FMP		
Brown shrimp	<i>Penaeus aztecus</i>	Florida Adult Fall FL\flbsafa.PDF Florida Adult Spring FL\flbsasp.PDF Florida Adult Summer FL\flbsasu.PDF Florida Adult Winter FL\flbsawi.PDF

Common name	Specific name	Map source
		Florida Juvenile Fall FL\jflbsfa.PDF Florida Juvenile Spring FL\jflbssp.PDF Florida Juvenile Summer FL\jflbssu.PDF Florida Juvenile Winter FL\jflbswi.PDF La-Ms-Al Adult Fall LA-MS-AL\lmabsafa.PDF La-Ms-Al Adult Spring LA-MS-AL\lmabsasp.PDF La-Ms-Al Adult Summer LA-MS-AL\lmabsasu.PDF La-Ms-Al Adult Winter LA-MS-AL\lmabsawi.PDF La-Ms-Al Juvenile Fall LA-MS-AL\bsjfala.PDF La-Ms-Al Juvenile Spring LA-MS-AL\bsjspla.PDF La-Ms-Al Juvenile Summer LA-MS-AL\bsjsula.PDF La-Ms-Al Juvenile Winter LA-MS-AL\bsjwila.PDF Texas Adult Fall TX\txrbsfa.pdf Texas Adult Spring TX\txrbssp.pdf Texas Adult Summer TX\txrbssu.pdf Texas Adult Winter TX\txbsawi.pdf Texas Adult Fall TX\txbsjfa.pdf Texas Adult Spring TX\txbsjsp.pdf Texas Adult Summer TX\txbsjsu.pdf Texas Adult Winter TX\txbsjwi.pdf Florida Adults Florida\Apalache\Apalbsa.PDF Florida Juveniles Florida\Apalache\Apalbsj.PDF Florida Adults Florida\Apalcola\Acolabsa.PDF Florida Juveniles Florida\Apalcola\Acolabsj.PDF Florida Adults Texas\AranBay\aranbsa.PDF Florida Juveniles Texas\AranBay\aranbsj.PDF Florida Adults Louisiana\VermAtch\atchbsa.PDF Florida Juveniles Louisiana\VermAtch\atchbsj.PDF Texas Adults Texas\BaffBay\baffbsa.PDF Texas Juveniles Texas\BaffBay\baffbsj.PDF Louisiana Adults Louisiana\Baratar\barabsa.PDF Louisiana Juveniles Louisiana\Baratar\barabsj.PDF Texas Adults Texas\BrazosRv\brazbsa.PDF Texas Juveniles Texas\BrazosRv\brazbsj.PDF Louisiana Adults Louisiana\Breton\bretbsa.PDF

Common name	Specific name	Map source
		<p> Louisiana Juveniles Louisiana\Breton\bretbsj.PDF Louisiana Adults Louisiana\Calcas\calcbsa.PDF Louisiana Juveniles Louisiana\Calcas\calcbsj.PDF Florida Adults Florida\CalooRiv\Caloobsa.PDF Florida Juveniles Florida\CalooRiv\Caloobsj.PDF Florida Adults Florida\Chatlott\CharHbsa.PDF Florida Juveniles Florida\Chatlott\CharHbsj.PDF Florida Adults Florida\Choctaw\chctbsa.PDF Florida Juveniles Florida\Choctaw\chctbsj.PDF Texas Adults Texas\CorpCrBay\ccbbsa.PDF Texas Juveniles Texas\CorpCrBay\ccbbsj.PDF Florida Adults Florida\FIBay\Flbaybsa.PDF Florida Juveniles Florida\FIBay\Flbaybsj.PDF Texas Adults Texas\GalvBay\Galvbsa.PDF Texas Juveniles Texas\GalvBay\Galvbsj.PDF Louisiana Adults Louisiana\Potborg\pontbsa.PDF Louisiana Juveniles Louisiana\Potborg\pontbsj.PDF Texas Adults Texas\LagunaMd\llmba.PDF Texas Juveniles Texas\LagunaMd\llmbsj.PDF Texas Adults Texas\MatagBay\matabsa.PDF Texas Juveniles Texas\MatagBay\matabsj.PDF Louisiana Adults Louisiana\Merment\mermba.PDF Louisiana Juveniles Louisiana\Merment\mermbaj.PDF Louisiana Adults Louisiana\MissRiv\msrvbsa.PDF Louisiana Juveniles Louisiana\MissRiv\msrvbsj.PDF Mississippi Adults Mississippi\MissSd\mssdba.PDF Mississippi Juveniles Mississippi\MissSd\mssdbaj.PDF Alabama Adults Alabama\Mobile Bay\mbbsa.pdf Alabama Juveniles Alabama\Mobile Bay\mobbsj.PDF Florida Adults Florida\PensaBay\PenBbsa.PDF Florida Juveniles Florida\PensaBay\Penbbsj.PDF Florida Adults Florida\PerdidoBay\Perdbsa.PDF Florida Juveniles Florida\PerdidoBay\Perdbaj.PDF Texas Adults Texas\SabineLk\sblkbsa.PDF Texas Juveniles Texas\SabineLk\sblkbsj.PDF Texas Adults Texas\SanAnBay\sabbsa.PDF </p>

Common name	Specific name	Map source
		Texas Juveniles Texas\SanAnBay\sabbsj.PDF Florida Adults Florida\Suwanee\Suwanbsa.PDF Florida Juveniles Florida\Suwanee\Suwanbsj.PDF Florida Adults Florida\Tampa\Tampbsa.PDF Florida Juveniles Florida\Tampa\Tampbsj.PDF Florida Adults Florida\TenThous\TenKbsa.PDF Florida Juveniles Florida\TenThous\TenKbsj.PDF Louisiana Adults Louisiana\TerrTimb\terrbsa.PDF Louisiana Juveniles Louisiana\TerrTimb\terrbsj.PDF Figure 8 from the Generic Amendment All seasons, all G of M states, juveniles
White shrimp	<i>Penaeus setiferus</i>	Florida Adults Fall FL\flwsafa.PDF Florida Adults Spring FL\flwsasp.PDF Florida Adults Summer FL\flwsasu.PDF Florida Adults Winter FL\flwsawi.PDF Florida Juveniles Fall FL\jflwsfa.PDF Florida Juveniles Spring FL\jflwssp.PDF Florida Juveniles Summer FL\jflwssu.PDF Florida Juveniles Winter FL\jflwswi.PDF La-Ms-Al Adults Fall LA-MS-AL\lmawsafa.PDF La-Ms-Al Adults Spring LA-MS-AL\lmawsasp.PDF La-Ms-Al Adults Winter LA-MS-AL\lmawsawi.PDF La-Ms-Al Juveniles Fall LA-MS-AL\wsjfala.PDF La-Ms-Al Juveniles Spring LA-MS-AL\wsjspla.PDF La-Ms-Al Juveniles Summer LA-MS-AL\wsjsula.PDF La-Ms-Al Juveniles Winter LA-MS-AL\wsjwila.PDF Texas Adults Fall TX\txrwsfa.pdf Texas Adults Spring TX\txrwssp.pdf Texas Adults Summer TX\txrwssu.pdf Texas Adults TX\txrswi.pdf Texas Juveniles Fall TX\txrwsjfa.pdf Texas Juveniles Spring TX\txrwsjsp.pdf Texas Juveniles Summer TX\txrwsjsu.pdf Texas Juveniles Winter TX\txrwsjwi.pdf (Adults) Gulfwide\GOMWhtShrpAd.PDF (Juveniles) Gulfwide\GOMWhtShrpJv.PDF Figure 10 from the Generic Amendments:

Common name	Specific name	Map source
		juveniles, from all G of M states and all seasons.
Pink shrimp	<i>Penaeus duorarum</i>	Florida Adults Fall FL\flpsafa.PDF Florida Adults Spring FL\flpsasp.PDF Florida Adults Summer FL\flpsasu.PDF Florida Adults Winter FL\flpsawi.PDF Florida Juveniles Fall FL\jflpsfa.PDF Florida Juveniles Spring FL\jflpssp.PDF Florida Juveniles Summer FL\jflpssu.PDF Florida Juveniles Winter FL\jflpswi.PDF La-Ms-Al Adults Fall LA-MS-AL\lmapsafa.PDF La-Ms-Al Adults Spring LA-MS-AL\lmapsasp.PDF La-Ms-Al Adults Summer LA-MS-AL\lmapsasu.PDF La-Ms-Al Adults Winter LA-MS-AL\lmapsawi.PDF La-Ms-Al Juveniles Fall LA-MS-AL\psjfala.PDF La-Ms-Al Juveniles Spring LA-MS-AL\psjspla.PDF La-Ms-Al Juveniles Summer LA-MS-AL\psjsula.PDF La-Ms-Al Juveniles Winter LA-MS-AL\psjwila.PDF Texas Adults Fall TX\txrpsfa.pdf Texas Adults Spring TX\txrpssp.pdf Texas Adults Summer TX\txrpssu.pdf Texas Adults Winter TX\txrpswi.pdf Texas Juveniles Fall TX\txpsjfa.pdf Texas Juveniles Spring TX\txpsjsp.pdf Texas Juveniles Summer TX\txpsjsu.pdf Texas Juveniles Winter TX\txpsjwi.pdf (Adults) Gulfwide\GOMPkShrmpAJ.PDF (Juveniles) Gulfwide\GOMPkShrmpAJ.PDF Florida Adults Florida\Apalache\Apalpsa.PDF Florida Juveniles Florida\Apalache\Apalpsj.PDF Florida Adults Florida\Apalcola\Acolapsa.PDF Florida Juveniles Florida\Apalcola\Acolapsj.PDF Texas Adults Texas\AranBay\aranpsa.PDF Texas Juveniles Texas\AranBay\aranpsj.pdf Louisiana Adults Louisiana\VermaTch\atchpsa.PDF Louisiana Juveniles Louisiana\VermaTch\atchpsj.PDF

Common name	Specific name	Map source
		<p> Texas Adults Texas\BaffBay\baffpsa.PDF Texas Juveniles Texas\BaffBay\baffpsj.PDF Louisiana Adults Louisiana\Baratar\barapsa.PDF Louisiana Juveniles Louisiana\Baratar\barapsj.PDF Texas Adults Texas\BrazosRv\brazpsa.PDF Texas Juveniles Texas\BrazosRv\brazpsj.PDF Louisiana Adults Louisiana\Breton\bretpsa.PDF Louisiana Juveniles Louisiana\Breton\bretpsj.PDF Louisiana Adults Louisiana\Calcas\calcpsa.PDF Louisiana Juveniles Louisiana\Calcas\calcpsj.PDF Florida Adults Florida\CalooRiv\Caloopsa.PDF Florida Juveniles Florida\CalooRiv\Caloopsj.PDF Florida Adults Florida\Chatlott\CharHpsa.PDF Florida Juveniles Florida\Chatlott\CharHpsj.PDF Florida Adults Florida\Choctaw\chctpsa.PDF Florida Juveniles Florida\Choctaw\chctpsj.PDF Texas Adults Texas\CorpCrBay\ccbpsa.PDF Texas Juveniles Texas\CorpCrBay\ccbpsj.PDF Florida Adults Florida\FIBay\FIbaypsa.PDF Florida Juveniles Florida\FIBay\FIbaypsj.PDF Texas Adults Texas\GalvBay\Galvpsa.PDF Texas Juveniles Texas\GalvBay\Galvpsj.PDF Louisiana Adults Louisiana\Potborg\pontpsa.PDF Louisiana Juveniles Louisiana\Potborg\pontpsj.PDF Texas Adults Texas\LagunaMd\llmpsa.PDF Texas Juveniles Texas\LagunaMd\llmpsj.PDF Texas Adults Texas\MatagBay\matapsa.PDF Texas Juveniles Texas\MatagBay\matapsj.PDF Louisiana Adults Louisiana\Merment\mermpsa.PDF Louisiana Juveniles Louisiana\Merment\mermpsj.PDF Louisiana Adults Louisiana\MissRiv\msrvpsa.PDF Louisiana Juveniles Louisiana\MissRiv\msrvpsj.PDF Mississippi Adults Mississippi\MissSd\mssdpsa.PDF Mississippi Juveniles Mississippi\MissSd\mssdpdj.PDF Alabama Adults Alabama\Mobile </p>

Common name	Specific name	Map source
		Bay\mbpsa.PDF Alabama Juveniles Alabama\Mobile Bay\mobpsj.PDF Florida Adults Florida\PensaBay\Penbpsa.PDF Florida Juveniles Florida\PensaBay\Penbpsj.PDF Florida Adults Florida\PerdidoBay\Perdpsa.PDF Florida Juveniles Florida\PerdidoBay\Perdpsj.PDF Texas Adults Texas\SabineLk\sblkpsa.PDF Texas Juveniles Texas\SabineLk\sblkpsj.PDF Texas Adults Texas\SanAnBay\sabpsa.PDF Texas Juveniles Texas\SanAnBay\sabpsj.PDF Florida Adults Florida\Suwanee\Suwanpsa.PDF Florida Juveniles Florida\Suwanee\Suwanpsj.PDF Florida Adults Florida\Tampa\Tamppsa.PDF Florida Juveniles Florida\Tampa\Tamppsj.PDF Florida Adults Florida\TenThous\TenKpsa.PDF Florida Juveniles Florida\TenThous\TenKpsj.PDF Louisiana Adults Louisiana\TerrTimb\terrpsa.PDF Louisiana Juveniles Louisiana\TerrTimb\terrpsj.PDF Figure 12 in the Generic Amendment: juveniles, all seasons and all G of M states
Royal red shrimp	<i>Pleoticus robustus</i>	No maps are available for this species.
Stone Crab FMP		
Stone Crab	<i>Menippe mercenaria</i>	(Adults) Gulfwide\GOMStCrabAd.PDF (Juveniles) Gulfwide\GOMStCrabJv.PDF Florida Adults Fall FL\flscafa.PDF Florida Adults Spring FL\flscasp.PDF Florida Adults Summer FL\flscasu.PDF Florida Adults Winter FL\flscawi.PDF Florida Juveniles Fall FL\jflscfa.PDF Florida Juveniles Spring FL\jflscsp.PDF Florida Juveniles Summer FL\jflscsu.PDF Florida Juveniles Winter FL\jflsewi.PDF Figure 36 in the Generic Amendment Juveniles, all seasons, in Florida Florida Adults Florida\Apalache\Apalgscsa.PDF Florida Juveniles Florida\Apalache\Apalgscj.PDF Florida Adults Florida\Apalcola\Acolgscsa.PDF Florida Juveniles Florida\Apalcola\Acolgscj.PDF Texas Adults Texas\AranBay\arangscsa.PDF Texas Juveniles Texas\AranBay\arangscj.PDF Louisiana Adults

Common name	Specific name	Map source
		Louisiana\VerMAtch\atchgscA.PDF Louisiana Juveniles Louisiana\VerMAtch\atchgscj.PDF Texas Adults Texas\BaffBay\baffgscA.PDF
Spiny Lobster FMP		
Spiny Lobster	<i>Panulirus argus</i>	Florida Adults Florida\Apalache\Apalsla.PDF Florida Juveniles Florida\Apalache\Apalslj.PDF Florida Adults Florida\Apalcola\Acolasla.PDF Florida Juveniles Florida\Apalcola\Acolaslj.PDF Texas Adults Texas\AranBay\aransla.PDF Texas Juveniles Texas\AranBay\aranslj.PDF Texas Adults Louisiana\VerMAtch\atchsla.PDF Texas Juveniles Louisiana\VerMAtch\atchslj.PDF Texas Adults Texas\BaffBay\baffsla.PDF Texas Juveniles Texas\BaffBay\baffslj.PDF Louisiana Adults Louisiana\Baratar\barasla.PDF Louisiana Juveniles Louisiana\Baratar\baraslj.PDF Texas Adults Texas\BrazosRv\brazsla.PDF Texas Juveniles Texas\BrazosRv\brazslj.PDF Texas Adults Louisiana\Breton\bretsla.PDF Louisiana Juveniles Louisiana\Breton\bretslj.PDF Louisiana Adults Louisiana\Calcas\calcsla.PDF Louisiana Juveniles Louisiana\Calcas\calcslj.PDF Louisiana Adults Florida\CalooRiv\Caloosla.PDF Louisiana Juveniles Florida\CalooRiv\Calooslj.PDF Florida Adults Florida\Chatlott\CharHsla.PDF Florida Juveniles Florida\Chatlott\CharHslj.PDF Florida Adults Florida\Choctaw\chctsla.PDF Florida Juveniles Florida\Choctaw\chctslj.PDF Florida Adults Texas\CorpCrBay\ccbsla.PDF Texas Juveniles Texas\CorpCrBay\ccbslj.PDF Florida Adults Florida\FIBay\Flbaysla.PDF Florida Juveniles Florida\FIBay\Flbayslj.PDF Texas Adults Texas\GalvBay\Galvsla.PDF Texas Juveniles Texas\GalvBay\Galvslj.PDF Louisiana Adults Louisiana\Potborg\pontsla.PDF Louisiana Juveniles Louisiana\Potborg\pontslj.PDF Texas Adults Texas\LagunaMd\llmsla.PDF Texas Juveniles Texas\LagunaMd\llmslj.PDF Texas Adults Texas\MatagBay\matasla.PDF Texas Juveniles Texas\MatagBay\mataslj.PDF

Common name	Specific name	Map source
		Louisiana Adults Louisiana \Merment \mermsla.PDF Louisiana Juveniles Louisiana \Merment \mermslj.PDF Louisiana Adults Louisiana \MissRiv \msrvsla.PDF Louisiana Juveniles Louisiana \MissRiv \msrvslj.PDF Mississippi Adults Mississippi \MissSd \mssdsla.PDF Mississippi Juveniles Mississippi \MissSd \mssdslj.PDF Alabama Adults Alabama \Mobile Bay \mobsla.PDF Alabama Juveniles Alabama \Mobile Bay \mobslj.PDF Florida Adults Florida \PensaBay \Penbsla.PDF Florida Juveniles Florida \PensaBay \Penbslj.PDF Florida Adults Florida \PerdidoBay \Perdsla.PDF Florida Juveniles Florida \PerdidoBay \Perdslj.PDF Texas Adults Texas \SabineLk \sblksla.PDF Texas Juveniles Texas \SabineLk \sblkslj.PDF Texas Adults Texas \SanAnBay \sabsla.PDF Texas Juveniles Texas \SanAnBay \sabslj.PDF Florida Adults Florida \Suwanee \Suwansla.PDF Florida Juveniles Florida \Suwanee \Suwanslj.PDF Florida Adults Florida \Tampa \Tampsla.PDF Florida Juveniles Florida \Tampa \Tampslj.PDF Florida Adults Florida \TenThous \TenKsla.PDF Florida Juveniles Florida \TenThous \TenKslj.PDF Louisiana Adults Louisiana \TerrTimb \terrsla.PDF Louisiana Juveniles Louisiana \TerrTimb \terrslj.PDF Florida Adults Fall FL \flslafa.PDF Florida Adults Spring FL \flslasp.PDF Florida Adults Summer FL \flslasu.PDF Florida Adults Winter FL \flslawi.PDF Florida Juveniles Fall FL \jflslfa.PDF Florida Juveniles Spring FL \jflslsp.PDF Florida Juveniles Summer FL \jflslsu.PDF Florida Juveniles Winter FL \jflslwi.PDF La-Ms-Al Adults Fall LA-MS-AL \slafala.PDF * La-Ms-Al Adults Spring LA-MS-AL \slaspla.PDF *

Common name	Specific name	Map source
		<p>La-Ms-Al Adults Summer LA-MS-AL\slasula.PDF *</p> <p>La-Ms-Al Adults Winter LA-MS-AL\slawila.PDF *</p> <p>La-Ms-Al Juveniles Fall LA-MS-AL\sljfala.PDF</p> <p>La-Ms-Al Juveniles Spring LA-MS-AL\sljspla.PDF</p> <p>La-Ms-Al Juveniles Summer LA-MS-AL\sljsula.PDF</p> <p>La-Ms-Al Juveniles Winter LA-MS-AL\sljwila.PDF</p> <p>Texas Adult Fall TX\txrslafa.pdf</p> <p>Texas Adults Spring TX\txrslasp.PDF</p> <p>Texas Adults Summer TX\txrslasu.PDF</p> <p>Texas Adult Winter TX\txrslawi.pdf</p> <p>Texas Juveniles Fall TX\txrsljfa.pdf</p> <p>Texas Juveniles Spring TX\txrsljsp.PDF</p> <p>Texas Juveniles Summer TX\txrsljsu.PDF</p> <p>Texas Juveniles Winter TX\txrsljwi.pdf</p> <p>(Adults) Gulfwide\GOMSpyLobAd.PDF</p> <p>(Juveniles) Gulfwide\GOMSpyLobJv.PDF</p> <p>Figure 38 from Generic Amendment ; juveniles, all seasons</p> <p>Figure 39 from the Generic Amendment G of M: Offshore</p>

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