APPENDIX F

ESSENTIAL FISH HABITAT ASSESSMENT

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Bayou Casotte Energy LLC

Casotte Landing Natural Gas Import Terminal Project

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TABLE OF CONTENTS

1.0 INTRODUCTION 3
2.0 PROJECT DESCRIPTION 5
2.1 Terminal 5
2.2 Marine Slip 5
2.3 Pipeline Interconnections 5
3.0 ENVIRONMENTAL DESCRIPTION 6
3.1 Terminal Site 6
3.2 Natural Gas Pipeline Interconnections 6
4.0 ESSENTIAL FISH HABITAT 8
5.0 MANAGED FISH SPECIES 11
5.1 Ecological Notes on the EFH Fisheries and Species 11
5.1.1 Species Common to Bayou Casotte 11
5.1.2 Additional Species Potentially Present in Bayou Casotte 15
5.1.3 Marine Benthic Community 18
5.1.4 Summary of Seasonal Abundance 19
6.0 ASSESSMENT OF IMPACTS 21
6.1 Impacts to the Freshwater Component of the EFH 21
6.2 Impacts to the Estuarine Component of the EFH 21
6.2.1 Primary Dredging Impact 21
6.2.2 Turbidity Impacts 22
6.2.3 Submerged Aquatic Vegetation and Shellfish Beds 24
6.2.4 Potential for Offshore Spills 24
6.2.5 Summary of EFH Impacts 24
7.0 PROPOSED MITIGATIVE MEASURES 26
8.0 CONCLUSIONS 28
9.0 REFERENCES CITED 29

1.0 INTRODUCTION

Bayou Casotte Energy LLC (Bayou Casotte Energy), a subsidiary of Chevron U.S.A., Inc. (CUSA), proposes to build and operate an onshore liquefied natural gas (LNG) import terminal and associated facilities (Terminal) south of the existing CUSA Pascagoula Refinery (Pascagoula Refinery) on Bayou Casotte, just east of Pascagoula, Mississippi (Figure 1-1, see Resource Report 1) in Jackson County. The proposed Casotte Landing Natural Gas Import Terminal Project (Casotte Landing, Project, or Terminal) will include a double-berth slip for accommodation of an LNG carrier (LNGC); facilities to receive and store LNG offloaded from LNGCs; equipment to regasify the LNG; and pipelines to transport natural gas to up to five interconnections with the existing United States (U.S.) natural gas transmission system grid on and/or near the Terminal site. The Project also will involve the relocation of Pascagoula Refinery berths 6 and 7. The Project is designed to convert LNG to natural gas at a nominal rate of 1.3 billion standard cubic feet per day (BSCFD). The Terminal location was selected so LNG could be regasified using waste heat from the Pascagoula Refinery and to minimize environmental impacts. In addition, the Project will be located in an existing industrial area, minimizing effects on the local population and environment. The Project site formerly contained a refractory brick manufacturing plant that was remediated, closed, and issued “No Further Action” status by EPA prior to purchase by CUSA with only remnant foundations remaining.

This Essential Fish Habitat (EFH) Assessment has been prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through the Sustainable Fisheries Act (SFA) of 1996 (Magnuson-Stevens Act, Public Law 104-267). The Magnuson-Stevens Act was established to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan (FMP). The objectives of this EFH Assessment are to describe how the actions proposed by the Project may affect EFH designated by the National Marine Fisheries Service (NMFS) and Gulf of Mexico Fisheries Management Council (GMFMC). According to the GMFMC, EFH within the Gulf of Mexico includes all estuarine and marine waters and substrates from the shoreline to the seaward limit of the Exclusive Economic Zone (EEZ). The area of influence of the Project will be restricted to the area of Bayou Casotte that is outlined in Figure 1-1.

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional Fishery Management Councils (FMC), and other federal agencies to identify and protect EFH of economically important marine and estuarine fisheries.

A provision of the Magnuson-Stevens Act requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan (FMP) (U.S.C. 1853(a)(7)). There are FMPs in the Gulf of Mexico region for shrimp, red drum, reef fishes, coastal migratory pelagics, stone crabs, spiny lobsters, coral and coral reefs, and highly migratory species (e.g., billfish, swordfish, tuna, and sharks).

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). NMFS recommends consolidated EFH

consultations with interagency coordination procedures required by other statutes, such as the National Environmental Protection Act (NEPA) and Endangered Species Act (ESA), to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1. **Notification –** The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the environmental impact statement [EIS] or Rivers and Harbors Act Section 10 permit).
2. **EFH Assessment –** The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; 3) the federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.
3. **EFH Conservation Recommendations –** After reviewing the EFH Assessment, NMFS will provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.
4. **Agency Response –** The action agency must respond to NMFS within 30 days of receiving NMFS' recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

This EFH Assessment includes a description of the proposed action, an analysis of the direct and cumulative effects on EFH for the managed fish species and their major food sources, potential impacts created by the proposed action, and proposed mitigation measures selected to minimize expected Project effects if applicable.

2.0 PROJECT DESCRIPTION

Casotte Landing will be located in Mississippi on the east shore of Bayou Casotte, immediately north of Mississippi Sound in the eastern, central potion of the Gulf of Mexico (Figure 1-1). The Terminal location will be at Longitude 88° 30' 17.28" West, Latitude 30° 19' 55.21" North.

An important consideration in locating the Project adjacent to the existing Pascagoula Refinery is access to the Pascagoula Refinery's waste heat. This heat, as warm effluent water, will be captured and used to provide the heat transfer for the re-gasification process, allowing the Terminal to operate using a "closed-loop" system. This "closed-loop" regasification process eliminates impingement and entrainment impacts to ichthyoplankton and invertebrate species that would be associated with "open-loop" intake of cooling water from the surrounding environment.

2.1 Terminal

Bayou Casotte Energy is proposing to construct Casotte Landing to be an LNG receiving, storage, and regasification facility. The Project will include three full-containment LNG storage tanks, six vaporizers, a marine terminal, and a system of natural gas pipeline interconnections.

2.2 Marine Slip

Construction of the marine slip will require the excavation of approximately 1.0 million cubic yards (mcy) of dry material (with standard earthmoving equipment) and another 3.5 mcy of wet material (with mechanical dredging equipment such as clamshells or draglines) from the slip area. Clearing the approach channel for the berthing facility will require approximately 338,000 cubic yards (included in the totals above) of dredging in Bayou Casotte. Construction of the Marine Slip will begin with the protection of the shoreline and existing crude berth with sheet pile or equivalent. Sediment identified as containing detectable chemical constituents will be segregated and removed during site preparation to prevent the potential release of these chemicals into the estuarine environment. The slip will be excavated to –46 feet Mean Lower Low Water (MLLW) (42 feet nominal depth, 2 feet overdredging, 2 feet advance maintenance) using conventional grading equipment until the water table is reached. Below the water table, dredging will be conducted with mechanical dredging equipment. Care will be taken to conduct the marine sediment dredging at a time when it will have least impacts to essential fish habitat as well as threatened and endangered species.

2.3 Pipeline Interconnections

Pipeline interconnection construction is expected to require a 110-foot-wide temporary construction corridor to adequately and safely install the proposed 36-inch pipeline interconnection and an 85-foot-wide construction corridor for each of the smaller-diameter pipeline interconnections. Subsequent to construction, a 50-foot-wide permanent right-of-way will be maintained to allow for observation and maintenance of the interconnections. The pipeline with proposed Terminal location is shown in Figure 2-1.

3.0 ENVIRONMENTAL DESCRIPTION

The Gulf of Mexico supports extremely valuable commercial and recreational fisheries in state and federal waters. The Pascagoula and Pearl Rivers, Bayou Casotte, and Biloxi Bay are the primary sources of nutrients entering Mississippi Sound. High levels of phosphorus and nitrogen are found in the Bayou Casotte area where fertilizer manufacturing plants are located (GMFMC, 2004). Waters adjacent to industrial areas are subject to effluent discharge and associated Benthic Oxygen Demand (BOD) loadings and, thus, exhibit greater variability in nutrient levels (GMFMC, 2004).

Bayou Casotte is designated as a Fish and Wildlife waterbody according to the state's water quality standards. It is listed as an Impaired Water Body under Mississippi's 2002 and 2004 (Draft) listing of such waters under Section 303(d) of the Federal Clean Water Act (CWA) based on the level of total toxics and un-ionized ammonia. It is anthropogenically disturbed, which was considered during the site alternatives review and selection.

A relatively high number of recreational fishing boats use Bayou Casotte for docking and launching operations, but generally take their charters outside of Bayou Casotte. Private individuals use Bayou Casotte for recreational fishing, but no commercial fisheries are supported within the waters of Bayou Casotte.

Some shellfish, mainly crabs, are harvested from Bayou Casotte during the appropriate open seasons. Bayou Casotte is a nursery area for brown shrimp, but shrimp are not commercially harvested within this bayou. The nearest oyster fishery is located in Point-aux-Chenes Bay, approximately 0.5 mile southeast of the Project site. The next nearest is in Bangs Lake, approximately 1.7 miles northeast of the Project Site. None of these shellfish waterbodies or activities is expected to be affected by construction or operation of the Project. There is no seagrass located within the Project location [U.S. Geological Survey (USGS) – National Wetlands Research Center (NWRC), 2003].

EFH potentially impacted by the Project are identified in Table 3-1.

3.1 Terminal Site

Waterbodies within the final footprint of the Terminal consist of roadside ditches, artificial canals, and stormwater retention ponds, which will be rerouted, replaced, or removed as necessary. Drainage patterns downgradient of the site will be maintained in their existing condition. Wetlands within the Terminal site will experience temporary construction impacts in laydown areas and extra workspaces as well as permanent impacts in the footprint of the Marine Slip and Facility. These temporary and permanent impacts to the estuarine environment are provided in Table 3.1-1.

3.2 Natural Gas Pipeline Interconnections

The waterbodies traversed by the pipeline interconnection routes are shallow, artificial drainage ditches and canals and retention ponds, with a maximum depth of less than 10 feet. Many of

them are dry except after rainfall. Substrates are generally unvegetated or sparsely vegetated dredge spoil or dolomite fill from the previous use as a refractory brick manufacturing plant. Waterbodies in the pipeline interconnection construction corridor will be crossed using techniques appropriate to their environmental sensitivity. The pipeline interconnection route will cross freshwater and estuarine wetlands, artificial canals, and roadside ditches.

TABLE 3-1
POTENTIAL EFH AFFECTED BY CONSTRUCTION AND OPERATION OF THE PROJECT

Facility	Begin MP	End MP	Approximate Crossing Length (feet)	Wetland Type	Construction Requirements (acres)
Natural Gas Import Terminal	0.0	0.0	N/A	PEM	26.6
	0.0	0.0	N/A	PSS	12.1
	0.0	0.0	N/A	PFO	0.5
	0.0	0.0	N/A	EEM	20.5
	0.0	0.0	N/A	ESS	79.4
36-inch Gulfstream Pipeline Interconnection	0.5	1.5	5,280	EEM	13.3*
12-inch Gulf South Pipeline Interconnection	0.6	<0.7	210	EEM	0.4*
16-inch Destin Pipeline Interconnection	0.6	<0.7	210	EEM	0.4*
16-inch Chandeleur Pipeline Interconnection	0.6	<0.7	320	EEM	0.6*
12-inch Chandeleur Pipeline Interconnection	0.6	<0.7	420	EEM	0.8*
12-inch NGL Pipeline Interconnection	3.7	4.0	1,580	TBD	3.5*
		Totals	**8,020**	**—**	**158.1**

*Pipelines are co-located. Each entry represents impacts unique to that pipeline.

4.0 ESSENTIAL FISH HABITAT

EFH potentially affected by the Project is identified and described for various life stages of 19 managed fish and shellfish species. All federally managed species are listed in Table 4-1, including the NMFS-designated Billfish and Highly Migratory Species (NMFS, 2002). Most of these species do not have EFH within the boundaries of the Project (GMFMC, 2004) and, therefore, will not be impacted by the Project. Although more than 500 species of fish have been reported in the federal waters of the Gulf of Mexico, there are only six species that are expected to be commonly found in the Project area. These species are brown shrimp, pink shrimp, white shrimp, Spanish mackerel, red drum, and gulf stone crab (GMFMC 2004; NMFS 2002). Species accounts of these six species as well as the other 14 potentially present in Bayou Casotte (Table 4-2) are presented below. NMFS' Estuarine Living Marine Resources (ELMR) database provides further information regarding species abundances within the entire Mississippi Sound. Results from a database query for Mississippi Sound are provided within Appendix 3–A–A of this EFH Assessment Report.

EFH is separated into freshwater, marine, and estuarine components. There are no natural freshwater waterbodies associated with the Project; therefore, the freshwater component of EFH will not be affected. The marine component is defined as "all marine waters and substrates (mud, sand, shell, rock, hard bottom, and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone" (GMFMC, 2004). The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." The Project is located adjacent to Bayou Casotte and near Mississippi Sound, which are estuarine systems. Therefore, coastal estuarine fisheries and marine fisheries with estuarine life stages are considered within this analysis. Estuarine fishes include species that inhabit or are commonly associated with seagrass beds, oyster reefs, and unvegetated soft bottom habitats. Anadromous and catadromous species are not federally managed. Additional details regarding effects of the Project to anandromous, catadromous and/or threatened–and-endangered, state–managed, or non-federally managed species are provided in Resource Report 3 of the Environmental Report (ER). It is important to note that the proposed Project site is outside the area designated as Critical Habitat for Gulf Sturgeon (*Acipenser oxyrinchus* desotoi). No impact to Gulf Sturgeon individuals or its Critical habitat is expected as a result of the construction and/or operation of this proposed project.

The Grand Bay National Estuarine Research Reserve (NERR), the only Habitat Area of Particular Concern (HAPC) located in Mississippi, lies to the east of the Project, approximately 7,000 feet from the Terminal site. The proposed Gulfstream pipeline interconnection will approach the onshore boundary of the NERR but the short-term disturbance associated with pipeline installation (in an existing right-of-way) is unlikely to have significant impacts on the HAPC. Dredging/excavation of the slip has the potential to generate turbidity, but results from sediment turbidity modeling show that turbidity increases created by this Project will be localized

and temporary and will not impact the Grand Bay NERR. Please refer to Resource Report 2 of this ER for turbidity modeling information.

TABLE 4-1. FISHERY MANAGEMENT PLANS AND MANAGED SPECIES FOR THE GULF OF MEXICO

GULF OF MEXICO FISHERY MANAGEMENT COUNCIL

Shrimp Fishery Management Plan
- brown shrimp - *Farfantepenaeus aztecus*
- pink shrimp - *F. duorarum*
- royal red shrimp - *Pleoticus robustus*
- white shrimp - *Litopenaeus setiferus*

Red Drum Fishery Management Plan
- red drum - *Sciaenops ocellatus*

Reef Fish Fishery Management Plan
- black grouper- *Mycteroperca bonaci*
- gag grouper - *M. microlepis*
- gray snapper - *Lutjanus griseus*
- gray triggerfish - *Balistes capriscus*
- greater amberjack - *Seriola dumerili*
- lane snapper - *L. synagris*
- lesser amberjack - *S. fasciata*
- red grouper - *Epinephelus morio*
- red snapper - *L. campechanus*
- scamp grouper - *M. phenax*
- tilefish - *Lopholatilus chamaeleonticeps*
- yellowtail snapper - *Ocyurus chrysurus*
- vermilion snapper - *Rhomboplites aurorubens*

Stone Crab Fishery Management Plan
- stone crab - *Menippe* spp.

Spiny Lobster Fishery Management Plan
- spiny lobster - *Panulirus argus*

Coral and Coral Reef Fishery Management Plan
- varied coral species and coral reef communities comprised of several hundred species

Coastal Migratory Pelagic Fishery Mmgt. Plan
- bluefish - *Pomatomus saltatrix*
- dolphin - *Coryphaena hippurus*
- cobia - *Rachycentron canadum*
- king mackerel - *Scomberomorus cavalla*
- Spanish mackerel - *S. maculates*
- little tunny - *Euthynnus alleteratus*

NATIONAL MARINE FISHERIES SERVICE

Billfish and Highly Migratory Species

Billfish
- blue marlin - *Makaira nigricans*
- longbill spearfish - *Tetrapturus pfluegeri*
- white marlin - *T. albidus*
- sailfish - *Istiophorus platypterus*

Swordfish
- swordfish - *Xiphias gladius*

Tuna
- albacore - *Thunnus alalunga*
- Atlantic bigeye - *T. obesus*
- Atlantic yellowfin - *T. albacares*
- skipjack - *Katsuwonus pelamis*
- western Atlantic bluefin - *T. thynnus*

Sharks
- Atlantic angel shark - *Squatina dumerili*
- Atlantic sharpnose shark – *Rhizoprionodon terraenovae*
- basking shark - *Cetorhinus maximus*
- bigeye sand tiger - *Odontaspis noronhai*
- bigeye sixgill shark - *Hexanchus vitulus*
- bigeye thresher shark - *Alopias superciliosus*
- bignose shark - *Carcharhinus altimus*
- blacknose shark - *C. acronotus*
- blacktip shark - *C. limbatus*
- blue shark - *Prionace glauca*
- bonnethead - *Sphyrna tiburo*
- bull shark - *C. leucas*
- Caribbean reef shark - *C. perezi*

Sharks (continued)
- Caribbean sharpnose shark - *R. porosus*
- common thresher shark - *A. vulpinus*
- dusky shark - *C. obscurus*
- finetooth shark - *C. isodon*
- Galapagos shark - *C. galapagensis*
- great hammerhead - *S. mokarran*
- lemon shark - *Negaprion brevirostris*
- longfin mako shark - *Isurus paucus*
- narrowtooth shark - *C. brachyurus*
- night shark - *C. signatus*
- nurse shark - *Ginglymostoma cirratum*
- oceanic whitetip shark - *C. longimanus*
- porbeagle shark - *Lamna nasus*
- sandbar shark - *C. plumbeus*
- sand tiger shark - *O. taurus*
- scalloped hammerhead - *S. lewini*
- sharpnose sevengill shark – *Heptranchias perlo*
- shortfin mako shark - *I. oxyrinchus*
- silky shark - *C. falciformis*
- sixgill shark - *H. griseus*
- smalltail shark - *C. porosus*
- smooth hammerhead - *S. zygaena*
- spinner shark - *C. brevipinna*
- Tiger shark - *Galeocerdo cuvieri*
- whale shark - *Rhinocodon typus*
- white shark - *Carcharodon carcharias*

TABLE 4-2. GULF OF MEXICO FEDERALLY MANAGED FISHERY RESOURCES WITH DESIGNATED EFH WITHIN PROJECT AREA

Fishery Management Unit	Common Name (all life stages present unless otherwise noted)	Scientific Name
Shrimp Fishery	Brown shrimp	*Farfantepenaeus aztecus*
	White shrimp	*Litopenaeus setiferus*
	Pink shrimp	*Farfantepenaeus duorarum*
Red Drum Fishery	Red drum	*Sciaenops ocellatus*
Reef Fishery	Gag grouper	*Mycteroperca microlepis*
	Gray snapper (juveniles and adults only)	*Lutjanus griseus*
	Red snapper (juveniles only)	*Lopholatilus chamaeleonticeps*
	Lane snapper (juveniles only)	*Lutjanus synagris*
Coastal Migratory Pelagics	King mackerel (juveniles only)	*Scomberomorus cavalla*
	Spanish mackerel (juveniles and adults only)	*Scomberomorus maculatus*
	Cobia (juveniles and adults)	*Rachycentron canadum*
Stone Crab Fishery	Stone Crab (all stages but rarely found)	*Menippe mercenaria*
	Gulf Stone Crab	*Menippe adina*
NMFS	Billfish and Highly Migratory Species	
	Scalloped hammerhead shark (rarely found, late juvenile/subadult)	*Sphyrna lewini*
	Blacktip shark (rarely found, late juveniles)	*Carcharhinus limbatus*
	Tiger shark (rarely found, juveniles only)	*Galeocerdo cuvieri*
	Bonnethread shark	*Sphyrna tiburo*
	Atlantic sharpnose shark (all stages, but rarely found)	*Rhizoprionodon terraenovae*

5.0 MANAGED FISH SPECIES

The seasonal and year-round locations of designated EFH for the managed fisheries are depicted on the figures available on the NOAA Fisheries' Galveston web page (http://galveston.ssp.nmfs.gov/research/fisheryecology/EFH/Relative/estuaries/). Several of these images are included within Appendix 3–A–B of this EFH Assessment. The EFH determination is based on species-distribution maps, ELMR data, reports within the Generic Essential Fish Habitat Amendment for the above-listed FMPs (Table 4-2) for the Gulf of Mexico (GMFMC, 2004) and habitat association tables found within Species Profiles produced by the USGS (http://www.nwrc.usgs.gov/publications/ specindex.htm). In figures provided by NOAA Fisheries Galveston, the EFH of each estuarine species consists of those areas depicted on the maps as “common,” “abundant,” and “highly abundant”. In offshore areas, EFH consists of those areas depicted as “adult areas,” “spawning areas,” and “nursery areas.” After reviewing all of these resources, a determination was made regarding potential impacts to species that might be found within the Project area.

5.1 Ecological Notes on the EFH Fisheries and Species

A brief summary of ecological information was compiled for each species that may be affected by the Project. Especially sensitive areas (followed by the season or months of peak sensitivity) such as “spawning area” or “nursery area” are given for species where the description might help in mitigating impacts through scheduling of construction activities. Table 5.1-1 summarizes the information. These species are addressed in two groups: species common to Bayou Casotte and species potentially present (but not common), based on ELMR records and consultation with NMFS (NMFS, 2005).

5.1.1 Species Common to Bayou Casotte

Brown Shrimp (*Farfantepenaeus aztecus*)

Brown shrimp inhabit coastal waters from low tide to a depth of approximately 110 meters (m) throughout the Gulf of Mexico, and are most abundant off the coasts of Texas, Louisiana, and Mississippi. Non-spawning adults prefer turbid waters to soft sediments (i.e., mud and sand). In the spring and fall, adult brown shrimp move to slightly deeper waters (46 to 91 m) to spawn. Brown shrimp eggs are demersal. Larval brown shrimp are most abundant offshore, but do occur in waters that range from 0 to 82 m deep. Post-larval brown shrimp migrate to shallow vegetated habitats in estuaries in the spring. Late post-larval and juvenile brown shrimp are most abundant in shallow (less than 1 m) estuarine habitats in the spring and early summer, but typically are present through the fall.

Within the estuarine environment, juvenile brown shrimp prefer marsh edges and areas with submerged vegetation, but occur throughout the estuary (vegetated and non-vegetated habitats) and in the lower reaches of its tributaries. Juvenile abundance peaks after spawning in the spring and by mid-summer most will have moved back offshore. Sub-adults are most

Table 5.1-1. Summary of life stages for federally managed species describing their presence or absence near Bayou Casotte with seasonal appearance defined.

Life Stage	Brown Shrimp	White Shrimp	Pink Shrimp	Red Drum	Gag Grouper	Gray Snapper	Red Snapper	Lane Snapper	Stone Crab	Gulf Stone Crab	King Mackerel	Spanish Mackerel	Cobia	Scalloped Hammerhead Shark	Blacktip Shark	Tiger Shark	Bonnethead Shark	Altantic Sharpnose Shark
Eggs	-	-	-	-	-	-	-	-	All stages rarely found.	All stages, except brooding females, found year round.	-	-	-	These sharks give birth to live juveniles.				
Seasonal Appearance-Eggs	-	-	-	-	-	-	-	-										
Larvae				✓							-	-	-					
Seasonal Appearance-Larvae				common Sept.-Jan.														
Juveniles	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Seasonal Appearance-Juveniles	H.A. May-July found year round	Abu. June-Sept found year round	common year round	common year round	present June-October	common June-Aug.	present Oct.-Jan.	present July-Oct.			present July-Oct.	present June-Sept	present May-Oct.	potentially present	potentially present	potentially present	potentially present	rarely found
Adults		✓	✓	✓	-	✓	-	-			-	✓	✓	-	-	-	✓	✓
Seasonal Appearance-Adults	Abu. July-Oct. found year round	Abu. June-Sept found year round	common year round	common Feb.-Oct.		rarely found						present June-Sept	present May-Oct.				Highly Migratory potentially present	rarely found
Spawning Adults	-	-	-	-	-	-	-	-		Brooding females found from March – October.	-	-	-	-	-	-	-	-
Seasonal Appearance-Spawning Adults											-	-	-	-	-	-	-	-

- = absent, ✓ = present, H.A. = Highly Abundant, Abu. = Abundant

abundant in slightly deeper waters (1 to 18 m) than juveniles and prefer sand, mud, and shell substrates to the vegetated bottoms preferred by juveniles. As they develop, sub-adult brown shrimp continue to migrate toward deeper waters, eventually leaving the estuarine nurseries in mid-summer.

Adults are abundant in Bayou Casotte, based on GMFMC distribution figures, July though October, with common presence in the remaining months of the year. Spawning takes place offshore and Bayou Casotte is not considered a spawning area for brown shrimp. Juveniles are highly abundant May though July, with abundances decreasing throughout the remainder of the year. Bayou Casotte is considered a "major nursery area" for this species.

White Shrimp (*Litopenaeus setiferus*)

Non-spawning adult white shrimp inhabit offshore waters in the winter and move inshore in the spring. Spawning generally occurs offshore from spring to late fall (spawning peaks in the summer between June and July). Eggs are demersal and share the same distribution as the offshore spawning adults. Larval white shrimp hatch within 12 hours of spawning and begin to migrate toward estuaries as they develop into post-larvae. Estuarine migration peaks between June and September.

Juvenile white shrimp are most abundant in turbid estuaries of the Gulf of Mexico and, within these estuarine nurseries, reach their greatest densities in marsh edge habitats and in areas with submerged aquatic vegetation. However, juvenile white shrimp also are common in marsh ponds, channels, inner marshes, shallow subtidal areas, and oyster reefs. In non-vegetated areas, post-larval and juveniles inhabit mostly muddy substrates with large quantities of detritus. Sub-adult white shrimp move from the estuaries to coastal areas in late August and September as they migrate offshore for spawning.

Bayou Casotte area is not considered a spawning ground for white shrimp. Bayou Casotte is a year-round habitat for adults and juveniles. They will likely be found at the site in their greatest abundance from June through September.

Pink Shrimp (*Farfantepenaeus duorarum*)

Juvenile pink shrimp inhabit most estuaries in the Gulf but are considered to have their greatest abundance along the west coast of Florida where they have their major spawning areas. Juveniles are commonly found in estuarine areas with seagrass, such as *Halodule wrightii* and *Thalassia testudinum*. Postlarve, juvenile, and subadults may prefer coarse sand/shell/mud mixtures. Typically, adults inhabit offshore marine waters, with the highest concentrations in depths of 30 to 144 feet but can be found inshore, as well.

According to the GMFMC species-distribution maps, pink shrimp juveniles and adults are common in Bayou Casotte year round. However, Bayou Casotte is not considered to be a spawning ground or "major nursery area" for Pink Shrimp. The juvenile and adult stages are

never considered to be highly abundant within Bayou Casotte.

Red Drum (*Sciaenops ocellatus*)

In the Gulf of Mexico, red drum occur in a variety of habitats, ranging from depths of about 40 m offshore to very shallow estuarine waters. They commonly occur in virtually all of the Gulf of Mexico's estuaries (GMFMC, 2004), where they are found over a variety of substrates including sand, mud, and oyster reefs. Red drum can tolerate salinities ranging from freshwater to highly saline, but optimum salinities for the various life stages have not been determined. The GMFMC considers all estuaries in the Gulf of Mexico to be EFH for red drum.

Spawning occurs in deeper water near the mouths of bays and inlets, and on the Gulf side of the barrier islands (Perret et al., 1980) from September through November. Eggs typically hatch in late summer and early fall and larvae are transported into estuaries where the fish mature before moving back to the Gulf of Mexico (Pattillo et al., 1997). Larval red drum are most abundant in estuaries from mid-August through late November. Estuarine wetlands are especially important to larval, juvenile and subadult red drum.

NOAA Fisheries' ELMR data indicate that larval red drum are absent February through August in Mississippi Sound (Bayou Casotte is adjacent to Mississippi Sound). Juvenile and adult red drum are reported as common at all salinities throughout the year within Mississippi Sound.

Bayou Casotte is not considered a spawning ground or year-round nursery for red drum based on GMFMC figures. Adults are rarely found in the Bayou Casotte area from November through January, however, adults are common during the remaining months of the year. Larvae will most likely be found from September through January and juveniles are common in the Bayou Casotte area year round. Adult red drum are fast swimmers and will likely avoid areas of construction. It is possible that younger stages of red drum will have the potential for greater impact from dredging and construction of the Project.

Spanish Mackerel (*Scomberomorus maculatus*)

Spanish mackerel are pelagic. NOAA Fisheries (2002) states that this species occurs at depths 50m or less in the Gulf of Mexico from Florida through Texas. Adults usually are found in neritic waters and will inhabit estuarine areas, especially the higher salinity areas and during seasonal migrations, but are considered rare and infrequent in many Gulf of Mexico estuaries. Spawning occurs from May to October, offshore. Larvae are most frequently found offshore over the inner continental shelf. Juveniles are found in a variety of habitats including beach surf, estuarine habitat, and deeper offshore waters. ELMR data (Appendix 3–A–A) indicates that Spanish Mackerel eggs and larvae are not found within Mississippi Sound. Adult Spanish mackerel are commonly found in Mississippi Sound from June through August, only. The remaining months, this species is either absent or rarely found. Juvenile Spanish Mackerel are commonly found in Mississippi Sound from April through November and can tolerate salinities as low as 5 parts per

trillion (ppt). The likelihood of finding Spanish Mackerel juveniles in Bayou Casotte during this time is relatively high based on ELMR data.

Eggs and larvae of Spanish mackerel are not found in Bayou Casotte. Juvenile and adult stages of this species may be found in Bayou Casotte with greatest abundances in the late spring and summer months. Adult Spanish Mackerel are highly migratory and mobile and will likely avoid areas of disturbance.

Gulf Stone Crab (*Menippe adina*)

Mississippi Sound is considered an "adult area" for the gulf stone crab as well as a nursery habitat. Eggs are brooded beneath the female abdomen and their distribution is subtidal to shallow shelf across the northern Gulf of Mexico. Larvae are most abundant in the late spring and summer throughout Mississippi Sound and are pelagic. As the larvae age, they become oriented toward benthic existence. Late juvenile stages are most abundant from late fall through spring, and adult stages are found from March through September in shallow subtidal and intertidal habitat. Adults can be found on intertidal mud flats, oyster reefs, rock jetties, mud bottoms near pilings and structures, and along the edges of channels in the mid-estuarine environment

It is likely that adults, larvae, and juveniles of gulf stone crabs will be present within Bayou Casotte year round based on GMFMC (2004). The most sensitive life stage is the gravid female, which broods fertilized eggs beneath the abdomen. This stage is present from October to March.

5.1.2 Additional Species Potentially Present in Bayou Casotte

Gag Grouper (*Mycteroperca microlepis*)

Gag grouper adults are indicated on the GMFMC figures to occur within the Project area but not abundantly. NOAA Fisheries (2002) indicates that eggs are planktonic and are found offshore, mainly off the west Florida coast where spawning occurs. Larvae develop into juveniles within 40-50 days and move inshore during this time. Early juveniles prefer habitat with submerged aquatic vegetation (SAV), oyster beds in coastal lagoons, and estuaries and can be found in the Bayou Casotte area from June through October. Late juveniles return to the reefs in the fall to mature into adults. Adults prefer hard bottoms, reefs and coral with depths ranging between 10-100m.

Because adults prefer hard bottom and coral reef habitat, they will not likely be found within Bayou Casotte and the area is not a spawning ground for gag grouper. Juveniles may be found in Bayou Casotte and Mississippi Sound, based on life history tables provided by the GMFMC, from late spring through early fall.

Gray Snapper (*Lutjanus griseus*)

Spawning adults, eggs, and larvae are not present within Bayou Casotte as these life stages are only found offshore. Based on OAA Fisheries' ELMR data, adults are rarely found within Mississippi Sound. The juvenile stage of gray snapper will be the most common life stage that may be found within the Project area or Mississippi Sound. Juveniles will be present with greatest abundances from June through November.

Bayou Casotte does not provide EFH for spawning adults, eggs, or larvae of gray snapper. Adult gray snapper are reported to be rarely found within Mississippi Sound from NOAA Fisheries ELMR data. During summer months, juvenile gray snapper may be commonly found in Mississippi Sound estuarine waters with salinity ranging from 15-25 ppt, salinity similar to that found in Bayou Casotte. Based on this ELMR data, juvenile gray snapper will potentially be found in Bayou Casotte.

Red Snapper (*Lutjanus campechanus*)

Spawning adults, eggs, larvae, and adult stages of red snapper are not found within Bayou Casotte. The only life stage that may be found in the vicinity of the Project area is the juvenile stage. This stage prefers habitat that is structured with sand and mud. The GMFMC shows that the entire Mississippi Sound is considered EFH for the juvenile stage of red snapper. Juveniles will likely be found within Mississippi Sound in the late fall and early winter, after summer spawning is completed.

Lane Snapper (*Lutjanus synagris*)

Spawning adults, eggs, larvae, and adult stages of lane snapper do not occur in the Bayou Casotte area. Only juvenile stages may be found in the sand and mud habitat based on information from NMFS (2002). The juvenile stage of lane snapper will be found within Mississippi Sound after the larvae mature and migrate to estuarine habitats in the late summer and early fall.

Stone Crab (*Menippe mercenaria*)

All life stages of stone crabs are found rarely throughout Mississippi Sound and therefore will not likely be found in Bayou Casotte. The greatest abundances of stone crabs (all life stages) are found off the southwest coast of Florida (GMFMC, 2004). There is a very low likelihood that any life stage of stone crab will be impacted by the Project.

King Mackerel (*Scomberomorus cavalla*)

King mackerel juveniles are the only life stage of this fish that may be found in the vicinity of

Bayou Casotte based on NMFS (2002) with the greatest abundance from July through October.

Cobia (*Rachycentron canadum*)

Only the juvenile and adult stages of Cobia are found within Mississippi Sound (NMFS, 2002; GMFMC, 2004). The spawning adults, eggs, and larvae of this species are located off the Florida coast and northward Atlantic locations. This species is highly migratory; adults are only found in the Mississippi Sound area in the summer. Mississippi Sound is considered a nursery habitat for juvenile Cobia and this life stage can be found in the Project area from April through October.

Spawning adults, eggs, and larvae are not found in Bayou Casotte. Adults and juveniles can be found in Bayou Casotte from mid- spring through early fall. Cobia are highly mobile and are anticipated to avoid the area disturbed by dredging.

Scalloped hammerhead shark (*Sphyrna lewini*)

This species is circumglobal, residing in coastal warm temperate and tropical seas. Females give birth to live pups and it is reported in NMFS (2002) that the juvenile/subadult stage uses Mississippi Sound as a nursery area. The young scalloped hammerhead shark can be found from shoreline to 50 m depths. It is possible that Bayou Casotte could serve as a nursery habitat for scalloped hammerhead shark juveniles and young adults.

Blacktip shark (*Carcharhinus limbatus*) and Tiger Shark (*Galeocerdo cuvieri*)

NMFS (2002) lists the juvenile stages of blacktip and tiger sharks as the only life stage of these species present in Mississippi Sound and they are rarely found in this area. It is highly unlikely that the Project will impact any juvenile blacktip or tiger shark.

Bonnethead shark (*Sphyrna tiburo*)

All life stages of the bonnethead shark are found in the northern Gulf of Mexico (NMFS, 2002). The juveniles of this species prefer inlets, estuaries, and coastal waters less than 25 m. Adults have a distribution from Mobile Bay, Alabama, to South Padre Island, Texas. The juveniles and adults are the only stages that will be found in the vicinity of Bayou Casotte. These life stages of bonnethead shark are highly mobile and predatory. They will likely avoid areas of construction and will not be impacted by the Project adjacent to Bayou Casotte.

Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)

Adults and juveniles of this species are listed in NMFS (2002) as being present in Mississippi

Sound but are rarely found in this area. Because this species is so rarely found, the Project in Bayou Casotte will not have an impact to the status of this species.

5.1.3 Marine Benthic Community

Previous sampling efforts over broad areas of the northern Gulf of Mexico shelf as well as other marine habitats have demonstrated that sediment type is important in determining benthic infaunal communities. Shaw et al. (1982) surveyed infauna in the inner shelf area off Mississippi Sound. This comprehensive survey describes distinct infaunal assemblages that are associated with mud, muddy sand, or sandy substrata within varied depth zones in shelf waters. Barry A. Vittor & Associates, Inc. (1985) reviewed Shaw et al. and other Mississippi/Alabama benthic infaunal data, summarizing it in their review entitled "Tuscaloosa Trends Regional Data Search and Synthesis Study, Volumes I & II." In this work they described four depth-related benthic habitats for infaunal communities in the northeast Gulf of Mexico region. These four habitats are as follows:

1. shallow beach habitat
2. inner shelf habitat
3. intermediate shelf habitat
4. outer shelf habitat

Each of these habitats was further divided into sediment type (mud, sandy mud, muddy sand, or sand). Infaunal assemblage associations were recognized with each combination of water depth and substratum type. Cluster analysis revealed that infaunal taxa were closely tied to sediment type and texture. The inner shelf habitat recognized eight distinct infaunal assemblages in the area existing from 4 to 20 m depth. Three of these inner shelf assemblages exhibited narrow sediment texture preferences, while the other five assemblages showed transitional distributions (Byrnes et al., 1999; Vittor & Associates, Inc., 1985). Muddy sand (50% to 90% sand) did not support a habitat-specific assemblage on the inner shelf, but instead was inhabited by transitional taxa that extended their range into areas characterized by other sediment types (Byrnes et al., 1999; Vittor & Associates, Inc., 1985). Those assemblages that exhibited a narrow preference for a particular sediment texture were associated with mud, sandy mud, or sand (Byrnes et al., 1999; Vittor & Associates, Inc., 1985). The mud (<20% sand) habitat assemblage was represented by the hemichordate *Balanoglossus* cf. *aurantiacus*, the polychaete *Paramphinome* sp. B, and the mollusks *Nassarius acutus* and *Utriculastra canaliculata*. The sandy mud (20% to 50% sand) habitat assemblage included the ophiuroids *Hemipholis elongata* and *Micropholis atra*, the bivalve *Nuculana concentrica*, and the crab *Pinnixa pearsei* (Byrnes et al., 1999; Barry A. Vittor & Associates, Inc., 1985). Bayou Casotte is enriched with nitrogen and phosphorous from nearby fertilizer production facilities. The State of Mississippi's 2000 Water Quality Assessment Report indicated low levels of contaminants within Bayou Casotte. Vittor & Associates, Inc. (1985) reports that the estuarine sediments in the

Mississippi Sound area are characterized as having mostly silt and clay sediments with patchy areas of fine to medium sand near shoals and inter-island passes. Bayou Casotte is a moderate to low energy depositional environment. The marine sediment from this area has been described as marine silts mixed with fine to very fine sands. Therefore, it is likely that the infaunal communities within Bayou Casotte are of the mud (<20%) assemblage with some ubiquitous taxa, including the bivalve *Mulinia lateralis* and the polychaetes *Armandia maculata*, *Magelona* sp. H, *Mediomastus*, *Owenia fusiformis*, and *Paraprionospio pinnata* . These species are well adapted to burrowing and foraging in fine sediments. Feeding is one of the behavioral aspects most closely related to sedimentary habitat (Rhoads, 1974). Habitats with fine-textured sediments and little or no current are characterized by the deposition and accumulation of organic material, thereby favoring the occurrence of surface and subsurface deposit feeding taxa (Rhoads, 1974).

Hypoxia is known to occur in the Mississippi Sound region, and may be caused by water column organic enrichment and other hydrological factors. Bayou Casotte may experience seasonal hypoxia that will affect the diversity and abundance of benthic communities. The major invertebrate groups that comprise benthic assemblages exhibit varied levels of tolerance to hypoxia. Polychaetes are the most tolerant group, followed by bivalves. Crustaceans and echinoderms seem to be the least tolerant of hypoxic conditions (Byrne 1999; Stickle et al.,1989). Opportunistic infauna that commonly occur in Mississippi coastal waters, such as the polychaetes *P. pinnata*, *Heteromastus filiformis*, and *Streblospio benedicti*, commonly inhabit hypoxic areas. The inherent variability of local benthic habitats causes the coastal, inner shelf infaunal community to be dynamic, unstable, and to remain in an intermediate level of succession state (Rhoads and Germano 1982). These species are opportunistic; they reproduce rapidly and re-colonize their habitat rapidly (Rhoads and Germano, 1982).

5.1.4 Summary of Seasonal Abundance

The abundance of the six species common to Bayou Casotte was examined to determine whether impacts to these species could be minimized by scheduling construction activities for periods of minimal abundance. The data presented (NOAA, 2005) are for the entire Mississippi Sound, not for Bayou Casotte. Abundance data for Bayou Casotte is not available, but is assumed to be similar in pattern to those from Mississippi Sound.

- Brown shrimp juveniles are highly abundant in May and June. Adults are abundant from June through August. Both juveniles and adults are present/common throughout the year. Other stages are not present in Bayou Casotte (NOAA, 2005).
- White shrimp juveniles and adults are common throughout the year, and juveniles are abundant from June to November. Larvae are common from May to November and abundant from June to October. Eggs and spawning adults are rare or absent from Bayou Casotte (NOAA, 2005).
- Pink shrimp juveniles and adults are present throughout the year. Adults are abundant from March to May. Larvae are present only from May to August. Other stages are not

present in Bayou Casotte (NOAA, 2005).

- Red drum adults and juveniles are common throughout the year. Eggs are absent from the area. Larvae are abundant from September to January and generally rare the rest of the year. Spawning adults are rare or absent from Bayou Casotte (NOAA, 2005).
- Spanish Mackerel juveniles and adults are present (rare to common) from April to October but are never abundant. Other stages are not present in Bayou Casotte (NOAA, 2005).
- Gulf stone crab adults and juveniles are common throughout the year. Spawning adults are common from March to October. Eggs are brooded on females and larvae are common April through September (NOAA, 2005).

Preliminary examination of the seasonal patterns of abundance for these species suggests that at least one of the six species examined is present at all times of the year. Because the area to be dredged is a small section of unvegetated benthic habitat in a frequently dredged industrial shipping channel, the proposed dredging is unlikely to have significant long-term effects on the EFH regardless of the season during which it is conducted. However, Bayou Casotte Energy will work with NMFS to refine the dredging schedule if necessary to minimize dredging impacts to the extent practicable.

6.0 ASSESSMENT OF IMPACTS

In this section, potential impacts to managed species and their associated EFH including benthic infauna are examined. Identifiable impacts generated by the proposed action for the freshwater, estuarine, and marine components of EFH are described. Potential environmental consequences that may result from impacts to EFH are reviewed.

The installation of the Terminal and associated pipeline connection will require site preparation, dredging, trenching, directional drilling, pipe fabrication, non-destructive examination, coating of completed welds, pipeline lowering, backfill, and safety testing. In addition, shoreline construction of the Terminal will require filling and construction and installation of steel pilings. Dredging of the mouth of the slip will render the greatest impacts to EFH and the species likely found in Bayou Casotte. The depth of water in the proposed marine slip will be 46 feet (42-foot control depth plus 2 feet of overdredging and 2 feet of advance maintenance). There will be minimal EFH impacts created by pipelay because the proposed pipeline interconnections are restricted to artificial waterbodies.

6.1 Impacts to the Freshwater Component of the EFH

The freshwater waterbodies associated with the Project site are intermittent drainage ditches, artificial canals, and stormwater retention ponds. There are no natural freshwater waterbodies on or adjacent to the site. Creation of the marine slip and preparation and fill of the Terminal site will involve removal or fill of the waterbodies on the Terminal site. Because these waterbodies are low-quality, artificial stormwater conveyances, little or no impact to EFH is anticipated.

The pipeline interconnection route crosses two shallow, artificial canals. Installation of the interconnections through the canals most likely will be by open-cut methods. These in-stream construction techniques will cause a short-term increase in turbidity, but because these canals are artificial and the environment is regularly subjected to the disturbance of heavy water flow, the short-term turbidity of these activities is unlikely to have lasting effects.

6.2 Impacts to the Estuarine Component of the EFH

The Bayou Casotte shipping channel is dredged regularly (approximately every three years), by the USACE; therefore, the benthic community that proliferates in this frequently disturbed, organically enriched environment is well adapted to these conditions. The benthic infaunal community is dominated by opportunistic species that recolonize their habitat rapidly. Typical species found in this habitat include *Heteromastis filiformis*, *Capitella capitata*, *Streblospio benedicti*, *Paraprionospio pinnata*, and *Mulinia lateralis*. Dredging would be the principal impact to benthic species. The next section discusses primary dredging impacts to EFH.

6.2.1 Primary Dredging Impact

A small section of shoreline and unvegetated benthic habitat adjacent to the lower portion of

Bayou Casotte will be permanently altered by this Project. The excavated slip will disturb an area of unvegetated shoreline and benthic habitat in Bayou Casotte and would remove approximately 4.5 million cubic yards of material. Approximately 1 million cubic yards of material will be excavated from above the water table. The total slip area, including the portion landward of the shoreline, is approximately 55.3 acres. The dredging required to connect the slip to the existing navigational channel will result in the removal of approximately 338,000 cubic yards within an area of approximately 275,000 square feet (6.3 acres). A temporary loss of food supply for finfish and crustaceans could occur during construction. However, the dredging will oxidize nutrient-rich sediments and could stimulate recolonization in areas that are hypoxic and improve habitat for benthic polychaetes, mollusks, and crustaceans, which in turn provide forage for opportunistic benthic finfish and shrimp species. Although dredging will disturb approximately 6.3 acres of unvegetated benthic habitat from this heavily industrialized, regularly disturbed shipping channel, the benthic community will recolonize the impacted area rapidly and the long-term impacts to marine substrates, benthic communities and fisheries are anticipated to be insignificant. Creation of the slip will result in the creation of additional unvegetated benthic habitat (i.e., the double-berth slip, which will create approximately 49.0 acres of new benthic habitat). Appropriate Best Management Practices will be employed as necessary to be certain that potential impacts to EFH and to threatened and endangered species are minimized.

6.2.2 Turbidity Impacts

Bayou Casotte is a turbid estuary with background levels of approximately 15–20 NTUs. Based on worst-case scenario modeling results, mechanical dredging will not significantly increase the turbidity in Bayou Casotte above background levels, and no secondary (turbidity) impacts are anticipated. Please refer to Resource Report 2 of this ER for turbidity plume modeling, increase in NTUs, and dispersion rates. The increase in sediment turbidity during construction will be temporary. Modeling shows that the dredging will not increase turbidity significantly above background levels and the suspended sediments will redeposit upon completion of construction activities. Little increase above background sediment load is anticipated and none of the species listed with EFH in the Bayou Casotte vicinity deposit fertilized eggs in this habitat, so the possibility that deposition of suspended sediments could smother demersal eggs and larvae is remote. Red drum is the only species listed with EFH for larvae in Bayou Casotte, the larvae of this species is pelagic. Sedentary demersal fishes are unlikely to be affected by the low, temporary increase in sediment turbidity within the water column during construction. Figure 6.2.2-1 shows the results taken from Resource Report 2 of this ER. Total suspended solids (TSS) would have highest concentrations within 0-25 m from the dredging activities. By 50 m from the dredging operations TSS is reduced to below normal background values found in Bayou Casotte.

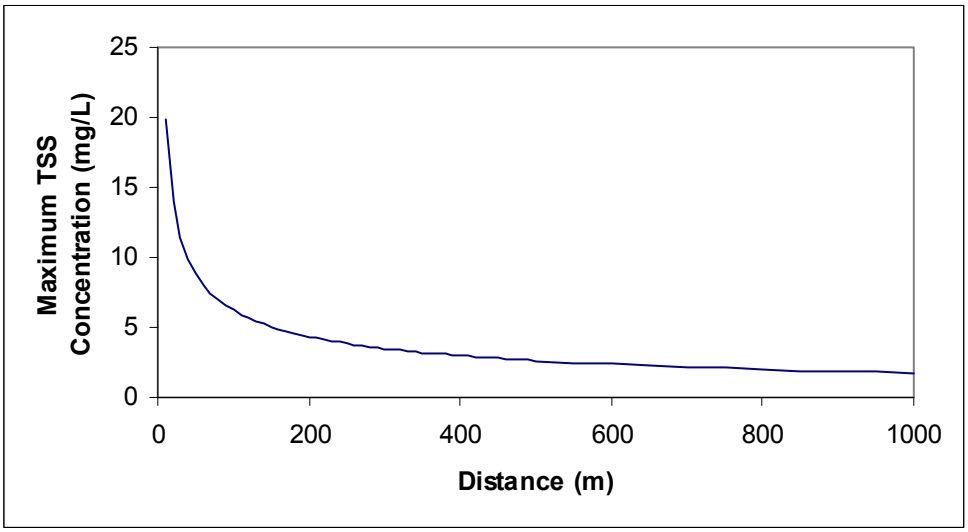


FIGURE 6.2.2-1 MAXIMUM TSS CONCENTRATION IN RELATION TO DISTANCE BASED ON DREDGE MODEL.

Potential sediment resuspension related to mechanical dredging of the slip material has been evaluated using the DREDGE model developed by the USACE. Model parameters were selected from a recent investigation (Hayes and Je, 2000; USACE, 2001) using aggressive operational tactics. Based on this simulation, the total suspended solids (TSS) generated by the mechanical dredge over a 1,000-m distance from the source is expected to average 6.7 milligrams per liter (mg/L). A maximum of 19.9 mg/L would be expected at the dredging source, itself, which is within the range of background values for Bayou Casotte turbidity. TSS generated from dredging operations would not likely produce a detectable turbidity plume, and the turbidity impacts of dredging are anticipated to be insignificant.

Maintenance dredging of the slip will be conducted according to federal, state, and local regulations and permits. Preliminary modeling suggests that maintenance dredging will be required every 12 to 36 months. The volume of maintenance dredging has been calculated to be 250,000 cy/year. This material will be disposed of in a manner acceptable to federal, state, and local agencies. Although turbidity will increase during dredging, it will not be significantly above background levels.

It is anticipated that the adult stages of most demersal and pelagic finfish species will avoid construction areas, and that potential impacts will be temporary and minor resulting in the displacement of, followed by rapid post-construction re-colonization by these species.

Although vessel operations may result in prop wash and erosion, which may impact EFH, vessel operations including transit to and from the slip will be in the existing federal channel located hundreds of feet from shorelines. Any prop wash, wakes, or surges from these operations would not be measurably different than that from other vessel traffic in the channel and have negligible impact to the shorelines compared to wave or tidal induced impacts. Erosion within the slip from vessel passage or prop wash will be controlled by the installation of appropriate

scour protection, such as stone riprap, and no significant erosion or impact to EFH is expected to occur.

6.2.3 Submerged Aquatic Vegetation and Shellfish Beds

Many juvenile fish species utilize estuarine SAV as habitat, but seagrasses do not grow in the silty sediment and turbid waters of the Project location, so no impacts are anticipated.

There are no known oyster beds in the vicinity of the Project site, therefore these resources will not be impacted by dredging or re-suspended sediments.

6.2.4 Potential for Offshore Spills

Another category of impacts to estuarine fish and wildlife is the potential for accidental spills of material during construction or operations. These spills could originate from: accidental spills from construction barges or support boats, loss of fuel during fuel transfers, or accidents resulting from collisions. Construction will involve a significant amount of work activity aboard vessels and other specialized marine equipment. Bayou Casotte Energy and their construction contractors will comply with all laws and regulations related to handling of fuels and lubricants, including 40 CFR 110, and related to vessel-to-vessel transfers, including 33 CFR 155.

6.2.5 Summary of EFH Impacts

Because Bayou Casotte does not support commercial fisheries other than occasional crab harvest during appropriate seasons, impacts to the commercial fisheries resources from this project are expected to be minimal. Local recreational fishing will not be impacted as fish will be able to move back into the habitat after construction is completed.

Potential impingement and entrainment impact must be considered for any project in areas of high fish egg and larvae abundance. The Project's regasification system will utilize "closed-loop" technology (i.e., no water intake from the ambient environment will be used for the re-gasification process), which eliminates the potential for impingement and entrainment mortality for normal regasification processes. The only water intake associated with the Project is part of shipping operations (ship's cooling water and ship's ballast water). The relatively low volumes of water associated with these activities ensure that impacts will be negligible. Impingement and entrainment impacts related to shipping operations are discussed within Resource Report 3 of this ER.

The EFH impact evaluation process for the Project is summarized below in Table 6.2-1. Impacts are listed by type and nature (i.e., significance of effects). Impacts are considered direct, indirect, temporary, short-term, long-term, permanent, and/or cumulative.

TABLE 6.2-1. SUMMARY OF POTENTIAL IMPACTS TO EFH BY IMPACT TYPE

Type of Impact	Temporary [Recovery Days to Weeks]	Short Term [Recovery <3 Years]	Long Term [Recovery >3 to <20 Years]	Permanent [Recovery ≥20 Years]	Cumulative
Barge Anchoring		✓			
Sedimentation/Turbidity[1]	✓				
Disruption of Soft Substrate		✓			
Seafloor Area Occupied*					✓
Epifauna/Infauna Destruction		✓			
Fish Fauna Disruption Species	✓				
Fish Fauna Disruption Habitat		✓			
Reduction Water Quality/ Spills, Mud discharges	✓				

* area permanently altered

[1] Sediment turbidity associated with LNG Vessel passage is temporary in nature but will be ongoing throughout the year.

Most of the above effects are temporary and will be offset by special construction techniques or environmental protection guidelines, or are negligible considering the degraded, industrialized state of the habitat near the Project site and the localized effect of the actions compared to the area of the Gulf of Mexico that will be unaffected. The proposed action will have minor effects on designated EFH or commercial fisheries. Recovery of EFH and commercial fisheries is expected to occur quickly (one growing season) for the affected environment.

7.0 PROPOSED MITIGATIVE MEASURES

Onshore wetland habitat that is impacted will be mitigated according to a mitigation plan/ratio currently being discussed with the USACE, MDMR, and other applicable agencies (through team permitting). Wetlands that would be potentially impacted by this Project that serve as EFH will be included within the finalized mitigation plan. EFH will be mitigated "in-kind"; no artificial reefs will be created as no artificial or natural reefs will be impacted by this Project. The primary source of impact to the marine environment is from dredging. The primary impact area is the 6.3 acres of unvegetated benthic habitat that will be disturbed to connect the slip to the shipping channel. The opportunistic benthic species in Bayou Casotte will quickly recolonize this area. The permanent creation of similar unvegetated benthic habitat in the double-berth slip will more than offset this temporary disturbance. Because the habitat is naturally turbid and sediment models predict that the dredging for construction and maintenance will not increase turbidity significantly above background, no impacts to EFH are predicted.

Consultation with NMFS is ongoing, and results will be communicated to FERC upon completion. Correspondence and communications indicate that significant adverse impacts to fisheries from this Project are unlikely; however, Bayou Casotte Energy has incorporated several strategies to minimize potential impacts to EFH:

- To prevent the introduction of exotic and/or invasive species in ballast water, on ship hulls, and anchors/chains, vessels calling on Casotte Landing will be required to follow the USCG Office of Operating and Environmental Standards Mandatory Practices For All Vessels with Ballast Tanks on All Waters of the United States. The mandatory practices include requirements to rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin and remove fouling organisms from hull, piping, and tanks on a regular basis and dispose of any removed substances in accordance with federal, state, and local regulations. Vessels will be required to comply with these requirements and to keep records documenting their compliance.
- Best Management Practices (BMPs) such as hay bales and silt fence will be strategically placed per Bayou Casotte Energy's Plan and Procedures to prevent siltation from shore-side construction from entering the estuarine environment.
- Bayou Casotte Energy analyzed the ELMR records of seasonable abundance to determine whether scheduling construction for seasons of low abundance was possible. These records indicate that, for the six species considered common to Bayou Casotte, eggs, larvae, and/or juveniles of at least one species are present throughout the year. Consultations with NMFS to refine the dredging schedule are ongoing.
- Bayou Casotte Energy has avoided oyster reefs and seagrass beds by careful site selection.
- Whenever possible, excavated materials will be stored and contained on uplands.
- Utilization of cooling water from industrial sources and "closed-loop" technology will

greatly reduce impacts to EFH that would otherwise be generated in the form of impingement and entrainment. The arrangement that has been established between Bayou Casotte Energy and Pascagoula Refinery to take the Refinery's warmed wastewater and use it for the warming regasification process is a unique mitigation measure.

8.0 CONCLUSIONS

The Project site was selected because it is among other industrialized locations along Bayou Casotte. It is important to note that the existing habitat at the Project location is anthropogenically impacted, frequently dredged, and highly turbid. This habitat, despite alterations, will remain estuarine and will be utilized by fish that return to the area after construction is completed. Locating the Terminal adjacent to the existing Pascagoula Refinery presents the unique opportunity to use its waste heat in the Terminal's regasification system, thereby eliminating the environmental impacts associated with water exchange (e.g., in open rack vaporizer systems).

In general, direct and indirect impacts to EFH for managed species will be temporary. The primary impacts will be disturbance of unvegetated benthic habitat. The Bayou Casotte benthic community is well adapted to dredging disturbance. These opportunistic species are expected to recolonize the area within one growing season. The temporary, minor impairment of water quality due to turbidity and suspended-solid concentrations during dredging in the shallow, estuarine water adjacent to the Project site will not be significantly above ambient conditions, nor will that caused by the passing of LNG vessels. Overall, the Project is not anticipated to have adverse or lasting impacts to EFH.

9.0 REFERENCES CITED

Barry A. Vittor & Associates, Inc. 1985. Tuscaloosa Trend Regional Data Search and Synthesis Study (Volume I-Synthesis Report). Final report submitted to Minerals Management Service, Metairie, LA. Contract No. 14-12-0001-30048. xxvi + 477 pp.

Byrnes, M.R., R.M. Hammer, B.A. Vittor, J.S. Ramsey, D.B. Snyder, K.F. Bosma, J.D. Wood, T.D. Thibaut, N.W. Phillips, 1999. Environmental Survey of Identified Sand Resource Areas Offshore Alabama: Volume I: Main Text, Volume II: Appendices. U.S. Department of Interior, Minerals Management Service, International Activities and Marine Minerals Division (INTERMAR), Herndon, VA. OCS Report MMS 99-0052, 326 pp. + 132 pp. appendices.

Gulf of Mexico Fisheries Management Council. 2004. Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment. Vol. I. 682 pp + appendices.

Hayes, D.F. and C. Je. 2000. DRAFT DREDGE Module User's Guide. Department of Civil and Environmental Engineering, University of Utah.

Hayes, D.F. and P. Wu. 2001. Simple Approach to TSS Source Strength Estimates. Western Dredging Association (WEDA) Proceedings, WEDA XXI, Houston, TX, June 25-27, 2001.

National Marine Fisheries Service. 2005. Telephone conversation with Mark Thompson (NMFS) Please see correspondence included in this ER.

National Marine Fisheries Service. 2002. Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies, Gulf of Mexico Region. 17 pp.

National Oceanic and Atmospheric Administration (NOAA). 2005. Estuarine Living Marine Resources (ELMR) Data Base. http://biogeo.nos.noaa.gov/products/elmr/

Patillo, M. E., T. E. Czapla, D. M. Nelson and M. E. Monaco, 1997 Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Vol. II. Species life history summaries. ELMR Rep. No. 11. NOAA/NOS Strategic Environmental Assessments Division, Silver Springs, MD

Perret, W.S., J.E. Weaver, R.O. Williams, P.L. Johansen, T.D. McIlwain, R.C. Raulcrson, and W.M. Tatum. 1980. Fishery profiles of red drum and spotted seatrout. Gulf States Marine Fisheries Commission Report No. 6.

Rhoads, D.C. and J.D. Germano, 1982. Characterization of organism-sediment relations using sediment profile imaging: An efficient method of remote ecological monitoring of the seafloor (REMOTSTM System). Marine Ecology Progress Series, 8: 115-128.

Rhoads, D.C.,1974. Organism-sediment relations on the muddy seafloor. In H. Barnes, ed. Oceanographic and Marine Biological Annual Reviews. Vol 12: 263-300.

Shaw, J.K., P.G. Johnson, R.M. Ewing, C.E. Comiskey, C.C. Brant, and T.A. Farmer. 1982.

Benthic macroinfauna community characterization in Mississippi Sound and adjacent waters. U.S. Army Corps of Engineers, Mobile District, Mobile, AL. 442 pp.

Stickle, W.B., M.A. Kapper, L. Liu, E. Gnaiger, and S.Y. Wang, 1989. Metabolic adaptation of several species of crustaceans and mollusks to hypoxia: Tolerance and microcalorimetric studies. Biological Bulletin, 177: 301-312.

U.S. Army Corps of Engineers (USACE). 2001. Providence River and Harbor Maintenance Dredging Project Final Environmental Impact Statement. August.

U.S. Geological Survey (USGS) – National Wetlands Research Center (NWRC). 2003. GIS Database. 1992 Mississippi Sound, MS Submerged Aquatic Vegetation Data.

Appendix 3–A–A

NOAA Estuarine Living Marine Resources (ELMR) Database Query for Mississippi Sound

Table 1. Life stages of Atlantic Brief Squid found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	2	2	2	3	3	3	3	3	3	3	3	2
SPAWNING	15-25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
SPAWNING	>25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	2	2	2	2	2	2	2	2
LARVAE	5-15 ppt	2	2	2	3	3	3	3	3	3	3	3	2
LARVAE	15-25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
LARVAE	>25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	4	4	4	4	4	4	4	4	3
JUVENILES	>25 ppt	3	3	4	4	4	4	4	4	4	4	4	4
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	2	2	2	2	2	2	2	2	0
EGGS	5-15 ppt	2	2	2	3	3	3	3	3	3	3	3	2
EGGS	15-25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
EGGS	>25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 2. Life stages of Atlantic Croaker found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	2	2	2	2	0	0	0	2	2	2	2	2
LARVAE	5-15 ppt	3	3	3	2	0	0	0	2	3	3	3	3
LARVAE	15-25 ppt	3	3	3	2	0	0	0	2	3	3	4	4
LARVAE	>25 ppt	3	3	3	2	0	0	0	2	3	3	4	4
JUVENILES	0-0.5 ppt	3	3	4	4	4	4	4	4	4	4	4	3
JUVENILES	0.5-5 ppt	4	4	5	5	5	5	4	4	4	4	4	4
JUVENILES	5-15 ppt	4	4	5	5	5	5	4	4	4	4	4	4
JUVENILES	15-25 ppt	4	4	5	5	5	5	4	4	4	4	4	4
JUVENILES	>25 ppt	4	4	5	5	5	4	4	4	4	4	4	4
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	2	2	2	2	0	0	0	0	2	2	2	2
ADULTS	0-0.5 ppt	2	2	2	3	3	3	3	3	3	3	2	2
ADULTS	0.5-5 ppt	2	2	3	3	3	3	4	4	4	4	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	4	4	4	4	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	4	4	4	4	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	4	4	4	4	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 3. Life stages of Atlantic Rangia found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	3	3	2	0	0	2	3	3	2	0
SPAWNING	5-15 ppt	0	0	3	3	2	0	0	2	3	3	2	0
SPAWNING	15-25 ppt	0	0	2	2	2	0	0	2	2	2	2	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	2	2	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	3	3	3	2	2	2	3	3	3	2
LARVAE	5-15 ppt	0	0	3	3	3	2	2	2	3	3	3	2
LARVAE	15-25 ppt	0	0	2	2	2	2	2	2	2	2	2	2
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	3	3	2	2	2	2	3	3	3	0
EGGS	5-15 ppt	0	0	3	3	2	2	2	2	3	3	3	0
EGGS	15-25 ppt	0	0	3	3	2	2	2	2	2	2	2	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 4. Life stages of the Bay Anchovy found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	3	4	3	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	2	2	3	4	5	5	5	5	5	4	3	2
SPAWNING	5-15 ppt	2	2	3	4	5	5	5	5	5	4	3	2
SPAWNING	15-25 ppt	2	2	3	4	5	5	5	5	5	4	3	2
SPAWNING	>25 ppt	2	2	3	4	4	4	4	4	4	4	3	2
LARVAE	0-0.5 ppt	.	0	0	2	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	2	2	3	4	5	5	5	5	5	4	3	2
LARVAE	5-15 ppt	2	2	3	4	5	5	5	5	5	4	3	2
LARVAE	15-25 ppt	2	2	3	4	5	5	5	5	5	4	3	2
LARVAE	>25 ppt	2	2	3	4	4	4	4	4	4	4	3	2
JUVENILES	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	0.5-5 ppt	4	4	5	5	5	5	5	5	5	5	5	5
JUVENILES	5-15 ppt	4	4	5	5	5	5	5	5	5	5	5	5
JUVENILES	15-25 ppt	4	4	5	5	5	5	5	5	5	5	5	5
JUVENILES	>25 ppt	4	4	5	5	5	4	4	4	4	4	4	4
EGGS	0-0.5 ppt	.	0	0	2	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	2	2	3	4	5	5	5	5	5	4	3	2
EGGS	5-15 ppt	2	2	3	4	5	5	5	5	5	4	3	2
EGGS	15-25 ppt	2	2	3	4	5	5	5	5	5	4	3	2
EGGS	>25 ppt	2	2	3	4	4	4	4	4	4	4	3	2
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	4	4	5	5	5	5	5	5	5	5	4
ADULTS	5-15 ppt	4	4	4	5	5	5	5	5	5	5	5	4
ADULTS	15-25 ppt	4	4	4	5	5	5	5	5	5	5	5	4
ADULTS	>25 ppt	4	4	5	5	5	4	4	4	4	4	4	4

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 5. Life stages of the Bay Scallop found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	2	2	2	2	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	3	3	3	3	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	3	3	3	3	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
EGGS	>25 ppt	0	0	0	0	0	0	0	3	3	3	3	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 6. Life stages of the Black Drum found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	2	2	2	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	3	3	3	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	2	3	3	3	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	2	3	3	3	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	2	3	3	3	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 7. Life stages of the Blue Crab found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	2	3	3	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	2	2	3	4	5	5	5	5	5	4	3	2
SPAWNING	5-15 ppt	2	2	3	4	4	4	4	4	4	4	3	2
SPAWNING	15-25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
SPAWNING	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
LARVAE	0-0.5 ppt	.	0	0	2	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	2	2	3	3	3	3	3	3	3	3	3	3
LARVAE	5-15 ppt	2	2	3	4	4	4	4	4	4	4	4	3
LARVAE	15-25 ppt	2	2	3	4	5	5	5	5	5	5	4	3
LARVAE	>25 ppt	3	3	3	4	5	5	5	5	5	5	4	3
JUVENILES	0-0.5 ppt	4	4	3	3	3	5	5	5	5	5	5	4
JUVENILES	0.5-5 ppt	4	4	3	3	3	5	5	5	5	5	5	4
JUVENILES	5-15 ppt	4	4	3	3	3	5	5	5	5	5	5	4
JUVENILES	15-25 ppt	4	4	3	3	3	5	5	5	5	5	5	4
JUVENILES	>25 ppt	4	4	3	3	3	5	5	5	5	5	5	4
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	2	2	3	3	3	3	3	3	3	3	3	2
EGGS	5-15 ppt	2	2	3	4	4	4	4	4	4	4	3	2
EGGS	15-25 ppt	2	2	3	4	5	5	5	5	5	4	3	2
EGGS	>25 ppt	2	2	3	4	5	5	5	5	5	4	3	2
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	5-15 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	15-25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	>25 ppt	3	3	3	4	4	4	4	4	4	4	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 8. Life stages of the Blue Runner found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	3	3	3	3	3	3	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	3	3	3	3	3	3	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 9. Life stages of the Bluefish found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	3	3	3	3	2	2	2	2
JUVENILES	5-15 ppt	2	2	2	2	3	3	3	3	2	2	2	2
JUVENILES	15-25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
JUVENILES	>25 ppt	2	2	3	3	4	4	4	4	4	3	3	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
ADULTS	>25 ppt	2	2	3	3	4	4	4	4	3	3	3	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 10. Life stages of the Brown Shrimp found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	2	2
SPAWNING	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	2	4	4	4	4	4	4	3	3	3	3	2
LARVAE	5-15 ppt	2	5	5	5	4	4	4	4	4	3	3	2
LARVAE	15-25 ppt	2	5	5	5	4	4	4	4	4	3	3	2
LARVAE	>25 ppt	2	5	5	5	4	4	4	4	4	3	3	2
JUVENILES	0-0.5 ppt	3	3	3	4	5	5	4	4	4	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	4	5	5	4	4	4	3	3	3
JUVENILES	5-15 ppt	3	3	3	4	5	5	4	4	4	3	3	3
JUVENILES	15-25 ppt	3	3	3	4	5	5	4	4	4	3	3	3
JUVENILES	>25 ppt	3	3	3	4	5	5	4	4	4	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	3	3	3	3	3	3	3	3	3	2
ADULTS	15-25 ppt	3	3	3	3	3	4	4	4	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	4	4	4	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 11. Life stages of the Bull Shark found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	3	3	2	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	3	3	2	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	3	3	2	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	3	3	2	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	2	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	3	3	3	2	0	0	0	0
LARVAE	5-15 ppt	0	0	0	2	3	3	3	2	0	0	0	0
LARVAE	15-25 ppt	0	0	0	2	3	3	3	2	0	0	0	0
LARVAE	>25 ppt	0	0	0	2	3	3	3	2	0	0	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	2	2	2	3	3	3	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	3	3	3	3	3	3	3	2	2	2
ADULTS	5-15 ppt	2	2	3	3	3	3	3	3	3	2	2	2
ADULTS	15-25 ppt	2	2	3	3	3	3	3	3	3	2	2	2
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 12. Life stages of the Code Goby found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	2	2	2	2	2	0	0	0	0
SPAWNING	15-25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
SPAWNING	>25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	2	2	2	2	2	2	0	0	0
LARVAE	15-25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
LARVAE	>25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	2	2	2	2	2	2	0	0	0
EGGS	15-25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
EGGS	>25 ppt	2	2	2	3	3	3	3	3	2	2	2	2
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 13. Life stages of the Crevalle Jack found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	0	0	0	2	2	2	2	2	2	2	0	0
JUVENILES	0.5-5 ppt	0	0	2	2	3	3	3	3	3	3	2	0
JUVENILES	5-15 ppt	0	0	2	2	3	3	3	3	3	3	2	0
JUVENILES	15-25 ppt	0	0	2	2	3	3	3	3	3	3	2	0
JUVENILES	>25 ppt	0	0	2	2	3	3	3	3	3	3	2	0
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	2	2	3	3	3	3	3	3	2	0
ADULTS	5-15 ppt	0	0	2	2	3	3	3	3	3	3	2	0
ADULTS	15-25 ppt	0	0	2	2	3	3	3	3	3	3	2	0
ADULTS	>25 ppt	0	0	2	2	3	3	3	3	3	3	2	0

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 14. Life stages of the Daggerblade Grass Shrimp found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	3	3	3	3	3	3	3	3	3	2
SPAWNING	5-15 ppt	0	0	3	4	5	5	4	4	5	5	4	3
SPAWNING	15-25 ppt	0	0	3	4	5	5	4	4	5	5	4	3
SPAWNING	>25 ppt	0	0	3	4	5	5	4	4	5	5	4	3
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	3	3	3	3	3	3	3	3	3	2
LARVAE	5-15 ppt	0	0	3	4	5	5	4	4	5	5	4	3
LARVAE	15-25 ppt	0	0	3	4	5	5	4	4	5	5	4	3
LARVAE	>25 ppt	0	0	3	3	3	3	3	3	3	3	3	2
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	15-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	3	3	3	3	3	3	3	3	3	2
EGGS	5-15 ppt	0	0	3	4	5	5	4	4	5	5	4	3
EGGS	15-25 ppt	0	0	3	4	5	5	4	4	5	5	4	3
EGGS	>25 ppt	0	0	3	3	3	3	3	3	3	3	3	2
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	15-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 15. Life stages of the Eastern Oyster found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	3	4	4	4	4	4	4	4	3	2
SPAWNING	5-15 ppt	0	0	3	4	4	4	4	4	4	4	3	2
SPAWNING	15-25 ppt	0	0	3	4	4	4	4	4	4	4	3	2
SPAWNING	>25 ppt	0	0	2	3	3	3	3	3	3	3	3	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	3	4	4	4	4	4	4	4	3	2
LARVAE	5-15 ppt	0	0	3	4	4	4	4	4	4	4	3	2
LARVAE	15-25 ppt	0	0	3	4	4	4	4	4	4	4	3	2
LARVAE	>25 ppt	0	0	3	4	4	4	4	4	4	4	3	2
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	3	4	4	4	4	4	4	4	3	2
EGGS	5-15 ppt	0	0	3	4	4	4	4	4	4	4	3	2
EGGS	15-25 ppt	0	0	3	4	4	4	4	4	4	4	3	2
EGGS	>25 ppt	0	0	2	3	3	3	3	3	3	3	3	2
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 16. Life stages of the Florida Pompano found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	5-15 ppt	0	0	0	2	2	2	2	2	2	2	0	0
JUVENILES	15-25 ppt	0	0	2	2	2	2	2	2	2	2	2	0
JUVENILES	>25 ppt	0	0	0	2	3	3	3	3	3	2	0	0
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	0	0	0	2	2	2	2	2	2	2	0	0
ADULTS	15-25 ppt	0	0	0	2	3	3	3	3	3	2	0	0
ADULTS	>25 ppt	0	0	0	2	3	3	3	3	3	2	0	0

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 17. Life stages of the Gizzard Shad found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	3	3	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	2	2	2	2	2	2	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	3	3	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	2	2	2	2	2	2	2	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
EGGS	0-0.5 ppt	.	0	3	3	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	2	2	2	2	2	2	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 18. Life stages of the Gray Snapper found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	5-15 ppt	2	2	2	2	2	3	3	3	3	3	3	2
JUVENILES	15-25 ppt	2	2	2	2	2	3	3	3	3	3	3	2
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 19. Life stages of the Gulf Flounder found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	0	0	0	0	0	0	0	2	2
LARVAE	15-25 ppt	3	3	3	0	0	0	0	0	0	0	3	3
LARVAE	>25 ppt	3	3	3	0	0	0	0	0	0	0	3	3
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	2	2	0	0	0	0	0	0	0	0	2	2
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 20. Life stages of the Gulf Killifish found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	2	2	2	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	2	2	2	3	3	3	3	3	3	2	2	2
SPAWNING	5-15 ppt	2	2	2	3	3	3	3	3	3	2	2	2
SPAWNING	15-25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
SPAWNING	>25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
LARVAE	0-0.5 ppt	.	2	2	2	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	2	2	2	3	3	3	3	3	3	2	2	2
LARVAE	5-15 ppt	2	2	2	3	3	3	3	3	3	2	2	2
LARVAE	15-25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
LARVAE	>25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	2	2	2	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	2	2	2	3	3	3	3	3	3	2	2	2
EGGS	5-15 ppt	2	2	2	3	3	3	3	3	3	2	2	2
EGGS	15-25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
EGGS	>25 ppt	2	2	2	3	3	3	3	3	3	2	2	2
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 21. Life stages of the Gulf Menhaden found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	2	2	2	2	0	0	0	2	2	2	2	2
LARVAE	>25 ppt	5	5	4	3	0	0	0	2	3	4	5	5
JUVENILES	0-0.5 ppt	5	5	3	4	4	4	4	4	4	3	3	5
JUVENILES	0.5-5 ppt	5	5	3	4	5	5	5	5	4	3	3	5
JUVENILES	5-15 ppt	5	5	3	4	5	5	5	5	4	3	3	5
JUVENILES	15-25 ppt	5	5	3	4	5	5	5	5	4	3	3	5
JUVENILES	>25 ppt	5	5	3	4	5	5	5	5	4	3	3	5
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	3	3	2	2	0	0	0	0	2	2	3	3
ADULTS	0-0.5 ppt	0	2	2	2	2	2	2	2	2	2	0	0
ADULTS	0.5-5 ppt	3	3	3	3	3	5	5	5	4	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	5	5	5	4	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	5	5	5	4	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	5	5	5	4	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 22. Life stages of the Gulf Stone Crab found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	3	3	3	2	0	0	0	0	2	3	3	3
SPAWNING	15-25 ppt	3	3	3	2	0	0	0	0	2	3	3	3
SPAWNING	>25 ppt	3	3	3	2	0	0	0	0	2	3	3	3
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	2	3	3	3	3	3	3	2	0	0
LARVAE	15-25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
LARVAE	>25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	2	3	3	3	3	3	3	2	0	0
EGGS	15-25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
EGGS	>25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 23. Life stages of the Gulf Sturgeon found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 24. Life stages of the Hardhead Catfish found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	2	3	3	3	3	3	2	0	0
SPAWNING	5-15 ppt	0	0	0	2	3	4	4	4	3	2	0	0
SPAWNING	15-25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
SPAWNING	>25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	3	3	3	3	3	2	0	0
LARVAE	5-15 ppt	0	0	0	2	3	4	4	4	3	2	0	0
LARVAE	15-25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
LARVAE	>25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	4	4	4	4	4	4	4	4	3
JUVENILES	5-15 ppt	3	3	3	4	4	4	4	4	4	4	4	3
JUVENILES	15-25 ppt	3	3	4	4	4	4	4	4	4	4	4	3
JUVENILES	>25 ppt	3	3	4	4	4	4	4	4	4	4	4	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	2	3	3	3	3	3	2	0	0
EGGS	5-15 ppt	0	0	0	2	3	4	4	4	3	2	0	0
EGGS	15-25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
EGGS	>25 ppt	0	0	0	2	3	4	4	4	3	2	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	4	4	4	4	4	4	4	4	3
ADULTS	5-15 ppt	3	3	3	4	4	4	4	4	4	4	4	3
ADULTS	15-25 ppt	3	3	3	4	4	4	4	4	4	4	4	3
ADULTS	>25 ppt	3	3	3	4	4	4	4	4	4	4	4	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 25. Life stages of the Pinfish found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	2	0	0	0	0	0	0	2	2
LARVAE	15-25 ppt	3	3	3	2	0	0	0	0	0	0	2	3
LARVAE	>25 ppt	4	4	3	2	0	0	0	0	0	0	2	3
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	2	2	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 26. Life stages of the Pink Shrimp found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	0	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	2	2	2	2	2	0	0	0
LARVAE	5-15 ppt	0	0	0	2	3	3	3	3	2	0	0	0
LARVAE	15-25 ppt	0	0	0	2	3	3	3	3	2	0	0	0
LARVAE	>25 ppt	0	0	0	2	3	3	3	3	2	0	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	3	3	2	2	2	2	2	2	2	2	2	3
ADULTS	5-15 ppt	3	3	2	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	4	4	4	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	2	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 27. Life stages of the Quahog found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	2	2	2	2	2	2	0	0	0	0
SPAWNING	15-25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
SPAWNING	>25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	2	2	2	2	2	2	2	0	0	0
LARVAE	15-25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
LARVAE	>25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	2	2	2	2	2	2	2	0	0	0
EGGS	15-25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
EGGS	>25 ppt	0	0	2	3	3	3	3	3	2	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 28. Life stages of the Red Drum found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	2	2	2	0	0	0	0	2	3	3	3	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	0	0	0	0	2	3	3	3	3
LARVAE	15-25 ppt	3	3	2	0	0	0	0	2	4	4	4	3
LARVAE	>25 ppt	3	3	2	0	0	0	0	2	4	4	4	3
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	2	2	2	0	0	0	0	2	3	3	3	2
EGGS	>25 ppt	3	3	2	0	0	0	0	2	4	4	4	3
ADULTS	0-0.5 ppt	0	0	0	2	2	2	2	2	2	0	0	0
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	3	3	2	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 29. Life stages of the Sand Seatrout found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	2	3	3	3	3	3	3	3	2	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	2	2	2	2	2	2	2	2	2	0	0
LARVAE	15-25 ppt	0	2	3	3	3	3	3	3	3	2	0	0
LARVAE	>25 ppt	0	2	3	3	3	3	3	3	3	2	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	4	5	5	5	5	4	3	3
JUVENILES	0.5-5 ppt	3	3	3	4	4	5	5	5	5	4	4	3
JUVENILES	5-15 ppt	3	3	3	4	4	5	5	5	5	4	4	3
JUVENILES	15-25 ppt	3	3	3	4	4	5	5	5	5	4	4	3
JUVENILES	>25 ppt	3	3	3	4	4	5	5	5	5	4	4	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	2	2	2	2	2	2	2	2	2	0	0
EGGS	>25 ppt	0	2	3	3	3	3	3	3	3	2	0	0
ADULTS	0-0.5 ppt	2	2	3	3	3	3	3	3	3	3	2	2
ADULTS	0.5-5 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	5-15 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	15-25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	>25 ppt	3	3	3	4	4	4	4	4	4	4	3	3

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 30. Life stages of the Sheepshead found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	2	2	2	2	0	0	0	0	0
LARVAE	15-25 ppt	2	3	3	3	2	2	2	0	0	0	0	0
LARVAE	>25 ppt	2	3	3	3	2	2	2	0	0	0	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 31. Life stages of the Sheepshead Minnow found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	3	3	3	3	3	3	3	0	0
SPAWNING	5-15 ppt	0	0	0	3	4	4	4	4	4	3	0	0
SPAWNING	15-25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
SPAWNING	>25 ppt	0	0	0	3	3	3	3	3	3	3	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	3	3	3	3	3	3	3	3	0
LARVAE	5-15 ppt	0	0	0	3	4	4	4	4	4	3	3	0
LARVAE	15-25 ppt	0	0	0	3	4	4	4	4	4	3	3	0
LARVAE	>25 ppt	0	0	0	3	3	3	3	3	3	3	3	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	4	4	4	4	4	4	3	3
JUVENILES	5-15 ppt	3	3	3	3	4	4	4	4	4	4	3	3
JUVENILES	15-25 ppt	3	3	3	3	4	4	4	4	4	4	3	3
JUVENILES	>25 ppt	3	3	3	3	4	4	4	4	4	4	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	3	3	3	3	3	3	3	0	0
EGGS	5-15 ppt	0	0	0	3	4	4	4	4	4	3	0	0
EGGS	15-25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
EGGS	>25 ppt	0	0	0	3	3	3	3	3	3	3	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 32. Life stages of the Silver Perch found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	2	3	3	3	3	3	2	2	0	0
SPAWNING	>25 ppt	0	0	2	3	3	3	3	3	2	2	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	2	3	3	3	3	3	3	2	0	0
LARVAE	15-25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
LARVAE	>25 ppt	0	0	2	3	3	3	3	3	3	2	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	2	3	3	3	3	3	2	2	0	0
EGGS	15-25 ppt	0	0	2	3	3	3	3	3	2	2	0	0
EGGS	>25 ppt	0	0	2	3	3	3	3	3	2	2	0	0
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 33. Life stages of the Silversides found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	2	3	3	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	2	3	4	4	4	4	4	3	2	2	0
SPAWNING	5-15 ppt	0	2	3	4	4	4	4	4	3	2	2	0
SPAWNING	15-25 ppt	0	2	3	4	4	4	4	4	3	2	2	0
SPAWNING	>25 ppt	0	2	3	3	3	3	3	3	3	2	2	0
LARVAE	0-0.5 ppt	.	2	3	3	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	2	3	4	4	4	4	4	3	3	2	0
LARVAE	5-15 ppt	0	2	3	4	4	4	4	4	3	3	2	0
LARVAE	15-25 ppt	0	2	3	4	4	4	4	4	3	3	2	0
LARVAE	>25 ppt	0	2	3	3	3	3	3	3	3	3	2	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	15-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EGGS	0-0.5 ppt	.	2	3	3	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	2	3	4	4	4	4	4	3	2	2	0
EGGS	5-15 ppt	0	2	3	4	4	4	4	4	3	2	2	0
EGGS	15-25 ppt	0	2	3	4	4	4	4	4	3	2	2	0
EGGS	>25 ppt	0	2	3	4	4	4	4	4	3	2	2	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	5-15 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	15-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ADULTS	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 34. Life stages of the Southern Flounder found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	2	0	0	0	0	2	2	2	2
LARVAE	15-25 ppt	3	3	3	2	0	0	0	0	2	3	3	3
LARVAE	>25 ppt	3	3	3	2	0	0	0	0	2	3	3	3
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 35. Life stages of the Spanish Mackerel found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	2	2	2	2	2	2	2	2	2	0
JUVENILES	5-15 ppt	0	0	2	3	3	3	3	3	3	3	2	0
JUVENILES	15-25 ppt	2	2	2	3	3	3	3	3	3	3	2	2
JUVENILES	>25 ppt	2	2	2	3	3	3	3	3	3	3	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	15-25 ppt	2	2	2	2	2	3	3	3	2	2	2	2
ADULTS	>25 ppt	2	2	2	3	3	3	3	3	3	2	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 36. Life stages of the Spot found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	3	3	2	2	0	0	0	0	0	2	3	3
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	2	0	0	0	0	0	2	2	2
LARVAE	15-25 ppt	4	4	3	2	0	0	0	0	0	2	3	4
LARVAE	>25 ppt	4	4	3	2	0	0	0	0	0	2	3	4
JUVENILES	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
JUVENILES	0.5-5 ppt	5	5	5	5	5	5	5	5	5	5	5	5
JUVENILES	5-15 ppt	5	5	5	5	5	5	5	5	5	5	5	5
JUVENILES	15-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
JUVENILES	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	3	3	2	2	0	0	0	0	0	2	2	3
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	3	3	3	3	3	3	3	3	2
ADULTS	5-15 ppt	2	2	2	3	3	3	3	3	3	3	3	2
ADULTS	15-25 ppt	2	2	2	3	3	3	3	3	3	3	3	2
ADULTS	>25 ppt	2	2	2	3	3	3	3	3	3	3	3	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

Table 37. Life stages of the Spottede Seatrout found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	2	2	2	2	2	0	0	0	0
EGGS	5-15 ppt	0	0	2	3	3	3	3	3	2	0	0	0
EGGS	15-25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
EGGS	>25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	2	2	2	2	0	0	0	0
LARVAE	5-15 ppt	0	0	2	3	3	3	3	3	2	0	0	0
LARVAE	15-25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
LARVAE	>25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	2	2	2	2	2	0	0	0	0
SPAWNING	5-15 ppt	0	0	2	3	3	3	3	3	2	0	0	0
SPAWNING	15-25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
SPAWNING	>25 ppt	0	2	3	4	4	4	4	4	3	2	0	0
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 38. Life stages of the Striped Mullet found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
ADULTS	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	0.5-5 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	5-15 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	15-25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
ADULTS	>25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
JUVENILES	0.5-5 ppt	5	5	4	4	5	5	5	5	5	4	4	5
JUVENILES	5-15 ppt	5	5	4	4	5	5	5	5	5	4	4	5
JUVENILES	15-25 ppt	5	5	4	4	5	5	5	5	5	4	4	5
JUVENILES	>25 ppt	5	5	4	4	5	5	5	5	5	4	4	5
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	2	2	2	2	0	0	0	0	0	0	0	2
LARVAE	15-25 ppt	3	3	3	3	2	0	0	0	0	2	2	3
LARVAE	>25 ppt	4	4	4	3	2	0	0	0	0	2	2	3
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 39. Life stages of the Tarpon found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	0.5-5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	5-15 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	15-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
JUVENILES	>25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	0	0	0	0	0	2	2	2	2	2	2	0
LARVAE	>25 ppt	0	0	0	0	2	3	3	3	3	3	3	2
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 40. Life stages of the White Shrimp found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
ADULTS	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ADULTS	0.5-5 ppt	2	2	2	2	2	3	3	3	2	2	2	2
ADULTS	5-15 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	15-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	>25 ppt	0	0	0	2	2	2	2	2	2	2	2	0
JUVENILES	0-0.5 ppt	2	2	2	2	2	3	3	3	2	2	2	2
JUVENILES	0.5-5 ppt	3	3	3	3	3	4	4	4	4	4	4	3
JUVENILES	5-15 ppt	3	3	3	3	3	4	4	4	4	4	4	3
JUVENILES	15-25 ppt	3	3	3	3	3	4	4	4	4	4	4	3
JUVENILES	>25 ppt	3	3	3	3	3	4	4	4	4	4	4	3
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	2	3	4	4	3	4	4	3	2
LARVAE	5-15 ppt	0	0	0	2	3	4	4	3	4	4	3	2
LARVAE	15-25 ppt	0	0	0	2	3	4	4	3	4	4	3	2
LARVAE	>25 ppt	0	0	0	2	3	4	4	3	4	4	3	2
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	>25 ppt	0	0	0	2	2	2	2	2	2	2	2	0
0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data													

Table 41. Life stages of the Yellowfin Menhaden found within Missippi Sound during each month and under various salinity conditions. Data downloaded from NOAA's Estuarine Living Marine Resources Database.

Life Stage	Salinity	January	February	March	April	May	June	July	August	September	October	November	December
ADULTS	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
ADULTS	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
EGGS	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
EGGS	15-25 ppt	2	2	2	0	0	0	0	0	0	0	2	2
EGGS	>25 ppt	2	2	2	0	0	0	0	0	0	0	2	2
JUVENILES	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	15-25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
JUVENILES	>25 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
LARVAE	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LARVAE	15-25 ppt	2	2	2	0	0	0	0	0	0	0	2	2
LARVAE	>25 ppt	2	2	2	0	0	0	0	0	0	0	2	2
SPAWNING	0-0.5 ppt	.	0	0	0	.	.	.	.	.	.	.	.
SPAWNING	0.5-5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	5-15 ppt	0	0	0	0	0	0	0	0	0	0	0	0
SPAWNING	15-25 ppt	2	2	2	0	0	0	0	0	0	0	2	2
SPAWNING	>25 ppt	2	2	2	0	0	0	0	0	0	0	2	2

0=not present, 2=rare, 3=common, 4=abundant, 5=highly abundant, and .=no data

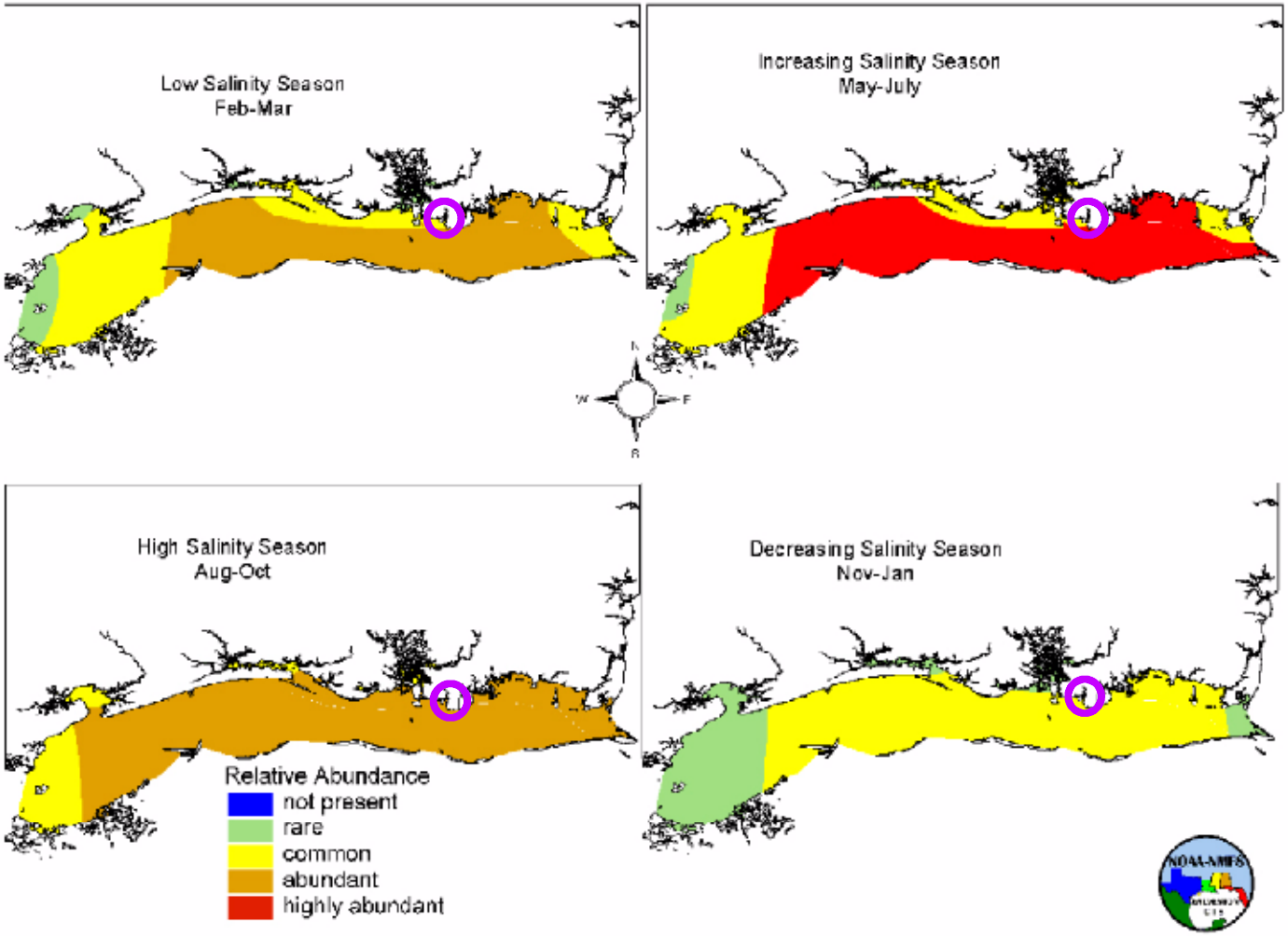
Appendix 3–A–B

NMFS Seasonal and Year-round EFH
(Source: http://galveston.ssp.nmfs.gov/research/fisheryecology/EFH/Relative/estuaries/)

Mississippi Sound, MS
EFH Mapping, NMFS Galveston Lab

Brown Shrimp, *Penaeus aztecus*
http://galveston.ssp.nmfs.gov/efh

Adults
July, 1998



Map Location

Legend

Project Location

Image Source: NOAA-NMFS Galveston

Casotte Landing
Natural Gas Import Terminal Project

EFH Mapping - Adult Brown Shrimp

April 2005

Project #: 01231-021

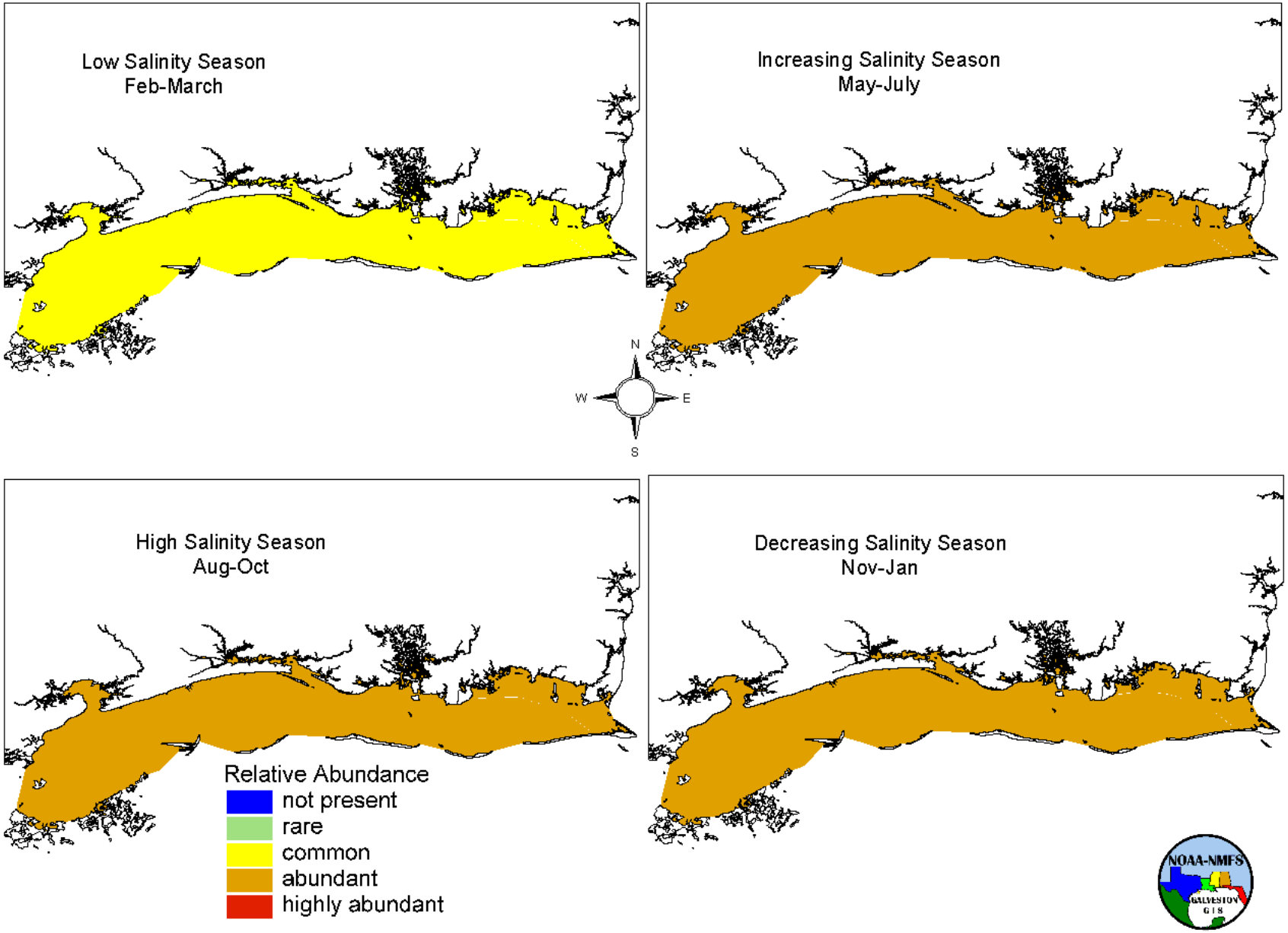
Bayou Casotte Energy, LLC

ENSR INTERNATIONAL

X:\Projects\ChevronTexaco\CTGG-Pascagoula\MXD\EFH figures\brown_shrimp_adults-1.mxd

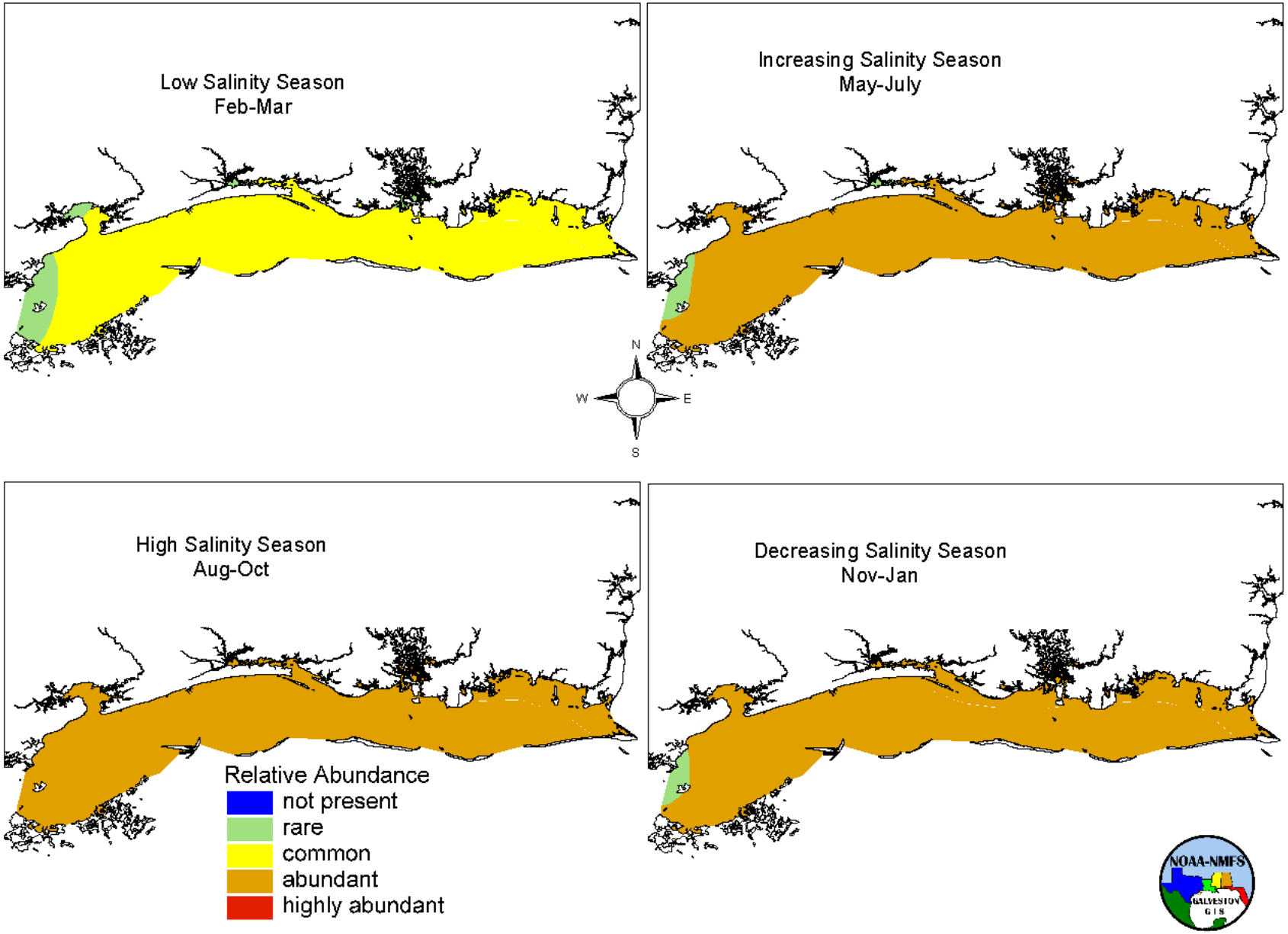
Mississippi Sound, MS | White Shrimp, *Penaeus setiferus* | Juveniles

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998



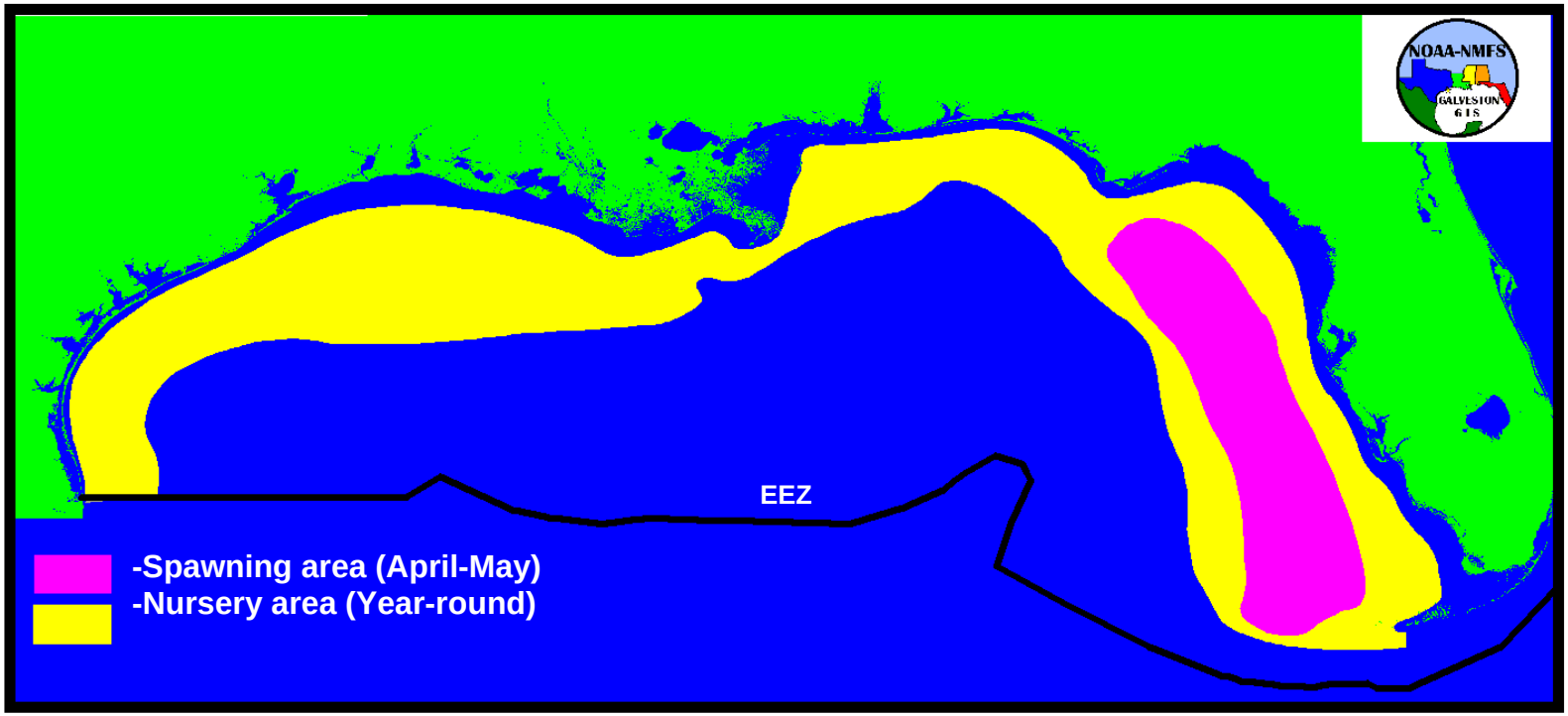
Mississippi Sound, MS | White Shrimp, *Penaeus setiferus* | Adults

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998



Gulf of Mexico, U.S. Red grouper, *Epinephelus morio* Juveniles

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).

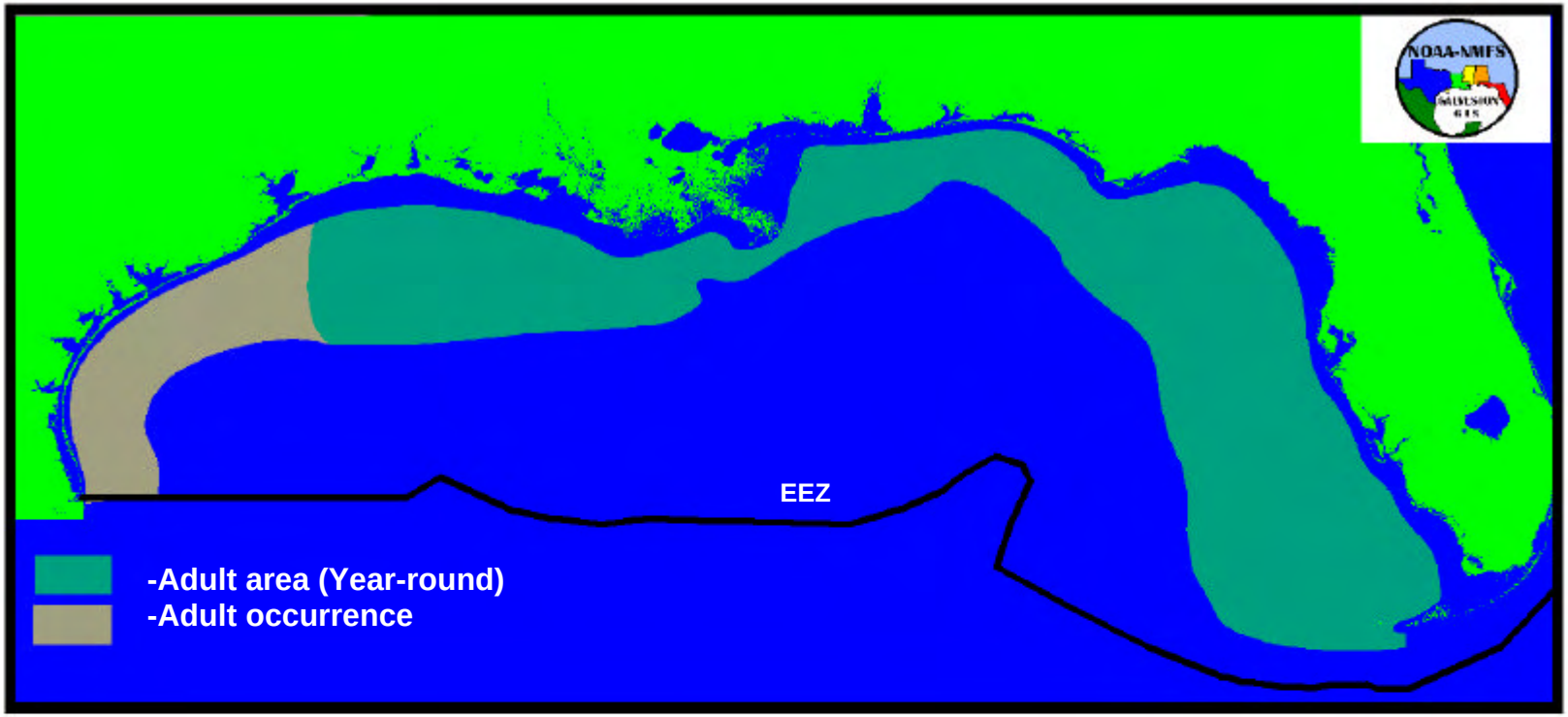


Spawning area shown is one of several in the Gulf, but is the only one that has been positively identified.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Red grouper, *Epinephelus morio* Adults

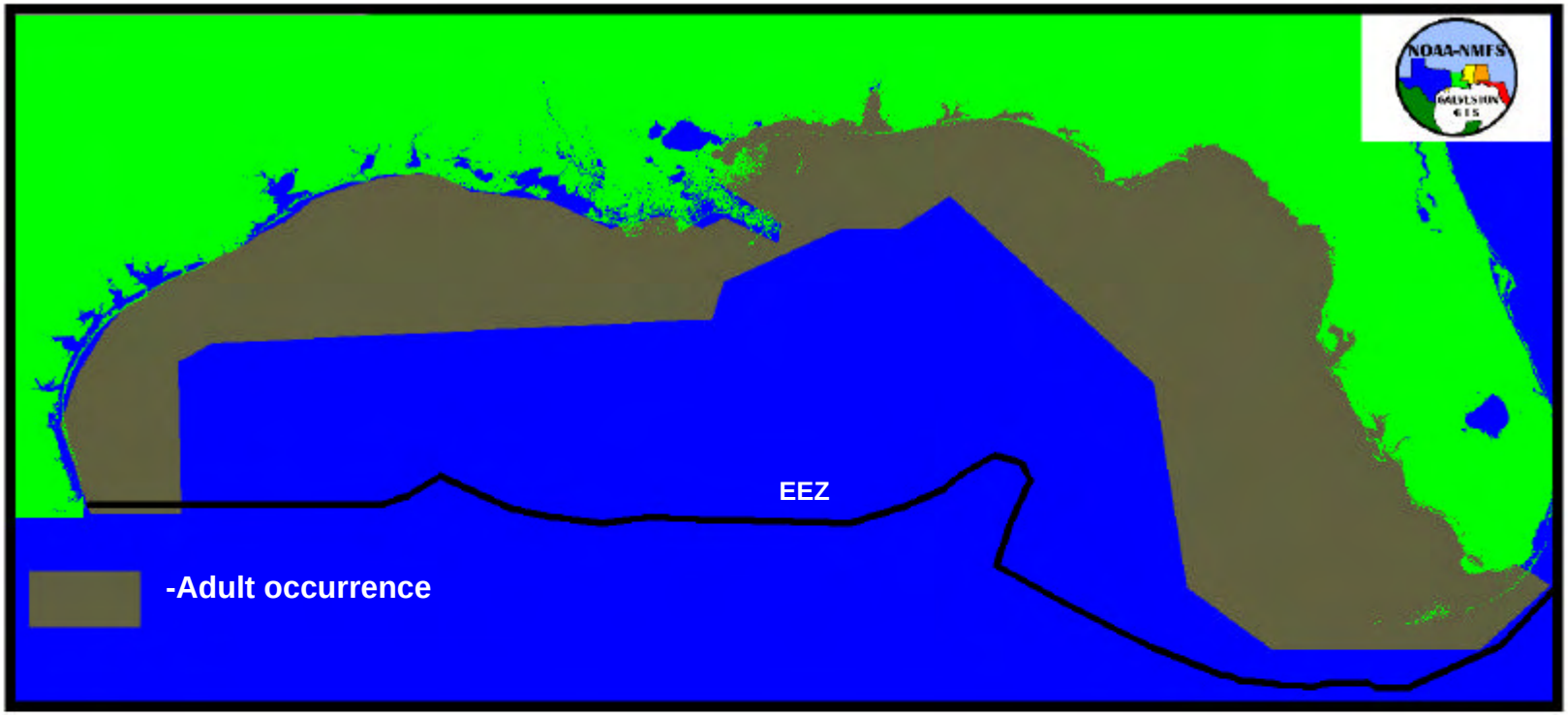
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Gag, *Mycteroperca microlepis* Adults

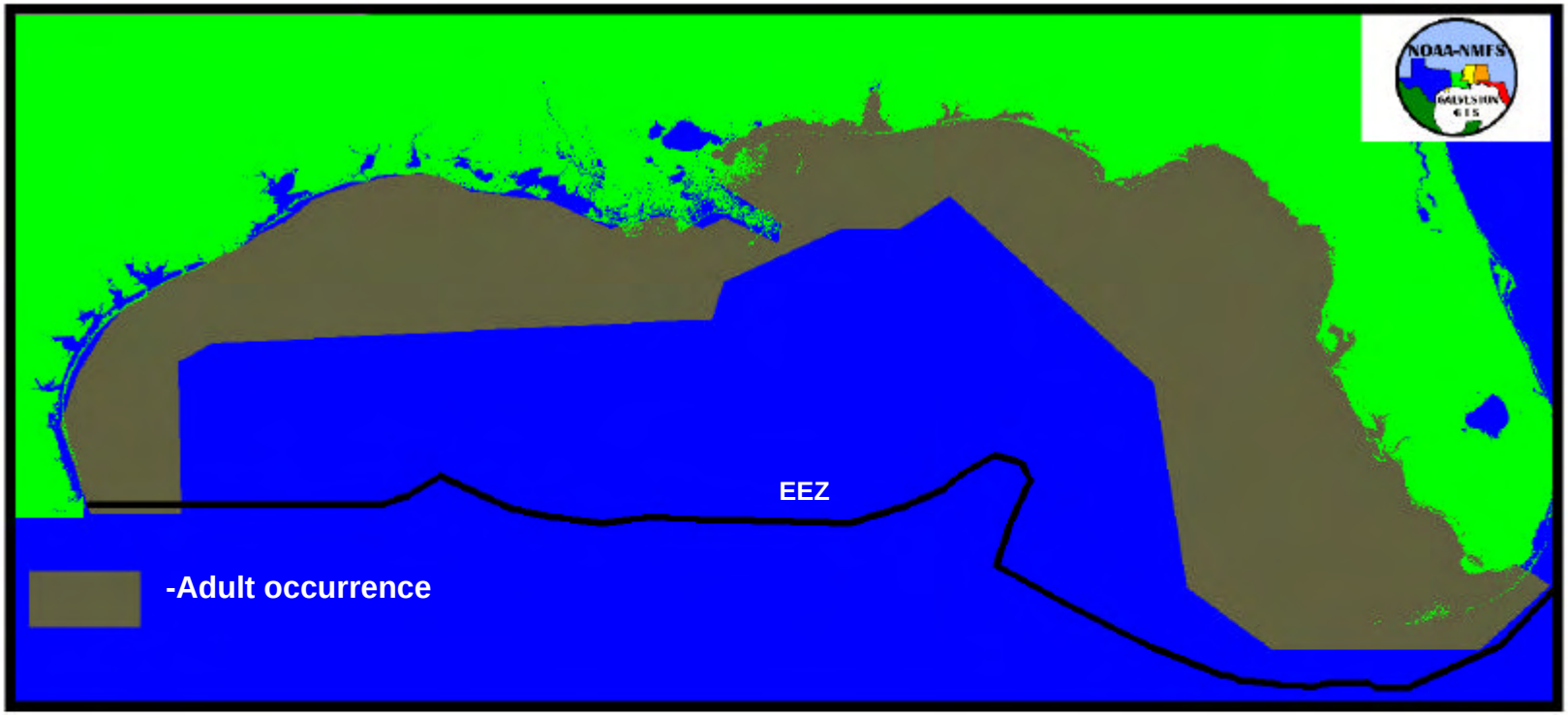
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Gag, *Mycteroperca microlepis* Adults

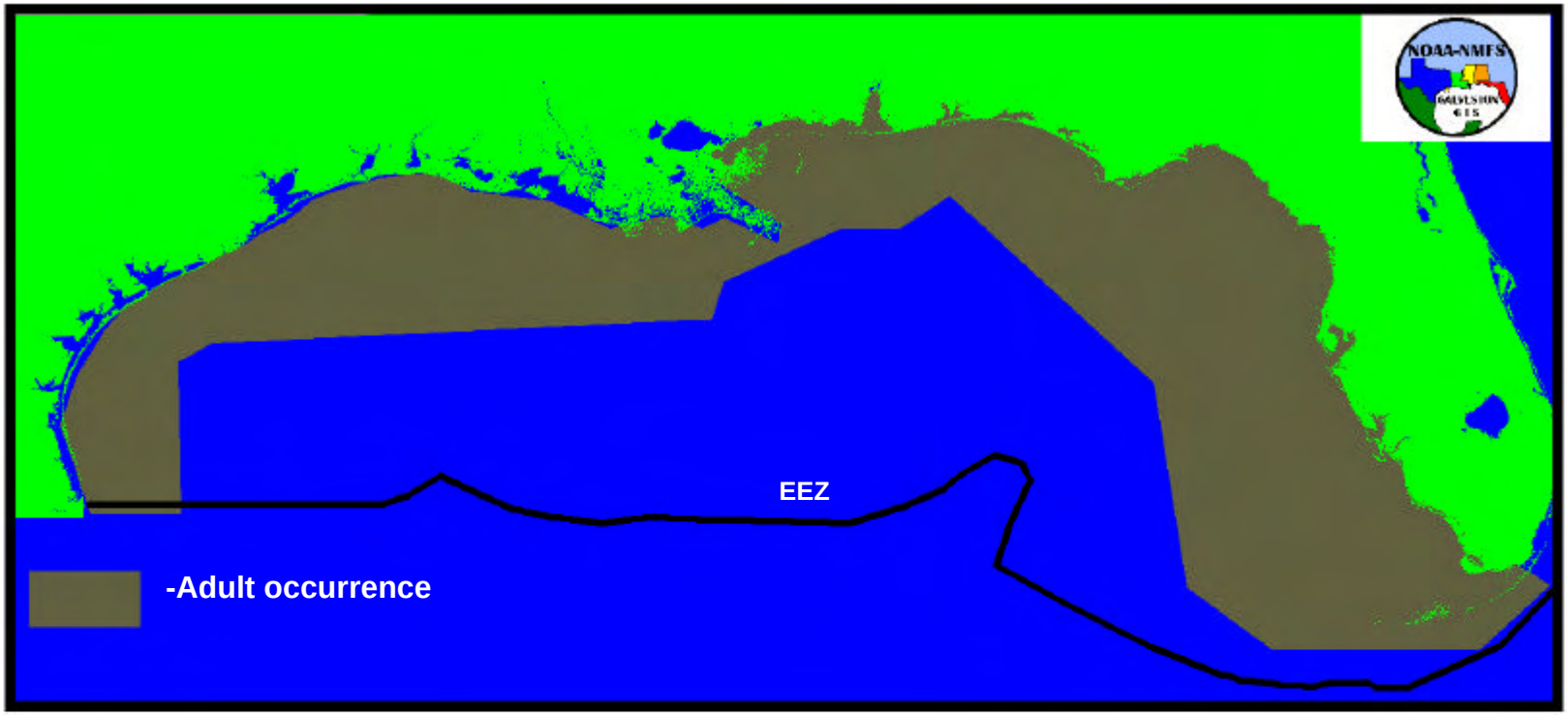
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Scamp, *Mycteroperca phenax* Adults

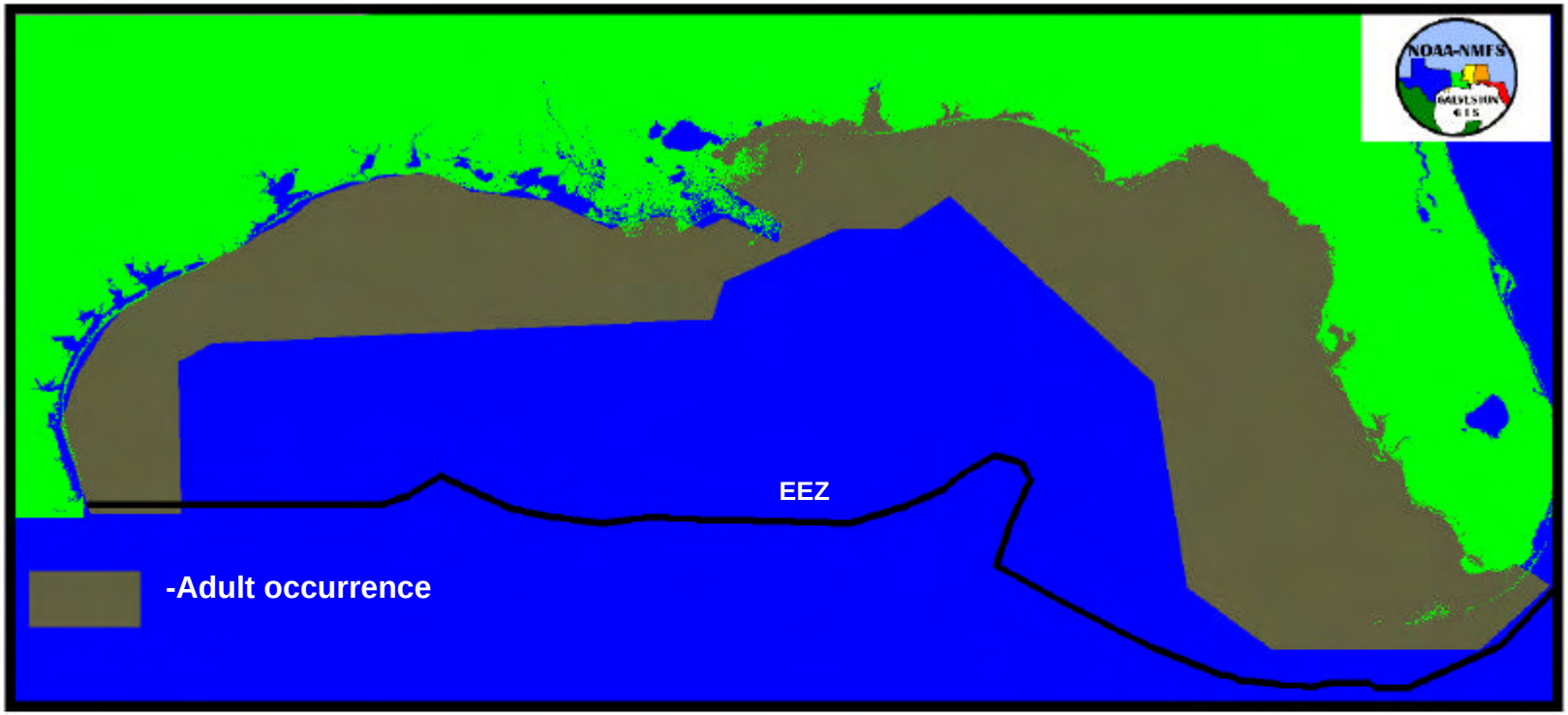
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Scamp, *Mycteroperca phenax* Adults

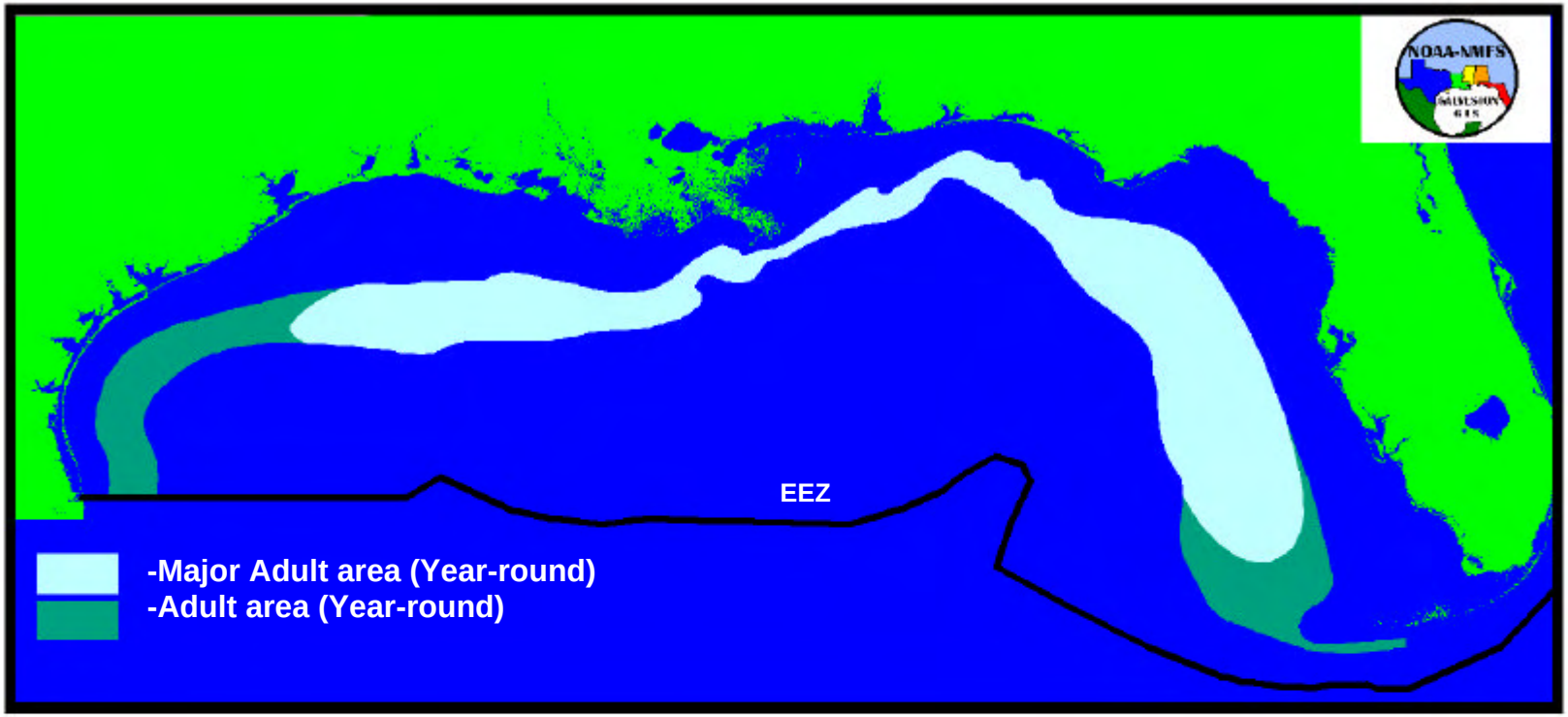
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Gulf of Mexico, U.S. Red snapper, *Lutjanus campechanus* Adults

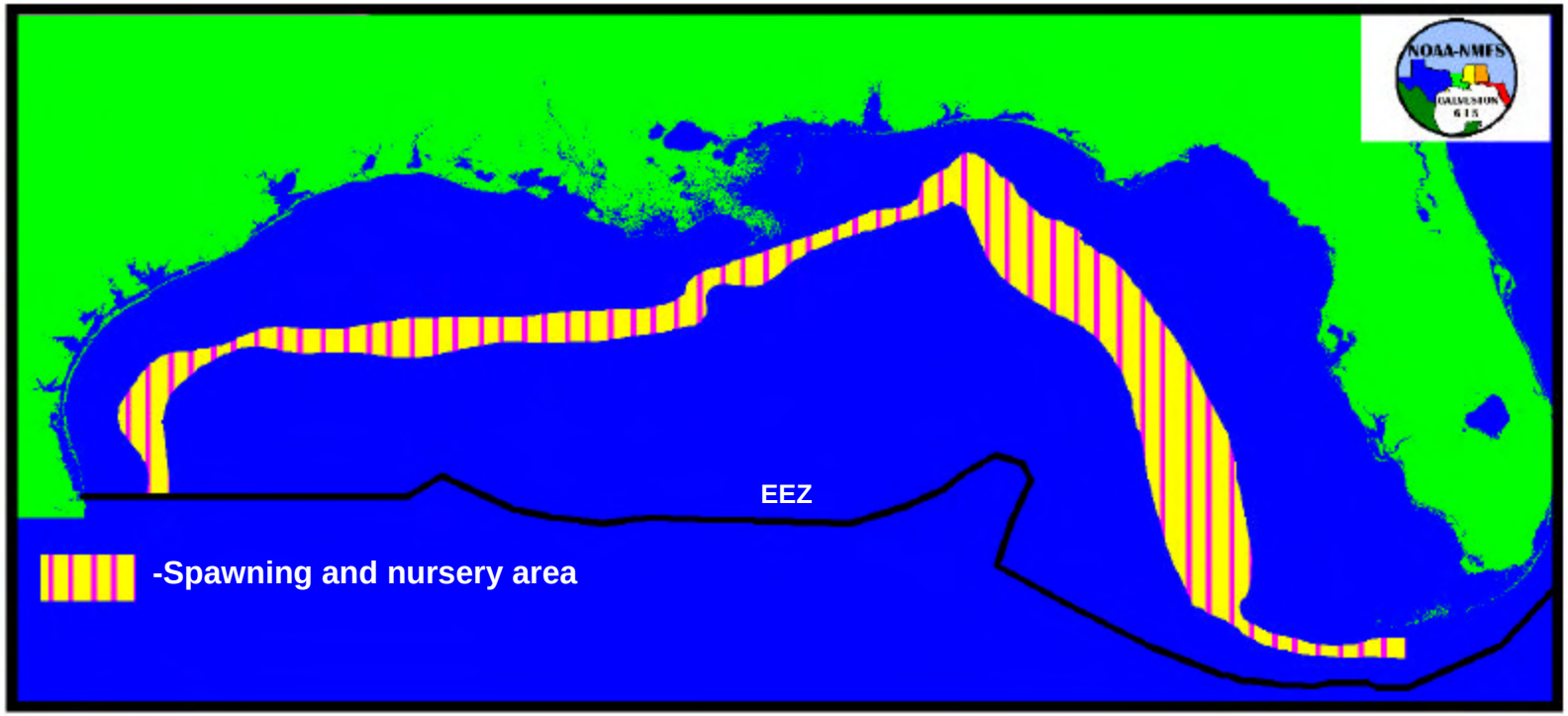
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Spawning, from June to October, occurs throughout the adult areas.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).

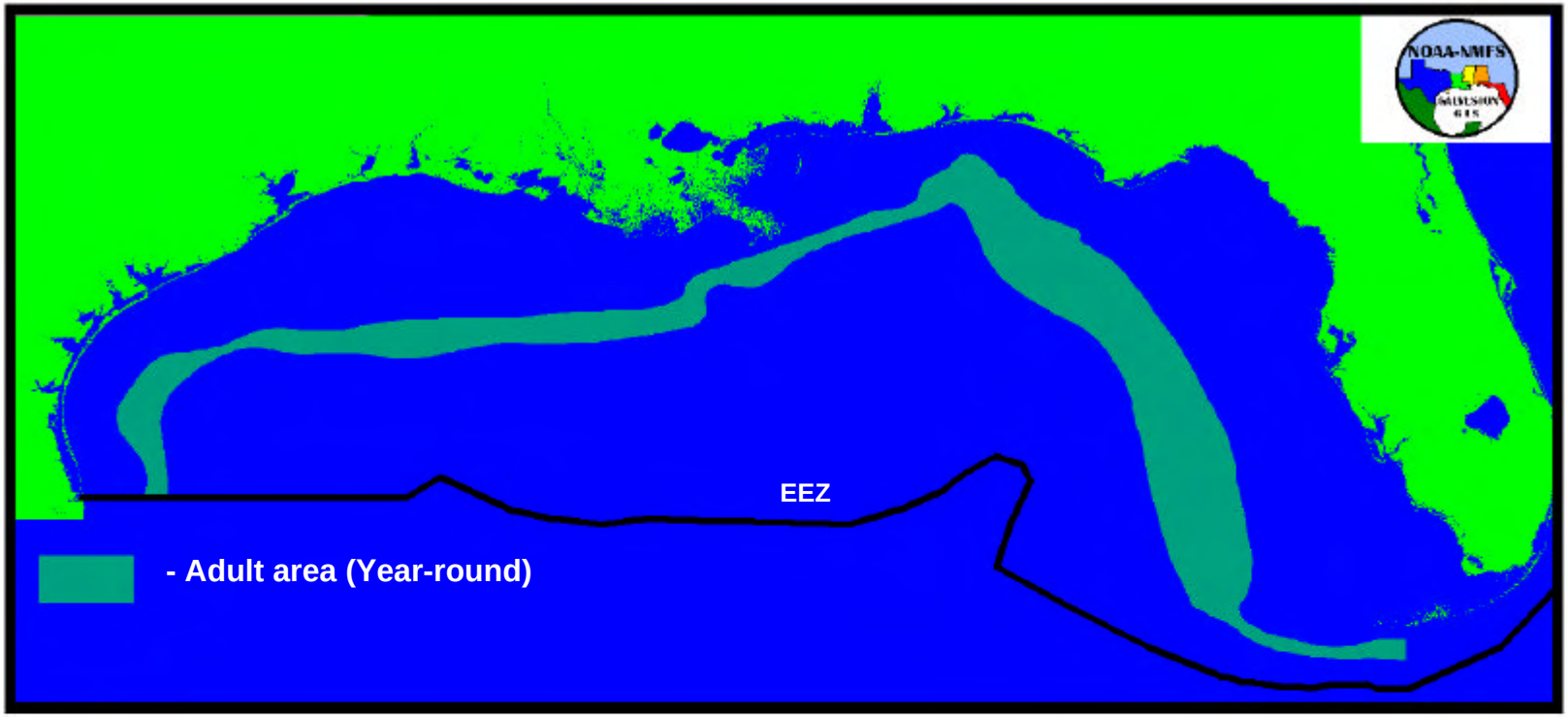


Spawning occurs throughout the adult area from March to September. The adult area is also the year-round nursery area.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

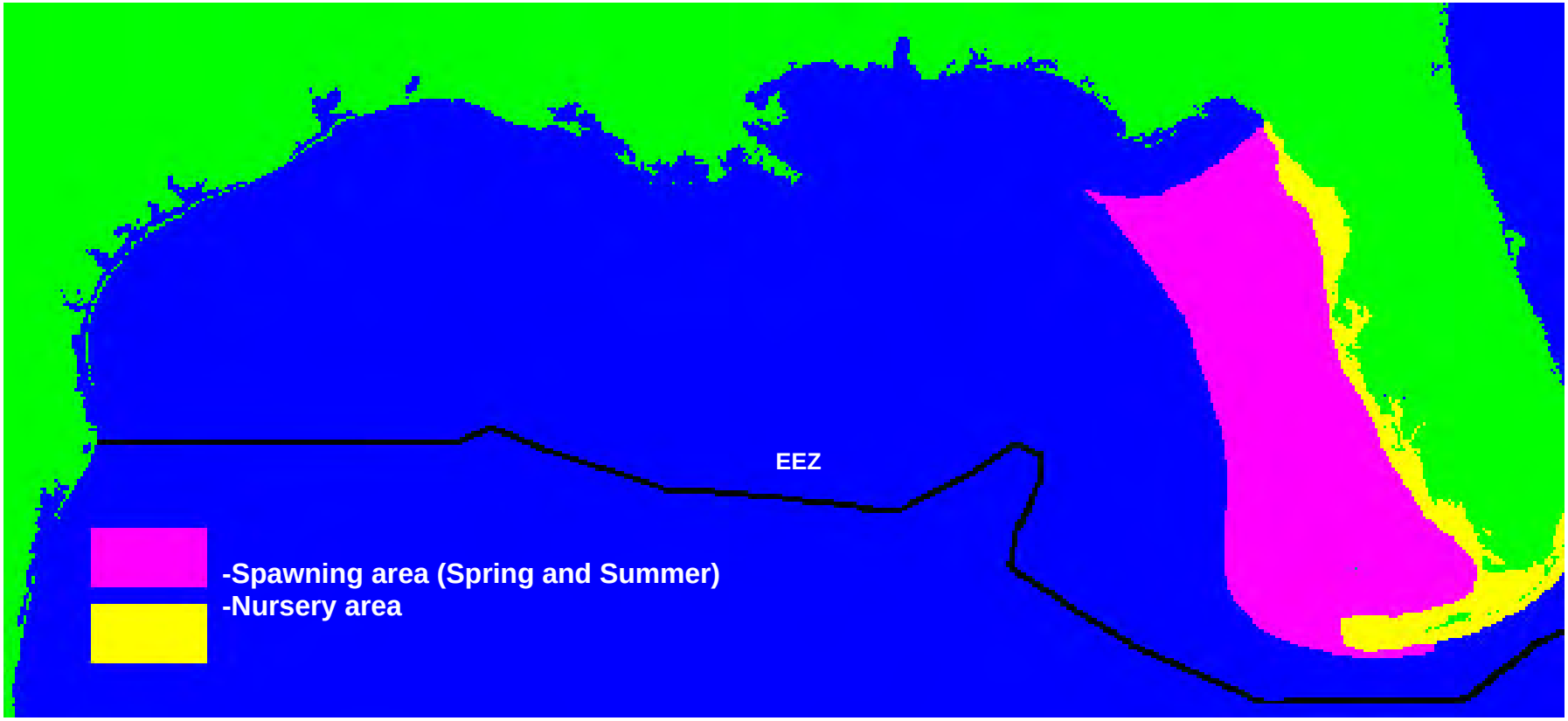
Gulf of Mexico, U.S. Tilefish, *Lopholatilus chamaeleonticeps* Adults

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).

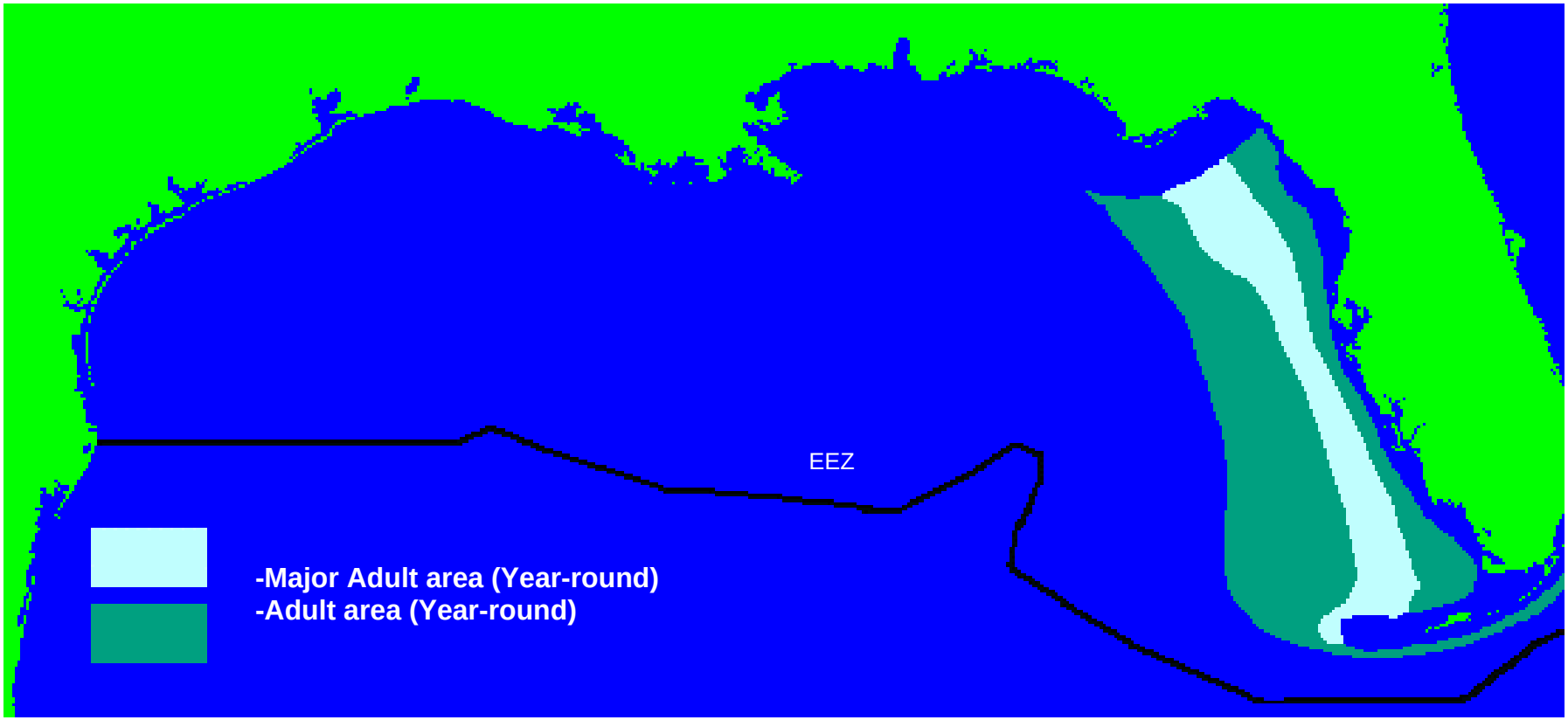


Spawning occurs predominantly in Spring and Summer in adult areas in the eastern Gulf.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

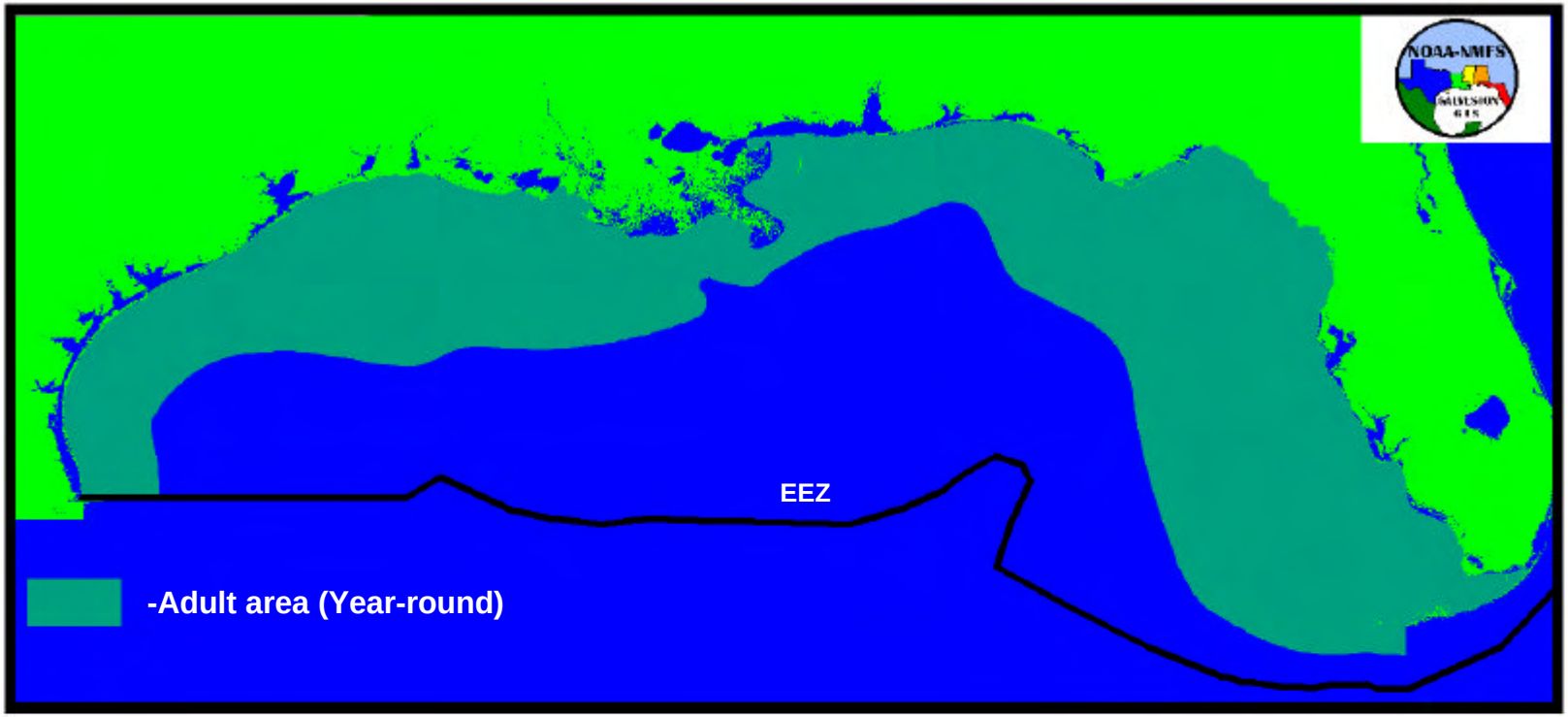
Gulf of Mexico, U.S. Yellowtail snapper, *Ocyurus chrysurus* Adults

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

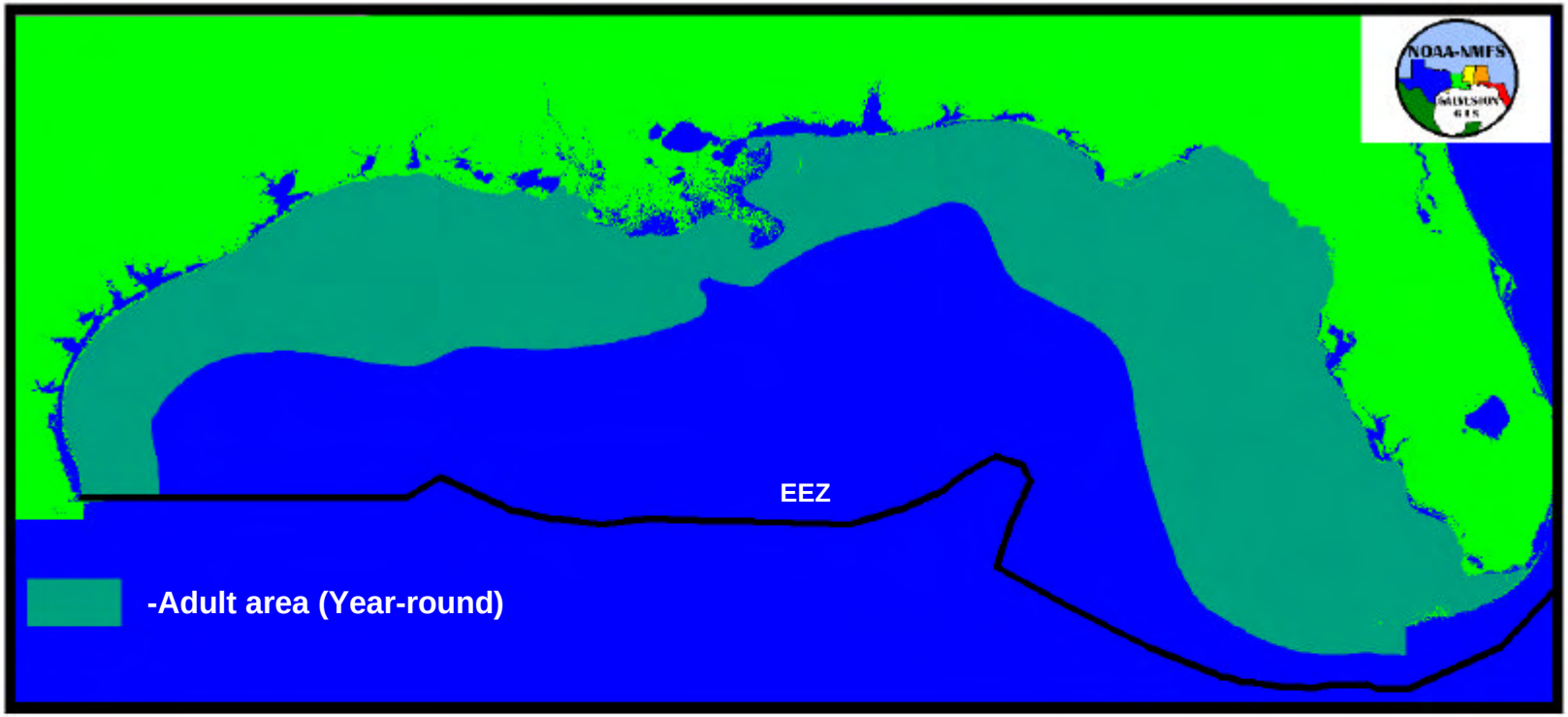
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Year-round spawning occurs throughout the adult area. Year-round nursery area is throughout the adult area.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).

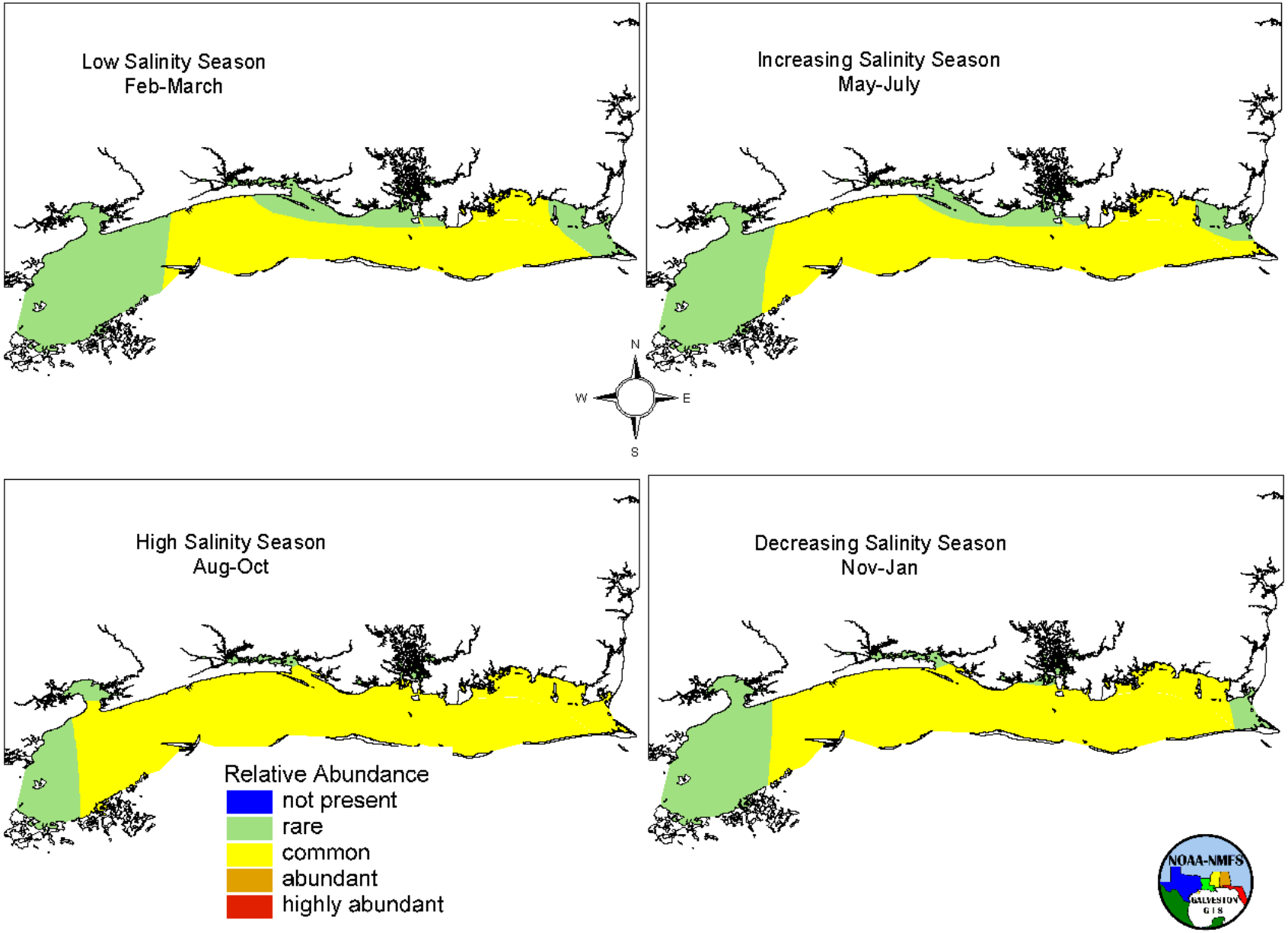


Year-round spawning occurs throughout the adult area. Year-round nursery area is throughout the adult area.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

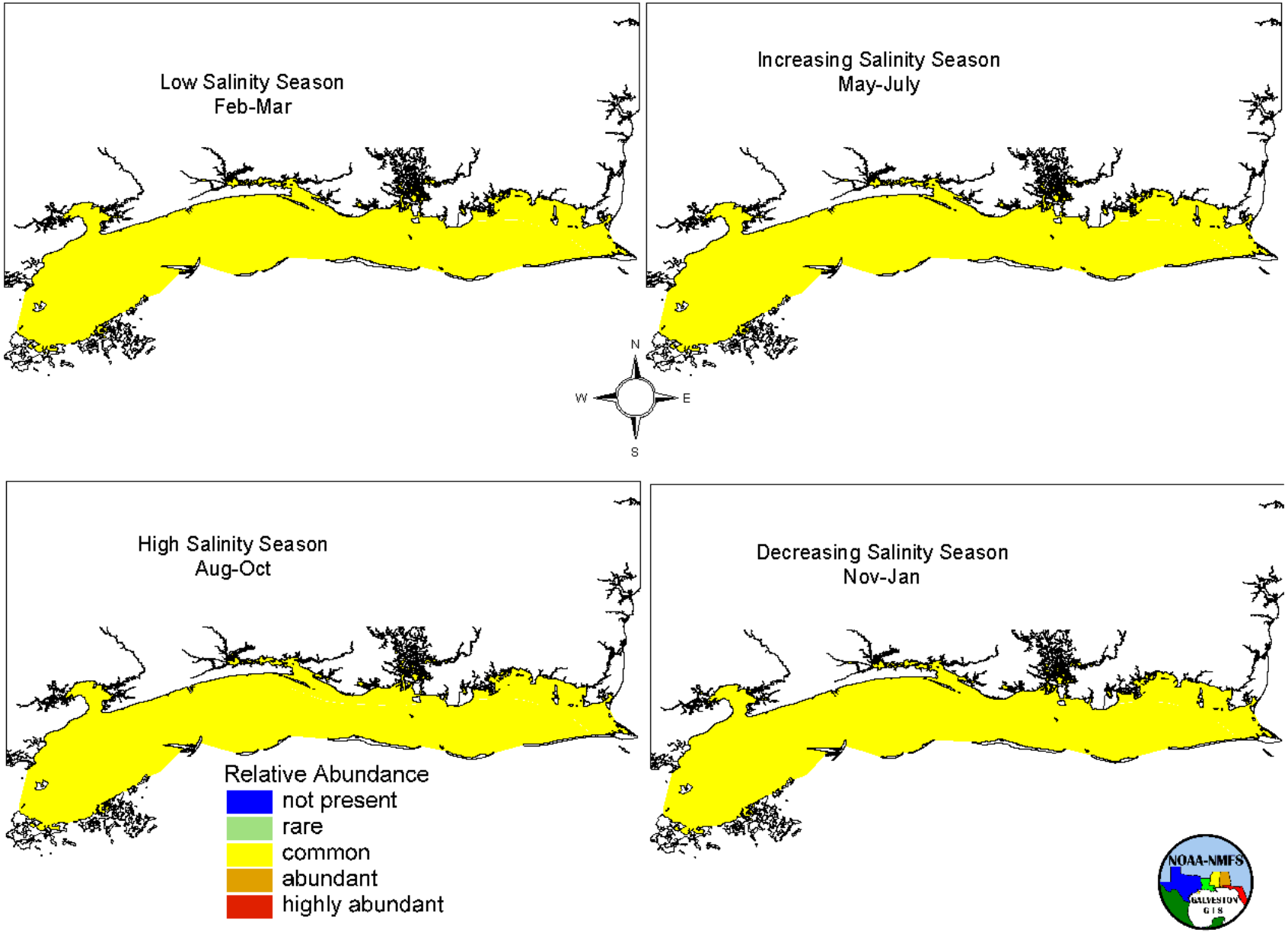
Mississippi Sound, MS | Gulf Stone Crab, *Menippe adina* | Juveniles

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998



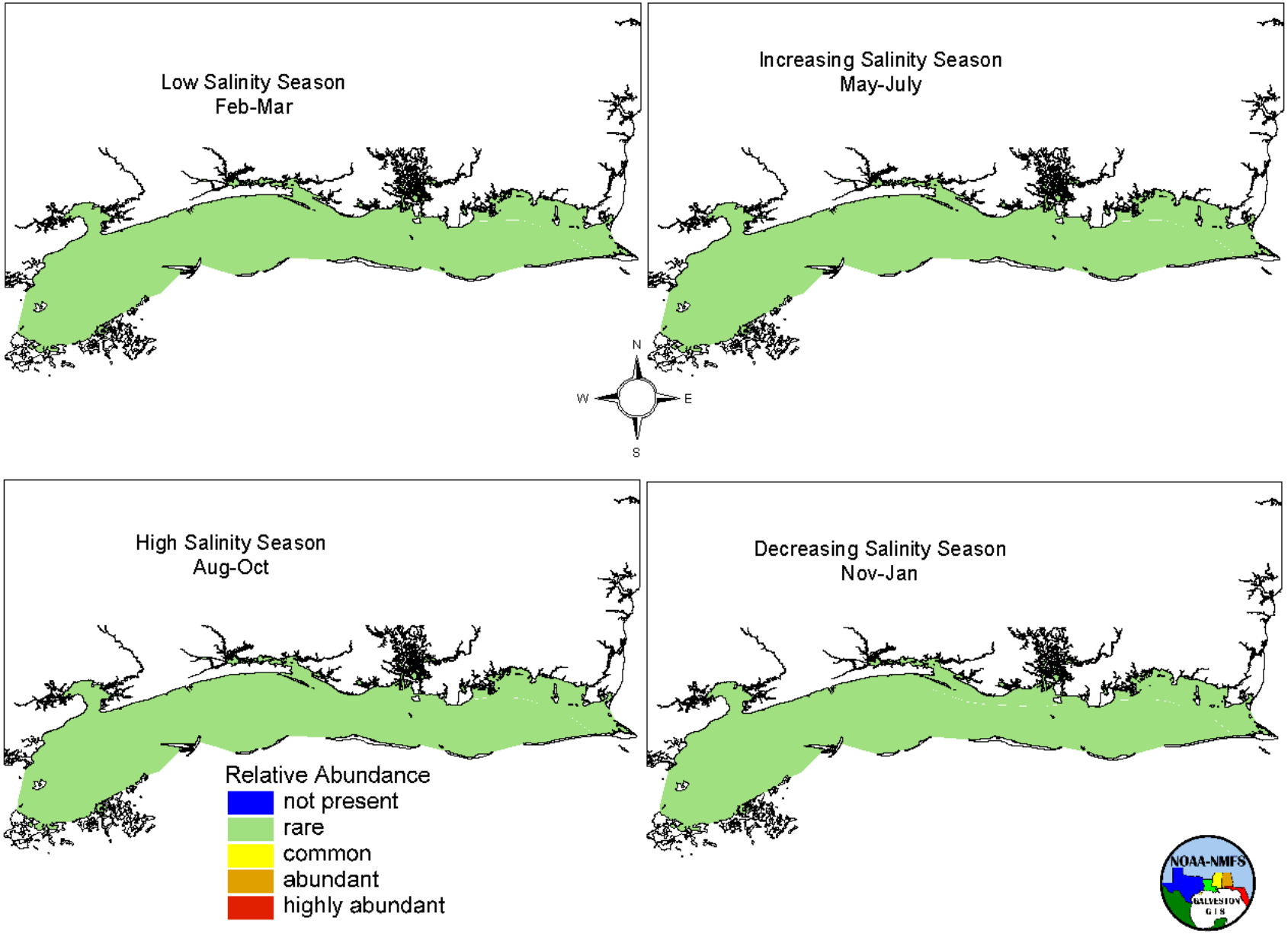
Mississippi Sound, MS | Gulf Stone Crab, *Menippe adina* | Adults

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998

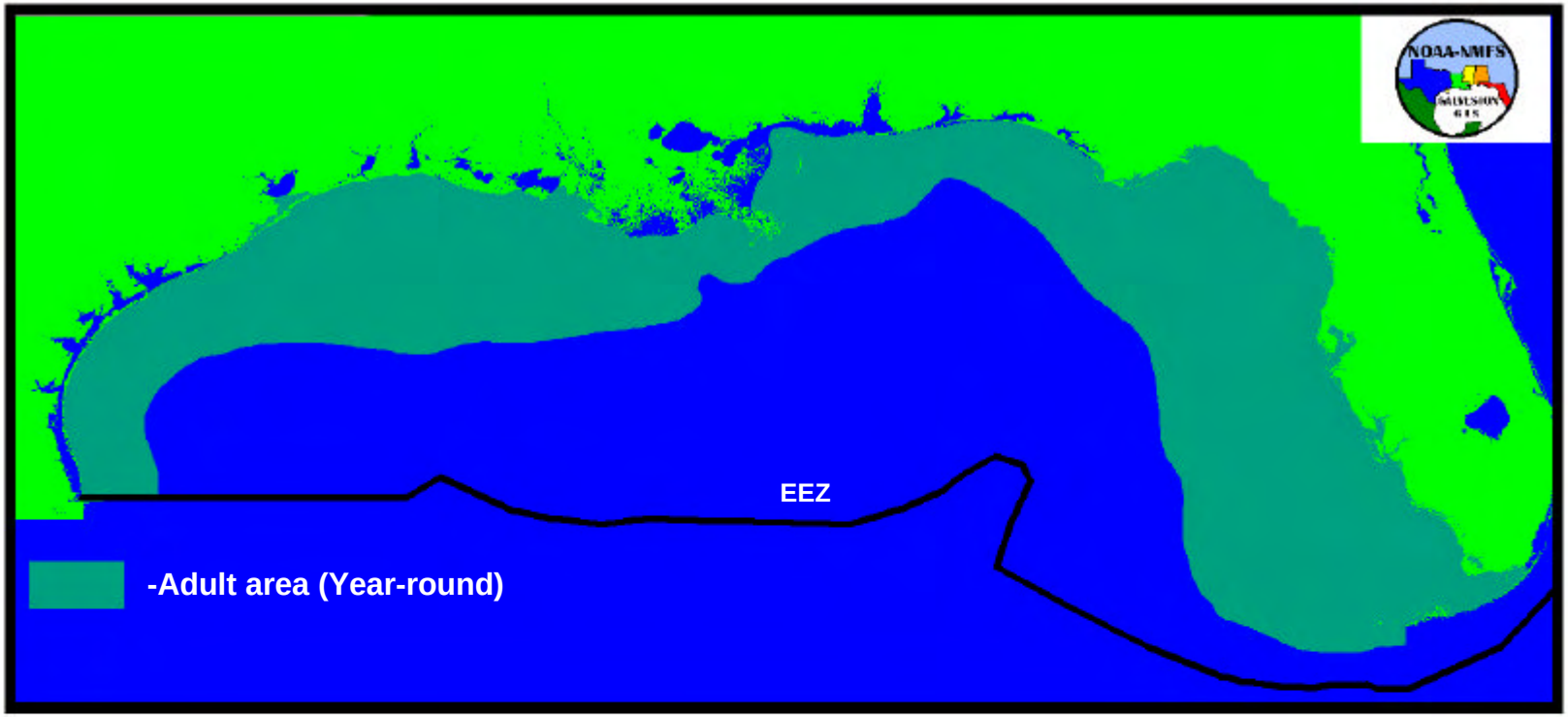


Mississippi Sound, MS | Stone Crab, *Menippe mercenaria* | Adults

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998



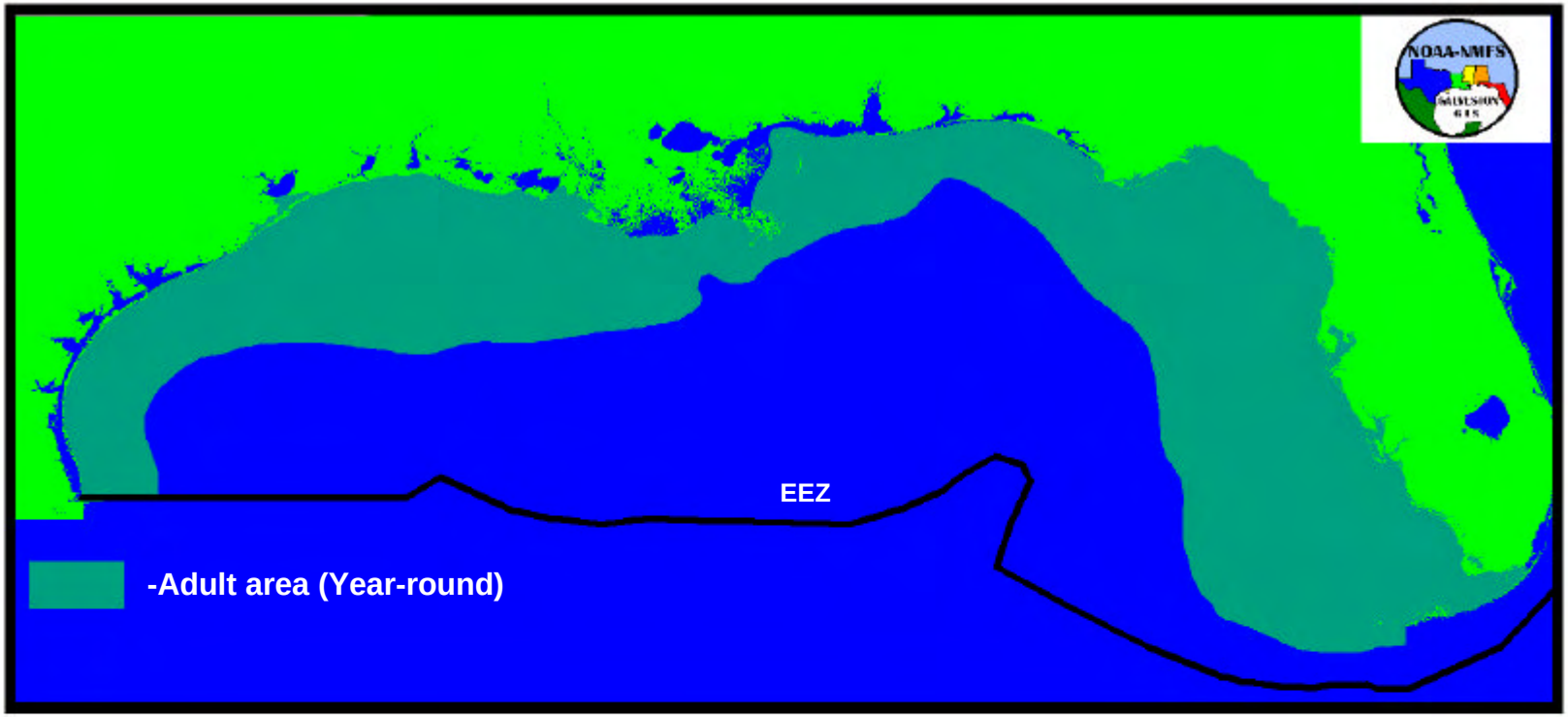
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Adults area is also spawning area from May to November, and is year-round nursery area.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).

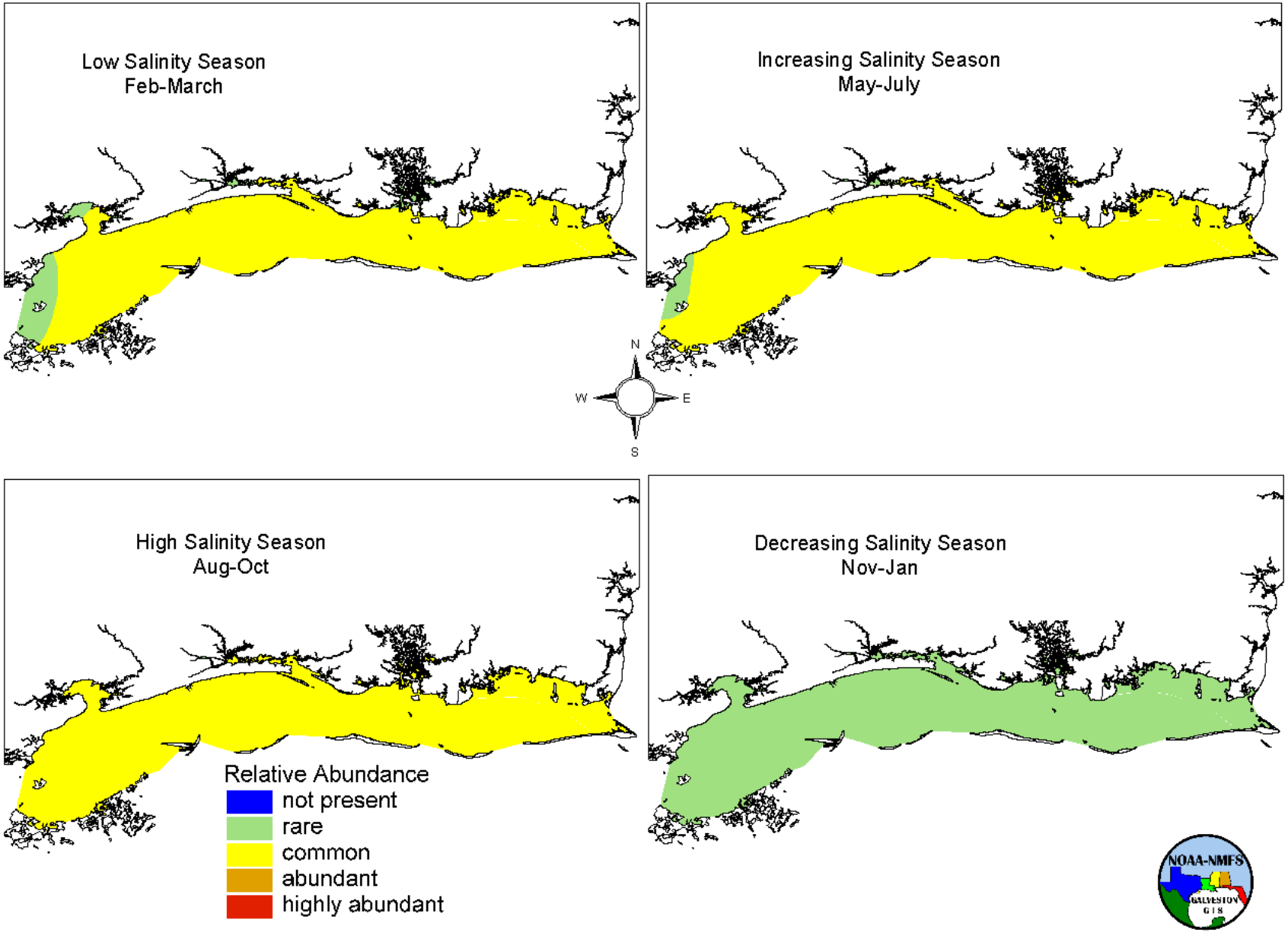


Adults area is also spawning area from May to November, and is year-round nursery area.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

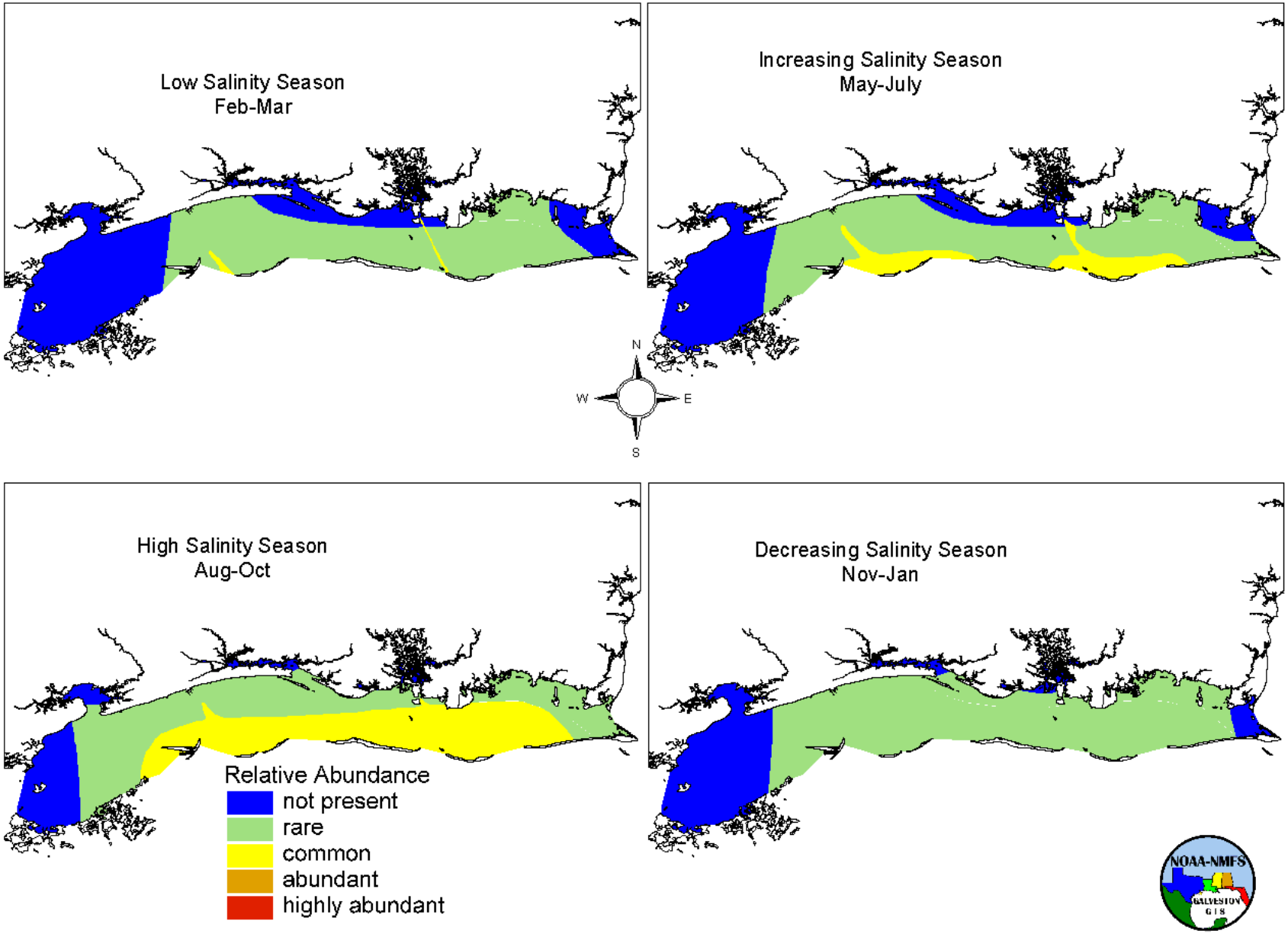
Mississippi Sound, MS | Spanish Mackerel, *Scomberomorus maculatus* | Juveniles

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998

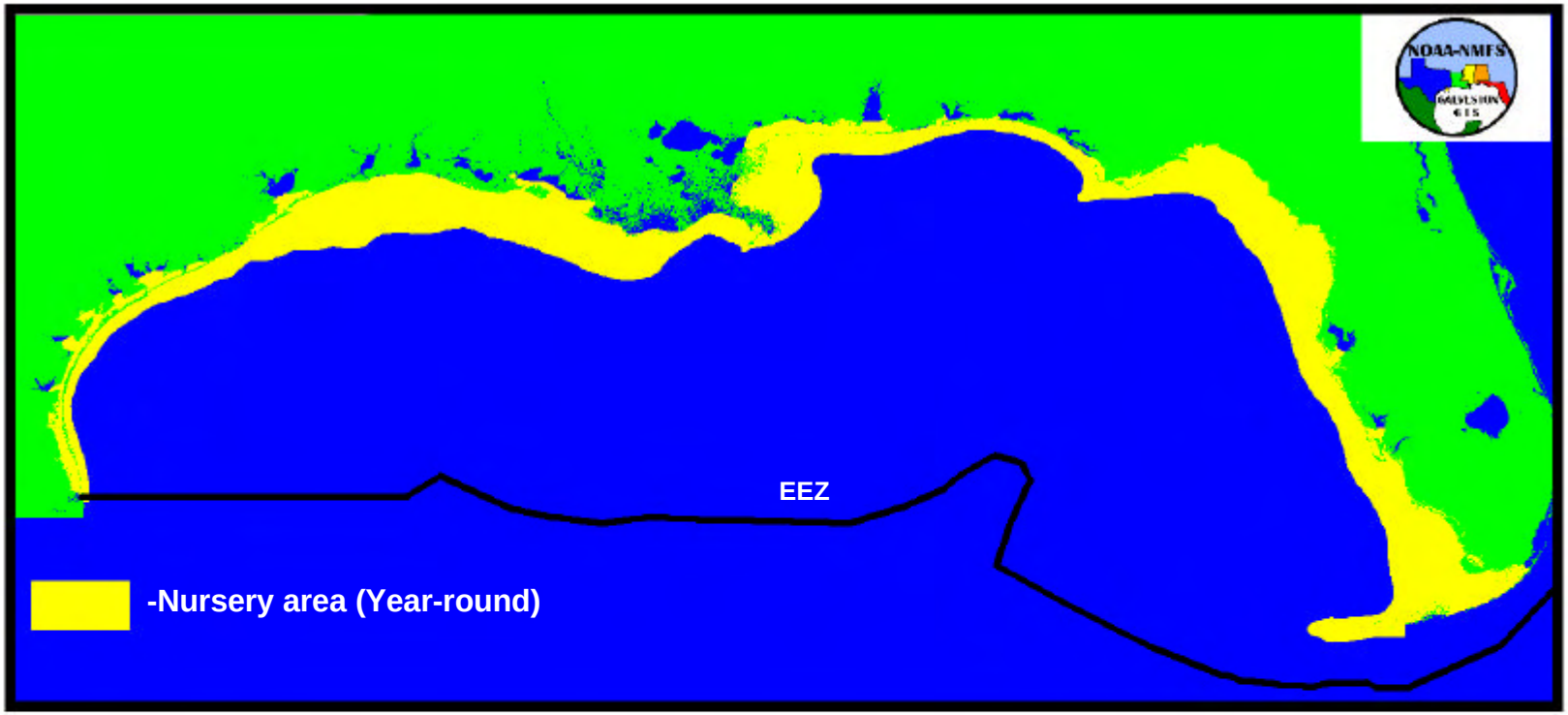


Mississippi Sound, MS | Spanish Mackerel, *Scomberomorus maculatus* | Adults

EFH Mapping, NMFS Galveston Lab | http://galveston.ssp.nmfs.gov/efh | July, 1998



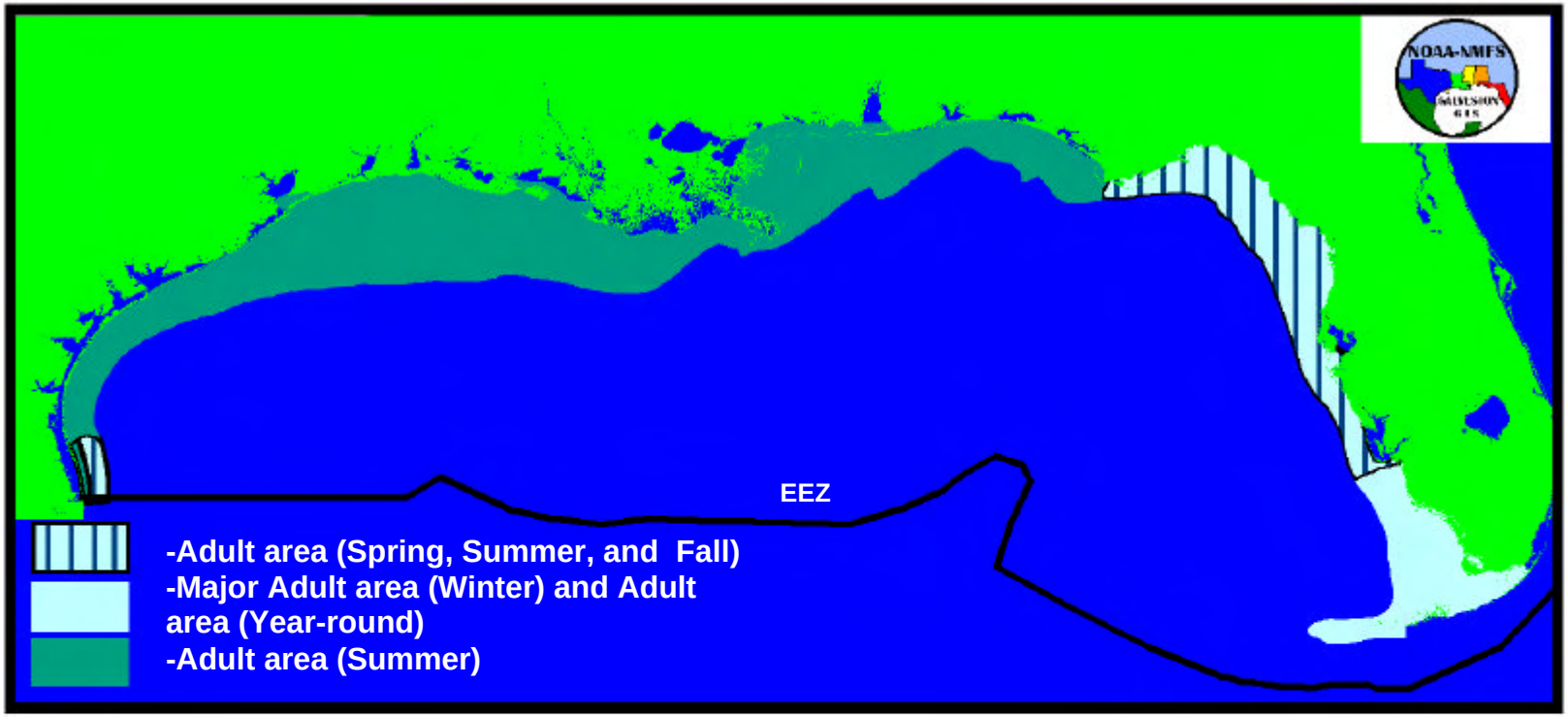
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Seasonality in the nursery area is the same as in the adult areas. In the northern Gulf, spawning (Spring, Summer) occurs throughout the adult area, except in bays and estuaries. Spawning seasonality in the southern Gulf is unknown.

See additional EFH information at: http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

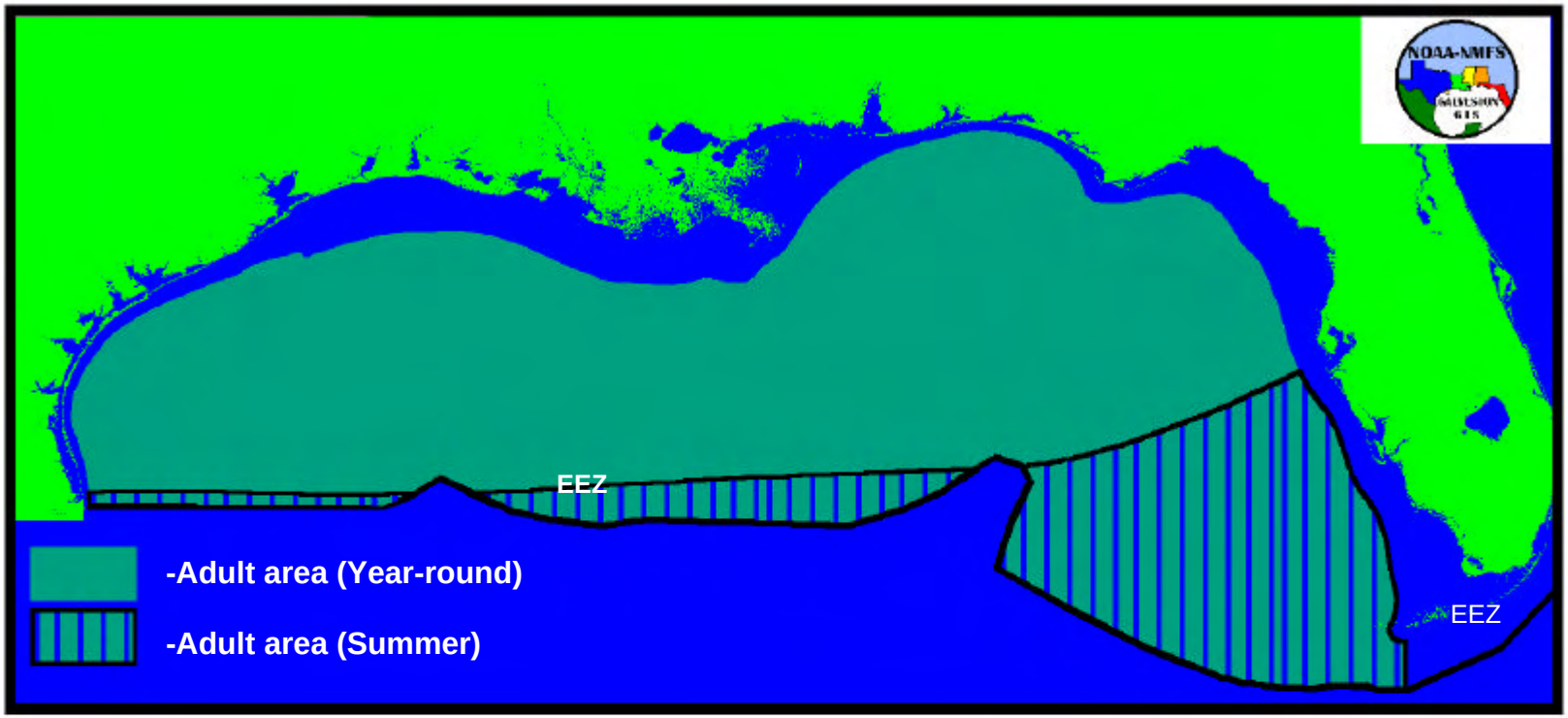
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Adults are known to occur year-round throughout the Gulf. In the northern Gulf, spawning (Spring, Summer) occurs throughout the adult area, except in bays and estuaries. Spawning seasonality in the southern Gulf is unknown.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

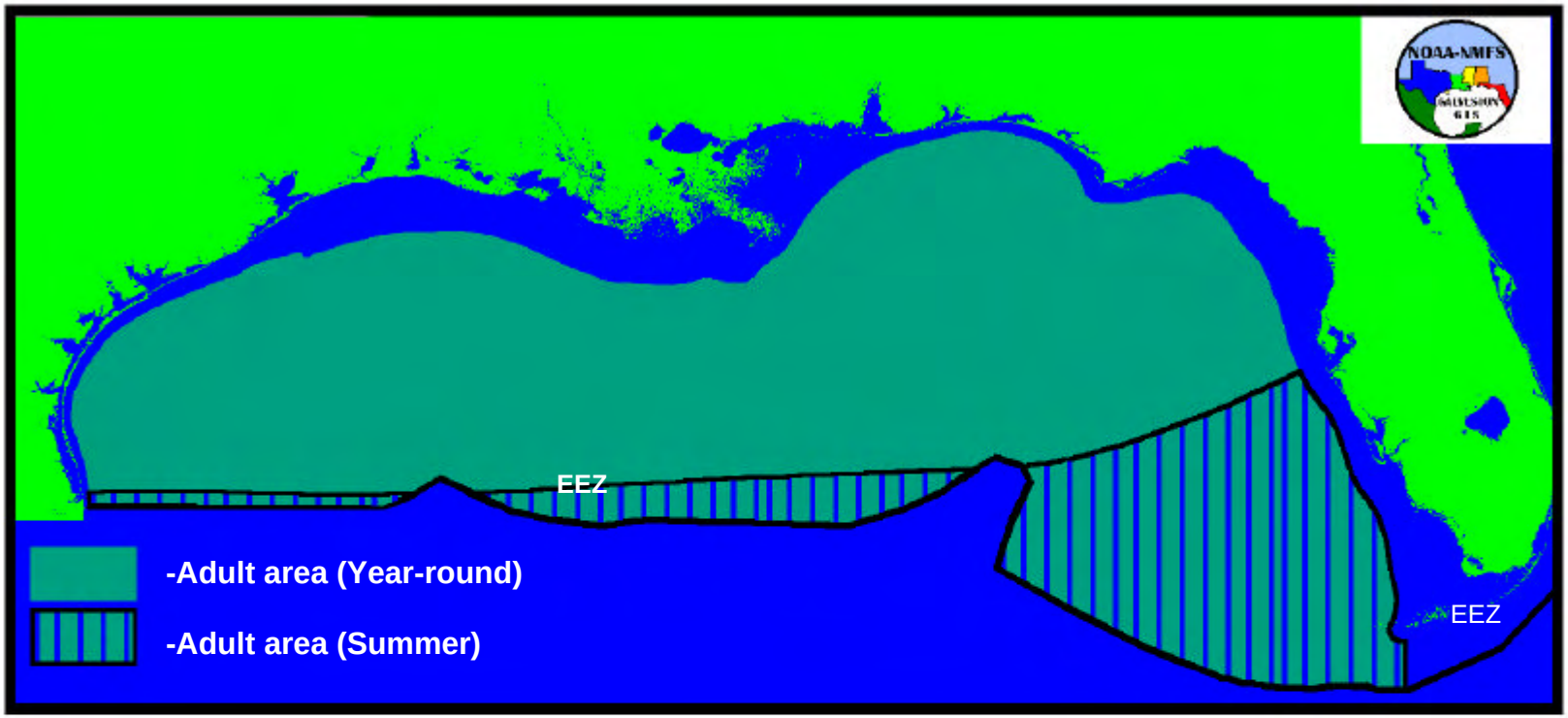
Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Spawning and nursery areas occur year-round throughout the adult areas.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH

Prepared for the GMFMC by the NMFS Fisheries Ecology Branch and the NOS-SEA Division based on species' distributions in the Gulf of Mexico Data Atlas (NOS-OAD-SAB, 1985).



Spawning and nursery areas occur year-round throughout the adult areas.

See additional EFH information at:
http://galveston.ssp.nmfs.gov/efh and http://christensenmac.nos.noaa.gov/GOM-EFH