Gear Impacts on Essential Fish Habitat in the Southeastern Region

by:

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Introduction

The alteration of Essential Fish Habitat (structural components, benthic community structure, and ecosystem level processes) by fishing activities is not well understood, yet it is generally acknowledged that fishing activities can influence species composition and diversity and reduce habitat complexity. Still, information to predict the level of the effect and whether damage is short- or long-term is generally lacking. Factors such as the frequency, duration and seasonality of the disturbance, coupled with environmental, ecological and physiological processes that regulate recruitment and recovery are complex and not well understood for essential fishery habitat (EFH).

Fishing can affect the structural components of habitat. Numerous studies cited in Auster and Langton (1999) indicate that mobile fishing gear reduces habitat complexity by: (1) directly removing epifauna or damaging epifauna leading to mortality, (2) smoothing sedimentary bedforms and reducing bottom roughness and (3) removing taxa which produce structure (i.e., biogenic structures and taxa which produce burrows and pits). Overall, the recovery of habitat structure is difficult to predict as timing, severity and frequency of impacts all interact and influence processes that lead to recovery.

The effects of fishing on benthic community structure, especially long-term effects, are difficult to characterize. Natural disturbance and variability (e.g., hurricanes, tropical depressions, thunderstorms) must be considered in any interpretations of damaging impacts. Given this, both short- and long-term studies of the effects of fishing in benthic habitats can be difficult to differentiate. Consistently, studies have demonstrated that there is an immediate effect in the density of non-target organisms after mobile gear impacts. Long-term studies are rare, but may afford important insight into separating inherent perturbations from those affected by fishing practices and allow more accurate predictive models. For example, a 100 year study in the Wadden Sea reported variability in abundance trends of common species. Certain groups (e.g., sponges, coelenterates and bivalves) declined in abundance while others (e.g., polychaetes) increased. Furthermore, subtidal organisms decreased in abundance whereas intertidal organisms increased. Additional studies on the order of months or a few years indicate that bottom - disturbing gear (e.g., scallop dredges in low energy muddy sand habitats) can result in an immediate loss of food quality at surface sediments. Recovery of the bottom faunal community is correlated with food quality and certain taxa recover quickly. Other species will not recolonize until surficial food quality is restored. Overall, the most consistent pattern in shallow water benthic communities, however, is the resilience of the benthic community to impacts by fishing gear. This is especially true in communities dominated by short-lived taxa. However, in communities dominated by long-lived taxa inhabiting stable environments (e.g., low-energy shallow mud bottom habitats or deep areas of

the continental shelf) periodic and infrequent impacts of fishing can be long-term.

Most studies on the effects of fishing gear on habitat have been conducted on small spatial scales, hence it is difficult to apply this information to manage on an ecosystem level. Simply, we do not have the knowledge to understand how communities respond to large-scale and long-term disturbances. Such knowledge is necessary to compartmentalize natural versus man-induced disturbances. Models developed from ecological studies of disturbance could be useful in understanding successional patterns and allow managers to predict future community seral stages to directly manage EFH. In this manner, research efforts should be linked to disturbance theory.

Auster and Langton (1999) indicate that three types of fundamental information are lacking that would allow for better monitoring, and improved experimentation leading to better predictive capabilities. These are (1) The spatial extent of fishing induced disturbance, (2) The effects of specific gear types, along a gradient of effort, on specific habitat types, and (3) The role of seafloor habitats on the population dynamics of fishes. These information needs should guide research in the Southeast.

Methods

This report is a summary of the Southeast Fisheries Science Center s (SEFSC) December 1999 workshop on gear impacts on essential fish habitat (EFH). The workshop was an in-house session called to outline what we currently know about gear effects on the essential fish habitat of our managed species. The agenda included the following topics:

Importance of the Essential Fish Habitat Initiative and NMFS mandates for action;
The need for collaboration from EFH participants;
EFH background events and a definition of terms as given in the Magnuson - Stevens Act and the Sustainable Fisheries Act of 1996;
The status of gear impact science in the southeast;
The South Atlantic, Caribbean and Gulf Councils fishery management plans allowable gears;
Existing fishing impact countermeasures;
Shrimping effort.

A facilitated discussion followed to identify areas of general agreement/disagreement, other or ongoing gear studies, and critical gaps in fishery dependent and independent data and to develop group consensus on relative impacts associated with each allowable gear. The intent was to require the audience to reach beyond current scientific understanding and make deductions and educated guesses about our research needs. After those discussions, we outlined and prioritized research needs critical to understanding gear-related impacts to EFH in the Southeast Region. Then, we identified and outlined gear-impact research projects which might be accomplished under constraints of limited time and budget. The presenters were:

Michael Barnette, James Bohnsack, Graciela Garcia - Molinar, Allyn Powell, Dave Meyer, Pete Sheridan, John Watson and Rickey Ruebsamen.

The workshop attendees were:

Allyn Powell
Dave Meyer
Ann Bull
Terry Henwood
Michael Barnette
Graciela Garcia-Moliner
Jeff Rester
John Watson
James Bohnsack
Gordon Thayer
Alonzo Hamilton
Greg Boland
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Results

Those attending the December, 1999 EFH Gear Impacts Workshop in Miami, FL, agreed that our ultimate purpose, in terms of ecosystem and habitat management, is to maintain the health of the ecosystem. Moreover, the following is the consensus of the participants at the Gear Impacts Workshop:

Research consensus

Understanding the spatial and temporal distribution of fishing is critical. In order to determine the effects of fishing, we must first estimate the total direct impact from each type of fishing gear, which is defined as the sum of all vessels multiplied by the total trips per vessel, gear per trip, deployments per gear and impact per deployment. Mapping the distribution of fishing effort is also an important step which should be followed by determining the dispersion of the fishing effort within specific habitat types.

The best way to determine impacts of fishing on impact is to compare similar habitats in areas that are and are not fished. For many parts of the Southeast region, this could only be accomplished by assessing long-term or permanent closures of large areas such as no-take marine reserves. In the case of Gulf of Mexico shrimp trawling, a possibility exists that some areas between hydrocarbon extraction structures may exist that were too small or too close to structures to be trawled but were far enough away from structures to serve as reference areas. The next best choice is to examine areas under different levels use. Potential areas include: lightly versus heavily fished regions; before, during, and after the

seasonal Texas shrimp closure; inside versus outside the Tortugas Sanctuary; and areas designated for artificial reef use where deployment of certain gears is prevented.

Emphasis should be placed on determining recovery rates after fishing gear is removed or altered. One approach is to close some representative areas currently being fished as no-take areas and measure the changes. Although the recovery of such areas could take decades, the rate of change could be used as an index of impact. The committee predicts that deeper habitats may take longer to recover than shallow habitats.

Review of potential impacts by fishing gear suggests that hard bottom habitats, seagrass, and soft bottom habitats may be the most vulnerable to fishing impacts.

During the presentations and discussions about gear impacts, the following eight basic questions formed the framework for the discussions.

Question 1: Was there any research conducted on all of the fishery management plan (FMP) allowable gear types? If so, How much?.

Question 2: Can information and research products from other geographically similar areas be applied to the southeast?

Question 3: What avenues/resources are available to address gear impacts in state waters and inshore habitats?

Question 4: What types of habitats characterize the continental shelf and how are they distributed in the Caribbean, Gulf of Mexico, and South Atlantic within the exclusive economic zone (EEZ)?

Question 5: What effect does the fishing operation per se have on habitat? What information is available on drifting vs. anchoring vessels, effects of recreational effort (e.g., propeller scars), gear deployment/ retrieval effects, and the effects of discarded gear?

Question 6: What has been published concerning the impact of fishing gear on the various bottom types?

Question 7: What databases are available for use in responding to EFH concerns and what is the content/status of those data files?

Question 8: What provisions in the Fishery Management Plan language could produce an indirect positive effect on EFH?

Several of the questions are responded to in this report (Appendix I), with others being researched as this report is being drafted. A mail-out requesting assistance in the identification and collection of this information from other federal, state and private sources

would help us gather and create a meta-database for the southeast. The critical need areas outlined for the SEFSC will be the product of a synthesis of existing information. NMFS staff will examine the literature that is pertinent to the allowed gears and, based on the criteria set forth at the workshop, evaluate the applicability of the results to each area. This synthesis should aid in the characterization of live-bottom habitats, and in the gear effects on that habitat.

A distribution of effort relative to live-bottom in the Southeast based on headboat surveys would assist in quantifying both commercial and recreational impact. This collection of knowledge on habitat characterization should be pursued by those investigators working in specific live-bottom areas. This would include what is known and what are the gaps in knowledge.

The group continued to discussed and characterized numerous gears having the greatest potential impact upon mud, sand, seagrass, rubble, hardbottom and other habitats (Appendix 2, Table 1). Habitat impacts were characterized as high, medium, low, negligible, and unknown. Outlined cells indicate the availability of habitat impact reference studies. Cells without outlines are consensus opinions on potential impact in the absence of known research data. The group defined the regions of gear usage by state/country, to determine gear usage overlap areas, the number of vessels in an area, the total number of trips a vessel made, the gear used by each vessel, the number of times the gear was deployed and the impact, if any, of a deployment. As discussions continued, the group agreed on five gear types possibly having major impacts on EFH. They agreed on the inclusion of research conducted in geographically similar areas and outlined seven gear evaluation criteria which led to the creation of the gear matrix table on page 8.

To further meet this need and to facilitate data collection a gear impact evaluation and fishery description form was developed(Appendix 2, Table 2). Included on this form are formulas developed to quantify impact, various fishing vessel types and possible impacts. A listing of the impact types was developed to identify and quantify potential impacts within and among commercial and recreational fishing . The intent is to eventually send out similar forms to port agents and receive additional input from their region.

Discussion

The sustainable fisheries act of 1999 requires the National Marine Fisheries Service to assess and determine the effects of fishery management plan allowed harvesting gear on EFH for the managed species over their entire life cycle. This charge/ mandate is extremely complex and there are no simple solutions. First, the mandate requires that scientist have at a minimum a working knowledge of the number and trophic complexities of an ecosystems to which the managed species belongs in association with a given bottom type and its inhabitants. Second, it requires the agency to oversee the minimizing of the adverse impact, of harvesting equipment in particular, anywhere a portion of the managed species life cycle occurs. Within the second requirement, scientist need to know the complete life cycle of the managed species, its diet at various developmental stages, where that species spawns, when that species spawns, the appropriate environmental and physical conditions for spawning and human impacts

detrimental to the completion of the life cycle, including but not limited to, the effect of the removal of either or both the targeted and non-targeted (incidental) species during a harvest. Third, is the delineation of EFH impact from earthquakes or plate shifts, hurricanes, and tropical depressions. The ability to separate the impacts of natural disturbances from the bottom harvesting gear may in fact be our greatest challenge.
Fourth, for many of the allowed gears scouring impacts, cutting depths, materials tensile strength and material degradation time information is available for the tested version of the gear and targeted species, but may or may not be available for modifications or variations of a given gear type and the incidental species taken at harvest. If this scientific information and these research products from other geographically similar areas can be applied to the southeast, compiling a detailed definitive list of gears and understanding the role of both, a managed and a non-managed, species in an ecosystem can be determined and should provide insight to EFH gear effects and biological response times to those gear effects. Gathering this information will be an ongoing process.

A unified effort from all individuals interested in the preservation of our marine resources is required. Public entities, private enterprise, educational institutions, developers and land owners have a marine ecosystem responsibility simply because they are apart of it. We impact that system at one level or another by what we take from it or put into it. This mandate is about what we want for ourselves. The NMFS is only our representation for entrusted with collecting and analyzing the data necessary to fulfill our mandate. Old partnerships and agreements must be renewed and new partnerships must be forged among all affected in an atmosphere of compromise and trust, with the preservation of our marine ecosystems as our objective. Managers and scientists in the southeast should view the requirements of the Magnuson - Stevens Fishery Conservation and Management Act and the provisions under the Sustainable Fisheries Act of 1996 as a welcomed challenge to refocus and expand the traditional single-species management approach to an ecosystem approach. Both approaches have similar goals, but they have a fundamentally different scope and philosophy. The ecosystem approach presents us an opportunity to combine our biological efforts with other agencies regularly doing physical, chemical, and environmental research and monitoring to gain an overall system wide understanding. The ecosystem management approach directs the scientific study of multiple species under a philosophy of preventing fisheries failures by understanding and maintaining a healthy ecosystem in structure and function. It would provide a system where *healthy* is characterized as the capacity for self-renewal, and *conservation* is a state of harmony between people and the ecosystem. Leopold (1949) writes all ethics so far evolved rests on a single premise: that the individual is a member of a community of interdependent parts. A fundamental understanding of this statement requires that we change the role of *Homo sapiens* from conqueror to plain member and citizen of the community. Leopold (1949) also notes that: a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community . Leopold recognizes that this new ethic, the biotic ethic as described by Bohnsack, (unpublished), *... cannot prevent the alteration, management, and use of these resources, but it does affirm their right to continued existence, and at least in spots, their continued existence in a natural state.*

A shift from single- species to ecosystem management represents a significant change

in philosophy and management. No-take marine ecological reserves are an essential component of ecosystem management and are not a luxury. Marine reserves are necessary for understanding ecosystem structure, function and process; for measuring changes; and for assessing management performance. More fishery independent monitoring is needed to supplement fishery data. Successful ecosystem management must routinely include more biological, physical, and environmental information and better integrate the human dimension into management practices (Bohnsack,1998). The single- species approach deals with individual species under a fix when it breaks philosophy (Bohnsack, 1998). Leopold (1949), outlines a basic weakness of the single - species approach and identifies what many students of the marine environment are dealing with or have observed: *A system of conservation based solely on economic self- interest is hopelessly lopsided. It tends to ignore, and thus eventually eliminate, many elements in the... community that lack commercial value, but that are (as far as we know) essential to its healthy functioning. It assumes, falsely, I think, that the economic parts of the biotic clock will function without the uneconomic parts.*

The first order of business was to outline what we knew and what we did not. The group wanted to know what NMFS databases are available for use in responding to EFH concerns. They wanted to know the content/status of those data files, and what has been published concerning the impact of fishing gear on the various bottom types? Does the fishing operation per se have an effect on habitat? What information is available on drifting vs. anchoring vessels, effects of recreational effort (e.g., propeller scars), gear deployment/ retrieval effects, and the effects of discarded gear? As discussions continued, we agreed this was information we were in of, and for us to offer more than anecdotal logic, we needed to conduct an overwhelming amount of baseline research in an incredibility short period of time or complete what we can on the gear matrix table for this report. Almost parallel to this concern was the major information need to identify other potential sources for physical data to compliment our National Ocean Survey efforts. We wanted to locate databases, reports or projects where the types of habitats on the continental shelf were characterize and how they were distributed in the Caribbean, Gulf of Mexico, and South Atlantic within the exclusive economic zone (EEZ). The group felt this would be more of a locate and synthesize existing research for the Gulf of Mexico and South Atlantic because of the research efforts of the US Navy, US Geological Survey, US Fish and Wildlife Service, Minerals Management Service, Environmental Protection Agency, state and private research entities, and that this published research effort would probably have to be conducted by NOAA/NMFS in the Caribbean. A true bright spot in these discussions was the identification of provisions in the Fishery Management Plan language which could produce an indirect positive effect on EFH. Specific and more detailed comments to this and the other seven questions are in appendix 1.

Recommendations

The goal of EFH research should be to provide information so managers can develop

strategies for the sustainable harvest of target species while maintaining ecosystem integrity. The following are our recommendations to the SEFSC based on the information presented in this workshop. We strongly urge two research directions: (A) synthesis of existing data, and recommendations for collecting missing data, and (B) empirical studies designed to address the following six items:

1. Use the Beaufort Laboratory s Summary of the Impacts of Fishing Activities on Habitat as a basic plan to be applied to each fishery with the understanding that:
a. Priorities may be different for each Council depending on the primary fishery;
b. Information available for each fishery may be limited when the gear matrix table below is completed;

Gear Matrix

	Synthesis of Data	Distribution of Effort	Characterize Habitat	Effects on Habitat	Research	Models	Recovery
Trawls							
Traps							
Recreational Fishing							
Dredge							
Bottom longline							

c. Determine the distribution of fishing-induced disturbance of those fishing practices that are potentially damaging to EFH. Considerations should include habitat typically impacted by the fishing practice, and the spatial and temporal expanse of the fishing practice. In the ecological literature, Type 1 disturbances, defined as a small patch of disturbed area surrounded by large undisturbed areas, might have little effect on habitat integrity. On the other hand, Type 2 disturbances, defined as small patches of undisturbed habitat surrounded by large areas of disturbed habitat, might have a major impact on habitat integrity. Type 2 disturbances, then, should be targeted.

d. Characterize the habitats (physical and biological characteristics) where fishing induced disturbances have the potential to be most damaging, and direct research to those habitats. Develop maps (GIS generated, side-scan sonar, etc:) of habitat characteristics and distribution of fishing effort in estuarine and continental shelf waters within the South Atlantic and Gulf of Mexico region.

e. Based on findings of c and d above, determine the effects of specific gear types, and

multiple gear impacts along a gradient of effort, on specific habitat types using ecological framework developed in disturbance studies (i.e., determine succession stages). This should include research that addresses changes in physical habitat structure; use of habitat by the fish community in terms of composition and size class; changes in the benthic community; and changes in ecosystem processes (e.g., benthic primary production, nutrient dynamics).

f. Research as noted in e above will require nonfishing control areas to compare effects of fishing on habitats. Control areas should be spatially and temporally substantial areas to cover the range of fishing effort from low to high. They should not be relegated to only those areas where fishers prefer not to fish. Some of the closed areas may have an impact on fishermen s livelihood.

g. Develop predictive models from empirical research to provide information to managers as to the impacts of specific fishing gear and multiple gear on specific habitats over a gradient of effort.

h. Determine recovery rates and successional stages for specific habitats that can be used to develop predictive models as to the seral stage of the community and the direction the community would proceed if disturbed by specific gear over a gradient of effort, or undisturbed.

i. Encourage the development of innovative gear technology that minimizes impacts to EFH.

2. Work with other agencies to obtain mapping information to identify critical habitats throughout the southeast. (NOS, Navy, MMS, USGS, US Army Corps of Engineers, and state agencies)

3. Identify fishery dependent and independent data sets throughout the southeast, for analysis. (Analyze fishery independent data in the Groundfish data base at NMFS Pascagoula, for distribution and habitat of Gulf species).

4. Evaluate papers in Rester s 2000 bibliography on effects of fishing gear using the following criteria:
    a. Is specific gear used in southeast region?
        Is it used in same manner as the southeast region?
    b. Are there similar fisheries?
    c. Are the habitats similar?
    d. Does the study apply to the southeast?
    e. Does the study describe habitat impacts?
        What / how (biological, physical, chemical, fishery related responses)
    f. What were the recovery metrics?
        Biological, physical, chemical, fishery related responses.
    g. Were there management recommendations?

5. Have Port Agents and others provide any additional data on the Habitat Impacts & Fishery Description spreadsheet (Attachment 2) and the Gear Information sheet (Attachment 1) .

6. Highly recommend putting together a list of the key people who would help design and develop a format for collection and processing of EFH research information in the southeast.

Specific recommendations in the Southeast Region.

We recommend, prior to any empirical studies, Item 1c above be given top priority, followed by item1 d. Addressing needs of both items c and d, would initially require a synthesis of literature (unpublished and published), and workshops to address synthesis of existing information with the goal of preparing a document(s) and GIS generated maps to provide quantitative information on the distribution of fishing effort based on habitat type. This approach would provide direction to fill information voids necessary to design empirical research.

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APPENDIX 1

Question 1:Was there any research conducted on all of the fishery management plan (FMP) allowable gear types? If so, How much?.

All utilized fishing gears permitted within the Gulf of Mexico Region have been identified, and the potential effects of the gear on various habitats have been proposed (Barnette, 1999). The status of research on the effects of a particular gear type and variations, among habitat types is in the process of being determined for a small number of gears, but, the majority of gears have not been assessed. Many of the gear construction requirements and specifications, as well as restricted use areas, are regulated by individual states. In waters under Federal jurisdiction, allowable gears consist of the following:

allowable chemical, bandit gear, barrier net, bully net, butterfly net, cast net, dip net, dredge, gill net, hand harvest, handline, harpoon, hook and line, hoop net, longline, pot, powerhead, purse seine, rod and reel, seine, snare, slurp gun, spear, trap, trawl and trolling.

In state territorial waters, the allowable gear types are as follows:

Alabama

Bandit gear, beach/haul seine, cast net, dip/landing net, drop net, gaff, gig, gill net, hand harvest, hook and line (includes rod and reel), hoop net, lance, longline, lawful archery equipment, oyster dredge, purse seine, push net, skimmer net, spear, spear gun, tongs (clam and oyster), trammel net, trap (blue crab and minnow), trawl (bait, frame/beam, otter, roller, skimmer), trolling and trotline.

Florida

bandit gear, barrier net, beach/haul seine, bully net, cast net, dip/landing net, drop net, fold-up trap, gaff, gig, hand harvest (includes feet), hand net, hook and line (includes rod and reel), hoop net, lance, lawful archery equipment, oyster dredge, purse seine, push net, push scrape, quinaldine, rakes, slurp gun, spear, spear gun, tongs (clam and oyster), trap (black sea bass, blue crab, lobster, peeler crab, pinfish, shrimp and stone crab), trawl (bait shrimp, bait fish, beam/frame, jellyfish, otter, roller, seahorse and skimmer), trolling and trotline.

Mississippi

bandit gear, Beach/haul seine, Cast net, Dip/landing net, Drop net, Gaff, Gig, Gill net, Hand harvest, Hook and line (includes rod and reel), Hoop net, Lance, Longline, Lawful archery equipment, Oyster dredge, Purse seine, Push net, Skimmer net, Spear, Spear gun, Tongs (clam and oyster), Trammel net, Trap (blue crab and minnow), Trawl (bait, frame/beam, otter, roller, skimmer), Trolling and Trotline.

Louisiana

bandit gear, beach/haul seine, cast net, dip/landing net, drop net, gaff, gig, gill net, hand harvest, hook and line (includes rod and reel), hoop net, lance, longline, lawful archery equipment, oyster dredge, purse seine, push net, skimmer net, spear, spear gun, tongs (clam and oyster), trammel net, trap (blue crab and minnow), trawl (bait, frame/beam, otter, roller, skimmer), trolling and trotline.

Texas

bandit gear, beach/haul seine, cast net, dip/landing net, drop net, gaff, gig, gill net, hand harvest, hook and line (includes rod and reel), hoop net, lance, longline, lawful archery equipment, oyster dredge, purse seine, push net, skimmer net, spear, speargun, tongs (clam and oyster), trammel net, trap (blue crab and minnow), trawl (bait, frame/beam, otter, roller, skimmer), trolling and trotline.

The principal allowable gears for the fishery management plans in the Southeast Region (Federal Register, 1999):

Caribbean Fishery Management Council

1. Caribbean Spiny Lobster Fishery (FMP):
A. Trap/pot fishery .....Trap/pot.
B. Dip net fishery .....Dip net.
C. Entangling net fishery .....Gillnet, trammel net.
D. Hand harvest fishery .....Hand harvest, snare.
E. Recreational fishery .....Dip net, trap, pot, gillnet, trammel net.

2. Caribbean Shallow Water Reef Fish Fishery (FMP):
A. Longline/hook and line fishery .....Longline, hook and line.
B. Trap/pot fishery .....Trap, pot.
C. Entangling net fishery .....Gillnet, trammel net.
D. Recreational fishery .....Dip net, handline, rod and reel, slurp gun, spear.

3. Coral and Reef Resources Fishery (FMP):
A. Commercial fishery ..... Dip net, slurp gun.
B. Recreational fishery ..... Dip net, slurp gun, hand harvest.

4. Queen Conch Fishery (FMP):
A. Commercial fishery .....Hand harvest.
B. Recreational fishery .....Hand harvest.

5. Caribbean Pelagics Fishery (Non-FMP):
A. Pelagics drift gillnet fishery .....Gillnet.
B. Pelagics longline/hook and line fishery .....Longline/hook and line.
C. Recreational fishery .....Spear, handline, longline, rod and reel.

6. Commercial Fishery (Non-FMP) ..... Trawl, gillnet, hook and line, longline, handline, rod and reel, bandit, gear, cast net, spear.

7. Recreational Fishery (Non-FMP) ..... Rod and reel, hook and line, spear, powerhead, handline, hand harvest, cast net.

Gulf of Mexico Fishery Management Council

1. Gulf of Mexico Red Drum Fishery (FMP) ..... No harvest or possession in the EEZ.

2. Coral Reef Fishery (FMP):
A. Commercial fishery .....Hand harvest.
B. Recreational fishery .....Hand harvest.

3. Gulf of Mexico Reef Fish Fishery (FMP):
A. Snapper-Grouper reef fish longline and hook and line fishery .... Longline, handline, bandit gear, rod and reel, buoy gear.
B. Pot and trap reef fish fishery ..... Pot, trap.
C. Other commercial fishery ..... Spear, powerhead, cast net, trawl.
D. Recreational fishery ..... Spear, powerhead, bandit gear, handline, rod reel, cast net.

4. Gulf of Mexico Shrimp Fishery (FMP):
A. Gulf of Mexico commercial fishery .....Trawl butterfly net, skimmer, cast net.
B. Recreational fishery .....Trawl.

5. Gulf of Mexico Coastal Migratory Pelagics Fishery (FMP):
A. Large pelagics longline fishery .....Longline.
B. King/Spanish mackerel gillnet fishery .....Gillnet.
C. Pelagic hook and line fishery .....Bandit gear, handline, rod and reel.
D. Pelagic species purse seine fishery ..... Purse seine.
E. Recreational fishery .....Bandit gear, handline, rod and reel, spear.

6. Gulf of Mexico Spiny Lobster Fishery (FMP):
A. Commercial fishery ..... Trap, pot, dip net, bully net, hoop net, trawl, snare, hand harvest.
B. Recreational fishery ..... Dip net, bully net, pot, trap, snare, hand harvest.

7. Stone Crab Fishery (FMP):
A. Trap and pot fishery ..... Trap, pot
B. Recreational fishery ..... Trap, pot, hand harvest.

8. Blue Crab Fishery (Non-FMP) ..... Trap, pot.

9. Golden Crab Fishery (Non-FMP) ..... Trap.

10. Mullet Fishery (Non-FMP):
A. Trawl fishery ..... Trawl.
B. Gillnet fishery ..... Gillnet.
C. Pair trawl fishery ..... Pair trawl.
D. Cast net fishery ..... Cast net.
E. Recreational fishery ..... Bandit gear, handline, rod and reel, spear, cast net.

11. Inshore Coastal Gillnet Fishery (Non-FMP) ..... Gillnet.

12. Octopus Fishery (Non-FMP) ..... Trap, pot.

13. Marine Life Aquarium Fishery (Non-FMP) ..... Dip net, slurp gun, barrier net, drop net, allowable chemical, trap, pot, trawl.
14. Coastal Herring Trawl Fishery (Non-FMP) ..... Trawl.

15. Butterfish Trawl Fishery (Non-FMP) ..... Trawl.

16. Gulf of Mexico Groundfish (Non-FMP):
A. Commercial fishery ..... Trawl, purse seine, gillnet.
B. Recreational fishery ..... Hook and line, rod and reel, spear.

17. Gulf of Mexico Menhaden Purse Seine Fishery (Non-FMP) ..... Purse seine. Fishery authorized gear types

18. Sardine Purse Seine Fishery (Non-FMP) ..... Purse seine.

19. Oyster Fishery (Non-FMP) ..... Dredge, tongs.

20. Commercial Fishery (Non-FMP) ..... Trawl, gillnet, hook and line, spear longline, handline, rod and reel, bandit gear, cast net, lampara net.

21. Recreational Fishery (Non-FMP) ……..Bandit gear, handline, rod and reel, spear, bully net, gillnet, dip net, longline, powerhead, seine, slurp gun, trap, trawl, harpoon, cast net, hoop net, hook and line, hand harvest.

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1. Golden Crab Fishery (FMP) .....Trap.
2. Crab Fishery (Non-FMP):
A. Dredge fishery ……Dredge.
B. Trawl fishery .....Trawl.
C. Trap and pot fishery .....Trap, pot.

3. Atlantic Red Drum Fishery (FMP) .....No harvest or possession in the EEZ.

4. Coral and Coral Reef Fishery (FMP):
A. Octocoral commercial fishery .....Hand harvest.
B. Live rock aquaculture fishery .....Hand harvest.

5. South Atlantic Shrimp Fishery (FMP) …….. Trawl.

6. South Atlantic Snapper-Grouper Fishery (FMP):
A. Commercial fishery ……Longline, rod and reel, bandit gear, handline, spear, powerhead.
B. Black sea bass trap and pot fishery .....Pot, trap.
C. Wreckfish fishery ……Rod and reel, bandit gear, handline.
D. Recreational fishery ……Handline, rod and reel, bandit gear, spear, powerhead.

7. South Atlantic Spiny Lobster Fishery (FMP):
A. Commercial fishery ……Trap, pot, dip net, bully net, snare, hand harvest.
B. Recreational fishery ……Trap, pot, dip net, bully net, snare, hand harvest.

8. South Atlantic Coastal Migratory Pelagics Fishery (FMP):
A. Commercial Spanish mackerel fishery ……Handline, rod and reel, bandit gear, gillnet, cast net.
B. Commercial king mackerel fishery ……Handline, rod and reel, bandit gear.
C. Other commercial coastal migratory pelagics fishery ……Longline, handline, rod and reel, bandit gear.
D. Recreational fishery ……Bandit gear, rod and reel, handline, spear.

9. Spiny Dogfish Fishery (FMP jointly managed by NEFMC and SAFMC):
A. Gillnet fishery .....Gillnet.
B. Trawl fishery .....Trawl.
C. Hook and line fishery .....Hook and line, rod and reel, spear, bandit gear.
D. Dredge fishery .....Dredge.
E. Longline fishery .....Longline.
F. Recreational fishery .....Hook and line, rod and reel, spear.

10. Smooth Dogfish Fishery (Non-FMP):
A. Gillnet fishery .....Gillnet.
B. Trawl fishery .....Trawl.
C. Hook and line fishery .....Hook and line, rod and reel, spear, bandit gear.
D. Dredge fishery .....Dredge.
E. Longline fishery .....Longline.
F. Recreational fishery .....Hook and line, rod and reel, spear.

11. Atlantic Menhaden Fishery (Non-FMP):
A. Purse seine fishery .....Purse seine.
B. Trawl fishery .....Trawl.
C. Gillnet fishery ..... Gillnet. Fishery authorized gear types
D. Commercial hook-and-line .....Hook and line fishery.
E. Recreational fishery ..... Hook and line, snagging, cast nets.

12. Atlantic Mackerel, Squid, and Butterfish Trawl Fishery (Non-FMP) .. Trawl.

13. Bait Fisheries (Non-FMP) .....Purse seine.

14. Weakfish Fishery (Non-FMP):
A. Commercial fishery .....Trawl, gillnet, hook and line.
B. Recreational fishery .....Hook and line, spear.

15. Whelk Fishery (Non-FMP):
A. Trawl fishery .....Trawl.
B. Pot and trap fishery .....Pot, trap.
C. Dredge fishery .....Dredge.
D. Recreational fishery .....Hand harvest.

16. Marine Life Aquarium Fishery (Non-FMP) .....Dip net, slurp gun, barrier net, drop net, allowable chemical, trap, pot, trawl.

17. Calico Scallop Fishery (Non-FMP):
A. Dredge fishery .....Dredge.
B. Trawl fishery .....Trawl.
C. Recreational fishery .....Hand harvest.

18. Summer Flounder Fishery (FMP managed by MAFMC):
A. Commercial fishery ..... Trawl, longline, handline, rod and reel, pot, trap, gillnet, dredge.
B. Recreational fishery .....Rod and reel, handline, pot, trap, spear.

19. Bluefish, Croaker, and Flounder Trawl and Gillnet Fishery (Bluefish FMP managed by MAFMC).....Trawl, gillnet.

20. Commercial Fishery (Non-FMP) .....Trawl, gillnet, longline, handline, hook and line, rod and reel, bandit gear, cast net, pot, trap, lampara net, spear.

21. Recreational Fishery (Non-FMP) .....Rod and reel, handline, spear, hook and line, hand harvest, bandit gear, powerhead, gillnet, cast net.

22. Sargassum Fishery (Non-FMP) .....Trawl.
23. Octopus Fishery (Non-FMP) .....Trap, pot.

Whether or not the species is managed, there is a need for the validation of potential gear impacts. Habitat impact research data on each of these gear types and their variations should be identified, if the work has been done. If the data does not exist, experiments must be conducted for the gears in question, in a manner that would allow for a critical assessment of the range of measurable impacts .

Question 2:Can information and research products from other geographically similar areas be applied to the southeast?

General consensus at the workshop was that research from other regions could have applicability in the southeast, if specific conditions were met. For instance, if biological components performed the same or similar roles, environmental conditions were the same, and gear and bottom types were the same, then the potentially observable impacts should be the same or similar. Completion of the gear matrix table on page 22, should accompany each article considered as an information source.

Question 3:What avenues/resources are available to address gear impacts in state waters and inshore habitats?

The committee agreed that this area could best be handled by the three Councils and Regional Office forming a partnership with the Sea Grant college network, other colleges and universities, states, other federal agencies and private entities having a vested interest the overall health of the respective ecosystems comprising the southeast region. This would create

a formal information and data network responsible for assessing the gear effects on habitat, especially from the five fathom contour to the estuarine and shoreline area. NOAA fishery research vessels do not customarily conduct survey operations inside this area for vessel safety reasons. A partnership would assure the committee that the monitoring of fishing effort and intensity in this critical habitat arena, is being consistently collected. Technically, this partnership may already be in place under the Southeast Area Monitoring and Assessment Program (SEAMAP). SEAMAP is a state/federal/university program for the collection, management and dissemination of fishery-independent data and information in the southeastern United States. The overall program consists of three operational components:

SEAMAP-Gulf of Mexico (begun in 1981);
SEAMAP-South Atlantic (implemented in 1983);and
SEAMAP-Caribbean (formed in 1988).

At present, SEAMAP - Gulf of Mexico has generated the largest fishery independent data base in the gulf region from the five fathom contour out to the Exclusive Economic Zone (EEZ) . From this database, managed by the Mississippi Laboratories, valuable information on fishing effort and intensity in managed species habitats can be obtained, as would be the case for the two other operational components. SEAMAP resource surveys include the Fall Shrimp / Groundfish Survey, Spring Ichthyoplankton Survey, Reef Fish Survey, Summer Shrimp / Groundfish Survey, Fall Ichthyoplankton Survey, and plankton and environmental surveys. Publications of the SEAMAP program include environmental and biological atlases of the Gulf of Mexico for each year from 1983 through 1997.

Another resource would be a video tape library that could be used to illustrate effects of gear types on various habitats (mud, seagrass) and epifauna found in the Gulf of Mexico. The tapes would be used to document fishing gear impacts on EFH. They would permit the observation of seabed penetration and the impact potential of the various gears and gear components.

Question 4. What types of habitats characterize the continental shelf and how are they distributed in the Caribbean, Gulf of Mexico, and South Atlantic within the exclusive economic zone (EEZ)?

Information needed. This question will be addressed after a synthesis of existing data.

Question 5. What effect does the fishing operation per se have on habitat? What information is available on drifting vs. anchoring vessels, effects of recreational effort (e.g., propeller scars), gear deployment/ retrieval effects, and the effects of discarded gear.

Recent studies conducted in the Dry Tortugas National Park and the Tortugas region of the Florida Keys National Marine Sanctuary currently cover all habitat types (shallow seagrass, shallow patch reefs, banks, coral reefs and deep water reefs). The survey is directed toward habitat and reef fish species. Aerial and diver studies recorded species composition,

abundance, size, and distribution. It was recently noticed that reef habitat is being lost due to shrimpers creating accessible habitat by trawling over reefs. A suggestion to prevent this is to develop maps showing authorized areas for deployment of certain types of fishing gear to avoid habitat damage from inappropriate gear use in vulnerable EFH.

For example, no-take zones have been proposed or put into effect throughout the Southeast. Cape Canaveral has no-take fishing zones in several local rivers for the purpose of protecting the Cape. Studies have been conducted showing greater biodiversity in the no-take zones.

Report on Impacts of Recreational Fishing on Essential Fish Habitat

James Bohnsack

Even though the consensus opinion was that potential direct gear impacts of hook and line on habitat was low, recreational fishing was identified as a major concern because of the sheer quantity of participants in the fishery and the possible intense, concentrated use of certain habitats. In 1991 recreational fishers made an estimated 32 million fishing trips in the southeastern U.S. (Van Voorhees et al., 1992). The cumulative impacts of the fishery on habitat could be significant. A major concern is the anchor damage caused by large numbers of recreational fishing boats. Often "favorite" fishing areas, such as reefs, are targeted where fishing effort is concentrated in habitats that may be vulnerable to damage. The cumulative effects of such damage are unknown. Certain practices may be more damaging than others and skill of vessel operators may be important.

Lost and improperly disposed recreational fishing gear also can impact habitat. Fishing line and wire leaders, for example, can entangle marine life and benthic organisms. A small boat in 300 ft of water off Key Largo, FL, for example, was covered with so much fishing line that the captain of the U.S. NAVY nuclear research sub NR-1 and surface ROV operators involved with the JASON VII project refused to go near it for fear of getting equipment tangled and damaged. Total impact depends partly on the rate of gear degradation. Trolling downriggers also can strike bottom causing habitat damage. Possible local chemical impacts of lost lead sinkers are also a concern depending on the interactions of lead with marine organisms.

Report on Impacts of Shrimp Trawling on Essential Fish Habitat

Pete Sheridan & John Watson

Of the many natural and anthropogenic factors that disturb the sea floor, reduce structural complexity, and perhaps degrade essential fish habitat, the leading factor in the Gulf of Mexico and perhaps the southeastern U.S. is mobile fishing gear such as trawls. Structural complexity leads to diversity via provision of shelter, feeding areas, materials accumulation, and altered fluid dynamics. Structures that benthic species create also increase habitat complexity. Although not well-studied in NMFS Southeast Region, trawling elsewhere in the world reduces diversity and produces communities comprised of large numbers of a few

opportunistic species. Long-lived, disturbance-sensitive, structure-forming species are eliminated, freeing up space for short-lived, opportunistic species. Mobile fishing gear overturns rocks, flattens sand waves, smooths bed forms, reduces bottom roughness, strips sponges, corals, and seagrass, and crushes, buries, or exposes benthic organisms and their structures. Otter board tracks in sand habitats may be shallow and short-lived, but in mud such tracks are deeper and last longer. Mobile fishing gear can disturb habitat faster than succession and other benthic processes restore seabed structure. Demersal fish habitat is being stripped of its essential structural complexity - once converted, such habitat may support high, stable densities of opportunistic, disturbance-tolerant taxa.

The recovery time of benthic habitats after trawling has been difficult to predict, since it is influenced by timing, severity, and frequency of impact. The decrease in abundance and diversity of benthic organisms and in habitat complexity is most clear in stable habitats dominated by large emergent species such as sponges, corals, and bryozoans. Most of such habitats have long been opened to fishing.

The effects are least clear in shallow waters with sandy substrates, few large epifauna, less structure, and rapid recovery times. The magnitude of the effects of fishing in different habitats varies relative to the background of natural disturbances encountered in the habitat. Benthic communities at depths < 50 fathoms (90 m), encompassing the primary shrimp trawling range, experience continual natural disturbance at various scales, from seasonal storms to monthly variations in tidal currents and scour to daily predator impacts. However, large scale disturbances such as hurricanes are known to have relatively short-term effects on shallow water communities adapted to frequent disturbance. Benthic communities in frequently disturbed environments are less likely to exhibit long term changes in structure or composition in response to fishing activity than those in stable habitats. Therefore, disturbance of fish assemblages depends on how closely they are associated with a given habitat and its vulnerability to disturbance.

In addition to direct effects, there are numerous possible indirect effects of mobile fishing gear. At a minimum, these include 1) increased turbidity, which negatively affects seagrasses and positively affects deposit feeders, which then prevent suspension feeders from recovery; 2) alteration of surface sediment types; 3) removal of prey, leading to declines in predator abundance; 4) removal of predators, leading to a re-structuring of communities and affecting structure-forming organisms such as coral and algae; and 5) generation of marine debris and ghost-fishing.

Shrimp trawling in the Southeast Region has had a long-term, pervasive impact of unknown degree on estuarine and shelf habitats from shoreline to 50 fm (90 m) depths or greater. In essence, all trawl-susceptible benthic habitats that can be trawled have been trawled, and most have received decades of continuous pressure. Non-susceptible areas which might serve as reference or research sites include waters too shallow to fish, reefs, hard bottoms, wrecks, hangs, mineral extraction platform perimeters, and seasonal or areal regulatory closures. The magnitude and ultimate effects of trawling on most demersal habitats in the Southeast Region have not been examined.

The spatial and temporal distributions of fishing-induced disturbance in the Gulf of Mexico are well-known. Coincident with the expansion of the shrimp fleet in the late 1950's, NMFS began collecting monthly catch and effort data by 5 fm (9 m) depth strata (0-50 fm,

Michael Barnette & Graciela Garcia - Moliner

Traps (including crab pots, conch pots, lobster traps and pots, and fish traps and pots) are utilized in numerous fisheries, both in state waters and in the exclusive economic zone (EEZ). Traps are deployed in various habitats including submerged aquatic vegetation (SAV), live bottom, soft sediments, and in the vicinity of coral reefs. The use of traps result in primary and secondary impacts to habitat. Coral damage from the deployment or recovery of traps and smothering of SAV are two of the most serious forms of primary impacts. Degradation of coral habitat and SAV from trap movement due to storm action and abrasion of SAV and coral colonies against traps and trap lines are examples of secondary impacts. There have been few studies conducted on trap impact on habitat (Eno et al., 1996; Quandt, 1999).

Recovery of habitat from trap impacts would be expected to be relatively slow on coral reefs since coral colonies take a long time to grow back (CFMC Coral FMP, 1994). The recovery from damage to SAV would be expected to be faster than for corals. Attempting to distinguish impacts in the field resulting from traps versus anchors, or other potentially damaging activities, would be difficult unless ground-truthing studies were conducted. The relative damage caused by traps needs to be assessed and compared to damage caused by other activities (e.g., anchoring, vessel grounding, and propeller scarring).

Report on Impacts of Bottom Longline Fishing on Essential Fish Habitat

Melissa Bahnick

The committee designated bottom longline gear as having a low impact on various habitat types. Bottom longline gear is typically used on mud or sand bottom, but when used in hard bottom areas it could cause major damage to habitat. Environmental factors such as strong currents and inclement weather could also affect the amount of damage caused to EFH. The general characteristics of the gear include monofilament bottom longlines ranging from 6-15 miles in length to which gangions and baited hooks (approximately 500-1200) are attached. Weights are placed on the line at varying intervals and buoys mark the location of the line. The lines are deployed horizontally and fished for 10-15 hours depending on the target species, usually sharks or reef fish.

In 1998 the bottom longline catch for South Atlantic and Gulfreef fish totaled 6,352,837 pounds valuing $11,782,034. The Sustainable Fisheries Division has an ongoing data base of fishery dependent data covering Gulf of Mexico reef fish, South Atlantic snapper-grouper and shark fisheries. The log book data contain information on the total effort and area of effort throughout the Southeast. These data will be a useful aid to establish the distribution of effort.

Observer programs are another viable source for establishing effort. In 1994, the Gulf and South Atlantic Fisheries Development Foundation and the University of Florida initiated a three year program. The data set consists of 501 observer sea-days, 408 longline sets, 4.1 million hook-hours of fishing effort, and a catch of more than 16,500 sharks (158 metric tons). The program documented 2.0% of the entire U.S. commercial shark landings for the 3-year period.

Very little information exists on the effects of bottom long lining on benthic habitats.

A National Marine Fisheries Service study off the southeast coast of Alaska included submersible dive observations of halibut longline gear (NMFS,1998a). The following is a summary of the observations:

> Setline gear often lies slack on the sea-floor and meanders considerably along the bottom. During the retrieval process the line sweeps the bottom for considerable distances before lifting off the bottom. It snags on whatever objects are in its path, including rocks and corals. Smaller rocks are upended, hard corals are broken, and soft corals appear unaffected by the passing line. Invertebrates and other light weight objects are dislodged and pass over or under the line. Fish, notably halibut, frequently moved the groundline numerous feet along the bottom and up into the water column during escape runs, disturbing objects in their path. This line motion was noted for distances of 50 feet or more on either side of the hooked fish.

A 1991 amendment to the South Atlantic Snapper-Grouper IMP prohibited the use of bottom longline gear in the wreckfish fishery in the entire South Atlantic EEZ. The "wreckfish grounds" are found in a 50-75 square nautical mile area of the Blake Plateau. The habitat is characterized by a rocky ridge system (relief greater than 50 meters) with areas as narrow as a few hundred yards wide and often less than a mile long, at depths between 450-600 meters. The relief is composed of manganese phosphate pavements, phosphorite slabs and coral banks. The high relief and strong tidal effects made gear loss probable. Longline cable on the bottom had the potential to break some of the ledges, overhangs and associated organisms, and damage the habitat on which the wreckfish depend. Additional current or proposed amendments should also be examined especially if they involve measures to minimize impacts of fishing activities on EFH.

Report on Impacts of Dredging on Essential Fish Habitat

Allyn B. Powell, David Meyer and Gordon W. Thayer

We recommend an evaluation of papers in Rester's 2000 bibliography (following the criteria established at the workshop) that focuses initially on the impacts of oyster dredging on essential fish habitat in the Southeast. Based on our analysis of landings in the Southeast Region, the majority of shellfish landed (1998 landings; pounds of meat) are oysters, suggesting relatively considerable dredging effort. We examined landings by states to prioritize EFH studies. The majority of oyster landings occur in Louisiana (61 % of the total southeast landings), Texas (16 %) and Mississippi (11 %). The overwhelming majority of these landings are by oyster dredge. Oyster landings by dredge in Georgia and South Carolina are non-existent. Other-dredge directed fisheries of that potentially could impact essential fish habitat include hydraulic dredging of clams. This activity is most pronounced in North Carolina and South Carolina. However, if landings are an appropriate surrogate of effort, the percent of total clam landings by hydraulic dredge in North Carolina and South Carolina is 0.5% of the oyster landings by dredge in Louisiana, and 8.8% and 21.8% of the total clam landings in North

Carolina and South Carolina, respectively. The majority of clams are landed by rakes.

The availability of data on distribution of effort needs to be examined. It appears that relatively few states (NC, LA, GA, and FL) have a trip ticket program that provides data on landings by individual boat, gear, and area, and unfortunately, area designations are one degree squares. Therefore the distribution of effort might be difficult to estimate. Regardless, an effort should be made to determine the distribution of effort by interviewing Port Agents and Shellfish Biologists within those states where dredging has the greatest impact. If these data are not adequate in determining effort then surveys might be required to establish effort.

Characterizing habitat must consider both the structural and functional aspects of that habitat. The structural aspect requires the mapping of those habitats where fishery resource occurs, whereas the functional requires an ecological understanding of that habitat, both its community structure and its role at an ecosystem level process. As oyster dredging appears to be a major activity in specific geographic areas, the status of the distribution of oyster habitat needs to be determined, and recommendations provided to insure adequate documents (e.g.,GIS generated maps) are a final product.

An examination of the literature should determine what we know and what needs to be known relative to the ecological role of oyster habitat, and the potential impacts of dredging on the ecology of oyster habitat. A report should be developed to provide information on what is known, and what needs to be known with recommendations on how to achieve the latter.

The most difficult aspect of determining the effects of gear on habitat is the lack of high resolution data on the distribution of fishing effort (see above): hence, it is critical that we put our energies into that effort. We believe that the effects on habitat should proceed in three stages: (1) effects on the structural components of the habitat; (2) effects on the benthic community; and (3) effects on ecosystem- level processes.

We have summarized research recommendations in A *Summary ofthelmpacts ofFishing Activities on Habitat* (derived mainly from Auster and Langton (1999) and reviews of Amendments of the South Atlantic Fishery Management, Gulf of Mexico Fishery Management Council and the Caribbean Fishery Management Council) that has been distributed and discussed at the Essential Fish Habitat Meeting, December 7-9 1999, Miami, FL.

We recommend as a first priority in the area of dredge impacts, determining the effects of oyster dredges, along a gradient of effort, on oyster habitat using ecological framework developed in disturbance studies (i.e., determining successional stages in the development of oyster reef communities so predictive models can be designed and recovery rates determined). Research should address changes as discussed above. Research will require non-fishing control areas to compare effects of fishing on habitat. On the other hand, a reversible design could be used. Here closed areas would be opened to dredging. Adjacent control areas would be necessary. Research should be designed to determine recovery rates and succession stages that can be used to develop predictive models as to the seral stage of the community and the direction that community would proceed if disturbed by dredging over a gradient of effort. Finally, we need to encourage the development of innovative gear that minimizes impacts to essential fish habitat.

Question 6. What has been published concerning the impact of fishing gear on the various bottom types?

The Gulf States Marine Fishery Commission Habitat sub-committee has been examining the effects of fishing. Gear and the operation of fishing as a whole is not only being addressed. This assessment includes impacts made by gear, anchors, equipment, etc. A world wide annotated bibliography is currently being compiled.

Bibliography of the impacts of fishing on habitat: 1. Currently there are citations for approximately 530 papers. 2. GSMFC has over 295 papers in hand. 3. The list is available on the Internet. 4. An abstract or summary for each paper is included on the Internet.

As part of this collaborative effort, the Minerals Management Service has provided us with access to their published studies, lease stipulations and platform locations at the following websites:

http://www.gomr.mms.gov/homepg/regulate/environ/techsumm/rec_pubs.html.
http://www.gomr.mms.gov/homepg/regulate/regs/stips/stip%5Fovr.html.
http://www.gomr.mms.gov/homepg/pubinfo/repcat/arcinfo/index.html.

These websites provide a key source of information for the existing data synthesis by outlining the requirements under the topographic features stipulation, platform location, setting ofplatform and pipeline distance zones for gear deployment and other parameters which could have a habitat protection effect .This information could be useful in the selection of No-take research areas as well as provide descriptions of the bottom topography.

Question 7. **What databases are available for use in responding to EFH concerns and** what is the **content/status of those data files?**

Fishery -independent and -dependent information is needed.

Fishery independent databases of SEAMAP

Activities and operations of each SEAMAP component are wholly defined by the respective managing units: the SEAMAP-Gulf Subcommittee of the Gulf States Marine Fisheries Commission's Technical Coordinating Committee, the SEAMAP-South Atlantic Committee of the Atlantic States Marine Fisheries Commission's South Atlantic Board, and the SEAMAP-Caribbean Committee of the Puerto Rico Department of Natural and Environmental Resources. The Gulf and South Atlantic committees consist of designated representatives from each member state, NMFS/SEFSC, and the Gulf of Mexico and South Atlantic Fishery Management Councils. In addition, the SEAMAP-South Atlantic committee includes a representative from the Atlantic States Marine Fisheries Commission (ASMFC). The Caribbean component consists of members from Puerto Rico Department of Natural and Environmental Resources, Virgin Islands Division of Fish and Wildlife, Puerto Rico Sea Grant College Program, NMFS/SEFSC, U.S. Fish and Wildlife Service, and Caribbean Fishery Management

Council. Each committee meets yearly to review operations, examine priorities, and plan future activities. Daily operations are carried out by the respective SEAMAP coordinators, assisted by staffs of the two Commissions and Puerto Rico Department of Natural and Environmental Resources and personnel associated with the SEAMAP Information System, SEAMAP Archiving Center and SEAMAP Invertebrate Plankton Archiving Center.

In FY1999, collection of resource survey information continued for the eighteenth consecutive year. Surveys by each program component reflect distinct regional needs and priorities; however, survey operations in one geographic area often provide information useful to researchers in all three regions. For instance, the South Atlantic program's Bottom Mapping will be useful in SEAMAP-Gulf gear calibration efforts, while plankton and environmental surveys in the Gulf program have set the standards for the entire region's much-needed long-term data base. In the Gulf ofMexico, SEAMAP resource surveys include the Fall Shrimp/Groundfish Survey, Spring Plankton Survey, Reef Fish Survey, Summer Shrimp/Groundfish Survey, Fall Plankton Survey and plankton and environmental data surveys. In the South Atlantic region, surveys include Shallow Water Trawl Survey, Pamlico Sound Survey, Benthic Characterization, and Bottom Mapping Project. In the Caribbean, the Reef Resources Survey is conducted. In addition to the regularly-scheduled surveys, SEAMAP participates in a variety of other projects such as the Winter Trawling and Fish Tagging Cruise, a coordination role for developing finfish bycatch estimates. SEAMAP provides guidance, personnel, and other contributions to these studies for enhancement and protection of the marine resources.

Information from SEAMAP activities is provided to user groups through three complementary systems: the SEAMAP Information System, the SEAMAP Archiving Center and the SEAMAP Invertebrate Plankton Archiving Center. Products resulting from SEAMAP activities can be grouped into two major categories: (1) data sets managed by the SEAMAP Information System, the SEAMAP Archiving Center and the SEAMAP Ichthyoplankton Archiving Center and (2) program documents.

If you need additional information concerning this program, please contact Jeff Rester at the GSMFC office at (228) 875-5912 or via e-mail.

NMFS Sustainable Fisheries Division Databases

The Sustainable Fisheries Division has an ongoing data base of fishery dependent data. It can be accessed through the SEFSC Information Resources Management group after obtaining proper authorization. The data base is comprised of four data collection methods: operating units, log books, trip tickets, and trip interviews.

1. Operating Units

An annual survey, conducted since the 1960's in the SE and Gulf, by field personnel (port
agents). The port agent records a vessel's number when it first shows up in the port. It does not deal with a vessel's home port and there is possible duplication of that boat if it enters various ports throughout the year. The number of times the boat appears in the port and the area where the gear is used is not recorded.

Data provided:

Number of vessels with identification number

Type of gear used by vessel
Estimate of the number of units of gear (maximum)
Estimate of the size/quantity of gear (maximum)

2. Log Book Data

A Federal program with required reporting under the Fisheries Conservation and Management Act (FCMA). It only deals with fishing activity in the EEZ ; however, if the vessel has a permit it must report any trip regardless of where it occurs (state water included) on which FMP species were caught. This program deals with information about the fishing activity. There is some information for the Caribbean, especially from the swordfish fishery. Information is not recorded on the specific depth where the gear is used, an association may be made by area. Logs books are not required for charter boats.

Data Provided:

a.) Landings by gear and area

Gear for broad categories (hook & line, bottom long line, etc.)
Area is by one degree squares
If fishing is done in multiple areas only one area is reported on form, the area where most time is spent

b.) Time

Trip - amount of time the gear is in the water
Set - information about each time the gear is used

Fisheries that are covered:

Gulf of Mexico Reef fish - trip report
South Atlantic Snapper-Grouper - trip report
King and Spanish Mackerel (both Gulf and SA) - trip report
Swordfish (both Gulf and SA) - set report
Shark (both Gulf and SA) - set report
South Atlantic Golden Crab - trip report

3. Trip Ticket Data

State mandated programs that do not fall under the FCMA. Under the Cooperative Statistics Program the state collects the data and provides the data set for Federal use. The data come directly from a licensed dealer. Not all states require trip ticket information. The following are the states with current programs and the duration of the program: NC-1994, LA-1999, GA-June 1999, and FL-1986.

Data Provided:

Landings (pounds sold) by individual boat for each trip
Landings (pounds sold) by gear and area

Gear is by broad categories

Area is by one degree squares

4. Trip Interview Program

A sampling program conducted by Federal and state port agents. An interview is conducted on individual fishing trips. The primary focus of the data is to obtain size frequency information. Species in FMP's are targeted by port agents.

Data Provided:

Gear used
Area & depth fished
Length frequency
Fishing effort

Question 8: **What provisions in the Fishery Management Plan language could produce** an indirect positive effect on EFH?

Each Fishery Management Plan has restrictions on allowable gear types primarily to address effects of populations of fishing. The restrictions have an indirect benefit to habitat; some of the more destructive gears are now banned. Each region has specific measures currently in place to minimize adverse impacts from fishing and conserve EFH.

Coral Reef Protection (Southeast Region)

Collection prohibited for reef corals, stony corals, hydrocorals, black corals, seafans, and live rock, except permits may be authorized for scientific and educational purposes. Harvest of allowable octocorals for the aquarium and pharmaceutical trade is permitted in the EEZ but must not exceed 50,000 colonies per year (Gulf and South Atlantic EEZ combined).

Caribbean:

Seasonal closures in primary spawning areas
Closed reserve near St. Thomas
Coral protection - no allowable chemical usage in coral areas
Ban on types of damaging gear in certain areas

South Atlantic:

Oculina Banks - closure
No roller rigs allowed
Size restrictions on gear types
Proposed FMP dealing with Sargassum

Gulf of Mexico: Dry Tortugas National Park and the Florida Keys National Marine Sanctuary Proposed closed Gag grouper area in the FL Middle Grounds End fish traps by 2007

<u>Gulf Shrimp</u>:

1) The May 1981 FMP established a cooperative Tortugas Shrimp Sanctuary with the State of Florida, and established seasonal closures off Texas and Florida.

2) Amendment 2 (1983) modified seasonal closures off Florida to avoid gear conflicts, but indirectly may have benefitted EFH. Several actions modified existing area/season closures over time.

3) Initial TED regulations were implemented in 1989, and requirements for the use of TED in all shrimp nets was gradually implemented through 1994.

4) Amendment 9 (1997) mandated the use of BRDs in shrimp trawls to allow fish escapement, thus enhancing stocks, and indirectly enhancing EFH. This regulation stemmed form the development and completion of a 5-year NMFS-sponsored "Bycatch Reduction Research Program" as mandated by Congress in the 1990 re-authorization of the Magnuson Act.

South Atlantic Shrimp:

1) The 1993 FMP implemented regulations that provided for concurrent closures of the EEZ when adjacent state waters were closed to shrimping.

2) Amendment 1 (1996) closed areas of the Oculina Bank to rock shrimp fishing to protect this delicate habitat.

3) Amendment 2 (1997) mandated the use of BRDs in all shrimp trawls fished in EEZ waters of the South Atlantic to allow fish escapement, thus enhancing stocks, and indirectly enhancing EFH. This regulation stemmed form the development and completion of a 5-year NMFS-sponsored "Bycatch Reduction Research Program" as mandated by Congress in the 1990 re-authorization of the Magnuson Act.

Coastal Migratory Pelagics:

No actions have been taken specifically to address EFH by this FMP. The EIS associated with the FMP, and EAs associated with Amendments 1, 3, 6, and 8. Those reviews determined that gears traditionally used in this fishery have no adverse impact on the bottom substrate or other habitat. Limitations to allowable gears would indirectly benefit EFH. Otherwise, all actions associated with this FMP have been intended to maintain sustainable healthy stocks of king and Spanish mackerel, and thus enhance the overall environmental quality of the region.

Caribbean Reef Fish:

1) The FMP, implemented in 1985, set size limits and seasonal closures to protect stocks of reef fish, and described gear limitations that would reduce bycatch.

2) Amendment 1, implemented in 1990, increased mesh size limits on fish traps to reduce

catch of undersized fish, prohibited the possession of Nassau grouper, closed an approximately 14 square mile area to fishing (this area was adjusted in size in 1996), and prohibited the use of explosives in the fishery.

3) Amendment 2, implemented in 1993, incorporated the major species of deep-water reef fishes into the management unit, thus offering them protection form overexploitation; prohibited the capture and possession of several aquarium trade species and j ewfish, closed two red hind spawning areas and mutton snapper spawning area during the spawning season (seasonal closures do not provide more than limited habitat protection and benefit).

Excluding the prohibited use of explosives and the closed areas, the actions do not directly effect habitat, but do indirectly enhance the overall environment.

Queen Conch:

The FMP, implemented in 1996, closed the fishing season during part of the year, and allowed only hand gathering from either free or scuba diving as methods of collection. These actions will protect habitat by not allowing destructive gear collection methods.

Snapper-Grouper FMP:

1) The FMP prohibited the use of poisons and explosives for taking of fish in the management unit.

2) Amendment 1 prohibited the use of trawl gear in this fishery.

3) Amendment 4 prohibited the use of fish traps in the south Atlantic and restricted the use of sea bass pots to north of Cape Canaveral, Florida; prohibited the use of entanglement nets; prohibited the use of longline gear within 50 fathoms; and prohibited the use ofbottom longlines for wreckfish.

4) Amendment 6 established the Oculina Bank HAPC as an experimental closed area to fishing.

5) Amendment 7 established allowable gear for this fishery which essentially limits gear to hook-and-line, black sea bass ports north of Cape Canaveral, and bottom longlines north of St. Lucie Inlet and outside of 50 fathoms depth. This measure ensures that gear will be examined before it is allowed to enter this fishery.

6) Amendment 8 established a limited entry program for this fishery which will have the effect of limiting interactions of fishing gear with critical habitat.

Golden Crab FMP:

1) The FMP established traps as the only allowable gear; limited the fishery to depths greater than 900 feet off North Carlina, Georgia and South Carolina; and limited the fishery to depths greater than 700 feet off Florida. Limiting the fishery to deep water was done partially to protect coral habitat.

Reef Fish FMP:

1) 1984. The FMP prohibited the use of explosives or poisons for taking of fish in the management unit. The FMP also prohibited fish traps and roller trawls within an inshore stressed area.

2) 1990. Amendment 1 established a longline and buoy gear boundary inshore of which these gear were prohibited.

3) 1992. Amendment 4 established a moratorium on issuance of new reef fish permits, which would have the effect of limiting the increase in effort. This would be expected to reduce the potential for habitat damage cause by fishing gear.

4)1994. Amendment 5 established restrictions on fish traps, created special management zones where fish traps were prohibited, and closed Riley's Hump to all fishing during May and June.

5) 1997. Amendment 14 provided for a 10-year phase out of fish traps by 2007 and prohibited fish traps west of Cape San Blas, Florida

6) Amendment 17, if approved and implemented, would extend the reef fish permit moratorium.

7) The 1999 gag/black grouper regulatory amendment, if approved and implemented, would establish two areas in the eastern Gulf closed to all fishing.

Appendix 2

Table 1. Summary of evaluation of potential direct gear impacts on habitat. Outlined cells indicate referenced studies available. Cells without outlines are consensus opinions. Bold shows highest impact potential.

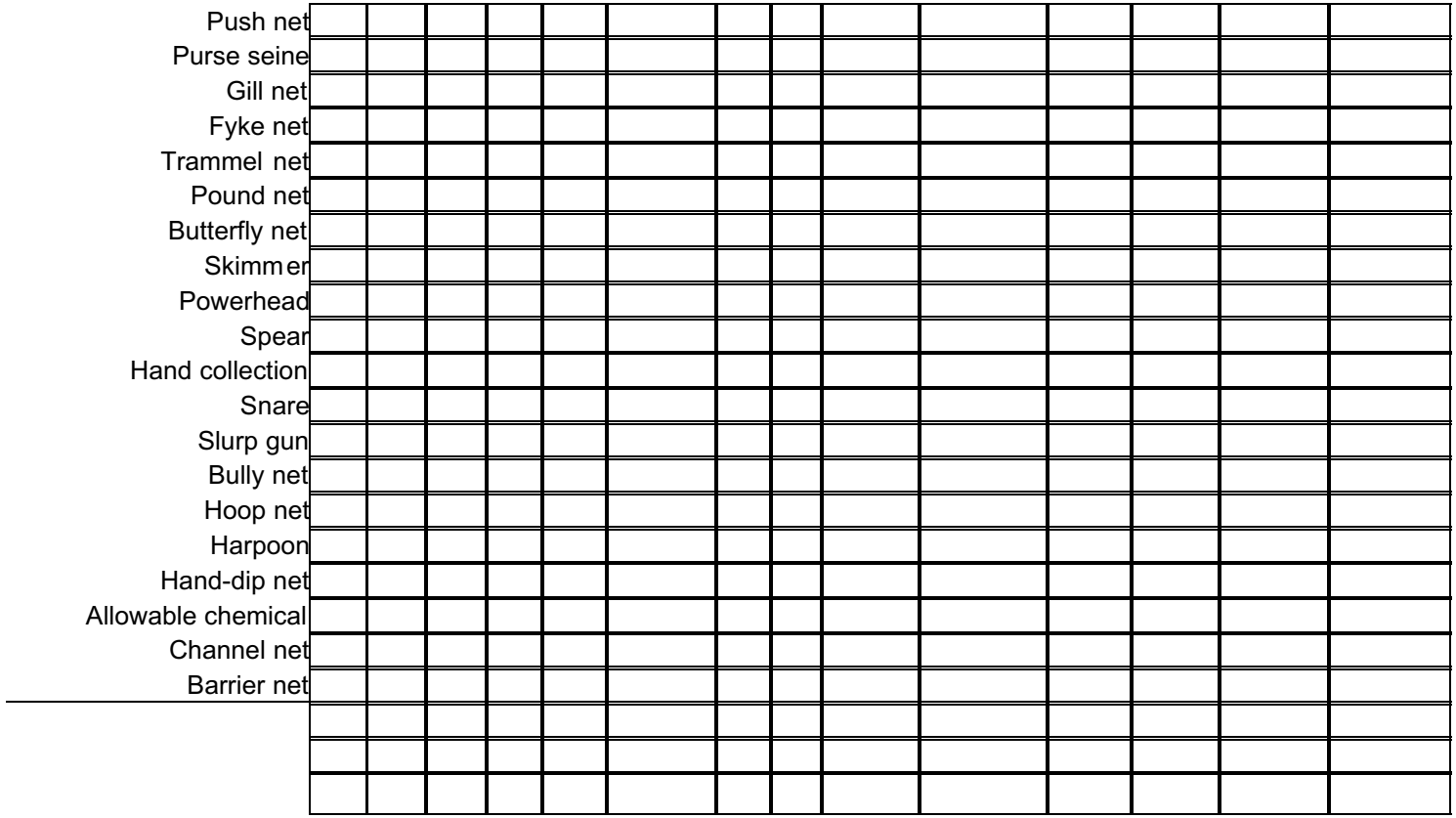
HABITAT IMPACTS (High +++, Medium ++, Low +, negligible 0, Unknown ?)									
	HABITAT						Habitat /	Source for	
Gear	Mud	Sand	Seagrass	Rubble	Hardbottom	Other	Species	Reference	
Otter trawl	++	++	++	+	++			Barnette 1999	
" " /chain sweep	++	++	+++	+	+++			Barnette 1999	
" " /roller gear	++	++		+	**+++**			Barnette 1999	
Roller trawl	++	++		+	**+++**		butterfish	Barnette 1999	
Trawl (unspecified)	+	+			+++			Barnette 1999	
Scallop dredge	++	++	++	+++	+++			Barnette 1999	
Oyster dredge	++	++	**+++**	++		**+++**	oyster reef	Barnette 1999	
Hydraulic dredging	+++	+++	+++	+++		**?**	oyster reef	Godcharles, Moore, others	
Hook & line, handline					+			Barnette 1999	
Bottom longline	+	+			+			Barnette 1999	
Fish trap	**?**	**?**	++		++	+	algal plain	Barnette 1999	
Crab trap	**?**	0	+					Barnette 1999	
Lobster trap	**?**	0	+		++		algal plain	Barnette 1999	
Clam kicking	+++	+++	**+++**	+++				Peterson et al., 1987	
Roller frame trawl	+	0	0		+		bait shrimp	Mayer, Tabb & Kennedy	

Rake	++	++	++	++		+++	oyster reef	Barnette 1999	
Patent tongs	++	++	+++	++		+++	oyster reef	Barnette 1999	
Trawl, midwater						0	midwater	Barnette 1999	
Electric reel					+			Barnette 1999	
Buoy gear					+			Barnette 1999	
Trollling gear					+			Barnette 1999	
Trot line	+	+	+				estuarine	Barnette 1999	
Cast net	+		+	+				Barnette 1999	
Haul seine	+	+	+			++	shoreline	Barnette 1999	
Hand & beach seine			+			+	shoreline	Barnette 1999	
Push net			+					Barnette 1999	
Purse seine	+	+	?			0	midwater	Barnette 1999	
Gill net	+	+	+	?	+		estuarine/coast	Barnette 1999	
Fyke net	+	+	+				estuarine	Barnette 1999	
Trammel net	+	+	+			0	estuarine	Barnette 1999	
Pound net	0	0	0			0	estuarine	Barnette 1999	
Butterfly net	0	0	0			0	estuarine/shore	Barnette 1999	
Skimmer	+	+	+						
Powerhead		0			0	0	offshore	Barnette 1999	
Spear		0			+			Barnette 1999	
Hand collection		0		+	++		lobster/trop fish	Barnette 1999	
Snare		0			+			Barnette 1999	
Slurp gun		0		0 +	0 +			Barnette 1999	
Bully net	0	0	0		+			Barnette 1999	
Hoop net	+	+	+		+			Barnette 1999	
Harpoon						0	pelagic	Barnette 1999	
Hand-dip net					+			Barnette 1999	
Allowable chemical					+			Barnette 1999	

Channel net	+	+	+						
Barrier net	**?**	**?**	**?**	**?**	+			Barnette 1999	
Explosives*	+++	+++	+++	+++	**+++**				
Cyanide / bleach fishing*					**+++**				
* Prohibited									

Fishery Descriptions:

Gear	RE NC	GI SC	ON GA	EF	WF	USED AL, MS	LA	TX	PR, VI	GEAR: Vessels	Total Trips	Gear / Trip	Deploy- Ment Gear	Impact / Deploy- Ment
Otter trawl														
" " /chain sweep														
" " /roller gear														
Roller trawl														
Trawl														
Scallop dredge														
Oyster dredge														
Hydraulic dredging														
Hook & line, handline														
Bottom longline														
Fish trap														
Crab trap														
Lobster trap														
Clam kicking														
Roller frame trawl														
Rake														
Patent tongs														
Trawl, midwater														
Electric reel														
Buoy gear														
Trollling gear														
Trot line														
Cast net														
Haul seine														
Hand & beach seine														


Push net
Purse seine
Gill net
Fyke net
Trammel net
Pound net
Butterfly net
Skimmer
Powerhead
Spear
Hand collection
Snare
Slurp gun
Bully net
Hoop net
Harpoon
Hand-dip net
Allowable chemical
Channel net
Barrier net