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1.0 PURPOSE AND NEED

1.1 Historical Overview of SAFMC Activities to Conserve Essential Fish Habitat

Through the years, the Council has taken a leading role in the protection of habitat essential to managed species. This is accomplished through two avenues as directed by the Magnuson-Stevens Act, the first being through direct regulation of fisheries to protect habitat from the direct or indirect impacts of fishing. With the implementation of the Coral Fishery Management Plan and subsequent amendments to that plan, the Council has protected coral, coral reefs, and live/hard bottom habitat in the south Atlantic region by establishing an optimum yield of zero and prohibiting all harvest or possession of these resources which serve as essential fish habitat to many managed species. Another measure adopted by the Council and implemented through the coral plan was the designation of the Oculina Bank Habitat Area of Particular Concern, a unique and fragile deepwater coral habitat off southeast Florida that is protected from all bottom tending fishing gear damage. The Council has also prohibited the use of the following gears in the snapper grouper fishery management plan to protect habitat: bottom longlines in the EEZ inside of 50 fathoms or anywhere south of St. Lucie Inlet Florida, fish traps, bottom tending (roller-rig) trawls on live bottom habitat, and entanglement gear. Also established under the snapper grouper plan is an Experimental Closed Area (experimental marine reserve) where the harvest or possession of all species in the snapper grouper complex is prohibited. Other actions taken by the Council that directly or indirectly protect habitat or ecosystem integrity include: the prohibition of rock shrimp trawling in a designated area around the Oculina Bank, mandatory use of bycatch reduction devices in the penaeid shrimp fishery, a prohibition of the use of drift gill nets in the coastal migratory pelagic fishery; and a mechanism that provides for the concurrent closure of the EEZ to penaeid shrimping if environmental conditions in state waters are such that the overwintering spawning stock is severely depleted.

In addition to implementing regulations to protect habitat from fishing related degradation, the Council actively comments on non-fishing projects or policies that may impact fish habitat. In response to an earlier amendment to the Magnuson Act, the Council adopted a habitat policy and procedure document that established a four state Habitat Advisory Panel and adopted a comment and policy development process. Members of the Habitat Advisory Panel serve as the Councils' habitat contacts and professionals in the field. The Advisory Panel is structured and functions differently than other panels. The Panel is made up of four state sub-panels each having representatives from the state marine fisheries agency, the U S Fish and Wildlife Service, state coastal zone management agency, conservationist, commercial fishermen, and recreational fishermen. In addition to the state representatives, at large members on the overall panel include representatives from EPA Region IV, NMFS Southeast Fisheries Center, NMFS SERO, Atlantic States Marine Fisheries Commission, and NMFS Habitat Conservation Division Headquarters. This body functions as a whole or as sub-panel depending on the scope of the issue. The Panel serves to provide the Council with both expert recommendations on activities being considered for permitting as well as guidance in development of Habitat policy statements. With guidance from the Panel, the Council, has developed and approved policies on; oil and gas exploration, development and transportation; dredging and dredge material disposal; submerged aquatic vegetation, and ocean dumping. These are included in Section 5 of this document under recommendations to protect EFH.

1.2 Habitat Responsibilities as Defined in the Magnuson-Stevens Fishery Conservation and Management Act of 1996

The Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1801 et seq. Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fishery habitat. Section 305 (b) Fish Habitat,

indicates the Secretary (through NMFS) shall, within 6 months of the date of enactment of the Sustainable Fisheries Act, establish by regulation guidelines to assist the Councils in the description and identification of essential fish habitat in fishery management plans (including adverse impacts on such habitat) and in the consideration of actions to ensure the conservation and enhancement of such habitat. In addition, the Secretary (through NMFS) shall: set forth a schedule for the amendment of fishery management plans to include the identification of essential fish habitat and for the review and updating of such identifications based on new scientific evidence or other relevant information; in consultation with participants in the fishery, shall provide each Council with recommendations and information regarding each fishery under that Council's authority to assist it in the identification of essential fish habitat, the adverse impacts on that habitat, and the actions that should be considered to ensure the conservation and enhancement of that habitat; review programs administered by the Department of Commerce and ensure that any relevant programs further the conservation and enhancement of essential fish habitat; and the Secretary shall coordinate with and provide information to other Federal agencies to further the conservation and enhancement of essential fish habitat.

The Act specifies that each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act. Additional provisions specify that each Council: may comment on and make recommendations to the Secretary and any Federal or State agency concerning any activity authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any Federal or State agency that, in the view of the Council, may affect the habitat, including essential fish habitat, of a fishery resource under its authority; and shall comment on and make recommendations to the Secretary and any Federal or State agency concerning any such activity that, in the view of the Council, is likely to substantially affect the habitat, including essential fish habitat, of an anadromous fishery resource under its authority.

Additional terms in the Act specify provisions for commenting on activities impacting essential fish habitat. If the Secretary receives information from a Council or Federal or State agency or determines from other sources that an action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any State or Federal agency would adversely affect any essential fish habitat identified under this Act, the Secretary shall recommend to such agency measures that can be taken by such agency to conserve such habitat. Within 30 days after receiving a recommendation, a Federal agency shall provide a detailed response in writing to any Council commenting and the Secretary regarding the matter. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on such habitat. In the case of a response that is inconsistent with the recommendations of the Secretary, the Federal agency shall explain its reasons for not following the recommendations.

On December 19, 1997, an interim final rule was published in the Federal Register to implement the essential fish habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). This rule establishes guidelines to assist the Regional Fishery Management Councils (Councils) and the Secretary of Commerce (Secretary) in the description and identification of EFH in fishery management plans (FMPs), including identification of adverse impacts from both fishing and non-fishing activities on EFH, and identification of actions required to conserve and enhance EFH. The regulations also detail procedures the Secretary (acting through NMFS), other Federal agencies, state agencies, and the Councils will use to coordinate, consult, or provide recommendations on Federal and state

activities that may adversely affect EFH. The intended effect of the rule is to promote the protection, conservation, and enhancement of EFH.

Essential fish habitat is defined in the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The definition for EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate within each FMP.

For the purpose of interpreting the definition of essential fish habitat: "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are utilized by fish. When appropriate this may include areas used historically. Water quality, including but not limited to nutrient levels, oxygen concentration and turbidity levels is also considered to be a component of this definition. Examples of "waters" that may be considered EFH, include open waters, wetlands, estuarine habitats, riverine habitats, and wetlands hydologically connected to productive water bodies.

"Necessary" , relative to the definition of essential fish habitat, means the habitat required to support a sustainable fishery and a healthy ecosystem. While "spawning, breeding, feeding, or growth to maturity" covers a species full life cycle.

In the context of this definition the term "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities. These communities could encompass mangroves, tidal marshes, mussel beds, cobble with attached fauna, mud and clay burrows, coral reefs and submerged aquatic vegetation. Migratory routes such as rivers and passes serving as passageways to and from anadromous fish spawning grounds should also be considered EFH. Included in the interpretation of "substrate" are artificial reefs and shipwrecks (if providing EFH), and partially or entirely submerged structures such as jetties.

This plan presents the habitat requirements (by life stage where information exists) for species managed by the Council. Available information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species is included.

The Council, in working with our Habitat and Coral Advisory Panels and through a series of workshops identified available environmental and fisheries data sources relevant to the managed species that would be useful in describing and identifying EFH. In addition, the EFH workshop process tapped in on habitat experts, at the State, Federal, and regional level, to participate in the description, and identification of EFH in the South Atlantic region. This process allowed the experts in the field to identify major species-specific habitat data gaps, deficits in data availability (i.e., accessibility and application of the data) and in data quality (including considerations of scale and resolution; relevance; and potential biases in collection and interpretation).

Information was compiled where it existed on: current and historic stock size, the geographic range of the managed species, the habitat requirements by life history stage, and the distribution and characteristics of those habitats; the temporal and spatial distribution of each major life history stage: the distribution, density, growth, mortality, and production; collected from all sources of quality information.

According to NMFS guidelines the councils should analyze information within the constraints of the of the available data when describing and identifying essential fish habitat. There are four levels of information. Level one is based on presence / absence distribution data, which is available for some or all portions of the geographic range of a species. At this level this is the only data available to describe the distribution of a species in relation to it's potential habitats. At level 2 data is available for habitat-related densities of species. Level 3 data provides

growth, reproduction or survival rates within habitats, and level 4 information provides data on production rates by habitat.

The goal is to obtain the highest level of information. This information would relate the production rates or life history stages of a species to habitat requirements (including, type, quality, quantity and location). It would also track essential habitats necessary to maintain fish production which would be consistent with a sustainable fishery and in addition would demonstrate the managed species' contribution to a healthy ecosystem.

In assessing the relative value of habitats the Council is taking a risk-averse approach. This approach will ensure that adequate areas are protected as EFH of managed species. In the South Atlantic region mostly level 1 and some level 2 data is available. This information was used to identify the geographic range of a species and the presence/absence data was evaluated to identify those habitat areas that are most commonly used and essential for the species. This includes habitats that will better ensure the health of the fish population and the ecosystem. The Council used the best scientific information available to describe and identify EFH in the south Atlantic. Habitat loss and degradation may be contributing to species being identified as overfished, therefore all habitats used by these species are considered essential.

Based on the ecological relationships of species and relationships between species and their habitat the council is taking an ecosystem approach in determining EFH of managed species and species assemblages. This approach is consistent with NMFS guidelines. Through the existing habitat policy, the Council directs the protection of essential fish habitat types and the enhancement and restoration of their quality and quantity.

The general distribution and geographic limits of EFH is described and where information exists presented by life history stage in maps that are part of a developing Council ArcView geographic information system (GIS). Maps developed to date by Council staff, Florida Marine Research Institute, NMFS Southeast Fisheries Science Center, NOAA SEA Division, North Carolina DNR encompass appropriate temporal and spatial variability in presenting the distribution of EFH. Where information exists, seasonal changes are represented in the maps. EFH is identified on maps along with areas used by different life history stages of the species. The maps present the various habitat types described as EFH.

The document also presents information on adverse effects from fishing and describes management measures the Council has implemented to minimize adverse effects on EFH from fishing. The conservation and enhancement measures implemented by the Council to date may include ones that eliminate or minimize physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. The Council has implemented restrictions on fisheries to the extent that no significant activities were identified in the review of gear impact conducted for the NMFS by Auster and Langton (1998) that presented available information on adverse effects of all fishing equipment types used in waters described as EFH. The Council has already prevented, mitigated, or minimized most adverse effects from most fisheries prosecuted in the south Atlantic EEZ.

The Council is considering evidence that a some fishing practices are having an identifiable adverse effect on habitat, and are addressing these in the comprehensive habitat amendment. The Council, as indicated in the previous section, has already used many of the options recommended in the guidelines for managing adverse effects from fishing including: fishing equipment restrictions seasonal and aerial restrictions on the use of specified equipment; equipment modifications to allow the escape of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on

anchoring or setting equipment in sensitive areas; and prohibitions on fishing activities that cause significant physical damage in EFH; time/area closures including closing areas to all fishing or specific equipment types during spawning, migration, foraging, and nursery activities; and designating zones for use as marine protected areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages, such as those areas designated as habitat areas of particular concern; and harvest limits.

This document identifies non-fishing related activities that have the potential to adversely affect EFH quantity or quality. Examples of theses activities are dredging, fill, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. Included in this document is an analysis of how fishing and non-fishing activities influence habitat function on an ecosystem or watershed scale. This analysis presents available information describing the ecosystem or watershed and the dependence of managed species on the ecosystem or watershed. An assessment of the cumulative and synergistic effects of multiple threats, including the effects of natural stresses (such as storm damage or climate-based environmental shifts), and an assessment of the ecological risks resulting from the impact of those threats on the managed species' habitat is included.

General conservation and enhancement recommendations are included in Section 5 of this document. These include but are not limited to recommending the enhancement of rivers, streams, and coastal areas, protection of water quality and quantity, recommendations to local and state organizations to minimize destruction/degradation of wetlands, restore and maintain the ecological health of watersheds, and replace lost or degraded EFH.

This document, pursuant to the guidelines, also presents areas which meet the criteria for designation of essential fish habitat-habitat areas of particular concern (EFH-HAPCs) by individual habitat type or managed species or species complex. The following criteria are considered when determining whether a type, or area of EFH is an essential fish habitat-habitat area of particular concern: (1) the importance of the ecological function provided by the habitat; (2) the extent to which the habitat is sensitive to human-induced environmental degradation; (3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and the rarity of the habitat.. The identification of EFH-HAPCs will continue through the public hearing process and the Council will consider additional areas if identified through this process. A coral HAPC process under the coral plan already exists and differs somewhat from the process recommended in the EFH guidelines.

The Council will periodically review and update EFH information and revise this Habitat Plan document as new information becomes available. NMFS should provide some of this information as part of the annual Stock Assessment and Fishery Evaluation (SAFE) report. A complete review of EFH information will also be conducted as recommended in the guidelines in no longer than 5 years.

1.3 SAFMC Habitat Plan and Comprehensive Habitat Amendment Development Process

A proposed rule was published by NMFS on April 23, 1997 specifying regional fishery management council guidelines for the description and identification of essential fishery habitat (EFH) in fishery management plans, adverse impacts on EFH, and actions to conserve and enhance EFH. In order to address the new essential fish habitat mandates in the Magnuson-Stevens Act, the South Atlantic Council began development of: (1) a habitat plan which will

serve as a source document describing EFH (SAFMC 1998a); (2) a comprehensive amendment which will amend each of the existing fishery management plans, identifying and describing EFH and addressing impacts of fishing gear and/or fishing practices on EFH (SAFMC 1998b); and (3) a monitoring program for each fishery management plan to determine new impacts from fishing gear and/or fishing practices in an effort to minimize, to the extent practicable, the adverse impacts on EFH.

The Council, recognizing the scope of the significant task necessary to meet the essential fish habitat mandates of the Magnuson-Stevens Act, called upon the Panel members to serve as or identify appropriate experts to function on a quasi-plan development team. Subsequently, the Council initiated a workshop process to identify habitat experts and information availability to facilitate identifying essential fish habitat in the south Atlantic region. Workshops were conducted on habitat types including, wetlands, oyster/shell habitat, seagrass, pelagic habitat (including Sargassum and water column), coral and live/hard bottom, and artificial reefs. In addition, workshops on the use of GIS to map habitat and species distributions and research and monitoring were also held. The workshop process not only provided the Council with an indication of the availability of information that could be used to identify essential fish habitat but also brought together habitat experts that have participated directly in the drafting of this Habitat Plan.

The Council and NMFS have coordinated their efforts to address their respective EFH mandates in the Magnuson-Stevens Act. Representatives of the NMFS southeast regional habitat team from NMFS Southeast Fisheries Science Center Beaufort Laboratory, NMFS Southeast Regional Office, and NMFS Headquarters are directly involved in the development of this Habitat Plan. On December 19, 1997, an interim final rule was published in the Federal Register to implement the essential fish habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

2.0 SUMMARY

2.1 Geographic Coverage

The Council, in developing this Habitat Plan, has consolidated the best available information on habitat essential to species managed in the south Atlantic region. The description and distribution of essential fish habitat in this document includes estuarine inshore habitats, mainly focusing on North Carolina, South Carolina, Georgia, and the Florida east coast as well as adjacent offshore marine habitats (e.g. coral, coral reefs, and live/hard bottom habitat, artificial reefs, *Sargassum* habitat and the water column). The structural component of these habitats constitute the basis for the habitat distribution information presented in this document. A primary goal of this document is to relay information on the distribution of managed species and essential fish habitats and provide information to address fishing and non-fishing threats to the watershed or estuarine drainage area.

This document was prepared through a cooperative effort of State, Federal and regional habitat partners on the Councils' Habitat and Coral Advisory Panels, additional technical experts identified during Council EFH workshops, and Council staff. This approach was deemed appropriate and has resulted in a scientifically defensible product that describes the structural characteristics and function by habitat type and presents available information on distribution and use by managed species and their significant prey. The intent of this document is to serve as a source document for all species managed by the Council. It also represents an ecological characterization of the south Atlantic region describing essential fish habitat. The Council is therefore taking a risk-averse approach in describing and protecting essential fish habitat in its area of jurisdiction and making recommendations to protect essential habitat in state waters. The emphasis of the determination is on the interrelationships between habitat and State and Federally managed species and their prey and endangered and threatened species. The vast array of species using these habitats implies that the structural habitats serve such a wide variety of species at different times in different locations that these structural habitats (estuarine, palustrine, coral and live/hard bottom, artificial reefs, and *Sargassum*) are all inclusive as essential to the functioning of a healthy ecosystem in the south Atlantic region. In addition, the water column plays an important role in defining the nature of essential habitat by being the common link.

This document is a living document that will be revised as new information becomes available. New techniques such as Habitat Suitability Index (HSI) modeling being developed may be useful in better identifying these habitats and their use by managed species. In addition, more refined and accurate mapping techniques through geographical information systems (GIS), such as the ones being used in the Coastal Change Analysis Program (C-CAP), under development for south Atlantic states and continued refinement of the SEAMAP bottom mapping effort. These and other activities will provide even more refined information for future Habitat Plan versions.

2.1.1 Estuarine/Inshore Essential Fish Habitat

Estuarine inshore habitats include estuarine emergent vegetation (salt marsh and brackish marsh), estuarine shrub/scrub (mangroves), seagrass, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested (freshwater wetlands), and the estuarine water column. Section 3.1 presents individual detailed descriptions including species use of these habitats.

Estuarine Emergent

Estuarine marshes constitute a complex ecosystem that serves as essential fish habitat but also is vital to wildlife including endangered and threatened species, furbearers and other mammals, waterfowl, wading birds, shore and other birds, reptiles and amphibians, shellfish, and invertebrates. In contrast to freshwater marshes, salt marshes have low species diversity of the higher vertebrates, but high species diversity of invertebrates, including shellfish, and fishes. Optimal estuarine habitat conditions for managed species' spawning, survival, and growth is dependent on protecting the structural integrity as well as the environmental quality of these habitats. In North Carolina, South Carolina, Georgia and Florida, the marsh systems are of principal importance as nursery areas.

More detailed estimates of wetland by county are presented in Appendix A . This compilation of existing wetland habitat may, as refined to hydrological units, begin to serve as a baseline upon which to implement the policy directive and the long-term objective of a net gain of wetland habitats in the South Atlantic region. The Coastal Change Assessment Program (C-CAP) is presently being developed in response to the National Wetlands Policy Forum recommendation to improve inventory, mapping, and monitoring programs by USFWS and NOAA. The program was implemented to develop a nationally standardized geographic information system using ground-based and remote sensing data. It assesses changes in land cover and habitat in US coastal regions to improve understanding of coastal uplands, wetlands, and seagrass beds and their links to distribution, abundance, and health of living marine resources. At this time only South Carolina coastal counties are complete and will represent essential wetland habitat as mapped in that state. The state of Georgia information is under review and as North Carolina and Florida are completed the mapping coverage will be incorporated into the Habitat Plan as the most accurate presentation of inshore essential fish habitat in the South Atlantic region. The ecological value, function and distribution of this essential fish habitat is described in Section 3.1.1.1.

Estuarine Shrub/Scrub Mangroves (from NOAA 1995)

The red mangrove (*Rhizophora mangle*), black mangrove (*Avincennia germinans*), and white mangroves (*Laguncularia erectus*) are the three "true" species found in South Florida (Tomlinson, 1986). Red mangroves have prop roots and viviparous cigar-shaped seedlings, while black mangroves have a pneumataphore root system and gray-green leaves, the undersides of which are encrusted with excreted salt. White mangroves have rounded leaves, with a pair of salt glands on each petiole. Buttonwood (*Conocarpus erectus*), an associated species occurring with mangroves, is found in transitional wetland areas between mangrove and upland areas.

A mangrove classification system has been developed that identifies six major forest types based on geological and hydrological process: riverine, overwash, fringe, basin, dwarf, and hammock (Lugo and Snedaker). Riverine forests do not occur in southeast Florida due to the lack of freshwater rivers and the associated floodplains (Davis, 1943: Minerals Management Service 1990). Fringe forests occur along shorelines inundated by high tides, dominated by red mangroves, and exposed to open water. Tidal flow follows the same directional path along the fringe forest, resulting in sediment and litter accumulation.

Mangrove-related fish communities can be organized along various environmental gradients including salinity, mangrove detritus dependence, and substrate (Odum et al., 1982). The ecological value, function and distribution of this essential fish habitat is described in Section 3.1.1.2

Seagrass Habitat

Seagrass beds in North Carolina and Florida are preferred habitat areas of many managed species including white, brown, and pink shrimp, red drum, and estuarine dependent snapper and grouper species in the larval, juvenile and adult phases of their life cycle. Seagrass meadows provide substrates and environmental conditions which are essential to the feeding, spawning and growth of several managed species. Seagrass meadows are complex ecosystems that are essential habitat because they provide primary productivity, structural complexity, modification of energy regimes, sediment and shoreline stabilization, and nutrient cycling. Section 3.1.1.3 describes the ecological value and function and distribution of this essential fish habitat. The states of North Carolina through CGIA and Florida through FMRI provided geographical information system (GIS) coverage of seagrass habitat. Subsequent reconfiguration of the data was conducted by NMFS SEFSC to create a uniform ArcView format for inclusion into the Councils' essential fish habitat distribution data base and GIS system.

Oyster Reefs and Shell Banks

Oyster and shell essential fish habitat in the South Atlantic can be defined as the natural structures found between (intertidal) and beneath (subtidal) tide lines, that are composed of oyster shell, live oysters and other organisms that are discrete, contiguous and clearly distinguishable from scattered oysters in marshes and mudflats, and from wave-formed shell windrows (Bahr and Lanier 1981). Both intertidal and subtidal populations are found in the tidal creeks and estuaries of the South Atlantic. On the Atlantic coast, the range of the American oyster, *Crassostrea virginica*, extends over a wide latitude (20° N to 54° N). The ecological conditions encountered are diverse and the oyster community is not uniform throughout this range. Where the tidal range is large the oyster builds massive, discrete reefs in the intertidal zone. North of Cape Lookout, in North Carolina, the oyster habitat is dominated by Pamlico Sound and its tributaries. In these wind-driven lagoonal systems, oyster assemblages consist mainly of subtidal beds. Throughout the South Atlantic, oysters are found at varying distances up major drainage basins depending upon typography, salinity, substrate, and other variables.

Several terms used to describe the oyster/shell essential fish habitat are oyster reef, bar, bed, rock, ground and planting. The habitat ranges in size from small scattered clumps to large mounds of living oysters and dead shells. Predation and siltation limit oyster densities at the lower portion and outer regions of the reefs. The vertical elevation of intertidal oyster reefs above mean low water is maximal within the central Georgia coastal zone, where mean tidal amplitude exceeds 2 m (Bahr and Lanier 1981).

Large shell banks or deposits of oyster valves generated by boat wakes are found throughout the South Atlantic, usually along the Atlantic Intracoastal Waterway and heavily traveled rivers. These shell accumulations are usually elongated and conform to the underlying bottom topography from mean low water into the supra littoral zone. Further build-up may result in ridge structures and washovers. In South Carolina, 998 "washed shell" deposits have been located predominantly in the central and southern portion of the State. Washed shell is less resilient, partially abraded oyster shell with a lower specific gravity than recently shucked shells (Anderson 1979).

Intertidal Flats

Variability in the tidal regime along the South Atlantic coast results in considerable regional variability in the distribution and character of the estimated 1 million acres of tidal flat habitat. The coasts of North Carolina and Florida are largely microtidal (0-2m tidal range) with

extensive barrier islands and relatively few inlets to extensive sound systems. In these areas wind energy has a strong affect on intertidal flats. In contrast the coasts of South Carolina and Georgia are mesotidal (2-4m) with short barrier islands and numerous tidal inlets so that tidal currents are the primary force effecting the intertidal zone.

Tidal flats are critical structural components of coastal systems that serve as feeding grounds and refuges for a variety of animals. This constantly changing system provides essential fish habitat as; 1) nursery grounds for early stages of development of many benthically oriented estuarine dependent species. 2) refuges and feeding grounds for a variety of forage species of fishes 3) feeding grounds for a variety of specialized predators.

Palustrine Emergent and Forested

Palustrine emergent systems include tidal and non-tidal marshes. A large amount of the energy present in the palustrine emergent vegetation may be exported out of the system. Tidal currents, river currents, and wind energy all act to transport organic carbon downstream to the estuary, which is the nursery area for many of the Council-managed species. Migrating consumers, such as larval and juvenile fish and crustaceans, may feed within the habitat and then move on to the estuary or ocean. These links with managed species demonstrate the essential nature of this habitat type. Section 3.1.2.2 describes the ecological value, function and distribution of this essential fish habitat.

Aquatic Beds

Submersed rooted vascular vegetation in tidal fresh- or freshwater portions of estuaries and their tributaries performs the same functions as those described for seagrasses. Specifically, aquatic bed meadows possess the same four attributes: 1) primary productivity; 2) structural complexity; 3) modification of energy regimes and sediment stabilization; and 4) nutrient cycling. The ecological value, function and distribution of this essential fish habitat is described in Section 3.2.2.3.

Estaurine Water Column

This habitat traditionally comprises four salinity categories: oligohaline (< 8 ppt), mesohaline (8-18 ppt), and polyhaline waters (18-30 ppt) with some euhaline water (>30 ppt) around inlets. Alternatively, a three-tier salinity classification is presented by Schreiber and Gill (1995) in their prototype document developing approaches for identifying and assessing important fish habitats: tidal fresh (0-0.5 ppt), mixing (0.5-25 ppt), and sewater (>25 ppt). Saline environments have moving boundaries, but are generally maintained by sea water transported through inlets by tide and wind mixing with fresh water supplied by land runoff. Particulate materials settle from these mixing waters and accumulate as bottom sediments. Coarser-grained sediments, saline waters, and migrating organisms are introduced from the ocean, while finer-grained sediments, nutrients, organic matter, and fresh water are input from rivers and tidal creeks. The sea water component stabilizes the system, with its abundant supply of inorganic chemicals and its relatively conservative temperatures. Closer to the sea, rapid changes in variables such as temperature are moderate compared to shallow upstream waters. Without periodic additions of sea water, seasonal thermal extremes would reduce the biological capacity of the water column as well as reduce the recruitment of fauna from the ocean. While nearby wetlands contain some assimilative capacity abating nutrient enrichment, fresh water inflow and tidal flushing are primarily important for circulation and removal of nutrients and wastes from the estuary.

The water column is composed of horizontal and vertical components. Horizontaly, salinity gradients (decreasing landward) strongly influence the distribution of biota, both directly (physiologically) and indirectly (e.g., emergent vegetation distribution). Horizontal gradients of nutrients, decreasing seaward, affect primarily the distribution of phytoplankton and, secondarily, organisms utilizing this primary productivity. Vertically, the water column may be stratified by salinity (fresh water runoff overlaying heavier salt water), oxygen content (lower values at the bottom associated with high biological oxygen demand due to inadequate vertical mixing), and nutrients, pesticides, industrial wastes, and pathogens (build up to abnormal levels near the bottom from lack of vertical mixing).

2.1.2 Marine/Offshore Essential Fish Habitat

Marine offshore habitats include live/hard bottom, coral and coral reefs, artificial/manmade reefs, pelagic *Sargassum* and water column habitat. Section 3.2 presents individual detailed descriptions including species use of these habitats.

Live/Hard Bottom Habitat

Major fisheries habitats on the Continental Shelf along the southeastern United States from Cape Hatteras to Cape Canaveral (South Atlantic Bight) can be stratified into five general categories: coastal, open shelf, live/hard bottom, shelf edge, and lower shelf based on type of bottom and water temperature. Each of these habitats harbors a distinct association of demersal fishes (Struhsaker 1969) and invertebrates. The description of this essential fish habitat presented in Section 3.2.1.2, segregates the region into two sections: a) Cape Hatteras to Cape Canaveral; and b) Cape Canaveral to the Dry Tortugas. These regions represent temperate, wide-shelf systems and tropical, narrow-shelf systems, respectively. The zoogeographic break between these regions typically occurs between Cape Canaveral and Jupiter Inlet.

Covered by a vast plain of sand and mud underlain at depths of less than a meter by carbonate sandstone is relatively unattractive to fish. Live/hard bottom, usually found near outcropping shelves of sedimentary rock in the zone from 15 to 35 fathoms and at the shelf break, a zone from about 35 to 100 fathoms where the Continental Shelf adjoins the deep ocean basin and is often characterized by steep cliffs and ledges. The live bottom areas constitute essential habitat for warm-temperate and tropical species of snappers, groupers, and associated fishes including 113 species of reef fish representing 43 families of predominately tropical and subtropical fishes off the coasts of North Carolina and South Carolina.

The distribution of live/hard bottom habitat in the south Atlantic region is presented in the hardbottom maps in Section 3.2. These geographic coverage's are a compilation of the four state bottom mapping effort in the South East Monitoring and Assessment Program (SEAMAP). The Florida Marine Research Institute developed uniform ArcView coverage's of hard bottom habitat (including coral, coral reefs, live/hard bottom, and artificial reefs) as a 1998 SEAMAP program and provided it to the Council for inclusion into the south Atlantic essential fish habitat distribution data base and GIS system.

Coral and Coral Reefs

Coral reef communities or solitary specimens exist throughout the south Atlantic region from nearshore environments to continental slopes and canyons, including the intermediate shelf zones. Habitats supporting corals and coral-associated species are discussed below in groupings based on their physical and ecological characteristics. Dependent upon many variables, corals may dominate a habitat, be a significant component, or be individuals within a community characterized by other

fauna. Geologically and ecologically, the range of coral assemblages and habitat types is equally diverse. The coral reefs of shallow warm waters are typically, though not always, built upon coralline rock and support a wide array of hermatypic and ahermatypic corals, finfish, invertebrates, plants, and microorganisms. Hard bottoms and hard banks, found on a wider bathymetric and geographic scale, often possess high species diversity but may lack hermatypic corals, the supporting coralline structure, or some of the associated biota. In deeper waters, large elongate mounds called deepwater banks, hundreds of meters in length, often support a rich fauna compared to adjacent areas. Lastly are communities including solitary corals. This category often lacks a topographic relief as its substrate, but instead may use a sandy bottom, for example. Coral habitats (i.e., habitats to which coral is a significant contributor) are divided into five categories - solitary corals, hard bottoms, deepwater banks, patch reefs, and outer bank reefs. The order of presentation approximates the ranking of habitat complexity based upon species diversity (e.g., zonation, topographic relief, and other factors). Although attempts have been made to generalize the discussion into definable types, it must be noted that the continuum of habitats includes many more than these five distinct varieties.

The ecological value, function and distribution of this essential fish habitat is described in Section 3.2.1.2. The distribution of live/hard bottom habitat in the south Atlantic region is presented in the hardbottom maps in Section 3.2.

Artificial/Manmade Reefs

Manmade reefs are defined for this document as any area within marine waters in which suitable structures or materials have intentionally been placed by man for the purpose of creating, restoring or improving long-term habitat for the eventual exploitation, conservation or preservation of the resulting marine ecosystems naturally established on these sites. Manmade hard bottom habitats are formed when a primary hard substrate is available for the attachment and development of epibenthic assemblages. This substrate is colonized when marine algae and larvae of epibenthic animals successfully settle and thrive. Concurrent with the development of the epibenthic assemblage, demersal reef-dwelling finfish recruit to the new hard bottom habitat. Juvenile life stages will use this habitat for protection from predators, orientation in the water column or on the reef itself and as a feeding area. Adult life stages of demersal reef-dwelling finfish including species managed in the snapper grouper plan, will use the habitat for protection from predation, feeding opportunities, orientation in the water column and on the reef and as spawning sites. Pelagic planktivores occur on hard bottom habitats in high densities and use these habitats for orientation in the water column and feeding opportunities. These species provide important food resources to snapper grouper species and coastal migratory pelagics including king and Spanish mackerel and cobia. The pelagic piscivores use the hard bottom habitats for feeding opportunistically. Most of these species do not take up residence on individual hard bottom outcrops, but will transit through hard bottom areas and feed for varying periods of time.

Manmade hard substrates are considered essential fish habitat in the south Atlantic region because of the use of these habitats by species in the snapper grouper complex, coastal migratory pelagics and prey important to those species. The ecological value, function and distribution of this essential fish habitat is described in Section 3.2.2

The State of Florida Marine Research Institute, as part of the 1998 deliverable, provided the Council with uniform Arc View coverage’s for inclusion into the south Atlantic essential fish habitat distribution data base and GIS system.

Sargassum

Pelagic brown algae *Sargassum natans* and *S. fluitans* form a dynamic structural habitat within warm waters of the western North Atlantic. Most pelagic *Sargassum* circulates between 20°N and 40°N latitudes and 30°W longitude and the western edge of the Florida Current/Gulf Stream. The greatest concentrations are found within the North Atlantic Central Gyre in the Sargasso Sea. Large quantities of *Sargassum* frequently occur on the continental shelf off the southeastern United States. Depending on prevailing surface currents, this material may remain on the shelf for extended periods, be entrained into the Gulf Stream, or be cast ashore. During calm conditions *Sargassum* may form large irregular mats or simply be scattered in small clumps. Langmuir circulation, internal waves, and convergence zones along fronts aggregate the algae along with other flotsam into long linear or meandering rows collectively termed "windrows".

Pelagic *Sargassum* supports a diverse assemblage of marine organisms including fungi, micro-and macro-epiphytes, at least 145 species of invertebrates, over 100 species of fishes, four species of sea turtles, and numerous marine birds. The fishes associated with pelagic *Sargassum* in the western North Atlantic include juveniles as well as adults of a wide variety of species. The carangids and balistids are the most conspicuous, being represented by 21 and 15 species respectively. Therefore, this habitat is considered essential fish habitat because it provides protection, feeding opportunity and use as a spawning substrate to species managed by the Council. The ecological value, function and distribution of this essential fish habitat is described in Section 3.2.3.

Additional information is contained in the fishery management plan for pelagic *Sargassum* (SAFMC 1998d).

Water Column

Specific habitats in the water column can best be defined in terms of gradients and discontinuities in temperature, salinity, density, nutrients, light, etc. These "structural" components of the water column environment are not static, but change both in time and space. Therefore, there are numerous potentially distinct water column habitats for a broad array of managed species and life-stages within species.

The discussion of the ecological function of water column habitat and importance to managed species is presented in Section 3.2.3.2.

2.2 List of Fishery Management Plans and Species

South Atlantic Snapper-Grouper

Balistidae--Triggerfishes
- Gray triggerfish, *Balistes capriscus*
- Queen triggerfish, *Balistes vetula*
- Ocean triggerfish, *Canthidermis sufflamen*

Carangidae--Jacks
- Yellow jack, *Caranx bartholomaei*
- Blue runner, *Caranx crysos*
- Crevalle jack, *Caranx hippos*
- Bar jack, *Caranx ruber*
- Greater amberjack, *Seriola dumerili*
- Lesser amberjack, *Seriola fasciata*
- Almaco jack, *Seriola rivoliana*
- Banded rudderfish, *Seriola zonata*

Ephippidae--Spadefishes
- Spadefish, *Chaetodipterus faber*

Haemulidae--Grunts
- Black margate, *Anisotremus surinamensis*
- Porkfish, *Anisotremus virginicus*
- Margate, *Haemulon album*
- Tomtate, *Haemulon aurolineatum*
- Smallmouth grunt, *Haemulon chrysargyreum*
- French grunt, *Haemulon flavolineatum*
- Spanish grunt, *Haemulon macrostomum*
- Cottonwick, *Haemulon melanurum*
- Sailors choice, *Haemulon parrai*
- White grunt, *Haemulon plumieri*
- Blue stripe grunt, *Haemulon sciurus*

Labridae--Wrasses
- Hogfish, *Lachnolaimus maximus*
- Puddingwife, *Halichoeres radiatus*

Lutjanidae--Snappers
- Black snapper, *Apsilus dentatus*
- Queen snapper, *Etelis oculatus*
- Mutton snapper, *Lutjanus analis*
- Schoolmaster, *Lutjanus apodus*
- Blackfin snapper, *Lutjanus buccanella*
- Red snapper, *Lutjanus campechanus*
- Cubera snapper, *Lutjanus cyanopterus*
- Gray snapper, *Lutjanus griseus*
- Mahogany snapper, *Lutjanus mahogoni*
- Dog snapper, *Lutjanus jocu*
- Lane snapper, *Lutjanus synagris*
- Silk snapper, *Lutjanus vivanus*
- Yellowtail snapper, *Ocyurus chrysurus*
- Vermilion snapper, *Rhomboplites aurorubens*

Malacanthidae--Tilefishes
- Blueline tilefish, *Caulolatilus microps*
- Golden tilefish, *Lopholatilus chamaeleonticeps*
- Sand tilefish, *Malacanthus plumieri*

Percichthyidae--Temperate basses
- Wreckfish, *Polyprion americanus*

Serranidae--Sea Basses and Groupers
- Bank sea bass, *Centropristis ocyurus*
- Rock sea bass, *Centropristis philadelphica*
- Black sea bass, *Centropristis striata*
- Rock hind, *Epinephelus adscensionis*
- Graysby, *Epinephelus cruentatus*
- Speckled hind, *Epinephelus drummondhayi*
- Yellowedge grouper, Epinephelus flavolimbatus
- Coney, *Epinephelus fulvus*
- Red hind, *Epinephelus guttatus*
- Jewfish, *Epinephelus itajara*
- Red grouper, *Epinephelus morio*
- Misty grouper, *Epinephelus mystacinus*
- Warsaw grouper, *Epinephelus nigritus*
- Snowy grouper, *Epinephelus niveatus*
- Nassau grouper, *Epinephelus striatus*
- Black grouper, *Mycteroperca bonaci*
- Yellowmouth grouper, *Mycteroperca interstitialis*
- Gag, *Mycteroperca microlepis*
- Scamp, *Mycteroperca phenax*
- Tiger grouper, *Mycteroperca tigris*
- Yellowfin grouper, *Mycteroperca venenosa*

Sparidae--Porgies
- Sheepshead, *Archosargus probatocephalus*
- Grass porgy, *Calamus arctifrons*
- Jolthead porgy, *Calamus bajonado*
- Saucereye porgy, *Calamus*
- Whitebone porgy, *Calamus leucosteus*
- Knobbed porgy, *Calamus nodosus*
- Red porgy, *Pagrus pagrus*
- Longspine porgy, *Stenotomus caprinus*
- Scup, *Stenotomus chrysops*

Coastal Migratory Pelagics

Cero, *Scomberomorus regalis*
Cobia, *Rachycentron canadum*
Dolphin, Coryphaena hippurus
King mackerel, *Scomberomorus cavalla*
Little tunny, *Euthynnus alletteratus*
Spanish mackerel, *Scomberomorus maculatus*

Shrimp Fishery of the South Atlantic Region

Brown shrimp, *Penaeus aztecus*
Pink shrimp, *Penaeus duorarum*
Rock shrimp, *Sicyonia brevirostris*
Royal red shrimp, *Pleoticus robustus*
Seabob shrimp, *Xiphopenaeus kroyeri*
White shrimp, *Penaeus setiferus*

Spiny Lobster

Spiny Lobster, *Panulirus argus*

Golden Crab
Golden Crab, *Chaeceon fenneri*

Coral, Coral Reefs, and Live/Hard Bottom Habitat
Coral belonging to the Class Hydrozoa (fire corals and hydrocorals).
Coral belonging to the Class Anthozoa, Subclass Hexacorallia, Orders Scleractinia (stony corals) and Antipatharia (black corals).
A seafan, *Gorgonia flabellum* or *G. ventalina*
Coral in a coral reef, except for allowable octocoral
Coral in an HAPC, including allowable octocoral (HAPC means habitat area of particular concern)
Live rock means living marine organisms, or an assemblage thereof, attached to a hard substrate, including dead coral or rock (excluding individual mollusk shells).

Red Drum
Red drum, *Sciaenops ocellatus*

Calico Scallops
Calico Scallops, *Agopecten gibbus*

Sargassum
Sargassum, *Sargassum natans* and *Sargassum fluitans*