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PUBLIC HEARING DRAFT

FISHERY MANAGEMENT PLAN FOR REGULATING OFFSHORE MARINE AQUACULTURE IN THE GULF OF MEXICO

(Including a Draft Programmatic Environmental Impact Statement, Initial Regulatory Flexibility Analysis and Regulatory Impact Review)

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Acronyms/Abbreviations

ABC	acceptable biological catch
ACOE	Army Corps of Engineers
ADCNR	Alabama Department of Conservation and Natural Resources
AP	advisory panel
APA	Administrative Procedures Act
APHIS	Animal and Plant Health Inspection Service, US Department of Agriculture
B	biomass
$B_{CURRENT}$	current biomass of stock
B_{MSY}	Biomass at MSY
BOD	Biological Oxygen Demand
CFR	Code of Federal Regulations
Council	Gulf of Mexico Fishery Management Council
CPUE	catch per unit effort
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DEIS	draft environmental impact statement
DO	dissolved oxygen
DOC	U. S. Department of Commerce
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	exempted fishing permit
EIS	Environmental Impact Statement
ELMR	Estuarine Living Marine Resources
E.O.	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAO	Food and Agriculture Organization (United Nations)
FMP	fishery management plan
F_{MSY}	fishing mortality rate producing MSY
FMU	fishery management unit
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Fish and Wildlife Research Institute
GC	NOAA general counsel
GMFMC	Gulf of Mexico Fishery Management Council
GMMSEP	Gulf of Mexico Marine Stock Enhancement Program
Gulf	Gulf of Mexico
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
IFQ	Individual Fishing Quotas
IQA	Information Quality Act
IRFA	initial regulatory flexibility analysis
LDWF	Louisiana Department of Wildlife and Fisheries

MARFIN	Marine Fisheries Initiative
MFMT	Maximum Fishing Mortality Threshold
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MP	million pounds
MPA	Marine Protected Area
MRFSS	Marine Recreational Fishery Statistics Survey
MSAP	Mackerel Stock Assessment Panel
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	Same as NOAA Fisheries Service
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
OOA	Open Ocean Aquaculture
OMB	Office of Management and Budget
OCSLA	Outer Continental Shelf Lands Act
OY	optimum yield
PEIS	Programmatic Environmental Impact Statement
ppm	parts per million (e.g., oxygen)
ppt	parts per thousand (salinity)
RA	Regional Administrator of NOAA Fisheries Service
RDSAP	Red Drum Stock Assessment Panel
RFA	Regulatory Flexibility Act
RIR	regulatory impact review
SAFMC	South Atlantic Fishery Management Council
SAV	Submerged Aquatic Vegetation
SBA	Small Business Administration
SCD	Science Center Director, Southeast Region
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast Data Assessment Review (stock assessment)
SEFSC	Southeast Fisheries Science Center of NOAA Fisheries Service
SEIS	supplemental environmental impact statement
SERO	Southeast Regional Office (NOAA Fisheries Service)
SMZ	special management zone
SPL	saltwater products license (FL)
SPR	spawning potential ratio
SSB	spawning stock biomass
SSB/R	spawning stock biomass per recruit
TAC	total allowable catch
TOC	total organic carbon
TPWD	Texas Parks and Wildlife Department

UNH	University of New Hampshire
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WSSV	white spot syndrome virus

Programmatic Environmental Impact Statement (EIS) Cover Sheet

Responsible Agencies and Contact Persons

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Name of Action

Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico

Type of Action

(X) Administrative	( ) Legislative
(X) Draft	( ) Final

Filing Dates with EPA

Notice of intent (NOI) to prepare EIS published: September 2, 2004 (69 FR 53682).
DPEIS filed with EPA: (insert date)
DPEIS comment period ended: (insert date)
NOA of FPEIS published: (insert date; FR citation)
FPEIS wait period ends: (insert date)

Abstract

Demand for protein is increasing in the United States and commercial wild-capture fisheries will not likely be adequate to meet this growing demand. Aquaculture is one method to meet current and future demands for seafood. The Gulf of Mexico Fishery Management Council has authority to regulate fishing in federal waters, including aquaculture. Currently, NOAA Fisheries Service requires an exempted fishing permit (EFP) to conduct aquaculture in federal waters. This permit is of limited duration and is not intended for commercial production of fish, making aquaculture in federal waters not viable under the current permitting process.

The purpose of this Aquaculture Fishery Management Plan (FMP) is to maximize benefits to the Nation by establishing a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico. The Council initiated this action to provide a programmatic approach to evaluating the impacts of aquaculture proposals in the Gulf of Mexico and a comprehensive framework for regulating such activities. The FMP and associated draft programmatic environmental impact statement (DPEIS) are intended to streamline the regulatory process for authorizing current and future offshore aquaculture proposals by providing the Council and NOAA Fisheries Service the information required to review, authorize, and monitor offshore aquaculture operations. The primary goal of the proposed aquaculture permitting program is to increase the maximum sustainable yield (MSY) and optimum yield (OY) of federal fisheries in the Gulf of Mexico by supplementing the harvest of wild caught species with cultured product. Other objectives for this FMP are summarized in Section 3.0.

Table of Contents for PDEIS

Please note this fishery action is presented as an integrated document. It addresses different applicable laws including the National Environmental Policy Act (NEPA). Therefore, the document does not follow a standard EIS format, however, elements of the DPEIS are presented and identified in the following table of contents for the DPEIS. The Aquaculture FMP contains 10 actions with a total of 28 alternatives. The amount of analysis required to evaluate these alternatives is thus very extensive, causing the DPEIS to exceed 150 pages.

The table of contents and sections comprising the PDEIS are as follows:

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1.0 Executive Summary

Demand for protein is increasing in the United States; nearly 80 percent of all seafood consumed is currently imported from other countries. As demand grows, commercial wild-capture fisheries will not likely be adequate to meet this growing demand. Aquaculture is one method to meet current and future demands for seafood.

The Gulf of Mexico Fishery Management Council has authority to regulate fisheries in federal waters, including aquaculture. Currently, NOAA Fisheries Service requires an exempted fishing permit (EFP) to conduct aquaculture in federal waters. This permit is of limited duration and is not intended for commercial production of fish, making aquaculture in federal waters not viable under the current permitting process.

The purpose of this FMP is to develop a regional permitting process for regulating and promoting environmentally sound and economically sustainable aquaculture in the Gulf EEZ. If this FMP is approved and implemented, an estimated 5 to 20 offshore aquaculture operations are estimated to be permitted in the Gulf of Mexico over the next 10 years, with an estimated annually production of up to 64 million pounds. Establishing such a process requires the Council to develop a fishery management plan for aquaculture. This FMP, including the Draft Programmatic Environmental Impact Statement (DPEIS), would serve as the basis for evaluating the effects of issuing a permit for Gulf of Mexico aquaculture operations. Effects falling outside the scope of the actions proposed herein would be further analyzed through additional National Environmental Policy Act analyses conducted by the Council and NOAA Fisheries Service.

This FMP considers ten actions, each with an associated range of management alternatives, for establishing a regional permitting process. The full range of alternatives considered in this FMP is described in Section 4.0. A detailed discussion of the environmental consequences associated with each action and alternative is provided in Section 6. The proposed measures and actions in this FMP are all intended to assist the Council and NOAA Fisheries Service in achieving the purpose of this FMP, which is to maximize benefits to the Nation by establishing a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico. By establishing a regional permitting process for aquaculture, the Council will be positioned to achieve their primary goal of increasing maximum sustainable yield (MSY) and optimum yield (OY) of federal fisheries in the Gulf of Mexico by supplementing harvest of wild caught species with cultured product. Other objectives of this FMP are described in Section 3.0

A short summary of each action is provided below.

Major Conclusions

Action 1: Aquaculture Permit Requirements, Eligibility, and Transferability – This action considers establishing a permit(s) for conducting aquaculture in federal waters of

the Gulf of Mexico. The Council's preferred alternative (**Preferred Alternative 2**) would authorize a person to conduct any of the following activities: deploy and operate allowable aquaculture systems, harvest or designate hatchery personnel or other individuals to harvest wild broodstock, possess allowable aquaculture species, transport allowable aquaculture species in or from federal waters of the Gulf, and sell cultured species grown in an allowable aquaculture system. Additionally, **Preferred Alternative 2** would limit eligibility for a Gulf aquaculture permit to U.S. citizens or permanent resident aliens. **Preferred Alternative 2** would also allow transfer of permits, require a dealer permit for receiving cultured organisms, and prohibit landing of cultured species at a non-U.S. port. Other alternatives considered by the Council include maintaining the requirement for an EFP (**Alternative 1**) or requiring separate NOAA Fisheries Service operational and siting permits (**Alternative 3**). Aquaculture under the current EFP process is not viable, while requiring a separate siting permit would be partially duplicative of other federal permitting requirements already in place (e.g., Army Corps of Engineers siting permits). **Preferred Alternative 2** would still provide NOAA Fisheries Service authority to evaluate various siting criteria when deciding whether or not to issue an operational permit. Proposed criteria are summarized in Action 6 (Marine Aquaculture Siting Requirements and Conditions). In order to receive and maintain such a permit, conditions proposed in Actions 2 (Application Requirements, Operational Requirements, and Restrictions), 3 (Permit Duration), and 8 (Recordkeeping and Reporting) would also have to be met. **Alternative 1** would restrict the development of offshore aquaculture in the Gulf and therefore would result in no impacts to the physical, biological, and ecological environments unless an aquaculture facility was able to successfully develop an operation under the current EFP permitting process. **Preferred Alternatives 2** and **Alternative 3** would create a regulatory permitting process and therefore would indirectly effect the physical, biological, and ecological environments by allowing for the potential development of an aquaculture industry. Impacts to the physical and biological environments would depend on numerous factors, including where a facility is sited, the potential for fish escapement, types of species allowed for aquaculture, and the business practices of an operation. Preferred alternatives selected in other Actions within this FMP are intended to mitigate or prevent impacts to wild Gulf resources resulting from the permitting of marine aquaculture operations. Such measures include numerous operational, reporting, and recordkeeping requirements (Actions 2 and 8), a requirement to use only native Council managed species for culture (Action 4), case-by-case review of allowable marine aquaculture systems (Action 5), and siting criteria that prohibits facilities from being located in specific areas (Action 6).

Action 2: Application Requirements, Operational Requirements, and Restrictions – This action proposes application and operational requirements and restrictions that would have to be met to receive a permit and operate an aquaculture facility. The Council's preferred alternative (**Preferred Alternative 3**) would require the owner of an aquaculture firm to submit an application for an aquaculture permit at least 120 days prior to the desired date of deployment of any proposed aquaculture system. **Preferred Alternative 3** would also require applicants to submit information to NOAA Fisheries Service when applying for a permit. This would include contact information, the location of the proposed facility, a list of species to be cultured, hatchery information, copies of

other federal permits, a description of proposed aquaculture systems and equipment, documentation for vessels and aircraft, an assurance bond, certification that broodstock used to provide juveniles are from the Gulf of Mexico, certification that no genetically modified organisms or transgenic animals are used or possessed at the aquaculture facility, identification of an aquatic animal health expert, an emergency disaster plan, and other information necessary for issuance and administration of a permit. Additionally, **Preferred Alternative 3** would specify a use it or lose it provision for permits; require documentation from hatcheries that broodstock are marked or tagged; require a health certificate of inspection prior to stocking of fingerlings, require locating devices be maintained on cages; require permittees monitor feed usage; require permittees report interactions/entanglements with protected resources and migratory birds; require permittees comply with monitoring, drug, pesticide, and biologic regulations from other federal agencies; require cultured fish be maintained with head and fins intact; prohibit possession of wild fish, except when harvesting broodstock; and allow NOAA Fisheries Service employees access to facilities.

All of these conditions would have to be met to issue an aquaculture permit or operate an aquaculture facility. The assurance bond would require an operation remove all components of an aquaculture facility, including cultured species, as a condition of the permit; thereby diminishing long-term impacts that could result from structures and cultured organisms remaining in the environment. Certification that native, pathogen free, non-transgenic and non-genetically modified organisms would be used for aquaculture would minimize risks to wild stocks in the event escapement occurs. The "use it or lose it" provision would require permit holders to begin operation of a facility within two years of permit issuance and stock allowable species within 3 years. This will discourage speculative entry. The other requirements of the preferred alternative require other information to aid in enforcement, monitoring, and permit administration. **Preferred Alternative 3** would result in the greatest benefits to the biological and physical environments by providing necessary safeguards for authorizing, monitoring, and enforcing marine aquaculture. These safeguards would assist the Council, NOAA Fisheries Service, and other federal agencies (e.g., EPA, ACOE, and FDA) in preventing, or minimizing to the extent practicable, impacts on water quality, benthic habitat, and wild fish stocks. **Preferred Alternative 3** results in the greatest economic and administrative costs of any of the alternatives considered, but these costs are more than offset by the benefits to the biological, physical, and social environments.

Action 3: Permit Duration – This action proposes permit durations ranging from one year (EFP permit) (**Alternative 1**) to indefinitely (**Alternative 2(d)**). The Council's preferred alternative (**Preferred Alternative 2(b)**) would allow permits to be effective for 10 years, with renewals every five years thereafter. Ten years is considered by many to be the minimum permit duration necessary to attract financial investment at reasonable rates of return. The duration of permit issuance will not have any direct effects on the physical, biological, or ecological environments, but will indirectly effect those environments. Regardless of the length of the permit, NOAA Fisheries Service would regularly review operations for compliance with governing regulations (see Actions 2 and 8). This will ensure operations are operating properly and not causing unacceptable

impacts to the biological or ecological environments. Aquaculture permits would remain valid for the period of time indicated on the permit unless revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements.

Action 4: Species Allowed for Aquaculture and Included in the Aquaculture Fishery Management Unit – This action considers species that would be allowed for aquaculture and included in the Council's Aquaculture Fishery Management Unit. The Council's preferred alternative (**Preferred Alternative 4**) would allow the aquaculture of all Council managed species, except corals and shrimp. Only species native to the Gulf of Mexico would be allowed for culture. The Council would also request NOAA Fisheries Service develop concurrent rulemaking to allow aquaculture of highly migratory species. There is some evidence of the detrimental effects of non-native species on ecosystems. By allowing only native, non-genetically modified and non-transgenic species (see Action 2, Preferred Alternative 3(a)(2)(xii)) for culture, the potential for negative impacts on the biological, physical, and ecological environments will be eliminated or significantly reduced in the event escapement occurs. Other alternatives considered by the Council included not specifying allowable species for aquaculture (**Alternative 1**), only allowing Council managed finfish to be cultured (**Alternative 2**), and allowing all species managed by the Council, except shrimp, corals, and goliath and Nassau grouper (**Alternative 3**). Under all the alternatives in Action 4, the culture of live rock would continue to be regulated by management measures approved in Amendments 2 and 3 to the Coral and Coral Reef FMP.

Action 5: Allowable Marine Aquaculture Systems – This action specifies the types of aquaculture systems that would be allowed for culture. The Council's preferred alternative (**Preferred Alternative 3**) would provide NOAA Fisheries Service authority to evaluate each proposed aquaculture system on a case-by-case basis. Proposed systems would be evaluated based on potential risks to EFH, endangered and threatened species, wild fish stocks, and public health and safety. Applicants would be required to submit documentation, such as computer and oceanographic model results, sufficient to evaluate the ability of an aquaculture system to withstand physical stresses associated with major storm events. The Regional Administrator (RA) could approve or deny a proposed system, or specify conditions for its use. Other alternatives considered include: not specifying allowable systems (**Alternative 1**), and allowing only cages and net pens (**Alternative 2**). Unlike **Alternative 2**, **Preferred Alternative 3** would allow for novel new aquaculture systems to be used as they are developed and provide aquaculture operations with the greatest amount of flexibility when selecting systems for culture of a wide-array of species. **Preferred Alternative 3** would also provide for the most rigorous review of proposed aquaculture systems by NOAA Fisheries Service. For these reasons, **Preferred Alternative 3** would provide the greatest benefits to the physical, biological, social, and economic environments. However, because aquaculture grow-out systems would be reviewed on a case-by-case basis, the preferred alternative would also provide for a greater burden on NOAA Fisheries Service staff.

Action 6: Marine Aquaculture Siting Requirements and Conditions – This action proposes designating sites or areas for marine aquaculture. Proper siting of an aquaculture facility is critical to both an operation's success and the protection of the surrounding physical, biological, and ecological environments. If a facility is not properly sited, there is potential for significant environmental impacts to occur. These could range from habitat degradation of surrounding benthos to changes in water quality (e.g., low dissolved oxygen or increased nutrients). To prevent impacts to the biological and physical environments, Action 6 proposes either developing pre-authorized areas for marine aquaculture (**Alternative 2**) or developing siting criteria for facilities (**Preferred Alternative 3**). The Council also considered not specifying criteria or designating areas where aquaculture may occur (**Alternative 1**). NOAA Fisheries Service would continue to comment on permits issued by the ACOE. **Alternative 2** would establish 13 aquaculture zones throughout the Gulf of Mexico, encompassing approximately 5 percent of the total Gulf EEZ. These zones would allow for more rapid approval of siting locations, but additional site-specific data within a zone may be necessary to determine the suitability of a particular site. The Council's preferred alternative (**Preferred Alternative 3**) would prohibit marine aquaculture in specific areas, such as marine protected areas and HAPCs. **Preferred Alternative 3** would also require facilities to be sited at least 1.6 nm from another facility. The permitted site would also have to be twice as large as the total area encompassed by allowable aquaculture systems to allow for fallowing and rotation of systems. Permit applicants would also have to submit a video survey of benthic habitat at the proposed site. Lastly, NOAA Fisheries Service would be provided authority to conduct case-by-case review of sites based on additional criteria, such as depth and current speeds. The intent of this alternative is to determine siting locations that minimize or eliminate the potential for environmental impacts. The benefits to the biological and physical environments are expected to be greater than **Alternative 1** and **2**. **Alternative 2** would provide the least flexibility to aquaculture firms when siting a facility, while **Alternatives 1** would provide the most. Preferred **Alternative 3** would allow for rigorous case-by-case review of a proposed site by NOAA Fisheries Service.

Action 7: Establish Restricted Access Zones for Marine Aquaculture Facilities – This action proposes establishing restricted access zones around marine aquaculture facilities. **Alternative 1** would not restrict access around a marine aquaculture facility. **Preferred Alternative 2** and **Alternative 3** would restrict access around a marine aquaculture facility. Fishing and transit in or through restricted access zones by fishing vessels would be prohibited. The size of the restricted access zone for **Preferred Alternative 2** would correspond to the coordinates on the approved ACOE permit. For **Alternative 3**, access would be restricted within 100, 500, or 1,640 feet of allowable aquaculture systems. The Council does have authority to create restricted access zones that exclude fishing or fishing vessels. Creation of restricted access zones for aquaculture facilities would potentially provide benefits to investors; particularly in terms of liability issues and protection of investment. Restricting access around a facility may directly affect the physical, biological, and ecological environment by protecting species known to aggregate around structure. Aquaculture facilities have been shown as aggregation sites for many wild species. Additionally, the lack of anchoring or any other interactions

that may occur with the physical environment will benefit the benthos of these restricted sites. Also, preventing access around a facility will reduce the likelihood of damage to a facility, and particularly cages and net pens, thereby reducing any potential impacts associated with fish escapement. Overall, **Preferred Alternative 2** and **Alternative 3** would provide greater benefits to the physical, biological, economic, and ecological environments when compared to **Alternative 1**. However, the social environment may be negatively effected if restricted access zones are perceived as a form of marine protected area that limits where fishermen can catch fish or operate fishing vessels. Siting requirements in Action 6 require NOAA Fisheries Service to evaluate the location of a site relative to important commercial and recreational fishing grounds.

Action 8: Recordkeeping and Reporting – This action proposes recordkeeping and reporting requirements for aquaculture operations. As mentioned in the discussion for Actions 1 and 3 above, these requirements would be part of the conditions for maintaining an aquaculture permit and would allow NOAA Fisheries Service to evaluate the impacts of a marine aquaculture operation. The Council's preferred alternative (**Preferred Alternative 2**) includes numerous recordkeeping and reporting requirements. Requirements would include: submitting an annual report to NOAA Fisheries Service, providing copies of aquaculture permits from other federal agencies, notifying NOAA Fisheries Service of major escapement, pathogen outbreaks, or entanglements and interactions with marine mammals and protected resources, and numerous other recordkeeping and reporting requirements. The intent of these requirements is to minimize or prevent impacts to wild stocks, habitat, and other biological resources. The Council also considered another alternative (**Alternative 1**) that would allow the RA to specify recordkeeping and reporting requirements as specified in EFP regulations. Several other recordkeeping and reporting requirements were also moved to the considered, but rejected section (see Appendix D). **Preferred Alternative 2** requires a more comprehensive list of recordkeeping and reporting requirements than **Alternative 1**, and therefore would benefit the physical and biological environments more. Recordkeeping and reporting is an administrative function and would directly affect the administrative environment. Applicants would incur costs associated with preparing reports and maintaining records and the burden on NOAA Fisheries Service would be increased to review records and reports for compliance with permit conditions. However, these costs are outweighed by the environmental safeguards afforded to the physical and biological environments.

Action 9: Biological Reference Points and Status Determination Criteria – The MSFCMA was written in part to establish the legal framework for managing wild fisheries resources of the United States. Many of the principles and concepts that guide wild stock management under the MSFCMA are either of little utility or are not generally applicable to the management of offshore aquaculture. Despite this lack of conceptual similarity, offshore aquaculture falls within the realm of activities subject to regulatory control under the MSFCMA, and therefore must meet the MSFCMA legal requirements, until additional legal authority specifically suited for management of offshore aquaculture is established. One such legal requirement is establishment of biological reference points (MSY, OY) and status determination criteria (MSST, MFMT). **Alternative 1** would not

establish biological reference points and status determination criteria specific to aquaculture in the Gulf of Mexico. This alternative would not satisfy MSFCMA legal requirements to establish such criteria and reference points. **Preferred Alternative 2** would establish biological reference points and status determination. MSY would be set equivalent to either the total annual production capacity of all aquaculture operations in the Gulf of Mexico EEZ, or set equal to optimum yield. The Council's preferred alternative is to set MSY equal to OY. Optimum yield would be specified as the total yield harvested by all permitted aquaculture operations annually, but could not exceed 16, 32, 36, 64, or 190 million pounds annually. The Council's preferred value for OY is 64 million pounds. These OY proxies are likely substantially less than the yield that can be achieved by aquaculture operations over the long-term, allowing the Council to take a more precautionary approach to management while the aquaculture industry develops and more becomes known about offshore aquaculture. If, however, planned production happens to meet or exceed the OY specified by the Council, then the Council would initiate review of the aquaculture program and OY proxy, and NOAA Fisheries Service would publish a control date, after which entry into the industry may be limited or restricted. **Preferred Alternative 2** also specifies that definitions for overfished and overfishing status used for wild stocks would be used as proxies to assess the effects of aquaculture production on these stocks. Additionally, **Preferred Alternative 2** would cap production by individuals, corporations, or other entities at 5, 10, or 20 percent of OY. This provision is necessary to ensure entities do not obtain an excessive share of the allowable yield. The Council's preferred alternative is to cap production at 20 percent of OY for any individual, corporation, or other entity. **Preferred Alternative 2** is preferable because it specifies status criteria and biological reference points, and it establishes conservative levels of production until more is known about the impacts of aquaculture in the Gulf.

Action 10: Framework Procedures – This action includes three alternatives. Alternative 1 would not specify framework procedures, while Alternatives 2 and 3 would specify framework procedures. Both Alternatives 2 and 3 would rely on an Aquaculture Advisory Panel that would meet annually to provide recommendations to the Council. The authority of the Advisory Panel would be much more limited under Alternative 2; they could only recommend changes to MSY and OY. Under Preferred Alternative 3, the Panel would have broader authority, which would include recommending changes to: MSY and OY; application and operating requirements; recordkeeping and reporting requirements; siting requirements; and allowable aquaculture system requirements.

Under **Alternative 2**, if the Council supported the Panel's recommendations, it could then submit the recommendations to the RA for further consideration. The RA would have the authority to approve or deny the proposed changes to MSY and OY. If the RA approved the changes, then they would be published in the *Federal Register*. **Preferred Alternative 3** is similar to **Alternative 2**, except the Council would need to develop a regulatory amendment for proposed regulatory changes recommended by the Panel. The framework procedures described in **Alternatives 2** and **3** are both intended to allow timelier implementation of regulatory measures necessary to prevent or mitigate impacts to the physical, biological, social, economic, and administrative environments. For both

Alternatives 2 and **3**, several opportunities for public comment and input would be available before any proposed changes to regulatory measures are approved.

Areas of Controversy

Development of a regulatory framework for aquaculture has been controversial. Controversy has stemmed from several factors including, but not limited to:

- Concerns about potential impacts to the environment (e.g., water quality, habitat degradation, etc.) and wild fish stocks (e.g., genetic modification, competition, entanglement, etc.);
- Competing interests between fishermen, fishing communities, and aquaculture operations;
- The exclusive use of public resources for private profit; and,
- Multiple federal agencies having authority to regulate various aspects of offshore marine aquaculture.

Section 6.1 discusses each of these potential impacts and environmental consequences in greater detail and Section 6.16 discusses several unavoidable adverse effects that may result from the proposed actions. The proposed actions and preferred alternatives in this FMP are intended to minimize, to the extent practicable, impacts to the physical, biological, social, and economic environments. Measures to mitigate the impacts mentioned above, which are often the major causes of controversy, are discussed in Section 6.14. These include the exclusive use of non-genetically modified, non-transgenic, native species from the Gulf of Mexico (Actions 2 and 4) for aquaculture, extensive permitting, siting, and recordkeeping requirements (Actions 2, 6, and 8), and the use of reliable offshore aquaculture systems that would be approved on a case-by-case basis (Action 5). Implementation of the Council's Aquaculture FMP will require NOAA Fisheries Service to closely coordinate with other federal agencies when approving, monitoring, and reviewing offshore aquaculture operations.

2.0 Introduction

2.1 Background

Worldwide demand for protein is increasing and fisheries production will not be adequate to supply the needs of the world's population without supplementation through aquaculture (NMFS 1998). In the United States, nearly 80 percent of all seafood consumed is currently imported from other countries, creating a 9.1 billion dollar trade deficit (NOAA 2006). It is estimated by 2025, two million more metric tons of seafood will be needed over and above what is consumed today (NOAA 2004). Commercial wild-capture fisheries will not likely be adequate to meet this growing demand considering commercial fishery production has remained stable or declined in recent decades, due to overfishing and increasingly stringent management restrictions (Tidwell and Allan 2001; NOAA 2004).

Aquaculture is one method to meet current and future demands for seafood. NOAA's Aquaculture Policy defines marine aquaculture as the propagation and rearing of aquatic animals in controlled or selected aquatic environments for any commercial, recreational, or public purpose. Marine aquaculture is analogous to terrestrial farming and involves some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, and protection from predators. Marine aquaculture includes coastal and offshore aquaculture operations as well as saltwater pond and tank systems. Offshore aquaculture refers to marine aquaculture operations located in the exposed open ocean environment of the U.S. Exclusive Economic Zone (EEZ). Floating or submerged net-pens or cages are the most commonly used offshore aquaculture systems. Long-line or vertical-line arrays and artificial or natural hard-substrates may also be used for offshore aquaculture.

The Gulf of Mexico Fishery Management Council has authority to regulate fisheries in the Gulf of Mexico U.S. EEZ, which extends from state territorial waters to 200 miles offshore. Based on a legal opinion by NOAA General Counsel (GC), landings or possession of fish in the EEZ from commercial marine aquaculture production of species managed under fishery management plans (FMPs) constitutes "fishing" as defined in the MSFCMA [See Sec. 3(16)]. Fishing includes activities and operations related to the taking, catching, or harvesting of fish. Any FMP prepared by the Council, or by the Secretary, must include provision specified in Sec 303(a) of the MSFCMA. Additionally, numerous discretionary provisions may be prescribed, including measures, requirements, or conditions and restrictions determined to be necessary and appropriate for the conservation and management of a fishery (Sec. 303(b)(14) of the MSFCMA). In order to allow commercial aquaculture production in the EEZ, the Council is developing an FMP to allow for such activity for managed species and for the regulation of the activity by NOAA Fisheries Service. Scientific activity for marine aquaculture in the EEZ is currently regulated by an Exempted Fishing Permit under 50 CFR 600.745 (see Appendix A).

There has been increasing interest in conducting offshore aquaculture in the Gulf of Mexico in recent years. NOAA Fisheries Service issued one EFP in 1997 for an offshore aquaculture operation off of Texas and since that time has received several additional requests for EFPs. Additionally, the Sea Grant Gulf of Mexico Offshore Aquaculture Consortium (GOAC) was formed in 2000 to create a collaborative, Gulf-wide, university-based interdisciplinary research program to address social, environmental and technological issues associated with offshore aquaculture in the Gulf of Mexico. This program was later terminated because of a lack of federal funding. In 2004, the state of Louisiana created the Platforms for Mariculture Task Force to assess the economic feasibility, environmental impact, and legal/regulatory considerations of utilizing offshore oil and gas platforms for culturing marine organisms in the Gulf of Mexico. In January 2005, the Task Force completed a comprehensive report for the Louisiana legislature summarizing their findings and recommendations. Most recently, the MMS approved an Outer Continental Shelf Alternative Energy and Alternative Use PEIS (http://ocsenergy.anl.gov/documents/). This PEIS and implementing regulations would allow for alternative uses of oil and natural gas platforms, including aquaculture. A proposed rule for this action was published on July 9, 2008.

Despite the growing interest in offshore aquaculture in the Gulf of Mexico, there is currently no regulatory framework to allow commercial aquaculture production in the EEZ. The existing regulatory process is complex and multiple permits must be obtained from several different federal agencies, including the EPA, ACOE, and NOAA Fisheries Service, before a facility can begin operation. To date, all commercial finfish aquaculture facilities in the U.S. have been sited in state territorial waters.

Other impediments to the development of an aquaculture industry are numerous (Cicin-Sain et al. 2001) and include, but are not limited to:

1. Potential environmental impacts associated with aquaculture;
2. Public opposition;
3. User conflicts;
4. Multiple federal agencies with regulatory authority;
5. Economic risks from storm damage;
6. Availability of investment capital; and
7. Competition from foreign markets.

Aquaculture in general has received growing criticism due to past and potential environmental effects associated with aquaculture (Tiersch and Hargreaves 2002). Criticism stems from concerns about the escape of fish, the use of antibiotics, environmental impacts associated with excess feed and wastes, and the spread of disease (Goldburg and Triplett 1997; Naylor et al. 2000, 2001; Tidwell and Allan 2001; Borgotti and Buck 2004). Many of these concerns stem from previous practices in salmon, shrimp, catfish, and other forms of aquaculture that are no longer practiced in North America. For example, vaccination has replaced use of antibiotics and proper siting and feed management has reduced or eliminated concern about wastes. However, open ocean offshore aquaculture may present advantages over that of inshore or terrestrial

aquaculture. For example, offshore aquaculture facilities may allow for more efficient assimilation of wastes and feed in the open ocean environment (Borgotti and Buck 2004). Also, because facilities are located farther offshore, user conflicts may be diminished. Several research studies are currently underway or have been previously conducted in Hawaii, New Hampshire, California, and Puerto Rico to assess the environmental and economic impacts of open ocean aquaculture operations.

The Gulf of Mexico represents an opportune environment for the development of offshore aquaculture, with its broad continental shelf, numerous ports, and existing infrastructure of oil and gas platforms. Development and effective management of offshore aquaculture in the Gulf EEZ will require balancing the benefits of aquaculture (e.g., economic development, expanded protein supplies, and environmental benefits) with environmental and social concerns (DeVoe and Hodges 2002). Responsible marine aquaculture will require sound management, environmental safeguards, and continued research and technological development (Stickney and McVey 2002).

2.2 Management History

National Aquaculture Policy

In 1980, the National Aquaculture Act (NAA) was passed, which established a national aquaculture policy. The NAA "declares that aquaculture has the potential for augmenting existing commercial and recreational fisheries and for producing other renewable resources, thereby assisting the U.S. in meeting its future food needs and contributing to the solution of world resource problems. It is, therefore, in the national interest, and it is the national policy, to encourage the development of aquaculture in the United States."

The NAA required the Secretaries of Commerce, Interior, and Agriculture to prepare a National Aquaculture Development Plan (NADP) within 18 months of enactment. The NADP was to identify potential species for commercial aquaculture development, and to discuss public and private actions and research necessary to carry out the objectives of the Act. The Act also called for creation of the Joint Subcommittee on Aquaculture (JSA) in the Federal Coordinating Council on Science, Engineering, and Technology (Coordinating Council). The JSA's responsibility was to increase the productivity of federal aquaculture research, technology transfer, and economic assistance programs through study and assessment, coordination, planning, collection, and dissemination of information to the Coordinating Council.

The NAA provided an important statement of policy; however, it did not address continuing federal, state, and local barriers to domestic aquaculture. Those barriers were recognized in the NADP of 1984; however, because the administration's policy was that the primary responsibility for the development of commercial aquaculture rested with the private sector, there were no recommendations to increase federal funding.

In 1985, the NAA was reauthorized and two major amendments were enacted. First, the U.S. Department of Agriculture (USDA) was designated as the lead federal agency with

respect to the coordination and dissemination of national aquaculture information. Second, two new studies were commissioned to be reported to Congress. The Secretary of Commerce was required to study and report to Congress whether existing capture fisheries could be adversely affected by competition from commercial aquaculture enterprises; and the Secretary of the Interior was required to study and report to Congress the extent and impacts of the introduction of exotic species into U.S. waters as a result of aquaculture activities.

In April 1988, Commerce's study was completed and presented in the report, Aquaculture and Capture Fisheries: Impacts in U.S. Seafood Markets. The report focused exclusively on the effects of farm raised shrimp and salmon on capture shrimp and salmon fisheries. The report considered potential effects of increased supplies of domestically cultured shrimp and salmon on domestic prices of the two products; however, it did not consider potential adverse impacts of lower domestic market prices on long-run revenues and/or profits of salmon and shrimp fishermen and structural changes in the domestic industries that result from increased domestic aquaculture production.

One of the report's findings was that while domestic demand for shrimp would continue to grow, domestic production of wild shrimp was at its biological limit and domestic cultured shrimp production was limited. Another finding was that while domestic and foreign demand for salmon would continue to grow through the 1990s, U.S. salmon fishermen and salmon farmers were at a competitive disadvantage because both foreign imports of cultured salmon entered the U.S. duty free and U.S. seafood export opportunities were hindered by foreign trade barriers. Thus, it was predicted that foreign producers of cultured salmon would have an increasing share of the domestic market.

Aquaculture policies supporting the aims of the NAA were adopted by NOAA and the Department of Commerce in 1998 and 1999, respectively. In 2004, the U.S. Commission on Ocean Policy made recommendations for the advancement of marine aquaculture as part of its comprehensive review of national ocean policy. Soon after, the Administration included the transmission of offshore aquaculture legislation to Congress in the U.S. Ocean Action Plan prepared in response to the recommendations of the Ocean Commission. The result was the National Offshore Aquaculture Act of 2005, which was transmitted to Congress on June 7, 2005 and introduced by Senators Stevens and Inouye on June 8 as S. 1195. The Senate Commerce Committee, Subcommittee on National Ocean Policy held two hearings on S. 1195 in 2006, but the Congressional session ended before Congress acted on the bill.

The Administration's bill was revised and reintroduced in both the House and the Senate in 2007 as the National Offshore Aquaculture Act of 2007 (Appendix B). The Administration's bill was introduced as HR 2010 in the House on April 24 by Representatives Rahall and Bordallo, and as S. 1609 in the Senate on June 13 by Senators Inouye and Stevens. The Fisheries Subcommittee of the House Natural Resources Committee held a hearing on HR 2010 on July 12, 2007.

The stated purpose of the 2007 bill is to provide the necessary authority to the Secretary of Commerce for the establishment and implementation of a regulatory system for offshore aquaculture in the U.S. EEZ, and for other purposes. Specifically, the bill would authorize the Secretary to establish a process to make areas of the EEZ available to eligible persons for the development and operation of offshore aquaculture facilities, which would include:

- a permitting process;
- 20-year permits for offshore aquaculture, renewable in increments up to 20 years and transferable;
- Department of Interior (DOI) concurrence for aquaculture located on leases or authorized easements or for which a permit has been issued under the Outer Continental Shelf Lands Act (OCSLA) or within 1 miles of any other facility for which a permit has been issued under the OCSLA;
- Clear environmental requirements and safeguards for the marine environment and wild stocks;
- Requirement to conduct an environmental assessment of offshore aquaculture;
- Requirements to consult with other federal agencies, states, fisheries management councils, and the public;
- Criminal and civil penalties for permit violations;
- Anyone is eligible to apply for permits, but non-U.S. residents or companies must have a U.S. agent;
- All existing laws and regulations still apply;
- Exemption from the MSFCMA definition of fishing, but not from other provisions of MSFCMA; and,
- Ability for states to "opt out."

In 2007, NOAA completed and adopted the 10-Year Plan for Marine Aquaculture as and agency-wide policy document. The plan is intended to guide the agency as its works towards establishing marine aquaculture as an integral part of the U.S. seafood industry and as a viable technology for replenishing important commercial and recreational fisheries. The plan provides specific goals for the NOAA Aquaculture Program and an assessment of the challenges the agency will face.

The goals in the 10-Year Plan are:

- Development of a comprehensive regulatory program for environmentally sustainable marine aquaculture;
- Development of commercial aquaculture and replenishment of wild stocks;
- Public understanding of marine aquaculture; and,
- Increased collaboration and cooperation with international partners.

The plan was prepared at the request of the agency's Marine Fisheries Advisory Committee (MAFAC), which advises the Secretary of Commerce on all living marine resource matters that are the responsibility of the DOC.

Also in 2007, U.S. Secretary of Commerce Carlos M. Gutierrez hosted a National Marine Aquaculture Summit. At the Summit, national business leaders, policy experts, government officials, and researchers discussed the opportunities and challenges for marine aquaculture in the United States. Summit participants also made recommendations on how the United States can join the global aquaculture community and accelerate the integration of environmentally, economically, and socially responsible domestic aquaculture into domestic seafood production. Summit participants agreed on the need for national offshore legislation to provide regulatory certainty for those considering investing in federal waters.

Current Regulations Pertaining to Offshore Aquaculture

Currently, the only legal avenue for commercial-scale EEZ finfish aquaculture is under an EFP, as provided at 50 CFR 600.745. However, an EFP is intended to authorize the targeting or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. Specifically, an EFP authorizes activities for limited testing, public display, data collection, exploration, health and safety, environmental cleanup, and/or hazard removal purposes.

NOAA Fisheries Service also has authority under the Fish and Wildlife Coordination Act, the Essential Fish Habitat provisions of the MSFCMA, the Endangered Species Act, and the Marine Mammal Protection Act to comment and provide conservation recommendations on projects permitted, licensed, or funded by other federal agencies. In the case of aquaculture, this may include permits required from the Army Corps of Engineers, Environmental Protection Agency, or other federal agencies.

Gulf of Mexico Fishery Management Council's Aquaculture Policy

In November 2003, the Gulf Council adopted an open ocean aquaculture policy for the Gulf of Mexico EEZ (Appendix C). The policy consists of a variety of guidelines intended to encourage environmentally responsible aquaculture. The Council provided recommendations for six key areas: 1) allowable species, 2) habitat protection, 3) research, 4) location and design, 5) water quality, and 6) health management and disease control. These key areas were considered during the development of this FMP and the Council's recommendations are consistent with the proposed actions and preferred alternatives.

Federal Regulatory Management in the Gulf of Mexico

The history of federal regulatory management of aquaculture in the Gulf of Mexico is brief. In 1994 and 1995, the Gulf and South Atlantic Fishery Management Councils developed and NOAA Fisheries Service implemented a regulatory regime for the culture of live rock (GMFMC 1994, 1995). Wild live rock is coral-reef rubble that has been populated by attached organisms including anemones, sponges, tubeworms, sea squirts, bryozoans, algae, etc., as well as by mobile organisms. Because "wild" live rock is habitat and harvest reached levels exceeding 500,000 pounds annually in the early 1990s,

NOAA Fisheries Service phased out harvest of wild live rock and required persons in the industry to shift to aquaculture of live rock. Aquaculture of live rock consists of placing substrate, such as calcareous rock geologically or otherwise distinguishable from naturally occurring substrate, on permitted bottom sites for several years until attached organisms populate it. Site selection is regulated by certain criteria, as are the operations, including notifying enforcement agents when harvesting or placing of substrate are to occur (see GMFMC 1994, 1995 for details of these criteria). The state or ACOE requires permits for a site. An aquaculture permit and reporting of landings are required by NOAA Fisheries Service. In 2007, there were 35 live rock operations permitted in the southeast. This FMP would not modify existing regulations pertaining to live rock aquaculture.

Currently Operating Offshore Aquaculture Facilities in the U.S.

At present, there are only five operating offshore aquaculture farms in the U.S. or Puerto Rico; however, none of them operate in federal waters and, therefore, do not have an EFP. Furthermore, none of these farms operate in the Gulf of Mexico. These offshore finfish farms are: 1) Hukilau Foods, LLC, which grows Pacific threadfin, also known as moi, in Hawaiian waters; 2) Kona Blue Water Farms, which grows amberjack, also known as kampachi or kahala, in Hawaiian waters; 3) the University of New Hampshire Open Ocean Aquaculture demonstration project that raises halibut, haddock, summer flounder, and cod in New Hampshire waters; 4) Isle of Shoals Mussels, a commercial longline mussel operation started by commercial fishermen in New Hampshire, and 5) Santa Barbara Mariculture, a commercial operation growing mussels on long lines in California waters. One additional operation, Snapperfarm, Inc., which raised cobia and mutton snapper off the coast of Culebra, Puerto Rico, recently ended its operations when the Florida hatchery that supplied its fingerlings was shut down by Marine Farms ASA, the company that managed and owned the cobia hatchery. Sections 5.3.2 and 5.3.3 provide a description of each of these operations. Sections 5.3.4 and 5.3.5 describe other notable aquaculture proposals and operations both within and outside the Gulf of Mexico.

3.0 Purpose and Need

Aquaculture in federal waters is considered "fishing" under the MSFCMA. Fishing includes activities and operations related to the taking, catching, or harvesting of fish (Sec 3 (16) of the MSFCMA). Any FMP prepared by the Council, or by the Secretary, must include provisions specified in Sec 303(a) of the MSFCMA. Additionally, numerous discretionary provisions may be prescribed, including measures, requirements, or conditions and restrictions determined to be necessary and appropriate for the conservation and management of a fishery (Sec. 303(b)(14) of the MSFCMA). While current regulations authorize NOAA Fisheries Service to grant experimental fishing permits (EFPs) for aquaculture in federal waters, such permits are of limited duration and are not intended for the large-scale production of fish. As a result, commercial aquaculture in federal waters is not viable under the current permitting process. A federal fishery management plan (FMP) must therefore be developed to authorize the development of commercial aquaculture operations if aquaculture is to become a viable industry in federal waters.

Congress is currently considering national legislation that would authorize and establish a regulatory framework for offshore aquaculture in federal waters. The current bill, titled the "National Offshore Aquaculture Act" of 2007 (Appendix B), would exempt aquaculture from the MSFMCA definition of "fishing." This bill, if approved, would provide regional fishery management councils a consultative role in the development of an offshore aquaculture industry and would not override other existing laws and regulations intended to conserve and manage wild fish stocks.

The purpose of the Aquaculture FMP is to maximize benefits to the Nation by establishing a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico. The Council initiated this action to provide a programmatic approach to evaluating the impacts of aquaculture proposals in the Gulf of Mexico. This action was also initiated to provide a comprehensive framework for regulating such activities. The FMP and associated Draft Programmatic Environmental Impact Statement (DPEIS) are intended to improve the regulatory process for authorizing current and future offshore aquaculture proposals by providing the Council and NOAA Fisheries Service the information required to review and authorize offshore aquaculture operations.

The primary goal of the Council's proposed aquaculture permitting program is to increase the maximum sustainable yield (MSY) and optimum yield (OY) of federal fisheries in the Gulf of Mexico by supplementing the harvest of wild caught species with cultured product. The objectives of the Aquaculture FMP are:

1. Provide for the development of environmentally sound and economically sustainable aquaculture fishery to increase the potential yields of the fishery, consistent with the goals and objectives of the MSFCMA;

2. To achieve optimum yield, while not adversely affecting wild stocks, protected resources, and essential fish habitat;
3. To conserve and protect essential fish habitat through proper aquaculture facility siting;
4. To obtain necessary data and information for issuing aquaculture permits and monitoring potential impacts of aquaculture operations;
5. To minimize user conflicts among aquaculture permit operations, commercial fishermen, and recreational anglers;
6. To prevent or mitigate to the extent practicable adverse impacts to wild stocks, protected resources, and essential fish habitat resulting from aquaculture activities;
7. To reduce the nation's dependence on imports by supplementing the harvest of domestic fisheries with cultured products to meet growing U.S. consumer demand; and,
8. To promote and facilitate effective enforcement of the aquaculture management program.

Supplementing the harvest of domestic fisheries with cultured product will help the United States meet consumers' growing demand for seafood and may reduce the nation's dependence on seafood imports. Currently, the United States imports over 80 percent of the seafood consumed in the country, and the annual U.S. seafood trade deficit is at an all time high of over $9 billion. One-half of imported seafood products are produced by aquaculture operations. This worldwide trend toward aquaculture production is expected to continue in response to consumers' continued demand for safe, healthy seafood.

The primary goal of federal fishery management, as described in National Standard 1 of the MSFMCA, is to conserve and manage U.S. fisheries to "...prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry." OY is defined as the amount of fish that provides the greatest net benefits to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. While economic and social factors are to be considered in defining the OY of each fishery, OY may not exceed MSY, or the maximum amount of fish that can be removed without impairing the fishery's ability to replace removals through natural growth or replenishment. OY must prevent overfishing and, in the case of an overfished fishery, must provide for rebuilding stock biomass to a level consistent with that which would produce MSY.

The MSY and OY of each Council-managed fishery are currently limited by the fishery's biological potential. However, establishing an aquaculture fishery would increase total yield above and beyond that which can be produced solely from wild stocks. Increasing the seafood production potential of these fisheries will increase their contributions to national, regional, and local economies, and their capacity to meet the Nation's nutritional needs.

The environmental permitting, reporting, recordkeeping and siting conditions associated with the proposed aquaculture program are consistent with the Council's policy to encourage environmentally responsible marine aquaculture. These conditions are intended to ensure the operations of all offshore aquaculture facilities permitted in the Gulf of Mexico are consistent with the MSFCMA National Standards (Section 6.12) and do not compromise Council objectives for wild fisheries. Council objectives for wild fisheries include, but are not limited to:

1. Stabilize or sustain wild stocks over the long term (Spiny Lobster FMP (1982), Coastal Migratory Pelagics FMP (1983), Red Drum FMP Amendment 1 (1987), Reef Fish FMP Amendment 1 (1990));
2. Rebuild overfished stocks (Reef Fish FMP (1984));
3. Conserve and protect fish habitat (Reef Fish FMP (1984), Red Drum FMP Amendment 1 (1987));
4. Minimize impacts on protected species, consistent with the requirements of the Endangered Species Act and Marine Mammal Protection Act (Shrimp FMP (1981)); and,
5. Minimize user conflicts (Stone Crab FMP (1979), Spiny Lobster FMP (1982), Coastal Migratory Pelagics FMP Amendment 1 (1985), Reef Fish FMP Amendment 1 (1990)).

These conditions will assist the Council in promoting the development of a robust commercial aquaculture fishery in the Gulf of Mexico, without threatening the long-term sustainability or viability of wild fisheries or their contributions to the local, regional, and national economies.

4.0 Management Alternatives

The following section provides a discussion of the ten actions considered by the Council for this FMP to provide for regulation of offshore marine aquaculture. Section 6.0 examines the various actions and their alternatives relative to each other within the physical, biological, ecological, economic, social, and administrative environments. Appendix D provides a list of alternatives the Council considered, but rejected and the rationale for not including those alternatives. Appendix E provides a list of economic terms used throughout this section and Sections 6, 7, and 8.

4.1 Action 1: Aquaculture Permit Requirements, Eligibility, and Transferability

Alternative 1: No Action, an Exempted Fishing Permit (EFP) for conducting aquaculture would be required.

Preferred Alternative 2: Require a NOAA Fisheries Service Gulf of Mexico aquaculture permit to authorize a person to do any of the following:

- **Deploy or operate an allowable aquaculture system in the Gulf of Mexico EEZ;**
- **Operate a hatchery in the Gulf of Mexico EEZ for spawning and rearing of allowable aquaculture species;**
- **Harvest or designate hatchery personnel or other entities to harvest wild broodstock of an allowable aquaculture species native to the Gulf of Mexico for aquaculture purposes (Note: additional requirements for harvesting broodstock are specified in Action 8, Preferred Alternative 2(n)).**
- **Possess in the Gulf of Mexico EEZ allowable aquaculture species (see Action 4);**
- **Land allowable aquaculture species cultured in the Gulf of Mexico EEZ at a U.S. port;**
- **Transport an allowable aquaculture species in, from, or to the Gulf of Mexico EEZ for aquaculture purposes; and,**
- **Sell, only at the first point of sale, an allowable aquaculture species cultured in an allowable aquaculture system in the Gulf of Mexico EEZ.**

Require a Gulf aquaculture dealer permit to receive cultured organisms from the Gulf of Mexico EEZ. Requirements for obtaining a dealer permit are specified in 50 CFR 622.4(a)(4)(iii) and 50 CFR 622.4(b). (Reporting requirements are specified in Table 4.1.2)

Landing of allowable aquaculture species cultured in the Gulf of Mexico is prohibited at non-U.S. ports.

In addition, require that any vessel, aircraft, or vehicle authorized for use in aquaculture operations have a copy of the aquaculture permit onboard.

Eligibility for a Gulf of Mexico aquaculture permit is limited to U.S. citizens[1] or permanent resident aliens[2].

A Gulf of Mexico aquaculture permit is:
(a) transferable (Preferred);
(b) not transferable.

Alternative 3: Require separate NOAA Fisheries Service siting and operating permits for conducting offshore marine aquaculture in the Gulf of Mexico EEZ. A siting permit would authorize use of a site for conducting aquaculture. An operating permit would authorize the activities specified in Alternative 2.

Eligibility for Gulf aquaculture operating and siting permits is limited to U.S. citizens[2] or permanent resident aliens[3].

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[1] The Immigration and Nationality Act of 1952, as amended, describes persons who may become U.S. citizens by birth or through naturalization (http://www.uscis.gov/propub/ProPubVAP.jsp?dockey=cb90c19a50729fb47fb0686648558dbe). No corporation, partnership, or association shall be deemed a citizen of the United States unless the controlling interest therein is owned by citizens of the United States, and, in the case of a corporation, unless its chief executive officer, by whatever title, and the chairman of its board of directors are citizens of the United States and unless no more of its directors than a minority of the number necessary to constitute a quorum are noncitizens and the corporation itself is organized under the laws of the United States or of a State, Territory, District, or possession thereof, but in the case of a corporation, association, or partnership operating any aquaculture facility the amount of interest required to be owned by citizens of the United States shall be 75 per centum. The controlling interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to a majority of the stock thereof is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if the majority of the voting power in such corporation is not vested in citizens of the United States; or (c) if through any contract or understanding it is so arranged that the majority of the voting power may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or, (d) if by any other means whatsoever control of the corporation is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

Seventy-five per centum of the interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to 75 per centum of its stock is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if 75 per centum of the voting power in such corporation is not vested in citizens of the United States; or (c) if, through any contract or understanding, it is so arranged that more than 25 per centum of the voting power in such corporation may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or (d) if by any other means whatsoever control of any interest in the corporation in excess of 25 per centum is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

[2] The term "permanent resident alien" refers to a person lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with U.S. immigration laws.

A Gulf of Mexico aquaculture permit is:
(a) transferable;
(b) not transferable.

Discussion and Rationale

Permits are frequently required in fisheries to identify participants, limit entry, and restrict fishing activities. Regulations found at 50 CFR 622.4 summarize various fishery permits and permit requirements for the Gulf of Mexico and South Atlantic. In addition to requiring a permit, regulations include permit application requirements and conditions. Application and operational requirements for aquaculture are summarized in Section 4.2 (Action 2). Additionally, there are numerous recordkeeping and reporting requirements for aquaculture specified in Section 4.8 (Action 8). All of these requirements make it necessary for NOAA Fisheries Service to specify standards and criteria for approving, modifying, or denying permits. Such criteria and standards are identified for approving, modifying, or denying allowable aquaculture systems and siting locations in Actions 5 and 6. For the remainder of the regulations proposed in this FMP, broader criteria and standards are necessary. These permit standards and criteria will be included as part of any proposed rule that may be developed by NOAA Fisheries upon submission of this FMP for approval by the Secretary. Table 4.1.1 provides examples of criteria and standards that could be used for the approval, modification, or denial of aquaculture permits in the Gulf of Mexico

Additionally, during the Council's August 2008 meeting, the Council approved a motion to include a written notice and public comment period before issuance of each aquaculture permit. Such a process will be described in the draft proposed rule deemed by the Council when they take final action on this FMP. This public comment process will be similar to the process specified for EFPs in 50 CFR 600.745. EFP regulations require the Regional Administrator (RA) or Science Center Director (SCD) to publish a notice in the *Federal Register* that includes a brief description of the proposal and NOAA Fisheries intent to issue a permit. The public is then given 15 to 45 days to comment on a proposal, which may include public testimony at Council meetings. After receiving comments on an EFP, the RA or SCD is then required to notify the EFP applicant in writing of the decision to grant or deny an EFP.

Section 6.2 examines the various Action 1 alternatives relative to each other within the biological, physical, ecological, economic, social, and administrative environments. **Alternative 1**, the no action alternative, would maintain status quo regulations, which require an EFP to conduct marine aquaculture and other activities as described in 50 CFR 600.745. An EFP (Appendix A) is not intended to be used for commercial production of fish and is typically issued for no longer than one year, which is generally considered too short of a period for a lending institution to finance construction of most aquaculture facilities. While renewal is permitted under 50 CFR 600.745 (presumably in one-year increments), uncertainty as to whether the permit will be renewed would add to the uncertainty of the business venture and, hence, deter otherwise potential business

ventures. For these reasons, it is unlikely that a viable commercial aquaculture industry could develop in the Gulf of Mexico.

Preferred Alternative 2 would require a NOAA Fisheries Service permit to operate an aquaculture facility in the Gulf of Mexico EEZ. The permit would authorize the deployment and operation of allowable aquaculture systems, the harvest of broodstock, the possession and transport of allowable aquaculture species, the operation of a hatchery in the EEZ, and the landing and sale of cultured species. Stock enhancement or the intentional release of cultured fish into the wild would not be authorized by an aquaculture permit, and therefore would be prohibited. Only U.S citizens or permanent resident aliens would be eligible for an operational permit. Permits would be transferable to U.S. citizens and permanent resident aliens based on the requirements specified in this FMP and subsequent amendments. Before a permit could be transferred, many of the permit requirements specified in this FMP would have to be modified (e.g., application and operational requirements specified in Action 2). ACOE siting permits and EPA NPDES permits are transferable upon modification, so this provision would be similar to existing requirements for other federal agencies that regulate various aspects of offshore aquaculture.

A separate dealer permit would be required to receive cultured organisms from the Gulf of Mexico EEZ. Requirements for obtaining a dealer permit are specified in 50 CFR 622.4(a)(4)(iii) and 50 CFR 622.4(b). Dealer reporting requirements are summarized in Table 4.1.2 and are analogous to existing reporting requirements for dealers receiving Gulf of Mexico reef fish. NOAA Fisheries Service would review applications for an aquaculture permit and determine if the information provided by the applicant is sufficient to issue a permit. Applicants would be required to satisfy application and operational requirements described in Action 2 before receiving a permit. Additionally, NOAA Fisheries Service would ensure appropriate species and reliable grow-out systems were used for aquaculture, as specified in Actions 4 and 5, and evaluate if an aquaculture operation is sited in an appropriate location that would minimize or prevent environmental impacts (see Action 6). The preferred alternative in Action 6 provides NOAA Fisheries Service authority to review sites on a case-by-case basis. If a proposed site is denied for use, the RA would provide a determination and the basis for it, in writing to the applicant. Upon issuance of an aquaculture permit, operations would be required to maintain records and submit reports as described in the Action 8 preferred alternative. An aquaculture permit would remain valid for the period of time indicated on the permit unless it is revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements.

Alternative 3 would require NOAA Fisheries Service to issue separate siting and operating permits. Activities authorized for operation would be the same as those described in **Preferred Alternative 2**. Siting criteria described in Action 6 would be used as the basis for issuing or not issuing a siting permit. These criteria would be in addition to any criteria considered by the ACOE for siting a facility. Requiring a siting permit would be partially duplicative of the ACOE permit process, since the ACOE already issues permits for siting. However, there would be a key difference in these two

processes; under **Alternative 3**, NOAA Fisheries Service would have independent authority when approving or disapproving a proposed site. Currently, NOAA Fisheries Service only reviews and provides comments on permits submitted to the ACOE for review.

Both **Preferred Alternative 2** and **Alternative 3** would allow for the development of a commercial aquaculture industry in the Gulf EEZ. Both alternatives would also restrict eligibility to U.S. citizens or permanent resident aliens. Permits would be transferable based on the Council's preferred alternative in **Alternative 2**. In addition to the permit(s) NOAA Fisheries would require, the following permits, authorizations, and/or regulatory requirements from other federal agencies may be required:

1. Army Corps of Engineers Section 10 siting permit (Rivers and Harbors Act, 33 U.S.C. §403;
2. Environmental Protection Agency National Pollutant Discharge Elimination System permit (Clean Water Act, 13 U.S.C. §1342, 1343);
3. Minerals Management Service Alternative Use Rights-of-Use and Easements (Outer Continental Shelf Lands Act, 43 U.S.C. §1337; proposed rule - see 73 FR 39376);
4. U.S. Coast Guard structure marking requirements (Rivers and Harbors Act, 14 U.S.C. §85);
5. U.S. Fish and Wildlife Service requirements on importation of fish (Lacey Act, 18 U.S.C. §42);
6. Animal and Plant Health Inspection Service response to animal disease outbreaks (Animal Health Protection Act, 7 U.S.C. §8301 *et. seq.*);
7. U.S. Fish and Wildlife Service consultations on permitted activities affecting fish and wildlife, including endangered species (Fish and Wildlife Coordination Act, 16 U.S.C. §661 *et. seq*. and 16 U.S.C. §1536); and,
8. National Ocean Service regulations in national marine sanctuaries (National Marine Sanctuaries Act, 16 U.S.C. §1431 *et. seq.*).

Establishing a permitting process for offshore aquaculture would allow the Council to better achieve National Standard 1 and the primary goal of this FMP, which is: "to maximize benefits to the Nation by establishing a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico." The MSFCMA mandates that NOAA Fisheries Service conserve and manage U.S. fisheries to "...prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry". The MSY and OY of each Council-managed fishery are currently limited by the fishery's biological potential. Adding an aquaculture component would increase the total yields these fisheries could produce, thereby contributing to national, regional, and local economies, and their capacity to meet the Nation's nutritional needs.

Table 4.1.1 – Examples of criteria and standards that could be used for the approval, denial, or transfer of aquaculture permits in the Gulf of Mexico.

Application for permits Application forms for all permits are available from the RA. Completed application forms and all required supporting documents must be submitted to the RA at least 120 days prior to the date on which the applicant desires to have the permit made effective.
Change in application information The aquaculture permittee must notify the RA within 30 days after any change in the application information specified in this section, unless otherwise specified. The permit is void if any change in the information is not reported within the timeframe specified.
Fees Unless otherwise specified, a fee is charged for each aquaculture permit application submitted under this section and for each request for transfer or replacement of such permit. The amount of each fee is calculated in accordance with the procedures of the NOAA Finance Handbook, available from the RA, for determining the administrative costs of each special product or service. The fee may not exceed costs specified with each application or transfer form. The appropriate fee must accompany each application and request for transfer.
Initial Issuance (1) The RA will issue an aquaculture permit at any time to an applicant if the application is complete and the specific requirements for the requested permit have been met. An application is considered complete when the RA determines that all requested forms, information, and documentation necessary to make a determination have been received. (2) Upon receipt of an incomplete application, the RA will notify the applicant of the deficiency. If the applicant fails to correct the deficiency within 60 days of the date of the RA's letter of notification, the application will be considered abandoned.
Renewal (1) Aquaculture permits. Unless specified otherwise, a person, business, corporation, or other entity who has been issued a permit, license, or endorsement under this section must renew such permit, license, or endorsement 10 years after initial issuance. The RA will mail an aquaculture permittee whose permit is expiring an application for renewal approximately 6 months prior to the expiration date. A vessel owner or dealer who does not receive a renewal application from the RA 120 days prior to the expiration date of the aquaculture permit must contact the RA and request a renewal application. The applicant must submit a completed renewal application form and all required supporting documents to the RA prior to the applicable deadline for renewal of the permit, and at least 120 days prior to the date on which the applicant desires to have the permit made effective. If the RA receives an incomplete application, the RA will notify the applicant of the deficiency. If the applicant fails to correct the deficiency within 60 days of the date of the RA's letter of notification, the application will be considered abandoned. An aquaculture permit that is not renewed within the applicable deadline will not be issued.
Display An aquaculture permit issued under this section must be carried on board any vessel, aircraft, or vehicle used to transport in, from, or to the Gulf of Mexico EEZ cultured organisms, operate in or transit through an aquaculture facility restricted access zone, and harvest broodstock. The operator of an aquaculture facility, vessel, aircraft, or vehicle must present the aquaculture permit and personal identification that includes a picture (driver's license, passport, etc.) for inspection upon the request of an authorized officer. An aquaculture permit must also be on the premises of any facility or structure (e.g., oil and gas platform, barge, etc.) used to support offshore aquaculture operations.
Sanctions and Denials (1) An aquaculture permit issued pursuant to this section may be revoked, suspended, or modified, and a permit application may be denied, in accordance with the procedures governing enforcement-related permit sanctions and denials found at subpart D of 15 CFR part 904. (2) Grounds for denial of an aquaculture permit include: (A) The applicant has failed to disclose material information or has made false statements to any material fact, in connection with the aquaculture permit application; or (B) based on the best scientific information available, issuance of the permit would detrimentally affect the well-being of wild fish stocks, marine mammals, threatened or endangered species, essential fish habitat, public health, or safety; or (C) activities proposed to be conducted under the aquaculture permit are inconsistent with the aquaculture regulations specified in this section, the management objectives of the Aquaculture FMP, or other applicable law.
Alteration An aquaculture permit that is altered, erased, or mutilated is invalid.
Replacement A replacement aquaculture permit may be issued. An application for a replacement permit, license, or endorsement is not considered a new application.
Transfer Transfer forms are available from the RA. Aquaculture permits can be transferred to any U.S. citizen or permanent resident alien. To request the transfer of an aquaculture permit, complete the transfer form and return it to the RA.

Table 4.1.2 Reporting requirements for dealers receiving cultured species from the Gulf of Mexico EEZ.

Gulf aquaculture. A person who purchases species cultured from a permitted aquaculture facility in the Gulf of Mexico EEZ must maintain records and submit information as follows: (i) A dealer must maintain at his/her principal place of business a record of cultured species that he/she receives. The record must contain the name of each aquaculture permittee from which cultured species were received and the date, species, and quantity of each receipt. A dealer must retain such record for at least 1 year after receipt date and must provide such record for inspection upon the request of an authorized officer or the SRD. (ii) A dealer must provide information from his/her record of cultured species received, including the total poundage of each species received during the month and average monthly price paid for each species by market size. This information must be provided on forms available from the SRD and must be submitted to the SRD at monthly intervals, postmarked not later than 5 days after the end of the month. Reporting frequency and reporting deadlines may be modified upon notification by the SRD. If no cultured species were received during a calendar month, a report so stating must be submitted on one of the forms, postmarked not later than 5 days after the end of the month. (iii) The operator of a car or truck that is used to pick up cultured species harvested from the Gulf of Mexico must maintain a record containing the name of each aquaculture permittee from which cultured species on the car or truck have been received. The vehicle operator must provide such record for inspection upon the request of an authorized officer.

The actions and preferred alternatives in this FMP associated with the proposed aquaculture program are consistent with the Council's policy to encourage environmentally responsible marine aquaculture. These conditions are intended to ensure the operations of all offshore aquaculture facilities permitted in the Gulf of Mexico are consistent with the MSFCMA National Standards (Section 6.10) and do not compromise Council objectives for wild fisheries (see Section 3.0). Additionally, these conditions will assist the Council in promoting the development of a robust commercial aquaculture industry in the Gulf of Mexico, without threatening the long-term sustainability and viability of wild fisheries and their contributions to the local, regional, and national economies. This additional production of seafood may also assist the Council in preventing overfishing, by decreasing fishing pressure on some wild stocks.

Summary Comparison of Physical, Biological, and Ecological Consequences

Section 6.1 provides a detailed description of the potential impacts associated with marine aquaculture on the physical, biological, and ecological environments. These include, but are not limited to:

1) Modification of wild stock genetic diversity;
2) Transmission of pathogens to wild stocks;
3) Modification of benthic habitat from discharged effluents, such as solids and dissolved nutrients;
4) Reductions in water quality;
5) Escaped fish competing with wild fish;
6) Entanglement of wildlife with aquaculture structures; and,
7) Use of wild bait fishes for feed.

Action 1, by itself would not have any direct effects on the physical, biological, and ecological environments of the Gulf. However, Action 1 will indirectly affect these environments. **Alternative 1** would restrict the development of offshore aquaculture in the Gulf and therefore would result in no impacts to the physical, biological, and ecological environments unless an aquaculture facility was able to successfully develop an operation under the current EFP permitting process. Only one EFP permit has ever been issued by NOAA Fisheries Service to conduct marine aquaculture in the Gulf of Mexico (see Section 5.3.4). Currently, no aquaculture operations have an EFP permit to conduct aquaculture in the EEZ and there is no expectation that aquaculture operations could develop a successful business over the long-term under the EFP permitting process. Therefore, the potential impacts described in Section 6.1 would not occur.

Preferred Alternative 2 and **Alternative 3** would create a permit process and therefore would indirectly affect the physical, biological, and ecological environments by allowing the development of an aquaculture industry. Impacts to the physical and biological environments, as described in Section 6.1, would depend on numerous factors, including where a facility is sited, the potential for fish escapement, and the procedures and practices of an operation. Permitting marine aquaculture in the Gulf of Mexico (**Preferred Alternative 2** and **Alternative 3**) would have greater impacts than the status quo (**Alternative 1**). However, measures considered in this FMP are intended to mitigate or prevent impacts to wild resources resulting from marine aquaculture. Such measures include facility operation, reporting, and recordkeeping requirements (see Actions 2 and 8) and use of only native, non-transgenic, non-genetically modified species for culture (see Action 4). Other limitations include where facilities may be sited, and case-by-case review of allowable marine aquaculture systems (see Actions 5 and 6).

Conducting aquaculture offshore versus nearshore is desirable for two main reasons: 1) First, there are fewer competing uses and users further from shore, and 2) second, the deeper water and stronger water flows make it a more desirable location for mitigating environmental impacts, such as benthic and nutrient loading. As discussed in Section 6.1.3, the EPA has authority to set water quality standards for pollution discharge and has developed regulations for concentrated aquatic animal production in the United States (see Appendix H). The two greatest perceived risks to water quality and the benthic environment resulting from offshore aquaculture are increased organic loading and nutrient enrichment. Recent environmental studies off Puerto Rico and New Hampshire indicate nutrient and organic loading tends to be localized around aquaculture cages; however, nutrient and organic loading was not significantly different from nearby control sites without aquaculture facilities (Alston et al. 2005; Rapp 2006; UNH Marine Aquaculture Center 2006).

Other potential physical and biological impacts resulting from aquaculture include escapement of fish, competition with wild stocks, spread of pathogens, benthic habitat damage, increased use of bait fishes for aquaculture fish meal, and entanglement of wildlife. Non-native and genetically modified species can pose a threat to both wild stocks and biodiversity by competing for food and habitat and changing community and genetic structure. To address this risk, the Council is prohibiting the use of non-native,

genetically modified, and transgenic species for aquaculture in the Gulf of Mexico (see Sections 4.2 and 4.4). The potential for the spread of pathogens exists because most offshore aquaculture is anticipated to be conducted in net pens or cages that allow water to move freely through these grow-out systems. Pathogen outbreaks have been observed in farmed fish (see Section 6.1.2). However, if farmed fish are stocked as pathogen-free juveniles there is no scientific evidence to suggest disease transmission from farmed aquatic organisms to wild stocks or from farmed aquatic organisms escaping and intermingling with wild stocks (see Section 6.1.2). The Council has addressed this potential risk by requiring certification that cultured organisms are pathogen-free prior to stocking. The Council has also provided NOAA Fisheries Service, in coordination with the USDA, authority to remove cultured organisms infected with a reportable pathogen if it is determined that they pose a threat to the health of wild aquatic organisms (see Section 4.8). The Council's preferred alternative in Action 6 would also require facilities to be sited at least 1.6 nautical miles from one another to minimize transmission of pathogens among and between facilities. Section 4.8 also includes various recordkeeping and reporting requirements if pathogens are discovered and pathogen outbreaks occur (see Section 4.8).

Benthic degradation may occur through increased organic loading or direct damage from aquaculture facility structures. To prevent or minimize habitat degradation, facilities would be properly sited away from essential fish habitat and other ecologically important areas. Aquaculture operations would be required to meet EPA water quality standards. Additionally, this FMP would provide NOAA Fisheries Service authority to evaluate potential aquaculture grow-out systems and sites on a case-by-case basis (see Section 4.5 and 4.6) to ensure grow-out systems are reliable and operations are sited in areas that minimize impacts to benthic habitat. Aquaculture facilities would be prevented from being sited in particular sensitive areas, such as marine reserves, HAPCs, marine protected areas, coral areas, etc. (see Section 4.6). Permit applicants would also be required to provide NOAA Fisheries Service with video of benthic habitat at the proposed site before a site is approved for use.

Lastly, potential concerns have been expressed about the use of prey species as bait. Worldwide approximately 25-30 million tons of fish are reduced to fish meal and fish oil annually (Tacon et al. 2006). Fish meal and fish oil are used in a variety of feeds for aquaculture and agriculture (e.g., poultry). The amount of fish reduced to fish meal has been relatively stable over the past few decades. In 2003, the United States accounted for 5.6 percent of the worldwide fishmeal production and 9.6 percent of the worldwide fish oil production (Tacon et al. 2006). In the United States, Gulf and Atlantic menhaden represent the greatest source of fish meal production. Neither of these species is overfished or undergoing overfishing and both are managed by states and interstate compacts. These species are regularly assessed every four to five years by NOAA Fisheries Service. If demand for these species increases due to development of an aquaculture industry in the Gulf of Mexico and for livestock feeds, then stock assessments will be used to assess the status of each of these populations. Necessary management adjustments could then be made by state agencies and interstate fishery

commissions to protect these species if fishing mortality is too high or stock biomass has dropped below threshold levels.

For more information on the above described physical and biological impacts see Section 6.1.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1, the status quo alternative, would require any entity seeking to engage in long-term, commercial offshore aquaculture operations that involve species managed under an FMP or activities in violation of fishery regulations in the Gulf of Mexico EEZ to apply for an EFP. Under **Alternatives 2** and **3**, the same entity would not have to apply for an EFP, and instead, would be required to apply for either a single operational permit (**Preferred Alternative 2**) or separate operational and siting permits (**Alternative 3**).

The purpose of an EFP is inconsistent with long-term, large scale operations because it authorizes limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. The purpose of the proposed Gulf aquaculture permit under **Preferred Alternative 2** and dual permits of **Alternative 3** would be consistent with long-term, large scale operations.

Those eligible for an EFP are the owners of U.S. vessels, and an EFP is issued to a vessel (or vessels). Under **Preferred Alternative 2** and **Alternative 3**, eligibility for an offshore aquaculture permit would be limited to U.S. citizens and permanent resident aliens, and the permit would be required to operate an offshore aquaculture facility. The term "permanent resident alien" refers to a person lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with U.S. immigration laws. It is expected that the eligibility requirements for the three alternatives would be essentially the same.

An EFP issued under 50 CFR 600.745(b) is not transferable or assignable and is valid only for the vessel(s) for which it is issued. Moreover, it authorizes the permit holder only temporary use of a particular site for permitted project operations. Under **Preferred Alternative 2** and **Alternative 3**, an offshore aquaculture permit would be transferable, which would contribute to the establishment of an offshore aquaculture permit as a marketable asset available for purchase or lease by a U.S. citizen or permanent resident alien. As such, in theory it would give the holder of the permit the incentive to use the permit strategically because a decline in the economic value of the permit would represent a personal economic loss. However, **Preferred Alternative 2** and **Alternative 3** would also contribute to privatization of public waters by giving the permit(s) holder exclusive use of a particular site within the Gulf EEZ for purposes of offshore aquaculture, which would prohibit others from benefiting from use of the site for the same and/or other purposes.

Alternative 3 separates the single Gulf aquaculture permit into two permits: one for siting and the other for operation. This alternative would create two transferable permits. **Alternative 3** would have higher transaction costs than **Preferred Alternative 2** as it would involve one more transaction in order to site and operate an aquaculture facility. The maximum amount that can be charged for a permit under the MSFCMA is limited to administrative costs associated with issuing the permit, and it is expected that any fee for the single permit under **Preferred Alternative 2** would be equal to the combined cost of the two permits under **Alternative 3**.

Under **Alternative 1**, an entity who received cultured organisms from the Gulf EEZ would not be required to have an annual dealer permit if it received cultured individuals of species. However, under **Preferred Alternative 2** and **Alternative 3** the same entity would be required to apply for and be issued an annual dealer permit (OMB Control Number 0648-0205). On average, it takes about 20 minutes to complete an annual dealer permit, and the annual cost is $50 for the first fishery and $12.50 for any additional fishery.

Under the status quo alternative, an EFP or letter of acknowledgement (LOA) would be required by NMFS to operate a hatchery within the EEZ for spawning and rearing of species native to the Gulf of Mexico. To date, all hatchery operations have been land-based, and the harvest of species native to the Gulf for purposes of aquaculture broodstock has occurred predominantly for scientific purposes. An LOA is sufficient for such scientific activities. However, a LOA is only appropriate for scientific research activities conducted onboard a scientific research vessel (50 CFR 600.10, 600.745). Under **Preferred Alternative 2** and **Alternative 3**, neither an EFP nor LOA would be required to establish a hatchery in the Gulf EEZ. Instead, under **Preferred Alternative 2** and **Alternative 3**, an entity would be required to apply for and be issued a permit(s) in order to establish a hatchery in the Gulf EEZ. Potential economic benefits to an offshore aquaculture operation of locating a hatchery in the EEZ would derive mostly from lower transportation costs associated with moving fingerlings from the hatchery to the grow-out site.

Preferred Alternative 2 or **Alternative 3** would not eliminate the existing need for the applicant to receive any other Federal, State or Local authorizations as required by law.

Certain fisheries have mandatory reporting requirements. Under **Alternative 1**, a dealer who would receive cultured organisms from the Gulf EEZ would not be required to have an annual dealer permit and would not be required to report purchases of these products. Under **Preferred Alternative 2** and **Alternative 3**, a dealer would have to have an annual dealer permit and would have to report purchases of these products.

The administrative consequences of **Preferred Alternative 2** would likely be less than those of **Alternative 3** simply for the reason that the number of permits applied for and issued under **Alternative 3** would be double the number of permits under **Preferred Alternative 2**. Additionally, demands on the agency's administrative resources are expected to directly correspond with the number of permit applied for and issued.

Preferred Alternative 2 and **Alternative 3** would both require public notice and a written comment period prior to issuance of an aquaculture permit(s). Such a requirement could be similar to existing public comment opportunities specified for EFPs. NOAA Fisheries Service will need to describe in the proposed rule how the public would be notified of a decision to issue an aquaculture permit. Such a process is expected to benefit the social environment by affording the public an opportunity to comment on aquaculture proposals. Noticing proposed actions in the *Federal Register* and publishing Fishery Bulletins and other materials to notify the public about a proposed action will require additional staff time, thereby increasing the burden on the administrative environment.

4.2 Action 2: Application Requirements, Operational Requirements, and Restrictions

Alternative 1: Do not specify application requirements, operational requirements, or restrictions for aquaculture in the Gulf EEZ.

Alternative 2: Status quo. Require the Exempted Fishing Permit application and issuance requirements as specified at 50 CFR 600.745(b).

Preferred Alternative 3: Establish the following application requirements, operational requirements, and restrictions:

- **(a) Application Requirements**
  - **(1) A completed application for an aquaculture permit must be submitted by the owner of the aquaculture facility (in the case of a corporation, an officer or shareholder; in the case of a partnership, a general partner) on a form available from NOAA Fisheries Service at least 120 days prior to the desired date of deployment of any proposed aquaculture system.**
  - **(2) An applicant must provide all information indicated on the application form, including, but not limited to:**
    - **i. Applicant's name, address, and telephone number.**
    - **ii. Business name, address, telephone number, and date the business was formed.**
    - **iii. Description of the exact location (i.e., GPS coordinates) and dimensions of the proposed aquaculture facility, including a site map to scale.**
    - **iv. A list of allowable aquaculture species to be cultured and the estimated total annual poundage of each species to be harvested from the aquaculture facility.**
    - **v. Name and address or specific location of each hatchery that would provide juvenile organisms for grow-out in allowable aquaculture systems located within the Gulf of Mexico EEZ and a copy of any relevant, valid state or federal aquaculture permits issued to the hatchery. Only hatcheries located in the U.S. may provide juvenile**

organisms for grow-out in allowable aquaculture systems located within the Gulf EEZ.

vi. **A copy of all currently valid federal permits (i.e., ACOE, USCG, FDA, MMS, and EPA) applicable to the proposed aquaculture site, facilities, or operations.**

vii. **A description of the allowable aquaculture systems to be used, including, but not limited to the size and dimensions of allowable aquaculture systems, a description of the mooring system(s) used to secure the allowable aquaculture system(s), and documentation of the allowable aquaculture system's ability to withstand physical stress, such as hurricanes, wave energy, etc.**

viii. **A description of the equipment and methods necessary for feeding, transporting, maintaining, and removing cultured species from allowable aquaculture systems.**

ix. **A description of endangered and threatened species, essential fish habitat, wild marine fishes, wild invertebrates, and migratory birds present at the proposed aquaculture site, including their abundance and distribution.**

x. **A copy of the valid USCG certificate of documentation or, if not documented, a copy of the valid state registration certificate for each vessel involved in the aquaculture operation; documentation or identification numbers for any aircraft involved; and names, addresses, and phone numbers of the operators of such vessels or aircraft;**

xi. **Documentation certifying the applicant has posted an assurance bond sufficient to cover the costs of removal of all components of the aquaculture facility, including cultured organisms remaining in allowable aquaculture systems, from the Gulf of Mexico EEZ.**

xii. **Certification by the applicant that all broodstock used to provide juveniles to the aquaculture facility were originally harvested from U.S. waters of the Gulf of Mexico, were from the same population or sub-population of fish or invertebrates (based on best available science) where the aquaculture facility is located, and that each individual broodstock was marked or tagged at the hatchery to allow for identification of those individuals used in spawning.**

xiii. **Certification by the applicant that no genetically modified organisms (GMO) or transgenic organisms are used or possessed in the aquaculture facility. A GMO is an organism that has been transformed by the insertion of one or more transgenes (an isolated gene sequence often, but not always, derived from a different species than that**

of the recipient). A transgenic animal is an animal whose genome contains a nucleotide sequence that has been intentionally modified in vitro, and the progeny of such an animal. NOAA Fisheries may sample cultured organisms to determine genetic lineage and may order the removal of all cultured organisms upon a determination that GMOs or transgenic organisms were used or possessed at an aquaculture facility.

xiv. Identification of an aquatic animal health expert that provides services to the aquaculture facility. An aquatic animal health expert is defined as a licensed doctor of veterinary medicine or is certified by the American Fisheries Society, Fish Health Section, as a "Fish Pathologist" or "Fish Health Inspector".

xv. A copy of an emergency disaster plan that includes, but is not limited to, procedures for preparing allowable aquaculture systems, offshore aquaculture equipment, and cultured organisms in the event of a disaster (e.g., hurricane, tsunami, harmful algal bloom, chemical or oil spill, etc).

xvi. Any other information concerning the aquaculture facility or its operations or equipment, as specified on the application form.

xvii. Any other information that may be necessary for the issuance or administration of the permit, as specified on the application form.

(b) Operational Requirements and Restrictions

(1) At least 25 percent of allowable aquaculture systems approved for use at the time of permit issuance must be placed in the water at the permitted aquaculture site within 2 years of issuance of the aquaculture permit, and allowable species for aquaculture must be placed in the permitted aquaculture system(s) within 3 years of issuance of the permit. A permittee may request a one-year extension to the above time schedules in the event of a catastrophe (e.g., hurricane). Requests must be made in writing and sent to the RA. The RA will approve or deny the request after determining if catastrophic conditions exist and whether or not the permittee was affected by the catastrophic conditions. The RA shall provide the determination and the basis for it, in writing to the permittee.

(2) The permittee must obtain documentation from the hatchery indicating broodstock have been individually marked or tagged (e.g.,via a Passive Integrated Transponder (PIT), coded wire, dart, or internal anchor tag) to allow for identification of those individuals used in spawning. The

permittee must also obtain from the hatchery and provide NOAA Fisheries Service with a fin clip, or other genetic material, from each individual brood animal based upon procedures specified by NOAA Fisheries Service.

(3) Prior to stocking cultured animals in an allowable aquaculture system in the Gulf EEZ, the permittee must provide NOAA Fisheries Service a copy of a health certificate (suggested form is USDA/APHIS VS 17-141, OMB 0579-0278) signed by an aquatic animal health expert (as defined in (a)(2)(xiv)) certifying cultured animals were inspected and determined to be free of OIE-reportable pathogens (or additional pathogens that are subsequently identified as reportable pathogens in the National Aquatic Animal Health Plan as implemented by the USDA, Commerce, and Interior).

(4) Permittee must maintain a minimum of one properly functioning electronic locating device (e.g., GPS device, pinger with radio signal, EPIRB) on each net pen or cage used for aquaculture.

(5) The permittee must conduct feed monitoring and management practices in compliance with Environmental Protection Agency regulations at 40 CFR 451.21 (see also Appendix H).

(6) Permittee must comply with all applicable monitoring and reporting requirements specified in their valid Department of Army site permit and valid Environmental Protection Agency National Pollutant Discharge Elimination System permit.

(7) A permittee must inspect allowable aquaculture systems, including mooring and anchor lines, for entanglements or interactions with marine mammals, protected species, or migratory birds. If entanglements or interactions are observed, they must be reported as specified in Action 8, Preferred Alternative 2(c)(2).

(8) Use of drugs, pesticides, and biologics must comply with all applicable Food and Drug Administration, EPA, and U.S. Department of Agriculture regulations (Food, Drug and Cosmetic Act, 21 USC 321; Clean Water Act, 40 CFR 122; 9 CFR 101-124; 21 CFR 500-599; and 40 CFR 150-189)

(9) Cultured fish must be maintained with heads and fins intact until landed on shore.

(10) Possession of any wild fish or invertebrates at or within the boundaries of an aquaculture facilities restricted access zone is prohibited unless a hatchery is operating within the facilities' restricted access zone (see Action 7 and Alternative 2(n) in Action 8).

(11) Possession of any wild fish or invertebrates aboard an aquaculture operation's transport or service vessels, vehicles,

or aircraft is prohibited, except when harvesting broodstock as authorized by NOAA Fisheries Service.

(12) A permittee must provide NOAA Fisheries Service employees access to permitted aquaculture sites, facilities, and equipment to conduct inspections necessary to determine compliance with the applicable regulations (e.g., sample cultured organism to determine genetic lineage) relating to aquaculture in the Gulf EEZ. NOAA Fisheries Service shall conduct at least annual inspections of permitted aquaculture facilities.

Discussion and Rationale

Action 3 considers three alternatives for specifying permit requirements and restrictions. **Alternative 1** would not specify any requirements or restrictions when issuing a permit to an aquaculture facility. **Alternative 2** would require a facility to meet the requirements set forth in an EFP. **Preferred Alternative 3** would specify numerous application and operational requirements for permit issuance and aquaculture facility operation. Additional application and operational requirements not included in **Preferred Alternative 3** were considered by the Council, but eventually rejected (see Appendix D). Key application requirements for **Preferred Alternative 3** would include general contact information, descriptions of allowable aquaculture systems and equipment, site coordinates, documentation of an assurance bond, an emergency disaster plan, identification of an aquatic animal health expert, certification that broodstock used for juveniles were harvested from waters of the Gulf of Mexico, and certification that no genetically modified or transgenic species will be used for culture. Key operational requirements for **Preferred Alternative 3** include: a use it or lose it provision, documentation that broodstock are marked or tagged, certification that cultured animals are pathogen free prior to stocking, and various monitoring requirements. Requirements also include the use of drugs, biologics, and pesticides in compliance with regulations of other federal agencies, and maintenance of one locating device on each allowable aquaculture system.

Specifying application requirements will allow managers to access the impacts of a proposed facility by obtaining necessary information about the operation prior to permitting. Operational requirements will allow managers to practicably prevent, or minimize to the extent practicable, negative impacts on the physical or biological environments that may result from an aquaculture facility.

Summary Comparison of Physical, Biological, and Ecological Consequences

The alternatives specified in this section create (or do not create) requirements which must be met by an aquaculture facility. **Alternative 1** does not specify any application or operational requirements and would therefore have the most potential for causing negative effects on the physical, biological, and ecological environment. Not establishing application or operational requirements, which must be adhered to, would allow facilities to engage in activities that may be detrimental to the physical, biological, and ecological environments. **Alternative 2** maintains the use of the requirements and conditions

specified for an EFP. However, these requirements may vary from permit to permit because the RA can set terms and conditions for the permit and there is a general lack of specificity provided in the EFP regulations. For these reasons, **Alternative 2** may not afford adequate protection to the physical, biological, and ecological environments. **Preferred Alternative 3**, in contrast, sets forth specific application and operational requirements intended to prevent or minimize impacts on the physical, biological, and ecological environments. These requirements, and the recordkeeping and reporting requirements in Action 8, are intended to ensure the operations of all offshore aquaculture facilities permitted in the Gulf of Mexico are consistent with the MSFCMA National Standards (Section 6.12) and do not compromise Council objectives for wild fisheries.

All of the alternatives in Action 2 would indirectly affect the physical and biological environments. **Alternative 1** would not specify permit conditions and therefore would provide no protection to the physical or biological environments. Operations could conduct their businesses without any safeguards to prevent or mitigate environmental impacts associated with their operation. As a result, genetic modification of cultured species or use of transgenic species could occur and there could be increased risks of pathogens spreading to offshore cages and aquaculture facilities. Other operational issues include the inability to require removal of structures upon termination of an operation, little or no planning in the event of a disaster, and no or inadequate monitoring of physical, biological, and ecological impacts.

Alternative 2 would require permit applicants and permit holders meet the requirements specified for an EFP (see 50 CFR 600.745). EFP regulations require an applicant to submit the following information: Date of the application, relevant contact information, species expected to be harvested under the EFP, amount(s) of such harvest necessary to conduct the exempted fishing, arrangements for disposition of all regulated species harvested under the EFP, anticipated impacts on marine mammals or endangered species, and a statement of the purposes and goals of the exempted fishery for which an EFP is needed, including justification for issuance of the EFP. Additionally, the EFP applicant must provide documentation for each vessel to be covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. The RA or SCD, as appropriate, may request additional information for determining issuance of an EFP. **Alternative 2** would afford more protection to the physical and biological environments than **Alternative 1**, but issuance of a permit would be based partly on information specified at the discretion of the RA or SCD.

The application and operational requirements specified in **Preferred Alternative 3** are designed specifically to minimize impacts on the physical, biological, ecological, and administrative environments and would therefore be of a greater benefit to these environments than either **Alternative 1** or **2**. Requirements under **Preferred Alternative 3** would give NOAA Fisheries the best scientific information available with which to evaluate proposed and permitted aquaculture operations (National Standard 2). In addition, fishing permits would be issued to those applicants most likely to ensure the most efficient and economical use of fishery resources (National Standards 5 and 7).

Alternative 3(a)(1) requires applicants to submit an application for an aquaculture permit at least 120 days prior to the desired date of deployment of any proposed aquaculture system. Additional time for processing a permit may be necessary if an application is incomplete or to allow for public notice and written comment. NOAA Fisheries Service would provide written notice and a public comment period prior to issuance of an aquaculture permit, as described in Section 4.1.

Alternatives 3(a)(2)(i-x) would require applicants to submit the following information as part of the application: basic contact information, descriptions of the facility (i.e., coordinates), allowable systems and equipment proposed for use, a list of species to be cultured, copies of federal aquaculture permits, a description of protected species, marine fishes and invertebrates, and migratory birds (Note: a current list of migratory birds protected under the Migratory Bird Treaty Act can be found at: http://www.fws.gov/ migratorybirds/intrnltr/mbta/mbtandx.html) located at the proposed aquaculture site, and copies of valid certifications and documentation for vessels or aircraft. These requirements are intended to provide managers with basic information about the proposed aquaculture operation and facility to assist in permit approval, denial, or modification.

Alternative 3(a)(2)(xi) would require permitted aquaculture firms to provide documentation that they have posted an assurance bond sufficient to cover the costs of removal of all components of an aquaculture facility. The assurance bond would also cover the costs of removing organisms with OIE-reportable pathogens, genetically modified organisms, and transgenic species if a permittee does not remove these organisms upon order by NOAA Fisheries Service (see Action 2, Alternative 3(a)(2)(xiii) and Action 8, Alternative 2(d)). All oil, gas, and mineral extraction firms are required under MMS regulations to remove platforms and connecting pipe lines and return the ocean bottom to its original configuration (see http://www.gomr.mms.gov/homepg/ regulate/regs/ntls/ntl00-g16.html). Additionally, the National Offshore Aquaculture Act of 2007 (Appendix B), as proposed, requires an assurance bond for removal of the aquaculture structures as a criterion of the siting permit. Requiring an assurance bond would eliminate the potential for navigation hazards in the event an operation terminates their business. It would also protect the biological and physical environment by preventing long-term damage to habitat and entanglement of wildlife in derelict gear (National Standard 9).

NOAA Fisheries Service lacks the authority to retain the sum of any financial assurances as a condition of the aquaculture permit. Any funds NOAA Fisheries Service could receive through execution of an assurance bond would have to be deposited directly with the U.S. Treasury. Once deposited into the Treasury, funds cannot be withdrawn without an appropriation. Because NOAA Fisheries Service lacks the authority to retain and draw upon funds it receives, the bond may be executed with the signature of an additional entity as a surety, as is done by the ACOE. Based on ACOE regulatory guidance for assurance bonds, the surety agrees to ensure compliance with the permit if the ACOE determines the permit has defaulted.

Alternatives 3(a)(2)(xii-xiv) pertain to broodstock collection, genetic management, and aquatic animal health. Applicants would have to certify that all original broodstock used for producing juveniles were harvested from U.S. waters of the Gulf of Mexico, and from the same population or sub-population where the facility is located **(Alternative 3(a)(2)(xii))**. This alternative will help ensure that the genetic make-up of cultured organisms originates from the same stock where the facility will operate. **Alternative 3(a)(2)(xiii)** would require applicants to certify that no genetically modified or transgenic species will be used for culture. In the event of escapement, this will ensure that cultured fish are genetically similar to the wild stock they originated from. **Alternative 3(a)(2)(xiv)** would require applicants to identify an aquatic animal health expert. This expert would be responsible for certifying juveniles as pathogen-free prior to stocking. Additionally, the animal health expert would be responsible for diagnosing pathogens if an outbreak occurs and reporting information about outbreaks to NOAA Fisheries Service. The aquatic animal health expert would have to be either a licensed doctor of veterinary medicine or certified by the American Fisheries Society, Fish Health Section, as a fish pathologist or fish health inspector.

Alternative 3(a)(2)(xv) requires the applicant to have an emergency disaster plan in the event of a disaster. This plan would include, but is not limited to, procedures for preparing allowable systems, offshore aquaculture equipment, and cultured organisms. Requiring an emergency disaster plan will help businesses prepare their operations in the event of a disaster, thereby reducing risks of impacting the physical and biological environment.

The remaining alternatives (**Alternatives 3(a)(2)(xvi-xvii)**) would require other information concerning aquaculture operations and equipment necessary for issuance or administration of a permit. These alternatives are needed to ensure NOAA Fisheries Service has all relevant information necessary for making a decision to approve, disapprove, or deny issuance of an aquaculture permit.

Alternative 3(b) contains twelve operational requirements for marine aquaculture facilities. **Alternative 3(b)(1)** would specify a use it or lose it provision. Permittees would be required to deploy at least 25 percent of allowable aquaculture systems within two years of permit issuance and stock allowable species within these systems within three years. In the event of a catastrophic event, permittees could apply for a one year extension to meet these requirements. If permittees do not meet these conditions, then their permit would be annulled. The intent of this alternative is to reduce the potential for speculative entry into the fishery.

Alternatives 3(b)(2) and **3(b)(3)** pertain to identification of broodstock and animal health certification. Permittees would be required to obtain documentation from the hatchery certifying broodstock are marked or tagged. Permittees would also be required to obtain and submit broodstock fin clips, or other genetic material, to NOAA Fisheries Service. Procedures for submitting genetic material would be specified by NOAA Fisheries Service. This requirement will allow for enforcement and monitoring in the event that genetic modification of cultured organisms is suspected. NOAA Fisheries Service

personnel would be able to identify source broodstock using fin clips or other genetic material and compare it to the genetic make up of offspring used for culture. **Alternative 3(b)(3)** would require cultured animals prior to stocking be certified by an aquatic animal health expert (as defined in **Alternative 3(a)(2)(xiii)**) as pathogen free. Cultured animals prior to stocking would need to be accompanied by a health certificate signed by an aquatic animal health expert. This requirement will be in the best interest of both the applicant and NOAA Fisheries Service. By inspecting and certifying cultured animals as pathogen-free, risks of transmitting pathogens to open ocean cages would be minimized or eliminated. This would also reduce the risk of wild species being infected by pathogens from cultured animals. If pathogens are discovered once fingerlings are stocked, NOAA Fisheries Service, in coordination with the USDA, could order the removal of those cultured organisms upon a determination by an aquatic animal health expert that a suspected pathogen(s) exist and poses a threat to the health of wild aquatic organisms (see Action 8, Preferred Alternative 2(d)).

Alternative 3(b)(4) would require permittees to have one properly functioning locating device on each net pen or cage used for aquaculture. In the event that the net pen or cage breaks free of its mooring and becomes located away from the original permitting site, the locating device could be used to find it and either remove it from the water or return it to the permitted site. This alternative will help to prevent long-term damage to habitat and increase navigational safety.

Alternatives 3(b)(5) through **3(b)(8)** specify monitoring requirements that a permittee would have to abide by when operating an aquaculture facility. Water quality standards and monitoring requirements are required by the EPA and specified in National Pollutant Discharge Elimination System permits issued by the EPA. These requirements are intended to monitor water quality, including benthic and organic loading, for comparison with established EPA water quality standards. EPA regulations at 40 CFR 451.21 also include feed monitoring and management practices. Permittees would be required to abide by these existing EPA feed monitoring and management practices. Permittees would also have to abide by monitoring and reporting requirements specified by the ACOE and EPA. NOAA Fisheries Service would require permittees to regularly inspect allowable aquaculture systems for entanglements and interactions with marine mammals, protected species, and migratory birds. If an entanglement or interaction occurs, then permittees would be required to report this information to NOAA Fisheries Service. The FDA, EPA, and USDA regulate drugs, pesticides, and biologics. Permittees would be required to comply with the existing regulations of these agencies (Food, Drug and Cosmetic Act, 21 USC 321; Clean Water Act, 40 CFR 122; 9 CFR 101-124; 21 CFR 500-599; and 40 CFR 150-189).

Alternatives 3(b)(9-12) are all intended to assist in enforcement of aquaculture. Cultured fish would have to be maintained with heads and fins intact until landed on shore, possession of wild fish or invertebrates at a facility would be prohibited (with the exception of permitted broodstock), and permittees would be required to provide NOAA Fisheries Service access to their facility and equipment. NOAA Fisheries Service would also conduct at least one on-site inspection each year. The intent of the inspection would

be to determine compliance with applicable regulations related to aquaculture. The Council also previously included an alternative in this action that would have prohibited possession of fishing gear, other than what is needed for removing cultured organisms from allowable aquaculture systems, aboard an aquaculture operation's transport or service vessels. This alternative was inadvertently excluded during revisions to the FMP, and will be discussed at the October 2008 Council meeting for further consideration.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1 would not specify application requirements, operational requirements, or restrictions for an offshore aquaculture permit. Consequently, the onus would be on potential applicants and the public to consult with NOAA Fisheries Service and learn requirements and restrictions would apply to Gulf aquaculture operations to ensure that there are no significant impacts on the environment or on enforcement efforts regarding existing prohibitions on the taking of cultured species. This alternative has the least transparency of the three alternatives and would greatly increase the time and costs required by both applicants and the public to learn of baseline and other application requirements for offshore aquaculture in the Gulf EEZ. In turn, it would not give NOAA Fisheries Service either the information it would require to estimate a proposed offshore aquaculture operation's potential impacts on the environment and taking of cultured species or the documents it needed for effective enforcement of Federal laws.

Alternative 2, the status quo alternative, would continue the application requirements for an EFP as stated in 50 CFR 600.745(b)(2). On average, it takes about 5.5 hours to complete an application for an EFP; however, it is likely that it does and would take significantly longer for a proposed offshore aquaculture operation. The Regional Administrator or Director may charge a fee to recover the administrative expenses of issuing an EFP.

As stated previously, an EFP is designed for short-term use and its application requirements are not specific to aquaculture or adequate to assess the potential impacts of a long-term, commercial-scale aquaculture operation. As such, the insufficiency of the EFP application requirements could adversely affect the ability of NOAA Fisheries Service and the public to assess the potential impacts of a proposed aquaculture operation on the environment.

Alternative 2 would also maintain the status quo operational requirements and restrictions as represented by the terms and conditions that may be attached to an EFP (see 50 CFR 600.745(b)(3)(v)). When NOAA Fisheries Service announced receipt of an EFP application from Florida Offshore Aquaculture, Inc. for purposes of offshore aquaculture on July 30, 2003 (68 FR 44745), it stated terms and conditions for the issuance of the EFP to ensure that there are no significant impacts on the environmental or on enforcement efforts regarding existing prohibitions on the taking of the cultured species. These terms and conditions were proposed to apply for a particular EFP application for offshore aquaculture, not for Gulf offshore aquaculture in general. However, they do provide insight into potential operational requirements and restrictions that could be imposed by NOAA Fisheries Service under **Alternative 2**, and they do

offer greater transparency than the first alternative. Nonetheless, the operational requirements and restrictions under **Alternative 2**, although an improvement over **Alternative 1**, would be insufficient for potential applicants and the general public to adequately assess the operational requirements and restrictions necessary for environmentally sustainable long-term, commercial-scale operations and the costs and benefits of those operational requirements and restrictions.

Preferred Alternative 3 would establish application guidelines and operational requirements for Gulf aquaculture that are consistent with long-term, commercial-scale operations. As such, these application requirements would be an improvement over those proposed in the other two alternatives and would provide NOAA Fisheries Service and the public with better information in order to assess the potential impacts of a proposed aquaculture operation on the environment.

Within the application requirements of **Preferred Alternative 3** is the condition of financial assurances in the form of a performance bond, which would mitigate damages caused by the permittee's default. This requirement would require the signature of an additional entity as a bond surety who agrees to ensure performance in the event that the permittee defaults. Neither **Alternative 1** nor **Alternative 2** would require a performance bond. Without a performance bond, a permittee could abandon a facility, cultured organism, or other equipment at a site in the Gulf EEZ or cause other damage and the public and/or a new permit holder would likely have to pay for the removal of all components of an aquaculture facility. With a performance bond, the permittee who causes the damage or its bond surety would pay for removal of all components of an aquaculture facility.

Preferred Alternative 3 would also specify operational requirements and restrictions for a Gulf aquaculture permit, and for this reason is the most transparent of the three alternatives. It also would give NOAA Fisheries Service the information it requires to adequately estimate the impacts that a proposed offshore operation would have on the environment, and once in operation, monitor its operations and enforce Federal laws that protect the environment. Moreover, **Preferred Alternative 3** would provide better guidelines for potential applicants and the public to adequately assess what is legally required of commercial offshore aquaculture operations and the associated impacts of those legal requirements on the environment. It would require the least time and costs associated with providing and receiving information sufficient for an adequate assessment of the potential and realized impacts of commercial offshore aquaculture operations on the environment.

4.3 Action 3: Duration of the Permit

Alternative 1: No Action, Exempted Fishing Permits are effective for no longer than one year unless otherwise specified in the EFP or a superseding notice or regulation (50 CFR 600.745(b)(4)).

Preferred Alternative 2: Aquaculture permits are effective for:

a) 5 years
b) 10 years and may be renewed in 5 year increments (Preferred)
c) 20 years
d) Indefinitely.

An aquaculture permit remains valid for the period indicated on the permit unless it is revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements.

Discussion and Rationale

Alternative 1 would retain the current effective period of an EFP, which is one year unless otherwise specified. **Preferred Alternative 2** would establish a different effective period ranging from 5 years (**Alternative 2(a)**) to indefinitely (**Alternative 2(d)**).

The time period a permit is effective is primarily an economic consideration, although it could have ramifications to the physical and biological environments if a permit is not regularly reviewed for compliance with governing regulations. Under all of the subalternatives in **Preferred Alternative 2**, a permit would remain valid for the period indicated on the permit unless it is revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements. Actions 2 and 8 in this FMP require operations comply with several operational, recordkeeping, and reporting requirements. These requirements will alert NOAA Fisheries Service of potential problems occurring at a facility and provide them with a basis for modifying, suspending, or revoking a permit in accordance with subpart D of 15 CFR part 904. Additionally, Action 2 specifies that NOAA Fisheries Service staff will conduct on-site visits, at least annually, to review operations at aquaculture facilities. Site visits will allow NOAA Fisheries Service an opportunity to determine compliance with applicable regulations.

Short permit durations (less than ten years) would make it: 1) difficult to obtain financing for aquaculture operations and 2) undesirable for investors to commit money to such operations. Offshore aquaculture entrepreneurs will, in many instances, need to finance their operations. Lenders will provide financing only if there is sufficient certainty that the aquaculture operation can pay principal and interest on any loans. Obtaining capital has been a problem for offshore aquaculture entrepreneurs. Longer permit durations are expected to reduce risk costs associated with short-term output fluctuations and/or market fluctuations, which would increase the likelihood of entrepreneurs obtaining financing. Even if financing is available, costs will accrue each time a permit is renewed, so longer renewal periods will minimize costs. Ten years is considered by many to be the minimum timeframe necessary for an operation to be profitable and obtain sufficient investment and financing.

Summary Comparison of Physical, Biological, and Ecological Consequences

The time period of permit issuance will not have any direct effects on the physical, biological, or ecological environments. However, Action 2 will have indirect effects on

these environments. As discussed above, the duration of the permit is of primary importance for business planning purposes and not for monitoring effects on the physical, biological, and ecological environments. Regardless of the effective time period of the permit, NOAA Fisheries Service will regularly (at minimum annually) review operations for compliance with governing regulations. Aquaculture facilities will be required to meet operational requirements specified in Action 2 and recordkeeping and reporting requirements specified in Action 8, as well as other requirements specified in Actions 4, 5, and 6. NOAA Fisheries Service staff will also conduct site visits at facilities to ensure facilities are operating properly and not causing unacceptable impacts to the physical, biological, and ecological environments (see Alternative 3(b)(12) in Action 2). The effects on these environments are expected to be similar for all alternatives. However, **Alternative 1** would provide the shortest time period for permit issuance of any of the alternatives, and would allow NOAA Fisheries Service to deny renewing a permit, rather than revoke a permit, if an operation was causing negative environmental impacts to the physical and biological environments. **Alternatives 2(a)** through **2(d)** would allow permits for 5, 10, or 20 years, or indefinitely. If NOAA Fisheries Service encountered problems with revoking, suspending, or modifying a permit before it expired, then shorter permit durations would be more beneficial to the physical and biological environments, than longer permit durations, because after expiration a permit may not be renewed.

Summary Comparison of Socioeconomic and Administrative Consequences

Action 3 specifies the duration of an aquaculture permit, with options for 1 year (**Alternative 1**), 5 years (**Alternative 2(a)**), 10 years (**Preferred Alternative 2(b)**), 20 years (**Alternative 2(c)**) or indefinitely (**Alternative 2(d)**). Of those alternatives specifying permits of limited duration (**Alternatives 1**, **2(a)**, **2(b),** and **2(c)**), only **Alternatives 1** and **2(b)** give the possibility of renewal. Therefore, it is possible that **Alternatives 2(a)** and **2(c)** would not provide for opportunities for renewal and would require existing operations to apply for a new permit, if allowed. **Alternative 1**, the status quo alternative, could impose the greatest time demands and costs on those engaged in offshore aquaculture operations because they would have to apply and reapply for a continuous series of permits and renewals in order to have an ongoing commercial offshore aquaculture operation. This in turn would impose the greatest time demands and costs on NOAA Fisheries Service as it reviews applications for new and renewing permits. **Alternative 2(d)** would impose the least time and costs on NOAA Fisheries Service and those proposing offshore aquaculture operations because applicants would only have to apply for and be issued a permit once. However, **Alternative 2(d)** would also prevent others from benefiting from the use of a particular site for the purpose of aquaculture and/or other purposes for an indefinite period of time, which essentially encloses and privatizes an area of Federal waters that historically has been managed under the public trust doctrine. **Preferred Alternative 2(b)** would allow renewal in five year increments after the initial issuance of a 10-year permit. Consequently, this imposes the least time and costs associated with permit application and renewals, while offering an operation the minimum timeframe necessary to be profitable and obtain sufficient investment and financing.

4.4 Action 4: Species Allowed for Aquaculture and included in the Aquaculture Fishery Management Unit[3].

Alternative 1: No Action, do not specify species allowed for aquaculture and do not develop an Aquaculture Fishery Management Unit.

Alternative 2: Allow the aquaculture of all finfish species native to the Gulf of Mexico in the reef fish, red drum, and coastal migratory pelagics FMPs and include these species in the Aquaculture Fishery Management Unit[3].

Alternative 3: Allow the aquaculture of all species native to the Gulf of Mexico that are managed by the Council and included in a FMP management unit, except goliath grouper, Nassau grouper, and those species in the shrimp and coral[3] fishery management units, and include these species in the Aquaculture Fishery Management Unit.

Preferred Alternative 4: Allow the aquaculture of all species native to the Gulf of Mexico that are managed by the Council and included in a ~~Council~~ FMP management unit, except those species in the shrimp and coral[3] FMP management units, and include these species in the Aquaculture Fishery Management Unit. The Council will send a letter to NOAA Fisheries Service requesting development of concurrent rulemaking to allow aquaculture of highly migratory species.

Discussion and Rationale

Action 4 considers species that would be allowed for aquaculture in the Gulf of Mexico. **Alternatives 2-4** would also include allowable species in the Aquaculture FMP's fishery management unit (FMU). Alternatives range from prohibiting culture of species not native to the Gulf (**Alternative 1**) to allowing only the culture of finfish (**Alternative 2**) to prohibiting shrimp, corals, and grouper species currently prohibited from harvest (**Alternative 3**). The action and proposed alternatives would not affect the aquaculture of live rock, which will continue to be regulated by management measures approved in Amendments 2 and 3 to the Coral and Coral Reefs FMP.

Endangered and threatened species under the Endangered Species Act (ESA) in the Southeast Region cannot be used for commercial aquaculture. Section 9 of the ESA makes it unlawful for any person to take any endangered species of fish or wildlife. Take, as defined in the statute and regulations at 50 CFR Part 222.102, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Under Section 4 of the ESA, the take prohibition may be extended to species listed as threatened if deemed necessary and advisable for the conservation of the species. NOAA Fisheries has issued regulations extending the prohibition of take, with limited exceptions, for all threatened species listed in the Southeast Regions. None of the take

3 Live rock will continue to be regulated by management measures approved in Amendments 2 and 3 to the Coral and Coral Reefs FMP.

exceptions allow for the commercial aquaculture of any Southeast Region endangered or threatened species.

A "Species of Concern" (SOC) is a species or vertebrate population for which there is concern or great uncertainty about its status. Species of Concern are not listed under or protected by the ESA. No specific protections would be afforded SOC with regard to commercial aquaculture. Rather, the purpose of the SOC list is to: 1) increase public awareness about these species, 2) identify those species potentially at risk and in need of protective measures before listing under the ESA becomes necessary, 3) identify data deficiencies and uncertainties associated with the status of the species, 4) work cooperatively with regional co-managers and interest groups to obtain the information necessary to evaluate species status and threats, 5) identify conservation opportunities, and 6) work proactively with Federal and state agencies, Native American tribes, and the public to conserve the species.

Alternative 1, the no action alternative, would not specify which species would be allowed for aquaculture and would not establish an Aquaculture FMU. If **Alternative 1** were chosen, a permit applicant could request permission to culture any species, whether or not it was native to the Gulf of Mexico, managed by the Council, vertebrate or invertebrate, or already protected from fishing in the Gulf of Mexico EEZ. NOAA Fisheries Service would then determine whether culture of a particular species was acceptable, rather than the Council making that determination through this FMP. Under **Alternative 1**, NOAA Fisheries Service, in consultation with the U.S. Fish and Wildlife Service (USFWS) could determine if culture of a particular species was acceptable, including non-native species. The Lacey Act Amendments of 1981 (16 U.S.C. §§ 3371-3378) provide the USFWS with authority to regulate the import, transport, and possession of non-native species. Regulations at 50 CFR 16.13 state that no live fish, mollusks, crustaceans, or any progency or eggs of these organism may be released into the wild except by a State wildlife agency having jurisdiction over the area of release or by persons having prior written permission from such agency. However, such approval of non-native species is unlikely because the USFWS and NOAA co-chair the federal Aquatic Nuisance Species Task Force, whose task is to prevent and control aquatic nuisance species, and implement the Non-indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990. Further, The Gulf Council's Ad Hoc Aquaculture Advisory Panel has also indicated opposition to the use of any non-native species for aquaculture.

Alternatives 2 and **3** and **Preferred Alternative 4** would limit culture to species managed by the Council that are native to the Gulf of Mexico. All of these alternatives would include allowable aquaculture species in the fishery management plan's FMU. These species could not be genetically modified or transgenic (see Action 2). **Alternative 2** would further limit culture to only managed finfish, while **Alternative 3** would allow culture of Council managed finfish and invertebrates, but would prohibit culture of shrimp, corals, and goliath and Nassau grouper. **Preferred Alternative 4** would allow culture of all species managed by the Council, except shrimp and corals, and would include a request to NOAA Fisheries Service to develop concurrent regulations to

allow aquaculture of highly migratory species. Shrimp are currently raised in onshore ponds and it is expected that offshore aquaculture of this species will not be cost effective. Corals are currently prohibited from harvest and there is not expected to be high demand for culturing corals for commercial purposes.

There is some evidence of the detrimental effects of non-native species on ecosystems. If non-native species were allowed to be cultured in the Gulf of Mexico EEZ and some escaped, it could have negative impacts on the biological, physical, and ecological environments (see discussion in section 6.1). Potential negative effects caused by the introduction of non-native species include: competition with wild stocks, changes to community structure and food web dynamics, and modification of genetic structure if mating occurred with wild stock. In the most extreme cases in which non-native species become established, fundamental changes in ecosystem function may result in habitat degradation, transmission of pathogens, and loss of other species. Allowing only species native to the Gulf of Mexico and managed by the Council will ensure that any species being cultured are under an FMP and managed according to the National Standards, including National Standard 3 which requires that a stock be managed as a unit throughout its range, to the extent practicable. Action 2 requires all broodstock used to produce juveniles for aquaculture in the Gulf be harvested from waters of the Gulf of Mexico and be from the same population or sub-population where the aquaculture facility is located.

From the perspective of aquaculture companies, **Alternative 1** would be the least restrictive and allow culture of any species if NOAA Fisheries Service approved it. **Preferred Alternative 4** would be the second least restrictive as it would only prohibit culture of non-native species, shrimp, and corals. **Alternative 2** would allow aquaculture of all finfish managed by the Council. These species are likely to include all or most of those selected by the aquaculture industry initially for culture in the Gulf of Mexico (see discussion in Section 5.2.2). Red drum, cobia, and mutton snapper have already been cultured successfully. Many of the species in the Council's Reef Fish FMU have been successfully spawned in captivity; therefore fingerlings of these species could be produced for commercial culture. Spiny lobster and stone crab stocks are prohibited from being cultured under **Alternative 2**. **Alternative 3** would allow culture of all species managed by the Council, except shrimp, coral, goliath and Nassau grouper (see Appendix F for a list of all species included in the Council's FMPs).

Preferred Alternative 4 would allow for culture of all managed species listed in Appendix F, except corals and shrimp. Species overfished or undergoing overfishing would be allowed to be cultured. As such, culture of those species would increase optimum yield for those stocks and may reduce fishing mortality consistent with National Standard 1, if demand for wild caught fish is reduced.

Given the domestic and international aspects of fisheries for Atlantic highly migratory species (HMS), including tunas, swordfish, sharks, and billfish, these fisheries are managed under the dual statutory authorities of the Magnuson-Stevens Act and the Atlantic Tunas Convention Act. The Fishery Conservation Amendments of 1990 (Public

Law 101-627), vested managerial authority for Atlantic HMS in the U.S. Exclusive Economic Zone with the Secretary of Commerce. Acknowledging this management structure, as well as the interest and expertise of the Council on aquaculture issues, the Council is requesting NOAA Fisheries Service develop concurrent rulemaking pertaining to aquaculture activities for Atlantic HMS in the Gulf of Mexico (**Preferred Alternative 4**).

Summary Comparison of Physical, Biological, and Ecological Consequences

An indirect effect of culturing native fishes is the harvest of wild broodstock of the target species for use in aquaculture. If harvest is significant, this could result in increased fishing pressures and mortality on wild stocks. Harvest of native wild fish to support aquaculture activities could have negative indirect effects on the biological, physical, and ecological environments. The extent of these negative effects would depend on the extent of broodstock harvest allowed. Action 8 would provide NOAA Fisheries Service authority to regulate broodstock collection activities, including the quantity of fish harvested.

Introduction of non-native species through aquaculture could cause negative effects to the physical, biological, and ecological environments. Allowing the culture of non-native species by NOAA Fisheries Service is unlikely, because the intent of this FMP is to allow the culture of species already managed by the Council and those regulated by the HMS division of NOAA Fisheries Service. Additionally, the USFWS and NOAA co-chair a federal Aquatic Nuisance Species Task Force that oversees the potential introduction of aquatic nuisance species, which suggests that both agencies would either prohibit or advocate a very precautionary approach to introduction of non-native species.

Wild harvest of some species (i.e., Nassau grouper, goliath grouper, red drum, and corals) is currently prohibited in the Gulf EEZ. If a legitimate "cultured" source of these species developed, it could unfortunately provide a means to sell illegally harvested fish, by marking them as "cultured." Numerous law enforcement requirements in Actions 2 and 8 are intended to diminish the potential for illegal harvest. **Alternative 3** would prohibit culture of goliath and Nassau grouper. **Alternatives 2-4** would prohibit culture of corals. **Alternative 1** would not prevent poaching because it would allow culture of all these species, while **Preferred Alternative 4** would allow culture of Nassau and goliath grouper and red drum. By allowing culture of these species, poaching of wild stocks might occur, negatively impacting the biological and ecological environments by increasing fishing mortality on these species. However, recent developments in forensic methodology would allow law enforcement to analyze the origin of individuals to determine if fish were wild or cultured. Numerous operational requirements, such as recordkeeping, and reporting specified in Actions 2 and 8 would help NOAA Fisheries Service enforce aquaculture regulations to ensure poaching of wild stocks does not occur.

The other concern with the types of species allowed for aquaculture involves the use of genetically modified organisms (GMOs) and transgenic species. The Council has made it clear that GMOs and transgenic animals will not be allowed for aquaculture purposes in the Gulf's aquaculture industry (see Action 2). Therefore, it is unlikely any alternative

will cause negative effects to the physical, biological, and ecological environments due to the Council's and other agencies restrictions on the use of non-native, GMOs, and transgenic animals in the aquaculture industry. Instead, the range of alternatives merely provides a range of flexibility for aquaculture facilities in choosing species used for production. **Alternative 1** potentially could have the greatest effect on the physical, biological, and ecological environment of the Gulf by not prohibiting the use of non-native species for aquaculture.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1, the status quo alternative, would not specify the species in the Aquaculture FMU and allowed for aquaculture in the Gulf of Mexico EEZ. Consequently, this alternative would allow a commercial operation to culture species that are not native to the Gulf of Mexico or any other waters in the U.S., which could have significant adverse impacts on the biological, economic and social environments. Given that the USFWS would have to approve the use of any non-native species for aquaculturre it is not clear which species would be allowed to be cultured under Alternative 1 and which ones would not be allowed for culture. This could require potential applicants and the general public to incur significant time and costs to determine what species would or would not be allowed for culture by the USFWS and NOAA Fisheries Service. Moreover, the ability of NOAA Fisheries Service to regulate cultured species would be restricted to historical fishery management units and regulations designed to manage traditional wild fisheries in the Gulf.

Alternatives 2, 3, and **Preferred Alternative 4** would restrict allowable species to those native to the Gulf and limit allowable cultured species to those in particular FMPs. These three alternatives offer the benefit of greater transparency than **Alternative 1** and less time and costs required by applicants and the public to consult with NOAA Fisheries Service and learn which species would be allowed to be cultured. These three alternatives would also improve on the ability of NOAA Fisheries Service to regulate cultured species because, unlike the status quo alternative, it would not rely on historical fishery management units and regulations designed to manage traditional fisheries. The three alternatives differ in that **Preferred Alternative 4** offers the largest range of allowable species, followed by **Alternative 3**, then **Alternative 2**.

4.5 Action 5: Allowable Marine Aquaculture Systems

Alternative 1: No Action, do not specify allowable systems for offshore marine aquaculture in the Gulf EEZ.

Alternative 2: Allow only cages and net pens for offshore marine aquaculture in the Gulf EEZ.

Preferred Alternative 3: NOAA Fisheries will evaluate each proposed aquaculture system on a case-by-case basis and approve or deny use of the proposed system for offshore marine aquaculture in the Gulf EEZ. To assist the Regional Administrator (RA) in evaluating the structural integrity of a

proposed aquaculture system, an applicant would be required to submit to the RA documentation (e.g., computer and physical oceanographic model results) sufficient to evaluate the ability of the aquaculture system(s) (including moorings) to withstand physical stresses associated with major storm events, e.g. hurricanes. NOAA Fisheries Service will also evaluate the proposed aquaculture system and its operations based on potential risks to essential fish habitat, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health, or safety. The RA may deny use of a proposed aquaculture system or specify conditions for using an aquaculture system based on a determination of such significant risks. The RA's evaluation will be based on information provided by the applicant as well as consultations with NOAA Fisheries Service offices/programs. If the RA denies use of a proposed aquaculture system or specifies conditions for its use, the RA shall provide the determination and the basis for it, in writing to the permittee.

Discussion and Rationale

Any aquaculture system must be robust enough to withstand open ocean conditions and prevent fish escapes, and effective in dispersing wastes. The biological, physical, and ecological impacts of the alternatives under consideration differ primarily in the types of systems allowed for aquaculture. **Alternative 1** would not allowable systems for marine aquaculture in the Gulf EEZ. Presumably, permittees could use any type of system regardless of whether or not it was capable of withstanding the physical stresses of the marine environment. However, such a system would still need to be reviewed to ensure it does not violate other federal laws (e.g., ESA or EFH requirements under the MSFCMA). **Alternative 2** would allow only cages and net pens to be used for offshore aquaculture. This alternative would essentially be adequate for culturing all allowable species preferred by the Council in Action 4. **Preferred Alternative 3** would provide NOAA Fisheries Service with authority to conduct case-by-case reviews of allowable aquaculture systems. In researching how other countries and states permitted systems allowed for aquaculture, it was apparent that no single set of standards existed for permitting aquaculture grow-out systems. Because there is a wide variety of cage and net pen sizes and shapes, as well as other allowable systems, flexibility in allowing or disapproving the use of allowable aquaculture systems is necessary. This will ensure systems have sufficient structural integrity and will allow for innovation as allowable aquaculture system technology develops.

The main purpose of **Preferred Alternative 3** is to allow NOAA Fisheries Service to review each system to ensure maximum environmental safeguards are being used while at the same time allowing operations to use the most recent technology developed for aquaculture systems. Permit applicants would be required to submit documentation, such as computer model results, sufficient to evaluate the ability of the aquaculture system to withstand physical stresses associated with major storm events. NOAA Fisheries Service would further evaluate the proposed aquaculture system based on potential risks to EFH, endangered or threatened marine species, marine mammals, wild fish stocks, public

health, or safety. Use of a system could be denied or modified if significant risks are determined by the RA.

Summary Comparison of Physical, Biological, and Ecological Consequences

The alternatives under consideration differ in the extent to which they would limit environmental impacts and the use of novel fish culture systems. Those that limit use of novel systems may have negative effects on biological, ecological, socioeconomic, and administrative environments. **Alternative 1** would not specify allowable systems for marine aquaculture. An applicant could use any system imaginable to conduct aquaculture. No standards or requirements would be specified for NOAA Fisheries Service to approve or disapprove a proposed system. However, such a system would be reviewed by various NOAA Fisheries Service programs to ensure it does not pose a threat or risk to EFH or protected resources, as required by the MSFCMA and ESA.

Alternative 2 would only allow the use of cages and net pens. This alternative would not allow the use of future aquaculture system designs, which do not meet the definition of a cage or net pen. As technology evolves, future designs that are not cages or net pens may be developed that reduce impacts to the biological, physical, or ecological environments. If this occurs, then the Council would need to amend their FMP for aquaculture to allow these systems.

Alternative 2 would allow any type of cage or net pen proposed by an applicant, regardless of structural integrity. NOAA Fisheries Service would not have authority to limit use of such systems, unless the system was not a cage or net pen. As a result, the risk of harm to habitat and marine resources could be increased if these systems are more easily damaged by storms and other weather events. Additionally, no standards or requirements would be specified for NOAA Fisheries Service to approve or disapprove systems proposed under **Alternative 2**.

Preferred Alternative 3 would allow case by case review of proposed systems. Allowable aquaculture systems could include cages and net pens, as well as other types of systems that may be used to grow finfish, spiny lobster, and stone crabs. This alternative would allow for new and innovative systems to be used as technology evolves. Any proposed system would have to be approved by NOAA Fisheries Service and determined to be reliable and environmentally sound. Factors that would be used to determine the reliability of a system would include risks to essential fish habitat, endangered or threatened marine species, marine mammals, wild fish stocks, public health, and safety. Other important factors to consider when evaluating allowable aquaculture systems include:

1) Potential for habitat degradation;
2) Types of materials comprising the system;
3) Efficiency of mechanisms used for feeding;
4) Ability of the system to disperse wastes; and,
5) Accessibility of system for maintenance and repair.

Because **Preferred Alternative 3** would require NOAA Fisheries Service review, it would allow unreliable systems to be disapproved that otherwise may have been used if **Alternatives 1** or **2** are selected. Unlike the other two alternatives, **Preferred Alternative 3** would allow fish aquaculture systems that are not cages or net pens invented in the future.

Alternative 2 would not require NOAA Fisheries Service to review a cage or net pen design before it was deployed. **Preferred Alternative 3** would require such a review. The alternatives in order from least to most likely to adversely affect the physical, biological, and ecological environments due to lack of detection of a faulty marine aquaculture design are as follows: **Preferred Alternative 3**, **Alternative 2,** and **Alternative 1**. The alternatives in order from least to most likely to adversely affect the physical, biological, and ecological environments due to not using new innovative fish culture system designs are as follows: **Preferred Alternative 3**, **Alternative 1**, and **Alternative 2**. Therefore, the more restrictive the review process is for approving aquaculture systems, such as allowing an array of gear types, the less potential for negative effects on the physical, biological, and ecological environments.

Summary Comparison of Socioeconomic and Administrative Consequences

Neither **Alternative 1** nor **Preferred Alternative 3** specifies the types of systems that would be allowed for offshore marine aquaculture in the Gulf of Mexico, but **Alternative 2** does. **Preferred Alternative 3** differs from **Alternative 1** because it explicitly would limit systems to those that are reviewed by NOAA Fisheries Service and do not pose a significant risk to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety.

Alternative 1 would allow any type of system to be used. However, authorization of such a system would still depend on NOAA Fisheries Service review to determine if the system poses a significant threat or risk to EFH and protected resources. Current EFP requirements specify that an applicant must identify each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. If Action 1, Alternative 1 is selected as the preferred then NOAA Fisheries Service would use this information to assess the impact of the gear and harvesting practices of the proposed project on the environment and protected species Given that the Council has selected Action 1, Alternative 2 as the preferred, NOAA Fisheries Service would only use existing authorities under the MSFCMA and ESA to assess the impacts and structural integrity of a proposed aquaculture systems.

Alternative 1 is the least transparent of the three alternatives because it does not explicitly prohibit any systems from use in the Gulf EEZ, and in consequence, may impose the greatest time and costs on potential applicants, the public and NOAA Fisheries Service in obtaining the information necessary to assess which systems could be allowed. **Alternative 1** also may require the greatest amount of time and costs to adequately enforce Federal laws that protect EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety because those concerns are not explicitly part of the review process.

Preferred Alternative 3 does not specify the types of systems that would be allowed, but explicitly states that a proposed system would not be allowed if it were evaluated to pose a significant risk to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety. Consequently, **Preferred Alternative 3** could impose the least costs in terms of potential damages to and greatest benefits from protection of EFH, protected species, wild fish or invertebrate stocks, public health and safety than the other alternatives. However, **Preferred Alternative 3** is not as transparent as **Alternative 2** and increases time and costs incurred by applicants and the public to assess which systems have been and tend to be acceptable and what criteria the RA uses and has used to evaluate a system's risk. Under Action 1, written notice and a comment period will afford additional opportunities for the public to comment on proposed systems. This should assist the RA in better evaluating the risks of a proposed system.

Alternative 2 specifies the types of systems that would be allowed and as such is more transparent than the other two alternatives. However, this alternative does not explicitly address how risks to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety will be evaluated. Similar to **Alternative 1**, NOAA Fisheries Service would use existing authorities to evaluate threats and risks to protected resources and EFH. NOAA Fisheries Service would not allow cages or net pens that pose potential adverse impacts on EFH or protected species or that violate other existing Federal laws. Consequently, both applicants and the public would have to consult with NOAA Fisheries Service and obtain additional information in order to predict which types, quantities, and combinations of cages and net pens would be allowed or prohibited under existing Federal laws. The benefit of **Alternative 2** to Gulf aquaculture operations is that they would readily know what types of systems could be allowed for offshore marine aquaculture.

4.6 Action 6: Marine Aquaculture Siting Requirements and Conditions

Alternative 1: No Action, do not designate areas in the Gulf of Mexico EEZ where aquaculture would be allowed. The Army Corp of Engineers (ACOE) would permit sites for aquaculture. NOAA Fisheries Service and the Council would continue to review and comment on ACOE siting permits.

Alternative 2: Establish marine aquaculture zones within which individual sites would be permitted. Marine aquaculture facilities may only be sited in the zones specified in Figure 4.6.1. Coordinates for these areas are specified in Table 4.6.1.

Preferred Alternative 3: Establish the following criteria for siting marine aquaculture facilities:

(a) Prohibit marine aquaculture in Gulf EEZ marine protected areas and marine reserves, Habitat Areas of Particular Concern, Special

Management Zones, permitted artificial reef areas, and coral reef areas (as defined in 50 CFR 622.2).

(b) No marine aquaculture facility may be sited within 1.6 nautical miles (3 km) of another marine aquaculture facility.

(c) To allow fallowing and rotation of allowable aquaculture systems within a permitted site, the permitted site must be at least twice as large as the total area encompassed by the allowable aquaculture systems (e.g, cages and net pens).

(d) Provide NOAA Fisheries Service with a video survey of the benthic habitat at the proposed marine aquaculture facility site.

(e) NOAA Fisheries Service will evaluate siting criteria in addition to those preferred criteria selected by the Council in Alternative 3(a-d) on a case by case basis. Criteria considered by NOAA Fisheries Service during case-by-case review would include, but would not be limited to, depth of the site, current speeds, substrate type, the frequency of harmful algal blooms (HAB) or hypoxia at the proposed site, marine mammal migratory pathways, and the location of the site relative to commercial and recreational fishing grounds and important fishery habitats (e.g., seagrasses). NOAA Fisheries Service may deny use of a proposed aquaculture site based on a determination by the RA that such a site poses significant risks to essential fish habitat, endangered species, or threatened marine species, will result in user conflicts with commercial or recreational fishermen, the depth of the site is not sufficient for the allowable aquaculture system, substrate and currents at the site will inhibit the dispersal of wastes and effluents, the site poses significant risks of mortality to the cultured species due to low dissolved oxygen or HAB, or other grounds inconsistent with FMP objectives or applicable federal laws. The information used for siting a facility with regard to proximity to commercial and recreational fishing grounds would include, but is not limited to, electronic logbooks from the shrimp industry, logbook reported fishing locations, siting information from previously proposed or permitted aquaculture facilities, and other data that would provide information regarding how the site would interact with other fisheries. Such a determination by the RA shall be based on consultations with NOAA Fisheries Service offices and programs and siting information submitted by the permit applicant. If a proposed site is denied, the RA shall provide the determination and the basis for it, in writing to the permit applicant.

Discussion and Rationale

Action 6 would establish either broad zones for aquaculture activities or criteria that would be used to site a marine aquaculture facility. **Alternative 1** would allow NOAA Fisheries Service to evaluate potential aquaculture sites only through commenting on ACOE Section 10 permit applications. However, these applications may not provide all the information NOAA Fisheries Service would need, and would require NOAA

Fisheries Service to abide by the final ACOE decision when authorizing a permit. **Alternative 2** and **Preferred Alternative 3** would allow NOAA Fisheries Service to conduct its own evaluation of the proposed areas. **Alternative 2** would establish 13 zones for conducting marine aquaculture (see Figure 4.6.1). These zones would encompass 10,392 nm^2 of the Gulf of Mexico, or approximately 5 percent of the entire Gulf EEZ (209,226 nm^2). The zones are based on GIS maps developed by the Gulf States Marine Fisheries Commission, which identify suitable areas for aquaculture (see pink area in Figure 4.6.1). The zones represent approximately 36 percent of the total area considered to be suitable for conducting offshore marine aquaculture in the Gulf of Mexico EEZ. Areas not considered suitable for aquaculture included: navigational fairways, lightering zones, platform safety zones, permitted artificial reef areas, HAPCs, coral areas, marine sanctuaries, marine reserves, MPAs, areas of high shrimping effort based on electronic logbooks, hypoxic areas (< 2 mg/l), areas with current speeds of 0.1 m/s or less, depths less than 25 m (82 feet), and depths greater than 100 m (328 feet). Under **Alternative 2**, additional authority would still likely need to be provided to NOAA Fisheries Service to evaluate specific sites within a pre-authorized zone.

Preferred Alternative 3 would establish specific criteria for siting, but would not establish predefined zones. Based on the criteria summarized in sub-alternatives 3(a) and 3(e), approximately 28,719 nm^2 would be suitable for offshore aquaculture in the Gulf of Mexico (see pink area in Figure 4.6.1). This area would represent approximately 13.7 percent of the entire Gulf EEZ. Aquaculture would be prohibited in marine protected areas and marine reserves, HAPCs, SMZs, permitted artificial reef areas, and coral reef areas (**Alternative 3(a)**). Operations would also be required to be sited at least 1.6 nm from each other (**Alternative 3(b)**) and the permitted site would need to be twice as large as the area encompassed by allowable aquaculture systems to allow fallowing and rotation of cages, net pens, and other allowable systems (**Alternative 3(c)**). Additionally, permit applicants would be required to submit a video survey of the proposed site (**Alternative 3(d)**). This video would allow NOAA Fisheries Service to evaluate the benthic habitat at the proposed site to ensure siting would not affect any EFH or permitted artificial reef areas. NOAA Fisheries Service would also be provided authority to conduct case-by-case reviews of specific sites (**Alternative 3(e)**). The case-by-case approach of **Preferred Alternative 3** would provide for a more comprehensive review process for specific sites that is not provided by **Alternative 2**.

Summary Comparison of Physical, Biological, and Ecological Consequences

Proper siting of an aquaculture facility is critical to both an operation's success and the protection of the surrounding physical, biological, and ecological environments. Offshore aquaculture is often mentioned as an environmentally safer alternative to inshore or onshore aquaculture because facilities are often sited in deep water with sufficient current flow to disperse wastes. However, if a facility is not properly sited, there is potential for significant environmental impacts to occur. These could range from habitat degradation of surrounding benthos to changes in water quality (e.g., low dissolved oxygen or increased nutrients). To prevent impacts to the biological and physical environments, Action 6 proposes either developing siting criteria for facilities

(**Preferred Alternative 3**) or developing aquaculture zones for siting marine aquaculture facilities (**Alternative 2**).

Recent environmental monitoring studies conducted off Puerto Rico and New Hampshire indicate benthic and organic loading tends to be fairly localized around open-ocean aquaculture cages (Alston et al. 2005; Rapp 2006; UNH 2006). Alston et al. (2005) conducted bimonthly chemical and macroinvertebrate sampling at a control site and sites 0, 20 (65 feet), and 40 meters (131 feet) away from two cages off the coast of Puerto Rico in 2002 and 2003. There were no significant differences detected among control and sampling sites around cages in ammonia-N, nitrate-N, nitrite-N, phosphate concentrations, organic matter, including nitrogen in the sediments, nitrogen beneath the cages, and total carbon beneath the cages (Alston et al. 2005). Rapp (2006) conducted environmental monitoring in 2004 and 2005 at one of the same cages used in the Alston et al. (2006) study. No organic loading in the benthic water was observed for the first seven months of the study. In the eighth month of the study and thereafter an increase in benthic water organic loading was observed due to a change in the composition and integrity of the fish feed (Rapp 2006). The study reported no increase in organic loading in the sediment for the duration of the project. Lastly, environmental monitoring off New Hampshire (UNH Marine Aquaculture Center 2006) found no evidence of aquaculture activities affecting water quality parameters (e.g., suspended sediments, chlorophyll, and dissolved oxygen). The study did indicate, however, that lower total community taxa in areas or zones surrounding the cages may be early signs of increased organic loading.

Alternative 1 would maintain status quo regulations and would not provide NOAA Fisheries Service with the authority to site aquaculture facilities. NOAA Fisheries Service would continue to work with the ACOE when providing comments on proposed aquaculture facility sites. **Alternative 1** would not place any further limits on where aquaculture facilities could be located; therefore allowing maximum flexibility for aquaculture companies. The ACOE could potentially approve a site despite NOAA Fisheries Service' objection; however, the ACOE would have to consider any comments and conservation measures provided by NOAA Fisheries Service. Because criteria for approving a site likely will differ between these two agencies, there is potential for a site to be approved that results in negative effects to the physical and biological environments, such as habitat degradation and diminished water quality.

Alternatives 2 and **3** would provide NOAA Fisheries Service with authority to evaluate a proposed aquaculture site, rather than relying on the review and comment procedures of another agency (**Alternative 1**). This would allow NOAA Fisheries Service to disapprove aquaculture sites proposed for aquaculture, which may have been previously approved by the ACOE. **Alternative 2** would establish 13 predefined aquaculture zones. A benefit to this approach would potentially include the reduced time for approving a facility's location. However, a negative effect would include establishing broad zones that may not include sufficient detail to prevent or minimize localized, small-scale impacts associated with a particular site. If this alternative is selected by the Council as the preferred, then additional authority would likely need to be provided to NOAA Fisheries Service to evaluate specific sites within each of the predefined zones.

Table 4.6.1 Latitude and longitude coordinates for Alternative 2 aquaculture zones shown in Figure 4.6.1.

Zone	Coordinate	Latitude	Longitude	Area(nm)
1	A	25.46	-83.41	2233
	B	24.85	-83.41	
	C	24.85	-82.32	
	D	25.46	-82.25	
2	A	25.97	-83.43	526
	B	25.94	-83.43	
	C	26.02	-82.62	
	D	26.43	-82.62	
3	A	27.48	-84	2503
	B	26.17	-83.57	
	C	26.34	-83.04	
	D	27.48	-83.36	
4	A	28.1	-84.39	911
	B	27.69	-84.39	
	C	27.69	-83.68	
	D	28.1	-83.68	
5	A	29.33	-85.23	854
	B	28.54	-84.84	
	C	28.54	-84.69	
	D	29.33	-84.69	
6	A	30.01	-86.35	310
	B	29.74	-86.35	
	C	29.51	-86.08	
	D	30.01	-86.08	
7	A	29.98	-87.52	207
	B	29.58	-87.52	
	C	29.58	-87.35	
	D	29.98	-87.35	

Zone	Coordinate	Latitude	Longitude	Area(nm)
8	A	29.82	-88.37	350
	B	29.38	-88.37	
	C	29.38	-88.04	
	D	29.6	-88.04	
9	A	28.39	-91.33	729
	B	28.19	-91.33	
	C	28.19	-90.48	
	D	28.56	-90.02	
	E	28.56	-90.29	
	F	28.39	-90.55	
10	A	28.8	-92.49	514
	B	28.49	-92.49	
	C	28.35	-92.04	
	D	28.8	-92.04	
11	A	28.18	-95.96	644
	B	27.99	-95.86	
	C	28.49	-94.96	
	D	28.63	-95.13	
12	A	27.47	-96.84	304
	B	27.12	-96.84	
	C	27.12	-96.58	
	D	27.35	-96.5	
13	A	26.32	-96.82	307
	B	26.09	-96.82	
	C	26.09	-96.38	
	D	26.32	-96.38	

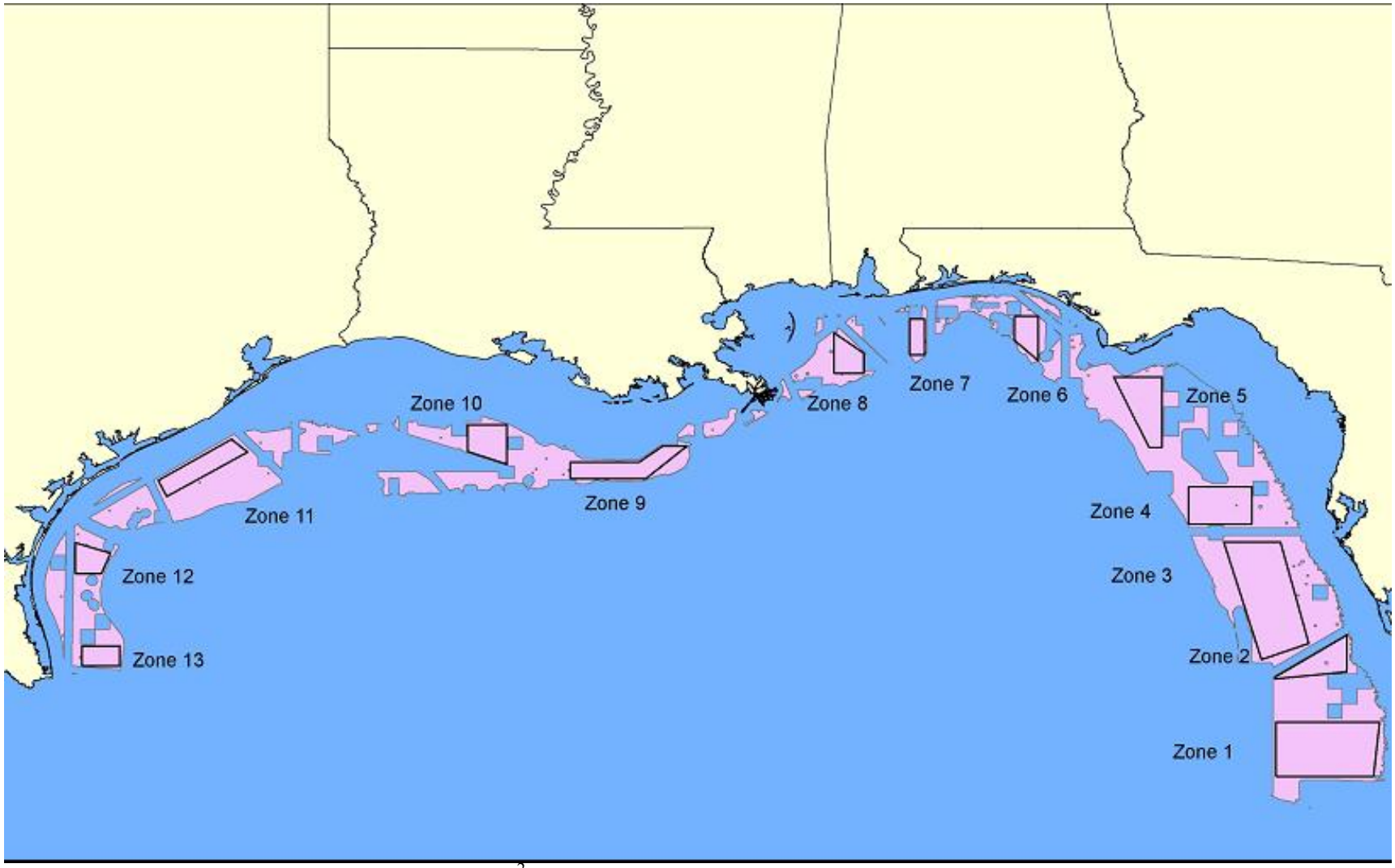

Figure 4.6.1 Aquaculture zones 1-13 (10,392 nm^2) developed for Action 6, Alternative 2. Pink represents all areas considered suitable for aquaculture in the Gulf of Mexico EEZ (28,719 nm^2).

Preferred Alternative 3 would prohibit aquaculture operations from being sited in certain areas and would allow NOAA Fisheries Service to review proposed aquaculture sites on a case-by-case basis. Explicitly prohibiting aquaculture in sensitive areas, such as coral reefs and HAPCs, will afford protection to those habitats and prevent, or minimize to the extent practicable, any impacts from occurring (e.g., nutrient loading) that are associated with aquaculture operation. The requirement to provide video surveys of the area will ensure that facilities are not being sited in those habitats considered sensitive areas. Requiring facilities be sited at least 1.6 nm from one another will limit transmission of pathogens between facilities. There is no widely accepted standard for how far apart facilities should be sited, but estimates range from 300 m to 8 km depending on the species being cultured and the country or state responsible for management (Levings et al. 1995). Lastly, requiring a site to be twice as large as the area encompassed by allowable aquaculture systems will allow permittees to rotate allow systems. This is analogous to terrestrial farming and crop rotation practices, and will diminish the build up of wastes and organic matter below cages, net pens, and other allowable systems, thereby benefiting the physical environment.

Overall, **Preferred Alternative 3** would include the most thorough review of a proposed site, and therefore would provide the greatest net benefits to the physical and biological environments. **Alternative 2** would provide benefits to the physical and biological environment on a broad scale by prohibiting aquaculture in areas not suitable for aquaculture, but this alternative may not adequately address small scale siting considerations within broader aquaculture zones. **Alternative 1** would not provide NOAA Fisheries Service with authority to regulate siting of aquaculture facilities. NOAA Fisheries Service would continue to comment on ACOE siting permits to ensure proper siting of facilities. This alternative would relegate NOAA Fisheries Service role to only commenting on permits under the authority of other federal agencies, potentially providing the least protection to the physical and biological environments.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1 and **Preferred Alternative 3** do not designate marine aquaculture zones, and therefore do not explicitly limit the geographic areas where an applicant can propose to locate an aquaculture operation. **Alternative 2** would designate marine aquaculture zones for siting facilities. The benefit of designating zones is that with little time and cost both applicants and the public learn the locations where aquaculture operations are allowed. However, the strict focus on zones in geographic space ignores physical, chemical, biological and other characteristics that differentiate one location from another within the same zone. **Alternative 2** also ignores the differing risks and associated costs of locating an aquaculture operation within a particular zone. Despite the designation of aquaculture zones, the ACOE would still have authority to issue a siting permit within a particular zone.

Alternative 1 does not designate aquaculture zones and it does not explicitly address the need or desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. However, as the status quo alternative, **Alternative 1's** review process would include an opportunity by NOAA Fisheries Service to comment on

a proposed ACOE permit. Under an EFP, concerns for potential risks of a project would have to be evaluated. Potential for environmental damages would likely be slightly less under **Alternative 2** than **Alternative 1**, because the areas allowed for aquaculture would be smaller. **Alternative 1** is the least transparent of the three alternatives and would create the largest time and financial expenses incurred by both applicants and the public to consult with NOAA Fisheries Service and the ACOE and obtain additional information in order to predict which sites would be acceptable for offshore aquaculture or not.

Preferred Alternative 3 explicitly addresses the need and desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. Consequently, it has the least potential for environmental damages and costs associated with those damages. However, it would impose larger time and costs on applicants and the public to obtain information to assess what sites are acceptable than **Alternatives 1** and **2**.

Preferred Alternative 3 would require a permitted site to be twice as large as the area encompassed by allowable aquaculture systems. If the permit holder has exclusive access to and use of the site under this alternative, it could essentially privatize larger areas of the Gulf EEZ relative to the other two alternatives. **Preferred Alternative 3** would also create areas around an existing facility, such that no future marine aquaculture facility could be sited within 1.6 nautical miles of another marine aquaculture facility. However, this restriction would limit the number of facilities that are located in areas that are highly desirable for offshore aquaculture operations, giving early entrants a significant competitive advantage by denying future aquaculturists access to and use of areas of the EEZ around pre-existing facilities. The benefit of this restriction is it does not allow the concentration of facilities, which may increase the spread of pathogens. Therefore, the benefits to the social, economic, and biological environments are expected to be positive, because the risk of pathogens spreading among aquaculture facilities would be reduced.

4.7 Action 7: Restricted Access Zones for Marine Aquaculture Facilities

Alternative 1: No Action, Do not establish restrict access zones around marine aquaculture facilities.

Preferred Alternative 2: Create a restricted access zone for each aquaculture facility. The size of an aquaculture facility's restricted access zone shall correspond with the coordinates on the approved ACOE siting permit. No recreational or commercial fishing may occur in the restricted access zone, and no fishing vessels may operate in or transit through the restricted access zone unless they have a copy of the facilities' aquaculture permit onboard.

Alternative 3: Prohibit recreational and commercial fishing and the operation or transit of federally permitted fishing vessels within:

(a) 100 feet (30 meters) of allowable marine aquaculture systems.

(b) 500 feet (152 meters) of allowable marine aquacultures systems.
(c) 1,640 feet (500 meters) of allowable marine aquaculture systems.

Discussion and Rationale

Section 6.8 examines the effects of the various Action 7 alternatives relative to each other within the biological, physical, ecological, economic, social, and administrative environments.

The Council has authority to create zones that exclude fishing or the operation of fishing vessels. Examples are zones where fishing with certain gear is prohibited and marine reserves where fishing and possession of fish is prohibited. Restricting access around aquaculture facilities would afford some protection to an operation's equipment and the product being cultured as well as increase safety by reducing encounters between vessels and aquaculture equipment (National Standard 10). On the other hand, limiting usage near these sites could be seen as a user conflict by denying the public from accessing these areas. The most prudent way to overcome this issue is for an aquaculture facility to request a large enough area to afford protection from potential user conflict problems (e.g. a vessel accidentally cutting a mooring line while passing the facility), while at the same time maximizing other user groups' access to the open ocean.

Summary Comparison of Physical, Biological, and Ecological Consequences

Establishing restricted access zones around aquaculture facilities is primarily administrative, but does indirectly affect the physical, biological, and ecological environments. **Alternative 1** would not restrict access around a marine aquaculture facility. Fishing vessels could fish close to allowable aquaculture systems and vessels could transit in or through permitted aquaculture sites. These activities could result in damage to allowable aquaculture systems, including escapement of cultured fish. To minimize the risks of allowable aquaculture systems being damaged, **Preferred Alternative 2** and **Alternative 3** propose establishing restricted access zones for marine aquaculture facilities.

The zone for **Preferred Alternative 2** would correspond to the coordinates on the ACOE siting permit, which should be an area at least twice as large as the total area encompassed by the allowable aquaculture systems (e.g., cages and net pens) as required in the siting criteria of Action 6. The ACOE permit will determine the appropriateness of the siting permit based on "the extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work is likely to have on the public and private uses to which the area is suited" (33 CFR 320.4(a)(2)(iii). This area would likely need to be marked with buoys or other gears to make boaters and fishermen aware of the restricted access zone. The U.S. Coast Guard (USCG) is responsible for the regulation and enforcement of various activities in the navigable waters of the U.S. and would be responsible for making the determination for the appropriate marking requirements. The USCG requires structures be marked with lights and signals to ensure compliance with private aids to navigation (33 C.F.R. 66.01). Title 33 C.F.R. 64 also requires the marking of structures, sunken vessels, and other obstructions for the

protection of maritime navigation. Types of structures and their marking requirements can be found at 33 CFR 67.

Alternative 3 is similar to **Preferred Alternative 2** in that it would restrict access around allowable aquaculture systems. Fishermen and vessels would be prohibited within 100, 500, or 1,640 feet of allowable aquaculture systems. This latter distance corresponds to the specified distance for MMS safety zones established for some oil and gas platforms in the Gulf of Mexico (see 33 CFR 147.15).

Restricting access around a facility may directly protect species known to aggregate around structure. Aquaculture facilities have been shown as aggregation sites for many wild species. For example, Alston et al. (2006) found species abundance and richness significantly increased around an aquaculture cage off the coast of Puerto Rico after it was deployed. Additionally, the lack of anchoring or any other interactions that may occur (e.g. divers stirring up the bottom) with the physical environment will benefit the benthos of these restricted sites. Also, preventing access around a facility will reduce the likelihood of damage to a facility, particularly cages and net pens, thereby reducing any potential impacts associated with fish escapement. Overall, **Preferred Alternative 2** or **Alternative 3** would benefit the physical, biological, and ecological environments more than **Alternative 1**.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1, the status quo alternative, would not limit access to and use of areas of the Gulf EEZ to recreational and commercial fishing, whereas **Preferred Alternative 2** and **Alternative 3** would. Both **Preferred Alternative 2** and **Alternative 3** prohibit recreational and commercial fishing in the restricted access zone. Consequently, **Alternative 1** would benefit traditional fishermen by not limiting how close their vessels operate and transit to aquaculture facilities; however, it also poses the greatest risk of damages to a facility, fishing vessel and personnel caused by use of traditional fishing gear and equipment near the aquaculture facility.

Preferred Alternative 2 uses the coordinates of the approved ACOE siting permit to create the restricted access zone. Permittees and the general public would incur greater time and costs than **Alternatives 3(a)**, **3(b)**, and **3(c)** to learn of and determine the sizes and locations of particular restricted access zones. For example, it could be less clear to fishing vessel operators where a restricted access zone begins and ends around a facility because there is no standard size. Unlike **Alternatives 3(a), 3(b),** and **3(c)**, all fishing vessels (whether federally permitted or not) without a copy of the aquaculture permit would be prohibited from operating in or transiting through the zone. Thus, the potential risk of and costs associated with damages to facilities, vessels, systems, and personnel potentially caused by fishing vessels or gear is the least under **Alternative 2**. Under **Preferred Alternative 2**, fishing vessels (federally permitted or not) that do not have a copy of the facility's aquaculture permit would be prohibited from transiting through the restricted access zone. The cost to a vessel operator that illegally operated in or transited through the zone, intentionally or not, would be equal to the cost associated with an unspecified penalty or fine.

The cost to the facility owner and others who engage in traditional fishing under **Preferred Alternative 2** and **Alternatives 3(a-c)**, is the loss of potential revenue and/or pleasure that would derive from traditional fishing (recreational or commercial) in the restricted access zone surrounding the facility.

Alternatives 3(a-c) would establish well-defined boundaries to create restricted access zones and is the most transparent of the three alternatives. Applicants and the public would incur the least time and costs to learn the criteria used by NOAA Fisheries Service to determine the sizes and locations of particular restricted access zones. Unlike **Preferred Alternative 2,** which would prohibit all fishing vessels without a copy of the permit from operating in or transiting through a restricted access zone, **Alternatives 3(a-c)** restrict this prohibition to federally permitted fishing vessels.

4.8 Action 8: Recordkeeping and Reporting

Alternative 1: No Action, the Regional Administrator has authority to specify recordkeeping and reporting requirements in an EFP (50 CFR 600.745).

Preferred Alternative 2: Establish the following reporting and recordkeeping requirements for aquaculture permittees:

- **(a) Submit a standardized annual report to NOAA Fisheries Service Southeast RA addressing the recordkeeping and reporting requirements specified in items (b) through (p) below. The annual report must be submitted to NOAA Fisheries Service RA on or before January 31 each year on a form available from the SERO Sustainable Fisheries Division.**
- **(b) Provide NOAA Fisheries Service currently valid copies of state, ACOE, FDA, MMS, USCG, and EPA permits pertaining to aquaculture. Maintain and make available upon request monitoring reports related to aquaculture activities conducted under each of these permits for the most recent three years;**
- **(c) Notify NOAA Fisheries Service within 24 hours of discovery of any of the following events:**
  - **(1) Major escapement. Major escapement is defined as the escape of 20 percent of the cultured organisms from a single allowable aquaculture system within a 24 hour period or the cumulative escape within a 24 hour period from all allowable aquaculture systems at a site representing 5 percent or more of the total cultured organisms. A permittee shall provide NOAA Fisheries Service with the following information if major escapement occurs or is suspected of having occurred: permit number, contact person and phone number, location of escapement, reason(s) for escapement and the number, type of species, size, and percent of cultured organisms that escaped, and actions being taken to address the escapement.**

(2) Entanglements or interactions with marine mammals, endangered species, and migratory birds. A permittee shall provide NOAA Fisheries Service with the following information if entanglements or interactions with marine mammals, endangered species, or migratory birds occur: 1) Date, time, and location of entanglement or interaction, 2) Species entangled or involved in interactions and number of individuals affected; 3) number of mortalities and acute injuries observed, 4) cause of entanglement or interaction, and 5) actions being taken to prevent future entanglements or interactions.

(d) Report all findings or suspected findings of any World Organization of Animal Health (OIE) suspected pathogen episodes or additional pathogens that are subsequently identified as reportable pathogens in the National Aquatic Animal Health Plan as implemented by the USDA, or U.S. Departments of Commerce or Interior that are known to infect the cultured species within 24 hours of diagnosis to NOAA Fisheries Service. Information reported must include: suspected pathogen, percent of cultured organisms infected, findings of the aquatic animal health expert, plans for submission of specimens for confirmatory testing (as required by the USDA), testing results (when available), and actions being taken to address the reportable pathogen episode. NOAA Fisheries Service may order the removal of all cultured organisms from an allowable aquaculture system upon a determination by a certified animal health expert that a suspected pathogen exists and poses a threat to the health of wild aquatic organisms (Note: the Animal Health Protection Act of 2002 provides the Secretary of Agriculture authority to carry out operations and measures to detect, control, or eradicate any pest or disease of livestock, including animals at a slaughterhouse, stockyard, or other point of concentration. NOAA Fisheries Service would coordinate with the USDA in ordering the removal of cultured organisms).

(e) Notify NOAA Fisheries Service in writing prior to any changes in hatcheries used for providing fingerlings and provide updated names and addresses/locations for the applicable hatcheries;

(f) Keep copies of purchase invoices for feed on file for three years from the date of purchase;

(g) Maintain and make available to NOAA Fisheries Service during inspection(s) or upon request, harvest and sale records for the most recent three years. Harvest and sale records must include the quantity of fish sold in both numbers and pounds and the names of companies or individuals to whom fish were sold;

(h) Notify NOAA Fisheries Service of the time and date of harvest of cultured organisms from the allowable aquaculture system at least 72 hours prior to harvest.

(i) Notify NOAA Fisheries Service of the time, date, and port of landing of transport vessels carrying cultured products harvested from

allowable aquaculture systems in the EEZ at least 72 hours prior to landing.

(j) Any cultured fish being transported for sale must be accompanied by the applicable bill of lading through the first point of sale. The bill of lading must include species name, quantity in numbers or pounds aquaculture permit number, and name and address of purchaser.

(k) Maintain and make available to NOAA Fisheries Service upon request a daily record of the number of cultured animals introduced or removed from each allowable aquaculture system, including mortalities, for the most recent three years.

(l) Permittee must provide NOAA Fisheries Service current information (i.e. updates if changed since application) regarding names, addresses, and phone numbers of captains, pilots, aircraft owners, and vessel owners, along with documentation or identification numbers for project vessels and aircraft.

(m) Permit applicants must provide NOAA Fisheries Service copies of valid state and federal aquaculture permits for each hatchery they obtain fingerlings from;

(n) At least 30 days prior to each time a permittee or their designee harvests broodstock, submit a request to NOAA Fisheries Service RA, including the following information: the number of animals, species, and size, and the methods, gears, and vessels to be used for capturing, holding, and transporting broodstock. Allowable methods or gears used for broodstock capture include those identified in 50 CFR 600.725, except red drum, which may be harvested with handline or rod and reel. The NOAA Fisheries Service RA may deny or modify a request for broodstock collection if allowable methods or gears are not proposed for use, the number of fish harvested for broodstock is more than necessary for purposes of spawning and rearing activities, or other grounds inconsistent with FMP objectives or other federal laws. If a broodstock collection request is denied or modified, the RA shall provide the determination and the basis for it, in writing to the permittee. If a broodstock collection request is approved, the permittee shall submit a report to the RA including the number and species of broodstock collected, their size (length and weight), and the geographic location where the broodstock were captured. The report shall be submitted on a form available from the SERO Sustainable Fisheries Division.

(o) During catastrophic conditions only, time schedules and methods (e.g., paper based reporting vs. electronic) for recordkeeping and reporting may be modified by the NOAA Fisheries Service RA. The RA will determine when catastrophic conditions exist, the duration of the catastrophic conditions, and which permittees or geographic areas are deemed affected by the catastrophic conditions. The RA will provide timely notice to affected permittees via publication of notification in the *Federal Register* and other appropriate means and

will modify or suspend the time schedules and reporting methods for the duration of the catastrophic conditions. In the event that records and reports cannot be submitted electronically to NOAA Fisheries Service during catastrophic conditions, the RA will provide each aquaculture permit holder the necessary paper forms, sequentially coded, and instructions for submission of the forms to the RA. The paper forms will also be available upon request from the RA. Assistance in complying with the requirements of the paper-based system will be available via the SERO's Sustainable Fisheries Division Monday through Friday between 8 a.m. and 4:30 p.m. eastern time.

(p) Any other appropriate recordkeeping and reporting requirements necessary for evaluating and assessing the environmental impacts of an aquaculture operation.

Discussion and Rationale

Section 6.9 examines the effects of the various Action 8 alternatives relative to each other within the biological, physical, ecological, economic, social, and administrative environments. The following is a brief summary of the environmental consequences associated with each of these alternatives.

Recordkeeping and reporting requirements are intended to allow both aquaculture facilities and NOAA Fisheries Service to examine the aquaculture operation and its impacts to the physical, biological, and ecological environments. Records and reports will act as the check and balance system in the time periods between permit issuance and renewal. These requirements will also help mitigate impacts associated with marine aquaculture and alert managers to potential problems. If potential problems arise, these requirements will allow NOAA Fisheries Service to work with a permittee to resolve potential problems and environmental impacts, or revoke an aquaculture permit if problems and impacts persist.

Action 8 considers two alternatives. Additional alternatives were considered for this action, but have been moved to the considered, but rejected section in Appendix D. **Alternative 1** would not establish recordkeeping and reporting requirements, while as many as 16 recordkeeping and reporting requirements could be specified by **Preferred Alternative 2**. Under either alternative, aquaculture operations would still have to abide by any permit requirements specified by other federal agencies (e.g., EPA NPDES permit, ACOE siting permit, etc.).

Additionally, the following text describes requirements that would be implemented as part of the aquaculture regulatory program. These requirements would be in addition to those described in the range of alternatives for Action 8. Additional requirements for dealer reporting are summarized in Action 1.

Landings and transactions of cultured species harvested from allowable aquaculture systems in the Gulf of Mexico EEZ would be tracked using an electronic reporting system developed by NOAA Fisheries Service. Transactions would be initiated by the

Gulf aquaculture dealer (see Action 1). Aquaculture permit holders would verify landings transactions before reporting is complete. If aquaculture permit holders indicate an error occurred during completion of a landing transaction, NOAA Fisheries Service may require participants to complete a landing transaction correction form.

The electronic reporting process would also be used to collect and monitor the following data and information. In some instances, reporting by phone would also be an option.

- Landing transactions (i.e. when an aquaculture permit holder sells cultured species to a permitted dealer), including the following information:

    - Date, time, and location of transaction;
    - The actual ex-vessel value of cultured species sold;
    - The weight of the catch sold by species; and,
    - Information necessary to identify the fisherman, vessel, and dealer involved in the transaction.

- Discovery of major escapement, entanglements, or interactions.
- Findings or suspected findings of pathogen episodes.
- Changes in hatcheries used for providing fingerlings.
- Harvest and landing notifications.
- Current contact information for captains, pilots, aircraft owners, and vessel owners, along with documentation or identification numbers for project vessels and aircraft.
- Requests for broodstock collection.
- Any other appropriate recordkeeping and reporting requirements necessary for evaluating and assessing the environmental impacts of an aquaculture operation.
- Standardized annual report addressing recordkeeping and reporting requirements.

For some information, it will not likely be practical to provide reports and records electronically. For the following information, hard copies may be mailed to NOAA Fisheries Service if this information cannot be provided electronically:

- Current valid copies of state, ACOE, FDA, MMS, USCG, and EPA permits pertaining to aquaculture
- Copies of valid state and federal aquaculture permits for each hatchery supplying fingerlings to a permitted aquaculture operation.

Summary Comparison of Physical, Biological, and Ecological Consequences

Alternative 1 would not specify recordkeeping and reporting requirements but would continue to allow the RA authority to specify EFP recordkeeping and reporting requirements if Action 1, Alternative 1 (Exempted Fishing Permit) is selected as the preferred alternative. Because Action 1, Alternative 2 (NOAA Fisheries Service permit to operate a facility) was selected by the Council as the preferred, only **Alternative 2** can be selected for Action 8.

The greatest impacts to the biological and physical environments would occur if the Council selects **Alternative 1** as the preferred. **Alternative 1** would not provide a standardized set of requirements for monitoring environmental impacts. If the RA does not specify an adequate range of recordkeeping and reporting requirements under the EFP, then environmental impacts to the physical and biological environments could over the short and long term resulting in increased potential for habitat degradation, escapement, and disease outbreaks.

Preferred Alternative 2 will require aquaculture facilities to meet multiple recordkeeping and reporting requirements. Four of the 16 subalternatives in **Preferred Alternative 2** pertain to recordkeeping (**Alternatives 2(f), 2(g), 2(j), and 2(k)**). Permittees would be required to maintain purchase invoices for feed, harvest and sale records, a record of the number of fish stocked for culture, and possess a bill of lading through the first point of sale. These recordkeeping requirements are intended to assist law enforcement in determining compliance with applicable regulations. Additionally, feed invoices will assist NOAA Fisheries Service and the EPA in the event that water quality problems arise as a result of the type of feed being used. As discussed in Section 6.1.3.1, the composition and integrity of feed can negatively affect organic loading (Rapp 2006). Harvest and sale records will be used to ensure that production does not exceed the maximum level allowed by Action 9. Harvest and sale records may also be used for auditing purposes to verify that more fish are not being harvested than originally stocked and/or produced.

The remaining alternatives would all require permittees to report to NOAA Fisheries Service. **Alternative 2(a)** would require a permittee to submit an annual report on or before January 31 each year. The report would summarize all requirements specified in Action 8. This report would assist NOAA Fisheries Service in determining compliance with applicable regulations. The report would also help to identify potential problems with a facility so that corrective action may be taken to protect the physical and biological environments.

Alternative 2(b) would require permittees to submit copies of valid state and federal aquaculture permits. This information will allow NOAA Fisheries Service to determine if a permittee possesses other necessary permits for operation. Permittees would also be required to maintain and make available monitoring reports required by other federal agencies for a period of three years. This information would alert NOAA Fisheries Service if monitoring requirements of other agencies identify impacts to the physical or biological environment. NOAA Fisheries Service would then work cooperatively with the ACOE, the EPA, and other federal agencies to correct or mitigate any problems caused by the operation.

Alternative 2(c) would require permittees to report major escapement events or entanglements and interactions with marine mammals, endangered species, or migratory birds (http://www.fws.gov/migratorybirds/intrnltr/mbta/mbtandx.html) within 24 hours of discovery to NOAA Fisheries Service. This reporting requirement will allow NOAA Fisheries Service to assess the severity of the problem and identify solutions for

addressing and preventing future escapements, entanglements, or interactions. There is no standard definition used for escapement in the aquaculture industry. The Council's definition for escapement is a modification of the State of Maine's definition, which requires permittees to report any known or suspected escape of 25 percent or more of a cage population and/or more than 50 fish with an average weight of two kg each or more within 24 hours (http://www.maine.gov/dmr/aquaculture/documents/StandardFinfishApplication07.pdf). The State of Washington also has escape reporting and recapture requirements, as well as an escape prevention plan, but does not have a definition for escapement (WAC 220-76-110 and WAC 220-76-120). The Council's definition for escapement would be slightly more conservative (20 vs. 25 percent for an individual aquaculture system) than Maine's definition and would expand the definition to include 5 percent or more of the cultured organisms within all allowable aquaculture systems at a site. Permittees would be required to specify the cause of the escapement, entanglement, or interaction and the quantity and type of species affected when reporting information to NOAA Fisheries Service. For marine mammals, endangered species, and migratory birds, permittees would also be required to provide information on the number of interactions, mortalities, and acute injuries, the date, time, and location of the entanglement or interaction, and actions being taken to prevent future entanglements or interactions.

To minimize the spread of pathogens, **Alternative 2(d)** would require cultured organisms to be inspected prior to stocking in allowable systems. Cultured organisms would have to be certified as pathogen-free by an aquatic animal health expert. Stocking pathogen-free organisms will be in the best interest of the operation, which wants to maintain healthy product, and not spread pathogens to wild stock. By not stocking organisms containing pathogens, the risk of disease spreading to other organisms within and outside an allowable aquaculture system will be reduced.

If OIE reportable pathogens are determined to exist, NOAA Fisheries Service, in cooperation with the Secretary of Agriculture, may order the removal of all cultured organisms from an allowable aquaculture system if the OIE-reportable pathogens pose a significant threat to the health of other cultured organisms or wild aquatic organisms (7 U.S.C. 8301 et seq.). Eradication is the most severe response and involves total depopulation of an affected population and potentially any populations linked to the diseased animals as identified through an epidemiologic trace. The Department of Agriculture must work with the affected parties and subject matter experts to determine the most effective means to undertake the eradication and must be responsible for effectively depopulating and then cleaning and disinfecting the affected premises.

Alternatives 2(e), **2(h)**, and **2(i)** all specify notification requirements for permittees. NOAA Fisheries Service would need to be notified prior to any changes in hatcheries, prior to the time and date of harvest of cultured organisms, and prior to landing. These alternatives will all benefit the biological environment by improving enforcement and ensuring wild species are not harvested or landed and reported as cultured products.

Alternatives 2(l) and **2(m)** would also be used for enforcement purposes and to ensure records are kept up to date. Permittees would be required to provide current contact information for captains, pilots, aircraft owners, and vessel owners used to support aquaculture activities and operations. Similarly, contact information would need to be provided for hatcheries used to obtain fingerlings.

Alternative 2(n) would specify requirements for harvesting broodstock. Action 1, Preferred Alternative 2, authorizes permittees to harvest or designate hatchery personnel or other entities to harvest wild broodstock of an allowable aquaculture species native to the Gulf of Mexico for aquaculture purposes. Prior to harvesting broodstock, permittees would need to submit a request to NOAA Fisheries Service that would include the species, number of animals, and the size of those animals they intend to harvest. The permittee would also need to identify the gears and methods used for harvest and transport. NOAA Fisheries Service would then be responsible for reviewing this information and approving, modifying, or denying the permittee's request. If broodstock harvest is approved, then the permittee would be required to report to NOAA Fisheries Service once broodstock have been harvested. The harvest of broodstock could negatively affect wild stocks if the amount harvested is significant and results in increased fishing mortality on the wild stock. NOAA Fisheries Service will be able to limit the amount of fish harvested for broodstock. Harvest of broodstock in most instances is expected to be small and insignificant when compared to landings by commercial and recreational fishermen. Additionally, restrictions on allowable gears and methods used for broodstock harvest will help minimize detrimental effects on habitat and the physical environment.

Alternative 2(o) would provide for modifications to recordkeeping and reporting requirements by the NOAA Fisheries Service RA in the event of a catastrophic event (e.g., hurricane). The RA would determine when catastrophic conditions exist and which permittees or geographic areas are affected by these conditions. The RA would then provide timely notice to those affected by the catastrophic conditions and may modify or suspend time schedules and reporting methods for the duration of the catastrophic conditions. If records and reports cannot be submitted electronically, then the RA would provide necessary forms for submission of records and reports. This provision is similar to regulations adopted for the Gulf Council's red snapper IFQ program and is intended to ensure NOAA Fisheries Service continues to receive reports and records in the event of a catastrophe.

Alternative 2(p) is a "catch-all" alternative and would allow other appropriate recordkeeping and reporting requirements to be established that are necessary for evaluating and assessing the environmental impacts of an aquaculture operation.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1 does not describe recordkeeping and reporting requirements, unless specified by the RA, while **Preferred Alternative 2** does. NOAA Fisheries Service has previously specified recordkeeping and reporting conditions for an EFP proposed for aquaculture in the Gulf EEZ. In a *Federal Register* notice published on July 30, 2003,

proposed terms and conditions for an offshore aquaculture project in the Gulf were specified (see 68 FR 44745). These terms and conditions are summarized in Section 5.3.4.3.

Alternative 1 does not explicitly state recordkeeping and reporting requirements specific to offshore aquaculture operations because an EFP includes all forms of exempted fishing. Consequently, the lack of transparency would cause applicants and the public to incur significant time and costs to consult with NOAA Fisheries Service and obtain other information in order to determine what the potential recordkeeping and reporting requirements would be for operation.

Preferred Alternative 2 more explicitly states recordkeeping and reporting requirements specific to offshore aquaculture operations than **Alternative 1**. Consequently, it offers greater transparency than the first alternative and requires less time and costs incurred by applicants and the public to consult with NOAA Fisheries Service and obtain other information in order to determine recordkeeping and reporting requirements.

Of the two alternatives, **Preferred Alternative 2** offers the least long-term risks and associated damages caused by actual or suspected events, such as entanglements with protected species or major escapements, by requiring timely reporting and responses in order to mitigate damages. However, **Preferred Alternative 2** would result in the greatest economic costs to the permittee, because of the extensive number of recordkeeping and reporting requirements that would have to be met. These economic costs are expected to be diminished by the social and biological benefits resulting for timely reporting and recordkeeping.

4.9 Action 9: Biological Reference Points and Status Determination Criteria.

Alternative 1. No Action. Do not establish biological reference points (maximum sustainable yield [MSY], optimum yield [OY]) or status determination criteria (maximum fishing mortality threshold [MFMT], minimum stock size threshold [MSST]) specific to aquaculture in the Gulf of Mexico EEZ.

Preferred Alternative 2. Establish the following new biological reference points and status determination criteria for aquaculture in the Gulf of Mexico EEZ:

The proxy for MSY is:
(a) the total yield harvested by all aquaculture operations in a given year within the management regime established in this FMP.
(b) equal to OY (Preferred).

The proxy for OY is the total yield harvested by all permitted aquaculture operations annually, but not to exceed:
(a) 16 million pounds.

(b) 32 million pounds.
(c) 36 million pounds.
(d) 64 million pounds (Preferred).
(e) 190 million pounds

No individual, corporation, or other entity can produce more than:
(a) 5 percent of OY.
(b) 10 percent of OY.
(c) 20 percent of OY (Preferred).

If planned aquaculture production exceeds the preferred OY specified in Alternative 2 than the Council would initiate review of the OY proxy and aquaculture program, and NOAA Fisheries Service would publish a control date, after which entry into the aquaculture industry may be limited or restricted.

Overfished (i.e., MSST) and overfishing (i.e., MFMT) definitions contained in the various FMPs to manage wild stocks will be used as proxies for assessing the status of those wild stocks potentially affected by excessive production in aquaculture operations.

Discussion and Rationale

The MSFCMA was written in part to establish the legal framework for managing wild fisheries resources of the United States, and was not explicitly written for managing at sea fish farming or aquaculture operations. Many of the principles and concepts that guide wild stock management under the MSFCMA are either of little utility or are not generally applicable to the management of aquaculture operations. Despite this lack of conceptual similarity, offshore aquaculture falls within the realm of activities subject to regulatory control under the MSFCMA and therefore must be accommodated within the existing legal framework. Many MSFCMA legal requirements do not fit well or are difficult to satisfy with respect to aquaculture, thereby making them seem less useful or even unnecessary. This is particularly true for yield targets and stock status parameters around which management of wild fisheries is based. Regardless, they are legal requirements, and until additional legal authority specifically suited for management of at sea aquaculture operations is established, all such requirements must be satisfied.

Alternative 1 would not establish biological reference points or status determination criteria for aquaculture in the Gulf of Mexico. Biological reference points and status criteria would continue to be specified for wild species managed by the Council, but similar criteria and reference points would not be established for aquaculture. This alternative would not satisfy MSA legal requirements and would require the Council to specify reference points and criteria in a subsequent amendment to this FMP.

Preferred Alternative 2 would establish biological reference points and status determination criteria for aquaculture in the Gulf of Mexico. MSY would either be equivalent to the total annual production capacity of all aquaculture operations in the

Gulf of Mexico EEZ, or set equal to OY. Setting MSY equivalent to the annual production capacity of all aquaculture operations in the Gulf of Mexico EEZ will involve some uncertainty. Theoretically, there will be some maximum capacity of the Gulf of Mexico to produce cultured fish that does not adversely affect wild stocks or the marine environment (e.g., water quality, habitat, etc.). In contrast, setting MSY equal to OY (Council's preferred option) allows the Council to take a more precautionary approach until more is known about the impacts of aquaculture in the Gulf of Mexico. The MSY specification, as with other fisheries, may be modified based on new information developed as this component of the fishery proceeds.

In addition to establishing a definition for MSY, **Preferred Alternative 2** would also establish a definition for OY. Optimum yield would either remain undefined for aquaculture in the Gulf of Mexico EEZ or be set at 16, 32, 36, 64, or 190 million pounds (mp). Guidance in 50 CFR 600.310 states OY should be based on MSY, or on MSY as it may be reduced by social, economic, and biological factors. Since aquaculture is essentially a farming operation, all animals cultured are intended for harvest. Unlike wild stock management, there is no need to leave cultured animals in offshore aquaculture grow-out systems to support future generations. Accordingly, there are currently no social, economic, or ecological factors supporting a reduction from MSY; therefore, OY and MSY can be set equal to one another. To the extent that harvesting MSY would result in adverse impacts to resources in the Gulf, OY may be reduced to a level where such adverse impacts do not occur. The Council's preferred option for OY is to set it equal to 64 mp (OY suboption (d)).

The proxies for OY are based on either the productivity of wild stocks (suboptions 2(c) or 2(e)) or expected production capacity (suboptions 2(a), 2(b), and 2(d)). The OY proxies summarized in suboptions 2(a-e) are likely substantially less than the yield that can be achieved by aquaculture operations over the long-term. Suboption 2(a), suboption 2(b), and preferred suboption 2(d) proxies are based on an estimated 5-20 operations starting business in the Gulf of Mexico over the next ten years and are considered reasonable estimates for future demand of aquaculture permits (see Table 4.9.1). The OY proxies also assume the operations will use 6 to 12 cages approximately 3,000 to 6,000 m^3 in size and that the production capacity of each cage is 22 to 44 pounds per m^3. The OY proxies specified for suboptions 2(c) and 2(e) represent average commercial harvest levels of marine species from the Gulf of Mexico during 2000-2006. Suboption 2(c) represents wild stock landings of all Council managed species proposed for culture in this FMP (i.e., reef fish, coastal migratory pelagics, stone crabs, spiny lobster, and red drum). Suboption 2(e) represents the average landings of all marine species in the Gulf of Mexico, except menhaden and shrimp, during 2000-2006. If menhaden and shrimp are included, landings would total 1.53 billion pounds. Although aquaculture has the potential to result in much greater production than wild fisheries, basing OY on the harvest of wild stocks can be useful when assessing risks (both environmental and economic/social) to domestic fisheries. These OY estimates are considered short-term proxies (next 10 years or until OY and MSY estimates are reviewed by the Council) for OY until more is known about the number and size of operations, potential environmental impacts resulting from

aquaculture, economic sustainability of aquaculture, and the production capacity of various marine aquaculture systems.

If the planned production level exceeds the preferred OY then the Council would initiate review of the OY proxy and aquaculture program, and determine whether OY should be increased or some other action is appropriate. Any change (increase or decrease) to OY should be based on the extent and magnitude of any adverse environmental and economic impacts that may result from the existing aquaculture management regime. During review of the program and OY proxy, NOAA Fisheries Service would publish a control date in the *Federal Register* after which entry into the aquaculture industry may be limited. Any permits issued after the control date may be subject to revocation. No individual, corporation, or other entity will be issued a permit authorizing the production of more than 20 percent of OY (Council preferred). The Council also considered capping planned production for a single operation at 5 or 10 percent of OY. Permit applicants should base their production capacity on the number of allowable aquaculture systems they propose to use, the frequency and size at which cultured species are harvested, and the overall productivity of the species proposed for culture. In reviewing permit applications, NOAA Fisheries Service will determine if planned production amounts are consistent with the permit application. This provision is necessary to ensure entities do not obtain an excessive share of the allowable yield (see National Standard 4: 50 CFR 600.325(a)(3)). The level selected by the Council for capping production must ensure against possible anti-competitive effects resulting from a small number of entities accounting for most or all of the offshore aquaculture production.

Aquaculture operations will harvest all cultured fish and invertebrates produced, excluding losses due to natural mortality. Due to cultured versus wild stocks being harvested, it would not be possible to overharvest the animals. Therefore, thresholds for determining overfishing and overfished status are not directly applicable to the cultured fish and invertebrates. However, it is conceivable that some level of aquaculture in the Gulf could result in adverse impacts to wild stocks, which could result in overfishing and depletion of such stocks. Therefore, the most logical way to assess impacts of overharvest in aquaculture operations is not on the cultured fish actually harvested, but the wild stocks remaining in the surrounding environment. Overfishing and overfished thresholds for wild stocks have been approved by the Council for evaluating the status of managed stocks and stock complexes. These thresholds will be used by NOAA Fisheries Service to determine if offshore aquaculture in the Gulf of Mexico EEZ is adversely affecting wild populations, causing them to become overfished or undergo overfishing.

Table 4.9.1 OY estimates for offshore aquaculture in the Gulf of Mexico based on 5-20 aquaculture operations, different amounts of cage productivity (22 vs. 44 pounds per m^3), different size cages (3,000 vs. 6,000 m^3) and different amounts of cages used per aquaculture operation (6 vs. 12 cages).

Productivity	# operations	# of cages[1]	cage size[2] ($m^{3)}$	production/cage (lbs)	total production (mp)
low productivity 22 lbs/m^3	5	6	3,000	66139	2
	5	6	6,000	132277	4
	5	12	3,000	66139	4
	5	12	6,000	132277	8
	10	6	3,000	66139	4
	10	6	6,000	132277	8
	10	12	3,000	66139	8
	10	12	6,000	132277	16
	20	6	3,000	66139	8
	20	6	6,000	132277	16
	20	12	3,000	66139	16
	20	12	6,000	132277	32
high productivity[1] 44 lbs/m^3	5	6	3,000	132277	4
	5	6	6,000	264554	8
	5	12	3,000	132277	8
	5	12	6,000	264554	16
	10	6	3,000	132277	8
	10	6	6,000	264554	16
	10	12	3,000	132277	16
	10	12	6,000	264554	32
	20	6	3,000	132277	16
	20	6	6,000	264554	32
	20	12	3,000	132277	32
	20	12	6,000	264554	64

[1] Posadas and Bridger 2004

[2] cage size based on two different sized SeaStation™ aquaculture cages

Preferred Alternative 2, unlike **Alternative 1**, would establish status criteria and reference points. MSY suboption 2(a) would be similar to **Alternative 1** in that it would set MSY at the level aquaculture operations are capable of producing on an annual basis. MSY suboption 2(b) would be considerably more precautionary and set MSY equal to OY (Council Preferred). The Council's preferred alternative would set OY at 64 mp (OY suboption 2d). The Council also considered setting OY equal to 16, 32, 36, and 190 mp (OY suboptions 2(a)-2(c) and 2(e)). The lower OY is set, the greater the benefit to the biological and physical environments. By establishing a precautionary OY level, the Council can assess the impacts of aquaculture as the industry grows to determine if the specified OY level is adequately protecting wild stocks and habitat. If impacts are not observed, or are considered to be minimized to the extent practicable and are not resulting in significant negative impacts, than the Council could consider increasing OY/MSY in the future.

Similarly, OY/MSY could be reduced in the future if negative impacts are determined to be occurring and cannot be prevented or mitigated. There is the potential for adverse impacts related to offshore aquaculture to occur, such as those described in Section 6.1. If NOAA Fisheries Service identifies adverse impacts to wild stocks resulting in populations falling below the established thresholds or becoming subject to excessive fishing mortality, as a consequence of aquaculture operations (reduced biomass levels resulting in increased F), the appropriate overfished or overfishing determination will be triggered. Adverse environmental impacts to the aquaculture operations will be based on data collected via the ongoing monitoring (including monitoring by other federal agencies) of permitted operations. If there is a reasonable basis to tie aquaculture operations to adverse environmental impacts, which are in turn resulting in reduced abundance (depletion) of wild stocks, action will be taken by NOAA Fisheries Service Such action could include, but is not limited to, reducing aquaculture production levels, removing cultured organisms containing pathogens, removing cultured organisms that are transgenic or that have been genetically modified, and reevaluating facility siting locations to avoid habitat degradation.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1 would not establish biological reference points or status criteria, whereas **Preferred Alternatives 2** would. Therefore, **Alternative 1** would not reap the benefits of scientific management of a fishery, and is the least beneficial and most costly of the alternatives.

Under **Preferred Alternative 2**, MSY suboption 2(a) would create a weaker biological standard than preferred suboption 2(b) by allowing for greater potential production. Among the alternatives under the OY suboption, the fourth and preferred alternative allows the benefit of the second highest amount of production of cultured organisms in the Gulf EEZ and the greatest entry into the fishery. Only OY suboption 2(e) would allow for greater production (190 mp). However, this latter alternative may result in it highest costs in terms of reduced market shares and prices for traditional commercial fishermen who may be in competition with Gulf aquaculturists.

Action 9 also includes suboptions for limiting the amount that an individual, corporation or other entity could produce as a percentage of OY. Among the alternatives under the production capacity suboption, preferred suboption 2(c) allows the benefit of the highest amount of production allowed by a single entity. None of these alternatives limit the market share of an individual, corporation or other entity because at present there are no entities producing cultured organisms in the Gulf EEZ and the first one that does will have a market share of 100 percent.

With the exception of OY suboption 2(e), the preferred OY suboption (2(d)) and the preferred production capacity suboption (2(c)) offer the greatest benefit to aquaculture facility owners because they would allow them to increase the scale of production, produce larger quantities, and potentially experience greater economies of scale than the other alternatives. However, it also may have the greatest adverse impacts on traditional commercial fishermen and their communities because of increased geographical and economic concentration from industrial fish farming.

4.10 Action 10: Framework Procedures

Alternative 1: No action (status quo), do not specify framework procedures for modifying aquaculture management measures, status determination criteria, or biological reference points.

Alternative 2: Specify the following framework procedures for modifying biological reference points (MSY, OY) for offshore marine aquaculture in the Gulf of Mexico EEZ.

A. The Council will appoint an Aquaculture Advisory Panel to meet annually to evaluate the aquaculture management program proposed in this FMP (and as amended by subsequent Council actions). The group shall be composed of Council staff, NOAA Fisheries Service biologists and social scientists, Scientific and Statistical Committee (SSC) members, Socioeconomic Panel (SEP) members, and other state, university, or private scientists with expertise related to aquaculture. The panel will address and review the following:

1. Annual planned aquaculture production levels relative to MSY and OY.

2. Condition and status of wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, and other resources managed by the Council and NOAA Fisheries Service, and whether or not their status is adversely affected by aquaculture through:

a. pathogens;
b. organic and benthic loading and changes in water quality;
c. entanglements and interactions;

d. escapement of cultured fish;
e. other factors.

3. Economic and social considerations of aquaculture in the EEZ as they relate to Gulf of Mexico fishing communities.

B. The panel will prepare a written report with its recommendations for submission to the Council each year. The report will provide the scientific basis for their recommendations, and may include, but is not limited to:

a. a summary of annual aquaculture landings and planned production;
b. a status summary of Council and NOAA Fisheries Service managed resources and whether or not they have been adversely affected by aquaculture;
c. a summary of ongoing research activities related to aquaculture in the Gulf of Mexico EEZ, including important findings and results; and,
d. recommendations for setting MSY or OY.

C. If the panel determines annual planned aquaculture production has met or exceeded OY, then they will notify the Council and NOAA Fisheries Service. NOAA Fisheries Service will then publish a control date in the *Federal Register*, after which entry into the aquaculture fishery may be limited.

D. If the panel determines aquaculture is adversely affecting wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, fishing communities, or other resources managed by the Council and NOAA Fisheries Service, they may recommend MSY and OY be reduced. Any decrease in MSY or OY shall include the scientific basis for the recommendation.

E. If the panel determines aquaculture is not adversely affecting wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, fishing communities, or other resources managed by the Council and NOAA Fisheries Service, they may recommend to the Council that MSY and OY be increased. Any increase in MSY or OY shall include the scientific basis for the recommendation.

F. The Council will consider the report and recommendations of the panel, and any public comments relevant to the panel's report. The Council will hold a public hearing to consider the recommendations of the panel's report. The Council may convene the SEP or SSC to provide additional advice prior to taking final action. After public input, the Council will make findings on the need for changes.

G. If changes are needed to MSY or OY, the Council will advise the NOAA Fisheries Service Southeast Region Regional Administrator (RA) in writing of their recommendations, accompanied by the panel's report, relevant background material, and public comments.

H. The RA will review the Council's recommendations for consistency with the goals and objectives of the Aquaculture FMP, national standards, the MSFCMA, and other applicable laws. If the RA concurs with the recommendations, regulations will be drafted and implemented through notice in the *Federal Register*. If the RA rejects the recommendations, the RA shall notify the Council in writing of the reasons for rejection and existing regulations would remain in effect.

Regulatory changes that may be implemented by the RA by notice in the *Federal Register* include:

a. adjustments to MSY; and,
b. adjustments to OY

Preferred Alternative 3: Specify the following framework procedures for modifying biological reference points (MSY, OY), and management measures for offshore marine aquaculture in the Gulf of Mexico EEZ.

A. The Council will appoint an Aquaculture Advisory Panel to meet annually to evaluate the aquaculture management program proposed in this FMP (and as amended by subsequent Council actions). The group shall be composed of Council staff, NOAA Fisheries Service biologists and social scientists, Scientific and Statistical Committee (SSC) members, Socioeconomic Panel (SEP) members, and other state, university, or private scientists with expertise related to aquaculture. The panel will address and review the following:

1. Annual planned aquaculture production levels relative to MSY and OY.

2. Condition and status of wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, and other resources managed by the Council and NOAA Fisheries Service, and whether or not their status is adversely affected by aquaculture through:

a. pathogens;
b. organic and benthic loading and changes in water quality;
c. entanglements and interactions;
d. escapement of cultured fish;
e. other factors.

3. Economic and social considerations of aquaculture in the EEZ as they relate to Gulf of Mexico fishing communities.

4. Management measures for regulating aquaculture, including:

a. permit application requirements (see Action 2);
b. aquaculture operational requirements and restrictions, including monitoring (see Action 2);
c. allowable aquaculture system requirements (see Action 5);
d. siting requirements (see Action 6); and,
e. recordkeeping and reporting requirements (see Action 8).

B. The panel will prepare a written report with its recommendations for submission to the Council each year. The report will provide the scientific basis for their recommendations, and may include, but is not limited to:

a. a summary of annual aquaculture landings and planned production;
b. a status summary of Council and NOAA Fisheries Service managed resources and whether or not they have been adversely affected by aquaculture;
c. recommended changes to permit application requirements, operational requirements and restrictions, allowable aquaculture system requirements, siting requirements, and recordkeeping and reporting requirements; and
d. a summary of ongoing research activities related to aquaculture in the Gulf of Mexico EEZ, including important findings and results; and,
e. recommendations for setting MSY or OY.

C. If the panel determines annual planned aquaculture production has met or exceeded OY, then they will notify the Council and NOAA Fisheries Service. NOAA Fisheries Service will then publish a control date in the *Federal Register*, after which entry into the aquaculture fishery may be limited.

D. If the panel determines aquaculture is adversely affecting wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, fishing communities, or other resources managed by the Council and NOAA Fisheries Service, they may recommend MSY and OY be reduced. Any decrease in MSY or OY shall include the scientific basis for the recommendation.

E. If the panel determines aquaculture is not adversely affecting wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, fishing communities, or other resources managed by the Council and NOAA Fisheries Service, they may recommend to the

Council that MSY and OY be increased. Any increase in MSY or OY shall include the scientific basis for the recommendation.

F. If the panel determines changes to permit application requirements, operational requirements and restrictions, allowable aquaculture system requirements, siting requirements, and recordkeeping and reporting requirements are warranted, they shall provide the Council with recommended changes, including rationale for such changes.

G. The Council will consider the report and recommendations of the panel, and any public comments relevant to the panel's report. The Council will hold a public hearing to consider the recommendations of the panel's report and develop a regulatory amendment if they believe changes are warranted. The Council may convene the SEP or SSC to provide additional advice prior to taking final action. After public input, the Council will make findings on the need for changes.

G. If changes are needed to MSY, OY, or management measures listed above, the Council will submit to the NOAA Fisheries Service Southeast Region Regional Administrator (RA) a regulatory amendment, accompanied by the panel's report and any relevant public comments.

H. The RA will review the Council's regulatory amendment for consistency with the goals and objectives of the Aquaculture FMP, national standards, the MSFCMA, and other applicable law. If the RA concurs with the recommendations, regulations will be drafted and implemented through a rulemaking in the *Federal Register*. If the RA rejects the recommendations, the RA shall notify the Council in writing of the reasons for rejection and existing regulations would remain in effect.

Regulatory changes that may be implemented by the RA by rulemaking in the *Federal Register* include:

a. adjustments to MSY;
b. adjustments to OY;
c. permit application requirements;
d. aquaculture operational requirements and restrictions, including monitoring requirements;
e. allowable aquaculture system requirements;
f. siting requirements for aquaculture facilities; and,
g. recordkeeping and reporting requirements.

Discussion and Rationale

Action 10 includes three alternatives and proposes framework procedures to allow for timelier implementation of some aquaculture regulatory measures. **Alternative 1** would not specify framework procedures for aquaculture. Any time the Council needed to modify aquaculture regulations, a plan amendment would need to be developed.

Development of a plan amendment could take considerable time and slow the implementation of various management measures in the event that negative impacts are occurring on the physical, biological, social, or economic environments. **Alternative 2** and **Preferred Alternative 3** propose framework procedures for modifying biological benchmarks (MSY/OY) and some aquaculture regulatory measures (**Preferred Alternative 3 only**). Both **Alternatives 2** and **3** would rely on an Aquaculture Advisory Panel that would meet annually to provide recommendations to the Council. The panel would be composed of Council staff, NOAA Fisheries Service biologists and social scientists, SSC and SEP members, and other state, university, or private scientists with expertise related to aquaculture. The authority of the Advisory Panel would be much more limited under **Alternative 2**; they could only recommend changes to MSY and OY. Under **Preferred Alternative 3**, the Panel would have broader authority, which would include recommending changes to: MSY and OY, application and operating requirements, recordkeeping and reporting requirements, siting requirements, and allowable aquaculture system requirements. The main responsibilities of the Panel would include: 1) reviewing annual planned aquaculture production levels relative to MSY and OY; 2) evaluating the condition and status of wild stocks and other marine resources and whether or not their status has been adversely affected by offshore aquaculture; and 3) assessing economic and social considerations of aquaculture in the Gulf EEZ.

Under **Alternative 2**, if the Council supported the Panel's recommendations, it could then submit the recommendations to the NOAA Fisheries Service RA for further consideration. The RA would have the authority to approve or deny the proposed changes to MSY and OY. If the RA approved the changes, then the regulatory measures would be published in the *Federal Register*. **Preferred Alternative 3** is similar to **Alternative 2**, except the Council would need to develop a regulatory amendment for proposed regulatory changes recommended by the Panel. The regulatory amendment would then be submitted to the NOAA Fisheries Service RA for further consideration. The framework procedures described in **Alternative 2** and **3** are both intended to allow timelier implementation of regulatory measures necessary to prevent or mitigate impacts to the physical, biological, social, economic, and administrative environments. For both **Alternatives 2** and **3**, several opportunities for public comment and input would be available before any proposed changes to regulatory measures are approved. **Alternative 2** could potentially take considerably less time than **Preferred Alternative 3**, because a regulatory amendment would not have to be developed. However, **Alternative 2** would be much more limiting in that it would only allow biological reference points to be changed.

Summary Comparison of Physical, Biological, and Ecological Consequences

All of the framework procedures proposed in Action 10 are administrative in nature, and therefore would not have any direct effect on the physical, biological, or ecological environments. The proposed framework procedures may however result in some indirect effects to these environments. Indirect effects would include adjustments to OY/MSY based on biological considerations and the timeliness of regulatory measures that could be implemented to address adverse impacts related to aquaculture.

As discussed in Action 9, the Gulf of Mexico has some maximum production capacity for aquaculture beyond which adverse impacts will result. The Council's preferred alternative in Action 9 would set OY equal to 64 mp. This value is considered relatively conservative in comparison to the Gulf of Mexico's ultimate production capacity, which is currently unknown. However, rather than establish MSY/OY at higher levels the Council is taking a precautionary approach to setting these values until more is known. **Alternatives 2** and **3** in Action 10 would provide procedures for modifying MSY/OY. Any changes would be based on recommendations by an Aquaculture Advisory Panel, as approved by the Council, after assessing whether or not adverse effects from aquaculture are impacting wild marine resources. If adverse impacts are occurring, then **Alternatives 2** and **3** would indirectly benefit the physical and biological environments by allowing more timely reductions in OY/MSY and adjustments to regulatory measures (**Preferred Alternative 3 only**). Similarly, if adverse impacts are determined to not be occurring, or have been minimized to the extent practicable, then both **Alternatives 2** and **3** would provide for timelier implementation of increased OY/MSY levels. **Preferred Alternative 3** has the added benefit of allowing regulatory adjustments through development of a regulatory amendment. Although development of a regulatory amendment would take longer than publication of regulations in the *Federal Register* (as proposed in **Alternative 2**), it would still be faster than implementation of a plan amendment. Timely implementation of regulatory measures will ensure NOAA Fisheries Service has appropriate operational, siting, recordkeeping, and reporting requirements for issuing, monitoring, and reviewing aquaculture permits.

Summary Comparison of Socioeconomic and Administrative Consequences

Alternative 1 would not establish framework procedures for modifying aquaculture regulations or biological reference points. Each time the Council amended their regulations, a full plan amendment would have to be developed. Development of a plan amendment is considerably slower than development of a regulatory amendment or *Federal Register* notice, and therefore would result in the greatest economic costs to the Council and NOAA Fisheries Service. Additionally, not being able to implement regulations in a timely manner may have negative physical, biological, social, and economic consequences. Of the alternatives considered in Action 10, **Alternative 1** is expected to result in the greatest economic costs and least social benefits.

Alternatives 2 and **Preferred Alternative 3** would establish an organizational framework for the Council and NOAA Fisheries Service to effectively manage the fishery. **Alternative 2** provides limited authority for making changes, only allowing modifications to MSY/OY. **Preferred Alternative 3** offers the opportunity for regulatory changes that may be implemented by the RA beyond adjustments to MSY or OY, such as permit application requirements, operational requirements and restrictions, and monitoring requirements. For both alternatives, the Council would appoint an Aquaculture Advisory Panel. **Preferred Alternative 3** is expected to result in greater economic costs to the Council and NOAA Fisheries Service than **Alternative 2**, but less economic costs than **Alternative 1**. Costs incurred by NOAA Fisheries Service under **Alternative 2** would include participating in AP meetings, review of AP and Council recommendations, and preparation of a Federal Register notice. **Preferred Alternative**

3 would include the same costs as **Alternative 2**, plus there would be additional economic costs for preparing a regulatory amendment. Overall, **Preferred Alternative 3** is expected to provide the best balance between timely review of the aquaculture program, timely implementation of regulatory measures, and public opportunities for proposed regulatory changes.

5.0 Affected Environment

Both the physical environment and biological environment for Gulf of Mexico fisheries are described in detail in the EIS for the Generic Essential Fish Habitat Amendment, which is incorporated here by reference (GMFMC 2004). Summaries of that information are presented in the following subsections.

5.1 Physical Environment

The Gulf of Mexico is bounded by Cuba, Mexico, and the U.S., and has a surface area of 1.51 million km^2 (Wiseman and Sturges 1999). It is a semi-enclosed, oceanic basin connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel. Conditions in the Gulf of Mexico are primarily affected by the Loop Current, the discharge of freshwater into the Northern Gulf, and a semi-permanent, anti-cyclonic gyre in the western Gulf.

5.1.1 Geological Features

The Gulf of Mexico can be divided into two major sediment provinces (Fig. 5.1.1-1). East of DeSoto Canyon and southward along the west Florida coast, sediments are primarily carbonates. Coarse surface deposits include quartz sand, carbonate sand, and mixtures of the two. To the west of DeSoto Canyon, sediments are terrigenous. Coarse sediments make up the very shallow nearshore bottoms from the Texas/Mexican border to off central Louisiana from the shore to the central third of the shelf. Beyond depths of 80 m, fine sediments are also strongly represented. Fine sediments are limited to the northern shelf under the influence of the Mississippi and Atchafalaya Rivers.

The west Florida shelf provides a large area of hardbottom habitat. It is comprised of low relief hardbottoms that are relict reefs or erosional structures. Some high relief can be found along the shelf edge in waters 130 to 300 m deep. Hardbottom provides extensive areas where reef biota, such as corals, can become established. These hardbottom have become important reef fish fishing areas and some areas, such as the Tortugas North and South closed areas, the Florida Middle Grounds habitat area of particular concern (HAPC), the Steamboat Lumps closed area, and the Madison and Swanson closed area limit fishing activities within their boundaries.

Off the Alabama/Mississippi shelf and shelf break, irregular-shaped aggregates of calcareous organic forms called pinnacles are found. These pinnacles average about 9 m in height and are found in waters about 80 to 130 m deep. In addition to the pinnacles, low-relief hardbottom areas can be found in waters less than 40 m adjacent to Florida and Alabama.

While the Louisiana/Texas shelf is dominated by muddy or sandy terrigenous sediments, banks and reefs do occur on the shelf. Rezak et al. (1985) grouped banks into the mid-shelf banks, (defined as those that rise from depths of 80 m of less and have a relief of 4 to 50 m) that are made of relatively bare, bedded Tertiary limestones, sandstones,

claystones, and siltstones, and relict reefs (defined as those that rise from water depths of 14 to 40 m and have a relief of 1 to 22 m) that are relict carbonate shelf. The Flower Garden Banks National Marine Sanctuary is located about 150 km directly south of the Texas/Louisiana border. This coral reef is perched atop two salt domes rising above the sea floor and ranges from 15 to 40 m deep.

5.1.2 Oceanographic Features

Most of the oceanic water entering the Gulf flows through the Yucatan Channel, a narrow (160 km wide) and deep (1,650-1,900 m) channel. Water leaves the Gulf through the Straits of Florida, which is about as wide as the Yucatan Channel, but not nearly as deep (about 800 m). This pattern of water movement produces the most pronounced circulation feature in the Gulf of Mexico basin, known as the Loop Current with its associated meanders and intrusions. After passing through the Straits of Florida, the Loop Current, also known as the Florida Current at this stage, merges with the Antilles Current to form the Gulf Stream.

Runoff from precipitation on almost two-thirds of the land area of the U.S. eventually drains into the Gulf of Mexico via the Mississippi River. The combined discharge of the Mississippi and Atchafalaya Rivers alone accounts for more than half the freshwater flow into the Gulf and is a major influence on salinity levels in coastal waters on the Louisiana/Texas continental shelf. The annual freshwater discharge of the Mississippi/Atchafalaya River system represents approximately 10 percent of the water volume of the entire Louisiana/Texas shelf to a depth of 90 m. The Loop Current and Mississippi/Atchafalaya River system, as well as the semi permanent, anticyclonic gyre in the western Gulf, significantly affect oceanographic conditions throughout the Gulf.

5.1.2.1 Temperature

The physical characteristics of the Gulf of Mexico have been extensively mapped. Darnell et al. (1983) mapped physical parameters for the northwestern Gulf of Mexico (the Rio Grande River to the Mississippi River). Bottom temperature was mapped for the coldest and warmest months (January and August). During January, the shallowest waters of the central shelf ranged between 12° C and 14° C. The temperature increased with depth, with a broad band of warmer water, between 17° C and 19° C, across the middle to deeper shelf. However, on the outer shelf off central Louisiana and south Texas, temperatures dropped below 17° C, presumably due to the intrusion of cold deeper waters in both areas.

During August, the shallowest waters of the central shelf reached 29° C, and bottom water temperatures decreased almost regularly with depth, attaining lows of around 17° C to 18° C toward the outer shelf. Thus, bottom temperatures showed a seasonal range of 15° C or more. On the outer shelf the seasonal range was only 2° C or less.

Darnell and Kleypas (1987) mapped the eastern Gulf of Mexico (Mississippi River to the Florida Keys), following the same protocol as Darnell et al. (1983) in gathering bottom

temperature data during January and August. During the month of January, the coldest shelf water (14° C) appeared just off the Mississippi barrier islands. Water colder than 16° C occupied the nearshore shelf out to the 25-m isobath from the Chandeleur Islands to Cape San Blas, Florida, and below that point it extended to the 20-m isobath to northern Tampa Bay. West of DeSoto Canyon all bottom shelf waters were below 18° C. However, east of DeSoto Canyon, all outer shelf waters exceeded 18°C, and the 18°C and 20° C isotherms passed diagonally shoreward across the isobaths so that all shelf waters from just above Charlotte Harbor to the Florida Keys were 18° C or above. The maximum January temperature (22° C) was encountered near the southern tip of the Florida shelf at a depth of 60 to 70 m.

During August, the temperature of the nearshore bottom water ranged from 26° C near Panama City, Florida, to 30° C around Cedar Key, Florida. Throughout the eastern Gulf shelf; bottom water temperatures decreased with depth. Near the Mississippi River Delta the outer shelf water was 22° C, but temperatures down to 16° C were observed along both the eastern and western rims of DeSoto Canyon and at several localized areas along the outer shelf of Florida. For most of the shelf of the Florida peninsula, bottom isotherms paralleled the isobaths.

Seasonal comparisons reveal that nearshore waters for the entire eastern Gulf shelf were 10° C to 15° C warmer in the summer than in the winter. Near the Mississippi River Delta, the bottom waters of the outer shelf were only about 5° C warmer in the summer than during the winter. However around the rim of DeSoto Canyon and along the shelf of Florida, summer temperatures ranged 1° C to 4° C colder in the summer than in the winter. This summer temperature depression is due to the intrusion of colder slope water onto the outer shelf during the summer months.

Figures 5.1.2.1-1 and 5.1.2.1-2 show sea surface temperature (SST) derived using the National Oceanographic Data Center and the University of Miami's Rosenstiel School of Marine and Atmospheric Sciences' Advanced Very High Resolution Radiometer Version 5.0 Pathfinder SST data from 1985-2001. Figure 5.1.2.1-1 depicts the monthly SST average for February, the coldest month, while Figure 5.1.2.1-2 depicts the monthly SST average for August, the warmest month. During February, average surface temperatures ranged from 15° C in the northern Gulf to 26° C between the Yucatan Peninsula and Cuba. During August, surface temperature for most of the Gulf of Mexico averaged either 29° C or 30° C.

5.1.2.2 Salinity

Surface salinities in the Gulf of Mexico vary seasonally. During months of low freshwater input, surface salinities near the coastline range between 29 and 32 ppt (MMS 1997). High freshwater input conditions during the spring and summer months result in strong horizontal salinity gradients with salinities less than 20 ppt on the inner shelf in the northern Gulf of Mexico. The waters in the open Gulf are characterized by salinities between 36.0 and 36.5 ppt (MMS 1997).

5.1.2.3 Hypoxia

Hypoxic waters occur when dissolved oxygen levels drop below 2 mg/L. In the northern Gulf of Mexico, a major and annually consistent area of hypoxia may occur from late February through early October extending from near the mouth of the Mississippi River to near the mouth of the Sabine River nearly continuously from mid-May through mid-September. The hypoxic area is most widespread, persistent, and severe in June, July, and August (Rabalais et al. 1999). Hypoxic waters in this zone can include 50 to 80 percent of the lower water column between 5 and 30 m water depth, and can extend as far as 130 km offshore to depths of 60 m (Rabalais and Turner 2001). Between 1985 and 1992, hypoxia generally formed two areas west of the Mississippi and Atchafalaya River deltas, with the total area averaging 8,000 to 9,000 km^2. After the Mississippi River flooded in 1993, the size of the hypoxic zone doubled in area forming a single continuous zone across the Louisiana continental shelf (Rabalais et al. 2002). In 2002, the hypoxic zone covered approximately 22,000 km^2 of the Louisiana-Texas shelf. Other smaller hypoxic zones may form in Gulf of Mexico bays and offshore waters periodically, but less regularly than in the Louisiana offshore area.

5.1.2.4 Turbidity

Riverine inputs, wind, and currents are the primary agents that cause turbidity in Gulf waters. Turbidity levels in the western and northern Gulf are higher than the eastern Gulf because of more sources of freshwater input. Surface turbidity is limited to areas of riverine inputs with the Mississippi and Atchafalaya Rivers the primary inputs for the Gulf. During the low water periods, the amount of sediment in suspension averages 0.260 g/L. The amount of sediment increases to 0.640 g/L during high water (flood) periods. These turbid waters are delivered to offshore locations by tidal currents and winds.

Another type of turbidity that is found near the bottom is called the nepheloid layer. This is a body of moving, suspended sediment that is formed when the turbulence of bottom waters is high enough to offset the settling (gravity driven) of the sedimentary particles. Along the south Texas continental shelf, Shideler (1981) found that the nepheloid layer thickened offshore to a maximum of 35 m near the shelf break and that the concentration of suspended sediment in the nepheloid layer decreased from a maximum nearshore to a minimum at the shelf break.

Rezak et al. (1985) studied the nepheloid layer on the Louisiana/Texas shelf from 1979 to 1982. Inshore of the 10-m isobath the water was turbid from top to bottom. Offshore of the 10-m isobath, the top 2 to 3 m of water was turbid with a layer of clear water between the bottom nepheloid layer and the top layer of turbid water. The nepheloid layer at the base of the water column up to 50 km offshore was heavily laden with suspended sediment. The nepheloid layer extends across the shelf in a well mixed bottom layer 10 to 15 m thick, and spills over onto the continental slope. At the shelf break, the nepheloid layer wells up to more than 25 m in thickness. Rezak et al. (1985) concluded that the

sediment in the nepheloid layer is kept in suspension over much of the inner shelf by swift currents.

5.1.3 Aquaculture Sites

5.1.3.1 Areas where aquaculture may be prohibited or should be avoided.

See Figure 5.1.3.1-1 Prohibited Aquaculture Areas East
See Figure 5.1.3.1-2 Prohibited Aquaculture Areas West

5.1.3.1.1 Marine reserves and seasonal-area closures

Madison/Swanson and Steamboat Lumps Marine Reserves – These areas are marine reserves intended to protect reef fish, and in particular gag spawning aggregations. Fishing, except for surface trolling during May through October, is prohibited (219 square nautical miles) in these marine reserves. The Madison/Swanson site was also identified as a Habitat Area of Particular Concern (HAPC) by the Council. A new site, the Edges 40-fathom break (390 nm^2), is proposed for implementation as a seasonal area closure in Amendment 30B to the Reef Fish FMP. If approved, this area would prohibit fishing from January through April each year along the 40 fathom break in the NE Gulf of Mexico.

Tortugas North and South Ecological Reserves – These areas are no-take marine reserves cooperatively implemented by the state of Florida, National Ocean Service (NOS), the Council, and the National Park Service (185 square nautical miles). These areas prohibit fishing for any species and bottom anchoring by fishing vessels.

5.1.3.1.2 USCG Lightering areas, safety zones, shipping fairways, and anchorages

The U.S. Coast Guard regulates numerous areas where navigation is restricted or prohibited. These areas include lightering areas (where oil is offloaded from vessels), anchorages, outer continental shelf safety zones, deepwater port safety zones (for the Louisiana Offshore Oil Port and the Gulf Gateway Port), and shipping fairways. Aquaculture facilities sited in these areas would pose hazards to navigation or national security, making these areas unsuitable for offshore aquaculture.

5.1.3.1.3 Areas prohibited by the U.S. Army Corps of Engineers

ACOE regulations prohibit aquaculture activities from occurring in disposal areas and their vicinity, navigation channels, borrow sites, and federal mitigation areas.

5.1.3.1.4 HAPCs

The Council has established a number of HAPCs. The regulations in these areas vary (Generic EFH Amendment 3 or 50 CFR 622.34), but have been primarily established to protect critical fish habitat from damage due to anchoring and fishing activities.

Individual reef areas and bank HAPCs of the northwestern GOM include: East and West Flower Garden Banks, Stetson Bank, Sonnier Bank, MacNeil Bank, 29 Fathom, Rankin Bright Bank, Geyer Bank, McGrail Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank. Bottom anchoring by fishing vessels and the use of trawling gear, bottom longlines, buoy gear, dredge gear, and all traps/pots on coral reefs are prohibited in the East and West Flower Garden Banks, McGrail Bank, and Stetson Bank (263.2 square nautical miles).

Florida Middle Grounds HAPC – This HAPC is located in the northeastern Gulf and includes an area of pristine soft corals (348 square nautical miles). All gear interfacing with the bottom is prohibited in this HAPC.

Pulley Ridge HAPC – A portion of this HAPC (110 square nautical miles) is closed to anchoring of fishing vessels and the use of trawling gear, bottom longlines, buoy gear, dredge gear, and all traps/pots (2,300 square nautical miles) to protect deepwater hermatypic coral reefs.

5.1.3.1.5 Sites designated as "No Activity Zones" by the Mineral Management Service

Several shelf edge, mid-shelf, and low relief banks with coral reef community organisms exist off of Louisiana and Texas. These banks are protected from potential oil and gas development impacts by the Minerals Management Service through a Topographic Features Stipulation (MMS 2002), which establishes a "No Activity Zone" at each bank. The "No Activity Zone" prohibits any structure, drilling rig, pipeline, or anchoring within the zone.

5.1.3.2 Other environmentally sensitive areas

See Figure 5.1.3.2-1 Areas of Concern East
See Figure 5.1.3.2-2 Areas of Concern West

5.1.3.2.1 Hypoxic zones

As discussed in Section 5.1.2.3, hypoxia can extend over vast areas of the Louisiana and upper Texas continental shelf. In order to avoid impacts to aquaculture organisms from low dissolved oxygen levels and having waste matter from aquaculture operations contributing to the hypoxic zone, areas that experience frequent hypoxia should be avoided.

5.1.3.2.2 Areas where harmful algal blooms frequently occur

Harmful algal blooms or red tide are common on the west Florida continental shelf. In order to avoid potential losses of all organisms due to harmful algal blooms, aquaculture facilities should be sited in areas where the history of occurrence of harmful algal blooms is low.

5.1.3.2.3 Ecological areas of concern

Currently, unprotected hardbottom areas exist that should be avoided when siting aquaculture facilities. For example, the Pinnacles area located on the Mississippi and Alabama continental shelf consists of a 1.6 km wide band of shelf-edge features in water depths ranging from 68 to 101 m. These pinnacles have vertical relief of about 9 m with some exceeding 15 m (Continental Shelf Associates, Inc. and Texas A&M Univ. 2001).

Seagrasses are very sensitive to anthropogenic disturbances and have a very low recovery capacity. Effluents from aquaculture operations might also have a negative effect on seagrass. Fish farming releases high organic and nutrient loading into the surroundings (Beveridge 2004). Organic matter may accumulate in the sediment under and nearby cages, degrading the benthic macrophyte communities, especially seagrass (Perez et al. 2005). Therefore, aquaculture facilities should avoid seagrass areas. Siting criteria specified for Action 6, Preferred Alternative 3, includes NOAA Fisheries Service consideration of important ecological habitats, such as seagrass.

5.1.3.3 Other special management areas

See Figure 5.1.3.3-1 Artificial Reefs East
See Figure 5.1.3.3-1 Artificial Reefs West

5.1.3.3.1 Traditionally highly fished areas

One of the many uses of the Gulf of Mexico is commercial and recreational fishing. Since aquaculture facilities will have some type of physical footprint, facilities should avoid user conflict as much as possible. One way to reduce user conflict with the fishing industries is, to the extent practicable, site aquaculture facilities outside of traditional highly fished areas. Aquaculture facilities should not be sited around artificial reefs, in artificial reef zones, or in highly trawled or fished areas. Siting criteria specified for Action 6, Preferred Alternative 3, includes NOAA Fisheries Service consideration of traditional fishing areas when siting an offshore aquaculture facility.

5.1.3.3.2 Alabama Special Management Zone (SMZ)

In the Alabama SMZ, fishing by a vessel operating as a charter vessel or headboat, a vessel that does not have a commercial permit for Gulf reef fish, or a vessel with such a permit fishing for Gulf reef fish, is limited to hook-and-line gear with no more than 3

hooks. Nonconforming gear is restricted to bag limits, or for reef fish without a bag limit, to 5 percent by weight of all fish aboard.

5.1.3.3.3 Areas of current or future oil and gas activities, dredge disposal, and military warning areas.

Approximately 4,000 oil and gas platforms exist in the Gulf of Mexico. Thousands of miles of oil and gas pipeline are buried throughout the Gulf of Mexico. When determining a site location, aquaculture companies and regulators will have to consider current and future oil and gas activities. Several interim and final unconfined dredge material disposal areas exist offshore of the major shipping channels throughout the Gulf of Mexico. Aquaculture companies and regulators should be aware of the potential problems unconfined dredge material disposal could have on facility operations. Aquaculture companies and regulators should also be aware that boat operations and aircraft use could be affected if facilities are sited in military warning areas.

5.1.3.3.4 Ordnance zones

The U.S. Air Force has released an indeterminable amount of unexploded ordnance in some areas of the Gulf of Mexico. The exact location of the unexploded ordnance is unknown and drilling or other activities may be potentially hazardous in these areas. Zones where this ordnance may occur have been defined and should be avoided when siting an aquaculture operation.

5.1.4 Possible environmental guidelines for siting of aquaculture facilities

Site selection is a key factor in any aquaculture project, affecting both the economic viability and the sustainability of the project. While correct siting is important for economic reasons, it is also important for environmental reasons. Culture of any species must be established in geographical regions having adequate water quality and exchange. Offshore aquaculture cages should be located in areas with a suitable surrounding environment. Variables to consider in site selection include water depth, water quality, currents, and sediment type (Buitrago et al. 2005; Hunter et al. 2006; Kapetsky and Aguilar-Manjarrez 2007; Levings et al. 1995; Perez et al. 2005; Ross et al. 1993).

5.1.4.1 Water Depth

Water depth requires detailed consideration for cage suitability as it has an influence on net size, anchoring system, and anchoring method. Cages may be damaged in shallow water, whereas anchoring systems needed for deeper waters may become limiting, giving a greater risk of losing stock. Cages should be located at sites where the water depth is sufficient to maximize water exchange and to keep cage bottoms well clear of bottom substrates. Conversely, costs and problems associated with cage anchoring increase with depth.

In order to avoid waste accumulation and cage damage during storms, water depths for cage aquaculture should be limited to areas where water depths are greater than one and one half times the cage height (Ross et al. 1993). Therefore, if a cage was 20 m in depth, it would require at least 30 m of water. Kapetsky and Aguilar-Manjarrez (2007) reviewed depth thresholds for cages based on a review of current experimental and commercial installations in the United States. They also examined specifications given by cage manufacturers worldwide. The minimum site depth found was 25 m. Kapetsky and Aguilar-Manjarrez (2007) recommended a minimum depth of 25 m in order to avoid waste accumulation under cages. They established 100 m as the maximum depth for anchored cages since inspection of mooring and anchoring systems in depths greater than 100 m would be difficult.

5.1.4.2 Water Quality

Water quality considerations include temperature, dissolved oxygen, and salinity. As detailed in Section 5.1.2.1, temperature can vary widely between seasons and locations in the Gulf of Mexico. Water temperature is the environmental parameter which has the most effect on fish (Lawson 1995). Temperatures on either side of the optimum can induce stress in the animal, affecting feeding, growth, reproduction, and disease inhibition. Facilities should be sited so that cultured species are within their optimum temperature range. Low dissolved oxygen can have a variety of physiological effects on cultured organisms, impacting growth and mortality. For most areas of the Gulf of Mexico, below optimum dissolved oxygen levels are not a problem. Off the coast of Louisiana, hypoxia can affect thousands of square kilometers each summer. While primarily affecting bottom waters between 5 and 30 m off Louisiana, hypoxia can affect 50 to 80 percent of the water column, occur in water depths out to 60 m, and extend onto the upper Texas shelf (Rabalais and Turner 2001). Salinity also varies widely seasonally and across the Gulf of Mexico.

5.1.4.3 Current speed

The Loop Current enters the Gulf of Mexico through the Yucatan Channel, turns clockwise and exits through the Straits of Florida. The speed of the Loop Current may exceed 2 m/sec. The intrusion of the Loop Current into the Gulf of Mexico varies. As the current travels farther north, it tends to shed eddies as large as 400 km or more in diameter that slowly move westward at speeds of approximately 5 cm/s (Wiseman and Sturges 1999). These eddies carry massive amounts of heat, salt, and water into the western Gulf. Currents over the inner continental shelf in the Gulf of Mexico are strongly wind driven out to depths of approximately 50 to 60 m (Wiseman and Sturges 1999). Current speeds over the inner shelf therefore vary.

Water currents are very important for cage site selection because they are integral to the water exchange rate and help in avoiding waste accumulation underneath cages. Bottom currents should be above 5 cm/s (Ross et al. 1993, Hambrey and James 2005), but water exchange and waste accumulation are a factor of depth and current speed. The

recommendation of 5 cm/s was based upon having more than the one and one half times the cage height underneath the cages. As the depth decreases towards the minimum of one and one half times the cage height, currents will need to be faster to avoid waste accumulation. While current offshore cage designs can handle sustained currents of over 100 cm/s, currents faster than this can adversely affect organisms, contribute towards food losses, and make maintaining the cages difficult. Excessive currents can also re-suspend wastes underneath cages. Therefore, areas with sustained currents over 100 cm/s should be avoided.

5.1.4.4 Sediment type

In the eastern Gulf, sediments are primarily coarse carbonates. To the west of DeSoto Canyon, sediments are terrigenous with a mixture of coarse and fine sediments. Sediment type can potentially affect the type of anchors or moorings used for cages and can also affect the rate of processing of organic waste from the cages. See Figure 5.1.4.4-1.

5.2 Biological Environment

5.2.1 Life History and Biology

The biological environment of the Gulf of Mexico, including the species addressed in this DPEIS, is described in detail in the final EIS for the Generic Essential Fish Habitat amendment and is incorporated here by reference (GMFMC 2004).

5.2.2 Gulf of Mexico Species Suitable for Aquaculture

Most reef fish and coastal migratory pelagic species could be raised in aquaculture systems, but likely only those commanding the highest value or with the highest growth rates will be raised. Cobia were successfully raised in net pens off Puerto Rico. Additionally, over the last eight years NOAA has funded numerous research studies pertaining to cobia, mutton snapper, and greater amberjack (www.aquaculture.noaa.gov). Hatchery technology, breeding programs, and larval rearing techniques for cobia and mutton snapper have been successfully developed. The Gulf of Mexico Marine Stock Enhancement Program (GMMSEP) has also conducted research for administering live food to larval red snapper. Red snapper were successfully spawned naturally in captivity and release experiments were conducted to evaluate the post-release survival of red snapper. Research and development activities were also conducted in Puerto Rico to refine culture technology for spiny lobster (http://www.snapperfarm.com/2006/ snapperfarmsr&dactivities.htm). Lastly, several states, including Florida and Texas, currently operate red drum stock enhancement programs in the Gulf of Mexico, making this species a viable option for use in offshore aquaculture.

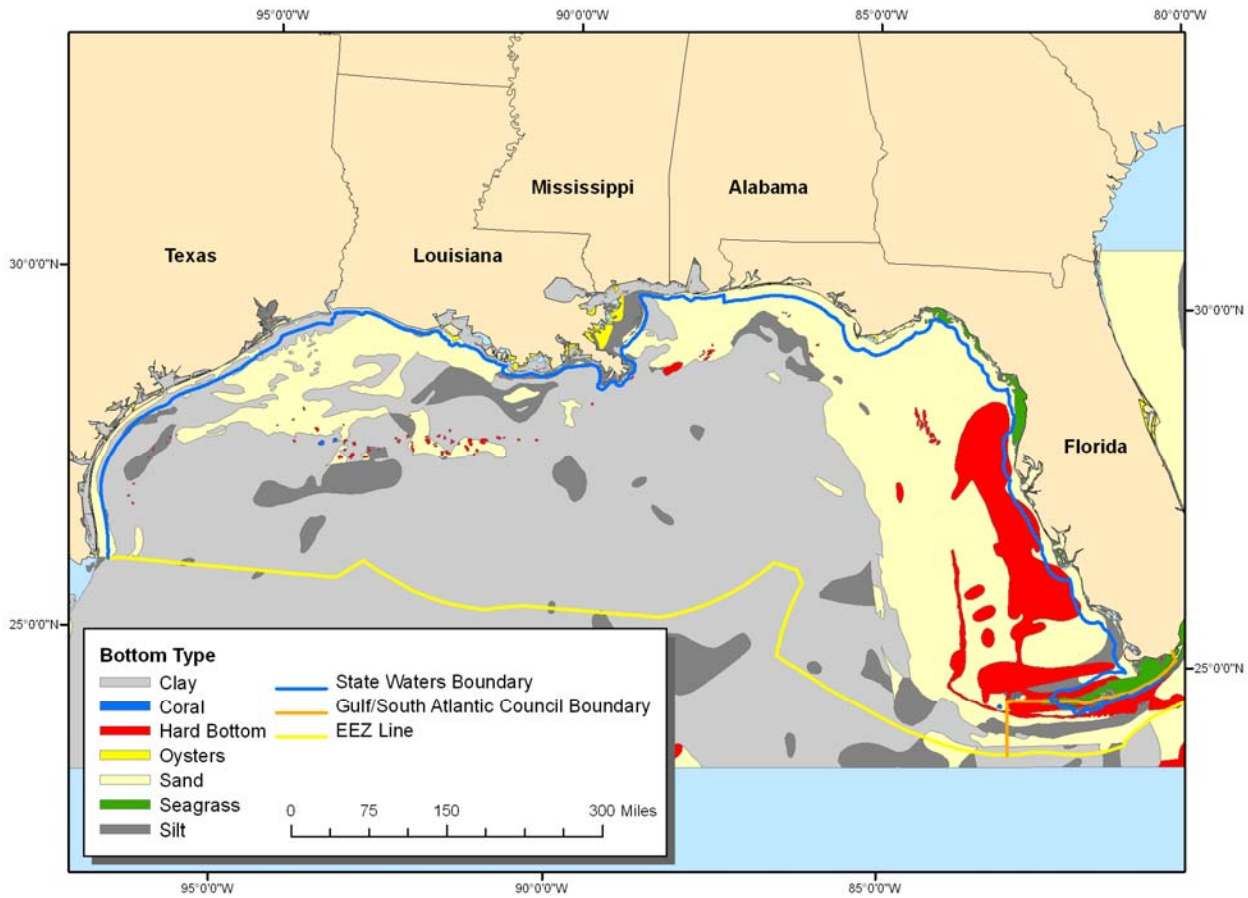

Figure 5.1.1-1. Sediment types throughout the Gulf of Mexico.

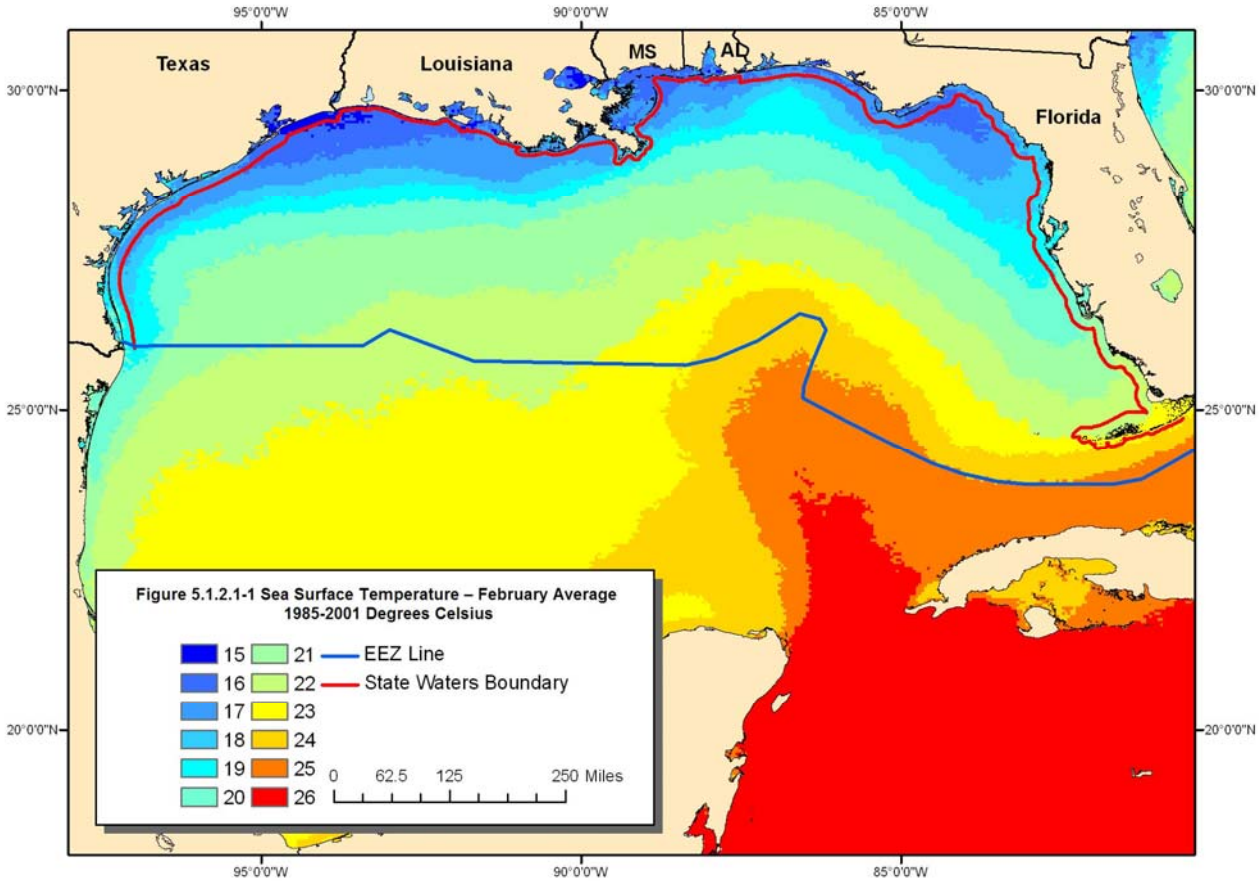

Figure 5.1.2.1-1. Average February sea surface temperatures in the Gulf of Mexico, 1985-2001.

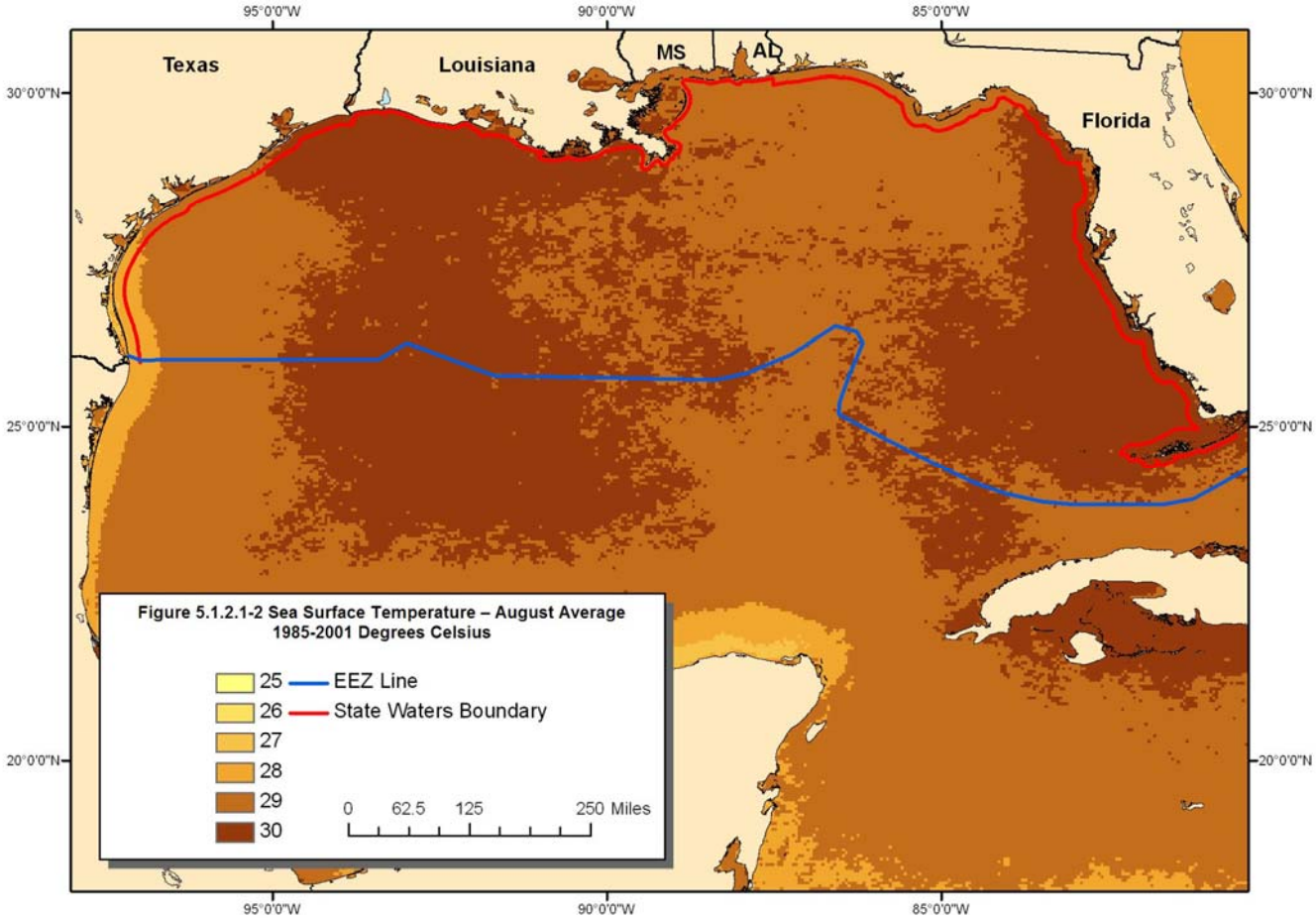

Figure 5.1.2.1-2. Average August sea surface temperatures in the Gulf of Mexico, 1985-2001.

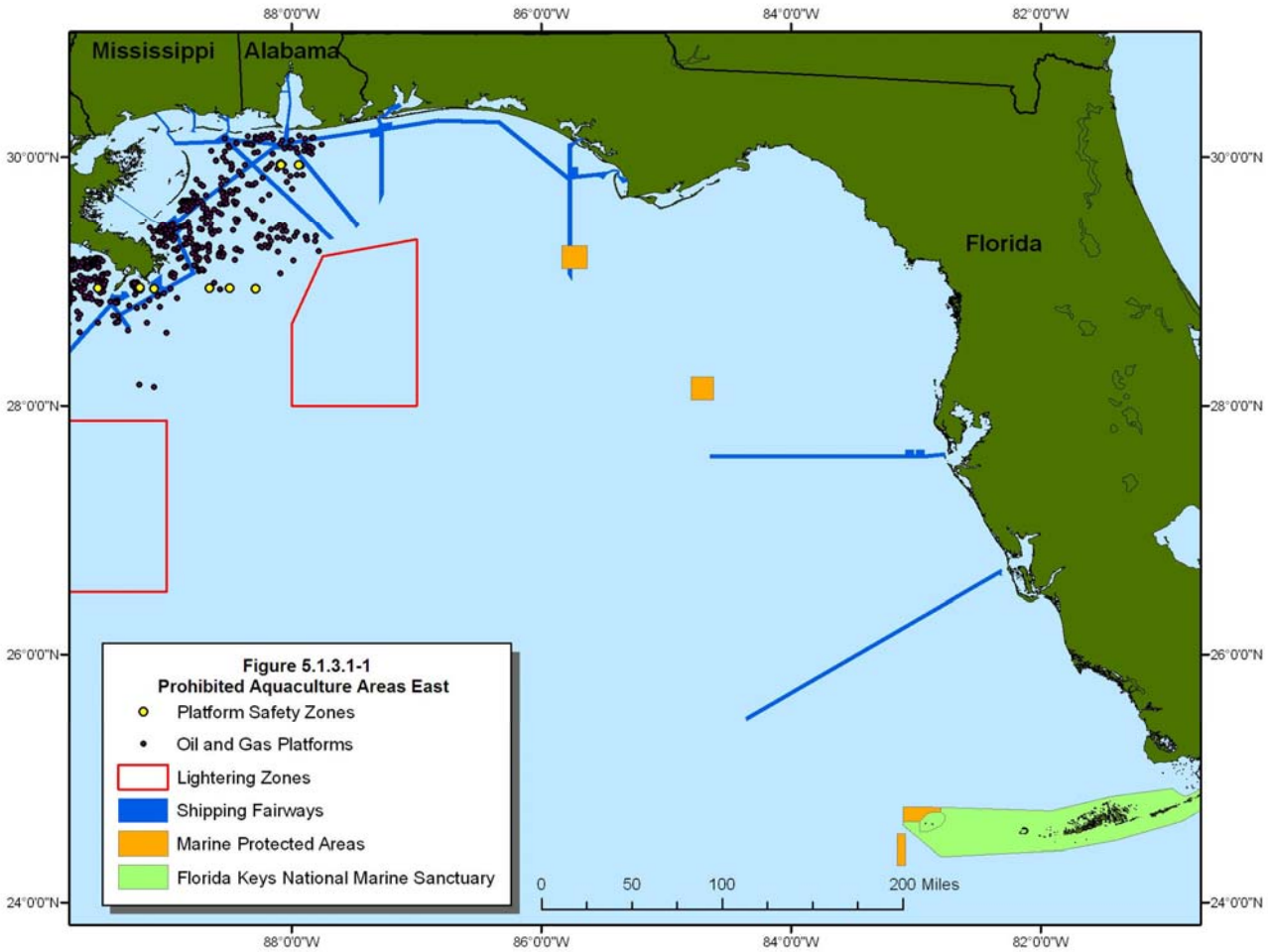

Figure 5.1.3.1-1. Platform safety zones, oil and gas platforms, lightering zones, shipping fairways, marine protected areas/marine reserves, and marine sanctuaries in the western Gulf of Mexico.

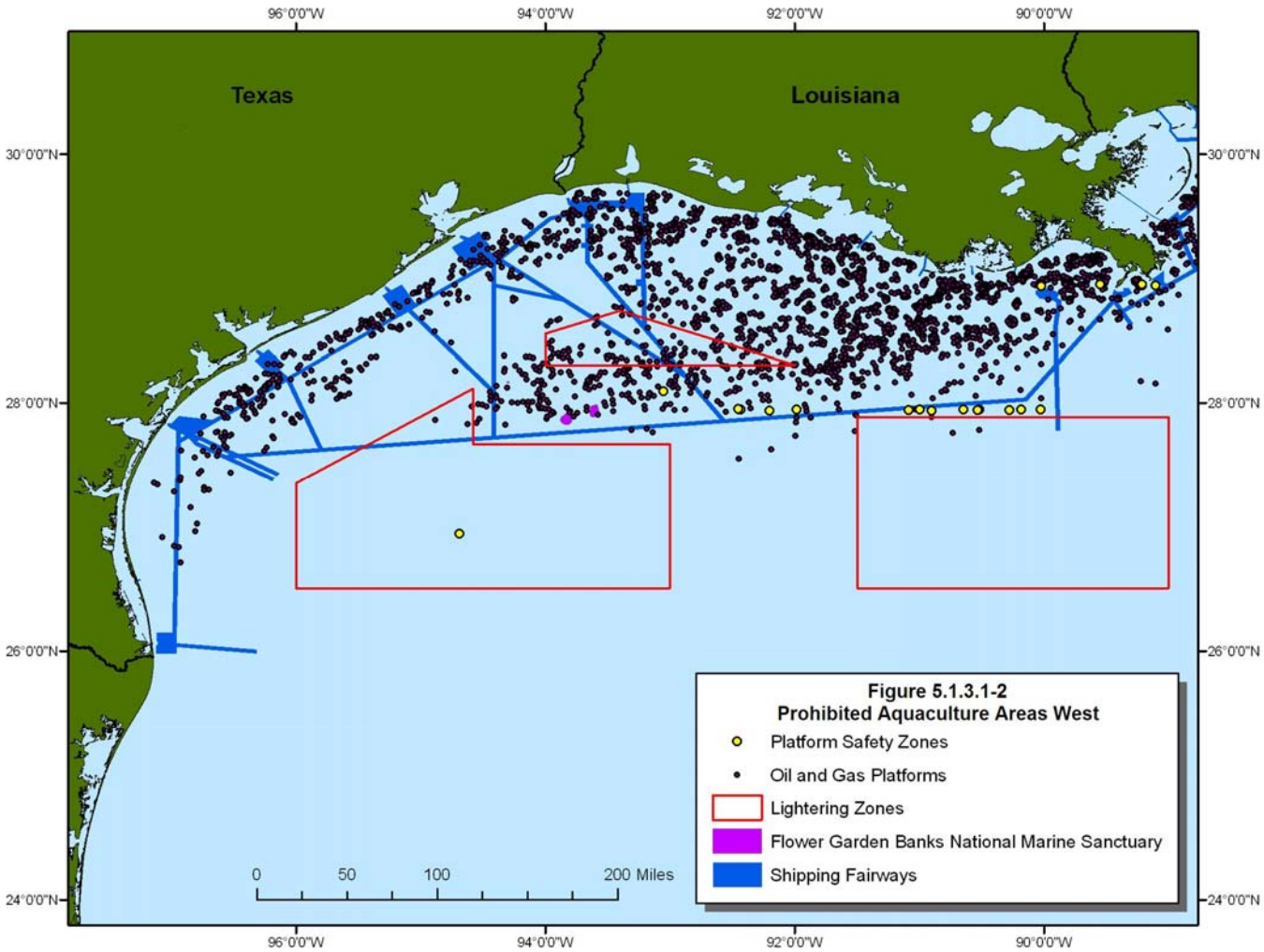

Figure 5.1.3.1-2. Platform safety zones, oil and gas platforms, lightering zones, shipping fairways, and marine sanctuaries in the western Gulf of Mexico.

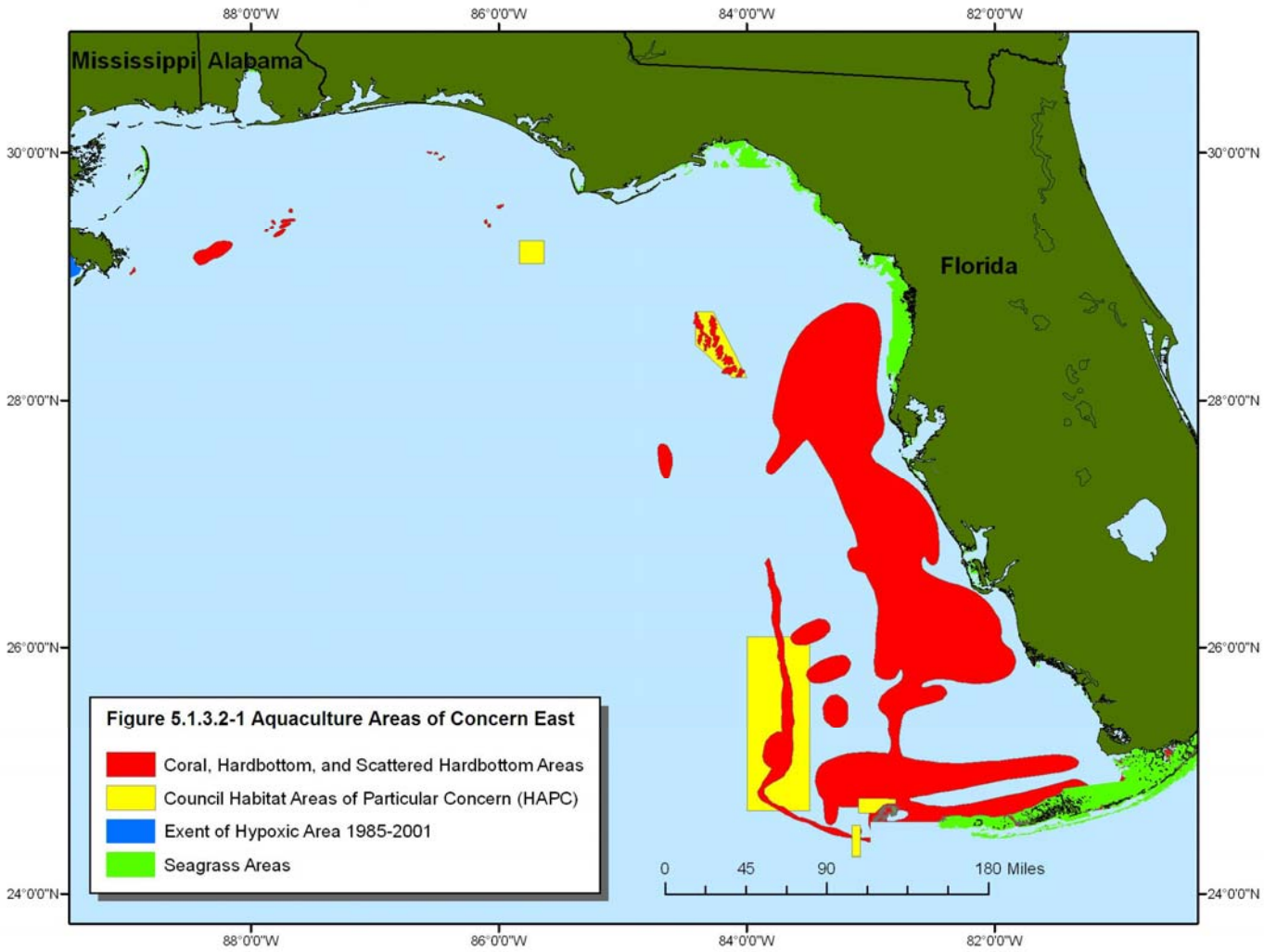

Figure 5.1.3.2-1. Areas of concern in the eastern Gulf of Mexico.

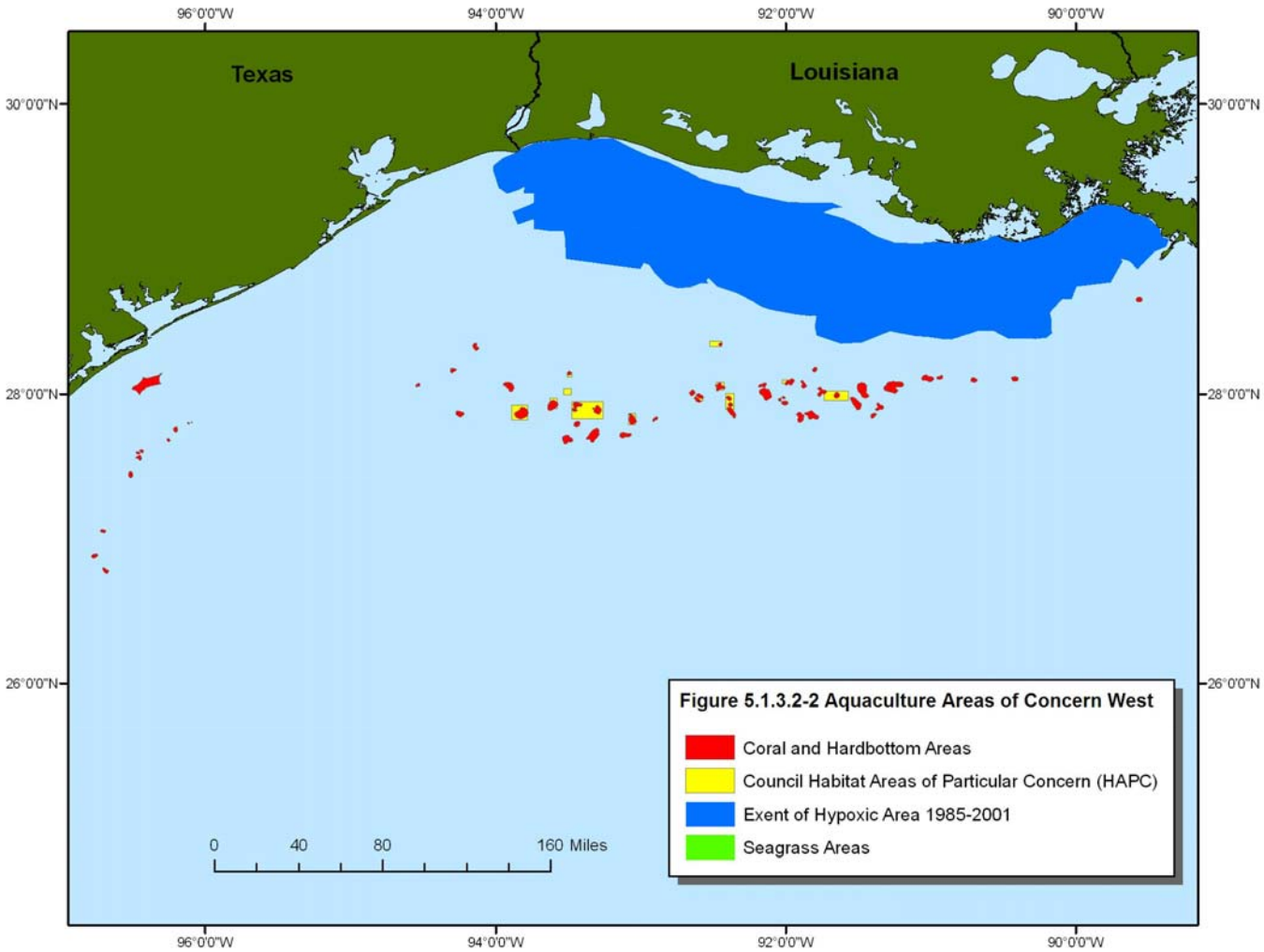

Figure 5.1.3.2-2. Areas of concern in the western Gulf of Mexico.

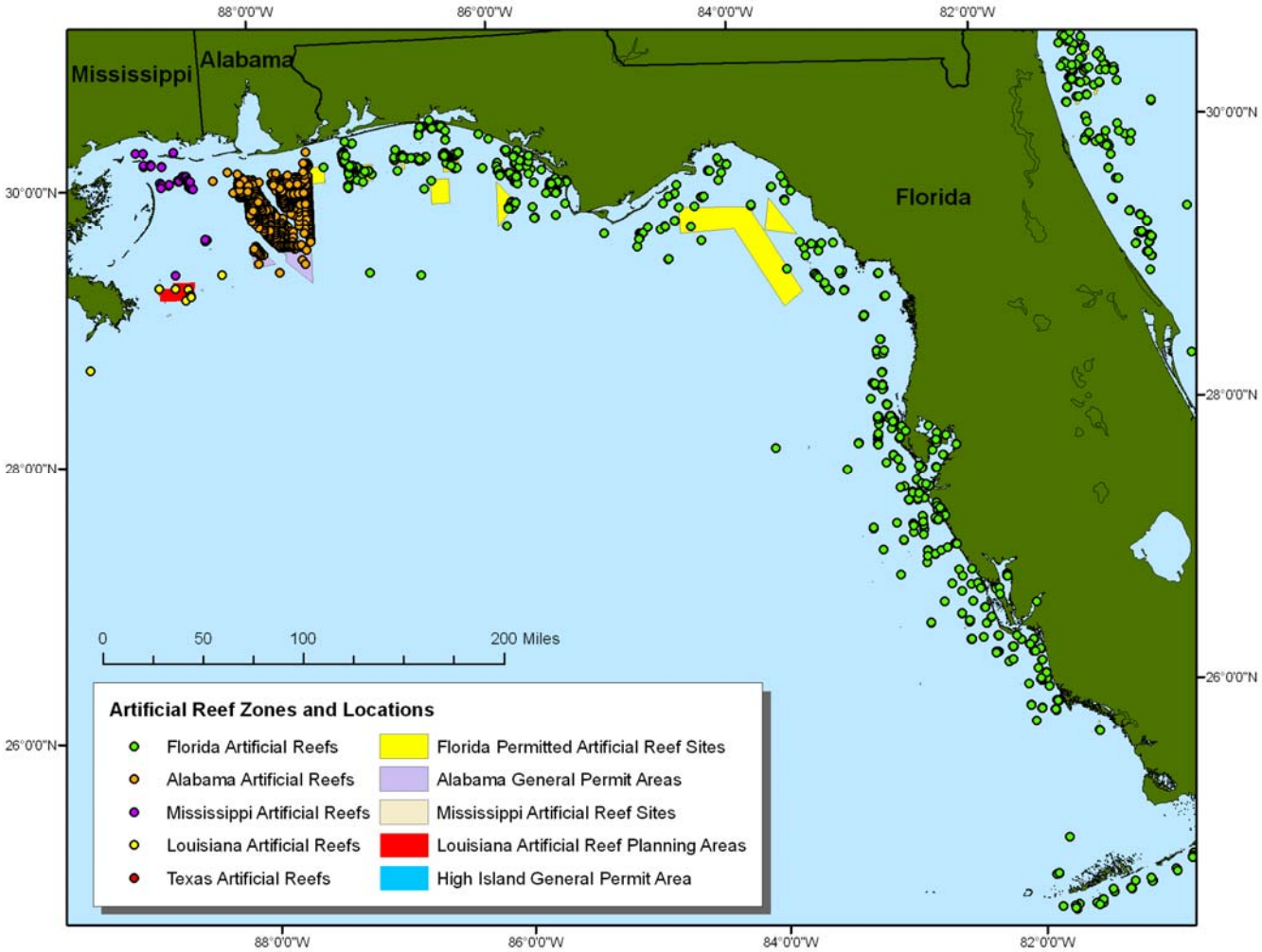

Figure 5.1.3.3-1. Permitted artificial reef sites and zones in the eastern Gulf of Mexico.

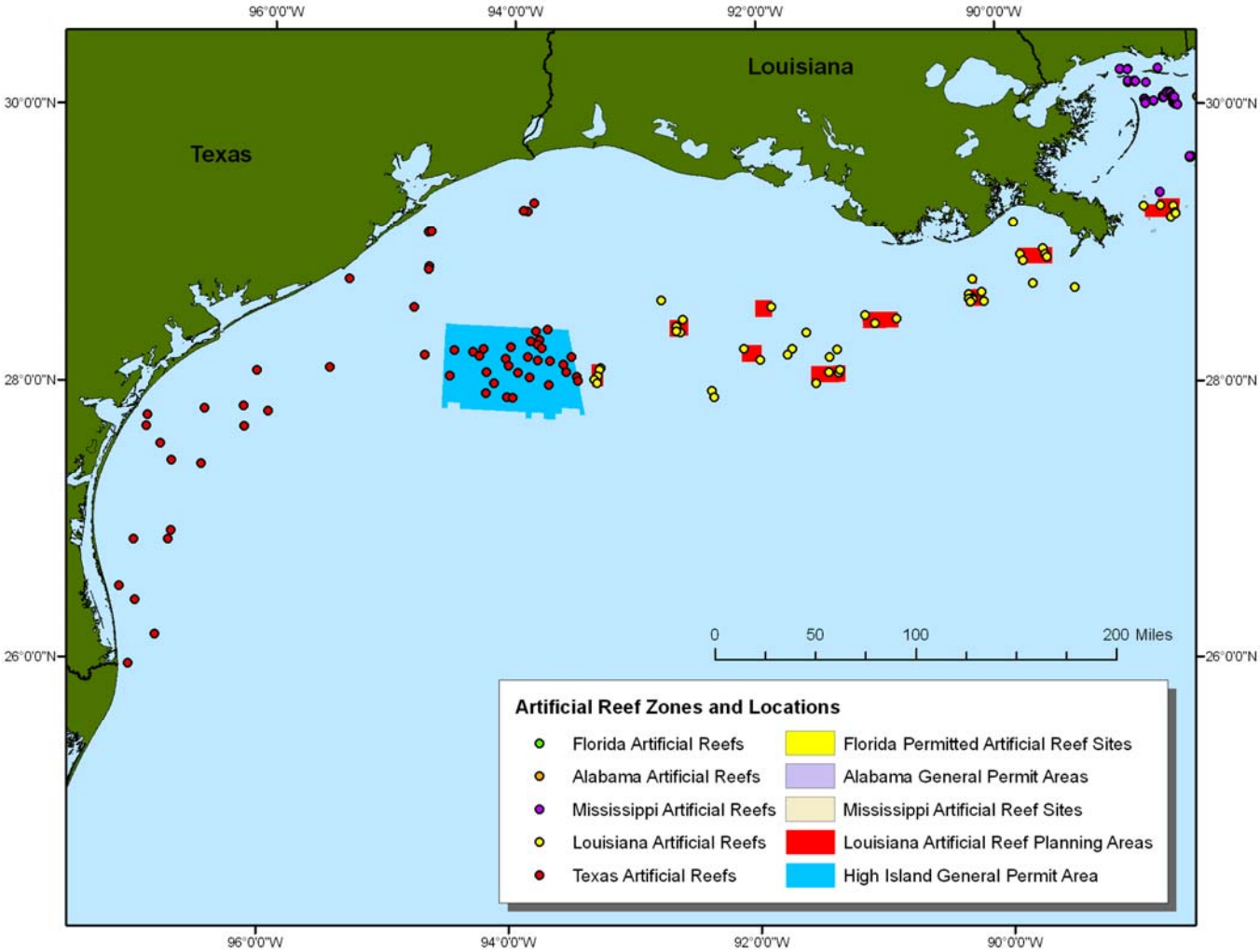

Figure 5.1.3.3-2. Permitted artificial reefs and zones in the western Gulf of Mexico.

5.2.3 Status of Stocks

5.2.3.1 Council Managed Species

The National Ocean Service (NOS) of NOAA collaborated with NOAA Fisheries Service and the Council to develop distributions of reef fish (and other species) in the Gulf (SEA 1998). NOS obtained fishery-independent data sets for the Gulf, including SEAMAP, and state trawl surveys. Data from the Estuarine Living Marine Resources (ELMR) Program contain information on the relative abundance of specific species (highly abundant, abundant, common, rare, not found, and no data) for a series of estuaries, by five life stages (adult, spawning, egg, larvae, and juvenile) and month for five seasonal salinity zones (0-0.5, 0.5-5, 5-15, 15-25, and >25). NOS staff analyzed the data to determine relative abundance of the mapped species by estuary, salinity zone, and month. For some species not in the ELMR database, distribution was classified as only observed or not observed for adult, juvenile, and spawning stages.

In general, reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in Table 5.2.3.1-1 and can be found in more detail in GMFMC (2004). In general, both eggs and larval stages are planktonic. Larvae feed on zooplankton and phytoplankton. Exceptions to these generalizations include the gray triggerfish that lay their eggs in depressions in the sandy bottom, and gray snapper whose larvae are found around submerged aquatic vegetation (SAV). Juvenile and adult reef fish are typically demersal, and are usually associated with bottom topographies on the continental shelf (<100 m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. Juvenile red snapper are common on mud bottoms in the northern Gulf, particularly off Texas through Alabama. Also, some juvenile snappers (e.g. mutton, gray, red, dog, lane, and yellowtail snappers) and groupers (e.g. goliath grouper, red, gag, and yellowfin groupers) have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems (GMFMC 1981). More detail on hard bottom substrate and coral can be found in the FMP for Corals and Coral Reefs (GMFMC and SAFMC 1982).

5.2.3.1.1 Reef Fish

The Reef Fish FMP currently encompasses 42 species. Stock assessments have been conducted on 12 species: red snapper (SEDAR 7, 2005), vermilion snapper (SEDAR 9 2006a), yellowtail snapper (SEDAR 3 2003), gray triggerfish (SEDAR 9 2006b), greater amberjack (SEDAR 9 2006c), hogfish (SEDAR 6 2004a), red grouper (SEDAR 12 2007), gag (SEFSC 2007a), yellowedge grouper (Cass-Calay and Bahnick 2002), mutton snapper (SEDAR 15A 2008), and goliath grouper (SEDAR 6, 2004b). A review of the Nassau grouper's stock status was conducted by Eklund (1994), and updated estimates of generation times were developed by Legault and Eklund (1998).

Table 5.2.3.1-1. Summary of habitat utilization by life history stage for most species in the Reef Fish FMP. This table is adapted from Table 3.2.7 in the final draft of the EIS from the Council's EFH generic amendment (GMFMC 2004).

Common name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Red snapper	Pelagic	Pelagic		Hard bottoms, Sand/ shell bottoms, Soft bottoms	Hard bottoms, Sand/ shell bottoms, Soft bottoms	Hard bottoms, Reefs	Sand/ shell bottoms
Queen snapper	Pelagic	Pelagic				Hard bottoms	
Mutton snapper	Reefs	Reefs	Reefs	Mangroves, Reefs, SAV, Emergent marshes	Mangroves, Reefs, SAV, Emergent marshes	Reefs, SAV	Shoals/ Banks, Shelf edge/slope
Schoolmaster	Pelagic	Pelagic		Mangroves, SAV	Hard bottoms, Mangroves, Reefs, SAV, Emergent marshes	Hard bottoms, Reefs, SAV	Reefs
Blackfin snapper	Pelagic			Hard bottoms	Hard bottoms	Hard bottoms, Shelf edge/slope	Hard bottoms, Shelf edge/slope
Cubera snapper	Pelagic			Mangroves, Emergent marshes, SAV	Mangroves, Emergent marshes, SAV	Mangroves, Reefs	Reefs
Gray (mangrove) snapper	Pelagic, Reefs	Pelagic, Reefs	SAV	Mangroves, Emergent marshes, Seagrasses	Mangroves, Emergent marshes, SAV	Emergent marshes, Hard bottoms, Reefs, Sand/ shell bottoms, Soft bottoms	
Dog snapper	Pelagic	Pelagic		SAV	Mangroves, SAV	Reefs, SAV	Reefs
Mahogany snapper	Pelagic	Pelagic		Reefs, Sand/ shell bottoms	Reefs, Sand/ shell bottoms	Hard bottoms, Reefs, Sand/ shell bottoms, SAV	
Lane snapper	Pelagic		Reefs, SAV	Mangroves, Reefs, Sand/ shell bottoms, SAV, Soft bottoms	Mangroves, Reefs, Sand/ shell bottoms, SAV, Soft bottoms	Reefs, Sand/ shell bottoms, Shoals/ Banks	Shelf edge/slope
Silk snapper						Shelf edge	
Yellowtail snapper	Pelagic			Mangroves, SAV, Soft bottoms	Reefs	Hard bottoms, Reefs, Shoals/ Banks	

Common name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Wenchman	Pelagic	Pelagic				Hard bottoms, Shelf edge/slope	Shelf edge/slope
Vermilion snapper	Pelagic			Hard bottoms, Reefs	Hard bottoms, Reefs	Hard bottoms, Reefs	
Gray triggerfish	Reefs	Drift algae	Drift algae	Drift algae, Mangroves	Drift algae, Mangroves, Reefs	Reefs, Sand/ shell bottoms	Reefs, Sand/ shell bottoms
Greater amberjack	Pelagic	Pelagic	Pelagic	Drift algae	Drift algae	Pelagic, Reefs	Pelagic
Lesser amberjack				Drift algae	Drift algae	Hard bottoms	Hard bottoms
Almaco jack	Pelagic			Drift algae	Drift algae	Pelagic	Pelagic
Banded rudderfish		Pelagic		Drift algae	Drift algae	Pelagic	Pelagic
Hogfish				SAV	SAV	Hard bottoms, Reefs	Reefs
Blueline tilefish	Pelagic	Pelagic				Hard bottoms, Sand/ shell bottoms, Shelf edge/slope, Soft bottoms	
Tilefish	Pelagic, Shelf edge/ Slope	Pelagic		Hard bottoms, Shelf edge/slope, Soft bottoms	Hard bottoms, Shelf edge/slope, Soft bottoms	Hard bottoms, Shelf edge/slope, Soft bottoms	
Dwarf sand perch					Hard bottoms	Hard bottoms, Soft bottoms	
Sand perch						Reefs, SAV, Shoals/ Banks, Soft bottoms	
Rock hind	Pelagic	Pelagic				Hard bottoms, Reefs	Hard bottoms, Reefs
Speckled hind	Pelagic	Pelagic				Hard bottoms, Reefs	Shelf edge/slope
Yellowedge grouper	Pelagic	Pelagic			Hard bottoms	Hard bottoms	
Red hind	Pelagic	Pelagic		Reefs	Reefs	Hard bottoms, Reefs, Sand/ shell bottoms	Hard bottoms
Goliath grouper	Pelagic	Pelagic	Man-groves	Mangroves, Reefs, SAV	Hard bottoms, Mangroves, Reefs, SAV	Hard bottoms, Shoals/ Banks, Reefs	Reefs, Hard bottoms
Red grouper	Pelagic	Pelagic		Hard bottoms, Reefs, SAV	Hard bottoms, Reefs	Hard bottoms, Reefs	

Common name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Misty grouper	Pelagic	Pelagic				Hard bottoms, Shelf edge/slope	Hard bottoms
Warsaw grouper	Pelagic	Pelagic			Reefs	Hard bottoms, Shelf edge/slope	
Snowy grouper	Pelagic	Pelagic		Reefs	Reefs	Hard bottoms, Reefs, Shelf edge/slope	
Nassau grouper		Pelagic		Reefs, SAV		Hard bottoms, Reefs, Sand/ shell bottoms	Hard bottoms, Reefs, Sand/ shell bottoms
Black grouper	Pelagic	Pelagic		SAV	Hard bottoms, Reefs	Hard bottoms, Mangroves, Reefs	
Yellowmouth grouper	Pelagic	Pelagic		Mangroves	Mangroves, Reefs	Hard bottoms, Reefs	
Gag	Pelagic	Pelagic		SAV	Hard bottoms, Reefs, SAV	Hard bottoms, Reefs	
Scamp	Pelagic	Pelagic		Hard bottoms, Mangroves, Reefs	Hard bottoms, Mangroves, Reefs	Hard bottoms, Reefs	Reefs, Shelf edge/slope
Yellowfin grouper				SAV	Hard bottoms, SAV	Hard bottoms, Reefs	Hard bottoms

Of the 12 species for which stock assessments have been conducted, the 2007 Report to Congress on the Status of the U.S. Fisheries (NOAA Fisheries Service 2008) classifies two as overfished (greater amberjack and red snapper), and four as undergoing overfishing (red snapper, gag, gray triggerfish, and greater amberjack). In June 2008, the overfished status for gray triggerfish also changed from undefined to overfished after Amendment 30A to the Reef Fish FMP was approved. Recent assessments for vermilion snapper (SEDAR 9 2006a) and red grouper (SEDAR 12 2007) indicate these species are not overfished and are not undergoing overfishing. Recent assessments for greater amberjack (SEDAR 9 2006c), gray triggerfish (SEDAR 9 2006b), and gag (SEFSC 2007a) indicate these species are experiencing overfishing, and stock recovery for greater amberjack is occurring slower than anticipated. The overfished status for gag is currently undefined. The Council recently approved Amendment 30B to the Reef Fish FMP to address overfishing for gag. This amendment will be submitted to the Secretary for approval in fall 2008. Many of the stock assessments and stock assessment reviews can be found on the Council (www.gulfcouncil.org) and SEDAR (www.sefsc.noaa.gov/sedar) Websites.

5.2.3.1.2 Coastal Migratory Pelagics

King Mackerel

Although the Gulf group king mackerel stock is no longer considered as overfished or undergoing overfishing, the current spawning stock biomass (SS) is below $SS_{MSY.}$ However, $F_{current}$ is below F_{MSY}; consequently the stock is expected to continue to recover under the present management strategy. Although the current TAC is set at 10.2 mp, catches in the most recent years have approximated catches at the ABC range for OY (7.0 mp to 8.0 mp). Preliminary analyses conducted as part of SEDAR 16 indicate Gulf group king mackerel are fully recovered. This assessment will be finalized in fall 2008.

Spanish Mackerel

Gulf group Spanish mackerel was assessed in 1999 using data through the 1997 fishing year. Based on the Council's proposed definitions for overfishing and the overfished condition for Gulf group Spanish mackerel, the stock is not considered as either overfished or undergoing overfishing (MSAP 2001a). Recent catch levels are less than half of the recommended TAC under the OY target of $F_{40\%}$ SPR. Furthermore, SSBcurrent is above SSBmsy.

Dolphin

Prager (2000) assessed the dolphin stocks in the Gulf of Mexico, South Atlantic, and Caribbean as one stock. He concluded that F_{1997} to Fmsy was approximately 50 percent, and B_{1998} to Bmsy was approximately 156 percent. Consequently, the stock was neither undergoing overfishing nor overfished. Furthermore, MSY was estimated at

Table 5.2.3.2-2 Species of the reef fish FMP. Species in bold have had stock assessments. *Deep-water groupers (Note: if the shallow-water grouper quota is filled, then scamp are considered a deep-water grouper) **Protected groupers

Common Name	Scientific Name	Stock Status
	Balistidae—Triggerfishes	
Gray triggerfish	***Balistes capriscus***	**Overfished, overfishing**
	Carangidae—Jacks	
Greater amberjack	***Seriola dumerili***	**Overfished, overfishing**
Lesser amberjack	*Seriola fasciata*	Unknown
Almaco jack	*Seriola rivoliana*	Unknown
Banded rudderfish	*Seriola zonata*	Unknown
	Labridae—Wrasses	
Hogfish	***Lachnolaimus maximus***	**Unknown**
	Lutjanidae—Snappers	
Queen snapper	*Etelis oculatus*	Unknown
Mutton snapper	***Lutjanus analis***	**Not overfished, not overfishing**
Schoolmaster	*Lutjanus apodus*	Unknown
Blackfin snapper	*Lutjanus buccanella*	Unknown
Red snapper	***Lutjanus campechanus***	**Overfished, overfishing**
Cubera snapper	*Lutjanus cyanopterus*	Unknown
Gray (mangrove) snapper	*Lutjanus griseus*	Unknown
Dog snapper	*Lutjanus jocu*	Unknown
Mahogany snapper	*Lutjanus mahogoni*	Unknown
Lane snapper	*Lutjanus synagris*	Unknown
Silk snapper	*Lutjanus vivanus*	Unknown

Yellowtail snapper	***Ocyurus chrysurus***	**Not overfished, not overfishing**
Wenchman	*Pristipomoides aquilonaris*	Unknown
Vermilion snapper	***Rhomboplites aurorubens***	**Not overfished, not overfishing**
	Malacanthidae—Tilefishes	
Goldface tilefish	*Caulolatilus chrysops*	Unknown
Blackline tilefish	*Caulolatilus cyanops*	Unknown
Anchor tilefish	*Caulolatilus intermedius*	Unknown
Blueline tilefish	*Caulolatilus microps*	Unknown
(Golden) Tilefish	*Lopholatilus chamaeleonticeps*	Unknown
	Serranidae—Groupers	
Dwarf sand perch	*Diplectrum bivittatum*	Unknown
Sand perch	*Diplectrum formosum*	Unknown
Rock hind	*Epinephelus adscensionis*	Unknown
Yellowfin grouper	*Mycteroperca venenosa*	Unknown
Scamp	*Mycteroperca phenax*	Unknown
Red hind	*Epinephelus guttatus*	Unknown
****Goliath grouper**	***Epinephelus itajara***	**Unknown, not overfishing**
****Nassau grouper**	***Epinephelus striatus***	**Unknown, not overfishing**
Red grouper	***Epinephelus morio***	**Not overfished, not overfishing**
Gag	***Mycteroperca microlepis***	**Not overfished, overfishing**
Yellowmouth grouper	*Mycteroperca interstitialis*	Unknown
Black grouper	*Mycteroperca bonaci*	Unknown
***Yellowedge grouper**	***Epinephelus flavolimbatus***	**Unknown**
*Snowy grouper	*Epinephelus niveatus*	Unknown
*Warsaw grouper	*Epinephelus nigritus*	Unknown
*Misty grouper	*Epinephelus mystacinus*	Unknown
*Speckled hind	*Epinephelus drummondhayi*	Unknown

approximately 27 million pounds per year, and average annual catches for the last 5 years were approximately 16 million pounds. Thus, there was little chance that the stock would become overfished unless fishing mortality drastically increased.

Cobia

MSAP (2001b) and Williams (2001) observed that F_{2000} was estimated at 0.67 and there was a 40 percent chance that F_{2000} was greater than F_{MSY}. Biomass in 2000 was estimated at 1.33 and there was a 30 percent chance that B_{2000} was less than MSST (defined as 70 percent of B_{MSY}). Consequently, under the Council's status determination criteria, cobia would not be considered as overfished or undergoing overfishing. Furthermore, catches in recent years have been approximately 1.1 to 1.2 million pounds and below the estimated MSY of 1.5 million pounds. Additionally, these recent catches have been below NOAA Fisheries' recommended OY catch of 75 percent of MSY. Thus, it is expected that if present catch levels continue the stock will continue to remain healthy.

Cero, Bluefish, and Little Tunny

The status of these three species was assessed in 2001. The little tunny assessment (Brooks 2002) estimated that there was only a 24 percent chance that the F for 2000/01 was greater than Fmsy; therefore, little tunny were not undergoing overfishing. The assessment also indicated there was a 78 percent chance that the little tunny stock was not overfished. The MSAP recommended that the catch not exceed 1.55 MP. The assessment for bluefish provided inconsistent results and no recommendations on stock status or management benchmarks were made by the MSAP. The MSAP did note however that

CPUE trends had declined since the mid to late 1980s. A preliminary analysis of cero landings was conducted in 2001, but no status determinations were made.

5.2.3.1.3 Stone Crab

Landings, in pounds of claws on a fishing-season basis, have varied without trend since 1989-90. Peak landings were 3.5 million pounds statewide in Florida in the 1997-98 fishing season. Statewide landings for 2004-05 were 3.0 million pounds of claws.

Since the 1962-63 fishing season (the first year with an estimate of the number of traps in the fishery), the number of traps in the fishery has increased more than a hundred-fold – from 15,000 traps in the 1962-63 season to 1.6 million traps in the 2001-02 season. In a physical count of traps conducted in the 1998-99 fishing season, FWC employees found 1.4 million traps, which was twice the number that was estimated in 1992-93. As a response to the rapidly increasing number of traps in the fishery, the legislature in 2000 approved the stone crab trap limitation program, which was implemented in October 2002. The number of commercial trips also increased from 19,000 in the 1985-86 season (the first season with trip information available) to a maximum of 38,000 trips in the 1996-97 season and then declined afterwards.

The status of the stock is best indicated by the stable landings after 1989-90. The three-fold increase in the number of traps since then suggests that the current level of landings is all that can be harvested under current environmental conditions, regulations, and fishery practices and that the fishery is overfishing (Muller et al. 2006). Recruitment does not show any decline over the time series. These conclusions were the same as those from the 1997 and 2001 assessments. The stone crab fishery may be resilient because most female stone crabs spawn one or more times before their claws reach legal size, because some crabs survive declawing, and because the fishing season is closed during the principal spawning season. However, the fishery continues to have too many traps in the water. Further evidence of excess traps is the low catch-per-trap level over a very wide range of numbers of traps. For the past decade (1995-96 to 2004-05 fishing seasons), the Gulf coast fishers have declawed approximately 10.5 million crabs during each seven-month fishing season.

5.2.3.1.4 Spiny Lobster

This section summarizes the "assessment of spiny lobster, *Panulirus argus*, in the Southeast United States" prepared by the SEDAR 8 U.S. Spiny Lobster Stock Assessment Panel.

Two assessment models were chosen during SEDAR 8: a simple, modified DeLury model and a statistical catch-at-age model (Integrated Catch-at-Age). The age-structured model was the base model and the DeLury model was a check for consistency. Recruitment of lobsters one year after settlement has varied over time. The spawning biomass in Florida has increased over time especially in the three most recent fishing years. Fishing mortality rates have varied without trend until the recent drop in fishing

mortality after 2000. Older lobsters appear to be less available to the fishery as reflected in the dome-shaped selectivity curve. Both assessment models interpreted the lower landings after the 1990-00 fishing years as decreased effort. The DeLury model estimated a lower population size with correspondingly higher fishing mortality rates than did the catch-at-age model, but when the DeLury model was adjusted for selectivity, the results were similar.

Amendment 6 of the Spiny Lobster FMP defined overfishing as fishing at a rate in excess of that associated with a static SPR value of 20 percent (F_{2005}). With the current life history values and fishery practices, the fishing mortality rate on fully recruited lobsters (age-3) at a static SPR of 20 percent was 0.49 per year. The spiny lobster fishery in the Southeastern United States has fluctuated at SPR values around the 20 percent objective until the three most recent years and was deemed to not be overfishing because the fishing mortality rate on age-3 in 2003-04 (0.26 per year) was below the Council's F_{MSY} proxy of $F_{20\%\ SPR.}$ Even when the fishing mortality rate was adjusted for retrospective bias (0.36 per year), the fishing mortality rate in 2003-04 was still below the Council's management objective. Without a Caribbean-wide stock assessment, the SEDAR panel was unable to determine the status of the stock with regard to the spawning biomass at MSY (B_{MSY}) or the Minimum Stock Size Threshold.

5.2.3.1.5 Red Drum

The 1987 Stock Assessment Panel report recommended that acceptable biological catch (ABC) be set at zero for the EEZ and that the states increase the escapement rate of red drum from estuaries to 20 percent. The 1989 SEFSC Stock Assessment report indicated the SSBR would likely decline to 13 percent. The 1989 Stock Assessment Panel report recommended ABC for the EEZ be maintained at zero, and that the states increase escapement to 30 percent.

During 1991, the Red Drum Stock Assessment Panel (RDSAP) reviewed stock assessments prepared by NOAA Fisheries, the Louisiana Department of Wildlife and Fisheries, and the State of Florida. The RDSAP recommendation was that ABC be set at zero. The Council recommended to NOAA Fisheries that total allowable catch (TAC) be zero for 1992, and that a more comprehensive assessment of a SSBR level be provided in 1992.

The most recent stock assessment for red drum is very uncertain, and the Red Drum Stock Assessment Panel (RDSAP) could not reach a firm conclusion on the Gulf-wide status of the red drum resource (RDSAP 2000). The RDSAP made several assessment runs with a variety of assumptions, and obtained results that ranged from overfished to not overfished (Michael Murphy, FWRI, pers. comm.). In general, however, most assessment runs showed an overfished condition. In contrast, red drum assessments by the Gulf of Mexico states show the red drum resource is not overfished (Michael Murphy, FWRI, pers. comm.).

5.2.3.2 Highly Migratory Species

Swordfish

The most recent assessment of North and South Atlantic swordfish stocks was conducted in 2006. The North Atlantic swordfish biomass at the beginning of 2006 was estimated to be about 99 percent of the biomass needed to produce MSY, and the 2005 fishing mortality rate was estimated to be about 14 percent below the fishing mortality rate at MSY. The South Atlantic swordfish stock is in good condition. The current estimated fishing mortality rate for South Atlantic swordfish is likely below that which would produce MSY, and the current biomass is likely above that which would result from fishing at F_{MSY} in the long term.

Tunas

West Atlantic Bluefin Tuna - The west Atlantic bluefin tuna stock assessment update is anticipated to be released in fall 2008. According to the 2004 west Atlantic bluefin tuna stock assessment, spawning stock biomass (SSB) was estimated at 41 percent of SSB_{MSY} and fishing mortality rate (F) was estimated to be between 170 and 310 percent of F_{MSY}; therefore, for west Atlantic bluefin tuna, the stock is overfished and overfishing is occurring (SCRS 2007).

Bigeye Tuna - According to the latest Atlantic bigeye tuna stock assessment, conducted in 2006, biomass (B) was estimated at 92 percent of B_{MSY} and F was estimated between 70 and 124 percent of F_{MSY} (SCRS 2007). The stock is considered to be rebuilding and overfishing is not occurring.

Yellowfin Tuna - The 2001 stock assessment for Atlantic yellowfin tuna estimated B at 73 to 110 percent of B_{MSY} and F at 87 to 146 percent of F_{MSY} (SCRS, 2007). The stock is considered to be approaching an overfished condition.

North Atlantic Albacore Tuna - The 2005 stock assessment for North Atlantic albacore tuna estimated B at 81 percent of B_{MSY} and F at 150 percent of F_{MSY} (SCRS 2007). The stock is considered to be overfished and overfishing is not occurring.

West Atlantic Skipjack Tuna - The last assessment on Atlantic skipjack tuna was carried out in 1999. The state of the stock(s), as well as the stocks of this species in other oceans, show a series of characteristics that make it extremely difficult to conduct an assessment using current models (SCRS, 2007). Among these characteristics, the most noteworthy are:

- The continuous recruitment throughout the year, but heterogeneous in time and area, making it impossible to identify and monitor the individual cohorts;
- Apparent variable growth between areas, which makes it difficult to interpret the size distributions and their conversion to ages; and,
- Exploitation by many and diverse fishing fleets (baitboat and purse seine), having distinct and changing catchabilities, which makes it difficult to estimate the effective effort exerted on the stock in the east Atlantic.

For these reasons, no standardized assessments have been able to be carried out on the Atlantic skipjack tuna stocks.

Billfish

Blue marlin - No new information on stock status has been provided since the 2006 assessment. The recent biomass level most likely remains well below the B_{MSY} estimated in 2000. Current and provisional diagnoses suggest that F has recently declined and is possibly smaller than $F_{replacement}$ but larger than the F_{MSY} estimated in the 2000 assessment. Over the period 2001-2005 several abundance indicators suggest that the decline has been at least partially arrested, but some other indicators suggest that abundance has continued to decline. Confirmation of these recent apparent changes in trend will require at least an additional four or five years of data, especially since the reliability of the recent information has diminished and may continue to do so (SCRS 2007).

White marlin - No new information on stock status has been provided since the 2006 assessment. The recent biomass most likely remains well below the B_{MSY} estimated in the 2002 assessment. Current and provisional diagnoses suggest that F is probably smaller than $F_{replacement}$ and probably also larger than the F_{MSY} estimated in the 2002 assessment. Over the period 2001-2004 combined longline indices and some individual fleet indices suggest that the decline has been at least partially reversed, but some other individual fleet indices suggest that abundance has continued to decline. Confirmation of these recent apparent changes in trend will require at least an additional four or five years of data, especially since the reliability of the recent information has diminished and may continue to do so (SCRS 2007).

Sailfish - No new assessments of the sailfish stocks have been conducted since 2001. No relative abundance indices have been presented since 2001. Although the 2001 attempts at quantitatively assessing the status of these two stocks (eastern and western sailfish) proved to be unsatisfactory, there were indications of early decreases in biomass for these two stocks. These decreases probably lowered the biomass of the stocks to levels that may be producing sustainable catches, but it is unknown whether biomass levels are below those that could produce MSY (SCRS 2007).

Sharks

Large coastal sharks (LCS), sandbar sharks, and blacktip sharks were assessed in 2005/2006. Based on this latest assessment, the LCS complex was determined to be unknown, sandbar sharks were determined to be overfished with overfishing occurring, and blacktip sharks were assessed as two populations: an Atlantic and a Gulf of Mexico population. The Atlantic population of blacktip sharks was determined to be unknown, and the Gulf of Mexico population was determined to not be overfished with no overfishing occurring. The small coastal shark (SCS) complex and individual species in the complex (blacknose, bonnethead, Atlantic sharpnose, and finetooth) were assessed in 2007. The SCS complex was determined to not be overfished with no overfishing occurring; however, the assessment scientists and peer reviewers recommended using the individual species assessments for stock determinations. According to the individual

assessments, bonnethead, Atlantic sharpnose, and finetooth sharks were determined to not be overfished with no overfishing occurring. Blacknose sharks were determined to be overfished with overfishing occurring.

5.2.3.3 Marine Mammals and Protected Species

There are 28 different species of marine mammals that may occur in the Gulf. All 28 species are protected under the MMPA and six are also listed as endangered under the ESA (sperm, sei, fin, blue, humpback and North Atlantic right whales). Other species protected under the ESA occurring in the Gulf include five sea turtle species (Kemp's Ridley, loggerhead, green, leatherback, and hawksbill); two fish species (Gulf sturgeon and smalltooth sawfish), and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). For information on these protected species in the Gulf, refer to the final EIS to the Council's Generic EFH amendment (GMFMC 2004) and the February 2005 ESA biological opinion on the reef fish fishery. Marine mammal stock assessment reports and additional information is also available on the NOAA Fisheries Service Office of Protected Species website: http://www.nmfs.noaa.gov/pr/species/.

There is a resident population of female sperm whales in the Gulf of Mexico, and whales with calves are sighted frequently. However, sperm whales are considered to commonly occur beyond shelf edge (> 200 m). Typically, no endangered species of whales occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Occasionally, North Atlantic right whales and humpback whales may be found in nearshore waters of the Gulf of Mexico, usually during the winter season, but sightings of these species are relatively uncommon.

Sperm whale pods have been observed throughout the GOM from the upper continental slope near the 100-m isobath to the seaward extent of the United States EEZ and beyond, from sightings data collected from NOAA cruises from 1991 to 2000 (Roden and Mullin 2000, Baumgartner et al. 2001, Burks et al. 2001). Based on NOAA surveys, opportunistic sightings, whaling catches, and stranding records, sperm whales in the GOM occur year-round. Sperm whales appear to favor water depths of about 1,000 m and appear to be concentrated in at least two geographic regions of the Northern GOM: an area off the Dry Tortugas and offshore of the Mississippi River delta (Maze-Foley and Mullin 2006); however, distribution also appears to be influenced by occurrence and movement of cyclonic/anti-cyclonic currents in the GOM. Davis et al. (2000a) noted the presence of a resident, breeding population of endangered sperm whales within 50 km of the Mississippi River Delta and suggested that this area may be essential habitat for sperm whales. The Southeast United States Marine Mammal Stranding Network received reports of 17 sperm whales that stranded along the GOM coastline from 1987 to 2003 in areas ranging from Pinellas County, Florida, to Matagorda County, Texas. The GOM sperm whale abundance has most recently been estimated at 1,349 whales (CV = 0.23) (Mullin and Fulling 2003), calculated from an average of estimates from surveys conducted between 1996 and 2001.

The GOM stock is comprised of mostly females and calves, although large mature bulls have been recently sighted in the GOM. Based on seasonal aerial surveys, sperm whales are present in the northern GOM in all seasons, but sightings in the northern GOM are more common during the summer months (Mullin et al. 1991, Davis et al. 2000a). Based on recent survey efforts, sperm whales concentrations are regularly sighted, and the boundaries of these areas of concentration in the Northern GOM appear to be approximately 86.5^{o}W to 90.0^{o}W, north of 27.0^{o}N (Mullin 2002), and off southern Florida in an area approximately 86.5^{o}W to 85.5^{o}W, 24.0^{o}N to 26.0^{o}N (Mullin 2002); however, sperm whales have been reported throughout the GOM in waters greater than 200 m.

Bottlenose dolphins, Atlantic spotted dolphins, and Risso's dolphins are the only dolphins in the Gulf that commonly occur in estuarine waters to continental shelf edge (0-200 m). Bottlenose dolphins are the most widespread and common cetaceans of the coastal Gulf waters. They inhabit the Gulf of Mexico year-round and are the most commonly observed dolphin in nearshore waters. Atlantic spotted dolphins prefer tropical to warm-temperate waters over the continental shelf, edge, and upper reaches of the slope. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>100 m depths).

The leatherback is the most abundant sea turtle in waters over the northern GOM continental slope (Mullin and Hoggard 2000). Leatherbacks appear to spatially use both continental shelf and slope habitats in the GOM (Fritts et al. 1983, Collard 1990), but primarily utilize pelagic waters > 200 m (Davis and Fargion 1996) throughout the northern GOM. Recent surveys suggest that the region from the Mississippi Canyon to DeSoto Canyon, especially near the shelf edge, appears to be an important habitat for leatherbacks (Mullin and Hoggard 2000). Surveys of sea turtles in the eastern GOM reported densities of 0.0026 individuals/km^2 (95 percent CI = 0.0004 - 0.0140) in 0-10 fathoms and 0.0029 individuals/km^2 (95 percent CI = 0.0015 - 0.0057) in 10-40 fathoms (Epperly et al. 2002). Leatherbacks are year-round inhabitants in the GOM with frequent sightings during both summer and winter (Mullin and Hoggard 2000). Temporal variability and abundance suggest that specific areas may be important to this species, either seasonally or for short periods of time.

Green sea turtles are found throughout the GOM. They occur in small numbers over seagrass beds along the south of Texas and the Florida GOM coast. Areas known as important feeding areas include the Homosassa River, Crystal River, and Cedar Key, Florida, and seagrass meadows and algae-laden jetties along the Texas coast. Sea turtle surveys in the eastern GOM have reported densities of 0.0021 individuals/km^2 (95 percent CI = 0.0006 - 0.0075) in 0-10 fathoms and 0.0137 individuals/km^2 (95 percent CI = 0.0060 - 0.0317) in 10-40 fathoms (Epperly et al. 2002).

The nearshore waters of the GOM are believed to provide important developmental habitat for juvenile Kemp's ridley sea turtles. Ogren (1989) suggests that the GOM coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern GOM. This species generally remains within the 50-m

isobath of coastal areas throughout the GOM. Surveys of sea turtles in the eastern GOM reported densities of 0.0079 individuals/km^2 (95 percent CI = 0.0030 - 0.0207) in 0-10 fathoms and 0.0011 individuals/km^2 (95 percent CI = 0.0004 - 0.0035) in 10-40 fathoms (Epperly et al. 2002). Stomach contents from Kemp's ridleys also indicate a nearshore distribution by their prey distribution which is consistent with other reported density estimates of 0.065 turtles per km^2 in 0-10 fathoms compared to a decrease of 0.013 turtles per km^2 in 10-40 fathoms (Epperly et al. 2002).

The nearshore waters of the GOM are believed to provide important developmental habitat for loggerhead sea turtles. Loggerhead nesting along the GOM coast occurs primarily along the Florida Panhandle, although some nesting has been reported from Texas through Alabama as well (NOAA Fisheries Service and FWS 1991). Surveys of sea turtles in the eastern GOM resulted in reported densities of 0.0532 individuals/km^2 (95 percent CI = 0.0295 - 0.0961) in 0-10 fathoms and 0.0452 individuals/km^2 (95 percent CI = 0.0233 - 0.0880) in 10-40 fathoms (Epperly et al. 2002). Loggerhead abundance does not appear to be significantly different between winter and summer months over shelf waters in the GOM (Davis et al. 2000b). Although loggerheads are widely distributed during both summer and winter, their abundance in surface waters over the continental slope may be greater during winter than in summer (Mullin and Hoggard 2000), and many sightings occurred near the 100-m isobath (Davis et al. 2000b). Sightings of loggerheads in waters over the continental slope suggest that they may be in transit through these waters to distant foraging sites or seeking warmer waters during the winter. The majority of sightings have occurred in waters over the continental shelf, although many sightings have been reported over the continental slope.

In addition to some distribution over the slope waters, surface sightings of this species have also been made over the outer slope, approaching the 2,000-m isobath. Loggerheads found in deep waters may be traveling to distant nesting beaches, traveling between forage sites on distant and disjunct areas of the continental shelf, or seeking warmer waters during winter (Davis et al. 2000b).

5.2.3.4 Menhaden and Other Bait Fishes

Approximately 50 species of baitfish exist worldwide (FWRI 2000). These fishes are important food sources for large predators and represent an integral part of the marine food web. They are used primarily for the production of fish oils and fish meal, pet food, fertilizer, and recreational and commercial fishing bait. In the Gulf of Mexico, several important species of baitfish exist, including: Gulf menhaden (*Brevoortia patronus*), Atlantic thread herring (*Opisthonema oglinum)*, Spanish sardines (*Sardinella aurita*), round scad (*Decapterus punctatus*), and bigeye scad (*Selar crumenophthalmus*). Of these five species, Gulf menhaden account for greater than 99 percent of the Gulf of Mexico baitfish landings. A similar species, Atlantic menhaden (*Brevoortia tyrannus*), is also landed in significant, although lesser quantities off several U.S Mid-Atlantic States. Figure 5.2.3.4-1 summarizes trends in Gulf menhaden landings and value from 1950-2006. Landings increased from 1950 through the mid-1980s. Beginning in 1984, landings began to decline. Landings during the last five years were approximately 50

percent less than landings during 1983-1987. The most recent stock assessment for Gulf menhaden was conducted by Vaughn et al. (2007). The assessment indicated that Gulf menhaden fishing mortality rates (F) and spawning stock biomass were between target and limit biological reference points, indicating the stock was neither undergoing overfishing or overfished (Vaughn et al. 2006). However, the assessment did express possible concerns regarding a recent increase in F and decrease in population fecundity.

The Atlantic menhaden stock is neither overfished, nor undergoing overfishing (AMTC 2006). The F in 2005 was well below the overfishing limit (56 percent of F_{limit}) and stock fecundity was well above the overfished threshold (317 percent of fecundity limit).

Gulf menhaden are obligate filter feeders; they strain plankton and detritus (Friedland 1955). They are an important food source for many fishes, sea birds, and marine mammals (Ahrenholz 1991). Gulf menhaden migrate inshore in early spring and offshore in late fall (Roithmayr and Waller 1963). Spawning occurs during fall and winter, peaking in December and January (Lewis and Roithmayr 1981). Ninety-percent of all harvested fish are 1-2 years old, but they may live to be 6 years or older. Gulf menhaden are fully mature by age-2.

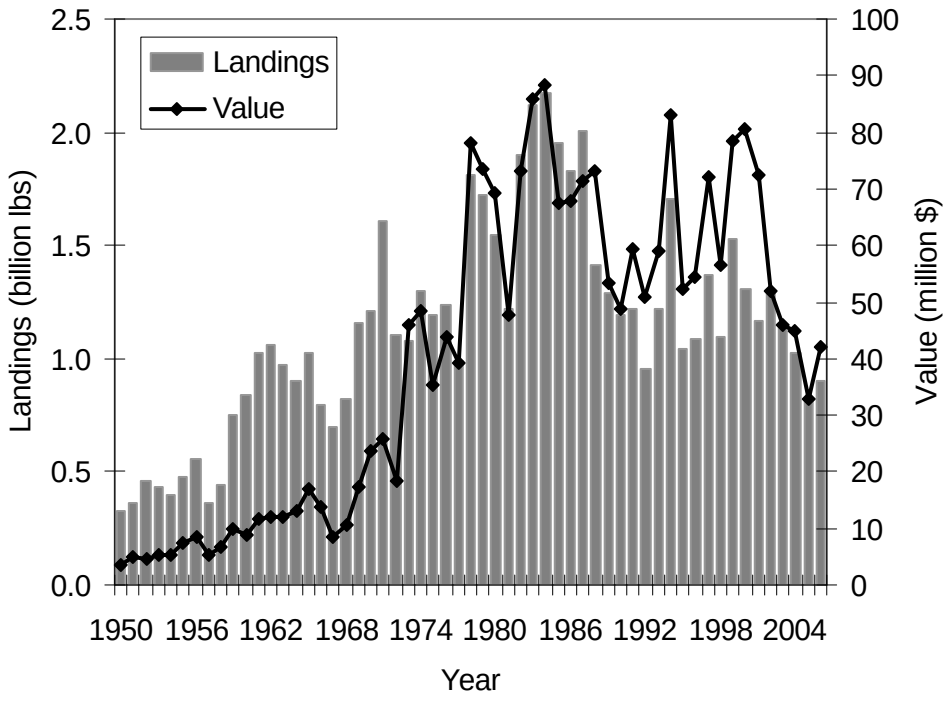

Figure 5.2.3.4-1. Trends in Gulf menhaden landings and value, 1950-2006.

5.3 Description of the Economic and Social Environment - Aquaculture Fishery

5.3.1 Introduction

At present, there are only three offshore aquaculture operations producing cultured fish in the U.S., although a fourth recently discontinued production. Two additional commercial operations are producing mussels using longlines. None of these operations are or were in the Gulf of Mexico. There are nearshore aquaculture operations in State waters of the Gulf; however, their sheltered conditions are not similar to those of the offshore environment with its deep water, large waves, and rapid currents. Offshore aquaculture facilities require different technologies, such as stronger cages and anchoring systems, which can withstand hurricanes and strong currents.

The intent of this section is to provide an overview and description of past, present, and currently proposed U.S. aquaculture operations (Sections 5.3.2.-5.3.5). These operations yield insights into the future of offshore aquaculture in the Gulf of Mexico and provide a historical context for the ongoing development of offshore aquaculture. Additional insights can be gained from Posadas and Bridger (2004), who evaluated the economic viability of potential Gulf of Mexico aquaculture operations (see Section 5.3.6).

5.3.2 Existing Offshore Aquaculture Operations in the U.S.

The three existing offshore aquaculture operations using cages in the U.S. are: 1) Hukilau Foods, LLC (formerly Cates International, Inc.), which grows Pacific threadfin (*Polydactylus sexfilis*), also known as moi, in Hawaiian waters; 2) Kona Blue Water Farms, which grows amberjack (*Seriola rirvoliana*), also known as kahala or Hawaiian yellowtail, in Hawaiian waters; and 3) the University of New Hampshire Atlantic Marine Aquaculture Center (UNH Aquaculture Center) demonstration project that has raised halibut, haddock, summer flounder, and cod in New Hampshire waters. A fourth, Snapperfarm, Inc., which raised cobia off Culebra, Puerto Rico, recently ended its operations when the Florida hatchery that supplied its fingerlings was shut down by Marine Farms ASA, the company that managed and owned the cobia hatchery. Although none of these offshore operations are or were in the Gulf of Mexico, the three commercial operations and to a lesser extent the UNH Aquaculture Center can yield insights into the future of offshore aquaculture in the Gulf. Additional insights can be gained by considering past proposed but not implemented offshore aquaculture operations both within and without the Gulf.

5.3.2.1 Current Hawaii Offshore Aquaculture Operations

Both of the offshore aquaculture operations in Hawaii waters are commercial, although the first began as a research project. In addition to County permits, each one of these operations has had to receive three State permits and one Federal permit in order to conduct offshore aquaculture operations in Hawaii marine waters.

All offshore waters in Hawaii are classified as a conservation district, and consequently, a Conservation District Use Permit is required by the Hawaii Department of Land and Natural Resources (DLNR). The Conservation District Use Permit is a conditioned permit that describes the conditions of the use of ocean resources, such as species, location and site layout, emergency response considerations, and management plans (Corbin 2006). An Environmental Assessment is required as part of the application for that permit.

The other required State permits are the National Pollution Discharge Elimination System Permit and Zone of Mixing Permit, which are issued by the Hawaii Department of Health. These conditioned permits govern discharges from the aquaculture facilities and require water quality and substrate monitoring. The one Federal permit is the Section 10 Permit issued by the U.S. Army Corps of Engineers (Corps), which is required to place structures in the country's navigable waters.

After all of the permits are issued, the DLNR can issue a long-term lease for a proposed ocean site. The lease document includes provisions, such as duration of the lease (15 to 20 years), a performance bond to cover project removal, rent, and transferability.

5.3.2.1.1 Hukilau Foods, LLC

Hukilau Foods, LLC, formerly Cates International, Inc., was formed out of two experiments of the Hawaii Offshore Aquaculture Research Project (Research Project). The Research Project is a partnership between the University of Hawaii and the Oceanic Institute in Waimanalo, Hawaii, to explore the biological, economic, and environmental sustainability of offshore aquaculture in Hawaii and the Pacific region. Experiments, of the Research Project were initiated in 1999 and ended in 2000.

The first experiment began in the fall of 1998 when the Research Project ordered an OceanSpar SeaStation 3000™ sea cage, and the Oceanic Institute began growing approximately 90,000 Pacific threadfin (*Polydactylus sexfilis*), also known as moi, fingerlings at its Waimanalo facility in February 1999. One month later, the sea cage was constructed on the surface about 2 miles off Ewa Beach and then deployed, and in mid-April an inner nursery was deployed around the central spur inside the cage. See Figure 5.3.2.1.1.

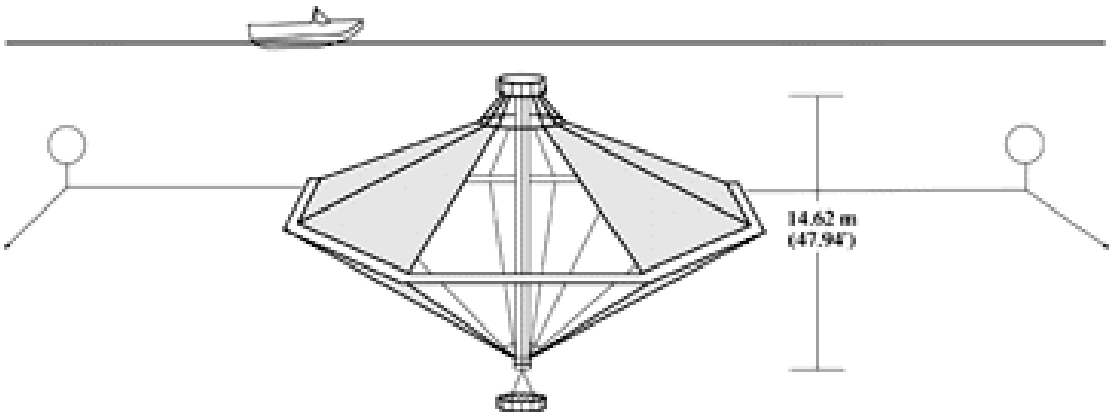

Figure 5.3.2.1.1 The Hawaii Offshore Aquaculture Research Project's two experiments used a bi-conical cage approximately 25 meters (82 feet) in diameter and 14.6 meters (48 feet) in depth with a working volume of 2,600 cubic meters (91,818 cubic feet). It was made of steel and NASA-developed mesh and designed to withstand 25-foot waves. The cage was kept fully submerged and moored on a four-point anchor system with each anchor attached to the cage with mooring line and a short piece of heavy anchor chain. Source: Helsley, 2000.

Days after the deployment of the nursery net, the juvenile fish were transported from Waimanolo to the ocean site. Relocation of the fingerlings from tanks on land to the sea cage occurred over three days and each trip took about five hours and involved the fingerlings being loaded into 1-ton containers, which were lifted by a crane and loaded onto a support boat provided by Safety Boats Hawaii, Inc. for a 2.5-hour trip to the sea cage. The nursery net was stocked with approximately 70,000 fingerlings of two cohort classes: 70-day old and 50-day old moi. The juvenile fish were fed to satiation each morning for six months with commercial dry, pelleted feed that was supplied through a venturi-style system (see Figure 5.3.2.1.2). After about one month, the inner nursery net was removed to give the young fish access to the entire main cage. The moi were harvested from early September until November using three to four divers and a fish pump, and fish ranged from 250 grams (0.55 pounds) to 750 grams (1.65 pounds) in size. At the end of the first experiment in 1999, the sea cage and its mooring system were secured and left at the site for the second experiment.

Figure 5.3.2.1.2 Using a pipe pictured above, Pacific threadfin, also known as moi, fingerlings were introduced into the offshore sea cage. Using a similar pipe, an operator on a boat at the surface released commercial fish pellets daily into the cage to feed the fish. Oceanic Institute photo. *Source:* NOAA Office of Oceanic and Atmospheric Research (www.oar.noaa.gov/spotlite/archive/spot_hawaii.html).

The second experiment began and ended in 2000, almost doubling the number of fish raised. In April 2000, eggs of the Pacific threadfin were collected from a spawning group of wild broodstock held at the Oceanic Institute. Six 5-ton circular tanks were stocked with an average of 150,000 eggs each. The larvae hatched in the tanks and were raised to 25 days of age and partially trained to accept pelleted feed. The fry were then harvested from the six tanks and about 120,000 fish were stocked in eight 5-ton tanks. Once 39 days of age, the fish were transferred to ten, 30-ton circular tanks to grow and condition for transfer to the sea cage. Once they were at least 50 days old, they were transported from Waimanalo to the submerged cage. Each hauling bin was supplied with a continuous flow of fresh seawater supplemented with pure oxygen during the trip. Once at the cage site, the fingerlings were gravity fed into a 1,200 cubic meter nursery net located inside the submerged cage using a 4-inch (10 centimeter) flexible hose and pumped water. Unlike the first experiment, which fed the fish once a day, the second experiment fed them a commercial dry, pelleted feed twice daily to satiation using the same venturi-style system as the first experiment. After one month the nursery net was removed and the juvenile fish had access to the entire cage. The moi were harvested after a 6-month grow out period (when they were 234 to 281 days old), with the average fish being between 0.9 to 1.0 pound commercial weight. Harvests occurred twice weekly through December 2, 2000, for distribution and sale to markets outside Hawaii (Ostrowski *et al*., 2001). Thirteen harvests were conducted, with each averaging 2,273 kilograms (5,001 pounds) of fish. At the time, the average farm-gate price was $3.84 per pound, and estimated cost of production was $3.97 per pound, suggesting it may not be profitable to culture moi. However, project researchers saw ways to improve future per unit costs, such as reducing hatchery-production and feed costs, to enhance profitability.

In 2001, the University of Hawaii turned the experiment over to Cates International, Inc., which was founded in 2000 by Randy Cates, owner of Safety Boats, Inc., and Virginia Enos. The university continued to run the environmental monitoring program; the company leased the sea cage from the Research Project, and the Oceanic Institute continued to serve as the hatchery that supplied the company with its juvenile fish. On March 9, 2001, the State Board of Land and Natural Resources authorized a 15-year ocean leasing agreement, with a 10-year option, between the State and Cates International for the commercial production of fish in offshore sea cages (Hawaii Dept. of Agriculture; 2001). The lease is for 11.2 hectares (28 acres), 3.2 kilometers (2 miles) off Ewa Beach, and up to four cages, anchored 40 to 50 feet below the surface, positioned at the site. According to the lease, rent is assessed as an annual rate of $1,400 or one percent of gross revenues, whichever is higher.

Cates International had its first commercial harvest in January 2002, and signed the actual lease document in August 2002 to become the first in U.S. history to obtain an ocean lease for aquaculture (Hawaii DLNR & DoA, 2003). Since signing the lease, the company expanded production and acquired, deployed and operated four Sea Station 3000™ submersible cages. In August 2005, Gima reported that the harvest had dropped to "as little as 1,200 pounds of moi" due to three factors: 1) the Oceanic Institute was unable to produce enough fingerlings; 2) Cates International's main harvest boat had been in dry dock for maintenance; and 3) the company was growing the fish to a larger size.

In 2003, Cates International posted sales of moi of $1.4 million, all of which was invested back into the company (Hedlund, 2004). The following year the company's production of moi climbed from 6,000 pounds a week to 7,000 to 10,000 pounds a week (Hedlund, 2004; Hawaii DLNR and DoA, 2003). However, production was inconsistent in 2006 because of problems getting enough fingerlings to stock its four sea cages, and these problems remain. Cates International has bought its fingerlings at cost from the Oceanic Institute, which is a research institution not driven by sales of juvenile fish, so the company has been unable to get larger numbers of fingerlings to stock its four cages. Another problem has been the location of the Oceanic Institute's hatchery, which is at Waimanalo's Wakapuu Point on the southeast corner of Oahu. The company has had to truck its fingerlings over 36 miles from Wakapuu Point to Ewa Beach, then transport them by boat to the cages.

From 2000 through 2006 Cates International received $2.3 million in both direct and guaranteed loans through NOAA's Fisheries Finance Program (www.fedspending.org). It also received Federal government contracts in the sum of $115,162 from 2000 through 2006 ($102,762 from NOAA and $12,400 from the Department of the Navy).

In January 2006, Cates International obtained a lease for a 4-acre site in the Kalaeloa Agricultural Park on the Leeward Coast of Oahu from Hawaii's Department of Agriculture (DoA) to build a large-scale moi hatchery capable of producing 12 million fingerlings annually (http://hawaii.gov/hdoa/meetings_reports/e-news/january-31-2006). In 2007, the company received up to $4.5 million in private financing from Vision LLC,

a company owned by AOL founder and Grove Farm Company owner Steve Case (Hao 2007).

Cates International was renamed Hukilua Foods, LLC, when its controlling interest was acquired by Grove Farm Land Corporation in 2007 (Grove Farm). Hukilau Foods is presently being organized as a subsidiary of Grove Farm Fish and Poi, LLC. The purchase by Grove Farm allowed the former company to address its problem of inconsistent supply of fingerlings by building a new fish hatchery in Kalalaeloa, Oahu, which is in the vicinity of Barbers Point Harbor and which is Hawaii's second busiest commercial harbor. To do so, Hukilau Foods obtained a lease for a site on the Leeward Coast of Oahu from the Hawaii Department of Agriculture to build a large-scale hatchery capable of producing up to 14 million fry. According to Hukilau Foods' website (www.hukilaufoods.com/about _us), the hatchery will be completed in 2009 and annual production is expected to be about 10 million fingerlings.

According to Global Duns Market Identifiers, as of May 13, 2008, Cates International had annual nets sales of $1.3 million and 5 employees. Hukilau Foods plan to increase hatchery production to 10 million fry per year translates into 6.25 to 7.5 million pounds of moi annually or 119,863 to 143,836 pounds per week. This figure is significantly greater than the 7,000 to 10,000 pounds per week produced in 2004 and represents at the minimum a 1,338 percent increase in pounds produced weekly since 2004. To grow out the larger numbers of juvenile fish, the company is seeking several additional ocean sites. According to the Hawaii DoA and DLNR (2007), the company is seeking to increase its level of investment to $10 million over the 24-month period from December 2007 to November 2009.

Moi is commercially fished in the present, although it was much more so in the past. From 2002 through 2006, annual commercial landings of threadfins in Hawaii have averaged 273 pounds with a dockside value of $1,256 and average of $4.59 per pound (NMFS, Commercial Fishery Statistics, Annual Landings).

5.3.2.1.2 Kona Blue Water Farms

Kona Blue Water Farms (Kona Blue) is a wholly owned subsidiary of Black Pearls Inc., the latter which consults and develops commercial pearl farms around the globe. Kona Blue was formed in 2001. Kona Blue produces Kona Kampachi® (*Seriola rivoliana*), also known as Hawaiian yellowtail, amberjack or kahala. Its hatchery is located in the Natural Energy Laboratory of Hawaii Authority's ocean science and technology park at Keahole Point in Kona on the island of Hawaii. From August 2002 through August 2005, before the company's first offshore harvest, Kona Blue sold 500 to 1,000 pounds of tank-raised fish each week to local restaurants for sashimi and also fillets to Pacific Rim countries (Command 2005).

Kona Blue's Draft Environmental Assessment, which was published in January 2003, reflected "two years of discussion with a broad cross-section of the community" (Jarman

et al., 2004, p. 13). Kona Blue conducted specific meetings with Native Hawaiians and met with industry and government specialists during its development process.

In 2003, Kona Blue received approval to lease 81 acres in Hawaiian waters that are 150- to 200-feet deep off Kona to raise mahi mahi and other fish in eight cages (Gonser 2003). In 2004, the company received $4 million from Thomas McCloskey, President and CEO of Cornerstone Holdings LLC, in Aspen, Colorado, who now serves as Kona Blue's chairman. The company has also benefited from funds received from Garrett Gruener, founder of Ask Jeeves.

In 2005, Kona Blue completed installation of the moorings and first pair of submersible grow-out cages off Onualoha Point, and stocked them with 30,000 juvenile kalaha (Associated Press, April 7, 2005). It harvested its first crop in fall 2005 and planned to eventually produce 800 tons of fish each year. It expects to double its production and increase its revenues to $9 million this year (O'Brien 2008).

Kona Blue currently uses eight cages that range from 2,800 to 3,200 cubic meters and in the fall of 2007 applied to increase the size of the cages to more than 6,200 cubic meters (Stanton 2008). There has been both public support of and opposition to the planned expansion, including the Kanaka Council filing an application for contested case against Kona Blue (Stanton 2008). In January 2008, in response to the Kanaka Council's opposition, Kona Blue withdrew its application for expansion.

While 20 percent of the company's product remains in Hawaii, about 80 percent is shipped to the mainland. Retail price has been close to $20 per pound, making Kona kampachi one of the most expensive fish on the market. With such a price, it has been a boutique commodity with a distribution largely limited to upscale retailers and sushi and gourmet restaurants. Contributing to the high price has been the cost of shipping the fish from Hawaii to the mainland, with shipping cost representing 20 percent of Kona Blue's revenue (O'Brien 2008). To help lower its price, Kona Blue has switched to a less costly feed by substituting one made from fish meal for one made from chicken meal. It is also planning to reduce handling and shipping costs by expanding production into Mexico and lower production costs by expanding production to achieve economies of scale (Forristall, 2008; Honolulu Advertiser.com, January 18, 2008). Furthermore, the company is also considering other locations for production and testing other species, such as the giant grouper (O'Brien 2008). As of January 2008, the company had 38 employees.

Kona Blue has also benefited from Federal government financial programs. In fiscal years 2001 through 2003, it was the recipient of grants totaling $1,499,090 from the U.S. Department of Commerce's National Institute of Standards and Technology through its Advanced Technology Program. That same year its parent company, Black Pearls, Inc., received a grant of $159,040 from NOAA's Saltonstall-Kennedy Grant program, and previously, in fiscal year 1998, Black Pearls, Inc, received $99,540 under the same grant program. In fiscal year 2006, the U.S. Department of Agriculture's Cooperative State

Research, Education and Extension Service gave Kona Blue $79,088 through its Small Business Innovation Research program.

There is no commercial kahala (amberjack) fishery in Hawaii because wild kahala is prone to ciguatera toxin, a reef toxin that can cause serious illness in humans. The wild fish get ciguatera through what they eat, and because Kona Blue can control what its fish eat, there has been no presence of ciguatera toxin in its product.

5.3.2.2 Snapperfarm, Inc., Puerto Rico

Snapperfarm, Inc. was founded in 1998 by Brian O'Hanlon and Joseph Ayvazian. Its operation has been in collaboration with the University of Miami and University of Puerto Rico.

Snapperfarm obtained all the required permits and deployed two sea cages off the coast of Culebra, Puerto Rico, in 2002. In the fall of that year, the company stocked one of the cages with mutton snapper (*Lutjanus analis*) and the other with cobia (*Rachycentron canadum*), which were purchased from the Aquaculture Center of the Florida Keys, a company then partially owned by Marine Farm ASA (Marine Farm) and in 2004 wholly owned by Marine Farm (Thurston 2007; Marine Farm website). Weeks after first stocking the cages, however, Snapperfarm decided to focus its production solely on cobia and obtained a registered trademark for its Culebra Cobia™. In 2003, the company produced 50,000 pounds of fish, mostly cobia (Hedlund 2005). Snapperfarm distributed its product through JC Seafood, Inc., a Miami company, owned and operated by James O'Hanlon.

In 2006, the company received financial backing from Aquacopia Capital Management (Aquacopia) and is described in Aquacopia's website (www.aquacopia.com) as one of its companies. As of July 1, 2006, Snapperfarm planned to install more cages in 2007, increasing its production from 50 to 750 tons annually (Thurston, 2007). Those plans, however, were conditioned upon the company's continued access to cobia fingerlings. The company bought its fingerlings from Marine Farm's Aquaculture Center of the Florida Keys and transported them to its Culebra site, which took 30 hours and was expensive. That access to cobia fingerlings from the Florida hatchery ended with Marine Farm's discontinuation of its hatchery operations in the state. Beginning in 2006 and ending by 2008, Marine Farm transferred its cobia-hatchery production to Belize in order to supply its grow-out operations in that country, and the Florida hatchery was shut down.

Snapperfarm removed its cages and discontinued production. It is unclear when or if production will resume, especially given the lack of access to cobia fingerlings and O'Hanlon and Aquacopia's shared interests in Ocean Blue Sea Farms (Ocean Blue Sea), a cobia offshore aquaculture operation in Panama expected to begin production in 2009. According to Aquacopia's website, Ocean Blue Sea has received permits for three offshore aquaculture sites, totaling 900 hectares. Its fingerlings may come from Marine Farm's Belize hatchery.

Another factor that may have contributed to Snapperfarm discontinuing its operation was the low survival rates due to disease outbreaks (Bennetti 2006). Cobia are susceptible to viruses, bacteria and parasites, and that susceptibility is one of the major challenges in culturing cobia. According to Bennetti (2006), in regards to the Snapperfarm's operation, "low survival rates due to disease outbreaks both at the hatchery and at the growout stages [were] causing severe economic impact and compromising the commercial viability of the operations." Researchers involved in the Snapperfarm operation identified ciliate protozoan parasites Amyloodinium, Cryptocaryon, and Brooklinella, a bacterial disease caused by Photobacterium species as "a major potential threat for cobia during the fingerling, juvenile and adult stages" (ibid.).

Still other reasons have been suggested for Snapperfarm discontinuing operations. For example, a 2008 article in *Caribbean Business* attributed the shutdown to the company being "unable to secure the necessary permits in a timely manner" and its investors being "disenchanted."

In fiscal year 2005, Snapperfarm was a recipient of a $58,480 NOAA Small Business Innovation Research Program Grant. In fiscal years 2004 and 2006, Snapperfarm was a co-recipient of National Marine Aquaculture Initiative Grants totaling $1,045,937 ($200,000 in 2004 and $906,337 in 2006).

From 1987 through 2006, U.S. annual commercial landings for cobia ranged from a high of 429,378 pounds in 1996 to a low of 165,682 pounds in 2005. During this same time period in the Gulf of Mexico, annual landings ranged from a high of 263,969 pounds in 1996 to a low of 93,609 pounds in 2006 (see Table 5.3.2.2). Since 1997, there has been a declining trend in commercial landings.

5.3.2.3. UNH Aquaculture Center

The UNH Atlantic Marine Aquaculture Center, formerly the Open Ocean Aquaculture, demonstration project, began in 1997. It began raising fish in 1999 at a 30-acre site in New Hampshire State waters approximately one mile south of White Island. The project cultured summer founder, also known as fluke, in 1999 and 2000, Atlantic cod in 2001, and stocked Atlantic halibut in 2001 and harvested it in 2004, stocked haddock in 2002 and harvested it in 2004, and stocked cod again in 2003 (UNH Aquaculture website). Both cod and summer flounder fingerlings were obtained from Great Bay Aquaculture, a commercial hatchery in Portsmouth, NH. The halibut fingerlings came from R&R Finfish Development, Ltd, a commercial hatchery in Digby, Nova Scotia; and the haddock fingerlings were acquired from a Canadian hatchery through Heritage Salmon, Ltd, a wholly owned subsidiary of George Weston Ltd, one of North America's largest food processing and distribution companies.

According to Food & Water Watch (2007), UNH's Atlantic Marine Aquaculture Center has been a sole and co-recipient of multiple grants since fiscal year 2001 from NOAA's National Marine Aquaculture Initiative and Small Business Innovation Research

Program. It has also received funding from the NOAA Saltonstall-Kennedy Grant program.

UNH's Atlantic Marine Aquaculture Center is a research institution, and sales of cultured fish have been minimal. According to Food & Water Watch (2007), from 1997 through 2006, it sold about 6,500 pounds of fish at a value of $23,711.

Table 5.3.2.2 Commercial landings of cobia. Source: NMFS, Fisheries Statistics, Accumulated Landings System.

	All States		Gulf[1]	
Year	**Pounds**	**$ Value**	**Pounds**	**$ Value**
1987	273,499	268,622	174,536	161,619
1988	261,833	286,532	160,529	169,740
1989	337,091	393,582	210,470	231,330
1990	284,352	367,423	160,563	202,202
1991	317,412	429,902	176,632	220,687
1992	372,543	542,460	235,097	321,855
1993	392,481	593,784	261,317	376,596
1994	398,594	626,166	263,561	411,131
1995	398,609	673,409	241,126	399,236
1996	429,378	754,258	263,969	461,367
1997	361,147	634,598	208,755	368,820
1998	329,841	616,780	203,640	371,380
1999	309,785	602,944	191,382	359,451
2000	252,372	480,416	152,569	287,377
2001	219,370	429,897	112,252	220,954
2002	213,355	428,999	122,378	243,650
2003	231,385	490,831	141,681	302,461
2004	212,513	459,165	117,345	249,779
2005	165,682	354,781	99,970	221,479
2006	183,214	388,709	93,609	193,101

[1] This includes Texas, Louisiana, Mississippi, Alabama and west Florida.

5.3.3 Existing Invertebrate Offshore Culture Operations in the U.S.

Two companies currently culture invertebrates in offshore waters: Isle of Shoals and Santa Barbara Mariculture.

Isle of Shoals mussel farm, located three miles off the New Hampshire coast, was started in 2005 by New Hampshire fisherman, Andy Lang. The farm uses know how and technology developed by the University of New Hampshire and local fishermen. Sales to local markets and restaurants began in 2007. At its current size of 12 longlines, this farm can produce up to 180,000 lbs of mussels annually.

Santa Barbara Mariculture, a commercial operation growing mussels, began harvesting its first crop in 2007. The company grows the mussels on longlines in California waters

using technology adapted from New Zealand and the University of New Hampshire project.

5.3.4 Gulf Offshore Aquaculture Experiences and Proposals

Although there are currently no offshore aquaculture operations in the Gulf of Mexico, experimental operations have occurred and commercial operations have been proposed. At least one entity states it is preparing to begin commercial offshore aquaculture operations in Texas waters of the Gulf in the near future.

5.3.4.1 First Gulf Offshore Aquaculture Operation

The first offshore aquaculture operation in the Gulf of Mexico was an experimental operation in Texas waters in the late 1980s and early 1990s. Texas Sea Grant scientists used an Occidental Petroleum Corporation platform to grow redfish (Waldemar Nelson International Inc. 2001). Severe storms damaged some of the cages and fish escaped. According to an aquaculture specialist at Texas A&M University, the cost of growing out the fish exceeded the market value of the harvest: the ocean-raised redfish worked out to a cost of $22 per pound, whereas the market price for redfish was only $3.50 per pound (Burdeau 2005).

5.3.4.2 First Gulf EEZ Offshore Aquaculture Operation

The first applicant to propose an offshore finfish aquaculture operation in the Gulf of Mexico EEZ was Seafish Mariculture LLC (SeaFish Mariculture), which received final approval from the ACOE, Galveston District, on July 3, 1997 (Waldemar Nelson International Inc., 2001). A week later, NOAA Fisheries Service published in the *Federal Register* a notice of receipt of SeaFish Mariculture's application for an exempted fishing permit (EFP) and a request for public comments (62 *FR* 132). In its application for an EFP, SeaFish Mariculture stated its purpose was to study over a 26-month period whether it is feasible to grow commercial quantities of native fish species in the offshore environment of the Gulf of Mexico using aquaculture techniques. To do so, it would place hatchery-raised juvenile fish in three cages attached to working oil and gas platforms operated by Shell Offshore Services, Inc. and located approximately 48 nautical miles south-southwest of Freeport, Texas; feed them; allow them to grow for approximately 12 months; harvest them from the cages; land them in Texas, and sell them.

SeaFish Mariculture received the first EFP for a marine finfish aquaculture project in the Gulf of Mexico EEZ in October 1997. The EFP authorized SeaFish Mariculture to harvest, possess, and sell red drum (*Sciaenops ocellata*), greater amberjack (*Seriola dumerili*), and red snapper (*Lutjanus campechanus*) from Federal waters of the Gulf of Mexico, to possess or sell greater amberjack or red snapper below the minimum size limit, and to harvest or possess red snapper in excess of established trip limits and/or during a closed season. Although SeaFish Mariculture successfully raised red drum from 3-inch hatchery raised fingerlings to market-size fish in a growth cycle of less than 12

months, the project did not make the progress as projected in the permit application. The first group of red drum fingerlings was stocked on November 30, 1997. Operations were disrupted by tropical storms and hurricanes in 1998. In fact, fish were either killed or escaped when the first cage was damaged by two storms and later destroyed by a tropical storm. Another unanticipated loss of fish occurred during an attempt to move the cage as requested by Shell Offshore Services, Inc., which operated the platform, and which needed the cage to be moved in order to give its work boats clear access to the platform. In July 1999, SeaFish Mariculture notified NOAA Fisheries Service that it planned to terminate the project as a result of increased gas production at the site.

5.3.4.3 Rejected Gulf Commercial Aquaculture Proposals

The first entity to propose commercial offshore aquaculture operations in the Gulf and to begin the permitting process was Sea Pride Industries (Sea Pride) of Gulf Breeze, Florida, which proposed in the late 1980s and early 1990s to develop and operate offshore finfish farms in Alabama, Florida, and Mississippi waters in the Gulf of Mexico. On February 24, 1992, the Mississippi Department of Wildlife, Fisheries and Park granted a permit to Sea Pride to set up an aquaculture operation on a 40-acre site 3 miles south of Horn Island (Leffler 1992). However, the company lacked the venture capital and funding to cover the approximately $5 million in set-up costs (ibid). On November 3, 1993, the ACOE, Mobile District, gave final approval to one of Sea Pride's projects; however, after receiving that approval, NOAA Fisheries Service expressed objection that there had been insufficient opportunity for comment (Waldemar Nelson International Inc. 2001). According to an October 23, 1995, article in *Forbes*, Sea Pride was planning to operate a finfish farm four miles southeast of Alabama's Fort Morgan peninsula (Flanagan 1995). However, Sea Pride's projects never materialized and its ACOE permit expired November 3, 1996. According to a 1995 article in the Lakeland, Florida, newspaper, *The Ledger*, the company was accused of selling unregistered securities in Mississippi and Alabama (Kaczor 1995). The same article reports that the company, at that time, was planning to place a $16 million dome-topped platform in the Gulf EEZ four miles southeast of Mobile Bay in Alabama and raise red fish, mahi mahi, red snapper, and other species in 6 barrel-shaped cages, each 170 feet long and which would extend from an oil and gas platform. On November 9, 1996, the *Miami Herald* reported that Florida regulators had accused the company of scheming to defraud investors through the sale of securities to finance a proposed fish farm in the Gulf.

The second and third applicants to propose commercial offshore finfish aquaculture operations in State waters of the Gulf were Watermark Corporation (Watermark) and Marine Artificial Habitats, Inc. (Marine Artificial), which submitted applications for Section 10 permits to the Corps, New Orleans District, in 1994 (Waldemar Nelson International Inc.; 2001). Watermark proposed to establish a platform-supported fishery in Grand Isle Blocks 75 and 76 off the coast of Louisiana. The ACOE returned the application to the company on January 12, 1995. Marine Artificial proposed to establish a privately managed artificial reef and processing plant in South Timbalier 176. Its application was denied and then withdrawn by the applicant.

NOAA Fisheries Service and the Gulf Council received the second EFP request for marine finfish aquaculture in the Gulf EEZ in 2003. On July 30, 2003, NOAA Fisheries Service announced that it had received an application for an EFP on behalf of the Florida Offshore Aquaculture, Inc. (Florida Offshore) of Madeira Beach, Florida (68 FR 146). An environmental assessment accompanied the application.

Florida Offshore proposed a feasibility study for 24 months of net cage culture of cobia, mahi mahi, greater amberjack, Florida pompano, red snapper, and cubera snapper at a site approximately 33 statute miles (53 kilometers) west southwest of John's Pass, Florida. The company proposed to place hatchery-raised fingerlings in four to eight Sea Station™ cages, feed them, allow the to grow about four months, harvest each cage three times annually, land them in Florida, and sell them. Each cage was to be 53 feet (16 meters) tall and 83 ft (25 m) in diameter and contain a maximum of 165,000 lb (75,000 kg).

Florida Offshore proposed to obtain the fingerlings from the Aquaculture Center of the Florida Keys and the Marine Institute of the University of Texas and use commercially pelletized feed. It also proposed a monitoring program that included benthic and water quality sampling.

In the July 30, 2003 announcement, NOAA Fisheries Service stated that it intended to add the following conditions to any issuance of the EFP to ensure that there are no significant impacts on the environment or on its enforcement efforts regarding existing prohibitions on the taking of species. The proposed conditions were:

1. Applicant must notify NOAA Fisheries Service of any changes to the list of hatcheries to be used.
2. All fingerlings must be certified by the hatchery to be disease-free prior to placement in the cages.
3. Only chemotherapeutants approved by the FDA or prescribed by a qualified veterinarian may be used.
4. Use of toxic chemicals as defined in 50 CFR 622.2 to control fouling of nets is prohibited.
5. Immediate notification must be provided to NOAA Fisheries Service if any of the following events occur:
    a. Damage to cages or malfunction of supporting structures;
    b. large-scale escapement, i.e., loss of more than 20 percent of a cage population;
    c. major disease outbreak resulting in mortalities exceeding 10 percent; or
    d. entanglements of marine mammals or endangered or threatened sea turtles.
6. Quarterly reports are required beginning 90 days after anchoring cages in site on:
    a. any disease occurrence;
    b. any use of chemotherapeutants approved by the FDA or prescribed by a qualified veterinarian;
    c. outcome of any events requiring immediate notification (see 5 above);
    d. changes in faunal composition of the area around the experimental site;
    e. substrate and water quality monitoring;
    f. harvests of maricultured fish species.

7. The following samples/records must be maintained a minimum of at least one year after the termination of the EFP and made available for inspection:
    a. Sources of feed including batch codes;
    b. Sources of each group of fish stocked including:
        i. Total number of fish by species;
        ii. Estimated size of fish;
        iii. Date of each introduction/stocking;
        iv. Name, address and phone number(s) of supplier(s);
        v. Disease status of supplier's facility including name, address, and phone number of analytical facilities assessing the disease status;
        vi. Samples of frozen specimens of each group of fish including fish harvested from cages, and during any unusual morbidity or mortality events as per USDA standards; and,
        vii. Phase one fry will be satellite DNA documented by FFWCC geneticists at Port of Manatee Hatchery;
8. Fish must be maintained intact through offloading ashore. Fish will be placed in live haul containers located on the harvest vessels, brought to shore, and loaded on live haul trucks for sale to traditional live markets. Any fish over the capacity of the live market will be processed at Double D Seafood in St. Petersburg, FL, and sold. Once harvested, the cultured fish must be reported in accordance with State and Federal reporting requirements. Sale is allowed only to dealers licensed by Florida to sell cultured fishery products landed in Florida.
9. Not less than 72 hours prior to harvest, provide the following information to the NOAA Fisheries Service Law Enforcement Office, Southeast Region, St. Petersburg, FL, (727-570-5344): date, port, and facility at which the cultured product will be landed and name(s) and phone number(s) of licensed dealer(s) receiving the fish.
10. NOAA Fisheries Service retains the authority to make periodic inspections of mariculture operations and records. If the applicant becomes a certified Florida aquaculturist, the applicant must notify NMFS Law Enforcement of the annual unique serial number required on all mariculture records, including sales, and the records must be made available for inspection by authorized offices and maintained for the duration of the EFP plus 1 year.
11. NOAA Fisheries Service has the authority to suspend or revoke the EFP if: the application is found to contain false, incomplete or inaccurate information; the applicant fails to comply with its terms and conditions; significant new information becomes available indicating that one of the conditions for denial of the EFP application applies (See 50 CFR 600.745(b)(8)). Revocation will require a General Counsel enforcement action per 600.745(b)(8) and 15 CFR 904 regulations.
12. Issuance of the EFP does not eliminate the need for the applicant to obtain any other Federal, State or Local authorizations required by law.

The Gulf Council considered the EFP request at their September 2003 meeting and recommended the EFP application be denied. The Council, as well as environmental organizations and individuals, identified numerous issues of concern, which are described

in a December 23, 2003, *Federal Register* Notice (68 FR 246). In summary, it was concluded the applicants lacked the experience to comply with above EFP conditions and had submitted false information in the application.

Another application for an EFP for purposes of offshore aquaculture in the Gulf was received on April 9, 2008, from Dr. Phillip Lee of Biomarine Technologies, Inc. of Galveston, Texas, although a business partner of Dr. Lee had begun talks with NOAA Fisheries Service regarding a possible EFP application as early as 2003. In early March 2003, Dr. Lee requested a letter of acknowledgement (LOA) regarding collection of broodstock for a large-scale, long term mariculture project. On March 20, 2003, NOAA Fisheries Service notified Dr. Lee that an LOA is only appropriate for scientific research activities conducted aboard a scientific research vessel, and NOAA Fisheries Service suggested an EFP may provide the project's partners the authority for the type of activities proposed on a limited basis. In June 2004, NOAA Fisheries Service met with John Ericsson of Gulf Marine Institute of Technology (Gulf Marine) and Biomarine Technologies regarding a request for an EFP for offshore aquaculture and mariculture research. In July 2004, NOAA Fisheries Service notified Gulf Marine that it had not received a copy of the Environmental Impact Statement and needed answers to questions in order to further consider the EFP application. On February 10, 2006, Gulf Marine provided NMFS with a copy of *Mariculture Site Characterization and Environmental Assessment* for its proposed offshore aquaculture operation. In a letter to Gulf Marine dated June 2, 2006, NOAA Fisheries Service noted that the Environmental Assessment did not include several key sections and was incomplete. On June 3, 2008, NOAA Fisheries Service notified Dr. Lee and BioMarine Technologies that there EFP application had been rejected because it sought to establish a long-term, commercial-scale aquaculture operation that is not one of the purposes for which an EFP may be issued.

5.3.4.4 Ongoing Proposal for Aquaculture in Texas Waters

In September 1998, the Gulf Marine and its commercial affiliate, BioMarine Technologies, Inc. (formerly Sea Pride Industries, Inc.), received approval from the Texas General Land Commissioner to use a 500-acre, four-platform oil and gas complex 10 miles southeast of Matagorda Peninsula to develop techniques to grow finfish in Texas waters (Poruban 2000; *Dewhurst v. Gulf Marine Institute of Technology*). Devon Energy Corporation (formally Seagull E & P, Inc.) donated the platform with a $5 million value to Gulf Marine. Gulf Marine agreed to dismantle the platform at an estimated cost of $2.5 million once it ceased its aquaculture operation or when required by Seagull's 1986 Lease, whichever came first.

In June 1999, the Corps issued Gulf Marine's permit to acquire and convert an existing oil and gas platform to an offshore aquaculture operation (Gulf Marine website at http://www.gmitinfo.com). The wells were plugged on July 9, 1999, and in October 1999, the Texas General Land Commissioner ordered Gulf Marine and BioMarine to dismantle the platform as required by the 1986 Lease. In response, Gulf Marine and BioMarine sued the Texas General Land Commissioner, claiming its agreement with the

General Land Office (GLO) had occurred on or after the plugging of the wells. In a September 4, 2005, press release, Gulf Marine and BioMarine announced that they had won their lawsuit and intended to proceed with a sea farming research and development project using the platform, since they had all necessary State permits, a Corps permit and a National Pollution Discharge Elimination System (NPDES) permit from the U.S. Environmental Protection Agency. However, the 2005 legal decision was subsequently appealed and then affirmed in part and reversed in part in February 2008. As of May 1, 2008, the Texas Parks and Wildlife Department had not permitted any offshore aquaculture activities in State waters. According to a May 25, 2008, article in the *San Antonio Express-News*, Gulf Marine hoped to sign a 30-year lease with the GLO, have all necessary permits, and have hatchery facilities located on the platform and cobia (also known as ling) and amberjack growing at the facility by the end of the year (Strait 2008).

5.3.5 Other Notable Proposed, Abandoned Proposals

Three additional Hawaiian companies have proposed to operate finfish farms in Hawaiian waters. These companies are the Ahi Nui Tuna Farming Company (Ahi Nui), Ahi Farms Inc. (Ahi Farms, also known as Ahi Aquaculture Farms), and Pacific Ocean Ventures (Pacific Ventures. Ahi Nui and Ahi Farms planned to farm yellow fin and big eye tuna and Pacific Ventures moi and kahala.

Ahi Nui submitted its Federal and State permit applications, State lease request, and Draft Environmental Assessment in July 2002 (Hawaii Dept. of Land and Natural Resources; 2003). The company initially proposed to place floating cages in a conservation area 4.5 miles northwest of Kawaihae Harbor in West Hawaii in approximately 170 feet of water (ibid). The total area of the site would have been 216 acres and the cages would have occupied 16 acres of surface water (ibid). However, the company dropped its plans for the original site because of public opposition. According to Jarman et al. (2004), unlike Kona Blue, Ahi Nui did not include Native Hawaiians, especially those in the Kawaihae community, in its consultations with community groups when developing its July 2002 Draft EA and instead limited consultations to mostly business and industry interests. Its first meeting with the Kawaihae community was not scheduled until after the Draft EA had been published. As of December 2004, the company was in the process of requesting a lease for another site located several miles offshore in very deep water and was preparing a new Draft EA (Hawaii Dept. of Land and Natural Resources; 2004). However, there is no evidence that such a request and Draft EA have been submitted.

Ahi Farms applied to lease two sites a mile offshore Kepuhi Point and Maili Point in 2003. The company proposed to establish 2 sites of 80 acres each that can hold up to 18 cages about 660 feet in circumference and 50 to 60 feet wide in waters with a depth of approximately 100 feet. As of December 2004, it had submitted its Federal permit application with the Army Corps of Engineers and was waiting for approval of its State Conservation District Use Application, with attached Environmental Assessment. At present, it appears that the company's plan has been either dropped or suspended.

In 2004, another company, Pacific Ocean Ventures, was preparing an offshore lease application to grow moi and kahala in cages off the coast of Maui (Hawaii Dept. of Land and Natural Resource and Dept. of Agriculture, 2004). The company's proposal was to include placing a cage in the Hawaiian Islands Humpback Whale National Marine Sanctuary. As of December 2004, the company was in the final stages of preparing the necessary Federal and State permit applications and lease request, which include an Environmental Assessment. However, the final minutes of the March 17, 2005, meeting of the Advisory Council of the Hawaiian Islands Humpback Whale National Marine Sanctuary states the company's Environmental Assessment was not accepted. It further goes to say that the company had proposed to place a cage in the heart of the Sanctuary, which is a "dense whale area that tends to have more mothers and calves."

In August 2003, Hubbs-Sea World Research Institute (HSWRI) leased part of an oil platform in the EEZ 10.5 nautical miles off the coast of Ventura, California, in the eastern Santa Barbara Channel with the intent to conduct a 3-year project to test the feasibility of using offshore platforms for the sustainable development of marine aquaculture (www.gracemaricultureproject.org). The Grace Mariculture Project, so named because it would operate from Platform Grace, was planned to culture 300 metric tons a year of white sea bass, striped bass, rockfish, California halibut, California yellowtail and bluefin tuna, and shellfish such as mussels and abalone (Miller; 2005). The aquaculture project was designed to use 10,000 square feet of deck, which is one-third of the platform's four decks, and place 4 submerged cages, each measuring 125,000 cubic meters, off the platform (ibid). According to the *Project Description*, the permitting process was expected to take place between January 2004 and August 2004, and upon approval, the project was expected to begin with cage and tank equipment delivery and assembly between April 2004 and December 2004. Nursery and grow-out were expected to begin in October 2004 (Hubbs-Sea World Research Institute 2003). However, the aquaculture project was abandoned when the owner of the platform, Venoco Inc., resumed oil drilling at the site (Collins 2008).

5.3.6 Characteristics and Economic Feasibility of Operations that May Operate in the Gulf of Mexico

The following description of individual aquaculture operations is largely based on Posadas and Bridger (2004). Because an aquaculture fishery currently does not exist, any description of a fishery is speculative. The intent of this section is to describe potential operations under the proposed regulatory framework in this FMP. .

This FMP proposes to allow the culture of Council managed finfishes, spiny lobster, and stone crabs. No sessile invertebrates are proposed for culture. Therefore, aquaculture operations in the Gulf of Mexico are all expected to use net pens, cages, or other enclosed structures for grow-out of allowable species. Cages and net pens vary widely in size and volume. SeaStation™ cages, which are manufactured by Ocean Spar Technologies, Inc, in Seattle, Washington, are likely to be used in the Gulf and currently range in size from 600 to 6,000 m^3. These cages are diamond shaped, may be submerged or float at the surface, and have been successfully used to culture finfish off Puerto Rico, Hawaii, and New Hampshire. Posadas and Bridger (2004) estimated that an operation would operate

6 to 12 3,000 m^3 cages; although the number and size of cages will vary depending on the maximum production capacity of the operation (no individual, corporation, or other entity can produce more than 20 percent of OY, which is equivalent to 12.8 million pounds). An operation using six 3,000 m^3 cages could produce 400 to 800 thousand pounds of fish annually, depending on productivity levels (22 to 44 pounds/m^3), whereas an operation using 12 6,000 m^3 cages could produce 1.6 to 3.2 million pounds annually (see Table 4.9.1. Other cages that could be proposed for use by offshore aquaculture operations include, but are not limited to the Aquapod™ developed by Ocean Farm Technologies Inc., Bridgestone sea cages, and various floating net pens/cages. Appendix E provides illustrations of various cages that may be used for offshore aquaculture. For more information about some of these cage types visit the following websites:

SeaStation – www.oceanspar.com
Aquapod – www.oceanfarmtech.com
UNH Open Ocean Aquaculture Project – http://ooa.unh.edu/finfish/finfish_cages.html

To ensure proper clearance between cages and the seafloor, operations are expected to be located at depths of 25 m or greater. However, the location of a facility will depend on siting considerations summarized in Action 6. In order to reduce operating costs related to vessel transit and transport, operations will likely seek areas near major ports that are relatively close to shore. It is expected that operations will likely develop in the central and western Gulf due to more immediate access to deeper water (i.e., the shelf in the eastern Gulf is broad and distances are much longer to get to water deep enough for aquaculture operations), access to oil and gas platforms, and numerous fishing ports. The MMS recently proposed regulations that would allow alternative uses for oil and gas platforms, such as aquaculture.

Posadas and Bridger (2004) estimated initial start up costs for a six-cage operation would be 2.89 million dollars. The initial fixed investment included $330,000 for onshore support facilities, such as trucks, fish transport vehicles, buildings, and land. Cages and net cleaners were estimated to cost $960,000 and aquaculture service vessels were estimated to cost $1.6 million dollars. Posadas and Bridger (2004) presumed operations would rely on an aquaculture support vessel, which would serve as a mobile offshore support structure for operations. Initial investment costs as estimated by Posadas and Bridger (2004) could be greatly reduced if operations instead use oil and gas platforms as support structures for their operation and rely on hatcheries owned by other companies. Both offshore oil and gas platforms and aquaculture support vessels could serve as quarters for crew and storage for feed and supplies. Transport vessels will be necessary to transport fingerlings to offshore facilities for stocking, as well as transporting cultured organisms to port after harvest. Action 1 would also allow permittees to develop hatcheries offshore, although operations during start up are likely to rely on onshore hatchery facilities.

Total annual variable and fixed costs for a six-cage operation were estimated to be $2.3 million dollars (Posadas and Bridger 2004). Variable costs were estimated to be $1.4 million dollars, while fixed costs were estimated to be $0.9 million dollars. Major

variable costs included: fuel and oil, repair and maintenance, fingerlings, feed, labor, insurance, and supply boats. Major fixed costs included: depreciation, farm management, interest, and insurance on stocks and equipment.

Formulated feed will be used to culture fish and invertebrates in pens. Feeds will be made from fishmeal and oil, and vegetable-based fats, proteins, and carbohydrates. Soybeans and other food sources could also be used for feed and are currently being researched as a potential substitute for feeds made of fishmeal and fish oil. Feeding will most likely be conducted using automatic feeders. Juvenile fish may be kept in smaller nursery pens either within or separate from cages used to culture larger, sub-adult fish. Once the smaller, juvenile fish grow large enough they will be released into the grow-out cages. The length of time for grow-out will vary by species, time of stocking, and the location of the operation. Once fish are ready for market, fish will be corralled and removed for transport to the dealer. Fish must be sold at a permitted dealer located in the U.S.

5.4 Description of the Economic and Social Environment - Wild Stocks

5.4.1 Commercial Fishery

The annual dockside value of the Gulf of Mexico commercial production has tended to fluctuate between $600 and $800 million, though occasionally it has reached $900 million. Product comes from both state and federal waters and includes both product for human consumption (e.g., reef fish and shrimp) and industrial use (e.g., menhaden). The most valuable commercially harvested species is shrimp, generally accounting for well in excess of one-half of the total. Other commercially important species (groups) include stone crab, blue crab, oysters, spiny lobsters, reef fish, coastal pelagics, and menhaden.

Many species (families) are managed under the auspices of the Gulf of Mexico Fishery Management Council. Management of other species is under the purview of each of the respective Gulf states. This section of the FMP briefly provides a description of the economic and social environment of some of the more economically relevant species,

In total, there are seven Gulf of Mexico Fishery Management Council plans. They are: (1) The *Red Drum Fishery Management Plan* (RDFMP) which was implemented in December 1986, (2) *The Fishery Management Plan* for the Reef Fish Resources of the Gulf of Mexico, which was approved in June 1983, (3) The fishery management plan for coastal migratory pelagic fisheries (*CMP FMP*), which was prepared cooperatively by the Gulf of Mexico and South Atlantic Fishery Management Councils, was implemented in February 1983, (4) The Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters, which was implemented in 1981, (5) *The Fishery Management Plan for the Stone Crab Fishery of the Gulf of Mexico (SCFMP)*, originally developed in response to competing gear use between stone crab and shrimp fishermen, was implemented in 1979, (6) The *Spiny Lobster Fishery Management Plan for the Gulf and South Atlantic (SLFMP)*, which was implemented in July 1982, and (7) The *Fishery Management Plan for Corals and Coral Reefs (CCRFMP)* was submitted for Secretarial

approval in April 1982 and was implemented in 1984. The GMFMC is proposing to amend five of these plans through this FMP. Fishery management plans for coral and shrimp are not being amended, because regulations already exist for live rock and it is impractical that shrimp will be cultured offshore given the success of existing onshore aquaculture facilities.

In 2007, there were a total of 945 federal reef fish permits and 1514 coastal migratory pelagic permits (Table 5.3.1-1). Other commercial fisheries currently permitted include: shrimp, red snapper, shark, spiny lobster, and swordfish. There are also permits required for charter and other recreational for-hire vessels in the reef fish and coastal pelagic fishery.

Table 5.3.1-1. Federal Permit Type as of October 2007 (NOAA Fisheries Service)

Type of Permit	Number
Shrimp	1848
Commercial Migratory Pelagic	1514
Reef Fish	945
Red Snapper	612
Commercial Spiny Lobster (non-Florida/tailing)	132/299
Charter/Headboat for Coastal Pelagics	1348
Charter/Headboat for Reef Fish	1356
Swordfish (directed/incidental/handgear)	180/80/82
Shark (directed/incidental)	132/283

Given that the majority of offshore production, at least in the near future, will likely be finfish species, with cobia, red drum, and snapper species being prime candidates, the analysis focuses primarily on management plans associated with these species. However, some attention is also devoted to species in the remaining two management plans.

A full description of all fisheries associated with Council FMPs is provided in detail in the EIS for the Generic Essential Fish Habitat Amendment (GMFMC 2004), while Section 5.4.3 describes Gulf of Mexico fishing communities. Much of the language used in the description of the fisheries was taken from previous Gulf of Mexico plan amendments.

5.4.1.1 Red Drum

The Red Drum Fishery Management Plan (RDFMP), when implemented in December, 1986, prohibited the directed commercial harvest from the EEZ for 1987 but did provide for an incidental catch allowance for commercial net and shrimp fishermen. The Gulf of Mexico Fishery Management Council prepared Amendment 1 to the RDFMP which was implemented in October, 1987. The amendment continued the prohibition of a directed commercial EEZ fishery. Since implementation of Amendment 2 in 1988, retention and possession of red drum from the EEZ has been prohibited.

While the commercial harvest of red drum in the EEZ is prohibited, only Mississippi allows commercial harvests from state waters. Since 2000, production from state waters has averaged 25 thousand pounds annually with an associated dockside value of about

$35 thousand. The states of Texas and Florida stock red drum fingerlings and fry into their coastal waters from their hatcheries in stock restoration projects. Red drum are a likely candidate for offshore aquaculture because of their rapid growth rate and existing production in land-based U.S. hatcheries.

5.4.1.2 Reef Fish

5.3.1.2.1 Permits and Landings

The Reef Fish FMP for the GOM was established in November 1984 to help rebuild declining reef fish stocks. In 1990, Amendment 1, to the Reef Fish FMP, established a commercial reef fish permit. Anyone wishing to harvest any reef fish as part of the commercial fishery or possess more than a bag limit was required to hold a valid reef fish permit for their vessel (50 CFR 622.4(a)(2)(v)). Amendment 4 was implemented in 1992 and created a three-year moratorium on the issuance of new commercial reef fish permits. Amendment 9 extended the moratorium until December 31, 1995. Amendment 11 further extended the moratorium until December 31, 2000. Amendment 17 extended the commercial reef fish permit moratorium for another 5 years, through December 31, 2005. Amendment 24, implemented in August, 2005, established a permanent limited access system. Of particular relevance, the recently implemented Amendment 26 established an IFQ program for the red snapper fishery.

Reef fish permits are required to commercially harvest reef fish species. Reef fish that are harvested may only be sold to buyers holding a valid permit to purchase reef fish. The holders of the harvesting permits define the universe of vessels that may legally harvest reef fish to be sold commercially.

The number of commercial reef fish permits has declined due to non-renewal of permits from approximately 2,200 in 1992 to approximately 1,145 as of July 2004 (GMFMC 2004c). Permit data indicate that 908 of those permits were assigned to vessels that were only permitted to fish reef fish commercially. The remaining 237 permits were assigned to vessels that can fish reef fish as commercial vessels or as charter vessels or headboats.

The state of residence of each of the permit holders and the number of permits held are presented in Table 5.4.1.2.1-1. Information in that table shows that 933 of the permits owners (81.5 percent) list Florida as owner's address. Texas is listed as the owner's state on 80 permits (7 percent). Louisiana is listed as the owner's state on 61 (5.3 percent) permits, Alabama on 37 (3.2 percent) permits, Mississippi on 16 (1.4 percent) permits, and the other states account for the 18 (1.6 percent) remaining permits.

Table 5.4.1.2.1-1: Number of Commercial Reef Fish Permits for the Gulf of Mexico by Owner's State of Residence

Owners' State	**Commercial Permit Only**	**Commercial and Charter/Headboat Permits**	Total
FL	736	197	933
TX	57	23	80
LA	55	6	61
AL	29	8	37
MS	16		16
DE	1		1
GA	3	1	4
IN	1		1
MA	1		1
MD		1	1
MO	1		1
NJ	2		2
NY	3		3
OH	1		1
SC	1		1
TN	1	1	2
Total	**908**	**237**	**1,145**

Source: NOAA Fisheries Service Reef Fish Permit Database, July 2004.

Reef fish commercial fishermen that may be directly impacted by successful offshore aquaculture of reef fish species are those approximately 1,056 individuals that currently hold a commercial reef fish permit. Other fishermen could be indirectly impacted if (a) reef fish fishermen change their seasonal fishing patterns and increase effort for other species or (b) there is strong cross-price flexibility between reef fish and other harvested species in the Gulf.

Gulf-wide average commercial harvests and ex-vessel values by species group are presented in Table 5.4.1.2.1-2. Averages were computed for the 1995-2003 period. Landings are expressed in pounds whole weight. Data were obtained from the NOAA Fisheries Service web site maintained by the Fisheries Statistics and Economics Division. Shallow water groupers and snappers constituted more than 85 percent of the commercial landings for the period considered. Total yearly reef fish ex-vessel values were, on average, in excess of $40 million.

Data for the 9-year period discussed in this section indicated that, red, vermilion and yellowtail snappers, gag and red groupers and, greater amberjack accounted for most of the commercial reef fish landings. Together, these species represented 85 percent of total reef fish landings. Gulf-wide average commercial landings by reef fish species, ex-vessel values, nominal and real prices are presented in Table 5.4.1.2.1-3. Red grouper, the species with the largest average yearly landings, accounted for 30 percent of the Gulf reef fish landings. Red snapper and gag, which are second and third in poundage landed, accounted for 22 percent and 12 percent of the landings, respectively.

Table 5.4.1.2.1-2: Gulf-wide Average Commercial Landings and Ex-Vessel Values by Species Group (1995-2003)

SPECIES GROUP	LANDINGS		VALUE	
	(lbs)	(%)	($)	(%)
Shallow Water Groupers	9,223,362	44.94	18,724,722	46.61
Snappers	8,694,078	42.36	17,088,708	42.54
Deep Water Groupers	1,401,087	6.83	3,103,882	7.73
Amberjack & Other Reef Fish	1,205,672	5.87	1,258,074	3.13
TOTAL	20,524,199	100.00	40,175,386	100.00

Source: NOAA Fisheries Service Fishery Statistics (http://www.st.nmfs.gov/st1/index.html).

The vast majority of the harvest of several reef fish species was from the Florida west coast. For example, over 99 percent of the red grouper, 96 percent of the black grouper, and 80.5 percent of the scamp harvested were attributed to the Florida west coast according to data from the NOAA web site. On average, red snapper was the most expensive species in the snapper complex. Nominal and real red snapper prices were $2.06 and $2.14 per pound, respectively. At $2.48 per pound, the highest reef fish average real price was for scamp. The average real price for red grouper, the species with the highest average harvest, was $1.93 per pound.

5.4.1.2.2 Vessel Characteristics

In terms of 2001-2003 annual averages from logbook-reported data, 1,050 vessels landed 19.2 MP gutted weight (GW) of Gulf reef fish with a real ex-vessel value of $44.6 million. Median reef fish landings were 5,705 pounds per vessel. The median vessel was 37 feet long, derived 98 percent of its gross revenues from reef fish harvests, had 275 to 300 horsepower engines, took 12 trips per year, and spent about 31 days at sea annually.

Averages computed for vessels using longlines indicated that 166 longliners harvested 6.5 MP GW of reef fish and had gross revenues estimated at $15.5 million. The median vessel length for this fleet was 43 to 45 feet, had 3-person crews (including the captain) and 228 to 240 horsepower engines, and spent between 113 to 121 days at sea annually. Median longline vessels took 14 trips per year. The annual gross revenue per vessel for all reef fish landed was between $96,000 and $102,000.

An average of 899 vessels using handlines took 15,613 trips a year and spent 43,463 days at sea annually. The average annual reef fish harvest of the handline fleet was 11.6 mp GW. The median handline vessel was 35 to 36 feet long, had 280 to 300 horsepower engines, had 2 person crews, and spent 33 to 35 days away from port. Gross revenues were between $12,000 and $13,000 per vessel.

Table 5.3.1.2.1-3: Gulf-wide Average Commercial Landings, Values, and Ex-Vessel Prices by Species (1995-2003).

Snappers	Landings (lbs)	Nominal Value($)	Price ($/lb) Nominal	Price ($/lb) Real
Red Snapper	4,491,230	9,258,348	2.06	2.14
Vermilion Snapper	1,916,805	3,517,124	1.83	1.91
Yellowtail Snapper	1,458,229	2,880,761	1.98	2.05
Gray Snapper	364,122	617,822	1.70	1.76
Mutton Snapper	205,909	359,718	1.75	1.81
Silk Snapper	110,769	226,429	2.04	2.12
Other	147,013	228,505	1.55	1.61
Total	8,694,078	17,088,708	---	---
Deep Water Groupers				
Yellowedge Grouper	933,542	2,206,240	2.36	2.46
Snowy Grouper	195,850	392,642	2.00	2.08
Warsaw Grouper	139,754	248,610	1.78	1.85
Other	131,942	256,390	1.94	2.02
Total	1,401,087	3,103,882	---	---
Shallow Water Groupers				
Red Grouper	6,129,500	11,409,603	1.86	1.93
Gag	2,416,492	5,751,162	2.38	2.47
Black Grouper	359,879	814,534	2.26	2.35
Scamp	301,630	720,169	2.39	2.48
Other	15,861	29,254	1.84	1.92
Total	9,223,362	18,724,722	---	---
Other Reef Fish				
Greater Amberjack	1,025,994	1,037,913	1.01	1.05
Other	179,678	220,161	1.23	1.27
Total	1,205,672	1,258,074	---	---

Waters (2002) provided participation rates by gear and state and reported that of the vessels with commercial reef fish permits, 782 vessels in Florida and 207 in other Gulf States indicated they landed reef fish using vertical lines in 2000. For the longline sector, 155 vessels in Florida and 33 in other Gulf States indicated landing reef fish using this gear in 2000. An additional 55 vessels, all of which are in Florida, reported landing reef fish using fish traps.

Waters (1996) reported results from a survey of the GOM commercial reef fish fishery that divided the vessels into high volume and low volume depending on whether or not they landed enough pounds to be in the top 75 percent of all vessels with a particular gear type in the fishery. The survey included vessels that reported using multiple types of gear. "Fishermen that primarily used fish traps for reef fishes tended to cite the use of fish traps, stone crab traps, rods and reels and gill nets, among others. Respondents with vertical hooks and lines in the eastern Gulf used bandit reels, electric reels and rods and reels. Respondents that primarily used bottom longlines for reef fishes also tended to cite experience with vertical hook and line gear" (Waters 1996). The survey asked vessel owners to report on their two most important kinds of trips for reef fish, even if non-reef fish alternative contributed more to the annual revenues of the boat. Comparisons were drawn between high volume and low volume boats within each category and between those in the northern Gulf and the eastern Gulf.

In the northern Gulf, catches differed by gear with vessels using vertical lines catching primarily snapper (red and vermilion) and vessels using bottom longlines catching primarily yellowedge grouper. Vessels in the eastern Gulf primarily caught groupers using bottom longlines, vertical lines, and fish traps. The vessels with vertical lines in the northern Gulf were longer on average (50 feet) than those in the eastern Gulf (38 feet). Longline vessels averaged about 42-44 feet in length and vessels using fish traps averaged about 38 feet. The average horsepower across all gear types was about 280 hp, the lowest with the longline vessels and the highest with vessels using fish traps. High volume longline vessels had the highest fuel capacity out of a range of 32-6,000 gallons. The average fuel capacity was 689 gallons.

Survey respondents reported having lived an average of 25 years in their current county or parish of residence; the overall average age of respondents was about 47 years with the mode at the 40-49 age group; 141 (72 percent) graduated from high school or had more than 12 years of formal education (Waters 1996). Household size ranged from 1-9 persons with an average of 3 persons. Household incomes ranged from less than $10,000 to more than $150,000 with approximately 50 percent of the respondents citing household incomes of $30,000 or less. Respondents averaged approximately 44 percent of household income from commercial fishing for reef fishes, 21 percent from other types of commercial fishing and 35 percent from all other sources including incomes earned in non-fishing jobs held by other household members, pensions, investments and other sources. The respondents had an average of 19 years experience at fishing, with 13.6 years of that experience in the positions they held at the time of the survey. Only 5 of the 196 respondents reported seasonal employment in other jobs. Typically, respondents from high volume vessels earned between 69-75 percent of household income from

commercial fishing while respondents from low volume vessels earned 25-39 percent of household income from commercial fishing (except for bottom longlining vessels) (Waters 1996).

Waters (1996) also reported annual gross receipts per vessel in the reef fish fishery, as summarized by the following information:

High-volume vessels using vertical lines:	
Northern Gulf:	$110,070
Eastern Gulf:	$ 67,979
Low-volume vessels using vertical lines:	
Northern Gulf:	$ 24,095
Eastern Gulf:	$ 24,588
High-volume vessels using bottom longlines:	
Both areas:	$116,989
Low-volume vessels using bottom longlines:	
Both areas:	$ 87,635
High-volume vessels using fish traps:	$ 93,426
Low-volume vessels using fish traps:	$ 86,039

When combined with cost information, these figures translate into the following results for net income (defined as gross receipts less routine trip costs; the numbers in parenthesis represent the percent to gross receipts) (Waters 1996):

High-volume vessels using vertical lines:		
Northern Gulf:	$28,466	(26)
Eastern Gulf:	$23,822	(35)
Low-volume vessels using vertical lines:		
Northern Gulf:	$ 6,801	(28)
Eastern Gulf:	$ 4,479	(18)
High-volume vessels using bottom longlines:		
Both areas:	$25,452	(22)
Low-volume vessels using bottom longlines:		
Both areas:	$14,978	(17)
High-volume vessels using fish traps:	$19,409	(21)
Low-volume vessels using fish traps:	$21,025	(24)

5.4.1.2.3 Dealers and Processors

Approximately 227 dealers possess permits to buy and sell reef fish species (NOAA Fisheries Service 2004). Based on mail address data, most of these were located in Florida (146), with 29 in Louisiana, 18 in Texas, 14 in Alabama, 5 in Mississippi and 15 out of the Gulf States region. More than half of all reef fish dealers are involved in buying and selling grouper. These dealers may hold multiple types of permits.

Average employment information per reef fish dealer is not known. Although dealers and processors are not synonymous entities, Keithly and Martin (1997) reported total employment for reef fish processors in the Southeast at approximately 700 individuals, both part and full time. It is assumed that all processors must be dealers, yet a dealer need not be a processor. Further, processing is a much more labor-intensive exercise than dealing. The profit profile for dealers or processors is not known.

Based on the NOAA Fisheries Service annual processor survey, 29 firms were engaged in the processing of snapper and/or grouper in the Gulf of Mexico in 1996. Reported production of snapper and grouper by these 29 firms totaled 2.30 million pounds valued at $12.3 million. In 2005, the number of reported processors equaled 21 and output of processed grouper and snapper product totaled 1.5 million pounds. These numbers would indicate that only a small portion of the harvested reef fish product is processed (at least in the Gulf).

5.4.1.2.4 Imports

During the 15-year period ending in 2005, Gulf of Mexico commercial snapper landings (all species combined) ranged from 7.1 million pounds (1991) to 9.4 million pounds (1997) and averaged 8.6 million pounds annually. Imports of fresh snapper products during this period increased from 10.8 million pounds to 27.5 million pounds and averaged more than 20 million pounds annually. Imports of frozen snapper products ranged from about 1.5 million pounds to three million pounds prior to 2000 but have since increased to 12.7 million pounds in 2005. Hence, as indicated, domestic production is but a fraction of total imports of a similar product.

Since 1991, the dockside price of the domestic product has consistently exceeded the price of the imported fresh product by $0.25 to $0.50 per pound with no trend of an increasing or decreasing differential. On a deflated basis, the price differential has ranged from about $0.16 per pound to $0.37 per pound and with no distinguishable trend.

The observed price differential between the domestic and imported fresh snapper product can be the result of any number of factors. First, the mix of snapper species constituting the domestic product may vary from that of the imported product. Second, the seasonality of the domestic product compared to the imported product may account for some of the price differential. Third, the domestic product may simply be of higher quality. If the issue is one of quality, then one is led to conclude that the imported product does not represent a perfect substitute for the domestic product. However, if the price differential reflects seasonality or a different product mix, then one cannot rule out that the imported product is a perfect substitute for the domestic product.

Like fresh snapper, fresh grouper imports are also large, equaling 8.4 million pounds in 2005. Unlike fresh snapper, however, imports of fresh grouper have not risen steadily during the 15-year period ending in 2005. Rather, they trended upwards during the early-to-mid 1990's before reaching a maximum of about 13 million pounds in 1998. After declining in subsequent years, they once again increased to the noted 2005 level. Imports

of frozen grouper are relatively minor, averaging less than one-million pounds annually in recent years.

As indicated in Table 5.4.1.2.1-2, Gulf of Mexico commercial grouper landings (shallow water and deep water, combined) have averaged about 10.6 million pounds annually during the nine-year period ending in 2003. This is about 15 percent above imports of the fresh product during the same period. While the price of the domestic grouper product exceeded the price of the comparable imported product by a sizeable amount in earlier years, the price differential has tended to narrow over time and there is currently little price differential between the two products.

5.4.1.3 Coastal Migratory Pelagics

Managed species under the CMP FMP include king mackerel, Spanish mackerel, and cobia. The FMP treated king and Spanish mackerel as unit stocks in the Atlantic and Gulf of Mexico. The FMP established allocations for the recreational and commercial sectors harvesting these stocks, and the commercial allocations were divided between net and hook-and-line fishermen.

Since its implementation, the CMP FMP has been amended numerous times and there have been some changes (additions) to identified problems as well as objectives. Two of the more relevant objectives added (Amendment 5 and Amendment 6 to the CMP FMP) include (1) to minimize waste and bycatch in the fishery and (2) to optimize the social and economic benefits of the coastal migratory pelagic fishery. The rationale for this last objective was to provide a goal to enhance economic benefits to all groups.

While detailed analyses of the amendments are beyond the scope of this document, there are a number of salient features addressed in these amendments that merit some attention. First, many of the amendments were enacted in response to allocation and/or gear issues. For example, Amendment 2 prohibited the use of purse seines on overfished stocks. Amendment 3, which was approved in 1990, prohibited drift gill nets for coastal pelagics and purse seines for the overfished groups of mackerels. Amendment 5 further refined gear usage by requiring that the Gulf group of king mackerel could only be taken by hook-and-line or with run-around gill nets. In addition, and of particular relevance to this amendment, actions taken in Amendment 5 limited cobia take to two per day per fisherman. As such, commercial harvests of cobia, as presented in a subsequent section, tend to be relatively minor.

Though direct control of effort was not seriously considered when the CMP FMP was first developed, more attention has been given to this issue over time. While the permit process was established under Amendment 1 to the CMP FMP, income requirements were relatively lax; proof that a minimum of ten percent of earned income was derived from commercial fishing activities. The somewhat unrestrictive criteria established under Amendment 1 would suggest that it had only a minor impact on restricting effort. The prohibition of purse seines on overfished stocks (Amendment 2) was an additional attempt to limit commercial effort though, as noted, the action was treated primarily as an

allocation issue. Furthermore, the action only limited effort in one small segment of the commercial fishing sector. The first all-inclusive attempt to restrict effort in the commercial sector can be traced to Amendment 8. As noted in Amendment 8, available effort exceeded that needed to optimally harvest available TAC.

In response to the excessive and expanding level of effort, Amendment 8 established a moratorium on all commercial king mackerel permits until no later than October 15, 2000 with a qualification date for initial participation of October 16,1995. The purpose of this moratorium was to provide stability and prevent speculative entry into the fishery while the Councils developed a limited access or limited entry program. The amendment was also intended to reduce overfishing of the Gulf group king mackerel and aid in the recovery of the stock. More recently, Amendment 15 created a permanent limited access program in the fishery.

5.4.1.3.1 Permits and Landings

As noted, three species – king mackerel, Spanish mackerel, and cobia- are included in the *CMP FMP*. No permit is required to harvest cobia. In 1998, the first year of the king mackerel permit moratorium, there were 2,172 commercial permits[4]. That number has declined to 1,740 active permits in 2003. The number of vessels with federal permits for commercial fishing for king mackerel declined at an average annual rate of 4.5 percent from 1998 through 2003.

Since 1995, Gulf of Mexico commercial landings of king mackerel have averaged 2.3 million pounds annually. The dockside value of this production has averaged $1.06 per pound. Examined on a deflated basis, the dockside price of king mackerel has gradually been declining over the past decade. In 1995, for example, the deflated price averaged $0.66 per pound. By 2005, it had fallen to $0.53 per pound (1982-84 Consumer Price Index).

Ex-vessel prices of king mackerel, the U.S. market, and estimated imports of king mackerel and possible substitute species have been described and analyzed using econometric models (Easley et al. 1993; Vondruska and Antozzi 1999; Vondruska 1999). The model results indicate that demand for king mackerel is relatively price elastic for the U.S. market as a whole. That is, compared with any given percentage change in market supply, the expected percentage change in ex-vessel price is much smaller, holding other factors constant.

Gulf of Mexico commercial landings of Spanish mackerel have averaged approximately one-million pounds per year since 1995 with an associated dockside value of approximately one-half million dollars. Overall, commercial landings of Spanish mackerel have fallen sharply since the mid-1990s due to, at least in part, the "Florida net

4 Since the *CMP FMP* is a joint management plan between the Gulf and South Atlantic Fishery Management Councils, the number of permits referenced in this section refers to the total for the two areas.

ban" (as it is commonly referred to) that went into effect on July 1, 1995. Nets conducive to the harvesting of Spanish mackerel were prohibited at this point in time.

As noted, Amendment 5 to the CMP FMP limited the harvest of cobia to two per fishermen per day. Hence, Gulf of Mexico commercial harvests of this species are relatively minor. Average annual landings during 1995-2004 have averaged 175 thousand pounds annually. Since 2000, landings have averaged about 130 thousand pounds annually. Dockside value since 2000 has averaged approximately $260 thousand indicating an average price per pound of approximately $2.00.

5.4.1.3.2 Vessel Characteristics

As noted, the number of vessels that had active federal permits to fish commercially for king mackerel declined by 20 percent from 2,172 in 1998 to 1,740 in 2003 (data for July 15 of each year).[5] Only about half of these permitted vessels had logbook-reported nominal landings of king mackerel (at least one pound of harvest) in each respective year, varying from 1,066 vessels in 1998 to 951 vessels in 2003. The 951 vessels in 2003 harvested approximately 4.5 million pounds of king mackerel (from the Gulf and South Atlantic), valued at $6.19 million in gross revenues, and received $9.57 million in gross revenues from sales of all logbook reported landings on the trips that harvested king mackerel.

The median harvest per vessel for vessels with active permits and nominal landings of king mackerel ranged from 941 to 1,324 pounds of king mackerel per vessel per year during 1998 through 2003. It should be noted that these amounts are annual medians (50th percentiles) and not averages; e.g., in 1998, half of the 1,066 vessels landed between 1 pound and 941 pounds, while the other half landed more than 941 pounds. Medians are used for comparison rather than averages since vessel performance is not normally distributed. At the lower end of the annual frequency distributions of vessels respecting pounds landed, 25 percent of the vessels landed only 144 to 238 pounds or less per year (25th percentiles), or roughly 14 to 24 individual fish per year assuming an average of 10 pounds each per fish. The 25 percent of vessels at the upper end of the annual frequency distributions landed more than 3,791 to 5,219 pounds per year (75th percentiles). Hence, there is substantial difference in vessel performance and averages may not adequately represent fleet performance. The annual producer surplus for this fishery under the limited access program established under Amendment 15 to the *CMP FMP* was estimated to be $142,650 to $380,400 at the time that the program was being considered.

For all vessels, the median length was 31 feet; half of the vessels were 25 to 39 feet long. Overall, the median number of trips per year for king mackerel was 6 to 7 trips and 20 to 22 trips per year for all logbook-reported landings of fish. The median percentage of

5 Since the early 1990s, fishermen have completed and submitted FMP-mandated logbooks for commercial fishing trips for Gulf reef fish, Atlantic snapper-grouper, shark, and, since 1998, king and Spanish mackerel.

king mackerel revenues to all logbook-reported landings ranged from 22 percent to 33 percent of annual gross revenues, or $10,663 to $12,183.

There is very little information on fishermen, fishing-dependent businesses, or communities that depend on the king and Spanish mackerel fisheries. … mackerel fisheries are open only part of the calendar year, or mackerel are only available seasonally to some communities; therefore most fishermen participate in other fisheries as well, and the communities they live in or support are not specifically "mackerel communities". Areas where king mackerel play an important role in the community include Monroe County, Florida, Dare County, North Carolina, and Lafourche Parish, Louisiana.

5.4.1.3.3 Processing

There is apparently very little processing of king and Spanish mackerel conducted in the Gulf of Mexico. According to NOAA Fisheries Service processor survey data, less than three Gulf of Mexico based establishments have been engaged in king and/or Spanish mackerel processing activities since 1998.

5.4.1.3.4 Imports

The U.S. Department of Customs does not differentiate the various types of mackerel that are exported to the United States. Imports of fresh product from Latin American countries (i.e., those countries likely to be exporting similar mackerel products), however, appear to be very limited (less than one-million pounds annually). Imports of frozen mackerel product from Latin American countries have fallen in the one million to four million pound range in recent years.

5.4.1.4 Spiny Lobster

Spiny lobsters are primarily harvested along the southern coast of Florida. Pounds landed in the Gulf, with few exceptions, generally fall in the 4.0 million to 6.5 million pound range.[6] Lobster pots represent the predominant gear used in the harvest of spiny lobster.

Imports dominate the U.S. supply (i.e., domestic production and imports) of spiny lobster. In 2004, for example, imports of spiny lobster (converted to a live-weight basis) equaled 95 million pounds, which equated to about 95 percent of the total supply. Since the mid-1990s, annual imports have fluctuated from about 75 million pounds to 95 million pounds with no clear trend. The domestic dockside price during this period has

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6 The primary fishing area for spiny lobster is the Florida Keys. Given the physical characteristic of this area, some discussion of the landings data is warranted. Specifically, all product landed in Monroe County, the primary landings port, is considered to be landed in the Gulf even though Monroe County traverses both the Gulf and South Atlantic Coasts.

generally fallen in the $4.00 to $5.00 with no apparent trend and the dockside value of the Gulf harvested product has averaged approximately $20 million annually since 2000.

The commercial spiny lobster fishery has been dominated by the use of traps since the 1960s. Overall, the number of fishermen holding trap certificates fell from 3,766 in 1992/93 to 2,235 in 2001; or by about 40 percent (unpublished data provided by the Florida Fish and Wildlife Commission). The size of the average operation between 1993 and 1999, however, increased from approximately 196 to 252 certificates while the maximum number of certificates held by any individual increased from 3,674 to 5,631 (Milon *et al*., 1998).

5.4.1.5 Stone Crab

Harvests of wild stocks have varied since 1989-90. The largest landings (3.5 million pounds of claws) occurred in 1997-98. Landings in 2004-05 were about 3.0 million pounds. For the past decade (1995-96 to 2004-05 fishing seasons), the Gulf coast fishers have declawed approximately 10.5 million crabs during each seven-month fishing season.

The number of traps used to harvest stone crab has increased from an estimated 15,000 in the 1962-63 fishing season to 1.6 million traps in the 2001-02 season. The number of commercial trips also increased from 19,000 in the 1985-86 season to a maximum of 38,000 trips in the 1996-97. The number of traps fished has declined since 1996-97.

Stable landings after 1989-90 and the three-fold increase in the number of traps suggests that the current level of landings is all that can be harvested under current environmental conditions, regulations, and fishery practices

It takes 3-4 years before females reach legal claw size. Hence, offshore aquaculture of stone crab will likely entail a long period prior to seeing any positive return on investment.

5.4.1.6 Menhaden

The following discussion is largely summarized from Vaughan et al. (2007). Management of the Gulf menhaden fishery is through interstate agreement through the Gulf States Marine Fisheries Commission. Purse-seining of menhaden is prohibited off Florida and Alabama. The remaining Gulf States regulate harvest of Gulf menhaden in their territorial waters. Since the mid-1980s, both the number of reduction plants and the number of purse-seine vessels has significantly declined. Historically, as many as 14 reduction plants operated along the Gulf coast. As of 2004, only four reduction plants are in operation, and a single company owns three of the four plants. Similarly, the number of vessels peaked at around 80 vessels in the 1970s-1980s, and has declined since to 42 as of 2004. Most of the annual Gulf menhaden catch is from Louisiana (~92 percent). In more recent years, the percent of menhaden landings used for bait has increased, but still represents only a small fraction of the total overall landings. Most landings are processed and used for fish meal, oils, pet food, and fertilizer.

5.4.2 Recreational Fishing

Total expenditures for marine recreational fishing activities in the Gulf of Mexico during 2001 were estimated at more than $ 2 billion by one survey, while another survey estimated those expenditures during 1999 at more than $ 4 billion (U.S. FWS and U.S. Census Bureau 2001; Steinback *et al.* 2004). The highest expenditures on recreational fishing in 2001 occurred in West Florida, followed by Louisiana, Texas, Alabama, and Mississippi (U.S. FWS and U.S. Census Bureau 2001).

The recreational fishery of the Gulf of Mexico includes private individuals, rental boats, charter vessels, head boats and party boats. The private recreational sector in the Gulf of Mexico is surveyed through the Marine Recreational Fisheries Statistics Survey (MRFSS) except for the state of Texas. Outside research on the charter and head boat sector provides much of the descriptive data, whereas the MRFSS survey is generally used to describe the private angling sector.

In the Gulf states, about 3.3 million in-state anglers took almost 23 million trips and caught over 167 million fish in 2003. This tally of anglers and trips does not include anglers and trips taken solely in Texas for all fishing modes or solely through head boats for all Gulf states. More than 70 percent of anglers were from Florida, with the rest coming from Louisiana, Alabama and Mississippi, in that order. Florida accounted for a large percentage (70 percent) of the trips, followed in order by Louisiana, Alabama, and Mississippi. The most commonly caught non-bait species were spotted seatrout, red drum, gray snapper, white grunt, sand seatrout, sheepshead, red snapper, king mackerel, and Spanish mackerel (NOAA Fisheries Service, 2004b).

The typical angler in the Gulf region is 44 years old, male (80 percent), white (90 percent), employed full time (92 percent), with a mean annual household income of $42,700. The mean number of years fished in the state was 16 years for GOM anglers. The average number of fishing trips taken in the 12 months preceding the interview was about 38 and these were mostly (75 percent) one-day trips where expenditures on average were less than $50. Seventy-five percent of surveyed anglers reported they held a saltwater license, and 59 percent of them owned boats used for recreational saltwater fishing. Those anglers who did not own their own boat spent an average of $269 per day on boat fees (Holiman 1999) when fishing on a party/charter or rental boat. About 76 percent of these anglers who did not own their own boat were employed or self-employed and about 23 percent were unemployed, mostly due to retirement (Holiman 2000). For-hire vessels are currently under a moratorium on the issuance of new for-hire federal permits to fish for reef fish or coastal migratory pelagics. A total of 3,340 permits were issued under the moratorium, and they are associated with 1,779 vessels. Of these vessels, 1,561 have both reef fish and coastal migratory pelagics permits, 64 have only reef fish permits, and 154 have only coastal migratory pelagics permits. About one-third of Florida charter boats targeted three or less species, two-thirds targeted five or less species and 90 percent targeted nine or less species. About 40 percent of these charter boats did not target particular species. The species targeted by the largest proportion of

Florida charter boats were king mackerel (46 percent), grouper (29 percent), snapper (27 percent), dolphin (26 percent), and billfish (23 percent). In the eastern GOM, the species receiving the most effort were grouper, king mackerel and snapper. About one-fourth of Florida headboats targeted three or less species, three-fourths targeted four or less species and 80 percent targeted five or less species. About 60 percent of headboats did not target any particular species. The species targeted by the largest proportion of Florida headboats are snapper and other reef fish (35 percent), red grouper (29 percent), gag grouper (23 percent), and black grouper (16 percent). In the eastern GOM, the species receiving the most effort were snapper, gag and red grouper.

The majority of charter boats in Alabama, Mississippi, Louisiana, and Texas reported targeting snapper (91 percent), king mackerel (89 percent), cobia (76 percent), tuna (55 percent), and amberjack. The species receiving the largest percentage of effort by charter boats in the four-state area were snapper (49 percent), king mackerel (10 percent), red drum (6 percent), cobia (6 percent), tuna (5 percent), and speckled trout (5 percent). The majority of headboat/party boat operators reported targeting snapper (100 percent), king mackerel (85 percent), shark (65 percent), tuna (55 percent), and amberjack (50 percent). The species receiving the largest percentage of total effort by headboats/party boats in the four-state area were snapper (70 percent), king mackerel (12 percent), amberjack (5 percent), and shark (5 percent) (Sutton et al., 1999).

5.4.2.2 Private Anglers

There were over 20.4 million marine recreational fishing trips in the Gulf of Mexico during 2000 (excluding Texas) (GMFMC 2004). Most of those trips were made in Florida (72 percent) with Louisiana second (18 percent) and both Alabama and Mississippi with 5 percent. There were over 2.6 million participants who caught a total of 149 million fish. The species that were most commonly sought on fishing trips were red snapper, white grunt, dolphin, black sea bass, spotted sea trout, and red drum. Most often, the catch came on trips where individuals fished primarily in inland waters (64 percent) or in the state territorial sea (27 percent). Descriptions of private angler fishing appear in the appendices for the EFH FEIS under the description of each state's fishing communities (GMFMC 2004).

5.4.2.3 Charter, Head and Party Boats

Charter boats are generally defined as for-hire vessels with a fee charged on a small group basis. Head boats and party boats also operate on a for-hire basis but with a per-person base fee charged. Charter boats are usually smaller, carrying six or fewer passengers. Party boats are larger and will carry as many passengers as possible to maximize income. They usually operate on a schedule and require a minimum number of passengers in order to make a trip. In their recent study of the Charter/Head boat sector for the Gulf States of Alabama, Mississippi, Louisiana, and Texas, Sutton *et al*. (1999) estimated there to be 430 charter vessel operators and 23 party boat operators in the four-state area. Over the past ten years there has been an increase in size and capacity of both

charter and party vessels. Since 1987 charter vessels have more than doubled in number from 210-430 and the number of passenger-trips have tripled from 95,000 to 318,716. The state with the largest increase in number of passenger-trips was Mississippi with a 300 percent increase. Alabama was next with an increase of 165 percent, since 1987. Party boats have decreased in number since 1987 from 26 to 23. However, the number of passenger-trips, as with charter vessels, has tripled from 37,148 to 117,990. This increase may be attributed to the increase in size of vessels. Sutton *et al*. (1999) estimated the impact of the charter industry on local economies for the four states in their study in 1997 to be $42.5 million in direct output, $15.6 million in income and 996 jobs.

The charter industry has raised concerns over certain aspects of the above study, specifically certain costs for repair and targeting behavior. The Gulf Socioeconomic Panel has also provided the GMFMC with a critique of the methodology and assumptions made in the report. However, the purpose here is to describe prior research for comparison and discussion purposes only. Holland *et al*. (1999) estimated there to be 615 charter and head boats on Florida's Gulf coast and approximately 230 in the Florida Keys. Major ports in Florida on the Peninsula Gulf - Naples and Ft. Myers (and Ft. Myers Beach); on Florida's Panhandle Gulf - Destin, Panama City (and Panama City Beach) and Pensacola; and in the Florida Keys - Key West, Marathon and Islamorada. In their sample, most charter boat operators in Florida (90 percent) operate full-time charter businesses and have been in business for an average of 16 years. The majority (95 percent) lives near their homeport and has lived in their home county for more than 10 years. Head boat operators also were full time had been in business on average 22 years. Like their charter boat counterparts they too lived near their homeport and almost all had lived in their county for more than ten years.

5.4.3 Fishing Communities

A "fishing-dependent community" is defined in the MSFCMA, as amended in 1996, as "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community" (MSFCMA section 3(16)). In addition, the National Standard Guidelines define a fishing-dependent community as a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent service and industries (for example, boatyards, ice suppliers, tackle shops)(50 CFR §600.345(b)(3).

The literature on fishing-dependent communities addresses three areas: identification of the communities, selection of variables appropriate for assessment and the assessment method itself. Community identification and selection criteria can be very complex or very simple. A simple first level approach would involve examining social and demographic variables at the county level where some fishing activity occurs. A more complex approach involves attempting to gather data and information on as small an entity as possible that qualifies as a fishing community. As the definition of community

moves farther from traditional economic or political entities, less official data are available and more field research is required to complete the baseline profile and include relevant social and cultural value data.

Jacob et al. (2001) developed a protocol for defining and identifying fishing-dependent communities in accordance with National Standard 8. The project used central place theory to identify communities. A central place is where services, goods and other needs are met for the residents in the central place, as well as for those in surrounding hinterlands. It differs from using an administrative unit such as county boundaries, which may distort smaller communities or locality data as it is aggregated. The authors believed central place theory works well for defining and identifying fishing-dependent communities or localities as it provides a geographic basis for including multiplier effects that capture forward and backward linkages. In most fishing-dependent communities, forward linkages include those businesses that handle the fish once it is brought to the dock, such as fish houses, wholesalers, exporters, and seafood shops and restaurants. Backward linkages are the goods and services fishermen depend upon such as boat building and repair; net making and repair; marinas; fuel docks; bait, tackle and other gear vendors. Using their protocol of defining fishing-dependent communities, the authors initially determined five communities as commercially fishing-dependent and seven communities as recreationally fishing dependent. Further investigations resulted in validating five communities as commercially fishing dependent. The authors expressed little confidence in the data used and indicators developed based on such data to confirm the other communities as recreationally fishing-dependent communities. The five commercially fishing-dependent communities in Florida are: Steinhatchee, Apalachicola, Panama City, Ochopee/Everglades City, and Panacea.

The Generic Essential Fish Habitat Amendment (GMFMC 2004) provides more extensive characterization of fishing-dependent communities throughout the Gulf coasts. The fishing communities included in the characterizations are: (1) Alabama: Fairhope, Gulf Shores, Orange Beach, Bayou La Batre, and Dauphin Island; (2) Florida: Pensacola, Gulf Breeze, Ft. Walton Beach, Destin, Panama City, Panama City Beach, Port St. Joseph, Apalachicola, East Point, Carabelle, St. Marks, Horseshoe Beach, Cedar Key, Yankeetown, Inglis, Crystal River, Homosassa, New Port Richey, Tarpon Springs, Clearwater, Madeira Beach, St. Petersburg, Tampa, Cortez, Matlacha, Bokeelia, Ft. Myers Beach, Naples, Marco Island, Everglades City, Key Largo, Islamorada, Marathon, Big Pine Key-Summerland Key, and Key West; (3) Louisiana: Venice, Empire, Grand Isle, Golden Meadow, Cutoff, Chauvin, Dulac, Houma, Delcambre, Morgan City, and Cameron; (4) Mississippi: Pascagoula, Gautier, Biloxi, and Gulfport; and, (5) Texas: Port Arthur, Galveston, Freeport, Palacios, Port Lavaca, Seadrift, Rockport, Port Aransas, Aransas Pass, Brownsville, Port Isabel, and South Padre Island.

Holland et al. (1999) identified the following areas as major activity centers for charter boats in Florida: Miami, Fort Lauderdale, Key West, Marathon, Islamorada, Naples, Ft. Myers, Ft. Myers Beach, Panama City, Panama City Beach, Destin and Pensacola. They also identified the following as major activity centers for headboats in Florida: Miami, Key West, Marathon, Islamorada, Ft. Myers, Ft. Myers Beach, Clearwater, Destin,

Panama City and Panama City Beach. Sutton et al. (1999) identified the following areas as major activity centers for charter boats in the rest of the Gulf: South Padre Island, Port Aransas, and Galveston-Freeport in Texas; Grand Isle-Empire-Venice in Louisiana; Gulfport-Biloxi in Mississippi; and, Orange Beach-Gulf Shores in Alabama. They also identified the following areas as major activity centers for headboats in the rest of the Gulf: South Padre Island, Port Aransas, and Galveston-Freeport in Texas and Orange Beach-Gulf Shores in Alabama.

The communities that will be affected as a result of developing offshore aquaculture in the Gulf are difficult to project at this time. There is no information available that describes where firms will be located, where their supplies will be purchased, where employees will be hired or live, where the offshore facilities will be located, or how social conditions will change. Until the firms develop their infrastructure, discussions of the communities that will be impacted are based upon conjecture.

To provide discussion in this document, five communities have been selected that represent different attributes that may interrelate with the aquaculture industry. Additional information regarding demographics of the communities can be obtained from reports developed by Impact Assessment, Inc. These reports are available on the NOAA Southeast Region web site at http://sero.nmfs.noaa.gov/publications/publications.htm.

The first community selected was Galveston, Texas. Galveston was selected for two reasons, (1) because it is important to the red snapper fishery and (2) it is close to the major metropolitan area of Houston. Red snapper is discussed in this amendment one of the primary candidates for offshore aquaculture production in the Gulf. Houston, being a major city, would provide a substantial market for fresh production. If a quality product is produced, Houston restaurants and fish sellers have the potential to create a strong demand for the local production.

Port Fourchon, Louisiana is the second community that will be discussed. Port Fourchon was selected because it is the main staging area for offshore oil and gas production in the Gulf. If the offshore aquaculture industry utilizes oil and gas structures, Port Fourchon may be a logical location to base the shore support industry.

Bayou La Batre, Alabama was selected because it is one of the primary commercial harvesting towns for shrimp. While this FMP would prohibit shrimp from being cultured offshore, Bayou La Batre possesses the infrastructure to support offshore aquaculture.

Panama City, Florida was selected as the fourth community. It is moderately sized community that has a diverse economic base comprised of local military base, tourism, commercial fishing, and recreational fishing. Panama City also is home to some fish processing facilities. Future research could consider the interactions between processors of wild stocks and species raised using aquaculture.

The final community discussed is Madiera Beach, Florida. Madeira Beach is an important location for the Gulf grouper fishery. It is also the location from where one offshore aquaculture application has been submitted.

Each of these communities will be discussed in terms of their social and economic characteristics. The reports used to provide this information were developed for NOAA Fisheries Service to identify fishing communities associated with the fishing industry by Impact Assessment, Inc (2005). All of the information for the various communities is taken directly from those reports. Summary statistics and demographics for each community are provided in Tables 5.4.3-1 to 5.4.3-14.

Galveston, Texas is an incorporated community with a population of 57,247 reported in the 2000 census. *"Galveston is a 32-mile-long, two-mile-wide barrier island located directly west of the Gulf of Mexico and east of mainland Galveston County. Houston is approximately 50 miles north. The University of Texas Medical Branch is the leading employer (Galveston, Texas Chamber of Commerce). Tourism, commercial and recreational fishing, and various maritime industry at the Port of Galveston are also highly significant in economic terms.*

Galveston Island was once home to Karankawa tribes, who hunted and fished in the area's resource-rich bays and sounds. The first non-indigenous settlement was established in 1817 by pirate Jean Laffite (Texas Online 1998). Galveston was incorporated in 1839 (McComb 2002).

Galveston's economy initially revolved around its port, with cotton as the principal export product. The area grew steadily until an outbreak of yellow fever killed approximately 75 percent of Galveston's population between 1867 and 1873. Another major setback occurred in 1900 when the Galveston hurricane flooded the island and 6,000 people died (McComb 2002). The population steadily increased over the course of the 20th century in large part in associated with immense growth around Houston.

The year 2000 census enumerated 57,247 residents, a three percent decline from 1990. During that ten year period, employment in several major industries such as agriculture, forestry, fishing and hunting, mining, and manufacturing underwent some measure of decline. Jobs in the both the management and government sectors accounted for over 67 percent of jobs held by residents during the period. Many residents now work in tourism related services, such as those provided by the numerous dockside inns and hotels that serve visitors along the Galveston waterfront.

Both commercial and recreational fishing services and infrastructure are available in the area. For instance, eight public boat ramps provide convenient access to the Gulf and back bays, and several docks and marinas, ocean sightseeing tours, and charter fishing services provide 109 amenities for visitors. A highly productive shrimp and bottom fish fleet is also based here, with numerous commercial fishing vessels mooring along the waterfront. A number of seafood dealers and retailers, and boat builder and brokers are

located in Galveston as well. As of 2003, three Galveston residents held Gulf shrimp permits." (Impact Assessment, Inc., 2005)

The total combined commercial landings of all species in Galveston during 2002 were 5,491,872 pounds. These landings had an ex-vessel value of $13,476,895. There were a total of 75 commercial fishing license holders (56 State and 19 Federal) in 2000. A total of 2,551 persons held State saltwater licenses to fish recreationally.

Table 5.4.3-1. Galveston Demographics

Factor	1990	2000
Total population	59,070	57,247
Gender Ratio M/F (Number)	28,539/30,531	27,649/29,598
Age (Percent of total population)		
Under 18 years of age	24.7	23.4
18 to 64 years of age	61.9	62.9
65 years and over	13.4	13.7
Ethnicity or Race (Number)		
White	36,315	33,582
Black or African American	17,161	14,592
American Indian and Alaskan Native	144	243
Asian	1,387	1,839
Native Hawaiian and other Pacific Islander	N/A	42
Some other race	4,063	5,571
Two or more races	N/A	1,378
Hispanic or Latino (any race)	12,649	14,753
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	13.7	10.3
Percent high school graduate or higher	70.0	74.4
Percent with a Bachelor's degree or higher	21.1	23.7
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	19.8	26.5
And Percent who speak English less than very well	7.6	11.2
Household income (Median $)	20,825	28,895
Poverty Status (Percent of pop. with income below poverty line)	24.2	22.3
Percent female headed household	16.3	16.9
Home Ownership (Number)		
Owner occupied	10,136	10,399
Renter occupied	14,021	13,443
Value Owner-occupied Housing (Median $)	57,200	73,800
Monthly Contract Rent (Median $)	309	531
Employment Status (Population 16 yrs and over)		
Percent in the labor force	62.7	59.7
Percent of civilian labor force unemployed	9.0	10.1
Occupation** (Percent in workforce)		
Management, professional, and related occupations	N/A	35.2

Service occupations	N/A	24.2
Sales and office occupations	N/A	24.0
Farming, fishing, and forestry occupations	1.8	0.3
Construction, extraction, and maintenance occupations	N/A	8.3
Production, transportation, and material moving occupations	N/A	8.0
Industry (Percent in workforce)		
Agriculture, forestry, fishing and hunting	1.5	0.3
Mining (includes the offshore oil/gas industry workforce)	1.0	0.5
Manufacturing	5.7	4.1
Percent government workers	32.1	31.5
Commuting to Work (Workers 16 yrs and over)		
Mean travel time to work (minutes)	N/A	19.1
Percent worked outside of county of residence	5.5	9.5

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude comparisons between those census years.

Table 5.4.3-2. Fishing Infrastructure and Services Observed in Galveston in 2003. *Source:* Impact Assessment, Inc. 2005.

Infrastructure or Service	**Quantity**
Air fill stations (diving)	1
Boat yards/ Boat builders (recreational/commercial)	1
Churches with maritime theme	1
Docking facilities (commercial)	8
Fishing Gear, Electronics, Welding, and other repair	5
Fishing associations (recreational/commercial)	2
Fish processors, Wholesale fish house	3
Fisheries research laboratories	1
Fishing monuments	0
Fishing pier	20
Hotels/Inns (dockside)	~20
Marine railways/haul out facilities	0
Museums—fishing/marine-related	0
Net makers	1
NOAA Fisheries Service or state fisheries office (port agent, etc.)	1
Public boat ramps	8
Recreational docks/marinas	5
Bait & Tackle/fishing supplies	20
Recreational Fishing Tournaments	Numerous
Sea Grant Extension office	1
Seafood restaurants	~20
Seafood retail markets	8
Trucking operations	0
Site-seeing/pleasure tours	10
Charter/Head Boats	12
Commercial Boats	25

Table 5.4.3-3. Primary Fishing-related Businesses Listed for Galveston in 2003. *Source:* Impact Assessment, Inc. 2005.

Type of Business	**Frequency**
Boat Builder/Broker	10
Boat Builder/Broker; Marina	1
Boat Rentals & Pier	9
Boat Rentals & Pier; Retail Seafood Dealer	1
Marina	13
Processor; Retail Seafood Dealer	1
Retail Seafood Dealer	6
Retail/Wholesale Seafood Dealer	3
Wholesale Seafood Dealer	2
Total	*46*

Port Fourchon, Louisiana's population is over-estimated in the 2000 U.S. Census (1,266). *"The community is located in the far southern portion of Lafourche Parish where Bayou Lafourche meets the Gulf of Mexico. Port Fourchon is an industrial center for deepwater petroleum exploration and development in the Gulf. It is also very likely the largest single concentration of offshore petroleum support facilities in the lower-48. The Louisiana Offshore Oil Port (LOOP), the nation's only super port, is located 19 miles southeast. Constructed by a group of major oil and pipeline companies, LOOP is the central point of distribution for supertankers in the Gulf region.*

While extensive offshore petroleum support facilities and vessel operations dominate the landscape and local economy, Port Fourchon is also a harbor for several deep sea charter boats and offshore shrimp trawlers. The offshore trawlers are docked at two locations near the southern and northern ends of the port near a small marina. As is the case for Leeville, secondary source data for Port Fourchon are sparse at best. This is due in large part because there is no permanent residential area here. Vessels are kept here, and captains operate from the area but live elsewhere.

There are many fish camps fronting Bayou Terellon along Route 3090 near Port Fourchon; these are almost entirely recreational/weekend dwellings. A great deal of fishing occurs in the adjacent bayous and canals. There are also a growing number of upscale camp settlements west of the junction of Highway 1 and Route 3090. Various offshore sports fishing vessels are docked along the canal here.

*Year 2000 census figures do not accurately portray the resident population of Port Fourchon in that census-delineated tracts for this area include part of the populations of Grand Isle and Leeville. In reality, there are few permanent residents here; many persons who moor their vessels here live north of the port in communities along Bayou Lafourche, or as far away as Houma", (*Impact Assessment, Inc., 2005).

There was no fishing-related businesses listed for Port Fourchon in 2003, nor was there any information on commercial landings or value in 2000. No commercial fishing licenses were reported as being held by persons with a physical address in Port Fourchon

in 2000. A total of 483 recreational State saltwater fishing licenses were sold in the community during 2000.

Table 5.4.3-4. Port Fourchon Demographics

Factor	1990	2000
Total population	1,372	1,266
Gender Ratio M/F (Number)	653/608	640/626
Age (Percent of total population)		
Under 18 years of age	28.2	23.1
18 to 64 years of age	63.8	61.4
65 years and over	8.0	15.5
Ethnicity or Race (Number)		
White	1,175	1,124
Black or African American	1	7
American Indian and Alaskan Native	68	106
Asian	14	0
Native Hawaiian and other Pacific Islander	N/A	0
Some other race	3	5
Two or more races	N/A	24
Hispanic or Latino (any race)	8	9
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	49.0	18.5
Percent high school graduate or higher	34.6	47.6
Percent with a Bachelor's degree or higher	1.4	3.2
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	44.8	38.7
And Percent who speak English less than very well	13.5	7.5
Household income (Median $)	18,935	19,062
Poverty Status (Percent of population with income below poverty line)	32.3	21.4
Percent female headed household	7.4	6.8
Home Ownership (Number)		
Owner occupied	333	408
Renter occupied	76	58
Value Owner-occupied Housing (Median $)	33,100	48,950
Monthly Contract Rent (Median $)	222	334
Employment Status (Population 16 yrs and over)		
Percent in the labor force	51.5	47.8
Percent of civilian labor force unemployed	2.1	4.2
Occupation** (Percent in workforce)		
Management, professional, and related occupations	N/A	12.0
Service occupations	N/A	15.8
Sales and office occupations	N/A	31.6
Farming, fishing, and forestry occupations	7.8	4.9

Construction, extraction, and maintenance occupations	N/A	10.6
Production, transportation, and material moving occupations	N/A	24.9
Industry** (Percent in workforce)		
Agriculture, forestry, fishing and hunting	6.4	6.2
Mining (includes the offshore oil/gas industry workforce)	7.7	8.9
Manufacturing	3.6	5.1
Percent government workers	12.7	2.2
Commuting to Work (Workers 16 yrs and over)		
Mean travel time to work (minutes)	40.0	18.8
Percent worked outside of county of residence	15.4	14.1

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons for those census years.

Table 5.4.3-5. Fishing Infrastructure and Services Observed in Port Fourchon in 2003

Factor	**Quantity**
Commercial Vessels	-
Trawls	30-40
Skimmers	0
Butterfly	0
Crabbers	0
Oyster	0
Other Commercial	3-5 Charter boats, 50-60 oil field support vessels
Recreational Vessels	-
Freshwater	0
Saltwater	0
Infrastructure and Services -	-
Marinas	1
Seafood Docks/Dealers	1
Commercial Ship/Boat Repair	0
Commercial Ship/Boat Builders	0
Net Makers/Dealers	0
Commercial Marine Supply	2
Seafood Transport	2
Air Fill Stations (diving)	0
Fishing Pier	0

Source: Impact Assessment, Inc. 2005.

Bayou La Batre, Alabama is an incorporated community with a population of 2,313 reported in the 2000 U.S. Census. *"Bayou La Batre is located along State Highway 188 in southern Mobile County. It is adjacent to the body of water of the same name. The bayou empties into Mississippi Sound, providing easy access to several major ship channels and the Gulf of Mexico. Bayou La Batre is some 25 miles south of Mobile and*

approximately 22 miles east of the Pascagoula-Moss Point, Mississippi Metro area. The Gulf of Mexico is about 17 miles south, accessible via Portersville Bay and the Mississippi Sound.

Bayou La Batre was founded in the 1780's by a Frenchman named Joseph Bosarge. "La Batre" refers to a strategic battery built by the French during that period. Following the introduction of rail service in the late 1800s, the area developed as a resort town (Howell 2003). A hurricane so devastated the area in 1906 that commercial fishing became the only source of income. Residents subsequently established a lengthy history of involvement in the harvest, processing, and distribution of seafood.

The year 2000 census enumerated 2,313 persons in Bayou La Batre, a decline from the 1990 count of 2,456. Most residents were employed in manufacturing industries or sales occupations in 2000. The commercial fishing and processing industries are vital to the local economy. Shrimp, oysters, crabs, and finfish are primary products. The commercial fishing industry here reportedly generates direct and indirect revenue of nearly $80 million per year, with an approximate annual ex-vessel value of nearly $30 million. According to the Auburn University Marine Extension and Research Center (2001), Bayou La Batre was ranked 10th in value of landings for all U.S. ports in 2000. Fishery participants from Bayou La Batre also produce the majority of Alabama seafood landings; shrimp accounts for 90 percent of landed seafood value. Crews for hundreds of shrimp vessels work out of and deliver product to Bayou La Batre. Local processing activities include cleaning, heading, picking, shucking, grading, breading, packaging, frozen storage, and transportation. Much of the seafood processed in Bayou La Batre's processing plants is trucked in from out-of-state. These plants employ approximately 1,500 year-round workers and 800 seasonal workers. An additional number of packing houses and wholesale seafood dealers employ many year-round and seasonal workers. There are also at least a dozen marine supply shops and marine electronics firms in Bayou La Batre (Bayou La Batre Chamber of Commerce). Shipbuilding is Bayou La Batre's other major industry. Oil supply boats, work boats, barges, shrimp boats, tugs, cruisers, and casino boats are among the vessels built in Bayou La Batre(Bayou La Batre Chamber of Commerce).

There is a small downtown business district at the intersection of Shell Belt Road and State Road 188. Shell Belt Road is the address of many fishing-related industries, such as seafood processors, fish houses, and boat building yards. Numerous shrimp vessels are docked nearby. There are no bars, hotels, or non-fishing related businesses located on the bayou. A NOAA Fisheries Service port agent has an office in town. A population of persons of Vietnamese ancestry is involved in all facets of the local seafood industry. Many settled in the community with the help of the Catholic Church after the end of the Vietnam War. The local fishing fleet here ranges from small bay boats that fish for shrimp and finfish to large Gulf vessels (called "steel slabs") that make extended trips throughout the Gulf of Mexico and Southeast Atlantic. There are small seafood dealers that handle shrimp, crab, oysters, and finfish and large-scale processors that ship specialty products worldwide. All types of support businesses from net manufacturers to marine electronics dealers are located here. A blessing of the fleet" and a "Miss Seafood

Contest" are held here each year. According to one fishery specialist, the recent rise in fuel prices and the increase in imports and subsequent drop in price for domestic shrimp have forced Alabama shrimp fishermen to adjust their annual fishing pattern. In the past, fishing trips would be made during the off-season even though shrimp were not as abundant since the trips were still economically feasible. That is no longer the case, and many vessels remain tied to the dock during the off-season - returns can no longer cover operating costs.

In 2000, 24 processors were located in Bayou La Batre, average of 30 employees were employed by each that year. Some 36 million pounds of seafood valued at over $123 million were produced that year. A large federally-permitted shrimp fleet is based in Bayou La Batre, and many vessels from around the region are moored here," (Impact Assessment, Inc., 2005).

Commercial landings reported for Bay La Batre during 2003 were 4,615,977 lbs and were valued at $7,744,316 ex-vessel. A total of 45 commercial fishing permits were held by persons with an address in the community (35 State permits and 10 Federal Permits).

Table 5.4.3-6. Bayou La Batre Demographics. *Source:* Impact Assessment, Inc. 2005.

Factor	1990	2000
Total population	2,456	2,313
Gender Ratio M/F (Number)	1,201/1,255	1,159/1,154
Age (Percent of total population)		
Under 18 years of age	34.3	29.9
18 to 64 years of age	54.7	59.0
65 years and over	11.0	11.2
Ethnicity or Race (Number)		
White	1,605	1,213
Black or African American	250	237
American Indian and Alaskan Native	3	6
Asian	595	770
Native Hawaiian and other Pacific Islander	N/A	10
Some other race	3	22
Two or more races	N/A	55
Hispanic or Latino (any race)	67	44
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	30.0	24.0
Percent high school graduate or higher	45.2	54.9
Percent with a Bachelor's degree or higher	6.0	7.4
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	26.3	29.1
Percent who speak English less than very well	18.0	15.8
Household income (Median $)	15,775	24,539
Poverty Status (Percent of population with income below poverty line)	36.1	28.2

Percent female headed household	15.6	17.6
Home Ownership (Number)		
Owner occupied	537	501
Renter occupied	234	268
Value Owner-occupied Housing (Median $)	35,200	45,800
Monthly Contract Rent (Median $)	164	366
Employment Status (Population 16 yrs and over)		
Percent in the labor force	54.2	53.7
Percent of civilian labor force unemployed	9.7	11.1
Occupation** (Percent in workforce)		
Management, professional, and related occupations	N/A	14.1
Service occupations	N/A	18.3
Sales and office occupations	N/A	20.7
Farming, fishing, and forestry occupations	8.6	5.2
Construction, extraction, and maintenance occupations	N/A	10.8
Production, transportation, and material moving occupations	N/A	30.9
Industry** (Percent in workforce)		
Agriculture, forestry, fishing and hunting, (and mining)	11.6	8.4†
Manufacturing	23.4	21.9
Percent government workers	9.0	7.7
Commuting to Work (Workers 16 yrs and over)		
Mean travel time to work (minutes)	N/A	23.9
Percent worked outside of county of residence	12.2	9.5

**Differences in the types of data used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.

Table 5.4.3-7. Fishing Infrastructure and Services Observed in Bayou LaBatre in 2003. *Source:* Impact Assessment, Inc. 2005.

Infrastructure or Service	Quantity
Air fill stations (diving)	0
Boat yards/ Boat builders (recreational/commercial)	0
Churches with maritime theme	2
Docking facilities (commercial)	Several
Fishing Gear, Electronics, Welding, and other repair	0
Fishing associations (recreational/commercial)	0
Fish processors, Wholesale Fish House	50
Fisheries research laboratories	0
Fishing monuments/ festivals	1
Fishing pier	1
Hotels/Inns (dockside)	0
Marine railways/haul out facilities	Several
Museums—fishing/marine-related	0

Net makers	2
NOAA Fisheries Service or state fisheries office (port agent, etc.)	2
Public boat ramps	1
Recreational docks/marinas	0
Bait & Tackle/fishing supplies	0
Recreational Fishing Tournaments	0
Sea Grant Extension office	0
Seafood restaurants	2
Seafood retail markets	0
Trucking operations	3
Site-seeing/pleasure tours	0
Charter/Head Boats	3
Commercial Boats	~300

Table 5.4.3-8. Primary Fishing-related Businesses Listed for Bayou La Batre in 2003. *Source:* Impact Assessment, Inc. 2005.

Type of Business	**Frequency**
Boat Builder/Broker	12
Boat Builder/Broker; Marina	3
Boat Rentals & Pier	1
Fish Hatchery	1
Marina	1
Processor	5
Processor; Retail/Wholesale Seafood Dealer	4
Processor; Wholesale Seafood Dealer	2
Retail/Wholesale Seafood Dealer	1
Wholesale Seafood Dealer	9

Panama City, Florida is an incorporated community with a population of 36,417 reported in the 2000 U.S. Census. *"Panama City is located on St. Andrews Bay just inland from the Gulf in the central panhandle region. The city is typically accessed by U.S. Highway 98 and State Highway 22. Tallahassee is nearly 100 miles to the southwest. Local and visiting fishing vessels access the Gulf through the channel at St. Andrew Bay, roughly two miles from the waterfront.*

The town was named in 1906 under the leadership of developer G.M. West, and incorporated in 1909. Development focused on the waterfront, where numerous piers, a post office, and the city jail were built. In 1908, the Atlanta and St. Andrew Bay Railroad connected Panama City with cities to the north. In 1913, Panama City became the seat of Bay County.

The year 2000 census enumerated 36, 417 persons in Panama City, up from 34,378 in 1990. More than 6,700 residents are employed at neighboring Tyndal Air Force Base. The U.S. Navy maintains a 648-acre Coastal Systems Station in the area, and employs approximately 2,200 persons, many of whom reside in Panama City. Many residents are

employed in positions associated with regional commerce and government. There are numerous commercial and recreational fishing businesses in Panama City. At least 100 commercial and charter vessels moor at various harbors. Several wholesale fish houses handle a wide variety of finfish and shellfish, and there are numerous bait and tackle shops, ship stores, boat builders and dealers, fishing piers, and marinas where charter fishing is offered. There were nine active processors in 2000, employing a total of 55 persons on average that year. In short, there is considerable infrastructure for both commercial and recreational fishing," (Impact Assessment, Inc., 2005).

Commercial landings reported for Panama City during 2002 were 1,972,052 lbs and were valued at $3,869,807 ex-vessel. A total of 264 commercial fishing permits were held by persons with an address in the community (125 State permits and 139 Federal Permits). A total of 1,352 State saltwater licenses were held by persons that reported Panama City as their address on the license.

Table 5.4.3-9. Panama City Demographics. *Source:* Impact Assessment, Inc. 2005.

Factor	1990	2000
Total population	34,378	36,417
Gender Ratio M/F (Number)	16,094/18,284	17,683/18,734
Age (Percent of total population)		
Under 18 years of age	24.5	23.0
18 to 64 years of age	58.5	61.1
65 years and over	17.0	15.9
Ethnicity or Race (Number)		
White	25,954	26,819
Black or African American	7,500	7,813
American Indian and Alaskan Native	215	231
Asian	583	564
Native Hawaiian and other Pacific Islander -- 28 Some other race	126	274
Two or more races	–	688
Hispanic or Latino (any race)	460	1,060
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	12.1	6.7
Percent high school graduate or higher	70.3	79.2
Percent with a Bachelor's degree or higher	16.7	18.9
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	5.3	7.2
Percent who speak English less than very well	1.9	2.0
Household income (Median $)	26,629	31,572
Poverty Status (Percent of population with income below poverty line)	19.6	17.2
Percent female headed household	23.0	15.4
Home Ownership (Number)		
Owner occupied	8,193	8,565
Renter occupied	5,860	6,254

Value Owner-occupied Housing (Median $)	49,800	75,800
Monthly Contract Rent (Median $)	279	526
Employment Status (Population 16 yrs and over)		
Percent in the labor force	58.6	56.4
Percent of civilian labor force unemployed	8.0	5.8
Occupation** (Percent in workforce)		
Management, professional, and related occupations	--	32.2
Service occupations	--	20.8
Sales and office occupations	--	27.7
Farming, fishing, and forestry occupations	1.5	0.4
Construction, extraction, and maintenance occupations	--	8.6
Production, transportation, and material moving occupations	--	10.4
Industry** (Percent in workforce)		
Agriculture, forestry, fishing and hunting	1.5	0.5†
Manufacturing	7.7	7.0
Percent government workers	20.4	18.6
Commuting to Work (Workers 16 yrs and over)		
Percent in carpools	12.5	13.7
Percent using public transportation	0.2	0.7
Mean travel time to work (minutes)	--	18.6
Percent worked outside of county of residence	1.8	3.3

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.

Table 5.4.3-10. Fishing Infrastructure and Services Observed in Panama City in 2003. *Source:* Impact Assessment, Inc. 2005.

Infrastructure or Service	**Quantity**
Air fill stations (diving)	Several
Bars/clubs (dockside or in town)	Several
Boat yards/ Boat builders (recreational/commercial)	Several
Churches with maritime theme	None observed
Docking facilities (commercial)	0
Fishing Gear, Electronics, Welding, and other repair	0
Fishing associations (recreational/commercial)	0
Fish processors, Wholesale Fish House	6
Fisheries research laboratories	0
Fishing monuments	0
Fishing pier	0
Hotels/Inns (dockside)	0
Marine railways/haul out facilities	0
Museums—fishing/marine-related	0
Net makers	0
NOAA Fisheries Service or state fisheries office	0

(port agent, etc.)	
Public boat ramps	8
Recreational docks/marinas	15+
Bait & Tackle/fishing supplies	15+
Recreational Fishing Tournaments	Several
Sea Grant Extension office	0
Seafood restaurants	10+
Seafood retail markets	20+
Trucking operations	0
Site-seeing/pleasure tours	0
Charter/Head Boats	100+
Commercial Boats	100+

Table 5.4.3-11. Primary Fishing-related Businesses Listed for Panama City in 2003. *Source*: Impact Assessment, Inc. 2005.

Type of Business	**Frequency**
Boat Builder/Broker	44
Boat Builder/Broker Boat Rentals & Pier	1
Boat Builder/Broker Diving & Fishing Equipment	1
Boat Builder/Broker Marina	13
Boat Rentals & Pier	15
Boat Rentals & Pier Marina	1
Marina	17
Retail Seafood Dealer	19
Retail/Wholesale Seafood Dealer	2
Wholesale Seafood Dealer	4
Total	117

Madeira Beach, Florida is an incorporated community with a population of 4,511 reported in the 2000 U.S. Census. *"Madeira Beach is located on a barrier island just west of St. Petersburg and north of John's Pass on Florida's central west coast. The town is one of several beachfront communities in the area with both a well-established population of year-round inhabitants, and a range of services and attractions suitable for tourists and seasonal residents.*

Madeira Beach incorporated in 1947. According to Wilson and McCay (1998) offshore fishing in Madeira Beach began as bandit reel fishing for grouper in the 1960's. There were two fish houses supported primarily by charter fishing and a small commercial operation. It was during the early 1970's that two vessels began experimenting with long line fishing, but were initially unsuccessful. Later, several vessels began using long lines successfully for swordfish, but as swordfish stocks began to diminish in the Gulf, they were forced to expand their fishing territory to the eastern seaboard. It was on return trips that these vessels began to experiment with long lines in deeper water, thereby discovering an abundance of tilefish and yellow edge grouper. Reportedly, 95 percent of the fishing fleet in Madeira Beach was using long lines (Wilson & McCay 1998). There were four fish houses in Madeira Beach at the time, dealing primarily in grouper, but

also swordfish, shark, and other species. Approximately 100 vessels were working from the are during the latter part of the 20th century.

The year 2000 census enumerated 4,511 persons, up from 4,225 in 1990. The community is undergoing change, as waterfront property values rise and condominium development ensues. . The town is sometimes referred to as the "Grouper Capital of the World" as the majority of snapper-grouper in the U.S. is landed here. The fish is an important recreational catch as well. Lucas (2001) reported an estimated 87 long line and 48 bandit reel vessels call Madeira their homeport. Moreover, she found that most captains and crew lived nearby, with over 40 captains living in Madeira, and the rest within 30 minutes away. Overall direct employment, related to vessels and fish houses, was approximately 441 persons in 2000. These numbers are likely less today than in the past, as the number of fish houses and vessels have decreased.

*With regard to recreational fishing, there are four marinas, including a public marina with over 90 slips. Many residents own their own boat and fish in the Gulf. Support industries do exist, as there are several bait and tackle shops, recreational boat yards, and other related businesses. The community continues to hold the Seafood Festival in October," (*Impact Assessment, Inc., 2005).

Commercial landings reported for Madeira Beach during 2002 were 935,201 lbs and were valued at $1,686,739 ex-vessel. A total of 264 commercial fishing permits were held by persons with an address in the community (15 State permits and 26 Federal Permits). A total of 125 State saltwater licenses were held by persons that reported Madeira Beach as their address on the license.

Table 5.4.3-12. Madeira Beach Demographics. *Source:* Impact Assessment, Inc. 2005.

Factor	1990	2000
Total population	4,225	4,511
Gender Ratio M/F (Number)	2,156/2,069	2,376/2,135
Age (Percent of total population)		
Under 18 years of age	8.7	8.2
18 to 64 years of age	65.7	69.8
65 years and over	25.6	22.0
Ethnicity or Race (Number)		
White	4,160	4,378
Black or African American	10	12
American Indian and Alaskan Native	7	14
Asian	32	26
Native Hawaiian and other Pacific Islander	--	2
Some other race	16	30
Two or more races	--	49
Hispanic or Latino (any race)	105	107
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	4.2	2.6
Percent high school graduate or higher	83.8	87.3

Percent with a Bachelor's degree or higher	19.5	22.2
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	4.5	6.8
Percent who speak English less than very well	1.5	2.0
Household income (Median $)	24,748	36,671
Poverty Status (Percent of population with income below poverty line)	8.4	9.8
Percent female headed household	5.3	5.3
Home Ownership (Number)		
Owner occupied	1,290	1,454
Renter occupied	940	1,074
Value Owner-occupied Housing (Median $)	111,400	171,000
Monthly Contract Rent (Median $)	392	555
Employment Status (Population 16 yrs and over)		
Percent in the labor force	58.5	61.5
Percent of civilian labor force unemployed	2.7	4.4
Occupation** (Percent in workforce)		
Management, professional, and related occupations	--	30.4
Service occupations	--	22.1
Sales and office occupations	--	28.9
Farming, fishing, and forestry occupations	1.4	0.7
Construction, extraction, and maintenance occupations	--	10.6
Production, transportation, and material moving occupations	--	7.2
Industry** (Percent in workforce)		
Agriculture, forestry, fishing and hunting	1.4	0.0†
Manufacturing	7.5	7.0
Percent government workers	8.2	4.5
Commuting to Work (Workers 16 yrs and over)		
Percent in carpools	8.7	14.7
Percent using public transportation	2.2	1.6
Mean travel time to work (minutes)	--	23.1
Percent worked outside of county of residence	10.6	16.0

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.

Table 5.4.3-13. Fishing Infrastructure and Services Observed in Madeira Beach in 2003. *Source:* Impact Assessment, Inc. 2005.

Infrastructure or Service	**Quantity**
Air fill stations (diving)	2
Boat yards/ Boat builders (recreational/commercial)	3
Churches with maritime theme	1
Docking facilities (commercial)	4
Fishing Gear, Electronics, Welding, and other repair	4 (2com/2 rec)
Fishing associations (recreational/commercial)	1 (com)

Fish processors, Wholesale Fish House	5
Fisheries research laboratories	0
Fishing monuments/ festivals	1
Fishing pier	0
Hotels/Inns (dockside)	Many
Marine railways/haul out facilities	0
Museums—fishing/marine-related	0
Net makers	0
NOAA Fisheries Service or state fisheries office (port agent, etc.)	0
Public boat ramps	2
Recreational docks/marinas	4
Bait & Tackle/fishing supplies	5
Recreational Fishing Tournaments	0
Sea Grant Extension office	0
Seafood restaurants	Many
Seafood retail markets	2
Trucking operations	1
Site-seeing/pleasure tours	7+
Charter/Head Boats	3+
Commercial Boats	40

Table 5.4.3-14. Primary Fishing-related Businesses Listed for Madeira Beach in 2003. *Source:* Impact Assessment, Inc. 2005.

Type of Business	**Frequency**
Boat Builder/Broker	3
Boat Rentals & Pier	10
Boat Rentals & Pier- Marina	1
Marina	3
Processor- Wholesale Seafood Dealer	1
Retail/Wholesale Seafood Dealer	1
Total	19

5.5 Administrative Environment

5.5.1 Federal Management

5.5.1.1 NOAA Fisheries Service

NOAA Fisheries is one of the primary agencies responsible for permitting aquaculture activities within the EEZ. NOAA Fisheries and the Gulf Council have already implemented a FMP for the culture of live rock and have developed a draft Code of Conduct for Responsible Aquaculture. There is also national legislation proposed that would authorize offshore aquaculture permits in the EEZ, if approved.

Section 10.0 describes NOAA Fisheries Service authority under the Fish and Wildlife Coordination Act, the Endangered Species Act of 1973, the Essential Fish Habitat provisions of the MSFCMA, the National Environmental Policy Act, and the Marine Mammal Protection Act of 1972,

5.5.1.2 Gulf of Mexico Fishery Management Council

Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. As marine aquaculture operations constitute fishing under the MSFCMA (C.F.R. § 229.2 1999), the Councils have the authority to make recommendations to NOAA Fisheries about management of marine aquaculture in the EEZ. Councils may develop fishery management plans to address conservation and management of marine species in need of federal management. Under the proposed 2007 offshore aquaculture legislation, aquaculture would be excluded from the definition of "fishing" and fishery management councils would have a consultative role in the issuance of permits.

5.5.1.3 U.S. Army Corps of Engineers

The ACOE is responsible for issuance of Section 10 permits for offshore aquaculture facilities. Section 10 of the Rivers and Harbors Act (33 U.S.C 403) prohibits the creation of structures not authorized by Congress that obstruct navigable waters of the United States. The ACOE permitting process (see Title 33 CFR Section 322) is designed to assess the environmental effects of a structure and any operations associated with the structure, including effects on navigable waters of the United States. NOAA Fisheries may provide comments to the U.S. ACOE regarding impacts to marine resources of proposed activities and can recommend methods for avoiding such impacts.

5.5.1.4 U.S. Environmental Protection Agency

The Clean Water Act authorizes water quality and pollution research, provides grants for sewage treatment facilities, sets pollution discharge and water quality standards, addresses oil and hazardous substances liability, and establishes permit programs for water quality, point source pollutant discharges, ocean pollution discharges, and dredging or filling of wetlands or waters of the United States. Under Section 318 of the Clean Water Act, the EPA asserts its jurisdiction to require point source pollution discharge permits for marine aquaculture operations in the open ocean. Title 40 CFR Parts 122-124 implement the EPA's National Pollutant Discharge Elimination System (NPDES) Program. Water quality and effluent standards and criteria for the NPDES are described in 40 CFR, Parts 125, 129, 133, 136, 400-471, and 503. The EPA also published a final rule on August 23, 2004 (69 F.R. 162) establishing Clean Water Act effluent limitations, guidelines, and new point source pollution standards for concentrated aquatic animal production facilities, including facilities that produce 100,000 pounds or more per year of aquatic animals in net pens or submerged cage systems.

5.5.1.5 Minerals Management Service

The Minerals Management Service has authority to lease sites for minerals development on the outer continental shelf; however, transfer of structure ownership from oil and gas lessees to other parties may be regulated. MMS is currently developing regulations under the authority of the Energy Policy Act of 2005 that would apply to alternate uses of oil and gas platforms. The Energy Policy Act of 2005 gives the Secretary of the Interior authority to issue a lease, easement, or right-of-way on the Outer Continental Shelf for activities that use energy facilities for other (non-energy related) authorized marine-related purposes, such as aquaculture. The MMS published a final Programmatic Environmental Impact Statement in November 2007 which assesses the impacts of allowing the use of energy facilities for non-energy related purposes. A final record of decision to approve and establish an Alternative Energy and Alternative Use Program was published in December 2007. On July 9, 2008 (73 FR 39376), MMS published proposed regulations for their Alternative Energy and Alternative Use Program. The *Federal Register* notice states the following regarding offshore aquaculture: "In the first example, an individual seeks to use an existing oil and gas platform in the Gulf of Mexico to conduct certain offshore aquaculture activities. Offshore aquaculture activities on the OCS are not currently authorized by any other statutory authority. Therefore, MMS may authorize the use of an existing facility for offshore aquaculture activities using an Alternate Use Rights of Use Easement."

5.5.1.6 U.S. Coast Guard

The U.S. Coast Guard is responsible for the regulation and enforcement of various activities in the navigable waters of the U.S. The USCG requires structures be marked with lights and signals to ensure compliance with private aids to navigation (33 C.F.R. 66.01). Title 33 C.F.R. 64 also requires the marking of structures, sunken vessels, and other obstructions for the protection of maritime navigation.

5.5.1.7 U.S. Food and Drug Administration

The FDA has jurisdiction over drugs to treat or prevent parasites or diseases of fish, anesthetize aquatic species, or regulate the reproduction of aquatic species. The FDA also regulates therapeutic agents by setting tolerance levels allowed for human consumption and regulates harvest and marketing of shellfish under the National Shellfish Sanitation Program.

The FDA Center for Veterinary Medicine (CVM) approves new animal drugs and animal feeds that may be used in the production of aquaculture fish and shellfish. The FDA requires scientific evaluation of a drug's effectiveness and safety for humans and the environment before approval.

5.5.1.8 U.S. Fish and Wildlife Service

Under the authority of the Fish and Wildlife Coordination Act (16 USC 661) the USFWS may review activities that are authorized, permitted or funded by the federal government and make recommendations to the responsible agencies regarding the interests of fish, wildlife and their habitats. The agency also has regulatory responsibilities under the Endangered Species Act of 1973, the Migratory Bird Treaty Act (MBTA) and the Marine Mammal Protection Act of 1972.

The Lacey Act (16 USC 701) and later amendments, particularly those of 1981 (16 USC 3371-3378) govern the interstate transportation and importation of fish and wildlife and their parts and have some relevance to the introduction of non-native species. The regulations implementing the Act at 50 CFR 16.3 generally prohibit the import into the U.S. of live or dead fish, mollusks or crustaceans unless a permit is obtained from the USFWS at the port of entry (50 CFR 16.13). Permits are generally granted for most species to be imported and held in captivity; except those which have been determined to be injurious. The regulations prohibit the release of imported species into the wild unless done so by a state fisheries agency or persons the agency has authorized to do so. The only species that are strictly prohibited from import are those that have been listed as injurious. The injurious species list currently consists of the walking catfish (family Clariidae), mitten crabs (*Eriocheir* spp), zebra mussels (*Dreissena* spp), numerous species of snakeheads (*Channa* and *Parachanna* spp), silver carp *(Hypophthalmichthys molitrix)*, and largescale silver carp *(Hypophthalmichthys harmandi)*. There are currently some legal uncertainties regarding application of the Lacey Act in the EEZ.

The USFWS and NOAA co-chair the federal Aquatic Nuisance Species Task Force, which was established under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701) to develop a program of prevention, monitoring, control, and study of aquatic nuisance species. Amendments to the Act authorized the USFWS and NOAA to issue rules and regulations to implement the program as recommended by the Task Force.

In an April 13, 2007 memo, the USFWS stated "there are no regulations under the MBTA requiring a permit, license, or other regulatory approval for the development and operation of open ocean aquaculture facilities as long as those activities do not 'take' migratory birds intentionally or unintentionally." For the purposes of this statement, take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect. There is no permit available to legalize incidental take of migratory birds under the MBTA; any take incidental to construction or operation of an aquaculture facility would technically be a violation of the MBTA and potentially subject to prosecution.

5.5.2 State Management

The states may comment on federally proposed regulations under the Coastal Zone Management Act.

5.5.2.1 Alabama

The Alabama Marine Resources Division (AMRD) of the Alabama Department of Conservation and Natural Resources (ADCNR) manages Alabama's marine fisheries resources. The AMRD can lease bottoms for culture of oysters and other organisms.

5.5.2.2 Florida

Chapter 597, Florida Aquaculture Policy Act, Florida Statutes, was amended in 1996 to require all Florida aquaculturists to obtain an annual Aquaculture Certificate of Registration. Regulations were amended again in 1998 to require that certified aquaculturists abide by aquaculture Best Management Practices (BMPs) formulated to preserve environmental integrity. Commercial aquaculturists cannot sell their products unless they possess an Aquaculture Certificate of Registration and include their Certificate number on business related invoice, bill of lading, and receipts.

The Department of Agriculture and Consumer Services is responsible for BMP development, revision, and farmer compliance. The BMPs are dynamic and subject to revisions driven by technological advancements. The BMPs are a component of Chapter 5L-3, Aquaculture Best Management Practices, Florida Administrative Code, and published by the Department in the form of a manual: http://www.floridaaquaculture.com/publications/P-00104-booklet-07_BMP_RULE.pdf. The Department adopted the first *Aquaculture Best Management Practices Manual* in 2000 and the fourth and current edition was adopted in May 2007.

Florida aquaculturists following the BMPs must meet the minimum standards necessary for protecting and maintaining offsite water quality and wildlife habitat. Farms certified through this program as being in compliance with the BMPs are presumed to be in compliance with state ground and surface water standards. The Florida Department of Environmental Protection is not authorized to institute proceedings against any certified facility to recover costs or damages associated with ground or surface water contamination or the evaluation, assessment, or remediation of contaminated ground or surface water.

Florida BMPs were developed and may be created or revised through stakeholder technical advisory committees consisting of farmer, state agency, extension, and environmental group representatives invited by the Department. Subsequent BMPs are subjected to Department review and comment before being submitted to normal state agency rule making processes that include public comment and legislative review.

The *Aquaculture Best Management Practices Manual* contains the following topics: federal permitting; construction; compliance monitoring; shipment, transportation, and sale; water resources; non-native and restricted non-native species; health management; mortality removal; preventing wildlife depredation; chemical and drug handling; marine shrimp; sturgeon culture; shellfish culture; live rock culture; aquatic plants; aquatic

animal welfare; and marine net pens and cages. The format is a brief description of the issue followed by a bulleted list of prescriptive and general BMPs.

The Department has created and supported several BMP educational and outreach activities. In concert with the University of Florida, Department of Fisheries and Aquatic Sciences, periodic BMP workshops are held and the agencies jointly developed and installed educational signage that illustrates and describes BMPs at four University of Florida operated aquaculture demonstration and research facilities (shellfish, food and bait fish, shrimp, and ornamental fish and aquatic plants). The Department also publishes a free newsletter, *Florida Aquaculture*, which provides farmers, agencies, legislators and other interested parties notification of BMP development or revision. There are no state dedicated funds to assist farmers with BMP implementation other than technical guidance. The Department of Agriculture and Consumer Services enforces and verifies BMP implementation through unannounced farm inspections. Farms that do not implement or maintain the BMPs are violating state law and are subject to written notice, fines, suspension/revocation of the Aquaculture Certificate of Registration, and potential misdemeanor charges.

Florida has accepted delegation of the Clean Water Act responsibilities from the U.S. Environmental Protection Agency. Concentrated Aquatic Animal Production facilities in the state that exceed EPA's warm water species production and discharge threshold of 100,000 pounds live weight must acquire a NPDES permit from the Florida Department of Environmental Protection (in Florida parlance an Environmental Resource Permit) as well as an annual Aquaculture Certificate of Registration and abide by appropriate BMPs.

According to the Florida Agricultural Statistics Service, in 2005, there were 710 active aquaculture operations, and in 2003, 544. Altogether, Florida aquaculture producers reported sales of $75 million in 2003 and $95.5 million in 2003. They produced tropical fish, aquatic plants, clams (including clam seed), oysters, shrimp, other fish (hybrid striped bass, koi, largemouth bass, bream, and carp), alligators, catfish, tilapia, other aquatics (crawfish, eels, snails, turtles, crabs, and frogs), and live rock.

Tropical fish are produced in ponds and tanks, and the more prominent species include ornamental favorites, such as guppies, mollies, swordtails, variatus, platies, tetras, gouramies, goldfish, cichlids, barbs, and tropical catfish. Aquatic plants are produced in vats and water surface acres, and include plants for water gardens and aquariums, farm-produced plants used in wetlands restoration, and watercress. Clams, oysters, and live rock are grown in operations that lease state-owned sovereignty submerged land.

5.5.2.3 Louisiana

Louisiana has no regulations for the permitting of offshore aquaculture. As the state entity with the authority and responsibility to manage fisheries in the state, the Louisiana Department of Wildlife and Fisheries (LDWF) would regulate offshore aquaculture as it relates to biological, enforcement, sociological and economic issues of fisheries and the coastal environments that support those fisheries. LDWF currently has authority to

permit mariculture in the coastal zone of the state on privately owned property and water bottoms under R.S. 56.579.1. The Platforms for Mariculture Task Force, consisting of state agencies, developed a report in 2005 to the Louisiana Governor examining the economic feasibility of using non-productive oil and gas platforms for sites for aquaculture.

The Louisiana Legislature enacted the "Louisiana Aquaculture Development Act of 2004", (La. R.S. 3:559.1 et seq). It defines "aquatic livestock" as finfish and crawfish produced, raised, managed, or harvested within or from any private, constructed impoundment that has no inlet from or outlet to any public waters as a segment of agriculture. The Louisiana Aquaculture Coordinating Council (LACC) was established within the Louisiana Department of Agriculture and Forestry (LDAF) under the Act. The LACC provides a regulatory framework for the orderly development and maintenance of a modern aquaculture segment of Louisiana's agriculture industry and for the promotion of aquaculture and aquaculture products.

During the Regular 2008 Legislative Session, the Louisiana Legislature passed a resolution indicating their opposition to offshore aquaculture in the Gulf of Mexico. During the 2008 Legislative Session, the Legislature also passed HB 488 (Act 280), which requires that marine biologists from LSU (Baton Rouge), the Louisiana University Marine Consortium (LUMCON), and the Louisiana Department of Wildlife & Fisheries review an aquaculture project to be located in state offshore waters prior to permitting of the project by the state.

5.5.2.4 Mississippi

The Mississippi Aquaculture Act of 1988 designates the Mississippi Department of Agriculture and Commerce as the agency responsible for issuing cultivation permits for facilities located "in whole or in part, in the Mississippi Sound, the Gulf of Mexico, or bays or estuaries thereof at such time that such facility complies with all state and federal requirements to protect marine resources" (Miss. Code Ann. § 79-22-17 (1999)). The Mississippi Secretary of State, "upon recommendation of the Mississippi Department of Marine Resources and the Mississippi Department of Environmental Quality may lease waters as provided by Section 29-1-107, Mississippi Code of 1972" (Miss. Code Ann. § 79-22-23(1)). The Mississippi Department of Marine Resources is "authorized to develop a marine aquaculture lease management program and may adopt such rules and regulations as may be necessary to implement the marine aquaculture lease management program and to regulate the growth of aquaculture" (Miss. Code Ann. § 79-22-23(1)). "The Commission on Wildlife, Fisheries, and Parks and the Commission on Marine Resources may promulgate regulations which specify design criteria to protect the resources within their jurisdiction and to prevent the release of undesirable species from an aquaculture facility into the environment" (Miss. Code Ann. § 79-22-15(5)).

5.5.2.5 Texas

The Texas Aquaculture Code authorizes the Texas Department of Agriculture (TDA) and the Texas Parks and Wildlife Department (TPWD) to adopt rules to carry out the duties of each agency with respect to aquaculture. TDA is the lead agency in charge of regulating aquaculture within the state of Texas and its coastal waters under Texas Agriculture Code § 12 Chapter 134 et seq.

TPWD has regulatory authority over the transport of aquatic products into or within state territory including its coastal zone (TPWD Code § 47.018). TPWD is also charged with establishing the rules and regulations governing the introduction of any aquatic product into public waters (TPWD Code § 66.015) and may lease state bottoms for aquaculture. TPWD Code § 57.251-259 describes TPWD's regulations for offshore aquaculture in Texas state waters of the Gulf of Mexico. TPWD regulations include: definitions, general regulatory provisions for offshore aquaculture facilities, permit application and renewal requirements (as well as reasons for denial), regulations for amending permits, reporting and recordkeeping requirements, prohibited acts, and violations and penalties.

5.5.3 Existing opportunities for public comment on aquaculture-related activities

5.5.3.1 Clean Water Act - Administered by EPA

Under Section 318 of the Federal Water Pollution Control Act (commonly known as the Clean Water Act), the EPA asserts its jurisdiction to require point source pollution discharge permits for marine aquaculture operations in the open ocean.

Implementing regulations at 40 CFR 124.10 describe procedures for public notice of permit actions and public comment periods under the Clean Water Act. Public notice must be made of the preparation of a draft permit, and at least 30 days are to be allowed for public comment. The regulations state "all persons, including applicants, who believe any condition of a draft permit is inappropriate or that the director's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate" must submit information to the Regional Administrator within the public comment period. The Regional Administrator must notify each person who has submitted written public comments of the final permit decision.

5.5.3.2 Magnuson-Stevens Fishery Conservation and Management Act - Administered by NOAA Fisheries Service

Implementing regulations for the Magnuson-Stevens Fishery Conservation and Management Act describe the procedure for issuance of an Exempted Fishing Permit (EFP) (50 CFR 600.745(b)). Public comment is solicited as follows: "If the Regional Administrator or Director determines that any application warrants further consideration, notification of receipt of the application will be published in the *Federal Register* with a brief description of the proposal, and the intent of NOAA Fisheries Service to issue an EFP. Interested persons will be given a 15- to 45-day opportunity to comment and/or

comments will be requested during public testimony at a Council meeting." (50 CFR 600.745(b)). If actions in the subject FMP established a new aquaculture permitting system, then aquaculturists would not apply for an EFP and this opportunity for public comment on proposed activities would not be applicable.

5.5.3.3 Rivers and Harbors Act - Administered by ACOE

Implementing regulations for Section 203 of the Rivers and Harbors Act of 1899 (33 CFR 325.2(d)) state public notice of a permit application will be issued within 15 days of receipt of all required application information. A 15 to 30 day comment period on the proposed permit begins the date of publication of the public notice. This comment period can be extended up to an additional 30 days if deemed warranted by the district engineer.

5.5.3.4 Energy Policy Act of 2005 - Administered by MMS

The Energy Policy Act of 2005 gives the Secretary of the Interior authority to issue a lease, easement, or right-of-way on the Outer Continental Shelf for activities that use facilities for other (non-energy related) authorized marine-related purposes, such as aquaculture. The MMS published a final Programmatic Environmental Impact Statement in November 2007 which assesses the impacts of allowing the use of energy facilities for non-energy related purposes. The MMS made a final decision on this action in December 2007. On July 9, 2008, the MMS published a proposed rule addressing alternative energy and alternative uses for energy structures. The public comment period for this rule ends September 8, 2008.

6.0 Environmental Consequences

6.1 General Description of the Marine Aquaculture Environment

6.1.1 Impacts of Marine Aquaculture on Local Wildstocks

The rapid development around the world of marine aquaculture has raised concerns over the possible genetic and ecological impact of escaped fish on natural populations. Potential effects include genetic alteration and reduced fitness, competition for food and space, introduction or spread of diseases and parasites, and predation on native stocks.

There is some information available on the intentional release of marine fish species for purposes of stock enhancement; however, there are almost no data available on accidental releases (escapees) as applied to marine aquaculture. Intentional releases for stock replenishment or stock enhancement may have positive or negative effects on natural populations by increasing stock size and abundance. Similarly, the effects of accidental releases by species or number may or may not have negative effects. The effect depends on the genetic state of the escaped cultured fish and the numbers and mean individual size of the escaped population.

For fishes, whether marine, anadromous or freshwater, the natural genetic variation is partitioned geographically across the range of the species. This universal feature of genetic stock structure in natural fish populations is the need to respond to environmental variability and is generally believed to be important to the long-term survival and fitness of populations within species. These locally adaptive features of fish populations are at risk from interbreeding with fish escaping from aquaculture facilities that are of non-local origin, or local indigenous stocks that have undergone artificial selection or domestication (Youngson *et al.* 2001).

Most scientific information on genetic and ecological impacts of escaped farmed fish is found in the scientific literature relating to salmon aquaculture and, although not directly applicable, is the closest comparison available for marine fish species. However, spawning adult salmon are reproductively isolated upon return to their natal streams and, unlike marine species, exhibit highly complex genetic structuring across their geographic range. Nevertheless, because of their long history as cultivars, data from salmon aquaculture and salmon hatcheries often provide the best available scientific information on the possible genetic consequences of marine fish escaping from offshore aquaculture facilities in the United States.

Fishery management in the United States and abroad is based on knowledge of stock structure within a species, and protection of stocks by managing harvest. Today, identifying population structure is essential for good fisheries management and an essential body of information required to assess the impact of escaped aquaculture fish. Large-scale population genetic analysis of marine fish stock structure has accelerated in recent years with the advent of allozyme, microsatellite, and mitochondrial DNA

polymorphism technology, and at least some genetic stock structure information exists for most finfish species presently in culture.

Naturalization of introduced non-native species that result in invasion and competition with native fauna and flora is recognized as a primary threat to global biodiversity (Wilcove *et al* 1998; Bax *et al* 2001; D'Antonio et al 2001; Olenin 2002). Non-native species have also been shown to be a primary causal factor in the loss of biodiversity of United States biota. The introduction and naturalization of non-native species is believed to be the second most detrimental loss of biodiversity after habitat degradation and loss. Nationwide, about 400 of the 958 (42 percent) species listed as threatened or endangered under the Endangered Species Act are considered to be at risk primarily because of competition with and predation by non-indigenous species.

Invasion of the nation's coastal ecosystems by marine non-native species is accelerating (Grosholz and Ruiz 1996) and species that become invasive have the potential to cause economic damage as well as ecological harm. In marine ecosystems, invasive species have the potential to change community structure, food web dynamics, genetic structure, and in general modify ecosystem processes (Verlaque and Fritayre 1994; Vitousek *et al.* 1997; Shiganova 1998; Grosholz *et al* 2000; Semmens *et al.* 2004). These fundamental biological changes in ecosystem services can result in degraded habitat, transmission of disease, and ultimately the loss of species through replacement of native species or stocks by the invader.

Most introduced species do not become invasive and documented negative effects of introductions are infrequent. Classification of an introduced species as invasive requires that the non-native species introduction is followed by successful colonization and becomes economically harmful (Williamson and Fitter 1996). However, the unpredictability of the ultimate geographic distribution of a NIS and the potential ecological damage to native biota is cause for concern for a non-native species escaping from aquaculture facilities.

The introduction and naturalization of non-indigenous marine finfish species through human activities may be intentional or inadvertent. Common marine pathways for inadvertent introductions are the dumping of ballast water from distant sites, the aquarium trade (Courtenay and Robins 1973; Courtenay and Stauffer 1990), culture-based fisheries, and purposeful introductions of a species for creating recreational or commercial fisheries. Aquaculture is also a recognized pathway for both purposeful and inadvertent introduction of non-native species in aquatic ecosystems.

Froese and Pauly (2002) list 1,145 successful finfish introductions worldwide. Of these 241 are marine species. Freshwater fishes appear to be the most invasive and problematic of the introduced finfish species (Zaret and Paine 1973; Goldschmidt et al. 1993). Anadromous fish species, although not as widely introduced as freshwater species, have been successfully introduced into North and South America, and elsewhere. Other examples are the successful introductions of anadromous striped bass and alewives

from the eastern United States to the west coast where they have become established in the states of California, Oregon, and Washington.

Fewer marine species are reported to be introduced, and of those successful introductions of tropical marine fish species have been rarely reported (Semmens et al. 2004). Fewer marine introductions may not represent a lower potential for naturalization rather than the lower frequency of attempts to make purposeful introductions.

Between 1955 and 1961 the Hawaiian Islands Division of Fish and Game released 11 species of non-native marine groupers (Serranidae) and snappers (Lutjanidae) to enhance near-shore fisheries of the Hawaiian Islands (Randall 1987). Of these, the peacock grouper (*Cephalophis argus*), the blacktail snapper (*Lutjanus fulvus*), and the bluestriped snapper (*Lutjanus kasmira*) became naturalized, and have now established self-sustaining populations.

Anecdotal information from the tropical western Atlantic indicates that 13 species were intentionally introduced to Bermuda for commercial and game fishing in the 1920s. Of those, *Holacanthus ciliaris* (queen angelfish), *Pomacanthus arcuatus* (grey angelfish), and *Lutjanus analis* (mutton snapper) have become established (Walford and Wicklund 1973; REEF 2002). In both Hawaii and Bermuda, when significant propagule pressure was applied through intentional or unintentional introductions, exotic fishes have established self-sustaining populations.

Since 1999 divers have reported 16 non-native marine fish species from 32 locales off the East Coast of the United States (REEF Fish Survey), and all of the observed non-native species have been imported in the marine aquarium trade (Semmens et al. 2004). The red lionfish *Pterois volitans* has apparently been established in marine waters of the southeastern United States (Whitfield et al. 2002). The largest set of intentional marine fish introductions were carried out in the temperate coastal and inland seas of Russia (Baltz 1991). Sixteen species became established, with ecologically and economically devastating results including harm to valuable fisheries, parasite introductions, and the endangerment and extinction of native species (Baltz 1991).

In the past, introductions of Turbot, *Psetta maxima,* have been carried out in the former USSR (FAO 1997), in Iran (Coad 1995), and in Chile for aquaculture purposes (FAO 1997; Pérez *et al* 2003), but with no successful recapture or establishment of breeding populations. However, self-sustaining populations of Turbot were successfully introduced in waters around New Zealand (Muus and Nielsen 1999). Experimental releases of cultured fry for stock enhancement purposes have been performed in Spain (Iglesias and Rodriguez-Ojea 1994), Denmark (Nicolajsen 1993; Støttrup and Paulsen 1998), and Norway (Bergstad and Folkvord 1998).

6.1.1.1 Escapement

With relatively few exceptions, marine fish presently used for aquaculture purposes are genetically and phenotypically close to their wild conspecifics, having been collected

directly from wild populations as eggs or juveniles, or derived from wild broodstock which are spawned in captivity. While these practices minimize the immediate risks to the genetic makeup of local populations, large scale aquaculture programs inevitably require continuous and dependable supplies of juveniles which can only be obtained from hatcheries.

Several factors merit consideration when evaluating the likely ecological, environmental, and genetic impacts cultured fish may have should they escape. Among them are the following: natural population genetic structure and phenotypic variability of the stock; the size of the stock relative to the estimated number and frequency of escapement; the type of breeding program to be used, including selection of the founding stock; and the likelihood that unintentional genetic drift (domestication) related to hatchery practices will occur. Also, the economic imperative to improve stock performance (growth rate, disease resistance) through selective breeding may decrease the genetic diversity of farmed strains compared with their wild counterparts. Natural mating of farmed fish and wild fish conspecifics has been documented, leading to alterations in the local genetic structure (Alarcon et al. 2004; Perez-Enriquez et al. 2001). However, these changes are not necessarily deleterious even when farmed fish greatly outnumber their wild counterparts.

6.1.1.2 Genetic Diversity

One outcome of introducing closely related species is the potential for interspecific hybridization leading to endogeneous selection against hybrids through loss of fitness, and reduced population size of the contributing species (Barton and Hewitt 1985; Campton 1987; Gardner 1997; Rao and Lakshmi 1999). The prevailing view has been that natural hybridization is an evolutionary dead end, because hybrids could generally never do better than parental types (e.g. Barton and Hewitt 1985).

Recently, natural hybridization has been documented in more marine species (Roques et al. 2001) along with the view that narrow hybrid zones between species have little consequence on the genetic integrity of the parental species (Barton 1979; Barton and Hewitt 1985, 1989; Hewitt 1988). It has been suggested that introgressive hybridization may sometimes be a rich source of genetic variability important to the evolution of new species (Arnold 1992; Martin and Cruzan 1999). Athough the first hybrid generation may be more robust and superior in some aspects to either parent species, reduced fitness can be a long-term result, a phenomenon referred to as outbreeding depression. This may occur due to loss of adaptation to specific habitats and disruption of coadapted gene complexes, potentially resulting in reductions in growth, survival, fertility, thermal tolerance, or homing (Leary et al.1995). Nevertheless, an example of natural hybridization and naturally occurring ocean hybrid zones are still rare, and controversial. The genetic consequences of hybridization is unknown. Therefore, the consequences of hybridization between escaped farmed fish and closely related natural species are still generally unknown and should be avoided.

6.1.1.3 Competition

Extinctions of long-term resident species resulting from the introduction of predators or pathogens into spatially-restricted environments such as islands or lakes, or by habitat alterations are well documented in the scientific literature. For example, predation by brown tree snakes *(Boiga irregularis),* introduced to Guam in the Mariana Islands during the last half of the twentieth century, caused the extirpation or serious reduction of most of the island's 25 resident bird species (Wiles et al. 2003). A community of over 400 fish species occupying Lake Victoria (Africa) collapsed to three co-dominant species in just 11 years following a staggered series of irruptions in the population of Nile perch *(Lates niloticus)*, an introduced species. The extirpation of fish species at virtually all trophic levels may have further intensified eutrophication of the lake by decoupling the internal nutrient cycling and export system (Kaufman 1992). These habitat alterations have furthermore decreased the range (and population size) of the few native species that remain.

While intertrophic interactions such as those cited above clearly can have profound ecological effects, including extirpation or extinction, competition between species at the same trophic level (controphic interactions) are often limited to changes in the dominance-abundance of a community (Davis 2003). To illustrate, the construction of the Suez Canal in 1869 permitted a sudden, large scale mixing of the formerly isolated marine biota of Mediterranean Sea and Red Sea. As described by Mooney and Cleland (2001), the introduction of over 250 species, 34 new genera, and 13 new families into the Mediterranean Sea has resulted in only one documented extinction. Niche displacement through competitive interactions among congeners has occurred, with native Mediterranean species adjusting their foraging depth distributions to accommodate the colonizing species (Golani 1993). Nevertheless, some confamiliar indigenous species have nearly disappeared from local catches, having been replaced by Red Sea species that occupy similar habitats (Golani 1998).

Deleterious changes in marine fish assemblages resulting from aquaculture development (and the corresponding introduction of non-native species) have been suggested, but not confirmed, by scientific studies. Conversely, a long-term study (1984-2001) comparing icthyofauna of the sandy shore of the Northern Red Sea assessing fish assemblages before the commencement of marine aquaculture, during the buildup phase (<100 tonnes per annum), and during full production (2000 tonnes per annum) found no significant change in number of individuals, number of species, biomass per sample, or cumulative number of species (Golani and Lerner 2007).

6.1.2 Aquatic Animal Health

6.1.2.1 Infectious Disease Interactions between Wild and Farmed Fish

Like terrestrial animals and humans, aquatic animals, such as fish, mollusks, and crustaceans, can become sick due to infectious diseases. Disease is a complex process

that involves a pathogen (a disease-causing agent such as virus, bacteria, or parasite), a susceptible host (fish or shellfish), a sufficient number or "dose" of pathogens to overcome the immune system of the aquatic animal in order to cause disease, and an aquatic environment that favors the pathogen and/or stresses the susceptible host. Wild and cultured aquatic animals are known to experience stress due to a variety of causes and this may increase their susceptibility to sickness.

Water moves freely between farmed fish in cages/pens and the open marine environment. Outbreaks of disease from pathogens have been observed in farmed fish. Further, escapes have occurred from farms where disease from pathogens may be occurring. There is no scientific evidence to suggest a significant risk of pathogen transmission from farmed aquatic animals to wild populations or from escaping farmed aquatic animals inter-mingling with wild stocks when the farmed fish start with pathogen free juveniles stocked in ponds or pens.

Both wild and farmed aquatic animals alike are constantly exposed to pathogens in the aquatic environment. These pathogens are part of the natural fauna and although wild marine organisms typically serve as carriers of these pathogens, disease actually occurs only when the pathogen overcomes its host's immune system; for example, humans are frequent carriers of *Streptococci* in their throats and influenza in their noses, but unless their immune systems are compromised in some way, they do not become sick.

Experience with commercial production of non-salmonid marine fish in hatcheries and open ocean systems in the United States is limited, though experiences in New Hampshire, Hawaii and Puerto Rico are increasing the existing knowledge base. On the other hand, this type of aquaculture has been practiced for many years in many countries in Asia and Europe and the U.S. has over forty years of experience working with salmon in open water marine pens. At commercial salmon hatcheries, juveniles are reared in fresh water typically from springs or wells which minimize exposure to serious diseases. Before transfer to saltwater the fish are required by State laws of Washington and Maine to be free of certain diseases. Other States, such as Texas and Florida, require that transfers of fish are carried out under the auspices of a permit issued by the State. Conditions can then be placed in these permits that would require pre-transfer inspections for disease.

After transfer to marine pens, fish may be exposed to pathogens already existing in the environment. Because of the high fish densities that are typical in cages or pens it is possible for pathogens to spread through the captive population and multiply sufficiently to cause an outbreak of disease. The trigger for these outbreaks may be alterations in environmental conditions (e.g. temperature), or perhaps handling during farm operations. There are no data to indicate that diseases that have occurred in marine fish farms in North America have been a pathway for the introduction of foreign or exotic diseases. Further, studies have shown that within a few meters of a marine net-pen experiencing a disease outbreak levels of pathogens shed are rapidly diluted – possibly to doses that are insufficient to initiate infections in healthy wild or farmed fish (Rose et al. 1989).

Observations and mathematical models developed by Canadian researchers (Morton et al. 2005; Krkosek et al. 2005) suggest that salmon farms in British Columbia have shed sea lice to the extent of causing significant infections in wild juvenile Pacific salmon. These authors have further postulated that the marine salmon farms are responsible for depressions in the wild salmon populations, to include the low return of adult pink salmon (*Oncorhynchus gorbuscha*) to the Broughton Archipelago. These assertions were made without data on the actual prevalence of sea lice on the salmon farms and without consideration of alternative hosts such as wild non-salmonid marine species serving as a source of infection for the wild salmon. Subsequent published reports provide data that demonstrate wild three-spine stickleback (*Gasterosteus aculeatus*) are carriers of sea lice (Jones et al. 2006). Other studies suggest that levels of lice fluctuate significantly year to year due to climatic conditions, currents, and salinity of seawater (Brooks 2005), and that wild salmon populations and farmed salmon can coexist successfully in the marine waters of British Columbia, Canada (Beamish et al, 2006). These most recent scientific studies appear to refute the conclusions of Morton et al. (2005) and Krkosek et al. (2005).

Disease outbreaks also occur in populations of wild aquatic animals. Significant disease events have been observed when large numbers of wild fish aggregate, such as at spawning time, or when there are stressful environmental conditions like prolonged elevated water temperatures in the summer; for example, an outbreak of viral hemorrhagic septicemia, a naturally-occurring disease in marine waters, caused significant mortality in wild pilchard and herring in the northeast Pacific Ocean (Traxler et al. 1999).

The transfer of pathogens from one geographic region to another via the intentional or natural movement of fish or shellfish is possible. One example is the white spot syndrome virus (WSSV) in live shrimp transferred from Asia to South America. This introduction was caused by illegal movements of shrimp and improper health inspections prior to legal shipments. Another example is the accidental introduction by the government of Norway of the ectoparasite, *Gyrodactylus salaris (G. salaris),* from the Baltic Sea region in Sweden to Norway. This introduction occurred due to inadequate health inspections prior to transfer of the juvenile salmon. Although the United States currently has regulations governing the movement of some pathogens from entering the country, those regulations only address the importation of salmonid species and their gametes. There are no current regulations governing the movement of pathogens associated with other fish families. In recent years the Animal and Plant Health Inspection Service (APHIS), NOAA, and USFWS have been tasked with developing a National Aquatic Animal Health Policy by the Joint Subcommittee for Aquaculture. This document is supposed to address issues of importation of all aquatic species and associated pathogens of concern, although such general importation legislative authorities and regulations have not yet been developed. The APHIS recently placed restrictions on interstate movement of aquaculture animals infected with certain viral pathogens and parasites, and some states have authority over aquaculture pathogens within their borders. There are no current regulations governing aquatic pathogens in the EEZ, although steps are currently being taken by both the United States and Canada to strengthen protective measures by augmenting their respective aquatic animal health policies and regulations.

Escape of farmed fish from marine net-pens is well documented. However, the ability of such escapees to spread disease to wild aquatic animals is thought to be limited because many of the farmed fish quickly become easy victims of predators. Should escapees be carrying a disease agent, the likelihood of their being the principal source of an outbreak in wild fish is remote because (i) any pathogens they carry are typically those to which the wild fish are routinely exposed; (ii) escapees are unlikely to generate enough infection pressure to result in disease in a healthy wild stock, and (iii) environmental factors play a larger role in triggering a disease event than the presence of a pathogen (Amos and Appleby 2001, and Amos and Olivier 2002).

In summary, the risk of transfer of disease from farmed fish to wild aquatic animals is low. There are examples of exotic diseases introduced by farmed aquatic animals resulting in disease events in native wild animals and other farmed animals, as in the case of *G. salaris* in Norway and WSSV in shrimp in South America. Disease outbreaks occur in both wild and farmed aquatic animals, but there is little scientific data to link disease episodes in wild populations to farmed animals, with the exceptions of exotic/foreign diseases. Notable exotic disease introductions by farmed aquatic animals have been the result of inadequate health inspections or illegal imports. Infectious diseases can be prevented or controlled at farms. Vaccines play an important role in protecting farmed fish from disease.

6.1.2.2 Therapies to Prevent and Control Infectious Diseases

Infectious diseases in cultured marine animals can result in mortality and decreased efficiencies in production due to slowed or altered growth patterns. To prevent or control infectious disease events the primary tools used by culturists are biologics (vaccines), antimicrobials such as antibiotics, external therapies such as drugs/chemicals that are applied via the aqueous rearing environment of the animal, and good or 'best management practices' (BMPs).

The most common biologics used for farmed fish are vaccines. Similar to vaccines used in human and terrestrial animal medicine, vaccines are injected into the host and the host subsequently develops immunity from the specific disease for which the vaccine was prepared. In finfish aquaculture, vaccines have been successfully used to prevent a variety of bacterial diseases, including vibriosis and furunculosis, and some viral diseases such as IHN and ISA. Scientific studies are in progress to develop vaccines for external parasites. All vaccines for use on fish destined for human consumption must be approved by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Agency – the federal agency responsible for regulating animal biologics. These approved vaccines have been determined by the USDA to be safe and effective for the aquatic host being vaccinated, and safe for the environment and the human consumer.

Antimicrobials are compounds used to treat animals that are infected with pathogens. The most common of the antimicrobials used in finfish aquaculture are antibiotics. Antibiotics are also used in human and animal medicine. Their primary function is to

treat diseases caused by bacteria. They function as bacteriostats (stop the bacteria from effectively reproducing in the host), or as bactericides (kill the bacteria in the host). All antibiotics used in the United States for animals must be approved for use by the U.S. Food and Drug Administration (FDA), Center for Veterinary Medicine. Before an antibiotic is approved for use it must be evaluated for target animal safety, efficacy, human food safety, and environmental safety. The FDA approval process takes several years and costs millions of dollars. Currently, there are three antibiotics approved for use in finfish. Antibiotics are applied by either as an ingredient of the feed or by an injection. Regardless of route of administration, careful guidelines must be followed for dose and withdrawal times. Prescription and the administration of antibiotics are made at the direction of a licensed veterinarian.

There is a concern by some that antibiotics in uneaten fish food may pass through nets, settle to the benthos, and potentially impact resident organisms. A concern has been raised that the potential exists for these antibiotic residues to induce drug-resistant strains of human pathogens. Studies indicate that oxytetracycline may persist in sediments below pens for a period of time, but there is no indication that these residues have had long-term negative impacts on the environment or have caused human health problems. Globally, the use of vaccines to prevent bacterial diseases has in the past twenty years reduced the use of antibiotics in marine farming by 95 percent.

Other types of drugs applied to fish are compounds to kill parasites. Sometimes these compounds are applied in the feed while in others they are applied as a bath to kill external parasites or bacteria on the skin of the fish. Like antimicrobials, use of these compounds depends on approval by the FDA or the Environmental Protection Agency – EPA (EPA is the lead federal agency if the compound is a pesticide and not a drug) and must be effective, safe for the host, safe for humans, and safe for the environment.

6.1.2.3 Measures to Protect the Health of Wild and Cultured Stocks

Prevention is the preferred method to deal with aquatic animal health issues. Three approaches need to be considered: 1) use of good management practices/BMPs by the fish culturist; 2) an ongoing fish health monitoring program by an aquatic animal health specialist; and, 3) a regulatory structure that supports aquaculture and wild stocks by preventing the introduction and dissemination of foreign or exotic diseases.

The fish farmer is the primary health giver for cultured animals. Attention must be given to providing bio-security to the culture site, practicing appropriate sanitary measures and following good management practices for fish culture. These practices include rapid removal of mortality, appropriate rearing densities, good record keeping, and working with an aquatic animal health expert in developing and implementing the health program.

The aquatic animal health expert, defined as a licensed doctor of veterinary medicine or certified by American Fisheries Society, Fish Health Section, as a “Fish Pathologist” or “Fish Health Inspector”, is responsible for regular observations and examinations of the

fish, using preventative measures, such as vaccines, directing the use of approved drugs as appropriate and notifying government officials upon discovery of a serious or 'reportable' disease.

The third measure of prevention is policies and regulations administered by State and Federal agencies. USDA/APHIS is the lead federal agency responsible for the health of all farmed animals. NOAA Fisheries and the U.S. Fish and Wildlife Service are the federal agencies that share responsibility for wild and feral aquatic animals. All three agencies work closely with States and Tribes that also have their respective aquatic health polices and regulations. Historically, States have been effective in developing and implementing regulations to prevent the introduction of exotic diseases. Since 2002, when the Animal Health Act was passed by Congress, USDA/APHIS has initiated programs to address the import of diseases of concern. In cooperation and collaboration with APHIS, NOAA Fisheries and the Fish and Wildlife Service are developing a national aquatic animal health plan. This plan is scheduled to be completed this summer with implementation to follow as resources allow. By utilizing all three mechanisms to manage aquatic diseases, the experiences of introducing or spreading serious diseases, such as the Norwegian experience with *G. salaries*, should be avoided.

6.1.3 Effluents from Marine Fish Culture Facilities

6.1.3.1 Effects on Benthos from Solids and Dissolved Nutrients

The responsibilities of the United States Environmental Protection Agency (EPA) include regulation of the country's coastal and offshore marine environments. For many years the Agency has continued to set parameters, both onshore and offshore, in which industries may operate. One is the marine aquaculture industry, and regulations are imposed through National Pollutant Discharge and Elimination System (NPDES) permits. The environments essential to fish habitats are managed by the Magnuson-Stevens Reauthorization Act of 2006 (MSFCMA), which continues to manage the fisheries and promote conservation, and the recently introduced National Offshore Aquaculture Act of 2007 (Appendix B) is designed to produce economic benefits and food production while ensuring the development of regulatory standards to protect marine ecosystems.

Today, concentrated aquatic animal production facilities, or marine fish farms, are being planned for operation much further offshore, and specifically inside the Exclusive Economic Zone (EEZ) of 3-200 miles. Consequently the effects of fish and shellfish farms in the deep water environments are significantly fewer than those near-shore, and have significantly less impacts. Primarily this is because the cumulative impacts of any uneaten feed and fish feces are significantly lower as these products are rapidly dissipated or consumed by a variety of marine species without concentrating their numbers and accumulating farm impacts. Secondly, the deep water enables a clustering of cages or crops so that it possible to consider a concentration of grow-out units and farms. With all the potentials for the benefits of depth, lay-out, and use of farm effluents, operations in deep water offshore have few environmental consequences.

It is practical and possible for NOAA to propose quality standards for the protection of marine ecosystems in the vicinity of aquaculture sites. These are being selected carefully and guided by effluent limitations and new source performance standards for the concentrated aquatic animal production point source category (Clean Water Act 2004); by ongoing national studies (NOAA 2001), general guidelines (Cole et al. 1999), and research and development by universities, such as the University of New Hampshire, and private farms in Hawaii and Puerto Rico. Primarily the current standards are the most qualitative. Marine farms in coastal waters, mostly for fish species, have been in existence all over the world for many years. Their impacts on their immediate environment have been measured and monitored continuously for respective regulatory authorities, and many sites have been the focus of innumerable ongoing research programs. Consequently experience now shows that some parameters are much more indicative of meaningful changes in the conditions of the environment than others, and these are proposed for management.

Secondly the standards are quantitative. Again, because of the accumulation of data regarding environmental change over time, most of which has been faithfully documented in scientific and technical literature, numerical levels of these parameters at which risks to the environment are becoming no longer acceptable are now identifiable, and it is these levels which are proposed. Finally, the procedures to measure the standards are relatively straightforward and inexpensive to carry out. Consequently it is intended that the parameters proposed are monitored frequently during the routine operations at any site, and do not impose any unnecessary or restrictive financial burden.

The relevant perceived risks of the field of marine fish culture as identified by international experts are divided into eight main categories (Nash et al. 2005). The two most important are (i) the risks of increased organic loading on the benthos, and (ii) the nutrient enrichment of the water column. The effects of organic effluents to and from the fish farm environments have been studied now for some forty years. Consequently the assessments of risks of fish farming and management have been summarized by Hargrave et al. (1997), Hambrey and Southall (2002), Levings et al. (2002), Brooks and Mahnken (2003), and Pérez et al. (2003); Scottish Executive Central Research Unit (2002), the British Columbia Ministry of Water, Air, and Land Protection (MWLAP 2002); and the International Council for the Exploration of the Sea (ICES 2002-2004).

A review of these risk assessments show that the majority of effects are based on the past and current farming practices for Atlantic salmon in specific countries, and only a few other marine fish. These assessments are by many countries specifically relevant to their coastal environments; for example, aquaculture in the fjords of Norway (Maroni 2000; Kutti et al. 2007a, 2007b); among the islands of the west coast of Scotland (SEPA 2000, 2005), in the cold waters of Sweden (Ackefors 2000) and Finland (Varjopuro et al. 2000); and south in Australia and Tasmania (ANZECC 1992, Walker and Waring 1998, and Macleod and Forbes 2004). Most of the European standards of marine fish culture which have emerged are based on the Norwegian and Scottish experiences and long-established data-bases, and have been summarized for Europe by Fernandes et al. (2001), Fernandes

and Read (2001), and Henderson and Davies (2001). However, it is necessary to remember that the farming areas around both Scandinavia and Europe currently are quite shallow because the net-pens are relatively close to shore. In the U.S., the EPA has developed NPDES standards concentrated aquatic animal point sources (see Appendix H).

Four standards are commonly recognized as the key indicators of change and potential environmental impact in and around an aquaculture site. These are:

(i) Total volatile solids (TVS) in the sediment,
(ii) The redox potential (eH) of the sediment,
(iii) The presence of soluble hydrogen sulfide (free sulfide) in the sediment,
(iv) Dissolved inorganic nutrients, nitrogen and phosphorus, in the water column.

TVS is an alternative measure of the suspended or dissolved organic matter in any aquatic habitat which is volatile. This measure is a good but crude indicator of the biological and chemical effects in the sediments beneath and around fish farms; however, it is the preferred indicator for monitoring the benthic impact of any fish farm. Determination of the redox potential (eH) in the sediment beneath and around a farm site provides an accurate indication of its stability and quality, and the reduction and oxidation characteristics of the sediment. The increased concentration of sulfides on the sediment beneath fish farms is another consequence of the continuous deposition and degradation of organic wastes. In such anaerobic conditions, these wastes are rapidly metabolized by the reduction of sulfates to sulfides by bacteria. Finally, it is important to prevent the development of noxious conditions above the substrate for the epifauna. In addition to toxicity such conditions can lead to eutrophication, resulting in concomitant reductions in dissolved oxygen levels or production of harmful algal blooms.

There are four optional standards which are useful indicators of some changes occurring in the environment. However, these are not imperative to determine every time as they do not provide information that cannot be deduced from the four priority standards. These four secondary standards are:

Dissolved oxygen levels in the water column,
The presence of chlorophyll-a,
The acidity or alkalinity (pH) of the water column, and
Suspended solids

The purpose for the standard of dissolved oxygen levels in the marine water column is to prevent the development of anoxic conditions which would impair the physiological processes and metabolism of aquatic organisms, and to maintain the natural balance of species populations within the ecosystem. Chlorophyll-a is a plant pigment used to determine the amount of algal biomass, or standing stock of phytoplankton, present in a body of water. Excessive amounts of chlorophyll-a indicate an algal bloom that may reduce water clarity and may result in depleted oxygen levels; therefore the algal bloom conditions are defined by routine chlorophyll measurements.

Recent environmental monitoring studies conducted off Puerto Rico and New Hampshire indicate benthic and organic loading tends to be fairly localized around open-ocean aquaculture cages (Alston et al. 2005; Rapp 2006; UNH Marine Aquaculture Center 2006). Alston et al. (2005) conducted bimonthly chemical and macroinvertebrate sampling at a control site and sites 0, 20, and 40 meters away from two cages off the coast of Puerto Rico in 2002 and 2003. There were no significant differences among sampling sites in ammonia-N, nitrate-N, nitrite-N, or phosphate concentrations in the water column. Similarly, there were no significant differences detected among sampling sites in organic matter or organic nitrogen in the sediments, organic nitrogen beneath the cages, organic matter among sampling stations, and total carbon beneath the cages (Alston et al. 2005).

Rapp (2006) conducted additional environmental monitoring at the same fish cage assessed in the Alston et al. (2005) study. This study was conducted for 15 consecutive months in 2004 through 2005. Organic and benthic loading was measured at four stations along a transect extending immediately under the cage out to 100 m away from the cage. No organic loading in the benthic water was observed for the first seven months of the study. In the eighth month of the study and thereafter an increase in benthic water organic loading was observed. This increase was attributed to a change in composition and integrity of the fish feed (Rapp 2006). The study reported no increase in organic loading in the sediment for the duration of the project. Organic loading in the water column did not integrate into the sediment because of the composition of the sediment ($CaCO_3$) and high current speeds near the benthos (Rapp 2006).

Since the late 1990s research has also been conducted at experimental aquaculture cages off the coast of New Hampshire (UNH Marine Aquaculture Center 2006). A series of sampling sites surrounding the cages was used to monitor water quality and benthic sediments. Since 1997, no change in the particulate organic content of bottom sediments has occurred (UNH Marine Aquaculture Center 2006). There is also no evidence of aquaculture activities affecting water quality parameters (e.g., suspended sediments, chlorophyll, and dissolved oxygen). Dissolved oxygen did decline near the bottom in fall 2006, but this decline was attributed to cooling of the water column and annual variations in dissolved oxygen in the Gulf of Maine region. Pollution intolerant benthic taxa represented a majority of taxa at sampling sites and there were no discernable trends among study sites. The study also examined species diversity and evenness, finding no significant differences in benthic taxa (pollution tolerant vs. intolerant) among study sites. However, the study did find significantly lower means for total community taxa in impact zones surrounding the cages suggesting early signs of increased organic loading. Additional studies and monitoring are now ongoing.

6.1.4 Physical Interaction with Marine Wildlife

There are a number of physical interfaces of aquaculture facilities and activities on marine wildlife. The specific sources which pose potential risks to marine wildlife include any floating or submerged structures themselves, any nets, ropes, anchor lines,

and anchors for structures; garbage lost by a farm; and artificial lighting. The route of exposure of any physical interaction between marine aquaculture and migratory wildlife is simply the existence of aquaculture structures in their migratory pathways, or in their habitats such as feeding or breeding grounds. Physical interaction with marine wildlife can result in entanglement in nets in place, structures, and/or moorings etc; entanglement with lost nets and other jetsam; attraction of wildlife species disrupting the natural patterns of migrants or displacing them from an area, and predator control methods.

Based on experience from operational facilities in Hawaii, New Hampshire, and Puerto Rico, interactions with marine wildlife appear to be minimal with no negative effects. Using on-site monitoring, no effects have been seen with marine mammals in Hawaii or Puerto Rico; the only noticeable problem was shark interactions in the Bahamas because of poor management practices in removing mortalitites in a timely manner from pens.

Nash et al. (2005) included a template that outlines an approach for conducting a risk assessment for physical interactions with marine wildlife, as well as ways to reduce the potential risks to low levels. Information applicable to offshore aquaculture in the Gulf of Mexico is provided in the following subsections.

6.1.4.1 Entanglement

Marine aquaculture activities in offshore environments pose a potential risk to wildlife because the facilities incorporate structures that use nets, ropes, or twine, all of which may be opportunities for their entrapment and entanglement. Of particular danger to marine mammals and turtles for entanglement are lines or ropes that are small in diameter, slack in the water, and possibly floating near the surface. Drowning after entrapment in or around a netted structure is a possible cause of loss, together with starvation following entanglement or consumption of discarded or lost debris from a farm, such as a piece of rope or plastic.

In the Gulf of Mexico, offshore dolphins pose the greatest risk of physical interactions with aquaculture facilities because they are more likely to remain around facilities than more migratory species. Reports in Australia and New Zealand document bottlenose dolphin drowning as a result of net pen entanglement. Offshore facilities in New Zealand also have documented marine mammal entanglements.

All five species of sea turtles risk entanglement because of their migratory nature. Although there no published reports of sea turtles being entangled in aquaculture facilities, leatherback sea turtles are the most likely to be become entangled or impacted by debris from facilities. This is because in addition to their pelagic offshore nature, their susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), their attraction to gelatinous organisms and algae that collect on lines kept in the water. Section 5.2.2.3 provides a list of species currently considered by the MMPA and ESA for the Gulf and the potential actions to determine the impact of aquaculture on these species.

Despite the potential risks, entanglements are unlikely if anchor lines and nets are kept taut at all times.

Since 1997, the University of New Hampshire has been monitoring marine turtles and mammals at an offshore aquaculture site near the Isle of Shoals. No interactions have occurred between during the course of the research project, although whales have been observed in the vicinity of the research site (UNH Marine Aquaculture Center 2006).

NOAA Fisheries' Office of Protected Resources conducted a workshop in 1999 to identify ways to avoid or minimize interactions between aquaculture operations and marine mammals and turtles. Potential permit requirements may include inspections of the facility via SCUBA and/or boat surveys by observers experienced in the collection of information on the presence of any listed species or marine mammals in the area. Weather permitting, daily inspection of net pens or cages may be required, regardless of whether or not stocked fish are present, so that information can be collected on the presence of marine mammals or listed species around the facility and their interactions with aquaculture gears. Reporting requirements such as monthly survey reports may also be specified. Information for each listed species and marine mammal observation may include: date, time, location of sighting on track line (either latitude or longitude or LORAN), visibility (distance), weather/cloud cover, sea state (use Beaufort scale), species and number of any observed listed species or marine mammals, approximate location of animals relative to vessel (distance and bearing), duration of sighting, (i.e., how long a particular animal or group of animals was observed), brief description of observed behaviors (feeding, diving, resting, breaching, etc.), description of interaction with net pen, a diagram of the actual track line followed, and the survey length.

6.1.4.2 Attraction of Wildlife

Wildlife may be attracted to aquaculture facilities as potential sources of food, shelter, and rest. A large cross section of marine wildlife is attracted to floating or submerged structures. Marine structures are primarily habitats where food can be found, and a place for rest and shelter. Fish aggregate in numbers to feed on smaller aquatic animals and plants that colonize around and on the structures. In other cases, wildlife may simply find them to be an obstruction in a migratory pathway or in a breeding area. Wildlife not necessarily close to a facility may also try to eat or play with garbage that has been lost from the facility.

Around structures close to the shoreline, marine mammals and birds are common visitors. The attraction is not just the chance opportunity to feed on the fish and shellfish being farmed, together with their feed, but other wildlife attracted to the area. Further offshore, the more common wildlife visitors focused on food are predatory elasmobranchs, such as sharks. The very presence of fish being cultivated may also serve as powerful attractants to marine mammals and birds that normally feed on similar or the same fish stocks in nature. Birds can potentially be entangled in nets while trying to feed on fish enclosed by the nets or cages. Above-surface lights on aquaculture facilities may also attract nocturnal birds to the facilities and thereby subject them to potential injury or death due

to collision or entanglement with exposed structures. Exposed wiring and cables pose particular hazards to birds due to potential collision with and entanglement in them. Reference by applicants to the USFWS guidelines for design and placement of communication towers, available on the USFWS web site (www.fws.gov) may help in minimizing harmful interactions with birds at aquaculture facilities. Wildlife, such as whales, porpoises, and migratory marine turtles may also visit sites looking for shelter and rest. Aggregation of birds and fish around structures pose the risk of changes to animal or bird foraging and migration patterns.

Aquaculture structures are typically fitted with one or two light units. However, the lights are secured in place about 4-5 m above the bottom, in order to create an effective of 10 lx (about 1 ft candle) in the furthest corner. This light level is weak, and in temperate waters is attenuated to 1 percent within 10-20 m from the perimeter of the net-pen, and less when the net is beginning to accumulate bio-fouling organisms. Therefore the risk of such lighting directly impacting the migration of juvenile fish, or attracting forage fish and predators is very low. Moreover, net-pen complexes are in waters up to 40 m deep, and typically only larger or migratory juveniles would have the opportunity to interact with a complex, and when out-migrations are taking place.

Visual surveys conducted before and after installation of sea cages at Snapperfarm's aquaculture site in Puerto Rico indicate both species richness and abundance of wild species increased after deployment of cages (Alston et al. 2005). The cages acted as fish aggregating devices, with most fish (> 90 percent) attracted to the site belonging to the jack family (Alston et al. 2005). Additionally, a decrease in benthic macroinvertebrates was observed immediately beneath the cages when compared to control sites.

The University of New Hampshire has conducted 15 videography cruises since 2002 to track changes in benthic epifauna around several experimental aquaculture cages (UNH Marine Aquaculture Center 2006). Some differences in the total number of species were observed between spring and fall 2006. An increase in the number of northern sea stars surrounding the cages was observed and partially attributed to cleaning of biofouling from the fish cages and strong storm activity, which exposed additional food sources. Once the short-term supply of food resulting from the cleaning of the cages had dissipated, the northern sea stars dispersed.

6.1.4.3 Predator Control

As noted previously, predators may be attracted to marine aquaculture sites since they supply and abundant source of food. Most of the literature to date concerning nuisance predators has focused on pinnipeds (seals, sea lions), which do not occur in the Gulf of Mexico. In the Gulf of Mexico, sharks and offshore bottlenose dolphins stocks are likely to be the most common predators.

To curb predation, many marine fish farms worldwide employ control methods which exclude, harass, or remove predators. One such method, predator netting, creates a barrier which protects farmed fish from attacks by airborne or under water predators.

Commercial acoustic deterrents have not proved to be effective against any of these visitors, as both animals and birds quickly get used to them, and for the most part they are no longer used or are prohibited by law.

Shark predation has led to major production loss in the Bahamas (Bennetti, pers. comm.). Collaboration with other institutions and the private sector, a major effort is currently being placed on anti-predator systems, including predator nets, solid barriers, electromagnetic and magnetic fields and chemical and electrical repellants to address shark predation.

Cetaceans have not been reported to consume fish or shellfish out of farms, but have been known to get entangled in equipment, resulting in self injury, damage to gear and release of fish. Dolphin predation is more problematic because of their protected status and ability to quickly adapt.

6.1.5 Competing Uses

The development of offshore aquaculture will require the production facility to have exclusive access to the portion of the ocean where they operate. The exclusive use of an area means that the offshore aquaculture firms will compete for space in federal waters with other activities[7] (Cicin-Sain et al. 2001). Because various users are competing for the same area of the ocean, it is important to consider the interactions of various user groups during the permitting process (Rieser and Branick 1998).

In the Gulf of Mexico, aquaculture firms will primarily compete with commercial and recreational fishers and with commercial vessels and recreational boaters for navigable waters. When considering offshore aquaculture, Knapp (2006) concluded that fewer direct conflicts with other users would be realized relative to nearshore aquaculture. Finally, as discussed in more detail in Section 7, the amount of open space occupied by offshore aquaculture facilities is likely to be exceedingly limited in relation to the total amount of available space. This would suggest that conflicts with competing uses may be relatively minor.

The following sections discuss some of these potential conflicts of this proposed EIS and the objectives of other federal, regional, and state resource use plans, policies, and controls for the area concerned.

6.1.5.1 Fishing Grounds

Conflicts between aquaculture firms and commercial or recreational fishers could arise if the aquaculture site is a desirable fishing area or if the site attracts fish. Alston et al (2005) conducted a study as part of a demonstration project to assess the possible environmental effects involved in the culture of mutton snapper (*Lutjanus analis*) and

7 For example, navigation, fishing, offshore oil development, military activities, recreation, and conservation

cobia (*Rachycentron canadum*) in submerged open-ocean cages in Puerto Rico. Alston et al stated in their research findings that "*A monthly visual census was made of the composition and relative abundance of fish aggregating at the cage site before the cages were installed and after fish were stocked and cultured. A high diversity and abundance of fish were found near the cages after stocking occurred. The pelagic and reef fishes around the pen may represent an expansion of the resources available to the fishermen and therefore a possible increase in fishing potential.* ***More research is needed to determine if the wild fish assemblage is benefiting directly or indirectly from additional nutrients from the aquaculture activity or if the cage structures naturally accumulate organisms and are simply serving as a substrate."*** Alston et al's (2005) research seems to indicate that fishers could benefit from the aquaculture activity, if they are able to access fish close to the pens. On the other hand, if the sites attract fish and fishers trying to harvest those species interfere with the aquaculture facility, conflicts could be exacerbated.

Commercial harvesters using trawl gear would need to maintain sufficient separation from the nets/pens when fishing. Entanglements between trawl gear and nets/pens could result in escapement from the facility and damage to both the fishing vessel's gear and the aquaculture facility. To minimize interactions, the nets/pens will be clearly marked.

It is important to ensure that traditional fishing grounds are considered by NOAA Fisheries Service during the siting process to ensure that conflicts are minimized. The Council's preferred alternative would not establish aquaculture zones, but would establish criteria for siting marine aquaculture facilities. Part of that siting criterion could be the consideration of historic fishing areas, in addition to the water depth and currents.

Not all interactions between the aquaculture industry and fishers are negative. The conflict resolution between recreational fishers and Texas marine aquaculture interests would have been easier if stakeholders entered the decision-making process earlier (Harvey and McKinney 2002). They concluded that if the process for determining usage of an area was viewed as fair, the participants are more willing to live with the outcome. To ensure that the process is viewed as fair all users of the resource must have a voice in the process.

Barnaby and Adams (2002) also found that commercial and recreational fishers could develop opportunities to work with offshore aquaculture businesses or start their own firm. Their knowledge of the ocean and access to vessels could prove to be of value to firms that need to transport crew, supplies, and products to and from the offshore facilities; potentially creating a symbiotic relationship.

6.1.5.2 Navigation

Because the USCG and ACOE regulate navigable waters, aquaculture firms must comply with their regulations in addition to those implemented as part of this FMP. The U.S. Coast Guard (14 U.S.C. 83 *et seq.*) requires that aquaculture structures located in navigable waters must be marked with lights and signals. The Coast Guard requirement

is similar to this FMP's permit requirement that states "*As condition of permit the applicant must agree agree to maintain a minimum of one locating device on each pen or enclosure and immediately notify NOAA Fisheries Service in the event the pen or any retention aquaculture enclosure is lost at sea.*" Pens could be marked with lights and markers as part of the locating devise required in this action. The lights and markers required should reduce unintentional conflicts with vessels navigating past the permitted aquaculture area. Persons intentionally interfering with a permitted aquaculture site could face fines or other penalties imposed by federal enforcement agencies.

The Rivers and Harbors Act (33 U.S.C. 403) requires a Section 10 permit for activities in or affecting the navigable waters of the United States, including installations and other devices permanently or temporarily attached to the seabed, erected for the purpose of exploring for, developing or producing resources from the outer continental shelf. Therefore, the aquaculture permit applicant will need to obtain a siting permit from the NOAA Fisheries Service and the Army Corps of Engineers. As discussed in Section 7, the permit applicant would be required to provide NOAA Fisheries Service with copies of state, ACOE and EPA permits and monitoring reports. The ACOE report will allow NOAA Fisheries Service to ensure that the permit holder has met the requirements of the Rivers and Harbors Act for siting a structure in navigable waters.

Implementing the requirements discussed above should minimize unintentional navigation conflicts. When conflicts result from intentional actions, those disputes would be settled through the enforcement/legal process.

6.1.6 Economic and Social Impacts on Domestic Fisheries

The economic and social impacts on domestic fisheries are discussed in detail in Section 5.4. That discussion is included here by reference.

6.1.7 Harvest of Prey Species for Feed

Baitfishes worldwide are under increasing fishing pressure due to expansion of the global aquaculture industry and demand from poultry and livestock farms. Because available fish meal and fish oils are not likely to increase, producers will need to find alternative sources of feed protein as the aquaculture industry continues to grow. In November 2007, NOAA Fisheries Service and the USDA began soliciting input and ideas from stakeholders on ways to lessen dependence on fish-based aquaculture feeds. Input was accepted through February 29, 2008. For more information about this initiative, including public comments received, go to: http://aquaculture.noaa.gov/news/feeds.html.

Worldwide approximately 25-30 million tons of fish are reduced to fish meal and fish oil annually (Tacon et al. 2006). This amount has generally been stable since the early 1970s (Tacon et al. 2006). Species from the Families Engraulidae (anchovies) and Clupeidae (includes menhaden) represent 89 percent of the fish destined for fish meal production worldwide (FAO 2005). The top species caught for production of fish meal globally include: Peruvian anchovy (6.2 million tons), blue whiting (2.38 million tons),

Japanese anchovy (2.09 million tons), Atlantic herring (1.96 million tons), and chub mackerel (1.86 million tons). Gulf menhaden are 11th worldwide in total tonnage converted for purposes of fish meal. In 2003, 0.53 million tons were converted to fish meal and oils (Tacon et al. 2006). This accounted for 2.4 percent of the worldwide fish (in pounds) converted to fishmeal in 2003. Overall, the United States accounted for 5.6 percent of the worldwide fishmeal production in 2003 and 9.6 percent of the worldwide fish oil production in 2003 (Tacon et al. 2006).

Worldwide, the amount of fishmeal available for export from other countries has decreased in more recent years due to expanding aquaculture sectors and increasing domestic fishmeal demands, especially in countries such as Chile, Norway, Thailand, and Japan (FAO 2005; Tacon et al. 2006). Southeast Asia, Europe, Russia, and Canada currently account for a majority of the worldwide imports of both fishmeal and fishoil. The increased demand for fishmeal in China has been driven by the rapidly growing aquaculture and livestock sectors, relaxation of Chinese import duty/tax rates, and the reduced demand for fishmeal from Peru and Chile by European Union countries (Jystad 2001; Tuan et al. 2004). Worldwide, it is estimated that in 2003 the aquaculture sector used 20-25 million tons of fish for feed to produce 30 million tons of farmed finfish and crustaceans (Tacon et al. 2006).

Although fishmeal and fishoil production has been stable worldwide, there is growing concern that demand may outpace supply. A significant amount of research is currently underway to find dietary supplements for fishmeal and fish feeds, such as plant proteins and oils and animal byproducts (Tacon et al. 2006). Currently, aquaculture accounts for 46 percent of the worldwide use of fishmeal and 81 percent of the worldwide use of fish oil (Tacon et al. 2006). Predictions for future use vary, with some projecting increases in fishmeal and fish oil use for aquaculture feeds, while others predicting decreases. Regardless, the United States is well positioned to manage demand for aquaculture feeds.

In the United States, Gulf and Atlantic menhaden represent the greatest source of fish meal production, with Atlantic herrings and Californian pilchards accounted for a lesser amount of U.S. fishmeal and fish oil production. As discussed in Section 5.2.3.4, Gulf and Atlantic menhaden are not overfished and are not undergoing overfishing. Both species are managed by interstate compacts and assessments are conducted every four to five years by NOAA Fisheries Service. If demand for these species increases due to development of an aquaculture industry in the Gulf of Mexico and increases in livestock feeds, then stock assessments will be used to assess the status of each of these populations. Necessary management adjustments could then be made on the basis of the assessments if fishing mortality is too high or stock biomass has dropped below threshold levels.

6.2 Action 1: Aquaculture Permit Requirements, Eligibility, and Transferability

The Council is considering three alternatives for permitting aquaculture facilities. The first alternative is to maintain the current practice of issuing EFPs for aquaculture

facilities. The second is to require a NOAA Fisheries Service permit to operate an offshore aquaculture facility. The third alternative requires both a siting permit as well as an operational permit.

U.S. per capita seafood consumption is comprised of a combination of domestic and imported product. Between 1990 and 2005, consumption of seafood has advanced from 15.0 pounds per capita (edible meat) to 16.2 pounds (edible meat) per capita (U.S. Department of Commerce 2005). With the population increasing during the same period from 248 million to 295 million, domestic distributors increasingly turned to imported product to satisfy domestic "wants" at an acceptable price. In 1990, for example, the U.S. supply of edible commercial fishery products totaled 12.7 billion pounds (round weight)[8]. Domestic production, equal to 7.0 billion pounds, represented approximately 55 percent of this total while imported product, equal to 5.6 billion pounds, represented the remainder. By 2005, the U.S. supply of edible commercial fishery products had advanced to 18.1 billion pounds (round weight)[9]. Domestic production, equal to 8.0 billion pounds, represented about 45 percent of this total while imported product, equal to 10.2 billion pounds, represented the remainder. Hence, while domestic production increased by approximately 1.0 billion pounds during the 15-year period ending in 2005, imported product increased by 4.6 billion pounds. Much of the increase in imported product represents aquaculture production; which is primarily comprised of shrimp and salmon.

As per capita seafood consumption continues to increase in conjunction with an increasing population, domestic wholesale, and retail suppliers are likely to increasingly turn to imported product to meet the country's demand for seafood at an acceptable price. This reflects two primary factors. First, many of the domestic capture fisheries are already fully utilized (if not overfished) and hence, any significant increase in supply from them is unlikely. Second, global aquaculture has expanded rapidly (an average compounded rate of 8.8% since 1950)[10], which has allowed the placement of additional product on the world market.

Currently, the U.S. seafood trade deficit is about $9 billion (valued at about $1 billion) , and in the absence of significant expansion of the domestic aquaculture program is expected to increase. In recognition of the growing trade deficit, the U.S. Department of Commerce has "called for the development of a domestic [aquaculture] industry worth $5 billion by 2025 (Marine Aquaculture Task Force, 2007)." Much of the emphasis is to be placed on increased production of marine species. This will require the development and implementation of a viable aquaculture policy related to the rearing of marine species in the EEZ. The policy should be crafted in a manner that ensures aquaculture facilities

8 These figures ignore exports (1.9 billion pounds, edible weight) and supply derived from recreational activities (U.S. Dept. of Commerce, 1991).
9 These figures ignore exports (2.9 billion pounds, edible weight) and supply derived from recreational activities (U.S. Dept of Commerce, 2005).
10 Sustainable Marine Aquaculture Task Force report (2007)

operate in an environmentally sound manner that does not pose threats to wild stocks or compromise Council objectives for managing wild fisheries.

6.2.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 1 creates (or does not create) a permitting system for offshore aquaculture in the Gulf of Mexico EEZ. The permitting process is primarily administrative in nature and does not directly affect the physical, biological, or ecological environment. However, it could have indirect effects on the physical, biological, and ecological environments. Under **Alternative 1**, no change in the number of operational aquaculture facilities is expected; therefore, **Alternative 1** would have the least effect on this environment. **Alternative 1** does not require the development of any permitting system, but maintains the status quo of requiring an EFP for the operation of aquaculture facilities. EFPs authorize, for limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited (50 CFR 600.745).

The requirement to procure an EFP before operating an aquaculture facility has proven to be an onerous task that has stifled the offshore aquaculture industry from developing. If an alternative permitting process is developed, as proposed in **Preferred Alternative 2** and **Alternative 3,** there will be an enhanced probability that the Gulf of Mexico offshore aquaculture industry would develop.

Preferred Alternative 2 would create a NOAA Fisheries Service permit to operate an offshore aquaculture facility. **Preferred Alternative 2** would authorize all of the following activities: deployment and operation of allowable aquaculture systems; operation of a hatchery in the Gulf EEZ; harvest of broodstock; possession, landing, and transport of cultured organisms; and, sale of cultured organisms. Additionally, this alternative would require dealers to possess a permit in order to receive cultured organisms and landing would be prohibited at non-U.S. ports. Lastly, permits would be transferable.

The development of an aquaculture industry is expected to have some indirect effects on the physical, biological, and ecological environments including issues discussed in Section 6.1. However, the implementation and use of a permitting process that has a multitude of conditions and requirements designed to monitor and/or negate negative effects on the physical, biological, and ecological environments would be the most prudent avenue to pursue, which is the intent of this FMP. The operational permit proposed under **Preferred Alternative 2** would include operating requirements and restrictions, as well as recordkeeping and reporting requirements (see Actions 2 and 8), tied to the continued operation of a facility under that permit. If it was found that a facility was not complying with aquaculture regulations, the permit could be revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 (see Action 3).

Alternative 3 would create a permitting system with a siting permit specifying the duration, size, and location of an offshore aquaculture facility. This alternative would also create an operating permit that would authorize the same activities as described in **Preferred Alternative 2**. The two-tier permit process in **Alternative 3** presents no additional safeguards to the physical, biological, and ecological environment. Rather, it would result in additional administrative costs and partial duplication of existing siting requirements required by the ACOE. Action 6 is intended to minimize impacts of a facility on the physical, biological, and ecological environment by applying a number of criteria and conditions which dictate where a facility may operate. This siting criteria action accomplishes what would otherwise be achieved by a dual permitting process as proposed under **Alternative 3**. Further, the ACOE will require a permit for siting aquaculture facilities in the EEZ under the authority of the Rivers and Harbors Act. Therefore, potential applicants would be subjected to redundant applications and permits if **Alternative 3** was chosen.

Both **Preferred Alternative 2** and **Alternative 3** would create a standardized permit that managers could authorize or deny based on criteria specified in other actions within this FMP (see Actions 2, 4, 5, 6, and 8). **Alternative 1** would have the least effect on the physical, biological, and ecological environment. The lack of development in the offshore aquaculture industry is not expected to change under **Alternative 1**; however, the intent of this FMP is to create a permitting process to foster the development of an aquaculture industry. Therefore, **Alternative 1** is the least preferred for the purposes of this Action. **Alternative 3** would create a dual permit process, which would create redundancy and unnecessary burden on potential applicants. This redundancy is both external and internal to NOAA Fisheries Service. Externally, the ACOE already has a siting permit requirement under their existing authority; internally, the conditions set forth in the siting criteria (Action 6) action will provide the necessary oversight for proper siting of facilities without the need for an additional permit. **Alternative 3**, by creating a permitting process, would have more of an affect on the physical, biological, and ecological environment than **Alternative 1**, but would accomplish the purpose and goals of this FMP.

Preferred Alternative 2 creates a single permit for regulating aquaculture in the Gulf of Mexico EEZ. In order for a facility to begin and continue operation permit requirements recordkeeping requirements, and reporting requirements would have to be met (see Actions 2 and 8). The conditions and requirements allow managers to efficiently examine the impacts of a facility on the physical, biological, and ecological environment in a standardized manner while still fostering the growth of an aquaculture industry in the EEZ. Additionally, **Preferred Alternative 2** does not place an undue burden on potential applicants by creating a redundant permitting process. Instead it creates one fully comprehensive permit. Though **Preferred Alternative 2** and **Alternative 3** have more of an effect on the physical, biological, and ecological environments than **Alternative 1**, they accomplish the purpose of this FMP in the best manner possible by creating a list of requirements to be met and maintained. These requirements will assist the Council and NOAA Fisheries Service in mitigating impacts associated with aquaculture to the greatest extent practicable. Therefore, **Alternative 1** has the least

impact on the physical, biological, and ecological environment, but **Preferred Alternative 2** and **Alternative 3** create a permit for aquaculture, which is the intent of this FMP. These alternatives accomplish the goals and objectives of the FMP by providing managers with the necessary tools for monitoring and maintaining the integrity of the physical, biological, and ecological environment.

6.2.2 Direct and Indirect Effects on the Economic and Social Environment

The status quo and two alternatives for issuing offshore aquaculture permits are considered in Action 1.

Alternative 1 is the status quo alternative, and as such, any entity seeking to engage in long-term, commercial offshore aquaculture operations that involve species managed under a FMP or activities in violation of fishery regulations in the Gulf of Mexico EEZ is and would be required to apply for an EFP. However, the purpose of an EFP is inconsistent with such operations. An EFP authorizes the following: limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations otherwise prohibited. Also, unless otherwise specified in the EFP or a superseding notice or regulation, an EFP is effective for no longer than one year, unless revoked, suspended or modified. EFPs have been previously issued for offshore aquaculture for a period of 2 years. An EFP may be renewed (50 CFR 600.745(b)(4)).

An EFP is issued to a vessel or vessels and authorizes the owner of the vessel(s) to engage in exempted fishing, which is fishing from a vessel of the United States that involves activities otherwise prohibited (50 CFR 600.10). Fishing is defined to be any activity, other than scientific research conducted by a scientific research vessel, that involves: 1) the catching, taking, or harvesting of fish; 2) the attempted catching, taking, or harvesting of fish; 3) any other activity that can reasonably be expected to result in the catching, taking, or harvesting of fish; or 4) any operations at sea in support of, or in preparation for, any activity described in paragraphs 1), 2), or 3) of this definition (50 CFR 600.10). Defined as such, offshore aquaculture operations in the Gulf EEZ involve fishing.

A vessel of the United States or U.S. vessel for purposes here means: (1) any vessel documented under chapter 121 of title 46, United States Code (USC) or (2) any vessel numbered under chapter 123 of title 46, USC, and measuring less than 5 tons.

Under 46 USC § 12102, a vessel of at least 5 net tons that is not registered under the laws of a foreign country is eligible for documentation if the vessel is owned by:

1) an individual who is a citizen of the United States;
2) an association, trust, joint venture, or other entity:
    a) all of whose members are citizens of the United States; and

b) that is capable of holding title to a vessel under the laws of the United States or of a State;

3) a partnership whose general partners are citizens of the United States, and the controlling interest in the partnership is owned by citizens of the United States;
4) a corporation established under the laws of the United States or of a State, whose chief executive officer, by whatever title, and chairman of the board of directors are citizens of the United States and no more of its directors are noncitizens than a minority of the number necessary to constitute a quorum;
5) the U.S. government; or,
6) the government of a State.

Under 46 USC 123, a vessel under 5 net tons must be registered and numbered by a State.

An EFP issued under 50 CFR 600.745(b) is not transferable or assignable and is valid only for the vessel(s) for which it is issued. Moreover, it authorizes the permit holder only temporary use of a particular site for permitted project operations.

To date, three applications for an EFP for purposes of offshore aquaculture in the Gulf EEZ have been received and only one has been issued. See section 5.3 for more details.

At present, an annual dealer permit (OMB No. 0648-0205) is required to receive the following species harvested in the Gulf EEZ: reef fish, sharks and swordfish. All applications must include a payment of a non-refundable application fee of $50.00 for the first fishery and $12.50 for each additional fishery requested on the application. It is estimated that the time required to complete the average application for an annual dealer permit is 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing the collection of information (Page 4 of Federal Permit Application for an Annual Dealer Permit). Presently, certain fisheries have mandatory reporting requirements. Under the status quo, an entity who would receive cultured organisms from the Gulf EEZ would not be required to have an annual dealer permit if it received cultured individuals of species not included in the above list of reef fish, sharks or swordfish. **Preferred Alternative 2** would require mandatory reporting by Gulf aquaculture dealers, as specified in Table 4.1.2.

At present, there is no Federal permit required by NOAA Fisheries Service to operate a hatchery within the EEZ for spawning and rearing of species native to the Gulf of Mexico, and no hatchery operations have occurred in the Gulf EEZ. To date, the harvest of species native to the Gulf of Mexico to create broodstock for purposes of aquaculture has occurred predominantly for scientific purposes and a letter of acknowledgement (LOA) is sufficient for such scientific activities. However, an LOA is only appropriate for scientific research activities conducted onboard a scientific research vessel (50 CFR 600.10, 600.745). As defined in section 600.10, the term scientific research does not include collection for product development or market research or testing of fishing gear. Similarly, an EFP can not be issued for ongoing commercial operations (50 CFR 600.745(b)).

Preferred Alternative 2 would create a Gulf Aquaculture Permit and, in so doing, would end the requirement that a proposed aquaculture operation in the Gulf EEZ have an EFP. Both U.S. citizens and permanent resident aliens would be eligible for a permit.

A person is a U.S. citizen by birth or through naturalization. The term "permanent resident alien" refers to a person lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with U.S. immigration laws. No corporation, partnership, or association shall be deemed a citizen of the United States unless the controlling interest therein is owned by citizens of the United States, and, in the case of a corporation, unless its chief executive officer, by whatever title, and the chairman of its board of directors are citizens of the United States and unless no more of its directors than a minority of the number necessary to constitute a quorum are noncitizens and the corporation itself is organized under the laws of the United States or of a State, Territory, District, or possession thereof, but in the case of a corporation, association, or partnership operating any vessel in the coastwise trade the amount of interest required to be owned by citizens of the United States shall be 75 per centum. The controlling interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to a majority of the stock thereof is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if the majority of the voting power in such corporation is not vested in citizens of the United States; or (c) if through any contract or understanding it is so arranged that the majority of the voting power may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or, (d) if by any other means whatsoever control of the corporation is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

Seventy-five per centum of the interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to 75 per centum of its stock is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if 75 per centum of the voting power in such corporation is not vested in citizens of the United States; or (c) if, through any contract or understanding, it is so arranged that more than 25 per centum of the voting power in such corporation may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or (d) if by any other means whatsoever control of any interest in the corporation in excess of 25 per centum is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

An EFP is not transferable, but a Gulf Aquaculture Permit would be transferable to U.S. citizens and permanent resident aliens who satisfy the regulatory requirements in this FMP and subsequent amendments. **Preferred Alternative 2** would contribute to the establishment of a Gulf Aquaculture Permit as a marketable asset available for purchase or lease by a U.S. citizen or permanent resident alien. As such, in theory it would give the holder of the permit the incentive to use the permit strategically because a decline in the economic value of the permit would represent a personal economic loss. However, it would also contribute to privatization of public waters by giving the permit holder

exclusive use of a particular site within the Gulf EEZ for purposes of offshore aquaculture, which would prohibit others from benefiting from use of the site for the same and/or other purposes.

Preferred Alternative 2 also would require a person who receives cultured organisms from the Gulf of Mexico EEZ at the first point of sale to have a dealer permit for Gulf aquaculture and authorizes operation of a hatchery (or hatcheries) in the Gulf EEZ. At present, an Annual Dealer Permit (OMB No. 0648-0205) is required to receive reef fish, sharks and swordfish harvested in the Gulf EEZ. This alternative would add organisms cultured in the Gulf to the permit requirement. Therefore, individuals who expect to receive cultured organisms from the Gulf at the first point of sale would be required to complete the application for an Annual Dealer permit and receive the permit before receiving such organisms. This action would not change current fees for the application nor is it expected to change the average time necessary to complete the application form. However, it would cost the person who receives cultured organisms from the Gulf an additional $50 or $12.50 annually, depending on if the person presently receives reef fish, sharks or swordfish.

Certain fisheries have mandatory reporting requirements. Under the status quo and this alternative, a person who receives cultured organisms from the Gulf EEZ would be required to report purchases of these products. Reporting requirements would be analogous to those currently required for Gulf reef fish. These reporting requirements are summarized in Table 4.1.2.

Preferred Alternative 2 would also allow a permit holder to site and operate a hatchery in the Gulf EEZ, although to date all hatchery operations have been land-based. Potential benefits to an offshore aquaculture operation of locating a hatchery in the EEZ would derive mostly from lower transportation costs associated with moving fingerlings from the hatchery to the grow-out site.

The issuance of the Gulf Aquaculture Permit does not eliminate the need for the applicant to receive any other Federal, State or Local authorizations required by law.

Preferred Alternative 2 would contribute to privatization of public waters by giving the permit holder exclusive use of a particular site for purposes of offshore aquaculture, which could have adverse socioeconomic impacts on those who could benefit from use of the site for aquaculture, traditional fishing and/or other purposes.

Alternative 3 separates the single Gulf Aquaculture Permit of **Alternative 2** into two permits: a Gulf Aquaculture Siting Permit and Gulf Aquaculture Operating Permit. This alternative is identical to **Alternative 2**, with the exception of requiring on additional permit for siting.

Alternative 3 would create two transferable permits, not one. Consequently, it could contribute to the establishment of two marketable assets available for purchase or lease by a U.S. citizen or permanent resident alien. However, transfers of an Operating Permit would likely be greatly limited by the physical and biological characteristics of the first

site of operations. In other words, the two permits would have to be compatible. Consequently, under **Alternative 3** someone interested in obtaining existing permits would have challenges and costs associated with obtaining two compatible permits through two separate transactions. Moreover, **Alternative 3** would contribute to privatization of public waters by giving the site permit holder exclusive use of a particular site within the Gulf EEZ for purposes of offshore aquaculture. This could have adverse socioeconomic impacts on those who could benefit from use of the site for aquaculture, traditional fishing and/or other purposes.

The costs of obtaining a permit under **Preferred Alternative 2** or two permits under **Alternative 3** are not expected to differ by any significant amount. The same basic information would be associated with the siting procedure and operating the facility and this information must be submitted to the respective Federal agencies (e.g., NOAA Fisheries Service and the ACOE) before obtaining the requisite permits for operating in the EEZ, one would anticipate comparable costs.

6.2.3 Direct and Indirect Effects on the Administrative Environment

The creation of a permitting system will have a direct effect on the administrative environment, though the extent of that effect is difficult to determine due to the uncertainty in the number of applicants expected to apply for a permit. It is estimated that 5-20 operations could begin operation and achieve the 64 mp OY level specified in Action 9. Despite not knowing how many operations may eventually operate in the Gulf of Mexico, a permit is almost completely administrative in nature and therefore is expected to have a direct effect on the administrative environment.

The status quo as applied under **Alternative 1** currently has a negative effect on the administrative environment. The full requirements and process for application and issuance of an EFP can be found in 50 CFR 600.745 and are summarized here. The RA must review all information pertinent to the EFP and, where necessary, request further information if clarification is needed. NOAA Fisheries Service must then publish the EFP in the *Federal Register* and solicit public comment on the proposal for 15-45 days. Finally, after the public comment period, the Council reviews the EFP, comments, and then NOAA Fisheries Service approves or disapproves the EFP. In addition to NOAA Fisheries Service and the Council's administrative environment being negatively affected, other regulatory agencies, depending on the nature of the EFP and their regulatory authority, may also have to comment or request additional information. This negatively affects these agencies' administrative environments.

The intent of creating a permitting process through this FMP, whether one permit (**Preferred Alternative 2**) or two (**Alternative 3**), is to eliminate some of the burden placed on the administrative environment of NOAA Fisheries Service and various agencies'. A standardized permit(s), as created by **Preferred Alternative 2** and **Alternative 3**, would afford agencies a more streamlined review of the aquaculture facility's operations and impacts without sacrificing the integrity of their review. NOAA Fisheries Service would incur increased administrative costs associated with review,

issuance, and renewal of permits, review of operations, enforcement, and publication of written notices and comment periods. **Preferred Alternative 2** also allows transferability of an aquaculture permit, which may create some addition burden on the administrative environment depending on how many modifications to the permit are needed. **Alternative 3** also has the option for transferability of a siting and operating permit, potentially doubling the burden of the administrative environment.

The permit will be designed to incorporate some of the requirements of other agencies (see Action 2), thereby eliminating the need for some additional information requests. Memoranda of Understanding (MOU) or General Permits could be issued by these agencies which provide authority to NOAA Fisheries Service in issuing aquaculture permits, provided conditions are met as specified in the MOU or General Permit. Such an MOU has been created for the culture of live rock. Considering the potential burden on the administrative environment that could be expected from the EFP process, both **Preferred Alternative 2** and **Alternative 3** are more beneficial than **Alternative 1**. Further, **Preferred Alternative 2** is more beneficial than **Alternative 3** to the administrative environment because it involves only one permit, thereby reducing the burden placed on the administrative environment even more.

For the same reasons as described above, **Preferred Alternative 2** and **Alternative 3** would have more beneficial indirect effects on the administrative environment than **Alternative 1**. By reducing the burden on the administrative environment in the application process and review, administrative resources could be allocated in areas of higher concern for both NOAA Fisheries Service and other agencies.

6.3 Action 2: Application Requirements, Operational Requirements, and Restrictions

This action includes three alternatives for establishing application and operational requirements and restrictions. **Alternative 1** would not specify any conditions when issuing a permit to an aquaculture facility. **Alternative 2** would require a facility to meet the conditions set forth in an EFP. **Preferred Alternative 3** would require each aquaculture operation to adhere to a number of application and operational requirements and restrictions for both the initial issuance of a permit and the continued operation of the facility under the permit. These requirements are designed to provide as much information as possible to NOAA Fisheries Service for permit issuance, review, and renewal.

The requirements and restrictions (as listed in Section 4.2) in **Preferred Alternative 3** are designed to: 1) obtain basic information about an aquaculture operation, 2) prevent or limit to the extent practicable impacts on wild Gulf stocks, 3) monitor the health of animals and habitat in and surrounding an aquaculture facility, 4) improve law enforcement capabilities, and 5) provide NOAA Fisheries Service with other details of facility operation.

6.3.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Requiring conditions to be met prior to issuing a permit and monitoring the compliance with those conditions is an administrative function and has no direct effect on the physical, biological, or ecological environment. However, the majority of these permit conditions are designed to limit the impact on wild populations and the environment and will therefore have an indirect effect on the physical, biological, and ecological environments.

Alternative 1 would allow aquaculture facilities to be issued permits without having to meet any application and operational requirements or other restrictions. This could negatively affect the physical, biological, and ecological environments by not providing NOAA Fisheries Service with the necessary information for permit issuance and monitoring. For example, basic information about an aquaculture facility would not be provided before permit issuance, nor would a permittee have to obtain an assurance bond, certify that they are not using genetically modified or transgenic species, identify an aquatic animal health expert, or abide by various monitoring requirements. Additionally, law enforcement capabilities would be greatly reduced because permitted aquaculture operations would not have to abide by numerous restrictions intended to aid law enforcement. By not specifying specific requirements and restrictions, permitted aquaculture facilities would only be subject to regulations specified by the EPA, ACOE, and other federal agencies, and any other regulations approved in this FMP. **Alternative 1** is the least conservative of any of the alternatives considered in Action 2 and therefore would have the greatest potential negative impact on the physical and biological environments.

Alternative 2 would require an aquaculture facility applying for a permit to meet the conditions specified in an EFP (See Appendix A). EFP regulations require an applicant to submit the following information: Date of the application, relevant contact information, species expected to be harvested under the EFP, amount(s) of such harvest necessary to conduct the exempted fishing, arrangements for disposition of all regulated species harvested under the EFP, anticipated impacts on marine mammals or endangered species, and a statement of the purposes and goals of the exempted fishery for which an EFP is needed, including justification for issuance of the EFP. Additionally, the EFP applicant must provide documentation for each vessel to be covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. The RA or SCD, as appropriate, may request additional information for determining issuance of an EFP. These conditions may vary from permit to permit because the RA can set terms and conditions for the permit and there is a general lack of specificity provided in the EFP regulations. In addition to the requirements listed above, Section 5.3.4.3 summarizes conditions and requirements proposed by the RA for a previous EFP application. This EFP application was later denied by NOAA Fisheries Service after review by the Council. However, these requirements and conditions serve as a baseline for comparison with requirements and restrictions proposed in **Preferred Alternative 3**. Overall, the proposed EFP requirements are similar to the requirements

proposed in **Preferred Alternative 3** and within other actions of this FMP, although less comprehensive. **Preferred Alternative 3** provides several additional requirements that are not included in the EFP conditions. Therefore, **Alternative 2** would afford more protection to the physical and biological environments than **Alternative 1**, but less than **Preferred Alternative 3** because issuance of a permit would be based partly on information specified at the discretion of the RA or SCD.

Preferred Alternative 3 would specify numerous application and operational requirements for permit issuance and aquaculture facility operation. Key application requirements would include contact information, descriptions of allowable aquaculture systems and equipment, site coordinates, documentation of an assurance bond, an emergency disaster plan, identification of an aquatic animal health expert, certification that broodstock used for juveniles were harvested from U.S. waters of the Gulf of Mexico, and certification that no genetically modified or transgenic species will be used for culture. Key operational requirements include: a use it or lose it provision, documentation that broodstock are marked or tagged, certification that cultured animals are pathogen free prior to stocking, and various monitoring requirements. Requirements also include the use of drugs, biologics, and pesticides in compliance with regulations of other federal agencies, and maintenance of one locating device on each allowable aquaculture system.

Preferred Alternatives 3(a)(1) requires potential permittees to complete an application form for an aquaculture permit. Any application considered for approval by NOAA Fisheries Service would have a written notice and public comment period before issuance. The details of how written notice and public comment would be conducted could be similar to current requirements for an EFP. NOAA Fisheries Service will have to specify the process for written notice and public comment as the proposed rule for this FMP is developed.

Preferred Alternative 3(a)(2) contains several additional requirements that would be included on the application form. Many of these requirements are administrative in nature (**Preferred Alternatives 3(a)(2)(i-ii), 3(a)(2)(v), 3(a)(2)(vi), 3(a)(2)(x), 3(a)(2)(xvi), and 3(a)(2)(xvii)**) and none of these requirements would have direct effects on the biological and physical environments. However, some of the requirements may have indirect effects on these environments. Specifying application requirements will allow managers to assess the impacts of a proposed facility by obtaining necessary information about the operation prior to permitting. Key requirements for reviewing and assessing environmental impacts prior to permitting would include:

1. Description of the exact location and dimensions of a proposed aquaculture facility (**Preferred Alternative 3(a)(2)(iii)**);
2. A list of species to be cultured and the estimated total annual poundage of each species to be harvested from the aquaculture facility (**Preferred Alternative 3(a)(2)(iv)**);
3. A description of the allowable aquaculture systems to be used (**Preferred Alternative 3(a)(2)(vii)**);

4. A decription of the equipment and methods necessary for feeding, transporting, maintaining, and removing cultured species (**Preferred Alternative 3(a)(2)(viii)**);
5. A description of endangered and threatened species, EFH, wild marine fishes and invertebrates, and migratory birds present at the proposed aquaculture site, including their abundance and distribution (**Preferred Alternative 3(a)(2)(ix)**);
6. Documentation that the applicant has posted an assurance bond for removal of all components of an aquaculture facility (**Preferred Alternative 3(a)(2)(xi)**);
7. Certification that all broodstock used to produce fingerlings were harvested from U.S. waters of the Gulf of Mexico (**Preferred Alternative 3(a)(2)(xii)**);
8. Certification that no genetically modified or transgenic species are used or possessed at the aquaculture facility (**Preferred Alternative 3(a)(2)(xiii)**);
9. Identification of an aquatic animal health expert (**Preferred Alternative 3(a)(2)(xiv)**); and,
10. An emergency disaster plan (**Preferred Alternative 3(a)(2)(xv)**).

All of these requirements would be used by NOAA Fisheries Service when determining whether or not to issue an aquaculture permit. Additional requirements pertaining to operation of a facility, allowable aquaculture systems, siting, and recordkeeping and reporting are contained in **Preferred Alternative 3(b)** and in other actions throughout this document.

Preferred Alternatives 3(a)(2)(iii) and **3(a)(2)(ix)** will assist NOAA Fisheries Service in determining whether or not a proposed site will negatively affect marine resources. Additional requirements in Action 6 will also be used for siting marine aquaculture facilities. These requirements will ensure facilities are sited in areas that prevent or minimize to the extent practicable negative impacts to EFH and other marine resources.

Preferred Alternatives 3(a)(2)(iv), 3(a)(2)(xii), and **3(a)(2)(xiii)** will provide NOAA Fisheries Service with necessary information to determine if allowable species are being used for culture, where those species were harvested as broodstock, and whether or not those species are transgenic or have been genetically modified. Information on production levels will also be used to determine if the proposed operation complies with the preferred production cap (20 percent of OY) in Action 9. This will ensure that no operation acquires an excessive share of the fishery. These alternatives will also ensure that genetic characteristics of cultured species are consistent with wild species in the event escapement occurs.

Preferred Alternatives 3(a)(2)(vii) and **3(a)(2)(viii)** would provide NOAA Fisheries Service with information on allowable aquaculture systems and equipment during case-by-case review. Additional requirements are specified in Action 5. All of these requirements would be used to determine if proposed aquaculture systems would be sufficient to withstand major storm events in the Gulf of Mexico. These requirements would help NOAA Fisheries Service assess the potential risk for escapement or damage to marine resources if the proposed aquaculture systems were to be used.

Preferred Alternative 3(a)(2)(xi) would require documentation certifying an applicant has posted an assurance bond sufficient to cover the costs of removal of all components of the aquaculture facility. The assurance bond would also cover the costs of removing organisms with OIE-reportable pathogens, genetically modified organisms, and transgenic species if a permittee does not remove these organisms upon order by NOAA Fisheries Service (see Action 2, Alternative 3(a)(2)(xiii) and Action 8, Alternative 2(d)). All oil, gas, and mineral extraction firms are required under MMS regulations to remove platforms and connecting pipe lines and return the ocean bottom to its original configuration (see http://www.gomr.mms.gov/homepg/regulate/ regs/ntls/ntl00-16.html). Additionally, the National Offshore Aquaculture Act of 2007 (Appendix B) proposes requiring an assurance bond for removal of the aquaculture structures as a criterion of the permit. Requiring an assurance bond would eliminate the potential for navigation hazards in the event an operation terminates their business. It would also protect the biological and physical environment by preventing long-term damage to habitat and entanglement of wildlife in derelict gear.

Preferred Alternative 3(a)(2)(xiv) would require applicants to identify a certified aquatic animal health expert. The aquatic animal health expert would be a licensed doctor of veterinary medicine or certified by the American Fisheries Society as a fish pathologist or fish health inspector. This individual would be responsible for inspecting animals prior to stocking and determining if pathogens exist. This requirement is intended to reduce the potential for the spread of pathogens to wild stocks. Additional information on pathogens in cultured species can be found in Section 6.1.2

Preferred Alternative 3(a)(2)(xv) would require an emergency disaster plan prior to permit issuance. The intent of this plan is to develop procedures for preparing allowable aquaculture systems and equipments, as well as cultured organisms, in the event of a disaster. Requiring an emergency disaster plan will help businesses prepare their operations in the event of a disaster, thereby reducing risks and potential impacts to the physical and biological environments.

In addition to the 17 application requirements mentioned above, Action 2 also specifies 12 operational requirements. Operational requirements include:

1. A use it or lose it provision to prevent speculative entry (**Preferred Alternative 3(b)(1)**);
2. Marking of broodstock at hatcheries (**Preferred Alternative 3(b)(2)**);
3. Inspection of cultured animals prior to stocking in allowable aquaculture systems (**Preferred Alternative 3(b)(3)**);
4. Maintenance of a electronic locating device on each cage or net pen (**Preferred Alternative 3(b)(4)**);
5. Compliance with EPA feed monitoring and management practices (**Preferred Alternative 3(b)(5)**);
6. Compliance with EPA and ACOE monitoring and reporting requirements (**Preferred Alternative 3(b)(6)**);

7. Inspection of allowable aquaculture systems for entanglements or interactions with marine mammals, protected species, and migratory birds (**Preferred Alternative 3(b)(7)**);
8. Use of drugs, pesticides, and biologics in compliance with other federal agency regulations (**Preferred Alternative 3(b)(8)**);
9. Maintenance of fish with heads and fins intact (**Preferred Alternative 3(b)(9)**);
10. Prohibition on possession of wild fish at or within the boundaries of an aquaculture facilities restricted access zone, with the exception of fish used for hatcheries at a facility (**Preferred Alternative 3(b)(10)**);
11. Prohibition on possession of wild fish or invertebrates onboard facility vessels, vehicles, or aircraft, except when harvesting broodstock (**Preferred Alternative 3(b)(11)**); and,
12. Allowing NOAA Fisheries Service access to permitted aquaculture sites, facilities, and equipment to conduct inspections (**Preferred Alternative 3(b)(12)**).

These requirements will allow NOAA Fisheries Service to prevent, or minimize to the extent practicable, negative impacts on the physical or biological environments that may result from an aquaculture facility.

Preferred Alternatives 3(b)(1) is administrative in nature (use it or lose it provision) and would have no direct or indirect effects on the physical or biological environments. Similarly, **Preferred Alternative 3(b)(2)** pertains to marking of captive broodstock. This requirement would also have no direct or indirect effect on the physical or biological environments, but could be used by NOAA Fisheries Service to determine genetic lineage in the event that genetic modification is suspected.

Preferred Alternatives 3(b)(3) and **3(b)(4)** would directly or indirectly benefit the physical and biological environments by requiring inspection of animals prior to stocking and marking of net pens and cages with locating devices. Stocking of pathogen-free organisms will be in the best interest of both the operation, as well as NOAA Fisheries Service. By requiring an aquatic animal health expert to certify cultured species as pathogen-free, the risk of transmitting pathogens to cages and subsequently wild stock would be reduced. Additionally, requiring locating devices on cages and net pens will reduce long-term damage to EFH and marine resources that could result from derelict gear.

Preferred Alternatives 3(b)(5), **3(b)(6)**, and **3(b)(8)** all refer to existing monitoring requirements or regulations imposed by other federal agencies. Regardless of whether or not the Council includes these alternatives in this FMP, these regulations would be in effect. It should also be noted that monitoring and reporting requirements imposed by other federal agencies may exist (e.g., USCG and MMS) and the proposed alternatives do not preclude aquaculture permittees from having to abide by other federal agency regulations.

Water quality standards and monitoring requirements are required by the EPA and specified in National Pollutant Discharge Elimination System permits issued by the EPA. These requirements are intended to monitor water quality, including benthic and organic loading, for comparison with established EPA water quality standards. NOAA Fisheries Service would also require permittees to comply with EPA regulations at 40 CFR 451.21 that include feed monitoring and management practices. The FDA, EPA, and USDA regulate drugs, pesticides, and biologics. Permittees would be required to comply with the existing regulations of these agencies. Lastly, the ACOE would issue siting permits for aquaculture operations. Within previously proposed siting permits are numerous requirements for assessing benthic habitat and other marine resources prior to and after permitting.

Preferred Alternative 3(b)(7) would require permittees to regularly inspect allowable aquaculture systems for entanglements and interactions with marine mammals, protected species, and migratory birds. This requirement will assist NOAA Fisheries Service in determining whether allowable aquaculture gear is negatively affecting these species. If entanglements or interactions occur, permittees would have to report this information to NOAA Fisheries Service as specified in Section 4.8.

Lastly, **Preferred Alternatives 3(b)(9)** through **3(b)(12)** are all intended to enhance enforceability of regulations pertaining to aquaculture operations and could indirectly benefit the physical and biological environments. Requiring fish to be maintained with heads and fins intact and prohibiting possession of wild fish at aquaculture facilities and onboard vessels (with limited exceptions) will reduce the likelihood that wild species will be caught and sold as cultured products. Inspections by NOAA Fisheries Service will also ensure that regulatory requirements are being met.

Overall, **Preferred Alternative 3** provides the most comprehensive list of requirements that aquaculture permittees and applicants would have to meet. This alternative would therefore provide the greatest protection and benefits to the biological and physical environments of any of the alternatives in Action 2. **Alternative 2** would also provide numerous application and operating requirements, but those requirements would be less comprehensive and subject to change from one permit to the next because of discretion given to the RA or SCD. **Alternative 1** would not specify any application or operational requirements and would provide the least benefit to the physical and biological environments.

6.3.2 Direct and Indirect Effects on the Economic and Social Environment

Action 2 considers specifying or not specifying application requirements and operational requirements for aquaculture in the Gulf EEZ.

Alternative 1 would not specify application requirements and operational requirements and restrictions for aquaculture in the Gulf EEZ if there is a Gulf Aquaculture Permit or Siting and Operational Permits. Consequently, the onus would be on potential applicants

and the public to consult with NOAA Fisheries Service and learn what application requirements, operational requirements, and restrictions would apply to Gulf aquaculture operations. This alternative has the least transparency of the three alternatives and would greatly increase the time and costs required by both applicants and the public to learn of application requirements, operational requirements, and restrictions. **Alternative 1** would not give NOAA Fisheries Service the information required to estimate a proposed offshore aquaculture operation's potential impacts on the environment, harvest of cultured species, or the documents needed for effective Federal law enforcement. Furthermore, this alternative would make it difficult for applicants and the public to assess what the legally allowable aquaculture practices are in Federal waters and the biological and economic impacts of those practices. Relative to **Alternative 2** and **Preferred Alternative 3**, **Alternative 1** would have the greatest economic benefits for applicants, but would provide the least benefits to the social, biological, and physical environments.

Alternative 2 is the status quo alternative. Thus, the relevant application and operational requirements or restrictions are those required to obtain and maintain an EFP for purposes of offshore aquaculture. As stated in 50 CFR 600.745(b)(2), the application for an EFP must include payment of any required fee as specified by paragraph (b)(1) of §600.745 and a written application that includes, but is not limited to, the following information:

i. The date of the application.
ii. The applicant's name, mailing address, and telephone number;
iii. A statement of the purposes and goals of the exempted fishery for which the EFP is needed, including justification for issuance of the EFP.
iv. For each vessel to be covered by the EFP, as soon as the information is available and before operations begin under the EFP:
    A. A copy of the USCG documentation, state license, or registration of each vessel, or the information contained on the appropriate document.
    B. The current name, address, and telephone number of the owner and master, if not included on the document provided for the vessel.
v. The species (target and incidental) expected to be harvested under the EFP, the amount(s) of such harvest necessary to conduct the exempted fishing, the arrangements for disposal of all regulated species harvested under the EFP, and any anticipated impacts on marine mammals or endangered species.
vi. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used.
vii. The signature of the applicant.
viii. The Regional Administrator or Director, as appropriate, may request from the applicant additional information necessary to make a determination required under this section.

The above application requirements are the status quo application requirements for an EFP, and as such are designed for short-term, one-time fishing projects. Therefore, the

status quo application requirements would provide insufficient information for Gulf Aquaculture Permit applicants to adequately complete an application that proposes a long-term, commercial-scale aquaculture operation. In turn, this would affect the ability of NOAA Fisheries Service and the public to assess the potential impacts of the proposed operation on the environment.

The status quo operational requirements and restrictions are represented by the terms and conditions that may be attached to an EFP. The RA or SCD may attach terms and conditions to an EFP consistent with the purpose of the exempted fishing (See section 7.5.2.3 for the regulatory language). When NOAA Fisheries Service announced receipt of an EFP application from Florida Offshore Aquaculture, Inc. for purposes of offshore aquaculture on July 30, 2003 (68 FR 44745), it stated the terms and conditions to any issuance of the EFP. These terms and conditions are stated in section 7.5.2.2.

The terms and conditions were proposed to apply for a particular EFP application for offshore aquaculture, and as such, were not and are not meant to represent general operational requirements and restrictions for Gulf offshore aquaculture. However, they do provide insight into potential operational requirements and restrictions imposed by NOAA Fisheries Service and offer greater transparency than the first alternative. Consequently, these one-time conditions and terms for an EFP, although an improvement over having no operational requirements and restrictions, would be insufficient guidelines for potential applicants and the public to adequately assess the operational requirements and restrictions necessary for environmentally sustainable long-term, commercial-scale operations. **Alternative 2** is expected to result in greater economic costs to the applicant than **Alternative 1**, but less economic costs than **Preferred Alternative 3**.

Preferred Alternative 3 is the most transparent of the three alternatives because it specifies what the application requirements and operational requirements and restrictions would be. It also would give NOAA Fisheries Service the information it requires to adequately estimate the impacts that a proposed offshore operation would have on the environment, monitor permitted operations, and enforce Federal laws that protect the environment. Moreover, **Preferred Alternative 3** would provide better guidelines for potential applicants and the public to adequately assess what is legally required of commercial offshore aquaculture operations. Consequently, **Preferred Alternative 3** is likely to require the least time and costs associated with providing and receiving information sufficient for an adequate assessment of the potential and realized impacts of commercial offshore aquaculture operations on the environment.

One of the conditions within the application form is financial assurances in the form of a performance bond, which would mitigate damages caused by the permittee's default. This requirement would require the signature of an additional entity as a bond surety who agrees to ensure performance in the event that the permittee defaults. This requirement would result in large economic costs to the applicant, but is considered necessary to prevent or mitigate long-term degradation to the marine environment from occurring.

6.3.3 Direct and Indirect Effects on the Administrative Environment

As stated in Section 6.3.1, application and operational requirements are primarily administrative in nature and would therefore have a direct effect on the administrative environment.

Alternative 1, the no action alternative, would allow the issuance of open ocean aquaculture permits to applicants without requiring any application or operational requirements or restrictions. This alternative would have no direct effect on the administrative environment, since it does not require potential permittees to submit information for issuance of an application. This alternative would also not impose requirements for operating a facility. Indirect effects associated with **Alternative 1** would be significant and could include the inability to monitor environmental impacts, issuance of permits without necessary information for review, and a general lack of regulations for protecting wild species. **Alternative 1** would therefore have the greatest indirect effects on the administrative environment and provide the least benefits to the physical and biological environments.

Alternative 2 would require any facility applying for an aquaculture permit to follow the EFP guidelines at 50 CFR 600.745 (b). Issuance of an EFP is a cumbersome, lengthy process, which negatively affects the administrative environment. Reviewing an application for an EFP, requesting additional information, and soliciting other agency and public comment can take six months or longer before an EFP is issued. This not only negatively affects the administrative environment of NOAA Fisheries Service, but also the Council and other federal and state agencies. As mentioned in Section 6.3.1, the RA has discretion to impose additional requirements for compliance with the EFP. Examples of such discretionary requirements are provided in Section 5.3.4.3. These requirements would represent a significant administrative burden on NOAA Fisheries Service staff to ensure permittees are complying with the restrictions.

Preferred Alternative 3 would create numerous application and operational requirements and restrictions to be met by an aquaculture facility prior to or after permit issuance. These requirements are described in detail in Section 4.2. The requirements are designed to minimize impacts on the physical, biological, and ecological environments of the Gulf of Mexico by requiring information necessary to issue an aquaculture permit and monitor the impacts of an aquaculture operation.

All application and operational requirements set forth by **Preferred Alternative 3** require involvement of the administrative environment. The administrative environment would be responsible for reviewing permit applications and determining compliance with regulations. Increased requirements would be placed on law enforcement to ensure operations are abiding by regulations. In general, the requirements set forth in **Preferred Alternative 3** can be divided into three categories affecting the administrative environment:

1) ensuring biological integrity of wild stocks,
2) limiting environmental impacts; and,
3) aiding law enforcement.

Specific conditions for ensuring the biological integrity of wild stocks include the identification of source broodstock, descriptions of proposed aquaculture systems and sites, an assurance bond, and pathogen inspection. Environmental impacts will be monitored through existing federal regulations for water quality and feed management, facility inspections, and surveys. Law enforcement requirements include permits being carried by vehicles (boats, trucks, planes, etc.) used in aquaculture operations, copies of valid aquaculture permits, maintaining fish with heads and fins intact, prohibiting possession of wild fishes (with limited exceptions) at aquaculture facilities and onboard vehicles used for aquaculture, submission of fin clips, and marking and tagging of broodstock.

Regardless of the preferred alternative chosen, NOAA Fisheries Service expects to have a Regional Aquaculture Program Coordinator who is directly responsible for monitoring and evaluating aquaculture operations. This will result in direct administrative costs to the agency. Additional costs will be incurred by NOAA Law Enforcement, since currently no aquaculture operations exist in the Gulf and are in need of enforcement.

In summary, although **Alternative 1** does not directly affect the administrative environment, the long-term consequences of not having application and operational requirements may be more burdensome than the other two alternatives. **Alternative 2** has proven to be onerous and burdensome on the administrative environment both directly and indirectly. **Preferred Alternative 3** while directly affecting the administrative environment provides the best solution for short-term and long-term burden placed on the administrative environment. The use of a specialized Program Coordinator will allow the development of an offshore aquaculture industry that is carefully monitored and held to standards set forth in this FMP.

6.4 Action 3: Duration of the Permit

Action 2 includes two alternatives. **Alternative 1**, no action, would continue to allow an EFP to be effective for one year. **Preferred Alternative 2** would require an aquaculture permit to have an effective period of 5, 10, or 20 years, or indefinitely.

6.4.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

The alternatives under consideration differ only in the length of the aquaculture permit effective period. Depending on the alternatives chosen for other actions in this FMP, records kept by the aquaculture facility owners may be reviewed by regulators well before a permit is up for renewal. However, renewal of the permit could entail a more thorough analysis of owner compliance with permit requirements and whether the environmental effects of the facility are acceptable. If a facility is causing unacceptable

physical, biological, or ecological effects (as defined and described elsewhere in this document), longer permit durations could lead to greater detrimental physical, biological, and ecological consequences than shorter ones because these unacceptable effects would persist over a longer time before remediation. Therefore, if a facility had negative effects, **Alternative 1** would have the least negative physical, biological, and ecological consequences since it has the shortest permit duration, while **Alternative 2(d)** would potentially have the most negative consequences because it allows the longest permit duration (indefinite). The remaining alternatives, in decreasing order of permit duration and potential for negative environmental effects, are **Alternative 2(c)**, **Preferred Alternative 2(b)**, and **Alternative 2(a)**.

However, with the recordkeeping and reporting requirements established in Action 8 and the conditions attached to the permit (Action 2), it is not expected that a facility will be able to operate for any extended period of time while engaging in detrimental activities to the physical, biological, and ecological environment. NOAA Fisheries Service is expected to have Regional Aquaculture Coordinators who will conduct on-site inspections on at least an annual basis, if not more frequent, to monitor compliance with the conditions and requirements specified in other actions of this FMP. Additionally, permittees will have to satisfy reporting requirements of other federal agencies. If an operation is determined to not be complying with aquaculture regulations, the operation's permit could be revoked, suspended, or modified in accordance with subpart D of 15 CFR part 904. Therefore, the permit duration most likely have no effect at all on the physical, biological, and ecological environment, whether directly or indirectly.

6.4.2 Direct and Indirect Effects on the Economic and Social Environment

Action 3 considers the duration of a permit. **Alternative 1** is the status quo alternative, and unless otherwise specified in the EFP or a superseding notice or regulation, an EFP is effective for no longer than one year, unless revoked, suspended or modified. EFPs have been issued for offshore aquaculture for periods of 2 years. An EFP may be renewed (50 CFR 600.745(b)(4)); however, the purposes of an EFP are not consistent with ongoing commercial offshore aquaculture operations. Also, an EFP is effective for the allowed duration unless it is revoked, suspended or modified. A commercial offshore aquaculture operation would have to apply for and receive a continuous combination of EFPs and renewals to continue ongoing operations.

Alternative 2(a) would extend the duration of an aquaculture permit to 5 years, but it does not specify if the permit could be renewed or not. Consequently, it would be less attractive to potential applicants who are seeking long-term use of a particular site for purposes of offshore aquaculture, especially if much of the time that a 5-year permit is valid for is dedicated to getting facilities at the site, in position and ready for the introduction of its first batch of fingerlings. Under **Alternative 2(a)**, a permit holder would have exclusive use of a particular site for 5 years, which would prevent others from benefiting from direct use of that site for that period, unless the permit was revoked, suspended or modified.

Preferred Alternative 2(b) would extend the duration of an aquaculture permit to 10 years and specifies that the permit can be renewed thereafter in 5-year increments. Ten years is considered by many to be the minimum timeframe necessary for an operation to be profitable and obtain sufficient investment and financing. Consequently, it would be less attractive to potential applicants who are seeking long-term use of a particular site for purposes of offshore aquaculture, especially if much of the time that the 10-year permit is valid is dedicated to getting facilities at the site, in position and ready for the introduction of its first batch of fingerlings. However, a single aquaculture permit or site permit would give the permit holder exclusive use of a particular site for a minimum of 10 years, which would prevent others from benefiting from use of that site for at least 10 years, unless the permit was revoked, suspended, or modified.

Alternative 2(c) would extend the duration of an aquaculture permit to 20 years. This duration is consistent with the permit duration proposed in the National Offshore Aquaculture Act of 2007. Consequently, it would be more attractive to potential applicants who seek a permit's duration to be greater than a 5-year or 10-year period. However, for those who prefer an option for operations to continue beyond 20 years, there may be no opportunities to continue beyond the duration of the permit. If renewal is not possible, the existing permit holder would have to apply for a new permit to continue operations. A single or site permit would give the permit holder exclusive use of a particular site for 20 years, which would prevent others from benefiting from use of that site, unless the permit was revoked, suspended, or modified.

Alternative 2(d) would extend the duration of an aquaculture permit to an indefinite amount of time. Consequently, an offshore aquaculture operation would never require renewal of a permit to continue operations. A permit of this duration would give the permit holder exclusive use of a particular site for an indefinite amount of time, which would prevent others from benefiting from use of that site for an indefinite amount of time, unless the permit was revoked, suspended or modified.

Of those alternatives specifying permits of limited duration (**Alternatives 1**, **2(a)**, **2(b)** and **2(c)**), only **Alternatives 1** and **2(b)** give the possibility of renewal. Therefore, it is possible that Alternatives 2(a) and 2(c) would not provide for opportunities for renewal and would require existing operations to apply for a new permit. **Alternative 1** could impose the greatest time and costs on those engaged in offshore aquaculture operations because they would have to apply and reapply for a continuous series of permits and renewals in order to have an ongoing commercial offshore aquaculture operation. At the same time, **Alternative 1** would offer the least amount of time that an offshore aquaculture permit holder could exclude others from use of its particular site. **Alternative 2(d)** would impose the least time and costs on those engaged in ongoing offshore aquaculture operations because they would only have to apply for and be issued a permit once. However, **Alternative 2(d)** would also prevent others from benefiting from the use of a particular site for the purpose of aquaculture and/or other purposes for an indefinite period of time, which essentially encloses and privatizes an area of federal waters that historically has been managed under the public trust doctrine. **Preferred**

Alternative 2(b) is the only alternative that offers continuous renewal of an existing permit. Consequently, this imposes the least time and costs associated with permit application and renewals, while offering an operation the minimum timeframe necessary to be profitable and obtain sufficient investment and financing.

6.4.3 Direct and Indirect Effects on the Administrative Environment

Permit renewal is administrative in nature and would affect this environment directly. However, the intensity of that effect varies with frequency of review and renewal. The administrative burden of reviewing applications for permit renewal decreases as the length of time between renewals increases. The administrative environment would be least affected with an indefinite period (**Alternative 2(d)**), and most affected by the continued use of EFPs. Given the lack of recent applications through the EFP process, it may be better to state **Alternative 2(b)** would impose the greatest burden to the administrative environment. The remaining alternatives, in decreasing order of permit duration and increasing potential for negative administrative effects are **Alternative 2(c)**, **Preferred Alternative 2(b)**, and **Alternative 2(a)**.

As stated previously, the development of an aquaculture industry is going to directly affect the administrative environment. Most of this burden comes from the inspection of facilities and checking for compliance with requirements and conditions of the permit, not from the renewal of permits which may be an unnecessary burden given the level of engagement from the administrative environment. At the same time, renewals should be fairly straight forward and easily accomplished due to the wealth of information that will already exist on a facility because of the reporting requirements, recordkeeping requirements, and inspections. Therefore, renewal periods may not directly effect the administrative environment much more than it will already be affected by carrying out the necessary responsibilities from the creation of a permit process. Therefore, any of the suboptions under **Preferred Alternative 2** would have less impact on the administrative environment than **Alternative 1**, because of the other actions that are part of creating a permit process (i.e., the information for determining to renew or not renew a permit will already exist from recordkeeping, reporting, and inspections).

6.5 Action 4: Species Allowed for Aquaculture and Included in the Aquaculture Fishery Management Unit

Action 4 has four alternatives. **Alternative 1**, no action, would not specify what species could be used for aquaculture. **Alternative 2** would allow the culture of all species in the Gulf Council's reef fish and coastal migratory pelagics complexes, and red drum. Harvest of red drum is currently prohibited in the Gulf EEZ. Shrimp, spiny lobster, stone crab, and corals could not be used for aquaculture under **Alternative 2**. Commercial harvest of corals is currently prohibited in federal waters. **Alternative 3** would allow the aquaculture of all marine species managed by the Gulf Council, except shrimp, corals, and goliath and Nassau grouper. Harvest of goliath and Nassau grouper is currently prohibited in the Gulf EEZ. **Preferred Alternative 4** would allow the aquaculture of all marine species in the Gulf of Mexico managed by the Council, except shrimp and corals,

and includes a request to the HMS division of NOAA Fisheries Service to allow the culture of species managed under their authority (tunas, billfish, sharks, and swordfish). No non-native or genetically modified species would be allowed under this alternative. **Alternatives 2-4** would each include allowable aquaculture species in the Aquaculture Fishery Management Unit (FMU).

Endangered and threatened species under the Endangered Species Act (ESA) in the Southeast Region cannot be used for commercial aquaculture. Section 9 of the ESA makes it unlawful for any person to take any endangered species of fish or wildlife. Under Section 4 of the ESA, the take prohibition may be extended to species listed as threatened if deemed necessary and advisable for the conservation of the species. NOAA Fisheries has issued regulations extending the prohibition of take, with limited exceptions, for all threatened species listed in the Southeast Regions. None of the take exceptions allow for the commercial aquaculture of any Southeast Region endangered or threatened species. Species of Concern (SOC) are not listed under or protected by the ESA. No specific protections would be afforded SOC with regard to commercial aquaculture.

6.5.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Determining what species are permissible for aquaculture activities could have both direct and indirect effects on the physical, biological, and ecological environment. The first factor to consider in determining allowable species is impacts to wild stocks. These impacts are discussed in Section 6.1.1, and briefly revisited here. **Alternative 1** is the only alternative that would allow for non-native species and/or genetically modified species to be used in aquaculture operations. Under **Alternative 1**, NOAA Fisheries Service, in consultation with the U.S. Fish and Wildlife Service (USFWS) could determine if culture of a particular species was acceptable, including non-native species. The Lacey Act Amendments of 1981 (16 U.S.C. §§ 3371-3378) provide the USFWS with authority to regulate the import, transport, and possession of non-native species. Regulations at 50 CFR 16.13 state that no live fish, mollusks, crustaceans, or any progency or eggs of these organisms may be released into the wild except by a State wildlife agency having jurisdiction over the area of release or by persons having prior written permission from such agency. However, such approval of non-native species is unlikely because the USFWS and NOAA co-chair the federal Aquatic Nuisance Species Task Force, whose task is to prevent and control aquatic nuisance species, and implement the Non-indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990. Further, The Gulf Council's Ad Hoc Aquaculture Advisory Panel has also indicated opposition to the use of any non-native species for aquaculture.

There is some evidence of the detrimental effects of non-native species on ecosystems. If non-native species were allowed to be cultured in the Gulf of Mexico EEZ and some escaped, it could have negative impacts on the biological, physical, and ecological environments (see Section 6.1). Potential negative effects caused by the introduction of non-native species include: competition with wild stocks, changes to community

structure and food web dynamics, and modification of genetic structure if mating occurred with wild stock. In the most extreme cases in which non-native species become established, fundamental changes in ecosystem function may result in habitat degradation, transmission of pathogens, and loss of other species. Allowing only species native to the Gulf of Mexico and managed by the Council will ensure that any species being cultured are under an FMP and managed according to the National Standards

The difference between **Alternatives 2**, **3**, and **4** is only in the number of species allowed for aquaculture, not the origin of the species. Shrimp and coral are excluded from all alternatives, except **Alternative 1**. Shrimp are currently raised in onshore ponds and it is expected that offshore aquaculture of this species will not be cost effective. Corals are currently prohibited from harvest and there is not expected to be high demand for culturing corals for commercial purposes. The effects on the biological, physical, and ecological environments are expected to be similar for **Alternatives 2-4**. Thus, the impact to the wild stocks would not be expected to come from the introduction of non-native species. Instead, the impact to the wild stock populations would come from two other sources. The first would be from competition from con-specifics that escape aquaculture facilities and interact with their wild counterparts. This potential impact is discussed in Section 6.1.1.1. The second potential impact would come from the collection of broodstock for use in hatchery operations. Any harvest of broodstock would be regulated under the authority of the MSFCMA, and therefore harvest would be constrained to the current regulations developed under the FMP for a particular species. Therefore, the harvest of broodstock is expected to have minimal impacts on the wild populations, as only a relatively few number of individuals is required for hatchery purposes at any given time. Selecting **Alternative 2**, **3**, or **4** would therefore have less effect on the physical, biological, and ecological environment than **Alternative 1** when examining the impact on wild stocks.

Another factor to consider in determining species allowed for aquaculture is the potential to create loopholes or opportunities for poaching to occur. The alternatives under consideration do not specify how many specimens would be taken. Instead, they differ in the number of species that could be cultured. **Alternative 1** would allow the greatest number of species to be cultured and so would potentially cause the greatest opportunity for poaching to occur. The remaining alternatives, in decreasing number of species allowed for culture and associated risk, are **Alternatives 2**, **3**, and **4**. **Alternative 3** would best protect recovery of goliath and Nassau grouper by preventing a means of illegal sale of wild-caught species. However, it should be noted that many operational requirements and reporting requirements in Actions 2 and 8 are intended to assist law enforcement and prevent illegal harvest and sale. Legal sale of cultured goliath and Nassau grouper, which could occur under **Alternatives 1**, **2**, and **4**, could make it easier to sell illegally harvested wild fish by fraudulently marking them as "cultured." Similarly, **Alternative 2** would best prevent harvest of wild corals by preventing a potential means of illegal sale of these species. Sale of illegally harvested red drum as "cultured" would be possible under all alternatives. However, the potential for illegal sale is greatly decreased by the permit requirements developed under Action 2. The requirements developed for improving law enforcement capabilities were a direct result

of the concerns of creating opportunities for illegal sales of fish in the marketplace under the pretext of those sales being cultured fish. By providing law enforcement the necessary tools for determining the origin of cultured species (submission of fin clips), agents can discern if in fact individual fish are products of aquaculture facilities.

Production of native species through aquaculture could result in a net biological benefit to the species and their ecosystems by creating a new source of seafood which could reduce the amount of fishing pressure on wild Gulf stocks. **Alternative 1** would allow culture of non-native species, if approved by the USFWS and NOAA Fisheries Service. Production of these non-native species would not as readily reduce demand for wild-caught native species as would production of native species. The more native species allowed for culture by a particular alternative, the more chances for relief from fishing pressure for those species. The remaining alternatives, in decreasing number of species allowed for culture and potential positive effects to wild populations from less fishing pressure, are **Alternatives 2**, **3**, and **4**. It must be noted; however, that differences in public demand for cultured versus wild fish could influence the extent of any reduction in fishing pressure on native stocks.

6.5.2 Direct and Indirect Effects on the Economic and Social Environment

Action 4 considers restricting the species that can be cultured in the Gulf EEZ and establishment of an Aquaculture Fishery Management Unit.

Alternative 1 is the status quo alternative. Currently, there is no Aquaculture Fishery Management Unit (FMU), and there are no regulations that specify the species allowed for aquaculture in the Gulf of Mexico EEZ. Consequently, this alternative would allow a commercial operation to culture species that are not native to the Gulf of Mexico or any other waters in the country, which could have significant adverse impacts on the biological, economic and social environments.

The three applications for EFPs for offshore aquaculture projects in the Gulf EEZ offer insights into what species would likely be considered for future aquaculture operations. These EFP applications proposed to aquaculture finfish species native to the Gulf of Mexico - cobia, mahi-mahi, greater amberjack, Florida pompano, red snapper, and cubera snapper. However, without specifying the particular species that may be cultured in the Gulf EEZ and in the Aquaculture FMU, cultured species may include non-native species.

Alternative 2 offers less uncertainty than **Alternative 1** in regards to the range of species that would be allowed to be cultured in the Gulf EEZ as it restricts the species to native finfish that are in the reef fish, red drum, and coastal migratory pelagic FMPs. Consequently, it offers the benefit of greater transparency than the first alternative and decreases the time and costs required by applicants and the public to consult with NOAA Fisheries Service and learn which species would be allowed to be cultured.

Alternative 3 and **Preferred Alternative 4** offer less uncertainty than **Alternative 1** in regards to the range of species that would be allowed to be cultured in the Gulf EEZ and a greater range of allowed species than **Alternative 2**. Consequently, these alternatives offer the benefit of the same or similar transparency as **Alternative 2**. **Alternative 3** also gives commercial offshore aquaculture operations the benefit of more options than **Alternative 2** in terms of species that can be cultured over the life of a particular operation. **Preferred Alternative 4** would give operations the most options in terms of species for culture.

In summary, **Alternative 1** does not limit what species can be cultured in the Gulf EEZ. Hence, both native and non-native species of the Gulf EEZ could be cultured, with potentially significant adverse impacts on the biological, economic, and social environments arising from the release of non-native species into Federal waters. **Alternatives 2-4** limit allowable species to native, non-genetically modified, and non-transgenic Gulf species and specify which of those species would be allowed. **Alternatives 2-4** offer the benefit of greater transparency that derives from the identification of which species are acceptable to NOAA Fisheries Service for offshore aquaculture in the Gulf EEZ. Among the three alternatives that limit what can be cultured **Preferred Alternative 4** offers the benefit of the largest range of native Gulf species allowable for aquaculture in the Gulf EEZ.

6.5.3 Direct and Indirect Effects on the Administrative Environment

As described above, **Alternative 1** would allow culture of non-native species and carries the highest risk of problems due to escapement of cultured fish and their detrimental effects on native stocks and the ecosystem. Because the other alternatives do not allow culture of non-native species, the negative impacts of accidental escapes on the stocks and ecosystem would be much less, as would the likelihood of agency action in response to such escapes.

Culture of goliath grouper, Nassau grouper, red drum, and/or corals could result in illegal harvest of wild animals, increasing the administrative burden on law enforcement. Choice of **Alternative 1, 2,** or **4**, which would allow culture of goliath and Nassau grouper, could result in increased administrative costs due to enforcement of regulations and prosecution of violators. **Alternative 3** would prohibit culture of these species of grouper, and ideally would not cause these expenses. **Alternative 2** prohibits culture of corals, so it would not cause administrative costs from addressing illegal sale of corals. Measures which would allow culture of corals could increase enforcement costs and therefore negatively affect the administrative environment.

Alternatives 2, **3**, and **4** allow the aquaculture of various ranges of marine species in the Gulf of Mexico that are currently managed by the Council and therefore have essential fish habitat identifications and descriptions in GMFMC (2004). Because the range of species in **Alternative 1** is not restricted to species currently managed by the Council (or

NMFS) the essential fish habitat provisions of the MSFMCA would need to be addressed in this FMP for any additional species added to the Aquaculture FMU.

6.6 Action 5: Allowable Marine Aquaculture Systems

The MSFCMA and 50 CFR 600.747 require the Secretary of Commerce to prepare a list of all fisheries and the gears used in those fisheries. The use of any gear or participation in a fishery is prohibited if it is not included on the allowable list of gears and fisheries in 50 CFR 600.725. An individual fisherman can notify the appropriate Council of the intent to use a gear not already on the list. Unless regulatory action is taken by the Council within 90 days to prohibit the use of such gear, the fisherman may use the gear in the fishery. Upon approval of this FMP, the aquaculture fishery and any allowable gear types would need to be added to this list by the Secretary.

Alternative 1 would not specify the types of marine aquaculture systems (e.g., cages, net pens) allowed in the Gulf of Mexico. Because **Alternative 1** would not specify any allowable gears, aquaculture either could not occur or the Secretary would have to specify all gears as allowable. **Alternative 2** would allow only cages and net pens for offshore aquaculture. Given that only finfish, spiny lobster, and stone crabs would be allowed for aquaculture in this FMP, allowing only cages and net pens should be sufficient. However, if the Council chooses to add additional species to their FMU, only allowing cages and net pens could limit culture of other species in the future that are grown using other gear types (e.g., mussel longlines). **Preferred Alternative 3** would not authorize (or prohibit) specific allowable aquaculture systems. Instead, NOAA Fisheries Service would evaluate the marine aquaculture system proposed in each permit application on a case-by-case basis. Permit applicants would be required to submit information sufficient for the RA to determine the structural integrity of proposed allowable aquaculture systems. The RA would also consult with NOAA's offices and programs to determine if proposed aquaculture systems pose a significant risk to EFH, protected resources, marine mammals, public health, and safety.

6.6.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Though determining what is considered an allowable marine aquaculture system is administrative in nature, it can have effects on the physical, biological, and ecological environments. An acceptable aquaculture system must be:

1). Robust enough to withstand open Gulf conditions (including hurricanes) without breaking apart;
2). Effective in preventing escapement, and
3). Effective at dispersing wastes by allowing sufficient current flow.

If a system does not meet these standards it may negatively affect the physical and biological environments. **Alternative 1** does not specify aquaculture systems, nor does it provide guidance for evaluating systems proposed by aquaculture operations. This lack

of guidance may allow systems to be used, which do not meet the three key factors in determining an effective system listed above. This could lead to negative impacts on the physical, biological, and ecological environment. Negative impacts could include: systems with low structural integrity that are vulnerable to storm events, damage or destruction of critical habitat due to lost or damaged gear, reduced water quality associated with poor dispersal of wastes, and increased risks of escapement by cultured organism.

Alternative 2 would only allow net pens or cages to be used (see Appendix G). As long as the applicant planned to use a cage or net pen it would be approved for aquaculture, unless the cage or net pen poses a risk to protected resources and EFH, as regulated under the ESA and MSFCMA. **Alternative 2** provides no requirements for evaluating the robustness and structural integrity of a cage. There would also be no requirements to evaluate a cage or net pen's ability to prevent escapement, prevent environmental damage, or prevent impacts to marine resources, such as marine mammals and protected resources. **Alternative 2** would also prevent the use of any system developed using technology not yet invented that does not meet the definition of a net pen or cage. Such new systems could be far superior to net pens or cages requiring the Council to amend their FMP if they elected to allow such systems. **Alternative 2** also would prevent other existing aquaculture systems from being used (e.g., longlines), especially if the Council includes more species in its FMU. **Alternative 2** is expected to provide slightly greater benefits to the physical and biological environments than **Alternative 1** because it would specify at least two allowable gear types. However, **Alternative 2** will provide less benefits to the physical and biological environments than **Preferred Alternative 3** because it does not provide criteria for evaluating the structural integrity of the system.

Preferred Alternative 3 would base approval not on the type of system proposed but on a case-by-case evaluation by NOAA Fisheries Service of the soundness of the proposed design. This is expected to be the best alternative with the least effects on the physical, biological, and ecological environment. As new technologies are developed and unique niches exploited in the aquaculture industry, a case-by-case review will allow NOAA Fisheries Service to examine the appropriateness of a system to its application while examining the impacts to the physical, biological, and ecological environments. Applicants would be required to submit documentation sufficient for NOAA Fisheries Service to evaluate the structural integrity of a proposed system. Documentation could include computer and physical oceanographic models. Additionally, NOAA Fisheries Service would assess the risks a proposed system poses to EFH, marine mammals, protected species, wild fish stocks, public health, and safety. Assessment and review would be based on consultations with NOAA offices and programs, such as the NOAA Aquaculture Program and the SERO Habitat Conservation and Protected Resources Divisions. If a proposed system is determined to cause or potentially cause significant risks to marine resources and the human environment, then the proposed aquaculture system would be denied. Any denial would be provided to the applicant in writing. Because of the multiple levels of review, as well as additional documentation that would need to be obtained from the applicant, **Preferred Alternative 3** is expected to provide the greatest benefits to the physical and biological environments.

6.6.2 Direct and Indirect Effects on the Economic and Social Environment

Action 5 considers allowable marine aquaculture systems. **Alternative 1** is the status quo alternative and would not specify systems allowed for aquaculture. Additionally, current regulations do not specify the systems allowed for a project requiring an EFP. Although **Alternative 1** appears to allow any system for offshore aquaculture, authorization of such a system would still depend on NOAA Fisheries Service review to determine if the system poses a significant threat or risk to EFH and protected resources or violates other Federal laws. Current EFP requirements specify that an applicant must identify each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. If Action 1, Alternative 1 is selected as the preferred then NOAA Fisheries Service would use this information to assess the impact of the gear and harvesting practices of the proposed project on the environment and protected species. Given that the Council has selected Action 1, Alternative 2 as the preferred, NOAA Fisheries Service would only use existing authorities under the MSFCMA and ESA to assess the impacts and structural integrity of a proposed aquaculture systems.

Alternative 1 is the least transparent of the alternatives of this action. Consequently, it has the greatest time and costs associated with obtaining the information necessary to determine which systems would be acceptable and later identifying the range of systems actually in use. It also requires the greatest amount of time and costs to identify and estimate the potential and realized socioeconomic impacts of systems and adequately enforce Federal laws.

Alternative 2 limits the range of allowable systems and is more transparent than the first alternative. This alternative, as written, would allow the use of any types, quantities and combinations of cages and net pens wherever and whenever the aquaculturist wants during the duration of the permit. However, the cage or net pen would first need to be approved and determined to be compliant with existing Federal laws, including not posing a threat to the environment.
Alternative 2 is more transparent than **Alternative 1**, but fails to inform potential applicants and the public of which types, quantities and combinations of cages and net pens that may be unacceptable because of likely and significant adverse impacts on the environment and protected species or violations of existing Federal laws. Consequently, both applicants and the public would have to consult with NOAA Fisheries Service and obtain additional information in order to determine which types, quantities, and combinations of cages and net pens would be prohibited.

Preferred Alternative 3 would not limit what systems are allowed, so it is not as transparent as **Alternative 2**. Limitations on allowable systems would depend on NOAA Fisheries Service case-by-case review to determine if a system poses significant risks to EFH, protected resources, public health, or safety. Opportunity to comment on approval of a proposed system would be given to the public through a written notice and public

comment period prior to permit issuance. This will provide the public an opportunity to provide comments on the potential socioeconomic impacts of proposed systems that could improve the RA's evaluation of the risk of a system being proposed for a particular area. It also provide applicants and the public information on criteria and information used by NOAA Fisheries Service to determine if a system may pose a significant risk to the environment. Because case-by-case review is expected to result in extensive increases in time for reviewing proposed systems, this alternative will have the greatest economic costs for both the applicant and NOAA Fisheries Service. Economic costs for the applicant would include time completing application paperwork describing the system and paying for computer and oceanographic modeling to determine if a system can withstand storm events and other stresses. Increased economic costs are expected to be more than offset, by the benefits to the physical and biological environments of using more rigorous and structurally sound systems for aquaculture.

Preferred Alternative 3 would benefit offshore aquaculture operations because it would not limit the types, quantities and combinations of cages, net pens or other containing technologies used, but instead would prohibit a system if it is evaluated to pose a significant risk to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety. However, this alternative is likely to cause applicants to incur greater time and costs to consult with NOAA Fisheries Service and obtain the information necessary to predict which system is consistent with their business plans and not likely to pose a significant risk.

Neither **Alternative 1** nor **Preferred Alternative 3** specify the types of systems that would be allowed for offshore aquaculture in the Gulf. **Alternative 2** allows cages and net pens and would allow any type or use of a cage or net pen as long as it does not impact EFH, protected resources, or violate other Federal laws. **Preferred Alternative 3** does not identify the types of system that would be allowed, but instead, states that a proposed system would not be allowed if it were evaluated to pose a significant risk to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety. Consequently, **Preferred Alternative 3** could impose the least costs in terms of potential damages to and greatest benefits from protection of the environment, public health, and safety. However, **Preferred Alternative 3** is not as transparent as **Alternative 2** and increases time and costs incurred by applicants and the public to assess which systems have been and tend to be acceptable and what criteria the RA uses and has used to evaluate a system's risk.

6.6.3 Direct and Indirect Effects on the Administrative Environment

Alternatives 1 and **2** would not require any additional NOAA Fisheries Service review of the proposed aquaculture system before it was deployed, but would require review under the ESA and provisions of the MSFCMA related to EFH. These alternatives would have the least effects on the administrative environment. **Preferred Alternative 3** would require direct review of each system proposed and would therefore directly affect the administrative environment more than the other alternatives. Because both **Alternatives 1** and **2** would not require additional administrative review other than what

is already required, they may lead to indirect effects on the administrative environment. Indirect effects could result if proposed systems are authorized that cannot handle the rigors of the offshore environment. If systems are of poor structural integrity, system failures could be expected, leading to escapement of cultured organisms and potential damage to EFH and other marine resources. This could lead to huge increases in demand on the administrative environment as mitigating efforts must be developed and implemented. **Preferred Alternative 3** is not expected to encounter these types of problems as any uncertainty in the use of systems would be addressed in the initial review of a proposed system. **Preferred Alternative 3**, however, would result in the greatest costs to the administrative environment because of the time-consuming nature of case-by-case review. Overall, **Preferred Alternative 3** is expected to have the greatest impact on the administrative environment, but the least impacts on the physical, biological, and social environments.

6.7 Action 6: Marine Aquaculture Siting Requirements and Conditions

Action 6 includes three alternatives. **Alternative 1**, no action, would not designate areas in the Gulf EEZ where aquaculture would be allowed. **Alternative 2** would establish marine aquaculture zones. Marine aquaculture would be limited to these zones. **Preferred Alternative 3** would establish criteria and include specific prohibitions to be used when siting a proposed aquaculture facility. These criteria and the video survey provided by the permit applicant would be used by NOAA Fisheries Service to evaluate each proposed location identified in a permit application on a case-by-case basis.

Regardless of the alternative selected in this FMP, the ACOE still has the authority to issue siting permits under its current authority. **Alternative 1** acknowledges this authority and defers to ACOE. However, the Council and NOAA Fisheries Service may have other criteria that would not be considered by the ACOE and therefore selecting an alternative that incorporates these criteria seems more prudent. **Alternative 2** would create aquaculture zones, where facilities may operate. The problem with **Alternative 2** would be in continuously updating these reference maps for acceptable locations of siting facilities. With the number of agencies that have authority in the EEZ, this is a monumental task to accomplish Gulf-wide given the probability that only select areas will be used for aquaculture within the Gulf.

Preferred Alternative 3 would establish specific criteria for siting, but would not establish predefined zones. It is estimated that approximately 28,719 nm^2 would be suitable for offshore aquaculture in the Gulf of Mexico (see Figure 4.6.1). This area would represent approximately 13.7 percent of the entire Gulf EEZ. Aquaculture would be prohibited in marine protected areas and marine reserves, HAPCs, SMZs, permitted artificial reef areas, and coral reef areas (**Alternative 3(a)**). Operations would also be required to be sited at least 1.6 nm from each other (**Alternative 3(b)**) and the permitted site would need to be twice as large as the area encompassed by allowable aquaculture systems to allow fallowing and rotation of cages, net pens, and other allowable systems (**Alternative 3(c)**). Additionally, permit applicants would be required to submit a video survey of the proposed site (**Alternative 3(d)**). This video would allow NOAA Fisheries

Service to evaluate the benthic habitat at the proposed site to ensure siting would not affect any EFH, artificial reefs, or ecologically important habitat. NOAA Fisheries Service would also be provided authority to conduct case-by-case reviews of specific sites (**Alternative 3(e)**). The case-by-case approach of **Preferred Alternative 3** would provide for a more comprehensive review process for specific sites that is not provided by **Alternative 2**.

6.7.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

If **Alternative 1** were chosen, NOAA Fisheries Service would evaluate each proposed site by commenting on the ACOE's Section 10 permit application. This permit is required before constructing an offshore aquaculture facility. The ACOE must consider "…a broad range of potential environmental and other impacts…" before issuing a Section 10 permit, including "…water quality, pollution, economic factors, safety, accurate charting of any structures, aesthetics, navigational integrity, and the effects of the structure on recreation, fish, and other wildlife (33 CFR 320.4)." However, the ACOE's evaluation of the effects of the structure may not address factors NOAA Fisheries Service considers critical. If NOAA Fisheries Service had concerns about the permit application, these concerns would not necessarily be addressed by the ACOE or the applicant before the Section 10 permit was issued.

Alternatives 2 and **Preferred Alternative 3** would be better than **Alternative 1** by allowing NOAA Fisheries Service to evaluate the suitability of a proposed site and its potential impacts to the physical, biological, and ecological environment. However, **Alternative 2** would not allow NOAA Fisheries Service to evaluate the characteristics of a potential site on a localized scale. Rather, **Alternative 2** would establish 13 predefined aquaculture zones. A benefit to this approach would potentially include the reduced time for approving a facility's location. However, a negative effect would include establishing broad zones that may not include sufficient detail to prevent or minimize localized, small-scale impacts associated with a particular site. If this alternative is selected by the Council as the preferred, then additional authority would likely need to be provided to NOAA Fisheries Service to evaluate specific sites within each of the predefined zones.

Preferred Alternative 3 would prohibit aquaculture operations from being sited in certain areas and would allow NOAA Fisheries Service to review proposed aquaculture sites on a case-by-case basis. Criteria considered by NOAA Fisheries Service during case-by-case review would include, but would not be limited to, depth of the site, current speeds, substrate type, the frequency of harmful algal blooms (HAB) or hypoxia at the proposed site, marine mammal migratory pathways, and the location of the site relative to commercial and recreational fishing grounds and important fishery habitats (e.g., seagrasses). These criteria will allow some flexibility in the siting review process without compromising environmental safeguards for the protection of EFH and other marine resources. Explicitly prohibiting aquaculture in sensitive areas, such as coral reefs and HAPCs, will afford protection to those habitats and prevent, or minimize to the extent practicable, any impacts from occurring (e.g., nutrient loading) that are associated

with aquaculture operation. The Council considering prohibiting offshore marine aquaculture in NOS marine sanctuaries, but ultimately moved this action to considered but rejected (see Appendix D), so that each marine sanctuary can evaluate whether marine offshore aquaculture is compatible with their management plan. The requirement to provide video surveys of benthic habitat at the proposed site will allow NOAA Fisheries Service to determine if critical and sensitive habitat at the site exists. If it does, alternative sites would have to be considered to avoid detrimental envioronmental impacts. Requiring facilities be sited at least 1.6 nm from one another will limit transmission of pathogens between facilities. There is no widely accepted standard for how far apart facilities should be sited, but estimates range from 300 m to 8 km (Levings et al. 1995). Lastly, requiring a site to be twice as large as the area encompassed by allowable aquaculture systems will allow permittees to rotate allow systems. This will diminish the build up of wastes and organic matter below cages, net pens, and other allowable systems, thereby benefiting the physical environment.

Overall, **Preferred Alternative 3** would include the most thorough review of a proposed site, and therefore would provide the greatest net benefits to the physical and biological environments. **Alternative 2** would provide benefits to the physical and biological environment on a broad scale by prohibiting aquaculture in areas not considered suitable for aquaculture, but this alternative may not adequately address small scale siting considerations within broader aquaculture zones. Additionally, as mentioned above, suitable areas for aquaculture would change over time as new regulations are established and old regulations are abolished by federal agencies. **Alternative 1** would not provide NOAA Fisheries Service with authority to regulate siting of aquaculture facilities. NOAA Fisheries Service would continue to comment on ACOE siting permits to ensure proper siting of facilities. This alternative would relegate NOAA Fisheries Service role to only commenting on permits under the authority of other federal agencies, potentially providing the least protection to the physical and biological environments.

Preferred Alternative 3 would more effectively identify unacceptable sites by evaluating each on a case-by-case basis using specified criteria and a video survey of benthic habitat at the proposed site. Therefore, it is less likely to result in negative impacts to the physical, biological, and ecological environment.

The alternatives in order from least likely to have negative effects on the physical, biological, and ecological environments to most likely are **Preferred Alternative 3**, **Alternative 2**, and **Alternative 1**.

6.7.2 Direct and Indirect Effects on the Economic and Social Environment

Action 6 considers establishment of marine aquaculture siting criteria or zones. **Alternative 1** is the status quo alternative and current regulations do not designate areas of the Gulf EEZ where offshore aquaculture is allowed or prohibited; however, there are existing prohibitions against fishing in designated areas, such as in marine protected areas or marine reserves. **Alternative 1** would continue to allow NOAA Fisheries Service to

comment on ACOE siting permits, but would not provide any additional authority to NOAA Fisheries Service with regard to siting. Unlike **Alternatives 2** and **3**, this alternative fails to inform potential applicants and the public of which areas of the Gulf EEZ would be allowed for offshore aquaculture. Consequently, both applicants and the public would have to incur time and costs to consult with NOAA Fisheries Service and the ACOE to obtain additional information in order to assess which areas and/or characteristics of areas would not be acceptable.

Alternative 2 would designate areas or zones within the Gulf EEZ where offshore aquaculture would be allowed, but it would not prohibit non-aquaculture operations in the zones. The establishment of zones would concentrate aquaculture operations in specific areas of the Gulf of Mexico. The proposed zones account for approximately 5 percent of the Gulf of Mexico EEZ. Applicants would likely seek areas within a zone that are close to a major port in order to reduce transport costs. The farther an operation is located offshore within a zone, the higher the costs it will potentially incur to operate. This will directly affect revenue from an operation. Additionally, **Alternative 2** would not provide specific criteria for NOAA Fisheries Service to review proposed sites within a broad-scale zone. Presumably, this activity would still be done through the issuance of an ACOE permit. However, if the ACOE has different or less rigorous siting criteria, then sites could be potentially sited improperly. This would have negative biological and social effects and could increase economic costs if a facility is not properly sited in an area that would maximize growth of cultured organisms.

Preferred Alternative 3 would prohibit offshore aquaculture operations in protected habitats, but would not limit offshore aquaculture operations to designated areas like **Alternative 2**, so it is not as transparent as **Alternative 2**. Preferred Alternative 3 would explicitly provide the public with a list of areas that would be prohibited for siting. These include: coral areas, SMZs, HAPCs, marine reserves, marine protected areas, and artificial areas. Additional requirements are also specified in **Preferred Alternative 3** that are intended to reduce the spread of pathogens, improve NOAA Fisheries Service review of proposed sites, and allow fallowing of aquaculture sites. Conducting a benthic video survey will result in direct economic costs to the applicant. NOAA Fisheries Service will also incur additional administrative costs associated with review of benthic video surveys. Lastly, **Preferred Alternative 3** would allow for case-by-case review of proposed sites. Criteria considered by NOAA Fisheries Service may include depth of the site, current speeds, substrate type, the frequency of harmful algal blooms (HAB) or hypoxia at the proposed site, marine mammal migratory pathways, and the location of the site relative to commercial and recreational fishing grounds and important fishery habitats. Case-by-case review would result in additional time and costs for the applicant to provide NOAA Fisheries Service with sufficient information to authorize or deny a proposed site.

Alternatives 1 and **3** do not designate marine aquaculture zones, and therefore do not explicitly limit the geographic areas where an applicant can propose to locate an aquaculture operation. **Alternative 2** does. The benefit of designating zones is that with little time and cost both applicants and the public learn the locations where aquaculture

operations are allowed. However, the strict focus on zones in geographic space ignores physical, chemical, biological, and other characteristics that differentiate one location from another within the same zone and various risks and associated costs of locating an aquaculture operation within a zone. Consequently, **Alternative 2** has the greatest potential for environmental damages and the costs associated with those damages. **Alternative 1** does not designate aquaculture zones and does not explicitly address the need or desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location; however, sites would continue to reviewed and permitted by the ACOE. **Preferred Alternative 3** explicitly addresses the need and desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. Consequently, it has the least potential for environmental damages and costs associated with those damages. However, it would impose larger time and costs on applicants and the public to obtain information to assess what sites are acceptable than **Alternative 2**, but less than **Alternative 1**. **Preferred Alternative 3 would** also limit the number of permitted sites within a set number of nautical miles, with the number being indirectly proportional to the scale of permitted operations. Also, if the permit holder has exclusive access to and use of the site under **Preferred Alternative 3**, the requirement essentially privatizes areas of the Gulf EEZ because a site would be at minimum twice as large as the area used by the operator for deployment of the systems, which has socioeconomic consequences.

6.7.3 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would require the least direct effects on the administrative environment, because NOAA Fisheries Service would only be commenting on the application for an ACOE permit and not evaluating a proposed site through its own permitting process. If the ACOE allowed a system NOAA Fisheries Service found had unacceptable biological, ecological, or physical effects, negotiation with the ACOE and the applicant to resolve NOAA Fisheries Service's concerns could be time consuming for staff. Indirect effects on the administrative environment could result if the ACOE sites a facility in an area that poses negative environmental impacts to marine resources and EFH.

Alternative 2 would have greater effects on the administrative environment than **Alternative 1**, but less effects than **Preferred Alternative 3**. Under this alternative, NOAA Fisheries Service would only need to determine if a proposed facility was located in the allowable aquaculture zones in Figure 4.6.1 and Table 4.6.1, and whether the site was consistent with other Federal laws (e.g., ESA, MSFCMA requirements for EFH) From the perspective of the administrative environment, **Alternative 2** would be advantageous relative to **Preferred Alternative 3** because it would allow for faster permit review. However, additional administrative effects may result from siting aquaculture facilities using broad pre-permitted zones, rather than siting facilities using case-by-case review. There is potential for EFH and other important marine resources to be within a large pre-permitted zone. If no site specific information is obtained by NOAA Fisheries Service, then aquaculture facilities cited within these zones have the potential to impact EFH and other marine resources. Therefore, additional information would be necessary for NOAA Fisheries Service to adequately review a proposed site,

placing a greater burden on the administrative environment during the review process or after the review process if negative impacts occur. Administrative costs for **Alternative 2** have largely been absorbed up-front through development of this FMP and the proposed zones.

Preferred Alternative 3 is expected to result in the greatest burden on the administrative environment when compared to the other alternatives in Action 6. NOAA Fisheries Service would need to ensure that facilities are not sited in prohibited areas, sites are of appropriate size, and are spaced at least 3 km from other facilities. NOAA Fisheries Service would also have to review benthic surveys of the site to ensure critical habitat or EFH does not exist or would not be impacted by the siting of an aquaculture facility. Lastly, NOAA Fisheries Service would have to conduct case-by-case reviews of a site to determine if facilities would be sited at appropriate depths with sufficient currents where HAB and hypoxia do not occur or occur infrequently. NOAA Fisheries Service Sustainable Fisheries Division would also have to consult with the Protected Resource and Habitat Divisions, as well as other NOAA offices to ensure sites do not pose significant risks to critical habitat, marine mammals and protected resources, or other marine resources. **Preferred Alternative 3** is expected to take considerable staff time to ensure applicants provide necessary data and information to approve their proposed aquaculture site.

In summary, **Preferred Alternative 3** would result in the greatest administrative effects (greater costs, more time spent reviewing sites), but would also have the greatest benefits to the biological and physical environment. **Alternative 2** would streamline the permitting process and reduce the burden on the administrative environment, but may negatively affect the biological and physical environments if a facility is not properly sited within a pre-permitted zone. **Alternative 1** would have no direct effects on the administrative environment, but indirect effects would result if the ACOE sites a facility in areas that NOAA Fisheries Service would recommend against.

6.8 Action 7: Restricted Access Zones for Marine Aquaculture Facilities

The Council has authority to create zones that exclude fishing or fishing vessels. Examples are zones where fishing with certain gear is prohibited and no-take zones where fishing and possession of fish is prohibited. Restricting access around aquaculture facilities would afford some protection to an operation's equipment and the product being cultured. On the other hand, limiting usage near these sites could be seen as a user conflict by denying the public from accessing these areas. The most prudent way to overcome this issue is for an aquaculture facility to request a site permit large enough to afford protection from potential user conflict problems (e.g. a vessel accidentally cutting a mooring line while passing the facility), while at the same time maximizing other user groups' access to the open ocean.

6.8.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Establishing restricted access zones around aquaculture facilities is primarily administrative and does not directly affect the physical, biological, or ecological environment, but does indirectly affect these environments. Restricted access zones would reduce gear and user conflict, and therefore have the potential to indirectly affect the physical, biological, or ecological environment.

Alternative 1 would not restrict access around a marine aquaculture facility. Fishing vessels could fish close to allowable aquaculture systems and vessels could transit in or through permitted aquaculture sites. These activities could result in damage to allowable aquaculture systems, including escapement of cultured fish. To minimize the risks of allowable systems being damaged, **Preferred Alternative 2** and **Alternative 3** propose establishing restricted access zones for marine aquaculture facilities.

The zone for **Preferred Alternative 2** would correspond to the coordinates on the ACOE siting permit, which should be an area at least twice as large as the total area encompassed by the allowable aquaculture systems (e.g., cages and net pens) as required in the siting criteria of Action 6. The ACOE permit will determine the appropriateness of the siting permit based on "the extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work is likely to have on the public and private uses to which the area is suited" (33 CFR 320.4(a)(2)(iii). This area would likely need to be marked with buoys or other gears to make boaters and fishermen aware of the restricted access zone. However, the U.S. Coast Guard is responsible for the regulation and enforcement of various activities in the navigable waters of the U.S. and would be responsible for making the determination for the appropriate marking requirements. The USCG requires structures be marked with lights and signals to ensure compliance with private aids to navigation (33 C.F.R. 66.01). Title 33 C.F.R. 64 also requires the marking of structures, sunken vessels, and other obstructions for the protection of maritime navigation. Types of structures and their marking requirements can be found at 33 CFR 67.

Alternative 3 is similar to **Preferred Alternative 2** in that it would restrict access around allowable aquaculture systems. Fishermen and vessels would be prohibited within 100, 500, or 1,640 feet of allowable aquaculture systems. This latter distance corresponds to the specified distance for MMS safety zones established for some oil and gas platforms in the Gulf of Mexico.

Restricting access around a facility may directly protect species known to aggregate around structure. Aquaculture facilities have been shown as aggregation sites for many wild species. For example, Alston et al. (2006) found species abundance and richness significantly increased around an aquaculture cage off the coast of Puerto Rico after it was deployed. Additionally, the lack of anchoring or any other interactions that may occur (e.g. divers stirring up the bottom) with the physical environment will benefit the benthos of these restricted sites. Also, preventing access around a facility will reduce the

likelihood of damage to a facility, particularly cages and net pens, thereby reducing any potential impacts associated with fish escapement. Overall, **Preferred Alternative 2** or **Alternative 3** would benefit the physical, biological, and ecological environments more than **Alternative 1**.

6.8.2 Direct and Indirect Effects on the Economic and Social Environment

Action 7 considers establishment of restricted access zones around each aquaculture facility. **Alternative 1** is the status quo alternative. At present, regulations do not create restricted access zones around an EFP-permitted facility, and the permit holder does not have exclusive access to and use of restricted access zones around its facility for purposes of exempted or non-exempted fishing. Consequently, the owner of a facility and anyone else benefits from the shared ability to operate fishing vessels in the areas immediately surrounding an offshore aquaculture facility. A potential cost of not restricting access around an aquaculture facility; however, is that operation of a fishing vessel close to an aquaculture facility could result in accidental damages to the facility, vessel and/or personnel caused by use of fishing gear or other equipment or a vessel strike.

Preferred Alternative 2 would create restricted access zones by limiting access to and use of areas around offshore aquaculture facilities for purposes of fishing. Specifically, it would prohibit recreational and commercial fishing in the restricted access zones by anyone and limit access to those zones to fishing vessels that have a copy of the facility's Gulf Aquaculture Permit onboard. The benefit of this alternative is that it reduces the risk and associated costs of damages caused by fishing gear, other equipment or vessel strike. However, a cost to the facility owner and others who fish is the loss of potential revenue and/or pleasure that would derive from engaging in traditional fishing (recreational or commercial fishing) in the restricted access zone surrounding the facility. Also, fishing vessels (federally permitted or not) that do not have a copy of the facility's aquaculture permit would be prohibited from transiting through the restricted access zone, and the cost to one that did operate or transit through the zone would be equal to the costs associated with an unspecified penalty or fine.

Preferred Alternative 2 is not as transparent as the other two alternatives, because it does not define the size(s) of these restricted access zones beyond corresponding with an approved ACOE siting permit. Consequently, it is unclear how fishing vessel operators would know where a restricted access zone begins and ends around a facility because there is no standard size. The applicant would also incur additional costs to mark the restricted access zone where transit and fishing activity would be restricted.

Alternative 3 would create restricted access zones around offshore aquaculture systems, such as cages and net pens. It would also create uniform restricted access zones, which offers the greatest transparency among the alternatives that establish a restricted access zone. Consequently, applicants and the public would incur the least time and costs to find the sizes and locations of these zones.

Like **Preferred Alternative 2**, **Alternative 3** would prohibit recreational and commercial fishing in the restricted access zones by anyone. It would also limit access to those zones to federally permitted fishing vessels that have a copy of the facility's Gulf Aquaculture Permit onboard. However, as written, unlike **Alternative 2**, fishing vessels that are not federally permitted and do not have a copy of the permit would be allowed to transit through the zone. The benefit of this alternative is that it reduces the risk and associated socioeconomic costs of damages caused by fishing gear, other equipment or vessel strike, yet the reduction is not as great as that created by **Alternative 2**.

Under **Alternatives 2** and **3**, socioeconomic costs to the facility owner and others who presently fish in an area that becomes a restricted access zone is the loss of potential revenue and/or pleasure that would derive from engaging in traditional fishing (recreational or commercial fishing).

Alternative 1 would not limit access and use of areas of the Gulf EEZ to recreational and commercial fishing, whereas **Alternatives 2** and **3** would. Consequently, **Alternative 1** would benefit traditional fishermen by not limiting how close their vessels operate and transit to aquaculture facilities. **Alternative 1** poses the greatest risk of damages to a facility, fishing vessel, and personnel caused by use of fishing gear and equipment or a fishing vessel strike.

Alternative 3 would establish well-defined boundaries to create restricted access zones and is the most transparent of the three alternatives. Applicants and the public would incur the least time and costs to learn the criteria used by NOAA Fisheries Service to determine the sizes and locations of particular restricted access zones. Anyone in a restricted access zone, whether aboard a vessel or not, would be denied the benefit of engaging in recreational or commercial fishing. Federally permitted fishing vessels without a copy of the aquaculture permit would be prohibited from operating in or transiting through a restricted access zone.

6.8.3 Direct and Indirect Effects on the Administrative Environment

As stated earlier, creating restricted access zones is primarily administrative in nature. **Alternative 1** would not have a direct effect on the administrative environment as it does not create any restricted access zone around aquaculture facilities. Selecting **Preferred Alternative 2** would rely on the coordinates of the aquaculture facility as established through the siting permit issued by the ACOE to delineate the restricted access zone. The direct effect on the administrative environment of **Preferred Alternative 2** would involve verifying the correct size of the siting permit (at least twice as large as the total area encompassed by the allowable aquaculture systems (e.g., cages and net pens) as required in the siting criteria of Action 6) and the enforcement of the restricted access zone. Administrative effects for **Alternative 3** would be similar to those of **Preferred Alternative 2** and there would be an increased burden on NOAA Fisheries Service to enforce the restricted access zones. The enforcement of these zones could result in significant costs given that at sea enforcement is difficult and expensive.

The creation of a restricted access zone may allocate resources, particularly those of law enforcement, away from their primary focus, and could therefore, directly affect the administrative environment. For these reasons **Preferred Alternative 2** and **Alternative 3** would have more of an effect on the administrative environment than **Alternative 1**. **Preferred Alternative 3** would likely have the greatest effect on the administrative environment, since no size standard would be established for restricted access zones. Without a size standard, it will be difficult for fishermen and the general public to know where fishing and transit is or is not prohibited around an offshore aquaculture facility.

6.9 Action 8: Recordkeeping and Reporting

Recordkeeping and reporting requirements are meant to allow both aquaculture facilities and NOAA Fisheries Service to examine the operation and thereby the impacts to the physical, biological, and ecological environments. These reports will act as the check and balance system in the time periods between permit issuance and renewal. By requiring annual reports (at a minimum), managers can assess all aspects of a facility and its operation. These recordkeeping and reporting requirements are intended to mitigate impacts associated with marine aquaculture and alert managers to potential problems. If potential problems arise, these requirements will allow NOAA Fisheries Service to work with a facility to resolve potential problems and environmental impacts, or revoke the facilities permit if problems and impacts persist.

6.9.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Recordkeeping and reporting are administrative in nature and would have no direct effect on the physical, biological, or ecological environment. However, information contained in recordkeeping and reporting may indirectly affect the physical, biological, and ecological environment as these requirements are designed to monitor the effects a facility has on the physical, biological, and ecological environment. By establishing reporting requirements, the impacts of an aquaculture facility on the physical, biological, and ecological environment can be examined. Where appropriate, additional conditions of an aquaculture's operation could be implemented to mitigate these impacts and therefore, reduce the effects on these environments.

As previously discussed in this Section the environmental impacts and concerns associated with marine aquaculture are largely associated with: 1) Modification of wild stock genetic diversity; 2) transmission of infectious disease to wild stocks; 3) modification of benthic habitat from discharged effluents, such as solids, and dissolved nutrients; 4) escaped fish competing with wild fish; and 5) entanglement of wildlife with aquaculture structures. Recordkeeping and reporting requirements are designed to monitor these concerns and where appropriate, implement plans to mitigate any deleterious effects.

Alternative 1 would provide the Regional Administrator authority to specify EFP recordkeeping and reporting requirements, but only if Action 1, Alternative 1 (Exempted

Fishing Permit) is selected as the preferred alternative. Because Action 1, **Alternative 2** was selected by the Council as the preferred (NOAA Fisheries Service permit to operate a facility), only **Alternative 2** can be selected. The greatest impacts to the biological and physical environments would have occurred if the Council did not select a preferred alternative for Action 8. By not selecting a preferred alternative, aquaculture operations would not have to meet recordkeeping and reporting requirements. There would be no checks and balances system to monitor environmental impacts. This could negatively affect the physical and biological environments by degrading habitat, spreading disease, and allowing fish escapement.

Instead, **Preferred Alternative 2** will require aquaculture facilities to meet the 10 recordkeeping and reporting requirements. These reporting requirements include, notifying NOAA Fisheries Service of escapement, entanglements, and disease outbreaks. These reporting requirements would also benefit enforcement, by providing them with information on dates/times when fish are harvested and landed and requiring facilities to maintain harvest and sale records. Facilities would be required to provide NOAA Fisheries Service with an annual report each year addressing all of the reporting requirements listed in **Preferred Alternatives 2(a-p)**. Overall, **Preferred Alternative 2** would provide NOAA Fisheries Service with sufficient information to monitor and assess the impacts of an aquaculture facility when determining compliance with permit conditions. **Preferred Alternative 2** would help mitigate any environmental impacts by alerting NOAA Fisheries Service to potential problems that can then be resolved.

Establishing reporting requirements as is done with **Preferred Alternative 2** for: Major escapement is defined as cumulative escapement of 20 percent of the cultured organisms from a single allowable aquaculture system within a 24 hour period; date, time, and location of entanglements or interactions with marine mammals, endangered species, and migratory birds; a reportable pathogen outbreak; keeping copies of feed labels on file for three years from date of use; and the impacts of an aquaculture facility on the ecological environment can be examined. Where appropriate, additional conditions of an aquaculture's operation could be implemented to mitigate these impacts and therefore, reduce the effects on the ecological environment.

Additionally, reporting requirements established in **Preferred Alternative 2** which inform NOAA Fisheries Service of all species being cultured or notify NOAA Fisheries Service of any changes in sources used for providing fingerlings, could be used to assess the effects on the biological environment. Likewise, requiring a facility to inform NOAA Fisheries Service when the type of aquaculture system used for culture is changed could allow an evaluation of the effects on the physical environment. This requirement could even avoid adverse effects prior to deployment of the system if the system is known to be deleterious to the biological or physical environment. **Preferred Alternative 2** also takes into consideration catastrophic conditions that could affect the physical, biological, and ecological environment. In the event a catastrophic conditions occur, only the effects on recordkeeping and reporting are discussed here, whereas the emergency disaster plan is discussed in **Action 2 (Preferred Alternative 3 (xv.))**. It is during a catastrophic event that time schedules and methods for recordkeeping and reporting may be modified.

The RA will determine when catastrophic conditions exist, the duration of the conditions, and the geographic area affected by the catastrophic conditions, potentially impacting the physical, biological and ecological environment.

Any reporting requirements of an aquaculture's operation could indirectly affect the physical, biological, and ecological environment. A standardized list, as presented in **Preferred Alternative 2** would be more beneficial than **Alternative 1** because it allows for comparison between facilities and their effects on the physical, biological, and ecological environments.

6.9.2 Direct and Indirect Effects on the Economic and Social Environment

Action 8 considers recordkeeping and reporting requirements. **Alternative 1** is the status quo alternative, and it would not explicitly specify recordkeeping and reporting requirements. This would prevent NOAA Fisheries Service from monitoring the impacts of an operation to ensure wild resources are protected. **Alternative 1** would result in significantly less time and economic costs to the applicant when compared to **Preferred Alternative 2**. However, social costs are expected to be much greater given that no system would be in place to regularly monitor the impacts of an aquaculture operation.

Under existing regulations, the RA could propose terms and conditions for a proposed offshore aquaculture project in the Gulf if an EFP is issued. However, the Council has not selected this option as their preferred. If an EFP was selected as the preferred alternative in Action 1, then NOAA Fisheries Service would impose terms and conditions for operating an aquaculture facility. For example, in a previous EFP application published by NOAA Fisheries Service on July 30, 2008 (68 FR 44745) quarterly reports were required beginning 90 days after anchoring cages in site on: a) any pathogen occurrence; b) any use of chemotherapeutants approved by FDA or prescribed by a qualified veterinarian; c) outcome of any events requiring immediate notification; d) changes in faunal composition of the area around the experimental site; e) substrate and water quality monitoring; and f) harvests of maricultured fish species. These terms and conditions would be based on the discretion of the RA and could vary from one

Preferred Alternative 2 more explicitly states recordkeeping and reporting requirements that are specific to offshore aquaculture operations than **Alternative 1**. Consequently, it offers greater transparency than the first alternative. However, this alternative will result in substantially greater costs to the permittee given the numerous recordkeeping and reporting requirements that would have to be met.

Of the two alternatives, **Preferred Alternative 2** offers the least long-term risks and associated socioeconomic damages caused by actual or suspected events, such as entanglements with protected species or major escapements, by requiring timely reporting and responses in order to mitigate damages.

6.9.3 Direct and Indirect Effects on the Administrative Environment

Record keeping and reporting is an administrative function and would directly effect this environment. Both the aquaculture facility and NOAA Fisheries Service would be directly affected by requirements to maintain, submit, prepare, and review reports and records. However, the use of records and reports is designed to monitor impacts associated with aquaculture operations, which may reduce long-term burdens on the administrative environment. Detecting problems with an operation and taking action to halt those negative practices before they become hazardous to the environment or have irreversible impacts will have less of an impact to the administrative environment than waiting for the permit renewal stage to discover these problems. Although recordkeeping and reporting is burdensome and directly affects the administrative environment, **Preferred Alternative 2** is more beneficial than **Alternative 1** because of the trade-off between long-term and short-term impacts and burden.

6.10 Action 9: Biological Reference Points and Status Determination Criteria

The MSFCMA was written in part to establish the legal framework for managing wild fisheries resources of the United States, and not explicitly written for managing at sea fish farming or aquaculture operations. Many of the principles and concepts that guide wild stock management under the MSFCMA are either of little utility or are not generally applicable to the management of aquaculture operations. Despite this lack of conceptual similarity, offshore aquaculture falls within the realm of activities subject to regulatory control under the MSFCMA and therefore must be accommodated within the existing legal framework. Many MSFCMA legal requirements do not fit well or are difficult to satisfy with respect to aquaculture, thereby making them seem less useful or even unnecessary. This is particularly true for yield targets and stock status parameters around which management of wild fisheries is based. Regardless, they are legal requirements, and until additional legal authority specifically suited for management of open ocean aquaculture is established, all such requirements must be satisfied.

Action 9 considers two alternatives. **Alternative 1**, no action, would not specify biological reference points or status determination criteria for aquaculture in the Gulf of Mexico. The Council would be required to establish these criteria and reference points in a subsequent amendment as required by the MSFCMA. **Preferred Alternative 2** would establish biological reference points and status determination criteria for aquaculture in the Gulf of Mexico. This alternative would specify MSY and OY for the entire aquaculture fishery. It would also set a cap on planned production for any individual, corporation, or other entity equal to 5-20 percent of OY. Preferred Alternative 2 would also require NOAA Fisheries Service to publish a control rule if planned aquaculture production exceeds OY. If the OY proxy is exceeded, the Council would initiate review of the OY proxy and aquaculture program. The control date would provide future participants notice that entry into the aquaculture fishery may be limited or restricted after the control date. In addition to satisfying the legal mandates of the MSFCMA,

Preferred Alternative 2 would also limit production of cultured species in the Gulf of Mexico until more is known about the impacts of offshore aquaculture.

6.10.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Setting status determination criteria and biological reference points for aquaculture will not directly affect the physical, biological, or ecological environments, but may have indirect effects on those environments. **Alternative 1** would not establish status criteria or reference points, allowing aquaculture production to go unregulated. Theoretically, there will be some maximum capacity of the Gulf of Mexico to produce cultured fish that does not adversely affect wild stocks or the marine environment (e.g., water quality, habitat, etc.). By allowing aquaculture production to go unregulated and not specifying status criteria for assessing stock status, production could exceed some critical threshold and negatively impact wild populations. Negative impacts to the physical and biological environments could occur if the cumulative impact of production significantly reduces water quality, degrades habitat, or increases the transmission of disease and pathogens to wild stocks. To avoid these negative impacts, **Preferred Alternative 2** proposes establishing biological reference points and status determination criteria for aquaculture in the Gulf of Mexico.

Preferred Alternative 2 includes two options for establishing a proxy for MSY. The first option would set MSY equivalent to the total annual production capacity of all aquaculture operations in the Gulf of Mexico EEZ, while the second option would set MSY equal to OY. Setting MSY equivalent to the annual production capacity of all aquaculture operations in the Gulf of Mexico EEZ is essentially the same as **Alternative 1,** in that production of cultured species would go unregulated. The number, size, and capacity of facilities, as well as the carrying capacity of the Gulf of Mexico for aquaculture would be the only factors that limit production. In comparison, the Council's preferred option would set MSY equal to OY. This allows the Council to take a more precautionary approach until more is known about the impacts of aquaculture in the Gulf of Mexico. As with other fisheries, the MSYproxy may be modified based on new information developed as this component of the fishery proceeds. Procedures for modifying both MSY and OY are proposed in Section 4.10 (Framework Procedures). If negative impacts are determined to occur from aquaculture then MSY could be adjusted downward to reduce environmental impacts. Similarly, if environmental impacts are not determined to be occurring, or have been minimized to the extent practicable, then MSY could be adjusted upward to allow more production. The ultimate level MSY is set at will depend largely on whether or not environmental impacts are determined to be affecting Gulf of Mexico marine resources and habitat.

In addition to establishing a definition for MSY, **Preferred Alternative 2** would also establish a definition for OY. NOAA Fisheries Service guidance states that OY should be based on MSY, or on MSY as it may be reduced by social, economic, and ecological factors (50 CFR 600.310). Unlike wild stock management, there is no need to leave cultured animals in offshore aquaculture grow-out systems to support future generations.

There is also no social, economic, or ecological factors supporting a reduction from MSY; therefore, OY and MSY can be set equal to one another. The Council has proposed setting OY anywhere from a minimum of 16 million pounds to a maximum of 190 million pounds. The Council's preferred option for OY is to set it equal to 64 million pounds.

The proxies for OY are based on either the productivity of wild stocks (Suboptions 2(c) or 2(e)) or expected production capacity of an estimated 5-20 operations starting business in the Gulf of Mexico over the next ten years (Suboptions 2(a), 2(b), and 2(d)). Methods for calculating OY proxies for suboptions 2(a), 2(b), and 2(d) are summarized in Section 4.9, and are incorporated here by reference. Suboption 2(c) represents wild stock landings of all Council managed species proposed for culture in this FMP (i.e., reef fish, coastal migratory pelagics, stone crabs, spiny lobster, and red drum), while Suboption 2(e) represents the average landings of all marine species in the Gulf of Mexico, except menhaden and shrimp, during 2000-2006. Using domestic commercial landings from the Gulf of Mexico provides a useful proxy for estimating OY. It also can be used to assess the relative risks and potential impacts to wild stocks especially given that offshore aquaculture has the potential to produce much higher landings than wild fisheries. Until more is known about the aquaculture fishery in the Gulf of Mexico, including potential environmental impacts and economic sustainability, these OY estimates are intended to serve as proxies for production capacity. The higher that OY is set, the greater the risk of impacts to the physical and biological environments. By establishing a precautionary OY level, the Council can assess the impacts of aquaculture as the industry grows to determine if the specified OY level is adequately protecting wild stocks and habitat. If impacts are not observed, or are considered to be minimized to the extent practicable and are not resulting in significant negative impacts, than the Council could consider increasing OY/MSY in the future. OY proxies, in order from greatest to least potential risks to the physical and biological environments, are: Suboption 2(e) – 190 mp, Suboption 2(d) – 64 mp, Suboption 2(c) – 36 mp, Suboption 2(b) – 32 mp, and Suboption 2(a) – 16 mp. The Council's preferred suboption for OY is 64 mp.

Preferred Alternative 2 also includes a process for reviewing the OY proxy and aquaculture program if planned production exceeds OY. This process and the one described in Section 4.10 would have no direct impacts on the physical or biological environments. Indirect effects would result only if changes are made to the OY proxy. Such changes would occur either through framework actions, as specified in Action 10, or through a full plan amendment. Any change (increase or decrease) to OY should be based on the extent and magnitude of any adverse environmental and economic impacts that may result from the existing aquaculture management regime. Benefits to the physical and biological environments would occur if OY is reduced (i.e., less risks to environmental impacts, such as habitat degradation and water quality), while increased environmental risks may result if OY is increased. The Council will need to proceed cautiously to ensure negative, detrimental impacts do not occur as an indirect result of the specified OY harvest level.

During review of the program and OY proxy, NOAA Fisheries Service would publish a control date in the *Federal Register* after which entry into the aquaculture industry may be limited. Any permits issued after the control date may be subject to revocation. No individual, corporation, or other entity will be issued a permit authorizing the production of more than 20 percent of OY (Council preferred). The Council also considered capping planned production for a single operation at 5 or 10 percent of OY. This provision is necessary to ensure entities do not obtain an excessive share of the allowable yield (see National Standard 4: 50 CFR 600.325(a)(3)). The level selected by the Council for capping production must ensure against possible anti-competitive effects resulting from a small number of entities accounting for most or all of the offshore aquaculture production.

Preferred Alternative 2 also identifies thresholds for determining overfishing and overfished status. These thresholds are not directly applicable to the cultured fish themselves, given that all fish stocked for culture are intended for harvest. However, it is conceivable that some level of aquaculture in the Gulf could result in adverse impacts to wild stocks, which could result in overfishing and depletion of such stocks. Therefore, **Preferred Alternative 2** proposes to assess impacts of aquaculture operations using overfishing and overfished thresholds for wild stocks approved by the Council. These thresholds will be used by NOAA Fisheries Service to determine if offshore aquaculture in the Gulf of Mexico EEZ is adversely affecting wild populations, causing them to become overfished or undergoing overfishing. If NOAA Fisheries Service identifies adverse impacts to wild stocks resulting in populations falling below the established thresholds or becoming subject to excessive fishing mortality, as a consequence of aquaculture operations (reduced biomass levels resulting in increased F), the appropriate overfished or overfishing determination will be triggered. Adverse environmental impacts to the aquaculture operations will be based on data collected via the ongoing monitoring (including monitoring by other federal agencies) of permitted operations. If there is a reasonable basis to tie aquaculture operations to adverse environmental impacts, which are in turn resulting in reduced abundance (depletion) of wild stocks, appropriate action will be taken by NOAA Fisheries Service (e.g., aquaculture operation production may be reduced, cultured fish transmitting disease may be removed, facility siting may be reevaluated to avoid habitat degradation, etc.).

6.10.2 Direct and Indirect Effects on the Economic and Social Environment

Action 9 considers the establishment of biological reference points and status determination criteria. **Alternative 1** is the status quo alternative, which does not establish biological reference points or status determination criteria. Biological reference points are necessary to sustainable fisheries management and are required by the MSFCMA. Without these status criteria and biological reference points, NOAA Fisheries Service would be unable to review the status and production capacity of the aquaculture fishery. Consequently, the socioeconomic benefits derived from scientific management of this fishery would be unrealized under **Alternative 1**.

MSY suboption 2(a) would establish a proxy for MSY equal to the total yield produced and harvested in a particular year, and Preferred MSY suboption 2(b) would establish a proxy for MSY equal to OY. Given fluctuations in total production due to a multitude of reasons, many of them not biological, MSY suboption 2(a) creates a weaker biological standard than MSY suboption 2(b). Hence, the potential socioeconomic benefits of MSY suboption 2(b) are greater than those that would derive from the weaker biological standard established by MSY suboption 2(a).

OY suboption 2(a) would establish a proxy for OY equal to the total yield harvested by all permitted aquaculture operations annually but not to exceed 16 mp. OY suboptions 2(b), 2(c), 2(d), and 2(e) would establish a proxy for OY equal to 32, 36, 64, and 190 mp, respectively. Preferred OY suboption 2(d) offers the second greatest direct benefit to aquaculture operations, dealers and support sectors because it allows the second greatest amount of production of any of the OY alternatives considered in Action 9. The higher production levels are set, the greater the production allowed for an individual facility, which could translate into increased profits and economic benefits. However, higher production levels could also reduce social benefits for persons concerned about the environmental risks of aquaculture. Potential social benefits from this action would include increased supply of domestic cultured seafood for U.S. consumption.

Preferred Alternative 2 would also limit the amount that an individual, corporation or other entity could produce as a percentage of OY. This alternative is necessary to prevent any one operation or entity from obtaining an excessive share of the fishery. Production would be capped at 5, 10, or 20 percent of OY. The Council's preferred alternative would cap production for any single individual, corporation, or entity at 20 percent, which is equivalent to 12.8 mp. The higher the production cap is set, the more an operation could produce, which could directly affect operating costs and result in economic benefits to the operation. None of the production cap alternatives limit the market share of an individual, corporation or other entity because at present there are no entities producing cultured organisms in the Gulf EEZ and the first one that does will have a market share of 100 percent. The preferred production cap alternative (20 percent of OY), offers the greatest socioeconomic benefit to aquaculture facility owners and those who benefit from their production because it would allow aquaculture producers to increase the scale of production, produce larger quantities, and potentially experience greater economies of scale than the other two alternatives.

6.10.3 Direct and Indirect Effects on the Administrative Environment

Both **Alternative 1** and **Preferred Alternative 2** would directly impact the administrative environment. **Alternative 1** would not specify biological reference points or status criteria as required by the MSFCMA, thereby making NOAA Fisheries Service susceptible to legal challenges. The Council would have to develop a subsequent amendment to this FMP in order to satisfy this MSFMCA requirement, which could result in significant costs and considerable staff time. Additionally, the inability to restrict production and lack of status criteria to assess impacts of aquaculture on wild stocks will indirectly affect the administrative environment if negative impacts occur in the future.

Preferred Alternative 2 would satisfy MSFCMA requirements for establishing biological reference points and status criteria, thereby diminishing the potential for legal challenges. Effects on the administrative environment from this action would include publication of a control date in the *Federal Register* and review of the OY proxy and aquaculture program. Control dates are occasionally published by NOAA Fisheries Service, and would not represent a substantial burden relative to the status quo. Review of the OY proxy and aquaculture program could be costly, but this review is a necessary part of any managed fishery. Status determinations for wild fisheries would be made through periodic stock assessments that are reviewed by peer-reviewed panels and the SSC. Assessments are regularly conducted for most recreationally and commercially important species; therefore, monitoring the status of wild stocks based on proposed status criteria would not be an additional burden on the administrative environment. Effects on the administrative environment are expected to occur based on the procedures for modifying MSY and OY specified in Action 10, and not directly from Action 9.

6.11 Action 10: Framework Procedures

The intent of this action is to establish a framework procedure for implementing changes to various aquaculture regulatory measures in a more timely fashion. The proposed framework procedures would continue to allow several opportunities for public comment and input before any proposed changes to regulatory measures are approved by the Council and NOAA Fisheries Service. Additionally, the framework procedures propose an annual process for reviewing the aquaculture program.

6.11.1 Direct and Indirect Effects on the Physical, Biological, and Ecological Environment

Action 10 would have no direct effects on the physical or biological environments. Indirect effects may result from this action as a result of recommendations and regulations proposed by the Council and their Aquaculture Advisory Panel (**Alternatives 2** and **3**). Indirect effects would include adjustments to OY/MSY based on biological considerations and the timeliness of regulatory measures that could be implemented to address adverse impacts related to aquaculture.

Alternative 1 would not specify framework procedures for aquaculture. This alternative would affect how quickly management measures and biological benchmarks could be changed or implemented, thereby resulting in indirect effects. Negative indirect effects could occur if modifications to regulations are not be implemented in a timely fashion to prevent further environmental impacts, if occurring. Because the Council would have to implement or modify aquaculture regulations through a plan amendment, considerable time could be spent for regulations are put in place that benefit both the biological and physical environment and the overall aquaculture program.

Alternatives 2 and **3** propose framework procedures for modifying biological benchmarks (MSY/OY) and some aquaculture regulatory measures (**Preferred**

Alternative 3 only). Both **Alternatives 2** and **3** would rely on an Aquaculture Advisory Panel that would meet annually to provide recommendations to the Council. The authority of the Advisory Panel would be much more limited under **Alternative 2**; they could only recommend changes to MSY and OY. Under **Preferred Alternative 3**, the Panel would have broader authority, which would include recommending changes to: MSY and OY, application and operating requirements, recordkeeping and reporting requirements, siting requirements, and allowable aquaculture system requirements. The main responsibilities of the Panel would include: 1) Reviewing annual planned aquaculture production levels relative to MSY and OY; 2) evaluating the condition and status of wild stocks and other marine resources and whether their status has been adversely affected by offshore aquaculture; and 3) assessing economic and social considerations of aquaculture in the Gulf EEZ. This Panel would indirectly benefit the physical and biological environments by providing oversight of the aquaculture program. The Panel would provide recommendations to the Council, and ultimately NOAA Fisheries Service, that are intended to improve the program and further minimize environmental impacts from occurring.

Under **Alternative 2**, if the Council supported the Panel's recommendations for MSY and OY, it could then submit the recommendations to the RA for further consideration. The RA would have the authority to approve or deny the proposed changes to MSY and OY. If the RA approved the changes, then they would be published in the *Federal Register*. This would benefit the physical and biological environments if negative environmental impacts (e.g., disease transmission to wild stocks, benthic and organic loading, habitat degradation, etc.) are determined to be occurring because MSY/OY is set to high. Social and economic benefits could also result from this alternative if the Panel recommends increasing MSY/OY because there is no evidence of environmental impacts, or impacts have been minimized to the extent practicable. **Alternative 2** would provide the fastest process for making changes to MSY/OY, but the Panel and Council's authority would be much more limited when compared to **Preferred Alternative 3** framework procedures.

Preferred Alternative 3 is similar to **Alternative 2**, except the Council would need to develop a regulatory amendment for proposed regulatory changes recommended by the Panel. **Preferred Alternative 3** would provide for numerous modifications or additions to aquaculture regulations, unlike **Alternative 2**. This would allow the Council and NOAA Fisheries Service to address key aspects of the aquaculture program in a timely fashion if negative environmental impacts are determined to occur. This would also allow the Council to make changes more quickly to improve the program and the information needed to monitor and evaluate it. Any regulatory amendment developed by the Council would then be submitted to the NOAA Fisheries Service RA for further consideration.

The framework procedures described in **Alternative 2** and **3** are both intended to allow timelier implementation of regulatory measures necessary to prevent or mitigate impacts to the physical, biological, social, economic, and administrative environments. In addition to allowing faster implementation of regulations, both **Alternatives 2** and **3**

would provide oversight and review of the aquaculture program through the use of an Aquaculture Advisory Panel composed of scientists, sociologists, and aquaculture experts. This would indirectly benefit the physical and biological environments by providing regular review and modifications to the aquaculture program.

6.11.2 Direct and Indirect Effects on the Economic and Social Environment

Acton 10 considers specifying framework procedures for modifying aquaculture management measures, status determination criteria or biological reference points.

Alternative 1 would not establish framework procedures for modifying aquaculture regulations or biological reference points. Each time the Council amended their regulations, a full plan amendment would have to be developed, which would take considerably more time than development of a regulatory amendment or *Federal Register* notice. This alternative would therefore result in the greatest economic costs to the Council and NOAA Fisheries Service of any of the alternatives considered in Action 10. Additionally, not being able to implement regulations in a timely manner may have negative physical, biological, social, and economic consequences. Lack of an annual review process would also result in negative social effects, especially for persons concerned about the potential negative environmental impacts that may result from offshore aquaculture. Of the alternatives considered in Action 10, **Alternative 1** is expected to result in the greatest economic costs and least social benefits.

Alternatives 2 and **Preferred Alternative 3** would establish an organizational framework for the Council and NOAA Fisheries Service to effectively manage the Aquaculture fishery. **Alternative 2** provides limited authority for the Council and NOAA Fisheries Service to make regulatory changes. The Council, upon recommendation by its Aquaculture Advisory Panel could recommend to NOAA Fisheries Service changes to MSY/OY. **Preferred Alternative 3** would also include an Aquaculture Advisory Panel. The panel could recommend to the Council changes to MSY or OY, permit application requirements, operational requirements and restrictions, and monitoring requirements. **Preferred Alternative 3** would provide the Council with broader authority to make regulatory changes than **Alternative 2**. **Preferred Alternative 3** is expected to result in greater economic costs to the Council and NOAA Fisheries Service than **Alternative 2**, but less economic costs than **Alternative 1**. Costs incurred by NOAA Fisheries Service under **Alternative 2** would include participating in AP meetings, review of AP and Council recommendations, and preparation of a *Federal Register* notice. **Preferred Alternative 3** would include the same costs as **Alternative 2**, plus there would be additional economic costs for preparing a regulatory amendment. Overall, **Preferred Alternative 3** is expected to provide the best balance between timely review of the aquaculture program, timely implementation of regulatory measures, and public opportunities for proposed regulatory changes.

6.11.3 Direct and Indirect Effects on the Administrative Environment

All three alternatives in Action 10 would either directly or indirectly affect the administrative environment. **Alternative 1** would not establish framework procedures in this FMP. Any changes to regulations or MSY/OY would have to be made through a subsequent plan amendment. Development of a plan amendment will potentially take longer than developing and implementing regulations through framework procedures. This could result in additional indirect effects to the administrative environment if negative impacts to the physical, biological, or socioeconomic environments occur during development of a plan amendment.

Alternatives 2 and **3** propose framework procedures for aquaculture. Both alternatives would use an Aquaculture Advisory Board. This board would meet annually and result in direct costs to the Council associated with travel and holding a meeting. The charge of the Advisory Panel would be much more limited under **Alternative 2**; they could only recommend changes to MSY and OY. Under **Alternative 3**, the Panel would have broader authority, which would include recommending changes to: MSY and OY, application and operating requirements, recordkeeping and reporting requirements, siting requirements, and allowable aquaculture system requirements. Any recommendations made by the Panel would be provided to the Council for further consideration. **Alternative 2** would require the Council to submit their recommendation for MSY/OY to NOAA Fisheries Service, including the rationale and supporting documentation for the decision. Preparation of a report and a letter to NOAA Fisheries Service would increase the burden on the administrative environment, but to a much lesser extent than preparing a full plan amendment. If NOAA Fisheries Service approved the MSY/OY values recommended by the Council, then a *Federal Register* notice would be published. This would have an effect on the administrative environment, but once again to a lesser extent than developing a plan amendment. NOAA Fisheries Service frequently publishes *Federal Register* notices and this requirement is a regular part of operating procedures. Alternative 3 would have similar effects on the administrative environment as Alternative 2. One major difference is that Alternative 3 would require the Council to develop a regulatory amendment for changes recommended by their Advisory Panel. Development of a regulatory amendment would be more time consuming than simply submitting a recommendation to NOAA Fisheries Service (as proposed in Alternative 2), but less time consuming than preparation of a full plan amendment. In either case, both alternatives would allow timelier implementation of regulatory measures.

6.12 Comparison of Alternatives to Magnuson-Stevens Fishery Conservation and Management Act National Standards

NOAA General Counsel has concluded that aquaculture in the EEZ constitutes “fishing” under the MSFCMA. Fishing includes activities and operations related to the taking, catching, or harvesting of fish. Any FMP prepared by the Council, or by the Secretary, must include provision specified in Sec 303(a) of the MSFCMA. Additionally, numerous discretionary provisions may be prescribed, including measures, requirements, or

conditions and restrictions determined to be necessary and appropriate for the conservation and management of a fishery (Sec. 303(b)(14) of the MSFCMA). Any FMP or regulations prepared to implement an FMP or amendment, must be consistent with the ten MSFCMA national standards for fishery conservation and management. These national standards are:

1. Conservation and management measures shall prevent overfishing while achieving on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
2. Conservation and management measures shall be based upon the best scientific information available.
3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
4. Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
8. Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent possible, minimize adverse economic impacts on such communities.
9. Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.
10. Conservation and management measures shall, to the extent possible, promote the safety of human life.

The development of an aquaculture program requires balancing the potential benefits of aquaculture to the nation's economy and food supply while maintaining the quality and health of the marine environment and its resources. The effects of the actions and

preferred alternatives in this FMP as they relate to the MSFCMA and the National Standards are discussed below.

National Standard 1

This National Standard requires conservation and management measures to prevent overfishing while achieving, on a continuing basis, the OY from the fishery (16 U.S.C. § 1851(a)(1)). Though separate issues, the prevention of overfishing and the achievement of OY are related. In effect, the most important limitations on the specification of OY are that management measures designed to achieve it must also prevent overfishing. "Overfishing" is defined in the MSFCMA as a level or rate of fishing mortality that jeopardizes the capacity of a fishery to produce MSY on a continuing basis (16 U.S.C § 1802(3)(29)).

The primary goal of federal fishery management, as described in National Standard 1 of the MSFMCA, is to conserve and manage U.S. fisheries to "...prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry". OY is defined as the amount of fish that provides the greatest net benefits to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. While economic and social factors are to be considered in defining the OY of each fishery, OY may not exceed MSY, or the maximum amount of fish that can be removed without impairing the fishery's ability to replace removals through natural growth or replenishment. OY must prevent overfishing and, in the case of an overfished fishery, must provide for rebuilding stock biomass to a level consistent with that which would produce MSY.

Action 9 specifies the MSY and OY for the aquaculture fishery. The Council's preferred alternative would set MSY and OY equal to one another, since there are currently no social, economic, or ecological factors supporting a reduction from MSY. The values for MSY and OY would serve as proxies until more is known about the environmental impacts of aquaculture and the production capacity of the Gulf of Mexico. The Council's preferred alternative for OY is 64 million pounds. It is estimated that 5 to 20 operations could harvest OY over the short-term.

Aquaculture operations will harvest all cultured fish and invertebrates produced, excluding losses due to natural mortality. Because the harvest and yield of cultured animals is separate from that of wild stocks, it would not be possible to overharvest the animals. Therefore, thresholds for determining overfishing and overfished status are not directly applicable to the cultured fish themselves. However, it is conceivable that some level of aquaculture in the Gulf could result in adverse impacts to wild stocks, which could result in overfishing and depletion of such stocks. Therefore, overfishing and overfished thresholds for wild stocks will be used by NOAA Fisheries Service to determine if offshore aquaculture in the Gulf of Mexico EEZ is adversely affecting wild populations.

Offshore aquaculture may also help reduce fishing mortality on Council and HMS

managed stocks by providing an alternate source of food in place of overfished wild stocks and stocks undergoing overfishing. Additionally, increased supply from domestic aquaculture could relieve some fishing pressure on wild stocks.

National Standard 2

National Standard 2 requires conservation and management measures to be based on the best scientific information available (16 U.S.C § 1851(a)(2)). The analytical work and data sources queried in developing this FMP were extensive. This analytical work relied on the most current economic, social, and biological information available at the time of the analysis. Data and analysis sources are provided in Section 10. Prior to approval of this FMP, the Southeast Fisheries Science Center will make a determination if this FMP is based on the best scientific information available. The preferred alternatives summarized in Sections 4.2 and 4.8 would enhance data collection, therefore assisting the Council and NOAA Fisheries Service in identifying and utilizing the best scientific information available when developing subsequent NEPA analyses and amendments.

National Standard 3

This standard requires an individual stock of fish to be managed, to the extent practicable, as a single unit throughout its range, and interrelated stocks of fish to be managed as a unit or in close coordination (16 U.S.C § 1851(a)(3)). Action 4, Preferred Alternative 4 would only allow species native to the Gulf of Mexico. Additionally, Action 2 would prohibit the use of genetically modified or transgenic species and require all broodstock to be harvested from U.S. waters of the Gulf of Mexico. Broodstock would also have to be collected from the same population or sub-population where the aquaculture facility is located. This FMP considers the entire range of each stock proposed for aquaculture under the management jurisdiction of the GMFMC and NOAA Fisheries Service and therefore complies with National Standard 3.

National Standard 4

Under National Standard 4, conservation and management measures shall not discriminate between residents of different states (16 U.S.C § 1851(a)(4)). Discrimination is defined as differentiating among people or corporations based on their state of residency. Fishery management plans must not rely on or incorporate a discriminatory state statute (50 CFR § 600.325(b)). Allocation is defined as direct and deliberate distribution of the opportunity to participate in a fishery among identifiable, discrete user groups or individuals (50 CFR § 600.325(c)(1)). To be consistent with the "fairness and equity" criterion, an allocation should be rationally connected with the achievement of OY or with the furtherance of a legitimate FMP objective (50 CFR § 600.325(c)(3)(i)(A)). Otherwise, inherent advantage of one group to the detriment of another would be without cause. In addition, an allocation of fishing privileges may impose hardships on one group if they are outweighed by the total benefits received by another group (50 CFR § 600.325(c)(3)(i)(B)).

Persons who are granted permits for an aquaculture facility will be those who demonstrate they can comply with the permit requirements stated in this FMP and subsequent regulations. This FMP does not consider actions or alternatives that would

discriminate between residents of different states, nor does it assign fishing privileges associated with the permitting process. Criteria used to assess where an aquaculture facility is sited will be considered on a case-by-case basis and does not discriminate among permittees or aquaculture operations based on their proposed location of operation.

National Standard 5

This standard requires conservation and management measures to promote efficiency in the use of fishery resources, where practicable, except that no such measure will have economic allocation as its sole purpose (16 U.S.C § 1851(a)(5)). The National Standard Guidelines recognize that, theoretically, an efficient fishery would harvest the OY with the minimum use of economic inputs such as labor, capital, interest, and fuel (50 CFR § 600.300(b)(2)). Hence, an efficient management regime conserves all resources, not just fish stocks.

It is anticipated that the culture processes will be carried out efficiently, especially the feeding process. Aquaculture operations will require large investments of capital and financial resources. Each operation will function as a private business with profits depending on productivity and marketability of cultured products minus costs. If an operation does not function efficiently, then it will not be profitable. Additionally, actions and alternatives considered in this FMP are intended to prevent or mitigate to the extent practicable environmental impacts on wild fisheries. These measures are considered necessary for preventing or mitigating impacts to marine resources when operating aquaculture facilities and will allow managers to efficiently assess an operation's compliance with regulatory requirements.

National Standard 6

National Standard 6 requires management measures allow for variations among, and contingencies in, fisheries, fishery resources, and catches (16 U.S.C § 1851(a)(6)). Variations, uncertainties, and unforeseen circumstances can be experienced in the form of biological or environmental changes, or social, technological, and economic changes. Flexibility of a management regime is necessary to respond to such contingencies (50 CFR § 600.335(b) and (c)).

Several actions and preferred alternatives in this FMP provide for flexibility in the management regime. These include actions 5 and 6, which allow for NOAA Fisheries Service to evaluate siting criteria and allowable marine aquaculture systems on a case-by-case basis. By allowing case-by-case review, technological changes and new biological and environmental information on the impacts of marine aquaculture can be accounted for and addressed. Additionally, the numerous reporting and recordkeeping requirements required in Actions 2 and 8 allow for unforeseen circumstances to be accounted for and addressed. These unforeseen circumstances include, but are not limited to: storm damage, escapement, disease outbreaks, and entanglements of wildlife.

National Standard 7

This National Standard requires management measures to minimize costs and avoid

unnecessary duplication (16 U.S.C § 1851(a)(7)). Management measures should not impose unnecessary burdens on the economy, individuals, organizations, or governments (50 CFR § 600.340(c)).

The RIR indicates the aquaculture programs would initially increase annual administrative and enforcement costs. Actions 2 and 8 require extensive application , operational, recordkeeping and reporting requirements to be met. Costs associated with meeting these requirements will be incurred by both aquaculture operations and NOAA Fisheries Service. Additionally, costs to enforcement will increase since the regulations proposed in this FMP constitute new regulations to monitor and enforce. These additional costs are believed to be necessary, and have been minimized to the extent practicable, to ensure environmental impacts are prevented or mitigated,

When possible and to the extent practicable, the Council and NOAA Fisheries Service have attempted to avoid duplication of paperwork requirements. Aquaculture or regulations affecting aquaculture fall under the jurisdiction of multiple federal agencies, each with distinct jurisdictions. This FMP acknowledges the role of each of these agencies in the permitting and monitoring process and does not attempt to impose overlapping requirements on aquaculture permit applicants. The authority of each federal agency is discussed briefly in Sections 5.5 and 9.0. With the exception of Actions 2 and 6, no other actions in this FMP would duplicate requirements of other federal agencies. Action 2 will require permittees to comply with EPA, USDA, and FDA regulations for administering drugs, biologics, and pesticides. Action 2 also requires permittees to comply with ACOE and EPA monitoring and reporting requirements and EPA feed management practices. None of these regulations duplicate the regulations of these other federal agencies. Rather, Action 2 merely highlights that these regulations will be an important component of the Council and NOAA Fisheries Service's aquaculture program.

Action 6 provides NOAA Fisheries Service with authority to review proposed sites for aquaculture. The ACOE has authority to issue a siting permit for structures in navigable waterways, including aquaculture facilities. This FMP would not require a siting permit for aquaculture, but would include criteria used by NOAA Fisheries Service for assessing the adequacy of an aquaculture site. These criteria may differ from criteria used by the ACOE to assess a site, but there still remains potential for duplication and multiple reviews of an aquaculture site.

Lastly, both Actions 2 and 8 refer to permits required by other agencies, such as the EPA and ACOE. The information required for these actions is intended to assist NOAA Fisheries Service in determining compliance with and issuance of aquaculture permits and is not believed to be duplicative since similar standards and permits will not be required by NOAA Fisheries Service.

National Standard 8

This National Standard provides that conservation and management measures shall, consistent with the conservation requirements of the MSFCMA (including the prevention

of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities (16 U.S.C § 1851(a)(8)).

Gulf of Mexico fishing communities potentially affected by this action are listed in the Generic Essential Fish Habitat Amendment EIS (GMFMC 2004 and GMFMC 2005) and in Section 5.4. Impacts to fishing communities are also discussed in Sections 4, 6, 7, and 8 of this FMP. It is unknown at this time whether aquaculture will directly compete with landings from domestic fisheries. If aquaculture does compete with domestically landed wild fisheries, then there is potential for impacts on fishing communities to occur (loss of jobs, loss of revenue due to decreased prices). However, because foreign imports represent a significant amount of the current U.S. seafood, it is not expected that domestically cultured species will significantly impact fishing communities over the short term. Over the long-term economic benefits may accrue to those communities providing support to aquaculture ventures, which may have some negative ramifications on fishing communities relying on wild stocks.

National Standard 9

The MSFCMA requires fishery management plans establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery (16 U.S.C. §1853(a)(11)). National Standard 9 requires conservation and management measures, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch (16 U.S.C. §1851(a)(9)).

Actions 2, 5, and 8 are the only actions considered in this FMP that are expected to affect bycatch. Action 2 requires permittees to inspect allowable aquaculture systems for entanglements and interactions with marine mammals and protected resources. If entanglements or interactions are observed to occur, than permittees would be required to report this information to NOAA Fisheries Service as specified in Action 8. This will allow NOAA Fisheries Service to assess if aquaculture operations and gears are negatively impacting protected resources and marine mammals. If mortalities occur, NOAA Fisheries Service Protected Resources Division would be consulted.

Action 5 specifies allowable marine aquaculture systems. The type of system used for aquaculture may incidentally create bycatch of fish, sea turtles, and other protected resources. Bycatch could occur if a species becomes trapped or entangled in an aquaculture system, such as a cage. To minimize bycatch to the extent practicable, NOAA Fisheries Service will review and approve aquaculture systems on a case-by-case basis. Those systems that pose a significant entanglement risk to endangered and threatened species, and other marine species would not be permitted.

Lastly, in Action 8, permittees are required to submit a request to NOAA Fisheries Service prior to collecting broodstock. The request would specify the number and size of broodstock proposed for capture and the gears used for capture. NOAA Fisheries Service could limit the number of broodstock harvested. It is expected that only a small number

of fish (sufficient to satisfy genetic diversity requirements) will be captured each year by aquaculture permittees or hatchery designees. Although bycatch may occur during the capture of broodstock, the amount of bycatch is expected to be small and negligible relative to overall bycatch occurring in each fishery.

National Standard 10

This national standard provides that, conservation measures shall, to the extent practicable, promote the safety of human life at sea (16 U.S.C § 1851(a)(10)).

All offshore aquaculture facilities must comply with the private aids to navigation (33 C.F.R. 66) and the vessel safety requirements of the U.S. Coast Guard. The ACOE permitting process will apply to the offshore facilities constructed by permit applicants. That includes review of the construction characteristics of the facility. Additionally, Action 2 requires aquaculture operations to describe emergency disaster plans, which should assist operations in improving safety-at-sea during natural catastrophies.

6.13 Required Magnuson-Act Provisions for Fishery Management Plans

Section 303(a) of the MSFCMA outlines 15 required provisions that must be included in a Council FMP. Section 303(b) of the MSFCMA outlines an additional 14 discretionary provisions, which may be included but are not required in FMPs. This section summarizes each of the required MSFCMA provisions for FMPs and describes where they have been addressed in this FMP.

(a) REQUIRED PROVISIONS.—Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, shall—

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are—

(A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery;

(B) described in this subsection or subsection (b), or both; and

(C) consistent with the national standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

Discussion: All ten actions contained within this FMP are necessary and appropriate for the conservation and management of wild fisheries. Actions in this FMP are intended to prevent, or minimize to the extent practicable, adverse impacts to wild stocks, essential fish habitat, fishing communities, and public safety. The actions are consistent with the national standards, other provisions of the MSFCMA, and other applicable laws, as described in Sections 6.12 and 9.0 of this FMP.

(2) contain a description of the fishery, including, but not limited to, the number of

vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

Discussion: A description of the aquaculture fishery is included in Section 5.3. Because an aquaculture fishery does not currently exist in the Gulf of Mexico, the description is speculative with regard to the types and quantities of fishing gear used, the species involved, and the locations of operations. Section 5.3 provides numerous examples of aquaculture firms in the U.S. that are currently operational. Costs to management and potential revenues are described in Sections 6.10, 7, and 8. There are no recreational interests in the fishery, although user conflicts may arise between commercial operations and recreational anglers over siting. Lastly, the FMP requires permit holders to be U.S. citizens or permanent resident aliens. Operations would be required to land all cultured products at a permitted dealer within the U.S.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

Discussion: The conditions of stocks proposed for inclusion in the Aquaculture FMU are described in Section 5. The Council's preferred alternative would include 55 species in the Aquaculture FMU. Most of the species would be reef fishes. Only four of those species are undergoing overfishing (red snapper, gag, gray triggerfish, and greater amberjack) and three are overfished (red snapper, gray triggerfish, and greater amberjack). The maximum sustainable yield and optimum yield estimates for the aquaculture fishery are summarized in Sections 4.9 and 6.10. Maximum sustainable yield is equal to optimum yield. Optimum yield is estimated to be 64 million pounds.

(4) assess and specify—

(A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3),
(B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing, and
(C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

Discussion: Because no aquaculture industry currently exists in the Gulf of Mexico, it is currently unknown whether or not permitted aquaculture operations will produce OY, as specified in Action 9. The Council's preferred OY is 64 mp. It is estimated that 5 to 20 aquaculture operations could produce this OY in the Gulf of Mexico over the short-term.. However, at least at the onset of the aquaculture program, OY is unlikely to be achieved until the fishery develops and operations start business. For more discussion of OY, see

Sections 4.9 and 6.10.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, charter fishing, and fish processing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, economic information necessary to meet the requirements of this Act, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

Discussion: Actions 2, 5, 6, and 8 specify the pertinent data that shall be submitted to the Secretary with respect to the aquaculture fishery. These actions require data for permit issuance, siting, allowable gears, and permit review and monitoring.

(6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

Discussion: No proposed regulatory requirements would prevent access to the fishery or affect the safe conduct of the fishery. Actions 2 and 8 do allow the Regional Administrator to modify use it or lose it provisions and recordkeeping and reporting requirements during and after catastrophic conditions.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Discussion: As mentioned in Section 6.5.3. the EFH provisions of the MSFMCA would need to be addressed in this FMP for any species added to the Aquaculture FMU that are not currently managed by the Council (or NOAA Fisheries Service). However, because cultured species would be restricted and maintained within artificial environments (hatchery and offshore enclosures) throughout their life history, the description and identification of EFH is not directly relevant to any cultured species exclusive to the aquaculture FMU. Essential fish habitat for Council managed species has already been identified and described in GMFMC (2004). Therefore, this FMP addresses the EFH provisions by specifying procedures for minimizing the adverse affects of aquaculture operations. Siting criteria specified in Sections 4.6 and 6.7 and requirements for allowable aquaculture systems in Sections 4.5 and 6.6 are intended to minimize or prevent damage to EFH. Additionally, offshore aquaculture would be prohibited from occurring in numerous areas identified as EFH. These areas include: HAPCs, marine

reserves, marine protected areas, and coral areas. Other critical habitats (e.g., seagrasses) would also be considered during case-by-case review.

(8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

Discussion: Actions 2, 5, 6, and 8 specify the nature and extent of scientific data needed for effective implementation and monitoring of the aquaculture program. Much of this data and information will be collected by or provided to NOAA Fisheries Service. Other pertinent scientific data, such as water quality monitoring, will be provided to other federal agencies in compliance with their regulations.

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for—

(A) participants in the fisheries and fishing communities affected by the plan or amendment;

(B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants; and

(C) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery;

Discussion: A fishery impact statement is included on page xii of this FMP.

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

Discussion: Aquaculture operations will harvest all cultured fish and invertebrates produced, excluding losses due to natural mortality. Because the harvest and yield of cultured animals is separate from that of wild stocks, it would not be possible to overharvest the animals. Therefore, thresholds for determining overfishing and overfished status are not directly applicable to the cultured fish themselves. However, it is conceivable that some level of aquaculture in the Gulf could result in adverse impacts to wild stocks, which could result in overfishing and depletion of such stocks. Therefore,

Action 9 proposes to use status criteria for wild stocks to determine if offshore aquaculture in the Gulf of Mexico EEZ is adversely affecting wild populations, causing them to become overfished or undergo overfishing.

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—

(A) minimize bycatch; and

(B) minimize the mortality of bycatch which cannot be avoided;

Discussion: Action 8 includes numerous recordkeeping and reporting requirements for monitoring marine mammal and protected species bycatch associated with aquaculture. Actions 5 and 6 provide for case-by-case review with NOAA programs and offices for allowable aquaculture sites and systems. This review will help to minimize impacts of allowable systems and siting locations on bycatch and bycatch mortality of wild species. Action 8, Preferred Alternative 2(o) specifies allowable gears for harvesting broodstock. Requests for harvesting broodstock will need to be authorized by the RA. Broodstock will be harvested in limited quantities, likely resulting in limited bycatch and bycatch mortality of wild fish.

(12) assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

Discussion: The Aquaculture FMP only pertains to commercial operations, making it unnecessary to assess the type and amount of fish caught and released alive during recreational fishing.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery, including its economic impact, and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

Discussion: The Affected Environment (Section 5) contains a description of the types of commercial aquaculture firms likely to operate in the fishery. Sections 6-8 include discussions of economic impacts resulting from the proposed regulatory actions in this FMP. No landings data are presented for the Gulf of Mexico, because no aquaculture operations currently exist. Landings information is provided for firms operating in U.S. waters outside the Gulf of Mexico.

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate, taking into consideration the economic impact of the harvest restrictions or recovery benefits on the fishery participants in each sector, any harvest restrictions

or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery and;

Discussion: Rebuilding plans are not applicable to cultured species, therefore, there is no need to allocate harvest restrictions or recovery benefits among sectors. The aquaculture fishery will be comprised of a single sector – permitted commercial offshore aquaculture operators. Action 9 includes measures to ensure that one permittee does not obtain an excess share of the overall OY for the fishery.

(15) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

Discussion: Proposed NOAA Fisheries Service ACL guidelines state the following: "There are limited circumstances that may not fit the standard approaches to specification of reference points and management measures set forth in these guidelines. These include, among other things, conservation and management of ESA-listed species, harvests from aquaculture operations, and stocks with unusual life history characteristics (e.g. Pacific salmon, where the spawning potential for a stock is spread over a multi-year period). In these circumstances, Councils may propose alternative approaches for satisfying the National Standard 1 requirements of the Magnuson-Stevens Act than those set forth in these guidelines. Councils should document their rationale for any alternative approaches for these limited circumstances in an FMP or FMP amendment, which will be reviewed for consistency with the Magnuson-Stevens Act."

The Council's Aquaculture FMP sets an annual catch limit in Action 9 of 64 mp (= OY). Action 9 also limits a person, corporation, or other entity from producing more than 20 percent of the total annual OY (= 12.8 mp). The caps on production should be sufficient to constrain landings to less than or equal to the OY. If however, this limit is exceeded NOAA Fisheries Service would issue a control date, after which entry into the aquaculture fishery may be limited or prohibited. The control date would serve as an accountability measure while the Council initiates review of the OY proxy and aquaculture program.

6.14 Mitigation Measures

Regulations for implementing the National Environmental Policy Act (NEPA) require environmental impact statements include appropriate mitigation measures not already included in the proposed action or alternatives (40 CFR 1502.14(f) and 1502.16(h)). The preferred alternatives in this FMP would allow commercial aquaculture in the Gulf of Mexico. The impacts of allowing aquaculture are described in detail for each action in Sections 4, 6, and 7. Each action and its subsequent alternatives propose measures to mitigate the impacts of allowing aquaculture. No additional measures are proposed to mitigate the impacts of aquaculture. The following discussion summarizes the mitigation measures proposed in each action.

6.14.1 Action 1: Aquaculture permit requirements, eligibility, and transferability

This action considers whether or not to develop a permitting system for offshore aquaculture in the Gulf of Mexico. **Alternative 1** would require an EFP and would likely continue to constrain development of commercial aquaculture in the EEZ. **Preferred Alternative 2** and **Alternative 3** would require either a single aquaculture permit (**Alternative 2**) or an operating and siting permit (**Alternative 3)** to conduct aquaculture. In order to obtain permit(s) under either **Alternatives 2** or **3**, applicants must also meet various application and operational requirements summarized in Action 2. Review of applications for these permits would likely require more administrative effort to review than would an EFP, because this FMP would require many additional requirements than are currently required under an EFP. These permit requirements will also likely cost the applicant more than would an EFP, although applicants would no longer be required to develop extensive environmental assessments for their proposed project. These administrative costs and costs to the applicant are mitigated by the positive effects on the administrative, physical, and biological environments which would result from such a thorough evaluation of a permit before it was issued.

6.14.2 Action 2: Application requirements, operational requirements, and restrictions

Alternative 1 would not specify application or operational requirements for aquaculture operations. **Alternative 2** would maintain the same permit requirements as required by an EFP. **Preferred Alternative 3** would require applicants obtain an assurance bond and would prohibit genetically modified and transgenic species. Additionally, **Preferred Alternative 3** would require collection of broodstock from U.S. waters of the Gulf of Mexico and identification of an aquatic animal health expert. Requirements under **Preferred Alternative 3** are the most comprehensive of any of the alternative in Action 2 and would require the most time for the applicant to prepare and the agency to review. **Preferred Alternative 3** would also cost the applicant substantially more because the company would be required to obtain an assurance bond for permit issuance. The negative administrative and economic effects to the applicant and NOAA Fisheries Service are mitigated by the positive effects on the administrative, physical, and biological environments resulting from completion of a permit with such conditions and the assurance that aquaculture structures will be removed in the event an operation terminates.

Other permit conditions, including requirements for environmental monitoring, may be required by other agencies, such as the EPA. These monitoring requirements are intended to assess the impacts of an aquaculture operation and if necessary correct potential problems. Water quality and feed monitoring requirements would be specified by the EPA and may require operations to met pre-defined water quality standards. Other permit requirements would have to be met as specified by the ACOE. These monitoring requirements are intended to assess the impacts of aquaculture operations on marine

resources, and if necessary, will assist managers in developing regulations to mitigate environmental impacts if they occur.

6.14.3 Action 3: Duration of the permit

The duration of permit issuance is primarily an economic consideration, although it could have ramifications to the physical and biological environments if a permit is not regularly reviewed for compliance with governing regulations. Actions 2 and 8 in this FMP require operations comply with several operational, recordkeeping, and reporting requirements. These requirements will alert NOAA Fisheries Service of potential problems occurring at a facility and provide them with a basis for either revoking a permit or requiring a facility to change its business practices in order to prevent unacceptable impacts to the biological, physical, and ecological environments. An aquaculture permit would remain valid for the period indicated on the permit unless it is revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements.

Alternative 2(d) would allow for the longest permit duration (indefinite) and therefore be most beneficial to aquaculture operations seeking to obtain financial backing. **Alternative 1** would provide the shortest permit duration (1 year with a possibility of renewel) and would likely continue to constrain commercial aquaculture production from developing in the Gulf of Mexico. **Alternatives 2(a-c)** provide intermediate permit durations ranging from 5 to 20 years. Although the 10-year preferred permit duration would provide less financial benefits (more difficult to obtain financing and less desirable to investors) than longer permit durations, the negative effects of this alternative are believed to be mitigated by the benefits of more frequent permit review.

6.14.4 Action 4: Species allowed for aquaculture and included in the aquaculture fishery management unit

Alternative 1, which would not preclude culture of exotic species or the culture of genetically modified native species in the Gulf of Mexico EEZ, could have negative effects on the administrative, biological, physical, and ecological environments as described in Section 6.5 unless such introductions were based on a scientific risk analysis. **Alternatives 2, 3,** and **4** would not allow aquaculture of exotic species and differ from each other only in the particular native species which could be cultured. Alternative 4 would allow for the culture of all marine species in the Gulf of Mexcio managed by the Council with the exception of shrimp species and coral species (there currently exists a separate permitting system for live rock) and would request that NOAA Fisheries Service develop concurrent rulemaking to allow aquaculture of highly migratory species. Any negative economic effects to the applicant from limiting the number of species that could be cultured would be mitigated by the positive effects of keeping non-native and/or genetically modified species out of the Gulf in the event of escapement.

In addition to those species allowed for aquaculture, non-target species may be affected by aquaculture activities. These species could include protected resources and non-target fishes used for fishmeal. Impacts to protected species would be mitigated through ESA consultations (see Section 5.4.1.1). ESA statutes and regulations prohibit the take, import or export, possession, sale, delivery, or transport of all endangered species and most threatened species. Impacts to non-target species, such as menhaden, will be mitigated by potential adjustments to management measures following periodic stock assessments.

6.14.5 Action 5: Allowable marine aquaculture systems

Alternative 1 would not specify allowable aquaculture systems, and would not provide for NOAA Fisheries Service to specifically evaluate proposed systems. **Alternative 2** would allow applicants to use cages and net pens for aquaculture. **Preferred Alternative 3**, would allow for case-by-case review of each aquaculture system by NOAA Fisheries Service. **Preferred Alternative 3** would allow for technological innovations that may provide added protection to the physical and biological environments. The negative effect of limiting the type of system an applicant could use would be mitigated by the positive benefits to the administrative, biological, physical, and ecological environment of allowing only robust systems to be deployed in the Gulf of Mexico EEZ. Additionally, **Preferred Alternative 3** would mitigate negative effects to applicants by allowing future designs of aquaculture systems that have greater structural integrity. The more reliable the system, the less potential for environmental impacts incurred by the permittee.

6.14.6 Action 6: Marine aquaculture siting requirements and conditions

Alternative 1 would rely on NOAA Fisheries Service's review of site permits issued by the ACOE to evaluate proposed aquaculture sites. **Alternatives 2** and **3** would provide NOAA Fisheries Service with authority to use either pre-permitted aquaculture zones or to evaluate a proposed aquaculture site on a case-by-case basis, rather than relying solely on the review and comment procedures of another agency (**Alternative 1**). This would allow NOAA Fisheries Service to disapprove aquaculture sites proposed for aquaculture, which may have been previously approved by the ACOE. **Alternatives 2** and **3** may duplicate to an extent the ACOE's siting requirements, but this duplication is expected to mitigate potential environmental impacts to the physical and biological environments since NOAA Fisheries Service and the ACOE have different authorities and management objectives. Additionally, **Preferred Alternative 3** will involve case-by-case review for siting. Although this is expected to increase the amount of time needed to review a permit application relative to **Alternatives 1** or **2**, this inconvenience to the applicant and increased administrative costs to the government is mitigated by the detailed site-specific evaluation allowed.

6.14.7 Action 7: Restricted access zones for marine aquaculture facilities

Alternative 1 would not establish restricted access zones around offshore aquaculture facilities, while **Preferred Alternative 2** would establish restricted access zones around marine aquaculture facilities where fishing activities are prohibited. The economic burden to fishermen of being excluded from these zones could be substantial. Some fishermen may view restricted access zones as a form of marine protected area, where fishing is prohibited. It is well known that many fish aggregate around structures, and the aquaculture systems could attract fish from outside such a zone and keep fishermen from catching them. These negative economic effects are expected to be mitigated by proper siting of facilities; therefore **Alternative 2** is preferred.

6.14.8 Action 8: Recordkeeping and reporting

Keeping records and making reports to NOAA Fisheries Service and other federal agencies, as described in **Preferred Alternative 2,** could be seen as an administrative burden to aquaculture companies. **Alternative 1**, which would not require such recordkeeping and reporting, would not incur such a burden. However, if such records were not kept and reports were not made, problems with an aquaculture facility could result in negative effects to the administrative, economic, biological, physical, and ecological environments and go undetected and unresolved. Therefore, the benefits of prevention and review of environmental impacts are expected to mitigate any administrative and economic burdens suffered by the aquaculture operations.

6.14.9 Action 9: Biological Reference Points and Status Determination Criteria

Action 9 proposes two alternatives for setting biological reference points and status determination criteria. **Alternative 1** would not establish biological reference points and status criteria for the aquaculture fishery, while **Preferred Alternative 2** would. The MSFCMA requires these criteria and reference points be estimated and established. Establishing such benchmarks will mitigate the potential for legal challenges incurred if they are not implemented. Setting OY at 64 million pounds is expected to allow an aquaculture industry to develop in the Gulf of Mexico. The Council is taking a precautionary approach to setting OY and limiting production. The lower OY is set, the more environmental impacts would be prevented or mitigated. The Council's preferred OY is intended to provide a balance between environmental considerations and socio-economic considerations. If OY is determined to be set to high in the future, then procedures established in Action 10 would be used to adjust OY and minimize or mitigate environmental impacts.

6.14.10 Action 10: Framework Procedures

Action 10 proposes three alternatives. **Alternative 1** would not specify framework procedures, while **Alternatives 2** and **3** would. By not specifying framework procedures, the Council would be required to implement changes to aquaculture management measures through a full plan amendment. This would result in a timely process for implementing regulatory changes and could result in additional negative impacts to the

environment as changes are slowly approved and implemented. **Alternatives 2** and **3** would rely on an Aquaculture Advisory Board to annually review the aquaculture program. Both of these alternatives would provide regular oversight of ongoing aquaculture activities and operations and help to mitigate environmental, social, and economic impacts if they are determined to occur. The Panel would provide recommendations for review and approval by the Council. Recommendations could then be sent to the RA for approval. The major differences between these two alternatives are that a regulatory amendment would be required for **Alternative 3** and the Panel/Council would have broader authority for making changes to aquaculture regulations through the framework process specified in Alternative 3. For both alternatives, timelier implementation of regulations is expected to mitigate shorter public comment periods.

6.15 Cumulative Effects Analysis

NEPA mandates federal agencies assess not only the indirect and direct impacts associated with regulatory actions, but also the cumulative impacts associated with those actions. NEPA defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect is when the combined effects are greater than the sum of the individual effects.

This following CEA is based upon guidance offered in CEQ (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action. These items include:

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

The CEA for the biophysical environment will follow these 11 steps. Cumulative effects on the biophysical environment and the socio-economic environment will be analyzed separately.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The CEQ cumulative effects guidance states this step is accomplished through three activities. The three activities are as follows:

I. The direct and indirect effects of the proposed actions.

   Direct and indirect effects of the proposed actions are summarized in Sections 6.2 through 6.9.

II. Which resources, ecosystems, and human communities are affected?

   The resources, ecosystems, and human communities affected by this action are described in Section 5.0. These include:

   1. Managed resources (allowable aquaculture species)
   2. Non-target fisheries (menhaden and other fishes potentially used for feed)
   3. Habitat, including essential fish habitat
   4. Protected resources
   5. Gulf of Mexico fishing communities

III. Which effects are important from a cumulative effects perspective?

   The effects most important from a cumulative effects perspective are described in this CEA.

2. Establish the geographic scope of the analysis.

The immediate areas affecting managed resources, non-target fisheries, habitat, and protected resources are waters of the Gulf of Mexico, including both state and federal waters.

Most species managed by the Council are distributed in waters off the Yucatan, throughout the Gulf, to the waters off North Carolina. Some species, such as mackerel or cobia, migrate throughout this range seasonally, while others, such as gray triggerfish, have high site fidelity. Highly migratory species, such as tunas, and various protected species are managed by NOAA Fisheries Service Highly Migratory Species Division and occur throughout the world, including waters of the Gulf. Most species have pelagic larvae, thus, some exchange of fish between regions could occur. However, larval movement patterns are not well understood. Within the Gulf, genetic and life history data suggests multiple stocks or subpopulations of the same species may exist (e.g. mackerel and red snapper).

Aquaculture products are currently sold worldwide and products ultimately produced in the Gulf of Mexico will likely be sold in markets similar to those where wild caught products are sold. Therefore markets both around and outside the Gulf are expected to purchase and sell aquaculture products. However, most if not all aquaculture species would be landed in the Gulf and therefore would primarily affect local fishing communities. The immediate areas affecting humans would include fishing communities primarily along the Gulf of Mexico coast and to a lesser extent the South Atlantic coast. Although offshore aquaculture operations would only be sited in the Gulf of Mexico, many species managed by the Gulf Council occur in the South Atlantic. Production of cultured fish may therefore affect those South Atlantic fishing communities that harvest wild species that are also cultured in the Gulf of Mexico.

3. Establish the timeframe for the analysis.

Sections 2.2 and 5.3 describe the history of management for aquaculture nationally and in the Gulf. A national policy on aquaculture was first approved in 1980 through the passage of the National Aquaculture Act (NAA). The NAA was reauthorized in 1985 and subsequent legislative bills were proposed for Congressional consideration in 2005 and 2007. In the Gulf, the first offshore finfish aquaculture operation was an experimental operation in Texas state waters in the late 1980s and early 1990s. The first applicant to propose an offshore finfish aquaculture operation in federal waters of the Gulf was Seafish Mariculture L.L.C., which received an EFP from NOAA Fisheries Service in October 1997 to culture red drum, greater amberjack, and red snapper. This aquaculture project was later terminated in July 1999. To date, Seafish Mariculture is the only business that has successfully received an EFP for aquaculture in federal waters of the Gulf of Mexico, although several other businesses have made inquires to NOAA Fisheries on how to apply for an EFP.

The timeframe for the CEA should take into account both historical efforts to establish regional and national aquaculture programs, as well as future considerations if this FMP and its subsequent regulations are approved and implemented by NOAA Fisheries Service. The timeframe for the CEA begins in 1980, with the passage of the NAA, and extends through 2019, which is ten years after this FMP would first be approved and implemented. The end of the CEA also corresponds to the preferred duration of aquaculture permits as described in Action 3.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

This FMP proposes to include species from five of the Council's seven FMPs in the Aquaculture FMU. Only corals and shrimp would not be included in the FMU. Regulations that alter the allowable harvest of wild species managed under the Reef Fish, CMP, red drum, stone crab, and spiny lobster FMPs may alter the characteristics and operations of aquaculture facilities. When reduction in harvest of wild caught species occurs, a positive economic effect on the cultured conspecifics would be expected, while

conversely, increases in the wild caught fish would be expected to create a depressed value of aquaculture conspecifics. However, it is difficult to say with certainty if these trends would hold true for all species, some, or even none. Changes in value would largely depend on the health and status of wild fisheries and the amount of similar cultured species produced by aquaculture.

Other actions that affect aquaculture are those regulations which would be imposed and subsequently altered by other agencies with regulatory authority in the EEZ under various laws or existing authority. The EPA may affect aquaculture facilities by altering or imposing water quality parameters for offshore aquaculture under Section 318 of the Federal Water Pollution Control Act. The EPA must also approve chemicals and pesticides used in open ocean aquaculture. Additionally, FDA regulations may affect an aquaculture facilities' ability to use various chemicals or therapeutics for pest and pathogen control, as well as allowable levels of those agents for human consumption.

Similarly, the ACOE, through authority of Section 10 of the Rivers and Harbors Act of 1899, can affect aquaculture facilities by their review of the siting of such facilities in navigable waterways. Under the authorities of the Fish and Wildlife Coordination Act, the Endangered Species Act of 1973, the Migratory Bird Treaty Act, and the Marine Mammal Protection Act of 1972, the USFWS may review and comment on any project authorized, licensed or funded by the federal government with respect to effects on fish and wildlife.

More recently, the MMS published proposed regulations for alternative uses of energy related structures under the authority of the Energy Policy Act of 2005. This Act gives the Secretary of the Interior authority to issue a lease, easement, or right-of-way on the Outer Continental Shelf for activities that use energy facilities for other (non-energy related) authorized marine-related purposes, such as aquaculture. If a stock is not managed through a FMP, NOAA Fisheries Service may not have direct authority to permit or prohibit the activity under the MSFCMA. However, consultation requirements under the ESA and EFH provisions of the MSFCMA would still apply.

Since March 2003, the NMFS SERO has reviewed more than 20 applications for construction and operation of liquefied natural gas (LNG) terminals to be located in coastal and federal waters of the Gulf of Mexico. Of particular concern among LNG proposals are those facilities that propose open loop, or once-through, systems that would use sea water as the medium to heat and regasify LNG. In these cases, each facility would use 100 to 250 million gallons of sea water per day. The sea water would be cooled during the regasification process and treated with chemical additives to prevent biofouling. These aspects of LNG facility operation are likely to adversely affect EFH or species managed under the MSFCMA and species listed for protection under the ESA. The greatest concern with open loop systems in the Gulf of Mexico is the loss of eggs and larval life stages, with potential impacts on valued fish stocks for which rebuilding programs are in place or being developed. Other important issues include ecosystem impacts, impacts to National Marine Sanctuary resources, and impacts in coastal waters that fall within state jurisdiction. In a February 18, 2004 memorandum from the SEFSC

to the SERO, it was estimated that the operation of even a single offshore open loop facility could result in the mortality of five billion fish eggs and larvae per year for the life of the project and concluded that "[t]he negative impacts to fishery species and living marine resources in the Gulf from a single [open-loop] facility are potentially severe, and cumulative impacts from multiple facilities must be considered a threat to fishery resources."

As of early 2008 three facilities had been constructed in the Gulf of Mexico region; two onshore closed loop facilities and one offshore open loop facility. Additional facilities have received regulatory approvals including two offshore facilities (one closed loop and one open loop) and twelve on-shore closed loop facilities. Although approved, due to market capacity limitations it is expected that less than half of the proposed facilities will be constructed.

Lastly, the USCG has authority to require aquaculture-related structures be marked with appropriate lights and signals and the MMS is currently proposing regulations that would allow for alternative uses of oil and gas platforms. Offshore aquaculture has been identified as one potential alternative use.

Natural disasters and economic change can also affect resources, ecosystems, and communities. Such events include diseases outbreaks, red tides, changes in economic conditions, foreign imports, high fuel prices, hurricanes and storm events, and hypoxia. These disasters and economic changes can negatively affect the profits of aquaculture operations and fishermen. They can also damage existing infrastructure and reduce resource availability. However, aquaculture operations, unlike wild fisheries, will function as private businesses with successes and failures determined largely by business plans and the resilience of the operation to the above events. Compliance with the actions and alternatives proposed in this FMP will allow for environmentally sound and sustainable aquaculture. However, additional stresses could be placed on wild fisheries if operations impact the environment as described in Section 6.1. To prevent or minimize impacts from aquaculture, the alternatives proposed herein are intended to mitigate environmental and socio-economic impacts. Mitigation measures are described in detail in Section 6.14.

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components. According to the CEQ guidance describing stress factors, there are two types of information needed. The first are the socioeconomic driving variables identifying the types, distribution, and intensity of key social and economic activities within the region. The second are the indicators of stress on specific resources, ecosystems, and communities.

CEA factor 4 above describes the various stresses affecting the resources, ecosystems, and human communities of concern. Fishermen face numerous economic stresses.

These manifest themselves as either additional costs to fishing, or from reducing ex-vessel prices for harvested fish. Added costs include increases in such items as fuel, ice, food, and insurance. Factors reducing ex-vessel prices for fishermen include market gluts, increases in imported fish, or fish health issues. Changes in revenue and increased operating costs are two indicators of socioeconomic stress. In recent years, the additional stresses of overfishing, hurricanes, and fuel prices have resulted in marginal profits and losses in revenue forcing many fishermen to leave fisheries and seek more stable sources of employment. Fishermen targeting healthier stocks and with lower expenses are more resilient to the stresses described above. In contrast those fishermen relying on stocks that are frequently subject to overfishing and stringent management regulations, or that have greater expenses relative to other fishermen, are less resilient to various stresses making them more likely to seek other jobs. Because aquaculture operators would only rely on a small number of broodstock from wild stocks, they are more likely to be resilient to stresses such as overfishing of wild stocks. However, other stresses may affect aquaculture operations such as the ability to economically compete with wild caught fish, environmental factors which may diminish culture productivity (e.g., red tide, changes in temperature or dissolved oxygen), storm events, and large up-front financial investments.

Indicators of stress to the biological environment include reductions in population abundance and habitat degradation. As mentioned above, the Council and NOAA Fisheries Service evaluate the status of wild stocks relative to various pre-defined benchmarks and implement necessary management measures to maintain sustainable resources. The susceptibility to stress depends on a species productivity and life history. In general, longer lived, slower-growing species, such as many reef fishes, are more susceptible to stresses (overfishing, becoming overfished), then shorter-lived, more fecund species. As a result, the time to rebuild these populations is often much longer and reductions in harvest are much greater. For aquaculture operations, a species life history will affect the potential success of an operation and how profitable it may be. Faster growing species that are less susceptible to disease and command higher market prices will provide the fewest stresses to aquaculture operations. Similar, the location of a facility will be a critical aspect to its success or failure. For instance, facilities located in areas where hurricanes are more likely to occur or where current conditions are less optimal may incur more stresses due to lower production and potential for facility damage then facilities not located in these areas.

Wild stocks are another resource that could be potentially impacted by aquaculture operations through escapement of fish or disease outbreaks. Additionally, non-target species, such as menhaden, could be negatively affected if demand increases for fish meal. The stresses placed on wild stocks and their resilience to these stresses are largely contingent on wild fishery regulatory restrictions and the environmental regulations imposed on facilities. This FMP proposes numerous measures intended to mitigate impacts on the biological, physical, and ecological environments (see Section 6.14). All of these measures are intended to reduce stresses on wild stocks by preventing or minimizing escapement, disease, entanglements, and habitat degradation. The status of wild stocks, both managed and non-target species, is regularly monitored through both

state and federal stock assessments. These stock assessments allow managers to adapt to changes in fishing practices and adjust management to conserve natural resources. As a result, any stresses resulting from aquaculture on wild stocks above and beyond those stresses by domestic fisheries will be addresses through adjustments in Council fishery management plans (including this FMP) and federal/state regulations.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This section examines whether resources, ecosystems, and human communities are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

The MSFCMA requires federal fishery management plans to prevent overfishing and achieve optimum yield on a continuing basis. For many Council and HMS managed stocks, status determination criteria and benchmarks have been established to evaluate the status of a stock or stock complex. Currently, four species in the Gulf of Mexico are undergoing overfishing (gag, gray triggerfish, red snapper, and greater amberjack) and three species are overfished (red snapper, gray triggerfish, and greater amberjack). The remainder of Council managed species are either healthy or their status is unknown. Several HMS species are also overfished and/or overfishing as indicated in Section 5.2.3.2. Many of these species are not likely to be cultured, such as billfishes and sharks. Thirteen ESA-listed species are known to occur in the Gulf of Mexico and six species are considered candidates for listing as endangered or threatened. Several non-target species, such as menhaden, which are not managed by the Gulf Council may be affected by this action.

Stresses affecting each of these resources include directed fishing mortality, habitat loss and degradation, increasing demand for food and feed, and environmental changes (e.g., red tide, hurricanes, changes in temperature, etc.). The status of many of these species is regularly assessed through periodic assessments and their status is determined relative to pre-defined criteria. The status of Gulf fish stocks, endangered and threatened species, and highly migratory species is summarized in Section 5.0 relative to pre-defined benchmarks. When fisheries are determined to be undergoing overfishing or are overfished, NOAA Fisheries Service and/or the Councils are required by the MSFCMA to implement conservation and management measures to prevent overfishing and rebuild overfished stocks. States and interstate compacts may also impose regulations to control fishing mortality and harvest. The recent amendment to the MSFCMA requires Councils and NOAA Fisheries Service to establish annual catch limits and accountability measures to end overfishing of all stocks by either 2010 or 2011. For endangered and threatened

species, the ESA prohibits take, import or export, shipment, or sale of any endangered species and most threatened species.

Stresses affecting fishing communities include additional regulatory restrictions, competition from foreign seafood imports, coastal development, loss of infrastructure, and rising fuel prices. All of these stresses have placed a greater burden on fishermen and fishing communities that threaten their short- and long-term sustainability. In the past several years, the Council has implemented numerous regulations to end overfishing of reef fishes. The Council has also approved several rebuilding plans to increase stock biomass and abundance of reef fishes. These regulations have resulted in lower allowable catch levels, more restrictive trip limits, and limited access. Although the net benefit of these regulations is expected to result in more abundant and stable fisheries in the long-term, they have the unavoidable adverse effect of negatively affecting profits and value in the short-term. As a result, the cumulative effect of more restrictive regulations, coastal development, higher fuel prices, and natural disasters has led many fishermen to leave the industry in recent years and seek more stable forms of employment.

Developing an environmentally sound and sustainable aquaculture program is intended to alleviate some of these stresses. To the extent that development of an aquaculture industry may cause additional stresses (e.g., escape of cultured fish, nutrient loading, etc), the Council's preferred alternatives in this FMP are intended to minimize these stresses to the extent practicable (see Section 6.14 Mitigation Measures). The environmental permitting, reporting, recordkeeping and siting conditions associated with the proposed aquaculture program are consistent with the Council's policy to encourage environmentally responsible marine aquaculture. These conditions are intended to ensure the operations of all offshore aquaculture facilities permitted in the Gulf of Mexico are consistent with the MSFCMA National Standards (Section 6.12) and do not compromise Council objectives for wild fisheries. As discussed in Section 3 (Purpose and Need), open ocean aquaculture will assist NOAA Fisheries Service and the Council in optimizing yield above levels achieved solely from wild stocks, providing the greatest net benefit to the Nation with respect to food production, while taking into account necessary environmental protections needed to sustain Council and NOAA Fisheries Service managed fisheries native to the Gulf of Mexico. Aquaculture has the potential to increase yield to levels much greater than current MSY and OY estimates for wild Gulf fisheries. In addition to increasing OY, aquaculture may also help reduce fishing mortality on Council and HMS managed stocks by providing an alternate source of food instead of overfished wild stocks and stocks undergoing overfishing. Aquaculture may also provide additional job opportunities for local fishing communities, especially those fishing communities most affected by federal and state management restrictions.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects.

The status of Council managed resources are summarized in the annual status report to Congress on the Status of U.S. Fisheries (NMFS 2007). The baseline status of Council managed species is also described in section 5.0 of this FMP. Gag, gray triggerfish, red snapper, and greater amberjack are undergoing overfishing in the Gulf and red snapper, gray triggerfish, and greater amberjack are overfished. The remainder of Council managed species are either healthy or their status is unknown. Additionally several HMS species are overfished and/or undergoing overfishing (see Section 5.2.3.2). Many of these species are not likely to be cultured, such as billfishes and sharks. Additionally many ESA-listed species or candidate species for ESA-listing are known to occur in the Gulf (see Section 5.2.3.3).

The status and health of EFH is extensively described in GMFMC 2004 and GMFMC 2005. The Council, NOAA Fisheries Service, and other federal agencies have designated numerous areas in the Gulf of Mexico to protect and conserve EFH. These areas protect EFH from a wide variety of direct impacts, including: loss of fishing gear, restricted use of certain fishing gears, and damage from anchors. Section 5.1 in this FMP describes numerous environmentally sensitive areas where aquaculture could be restricted. In addition, Action 6 will require NOAA Fisheries Service conduct case-by-case reviews of aquaculture sites. The EPA already imposes monitoring requirements for NPDES permits to collect baseline data. Baseline data for a site, and plans for monitoring environmental impacts will also be required by NOAA Fisheries Service to evaluate localized changes to the benthos, water column, and biological environment.

Section 5.3.3 describes baseline conditions for fishing communities throughout the Gulf. The Generic Essential Fish Habitat Amendment (GMFMC 2004) provides more extensive characterization of fishing-dependent communities throughout the Gulf. The communities that will be affected as a result of developing offshore aquaculture in the Gulf are difficult to project at this time. There is no information available that describes where firms will have their headquarters, where their supplies will be purchased, where employees will be hired or live, where the offshore facilities will be located, or how social conditions will change.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Cause-and-effect relationships for various aspects of offshore marine aquaculture and measures proposed in this FMP to address these potential effects are summarized in Table 6.12.1.

Table 6.12.1 The cause-and-effect relationship of aquaculture activities and proposed regulatory actions.

Cause	Potential Effect	Measures to Address Potential Effects
non-native species	competition with native species, loss of biodiversity, economic damage, transmit disease, degrade habitat	prohibit use of species not native to the Gulf - Action 4
Genetic modification	changes in wild population genetic structure if fish escape	prohibit use of genetically modified and transgenic species for aquaculture - Action 2
improper siting	habitat degradation, reduced water quality, increased entanglements of wildlife, user conflicts, navigational hazard, decreased water quality	case-by-case review when siting a facility - Action 6; compliance with ACOE, EPA, and USCG permitting requirements
reduced water quality	reduced biological and ecological productivity, increased risk of infectious disease	case-by-case review when siting a facility by NOAA Fisheries Service - Action 6; compliance with EPA standards - Action 2
improper aquaculture system construction	increased entanglement and injuries of wildlife; habitat degradation	case-by-case review when permitting allowable aquaculture systems - Action 5
abandoned equipment	habitat degradation, navigational hazards	require assurance bond for structure removal - Action 2
permit duration	too long - increased potential for environmental impacts not being discovered; too short - problems with procuring capital	annual reporting and recordkeeping requirements - Action 8; operational requirements - Action 2; periodic on-site visits by NOAA Fisheries Service staff; EPA monitoring standards
escapement	genetic modification and competition with native, wild stocks	Regular inspection of allowable aquaculture systems - Action 2; Use of native, non-genetically modified stocks - Action 4; Notification of escapement - Action 8
speculative entry	large number of permits issued; permittees have no intent of using permits	use-it or lose-it requirement - Action 2
allowing offshore aquaculture	potential loss or increase in jobs to local communities, increased risks of localized environmental impacts, poaching of wild fish, competing uses	review social and economic data over time as the aquaculture industry develops; regular monitoring and permit requirements - Actions 2 and 8; appropriate siting - Action 6; Aquaculture Advisory Panel – Action 10.

9. Determine the magnitude and significance of cumulative effects.

It is difficult to predict the magnitude and significance of cumulative effects at this time, because it is unknown how many aquaculture operations will apply for permits in the near future. The following discusses the magnitude and significance of cumulative effects relative to past, present, and reasonably foreseeable future actions. For purposes of discussion, cumulative effects are discussed in the context of Action 1 (permit or do not permit a regional aquaculture program).

Past actions affecting aquaculture are described in Section 2.2 and Section 5.3. Since 1980, the U.S. has had a national aquaculture policy. However, to date there have been only limited offshore aquaculture operations; most of which have occurred in state and not federal waters. In the Gulf of Mexico, the current permitting framework (EFPs) is not conducive to the development of an aquaculture industry. Additionally, the U.S. is increasingly importing a larger share of seafood to meet domestic demand. Allowing a regional aquaculture program to develop will increase the supply of domestic seafood, while minimizing or preventing environmental impacts on wild fisheries, habitat, and water quality. Although not allowing a regional permitting program to develop would provide the least risk to the biological and social/economic environments, actions considered in this FMP are intended to mitigate such impacts, to the extent practicable. Under a best-case scenario, numerous (5-20) aquaculture operations would be permitted in the Gulf over the next 10 years. These operations would have environmentally sound aquaculture systems, pose minimal or no impacts to localized water quality and wildlife, be sited in areas that prevent or significantly reduce the likelihood of habitat degradation and user conflicts, and culture large amounts of native, non-genetically modified fish from the Gulf of Mexico helping to reducing fishing pressure on wild stocks and increase OY . In order to accomplish this best case scenario, the Council has selected numerous preferred alternatives in this FMP to mitigate or prevent negative environmental effects. These are described in greater detail in Section 6.14. The worst-case scenario would occur if potential effects in Table 6.12-1 occur. However, the Council and NOAA Fisheries Service have proposed numerous monitoring, recordkeeping, and reporting requirements to ensure these potential effects are prevented, or mitigated if they occur.

Presently, there are no proposed aquaculture operations applying for EFPs in the Gulf, although several firms have inquired about obtaining an EFP in the last few years. National aquaculture legislation is now currently being considered by Congress. A 2005 bill came under criticism because of the perceived lack of environmental safeguards. A bill resubmitted to Congress in 2007 is intended to address at least some of these criticisms; however, it is unknown when this legislation may be passed. Even if the bill is approved soon, it is expected to take several years to implement a national aquaculture program. The bill, as proposed, would exempt aquaculture from the definition of "fishing" and provide for consultations with fishery management councils. This legislation would potentially override the actions proposed in this FMP; however, it is unknown whether or not proposed national legislation would have greater or less environmental standards and requirements than those proposed in this FMP.

Other actions being considered by the Council and NOAA Fisheries Service that were recently implemented or are expected to be implemented in the foreseeable future include: 1) measures to end overfishing of red snapper (Amendment 27/14 to the Reef Fish and Shrimp FMPs), 2) modifications to shrimp trawl bycatch reduction device criteria, 3) measures to address overfishing of gag, gray triggerfish, and greater amberjack (Amendments 30A and 30B to the Reef Fish FMP), and 4) measures to increase red grouper TAC (Amendment 30B to the Reef Fish FMP). The Council is also developing an amendment, which would develop a grouper limited access privilege program in the Gulf of Mexico. If approved, a limited access program could be established as early as January 2010. A majority of the above mentioned amendments are intended to reduce mortality on wild stocks and rebuild overfished fisheries. These actions will have negative effects on fishermen and fishing communities in the short-term, with positive benefits accruing as stocks rebuild. Additionally, the MSFCMA will require the Council and NOAA Fisheries Service to implement annual catch limits and accountability measures for most managed stocks by 2010 or 2011. Annual catch limits and accountability measures are intended to prevent or greatly reduce the risk of overfishing and are expected to have positive biological benefits. However, they will also likely impose more restrictive catch levels on many fisheries resulting in negative social and economic impacts over the short-term. To the extent that catch limits and accountability measures can prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socio-economic environments.

Open-ocean aquaculture will allow yield to be optimized at levels above those achieved solely by wild stocks, providing the greatest net benefit to the Nation with respect to food production, while taking into account necessary environmental protections needed to sustain Council and NOAA Fisheries Service (i.e., highly migratory species) managed fisheries native to the Gulf of Mexico. In addition to increasing OY, aquaculture may also help reduce fishing mortality on Council and HMS managed stocks by providing an alternate source of food instead of overfished wild stocks and stocks undergoing overfishing. The FMP includes several recordkeeping and reporting requirements to prevent or mitigate impacts to habitat and protected resources (see Sections 4.2, 4.5, 4.6, and 4.8). Additionally, assessments will be conducted periodically for non-target species, such as menhaden, to determine if wild stocks are being managed at sustainable levels. If offshore aquaculture results in increased demand for fishmeal from species such as menhaden then states and interstate compacts may need to impose more restrictive regulations to protect these wild-prey species. Fishing mortality and abundance for these species, as well as managed species, will be determined periodically by assessments and established targets and thresholds.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The cumulative effects of developing a regional aquaculture permitting system on the socioeconomic environment are expected to be positive, although some negative social and biological impacts may result if aquaculture is not conducted in an environmentally

sustainable manner. To prevent or minimize impacts associated with aquaculture, the actions and alternatives in this FMP include various measures to mitigate impacts. Such measures include:

- Action 2: Requiring aquaculture permit holders to obtain an assurance bond for removal of structures if an operation terminates; identification of an aquatic animal health expert; prohibition on use of genetically modified, and transgenic species; emergency disaster plans; broodstock harvested only from U.S. waters of the Gulf of Mexico.
- Action 4: Use of only native Gulf species for aquaculture
- Action 5: Evaluate proposed aquaculture system on a case-by-case basis to ensure reliable offshore growing system technology is used to provide environmental safeguards.
- Action 6: Prohibit siting facilities in marine reserves, artificial reef zones, coral areas, marine protected areas, and HAPCs; review proposed sites on a case-by-case basis; space facilities at minimum 3 km from one another; require benthic surveys of a site during review.
- Action 8: Require the following recordkeeping and reporting requirements:
    - Report disease outbreaks, escapement, and entanglements of marine mammals and protected species.
    - Maintain harvest and sale records and feed labels.
    - Obtain prior approval for harvesting broodstock.
    - Submit an annual standardized report describing recordkeeping and reporting requirements.

In addition to these measures, NOAA Fisheries Service staff will conduct site visits at facilities to ensure aquaculture facilities are operating properly and not causing unacceptable impacts to the biological or ecological environments. If, at any time, permit conditions or recordkeeping and reporting requirements are not being met, NOAA Fisheries could initiate an on-site inspection to determine the operations impact and, if needed, revoke the operation's permit prior to its expiration.

For non-target species that may be indirectly affected by this action (e.g., menhaden used as fishmeal for aquaculture), stock assessments may be conducted periodically by NOAA Fisheries Service or state management agencies to determine if stocks are being managed at sustainable levels. If non-target stocks are not being managed at sustainable levels, states or interstate compacts may impose regulations to reduce fishing mortality, constrain harvest and rebuild overfished stocks.

Socioeconomic impacts will depend largely on whether or not cultured products supplant domestic, wild caught fish in the marketplace and displace fishing communities (e.g., job losses/increases, price competition). Currently, foreign imports represent a majority of seafood consumed in the U.S. Domestic aquaculture will increase the supply of fresh U.S. fish. However, the extent to which cultured fish will compete with domestic, wild fisheries is unknown at this time. If cultured fish supplant wild harvest, then fishing communities reliant on the harvest of wild fish may be negatively affected.

Alternatively, if aquaculture increases job opportunities for local fishing communities, then net economic and social benefits may result. Until socioeconomic impacts of domestic aquaculture are better understood, there is no way to mitigate potential future impacts.

11. Monitor the cumulative effects of the selected alternatives and adapt management.

The effects of the proposed actions will be monitored through the submission of periodic reports to NOAA Fisheries Service and other agencies, such as the EPA and ACOE. Action 2 requires aquaculture permit applicants to meet numerous operating requirements and restrictions. Additionally, Action 8 requires permit holders to maintain various records and submit various reports to NOAA Fisheries Service regarding issues ranging from disease outbreaks to entanglement of protected resources. This information, as well as water quality data provided to the EPA, will allow NOAA Fisheries Service and other federal agencies to monitor the cumulative effects of the preferred alternatives and make management adjustments, as necessary.

6.16 Unavoidable Adverse Effects

Administrative Costs

Implementing and administering a permitting program for aquaculture will result in additional unavoidable costs to federal agencies, particularly NOAA Fisheries Service Southeast Region. Although NOAA Fisheries Service Southeast Region currently issues EFPs, only one EFP has been issued to an aquaculture operation in the last 10 years and only two other EFPs have been considered for issuance. The numerous permit requirements, records, and reports will require additional workload for NOAA Fisheries Service staff. Costs to other federal agencies, such as the ACOE, EPA, MMS, USDA, and USCG, may also increase because of additional review and administration to issue siting, lease, chemical (drug, pesticide, and biologics), pollution discharge, and navigational permits.

Loss of Fishing Grounds

The development of offshore aquaculture will require the production facility to have access to the portion of the ocean where they operate. The exclusive use of an area means that the offshore aquaculture firms will compete for space in federal waters with other activities, such as recreational and commercial fishing. Conflicts between aquaculture firms and commercial or recreational fishers could arise if the aquaculture site is a desirable fishing area or if the site attracts fish (see Section 6.1.5.1). Action 6 establishes siting criteria by which NOAA Fisheries Service will evaluate a proposed aquaculture site and Action 7 would establish a restricted access zone around a facility. To the extent practicable, historical and important fishing grounds will be taken into consideration when approving or disapproving a particular facilities location. However, in some instances the loss of fishing areas may be unavoidable given the numerous other siting criteria that will be considered by NOAA Fisheries Service and the ACOE.

While empirical evidence is sparse, available information suggests that loss of fishing areas may be very limited. As discussed in the Sustainable Marine Aquaculture Task Force report (2007), several offshore facilities are currently operating in Hawaii. These operations lease a total of 193 acres which equates to an average of 64 acres per operation. If future operations in the Gulf are of a similar size to those currently operating in Hawaii, one can conclude that the amount of open space occupied by these structures will be exceedingly small relative to the total available area; even with a large number of operations.

Localized Water Quality and Benthic Changes

Section 6.1.3 discusses the effects of effluents from marine aquaculture facilities. Although the effects of aquaculture operations in the deep water environment are significantly fewer than those near-shore, impacts still exist and are unavoidable. Impacts are primarily related to two factors: 1) increased organic loading on the benthos, and 2) nutrient enrichment of the water column. The EPA regulates water quality through NPDES permits, while NOAA Fisheries Service has authority to protect and conserve EFH. Action 2 will require aquaculture applicants to abide by EPA feed management and water quality standards. Additionally, NOAA Fisheries Service will use siting criteria to avoid placing aquaculture facilities in areas of critical and essential fish habitat. However, because aquaculture and in particular cage culture will involve feeding and maintaining fish in a contained area, localized small-scale impacts to water quality and benthos are unavoidable and mitigated to the extent possible.

Exclusive Use of a Public Resource

During public comment periods throughout the development of this FMP numerous constituents voiced concerns about providing aquaculture operations exclusionary use of public resources. Siting and permitting in this FMP will afford aquaculture operations the privilege to conduct aquaculture at a specified site in the Gulf of Mexico EEZ. However, siting of a facility will be contingent on ACOE and NOAA Fisheries Service review. An operation would be provided use of a particular site for the duration of their permit, unless revoked before it expires or is renewed. Although an aquaculture operation may occupy both the water column and benthos at a particular site within the EEZ, the operation would not be provided ownership of the site, nor would they be leasing the site. With regard to biological resources, wild broodstock used for aquaculture would have to be accounted for when managing commercial quotas, TACs, and pending annual catch limits. The number or amount of fish used for aquaculture would be contingent on NOAA Fisheries Service approval, as specified in Action 8.

Fishing Communities

It is not well-known whether aquaculture will positively or negatively benefit fishing communities. Positive impacts could include a localized influx of business and increased jobs, while negative impacts could include increased price competition with wild-caught fish and loss of domestic fishing jobs. The severity and direction of the impact will to some extent depend on the species cultured and the location of an aquaculture facility relative to a fishing community. Unavoidable adverse impacts to fishing communities

will therefore occur if in fact aquaculture operations depress wild-caught fish prices and create competition for fishing-industry jobs.

As noted in the Sustainable Marine Aquaculture Task Force report (2007), "[a] large question looming as we begin to farm the sea is how will it transform coastal communities? Fitting into coastal communities will be a major challenge for the marine aquaculture industry as it expands into new areas and interacts with a variety of stakeholders. Coastal communities in many areas suitable for aquaculture have traditionally depended on fisheries and have, in recent decades, increasingly depended on tourism. The jobs and revenue that aquaculture brings have been welcomed in some coastal communities, including some hit hard by the decline in wild fisheries. Others, however, have rejected aquaculture development (p. 22)."[11] However, it is difficult to identify those communities along the Gulf coast which would "welcome" offshore aquaculture and which communities would oppose it without an in-depth social analysis of the individual communities and their perceptions regarding offshore aquaculture. As noted in the Marine Aquaculture Task Force report (2007), one reason for opposition to aquaculture operations located in nearshore waters is visual impact concerns. Given that net pens and cages are likely to be submerged and out of site of land, opposition due to aesthetic concerns may be relatively minor. The report also suggests that competition for space with other uses (e.g., recreational boating and fishing) has also generated opposition. Given the relatively limited amount of ocean space that will likely be required for even a sizeable number of these facilities, however, calls into question the amount of opposition that would likely to be forthcoming if an offshore aquaculture industry is developed.

6.17 Relationship Between Short-term Uses and Long-term Productivity

Developing a successful, environmentally sound aquaculture industry will allow optimum yield and long-term productivity to increase over time. Increasing the domestic supply of seafood will assist in alleviating the seafood import deficit while providing the U.S. with a safer, sustainable supply of seafood. Additionally, potential benefits of developing an aquaculture permit program over the long term could include decreased pressure on wild fish stocks and increased opportunities for employment in Gulf coast communities. Because an aquaculture industry currently does not exist in the Gulf, short-term uses will largely stem from the creation of profitable aquaculture operations. Initial financial investments for offshore aquaculture operations are often substantial and require many years before an operation is profitable and there is a return on one's investment. If an operation can succeed financially over the short-term, then the social and economic environments will benefit from the long-term productivity of sustainably-produced aquaculture products that comply with stringent federal environmental standards.

6.18 Irreversible and Irretrievable Commitments of Resources

11 In general, the discussion provided in the Sustainable Marine Aquaculure Task Force report (2007) is assumeed to relate observations of nearshore facilities (given the fact that there are few offshore facilities).

Freeman (1992) defines irreversible commitments as "those that cannot be reversed, except perhaps in the long term." These would include such instances where ore was removed from a mine or a species went extinct. Irretrievable commitments are "those that are lost for a period of time" such as when the right-of-way of a road running through a forest is lost from timber production.

Alternatives and actions in this FMP are largely intended to prevent irreversible commitments. Measures include preventing non-native, genetically modified, and transgenic species from being used for aquaculture, inspection of cultured species for disease prior to stocking, case-by-case review of aquaculture systems and siting criteria, and various recordkeeping and reporting requirements. Irreversible commitments that could potentially result from aquaculture include habitat damage or degradation if aquaculture structures are damaged or destroyed during storm events. In the event of escapement, native, non-genetically modified cultured species are expected to prevent negative biological and ecological impacts to wild stocks. An irretrievable commitment resulting from aquaculture would be the temporary loss of fishing grounds where an aquaculture facility is sited Fishing grounds would be lost for the period of time the permit is issued. However, siting criteria will assist NOAA Fisheries Service in identifying sites that minimize losses of important fishing grounds and other habitat.

6.19 Any Other Disclosures

CEQ guidance on environmental consequences (40 CFR §1502.16) indicates the following elements should be considered for the scientific and analytic basis for comparisons of alternatives. These are:

a) Direct effects and their significance.
b) Indirect effects and their significance.
c) Possible conflicts between the proposed action and the objectives of federal, regional, state, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned.
d) The environmental effects of alternatives including the proposed action.
e) Energy requirements and conservation potential of various alternatives and mitigation measures.
f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.
g) Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.
h) Means to mitigate adverse environmental impacts.

Items a, b, d, e, f, and h are addressed in Sections 4, 5, and 6. The other elements are not applicable to the actions in this document. Because this FMP concerns the management of captive marine fish and invertebrate stocks, it is not in conflict with the objectives of federal, regional, state, or local land use plans, policies, and controls (Item f).

Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures (Item g) is not a factor in this FMP. The actions taken in this FMP will affect a marine stock and it's fishery, and should not affect land-based, urban environments.

6.20 Evaluation of Significance Factors

NOAA's Administrative Order 216-6 (NAO 216-6) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 contain criteria for determining the significance of the impacts of a proposed action. CEQ regulations state that the significance of an action should be analyzed both in terms of "context" and "intensity." The significance of this action was analyzed based on criteria contained in both CEQ regulations and NOAA's Administrative Order 216-6. Where relevant, specific sections pertaining to each factor are identified below. These sections provide a more thorough discussion of each significance factor.

1) *Can the proposed action be expected to have a substantial impact on biodiversity or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

Discussion: Allowing the development of a marine aquaculture industry in the Gulf of Mexico is not expected to impact biodiversity or ecosystem function. Aquaculture operations would be allowed to take only a limited amount of wild fish for use as broodstock. The amount taken would likely pale in comparison to recreational and commercial fisheries harvest, and therefore would have no or little effect on ecosystem function. Requiring only native, non-genetically modified species to be cultured would provide an environmental safeguard in the event of escapement. Non-indigenous species or genetically modified species have been shown to compete with wild stocks, thereby affecting ecosystem function and predator-prey relationships. Additionally, localized affects around a marine aquaculture facility may occur. Studies have shown changes in nutrients, benthic diversity, and predators immediately surrounding open ocean net pens and cages (see Section 6.1). Although this may result in localized changes in biodiversity and predator-prey relationships, changes on a Gulf-wide scale are not expected to be significant.

2) *Can the proposed action be reasonably expected to have a substantial adverse impact on public health and safety?*

Discussion: Currently, the U.S. imports 80 percent or more of its seafood. Imports are largely from foreign countries with less restrictive environmental standards than the U.S. This FMP is expected to benefit public health by allowing the development of an environmentally sound aquaculture program in the Gulf of Mexico. Specific actions related to aquaculture in this FMP intended to increase public health and safety include: prohibiting the use of genetically modified, transgenic, non-native species for aquaculture (Actions 2 and 4), inspection of diseased fish prior to stocking (Action 2), allowing only

structurally sound and stable aquaculture systems (Action 5) for use, and case-by-case review of aquaculture facility sites (Action 6).

3) *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?*

Discussion: Section 5.0 describes the physical, biological, social, economic, and administrative environments affected by this action, including important fishery resources, critical habitat, threatened and endangered species, and Gulf fishing communities. Unique characteristics of the geographic area where an aquaculture facility will be sited will be evaluated on a case-by-case basis by NOAA Fisheries Service using various criteria identified in this FMP and by other federal agencies. One of the unique characteristics of the Gulf of Mexico geographic area is the predominance of oil and gas platforms (~4,000) that could be used for infrastructure of offshore aquaculture operations.

4) *Are the effects on the quality of the human environment likely to be controversial?*

Discussion: Allowing the development of a regional aquaculture permitting system is controversial. National aquaculture legislation proposed in 2005 was scrutinized in part because of concerns about adequate environmental safeguards. Commercial fishermen have expressed concerns that aquaculture products will increase competition and potentially reduce their profits. Concerns have also been expressed about impacts to water quality, the loss of fishing grounds, and habitat degradation.

5) *Are the effects on the human environment likely to be uncertain or involve unique or unknown risks?*

Discussion: Sections 6, 7, and 8 discuss the possible effects of aquaculture on the human environment. To date, most offshore aquaculture operations have been small-scale research or pilot projects primarily occurring in state waters. Although effects on the human environment are well-known for projects of this magnitude, the effects of potentially permitting numerous large scale operations are less known. In many places in this FMP/PDEIS, the authors have acknowledged whether or not the possible effects of this action on the human environment are known. One benefit of this FMP is that it will require recordkeeping and reporting requirements that will allow for the possible effects of this action to be better understood in the future. Because many effects are not well understood, the Council has elected to choose alternatives which mitigate these potential negative effects on the human environment (see Section 6.14).

6) *Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?*

Discussion: The proposed action would set a precedent if implemented before national legislation is approved by Congress. The U.S. has had a policy on marine aquaculture since 1980, but a sustainable, economically viable aquaculture industry in the U.S. has yet to develop. This action, if implemented, would become the first federal permitting program (excluding EFPs) for offshore marine aquaculture. In doing so, the actions and preferred alternatives in this FMP would set the first standards for regulating aquaculture in federal waters and protecting the marine environment from any potential adverse effects.

7) *Are the proposed actions related to other actions with individually insignificant but cumulatively significant impacts.*

Discussion: The cumulative effects analysis (see Section 6.15) provides a detailed description of the relationship of this action with past, present, and reasonably foreseeable future actions. This action is not related to any other actions that are individually insignificant but with cumulatively significant impacts.

8) *Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historical Places or cause loss or destruction of significant scientific, cultural, or historical resources.*

Discussion: The proposed actions are not expected to impact historic or cultural resources. Management measures proposed in this FMP, such as case-by-case review of aquaculture systems (Action 5) and siting criteria (Action 6), are intended to prevent loss or destruction of resources. Archeological sites, historical sites, and known wrecks would be avoided when a facility is sited by the ACOE and NOAA Fisheries Service.

9) *Can the proposed action reasonably be expected to adversely affect an endangered or threatened species, marine mammals, or critical habitat of these species?*

Discussion: Sections 5.2.3.3 and 6.1.4 discuss the potential adverse impacts on endangered and threatened species. The proposed action will alter the manner in which the fishery operates. Wild fish are primarily caught by hook-and-line or longlines, although spears and nets can be used for some species. The deployment of aquaculture systems will represent a new type of gear used in the Gulf. Additionally, aquaculture operations may be proposed in migration pathways or areas of important habitat for threatened or endangered species. NOAA Fisheries Service will prohibit the siting of operations in specific areas of the Gulf (see Action 6). NOAA Fisheries Service will also conduct case-by-case reviews of proposed aquaculture sites. These reviews will involve consultations with NOAA programs and offices, such as the Protected Resources Division. This helps ensure that adverse impacts to endangered or threatened species, marine mammals, or critical habitat do not occur, or are mitigated to the extent practicable.

10) *Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?*

Discussion: Applicable laws for the proposed action are summarized in Section 10.0. This action is consistent within the requirements of the M-SFCMA and will modify federal regulations. This action does not duplicate or threaten a violation of other federal, state or local laws. Several federal agencies have jurisdication to regulate activities associated with aquaculture, including the EPA, ACOE, MMS, and USCG. This FMP proposes no action that would supersede or duplicate the regulations of these agencies. Additionally, each Gulf state has authority to regulate aquaculture within territorial waters (inshore of 3 geographic miles off AL, MS, and LA, inshore of 3 marine leagues off FL and TX). State, local, and federal regulations may differ, but those differences and the requirements in this action would not threaten the protection of the environment based on the actions proposed in this FMP.

11) *Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?*

Discussion: The proposed action is not expected to jeopardize the sustainability of any target species. Limited quantities of wild fish will be taken for use as broodstock. All species used for marine aquaculture will have to be native to the Gulf of Mexico and cannot be genetically modified (Actions 2 and 4). Non-indigenous species would be prohibited from being cultured. This will prevent competition for food and habitat between wild fish and non-indigenous fish in the event that cultured fish escape. Stocked fish would also have to be inspected and certified as disease free before stocking in allowable aquaculture systems.

12) *Can the proposed action reasonably be expected to jeopardize the sustainability of non-target stocks?*

Discussion: The proposed action is not expected to jeopardize the sustainability of non-target species. Limited quantities of wild fish will be caught as broodstock. While harvesting broodstock, small amounts of non-target species may be caught as bycatch, but the number of fish discarded would be small and comparable to a recreational or commercial fishing trip. The use of cages, net pens, or other grow-out systems may increase entanglement of fishes, marine mammals, protected species, and other non-target species. The NOAA Fisheries Service Protected Resources Division would be consulted during the review of proposed marine aquaculture systems and no systems would be improved if they are determined to jeopardize the sustainability of non-target species. Additionally, larvae, eggs, and small prey may be consumed by fish residing in net pens or cages. However, impacts are expected to be small given that natural mortality is high during the egg and larval stage for most marine species. Increased nutrient loading and water quality changes could impact habitat surrounding an aquaculture facility, but impacts are typically localized (see Section 6.1) and siting criteria would be used to avoid areas with essential fish habitat. Non-target prey species, such as menhaden, would be

harvested and used for fish meal. The proposed action is not expected to jeopardize the sustainability of prey stocks given that they are periodically assesses by NOAA Fisheries Service and managed by states and interstate compacts.

13) *Can the proposed actions reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the M-SFCMA, and identified in FMPs.*

Discussion: No, the proposed actions are not expected to significantly damage or impact habitat. The physical environment affected by actions in this FMP is described in Section 5 and impacts to the physical environment are discussed in Section 6 and Actions 5 and 6. The Council's preferred alternative in Action 6 would require NOAA Fisheries Service to review a proposed marine aquaculture facility site on a case-by-case basis. Aquaculture operations would also be prohibited in specific areas, such as marine reserves, artificial reef zones, SMZs, MPAs, HAPCs, and coral areas (see Action 6). Additional criteria may also be required by other federal agencies. These criteria are intended to prevent, or minimize to the extent practicable, impact to EFH and bottom habitat in general.

14) *Are significant social and economic impacts interrelated with natural and environmental effects?*

Discussion: Section 6.1 describes the potential biological impacts that may result from this action. Measures proposed in this FMP are intended to prevent or mitigate such impacts (See Section 6.14), although some unavoidable adverse impacts may occur (Section 6.16). To the degree that the proposed measures prevent or mitigate environmental impacts, no significant social and economic impacts are expected to occur in relation to natural and environmental effects. Social and economic impacts are likely to be related to increased economic competition and public opposition to aquaculture by some stakeholders.

15) *Is the proposed action reasonably expected to result in the introduction or spread of non-indigenous species?*

Discussion: No, the Council's preferred alternatives in Actions 2 and 4 would prohibit the use of non-native, genetically modified, transgenic species for aquaculture. Only Council managed reef fishes, spiny lobster, stone crab, coastal migratory pelagics, and red drum would be allowed for aquaculture. The Council would also send a letter to NOAA Fisheries Service's Highly Migratory Species Division requesting concurrent rulemaking.

16) *Will the proposed action result in cumulative adverse effects that could have a substantial affect on the target or non-target species.*

Discussion: The cumulative effects of the proposed action are described in detail in Section 6.15. Significance factors 2 and 3 above describe expected impacts on target and non-target species. Cumulatively, allowing the development of an offshore aquaculture

industry is not expected to adversely affect target and non-target species, although impacts to the environment may occur as described in Section 6.1. For both target and non-target stocks, numerous actions throughout this FMP are intended to mitigate or prevent negative environmental consequences. These include: prohibiting non-indigenous species and genetically modified species from being used for aquaculture, requiring extensive permitting, recordkeeping, and reporting requirements, and evaluating marine aquaculture systems and sites on a case-by-case basis.

7.0 Regulatory Impact Review (RIR)

7.1 Introduction

NOAA Fisheries Service requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives which could be used to solve the problem; and (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 (E.O. 12866) and whether the approved regulations will have a "significant economic impact on a substantial number of small business entities" in compliance with the Regulatory Flexibility Act of 1980 (RFA).

7.2 Problems and Objectives

The purpose and need, issues, problems, and objectives of the proposed FMP are presented in Sections 1, 2, and 3, and are incorporated herein by reference.

7.3 Methodology and Framework for Analysis

This RIR assesses management measures from the standpoint of determining the resulting changes in costs and benefits to society.

To the extent practicable, the net effects of the proposed measures for an existing fishery should be stated in terms of producer and consumer surplus, changes in profits, and employment in the direct and support industries. However, there is not and never has there been a Gulf offshore aquaculture fishery.

This analysis does not question if there will be an offshore aquaculture fishery in the Gulf. Consequently, it does not describe or compare the costs and benefits of the existence versus the nonexistence of a Gulf offshore aquaculture fishery. Instead, the following analysis focuses on descriptions and estimates, when possible, of the costs and benefits of various regulatory conditions under which Gulf offshore aquaculture will exist as it develops.

7.4 Description of the Gulf Aquaculture Fishery

The Gulf offshore aquaculture fishery is described in Section 5.3, and is incorporated herein by reference.

7.5 Economic Impacts of Management Alternatives

7.5.1 Action 1: Aquaculture Permit Requirements, Eligibility, and Transferability

7.5.1.1 Alternative 1: No action, an Exempted Fishing Permit (EFP) is required for conducting offshore aquaculture operations. Also, no dealer permit for Gulf aquaculture is required for those receiving cultured organisms from the Gulf of Mexico EEZ at the first point of sale.

This is the status quo alternative, and, as such, any entity seeking to engage in long-term, commercial offshore aquaculture operations that involve species managed under an FMP or activities in violation of fishery regulations in the Gulf of Mexico EEZ is and would be required to apply for an EFP. However, the purpose of an EFP is inconsistent with such operations. An EFP authorizes limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. Also, unless otherwise specified in the EFP or a superseding notice or regulation, an EFP is effective for no longer than one year, unless revoked, suspended or modified, although EFPs have been issued for offshore aquaculture for periods for 2 years. An EFP may be renewed (50 CFR 600.745(b)(4)).

An EFP is issued to a vessel or vessels and authorizes the owner of the vessel(s) to engage in exempted fishing, which is fishing from a vessel of the United States that involves activities otherwise prohibited (50 CFR 600.10). Fishing is defined to be any activity, other than scientific research conducted by a scientific research vessel, that involves: (1) the catching, taking, or harvesting of fish; the attempted catching, taking, or harvesting of fish; (3) any other activity that can reasonably be expected to result in the catching, taking, or harvesting of fish; or (4) any operations at sea in support of, or in preparation for, any activity described in paragraphs 1), (2), or (3) of this definition (50 CFR 600.10). Defined as such, offshore aquaculture operations in the Gulf EEZ involve fishing.

A vessel of the United States or U.S. vessel for purposes here means: (1) any vessel documented under chapter 121 of title 46, United States Code (USC) or (2) any vessel numbered under chapter 123 of title 46, USC, and measuring less than 5 tons.

Under 46 USC § 12102, a vessel of at least 5 net tons that is not registered under the laws of a foreign country is eligible for documentation if the vessel is owned by:

3) an individual who is a citizen of the United States;
4) an association, trust, joint venture, or other entity:
    c) all of whose members are citizens of the United States; and
    d) that is capable of holding title to a vessel under the laws of the United States or of a State;

3) a partnership whose general partners are citizens of the United States, and the controlling interest in the partnership is owned by citizens of the United States;
4) a corporation established under the laws of the United States or of a State, whose chief executive officer, by whatever title, and chairman of the board of directors are citizens of the United States and no more of its directors are noncitizens than a minority of the number necessary to constitute a quorum;
5) the U.S. government; or
6) the government of a State.

Under 46 USC 123, a vessel under 5 net tons must be registered and numbered by a State.

An EFP issued under 50 CFR 600.745(b) is not transferable or assignable and is valid only for the vessel(s) for which it is issued. Moreover, it authorizes the permit holder only temporary use of a particular site for permitted project operations.

To date, three applications for an EFP for purposes of offshore aquaculture in the Gulf EEZ have been received and only one was issued. See section 5.3 for more details.

At present, an annual dealer permit (OMB No. 0648-0205) is required to receive the following species harvested in the Gulf EEZ: reef fish (see Appendix B), sharks and swordfish. All applications must include a payment of a non-refundable application fee of $50.00 for the first fishery and $12.50 for each additional fishery requested on the application. It is estimated that the time required to complete the average application for an annual dealer permit is 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing the collection of information (Page 4 of Federal Permit Application for an Annual Dealer Permit). Presently, certain fisheries have mandatory reporting requirements. Under the status quo, an entity who would receive cultured organisms from the Gulf EEZ would not be required to have an annual dealer permit if it received cultured individuals of species not included in the above list of reef fish, sharks or swordfish, such as cobia.

At present, there is no Federal permit required by NOAA Fisheries Service to operate a hatchery within the EEZ for spawning and rearing of species native to the Gulf of Mexico, and no hatchery operations have occurred in the Gulf EEZ.

To date, the harvest of species native to the Gulf to create broodstock for purposes of aquaculture has occurred predominantly for scientific purposes and a letter of acknowledgement (LOA) is sufficient for such scientific activities. However, an LOA is only appropriate for scientific research activities conducted onboard a scientific research vessel (50 CFR 600.10, 600.745). As defined in section 600.10, the term scientific research does not include collection for product development or market research or testing of fishing gear. Similarly, an EFP can not be issued for ongoing commercial operations (50 CFR 600.745(b)).

7.5.1.2 Preferred Alternative 2: Require a NOAA Fisheries Service Gulf of Mexico Aquaculture Permit for conducting offshore aquaculture operations, which will authorize a person to do any of the following:

1. **Deploy or operate an allowable aquaculture system in the Gulf of Mexico EEZ;**
2. **Operate a hatchery in the Gulf of Mexico EEZ for spawning and rearing of allowable aquaculture species;**
3. **Harvest or designate hatchery personnel or other entities to harvest wild broodstock of an allowable aquaculture species native to the Gulf of Mexico for aquaculture purposes;**
4. **Possess in the Gulf of Mexico EEZ allowable aquaculture species in, from, or to the Gulf of Mexico EEZ for aquaculture purposes;**
5. **Transport an allowable aquaculture species in, from, or to the Gulf of Mexico EEZ for aquaculture purposes;**
6. **Land allowable aquaculture species cultured in the Gulf of Mexico EEZ at a U.S. port;**
7. **Sell, only at the first point of sale, an allowable aquaculture species cultured in an allowable aquaculture system in the Gulf of Mexico EEZ; and**

This alternative will also limit those eligible for a Gulf Aquaculture Permit to U.S. citizens or permanent resident aliens.

A person is a U.S. citizen by birth or through naturalization. The term "permanent resident alien" refers to a person lawfully accorded the privilege of residing permanently in the United States as an immigrant in accordance with U.S. immigration laws.

No corporation, partnership, or association shall be deemed a citizen of the United States unless the controlling interest therein is owned by citizens of the United States, and, in the case of a corporation, unless its chief executive officer, by whatever title, and the chairman of its board of directors are citizens of the United States and unless no more of its directors than a minority of the number necessary to constitute a quorum are noncitizens and the corporation itself is organized under the laws of the United States or of a State, Territory, District, or possession thereof, but in the case of a corporation, association, or partnership operating any vessel in the coastwise trade the amount of interest required to be owned by citizens of the United States shall be 75 per centum. The controlling interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to a majority of the stock thereof is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if the majority of the voting power in such corporation is not vested in citizens of the United States; or (c) if through any contract or understanding it is so arranged that the majority of the voting power may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or, (d) if by any other means whatsoever control of the corporation is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

Seventy-five per centum of the interest in a corporation shall not be deemed to be owned by citizens of the United States (a) if the title to 75 per centum of its stock is not vested in such citizens free from any trust or fiduciary obligation in favor of any person not a citizen of the United States; or (b) if 75 per centum of the voting power in such corporation is not vested in citizens of the United States; or (c) if, through any contract or understanding, it is so arranged that more than 25 per centum of the voting power in such corporation may be exercised, directly or indirectly, in behalf of any person who is not a citizen of the United States; or (d) if by any other means whatsoever control of any interest in the corporation in excess of 25 per centum is conferred upon or permitted to be exercised by any person who is not a citizen of the United States.

This alternative also proposes that a Gulf Aquaculture Permit be transferable to U.S. citizens and permanent resident aliens.

An EFP is not transferable. This alternative would contribute to the establishment of a Gulf Aquaculture Permit as a marketable asset available for purchase or lease by a U.S. citizen or permanent resident alien. As such, in theory it would give the holder of the permit the incentive to use the permit strategically because a decline in the economic value of the permit would represent a personal economic loss. However, it would also contribute to privatization of public waters by giving the permit holder exclusive use of a particular site within the Gulf EEZ for purposes of offshore aquaculture, which would prohibit others from benefiting from use of the site for the same and/or other purposes.

This alternative also authorizes location of a hatchery (or hatcheries) in the Gulf EEZ.

As stated in Section 5.3, EFP applications were received for three proposed offshore aquaculture projects in the Gulf EEZ; however, only one of the projects was implemented. The Gulf of Mexico Aquaculture Permit established by this alternative would authorize a person to deploy or operate an allowable aquaculture system in the Gulf EEZ without need of an EFP. It would also allow a permit holder to site and operate a hatchery in the Gulf EEZ, although to date all hatchery operations have been land-based. Potential economic benefits to an offshore aquaculture operation of locating a hatchery in the EEZ would derive mostly from lower transportation costs associated with moving fingerlings from the hatchery to the grow-out site.

The issuance of the Gulf Aquaculture Permit does not eliminate the need for the applicant to receive any other Federal, State or Local authorizations required by law.

This alternative also requires a person who receives cultured organisms from the Gulf of Mexico EEZ at the first point of sale to have a dealer permit for Gulf aquaculture. Mandatory reporting requirements for a Gulf aquaculture dealer permit are specified in Table 4.1.2.

At present, an Annual Dealer Permit (OMB No. 0648-0205) is required to receive reef fish, sharks and swordfish harvested in the Gulf EEZ. This alternative would add organisms cultured in the Gulf to the permit requirement. Therefore, individuals who

expect to receive cultured organisms from the Gulf at the first point of sale would be required to complete the application for an Annual Dealer permit and receive the permit before receiving such organisms. This action would not change current fees for the application nor is it expected to change the average time necessary to complete the application form. However, it would cost the person who receives cultured organisms from the Gulf an additional $50 or $12.50 annually, depending upon if the person presently receives reef fish, sharks or swordfish or not.

Certain fisheries have mandatory reporting requirements. Under the status quo alternative, a person who receives cultured organisms from the Gulf EEZ would not be required to report purchases of some species. The Council's preferred alternative would establish reporting requirements analogous to those required currently for Gulf reef fish.

This alternative also prohibits landing of cultured organisms at a non-U.S. port.

Requiring cultured organisms to be landed in the U.S. is expected to provide the greatest net benefits to the Nation. Although this requirement would not prevent export of cultured products, it would ensure that products are first sold to a permitted dealer after being landed at a U.S. port. This preferred alternative is also intended to provide additional benefits for enforcing offshore marine aquaculture activities.

7.5.1.2.3 Total Economic Impact of Preferred Alternative 2

This alternative would affect entities that propose to engage in offshore aquaculture in the Gulf EEZ and those who purchase cultured organisms from the Gulf EEZ at the first point of sale.

The total economic cost to those who propose to engage in offshore aquaculture operations would be the cost of obtaining a Gulf Aquaculture Permit as opposed to the cost of obtaining an EFP. Such costs would be determined by the NOAA Fisheries Service Handbook for calculating fees. As stated previously, ongoing commercial offshore aquaculture is not consistent with the purposes of an EFP, which is intended for short-term, small-scale, more research-oriented, projects.

The total economic cost to those who may purchase cultured organisms from Gulf offshore aquaculture operations (at the first point of sale) would be the cost of obtaining an Annual Dealer Permit, which would cost $50 annually, if the person does not presently have a dealer permit, or $12.50 if the person does.

The total economic benefit to those who propose to engage in offshore aquaculture operations would be the benefit of obtaining a Gulf Aquaculture Permit as opposed to the benefit that would derive from having an EFP. Because a Gulf Aquaculture Permit would be transferable, it could become a marketable asset, whereas an EFP is not transferable and is valid for only a short period of time. Additionally, commercial production would be much more viable under a Gulf Aquaculture Permit when compared to an EFP. Issuance of a Gulf Aquaculture Permit would contribute to privatization of public waters by giving the permit holder exclusive use of a particular site for purposes of

offshore aquaculture. This could have adverse economic impacts on those who could benefit from use of the site for aquaculture and/or other purposes.

7.5.1.3 Alternative 3: Require separate NOAA Fisheries Service siting and operating permits for conducting offshore marine aquaculture in the Gulf of Mexico EEZ. A siting permit would authorize use of a site for conducting aquaculture. An operating permit would authorize the activities specified in Alternative 2. The same eligibility and transferability conditions that apply to Alternative 2 would apply to this third alternative. Also, the same dealer requirement would apply.

This alternative separates the single Gulf Aquaculture Permit into two permits: one for siting and another for operation. This alternative would create two transferable permits, not one. Consequently, it could contribute to the establishment of two marketable assets available for purchase or lease by a U.S. citizen or permanent resident alien. However, transfers of the operational permit would likely be greatly limited by the physical and biological characteristics of the first site of operations. In other words, the two permits would have to be compatible. Consequently, under Alternative 3 someone interested in obtain existing permits would have challenges and costs associated with obtaining two compatible permits through two separate transactions. Moreover, this alternative would contribute to privatization of public waters by giving the siting permit holder exclusive use of a particular site within the Gulf EEZ for purposes of offshore aquaculture, which could have adverse economic impacts on those who could benefit from use of the site for aquaculture and/or other purposes.

Under Alternative 3, dealers would not be required to have an Aquaculture Dealer Permit and cultured organisms could be landed at non-U.S. ports, as long as all Federal laws are satisfied. Dealers would not have to pay the annual $12.50 to $50 cost of obtaining a dealer permit. Fees for determining costs of issuing operational and siting permits would still be determined by the NOAA Handbook for fees. However, costs may be slightly greater because more than one permit would have to be processed during review and issuance.

7.5.1.4 Comparison of Alternatives of Action 1

Alternative 1 would continue to require an EFP. Development of commercial offshore aquaculture is contrary to the purposes of an EFP because an EFP is intended for short-term, small-scale projects, not ongoing commercial offshore aquaculture operations. Both Alternatives 2 and 3 would be consistent with such operations because the permit(s) created would be for purposes of commercial offshore aquaculture in the Gulf.

Both Alternatives 2 and 3 contribute to the establishment of permits as marketable assets and therefore, generate incentives for the permit holders to engage in strategic practices so as not to diminish the economic values of their permits. However, these two alternatives also contribute to the privatization of public waters by giving the single or site permit holder exclusive use of a particular site for purposes of offshore aquaculture, which prevents others from benefiting from the use of that site for the same and/or other

purposes. Alternative 3 would have higher transaction costs than Preferred Alternative 2 as it would involve one more permit in order to site and operate an aquaculture facility. This alternative could also require significantly greater due diligence and timeliness than Preferred Alternative 2 in order to obtain two compatible and existing permits through two separate transactions.

7.5.2 Action 2: Application Requirements, Operational Requirements, and Restrictions

7.5.2.1 Alternative 1: Do not specify Gulf Aquaculture Permit application requirements or operational requirements and restrictions for aquaculture in the Gulf EEZ.

This alternative would not specify application requirements and operational requirements and restrictions for aquaculture in the Gulf EEZ. Consequently, the onus would be on potential applicants and the general public to consult with NOAA Fisheries Service and learn what application requirements, operational requirements, and restrictions would apply to Gulf aquaculture operations. Such consultation would ensure NOAA Fisheries Service has the information necessary to determine whether or not an operation would pose significant impacts to the environment or to enforcement. This alternative has the least transparency of the three alternatives and would greatly increase the time and costs required by both applicants and the public to learn of baseline and other application requirements and operational requirements and restrictions for offshore aquaculture in the Gulf EEZ. In turn, it would not give NOAA Fisheries Service either the information it would require to estimate a proposed offshore aquaculture operation's potential impacts on the environment and taking of cultured species, or the documents it needed for effective enforcement of Federal laws. Furthermore, this alternative would make it difficult for applicants and the public to assess what the legally allowable aquaculture practices are in Federal waters and the biological and economic impacts of those practices.

7.5.2.2 Alternative 2: Require the Exempted Fishing Permit application and issuance requirements as specified at 50 CFR 600.745(b).

This is the status quo alternative. Thus, the relevant application and operational requirements or restrictions are those required to obtain and maintain an EFP for purposes of offshore aquaculture. As stated in 50 CFR 600.745(b)(2), the application for an EFP must include payment of any required fee as specified by paragraph (b)(1) of §600.745. Additionally, a written application must include, but is not limited to, the following information:

i. The date of the application.
ii. The applicant's name, mailing address, and telephone number.
iii. A statement of the purposes and goals of the exempted fishery for which the EFP is needed, including justification for issuance of the EFP.
iv. For each vessel to be covered by the EFP, as soon as the information is available and before operations begin under the EFP.

A. A copy of the USCG documentation, state license, or registration of each vessel, or the information contained on the appropriate document; and,
B. The current name, address, and telephone number of the owner and master, if not included on the document provided for the vessel.

v. The species (target and incidental) expected to be harvested under the EFP, the amount(s) of such harvest necessary to conduct the exempted fishing, the arrangements for disposal of all regulated species harvested under the EFP, and any anticipated impacts on marine mammals or endangered species.
vi. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used.
vii. The signature of the applicant.
viii. The Regional Administrator or Director, as appropriate, may request from the applicant additional information necessary to make a determination required under this section.

The above application requirements are the status quo application requirements for an EFP, and as such are designed for short-term, one-time fishing projects. Therefore, the status quo application requirements would provide insufficient information for Gulf Aquaculture Permit applicants to adequately complete an application that proposes a long-term, commercial-scale aquaculture operation, which would affect the ability of NOAA Fisheries Service and the general public to assess the potential impacts of the proposed operation on the environment.

The status quo operational requirements and restrictions are represented by the terms and conditions that may be attached to an EFP. The RA or SFD may attach terms and conditions to an EFP consistent with the purpose of the exempted fishing, including, but not limited to (50 CFR 600.745(b)(3)(v)):

A. The maximum amount of each regulated species that can be harvested and landed during the term of the EFP, including trip limitations, where appropriate.
B. The number, size(s), name(s), and identification number(s) of the vessel(s) authorized to conduct fishing activities under the EFP.
C. The time(s) and place(s) where exempted fishing may be conducted.
D. The type, size, and amount of gear that may be used by each vessel operated under the EFP.
E. The condition that observers, a vessel monitoring system, or other electronic equipment be carried on board vessels operated under an EFP, and any necessary conditions, such as predeployment notification requirements.
F. Reasonable data reporting requirements.
G. Other conditions as may be necessary to assure compliance with the purposes of the EFP, consistent with the objectives of the FMP and other applicable law.

When NOAA Fisheries Service announced receipt of an EFP application from Florida Offshore Aquaculture, Inc. for purposes of offshore aquaculture on July 30, 2003 (68 FR 44745), it stated that it intended to add the following terms and conditions to any issuance of the EFP to ensure that there are no significant impacts on the environment or enforcement. The proposed terms and conditions were:

1) Applicant must notify NOAA Fisheries Service of any changes to the list of hatcheries to be used.
2) All fingerlings must be certified by the hatchery to be disease-free prior to placement in the cages.
3) Only chemotherapeutants approved by the FDA or prescribed by a qualified veterinarian may be used.
4) Use of toxic chemicals as defined in 50 CFR 622.2 to control fouling of nets is prohibited.
5) Immediate notification must be provided to NOAA Fisheries Service if any of the following events occur:
    a. Damage to cages or malfunction of supporting structures;
    b. Large-scale escapement, i.e., loss of more than 20 percent of a cage population;
    c. Major disease outbreak resulting in mortalities exceeding 10 percent; or
    d. Entanglements of marine mammals or endangered or threatened sea turtles.
6) Quarterly reports are required beginning 90 days after anchoring cages in site on:
    a. Any disease occurrence;
    b. Any use of chemotherapeutants approved by FDA or prescribed by a qualified veterinarian;
    c. Outcome of any events requiring immediate notification (see 5 above);
    d. Changes in faunal composition of the area around the experimental site;
    e. Substrate and water quality monitoring;
    f. Harvests of maricultured fish species;
7) The following samples/records must be maintained a minimum of at least one year after the termination of the EFP and made available for inspection:
    a. Sources of feed including batch codes;
    b. Sources of each group of fish stocked including:
        1. total number of fish by species;
        2. estimated size of fish;
        3. date of each introduction/stocking;
        4. name, address and phone number of each supplier;
        5. disease status of supplier's facility including, name, address and phone number of analytical facilities assessing disease status;
        6. samples of frozen samples of each group of fish including fish harvested from cages, and during any unusual morbidity or mortality events as per USDA standards; and
        7. phase one fry will be satellite DNA documented by geneticists at designated hatchery.
8) Fish must be maintained intact through offloading ashore. Fish will be placed in live haul containers located on the harvest vessels, brought to shore, and loaded

on live haul trucks for sale to traditional live markets. Any fish over the capacity of the live market will be processed and sold. Once harvested, the mariculture fish must be reported in accordance with State and Federal reporting requirements. Sale is allowed only to dealers licensed by the State to sell maricultured fishery products landed in the State.

9) Not less than 72 hours prior to harvest, provide the following information to the NOAA Fisheries Service Law Enforcement Office, Southeast Region, St. Petersburg, FL: date, port, and facility at which the maricultured product will be landed and name(s) and phone number(s) of licensed dealer(s) receiving the fish.
10) NOAA Fisheries Service retains the authority to make periodic inspections of mariculture operations and records. If the applicant becomes an aquaculturist certified by the State, the applicant must notify NOAA Fisheries Service Law Enforcement of the annual unique serial number required on all mariculture records, including sales, and the records must be made available on inspection by authorized officers and maintained for the duration of the EFP for one year.
11) NOAA Fisheries Service has the authority to revoke or suspend the EFP if: the application is found to contain false, incomplete, or inaccurate information; the applicant fails to comply with its terms and conditions; significant new information becomes available indicating that one of the conditions for denial of the EFP applies.
12) Issuance of the EFP does not eliminate the need for the applicant to obtain any other Federal, State, or Local authorizations required by law.

The above stated terms and conditions were proposed to apply for a particular EFP application for offshore aquaculture, and as such, were not and are not meant to represent general operational requirements and restrictions for Gulf offshore aquaculture. However, these terms and conditions do provide insight into potential operational requirements and restrictions imposed by NOAA Fisheries Service and offer greater transparency than the first alternative. Consequently, these one-time conditions and terms for an EFP, although an improvement over having no operational requirements and restrictions, would be insufficient guidelines for potential applicants and the public to adequately assess operational requirements and restrictions necessary for operation.

7.5.2.3 Preferred Alternative 3 establishes application requirements, operational requirements, and restrictions (see Section 4.2 for a list of these requirements)

This alternative is the most transparent of the three alternatives because it specifies what the application requirements, operational requirements, and restrictions would be for an applicant. It also would give NOAA Fisheries Service the information it requires to adequately estimate the impacts that a proposed offshore operation would have on the environment, monitor permitted operations, and enforce Federal laws that protect the environment. Moreover, Preferred Alternative 3 would provide better guidelines for potential applicants and the public to adequately assess what is legally required of commercial offshore aquaculture operations and the associated impacts of those legal requirements on the environment.

One of the conditions within the application form is financial assurances in the form of a performance bond, which would mitigate damages caused by the permittee's default. This requirement would require the signature of an additional entity as a bond surety who agrees to ensure performance in the event that permittee defaults.

7.5.2.4 Comparison of Alternatives of Action 2

Alternative 1 would not specify any application requirements or operational requirements or restrictions, and as such, would be the least transparent of the three alternatives. It would require greater amounts of time and costs for applicants and the public to consult with NMFS and learn what the minimum requirements are to conduct offshore aquaculture operations in manners that do not damage the environment and violate Federal laws. It would also make it most difficult for NMFS to adequately estimate the potential impacts of a proposed offshore aquaculture operation on the environment and to effectively monitor operations and enforce Federal laws.

Alternatives 2 and 3 specify application requirements and operational requirements and restrictions, however, Alternative 2 continues existing EFP requirements and restrictions, which provide insufficient guidelines and information for applicants, NMFS and the public who are interested in and have concerns for commercial offshore aquaculture operations in the Gulf EEZ. The requirements and restrictions imposed by an EFP are for short-term, small-scale projects, not ongoing, commercial-scale offshore aquaculture. Alternative 3 specifies application requirements and operational requirements and restrictions specifically for the purposes of commercial offshore aquaculture in the Gulf EEZ. Consequently, Alternative 3 offers the greatest transparency and would require the least time and costs associated with providing and receiving information sufficient for an adequate assessment of the potential and realized impacts of commercial offshore aquaculture operations on the environment.

7.5.3 Action 3: Duration of the Permit

7.5.3.1 Alternative 1: No Action, the duration and renewal of an EFP applies.

This is the status quo alternative. Unless otherwise specified in the EFP or a superseding notice or regulation, an EFP is effective for no longer than one year, unless revoked, suspended or modified. EFPs have been previously issued for offshore aquaculture for periods of 2 years. An EFP may be renewed (50 CFR 600.745(b)(4)); however, the purposes of an EFP are not consistent with ongoing commercial offshore aquaculture operations. Also, an EFP is effective for the allowed duration unless it is revoked, suspended, or modified. A commercial offshore aquaculture operation would have to apply for and receive a continuous combination of EFPs and renewals to continue ongoing operations.

7.5.3.2.a Alternative 2(a): Aquaculture permits are effective for 5 year unless revoked, suspended or modified.

This alternative extends the duration of an aquaculture permit, but it does not specify if the permit can be renewed or not. Consequently, it would be less attractive to potential applicants who are seeking long-term use of a particular site for purposes of offshore aquaculture, especially if much of the time that a 5-year permit is valid for is dedicated to getting facilities at the site in position and ready for the introduction of its first batch of fingerlings.

A single or site permit would give the permit holder exclusive use of a particular site for 5 years, which would prevent others from benefiting from use of that site for 5 years, unless the permit was revoked, suspended or modified. Under this alternative, it is not clear if the permit holder would have to apply for a new permit or could seek renewal of an existing permit before it expires in order to continue operations. It also does not specify how many times a permit could be renewed.

7.5.3.2.b Preferred Alternative 2(b): Aquaculture permits are effective for 10 years unless revoked, suspended or modified and may be renewed in 5-year increments.

This alternative extends the duration of an aquaculture permit to ten years and specifies that the permit can be renewed thereafter in 5-year increments. Consequently, it would be less attractive to potential applicants who are seeking long-term use of a particular site for purposes of offshore aquaculture, especially if much of the time that the 10-year permit is valid is dedicated to getting facilities at the site in position and ready for the introduction of its first batch of fingerlings. However, a single or site permit would give the permit holder exclusive use of a particular site for 10 years, which would prevent others from benefiting from use of that site for 5 years, unless the permit was revoked, suspended or modified. Ten years is considered by many to be the minimum timeframe necessary for an operation to be profitable and obtain sufficient investment and financing.

7.5.3.2.c Alternative 2(c): Aquaculture permits are effective for 20 years unless revoked, suspended or modified.

This alternative extends the duration of an aquaculture permit to 20 years. Consequently, it would be more attractive to potential applicants than a 5-year or 10-year permit. However, for those who prefer an option for operations to continue beyond 20 years, there may be no opportunities to continue beyond the duration of the permit. If renewal is not possible, the existing permit holder would have to apply for a new permit to continue operations. A single or site permit would give the permit holder exclusive use of a particular site for 20 years, which would prevent others from benefiting from use of that site for 5 years, unless the permit was revoked, suspended or modified. This permit duration is consistent with the permit duration proposed in the National Offshore Aquaculture Act of 2007.

7.5.3.2.d Alternative 2(d): Aquaculture permits are effective indefinitely unless revoked, suspended or modified.

This alternative extends the duration of an aquaculture permit to an indefinite amount of time. Consequently, an offshore aquaculture operation would never require renewal of a permit to continue operations. A single or site permit of this duration would give the permit holder exclusive use of a particular site for an indefinite amount of time, which would prevent others from benefiting from use of that site for an indefinite amount of time, unless the permit was revoked, suspended or modified.

7.5.3.3 Comparison of Alternatives of Action 3

This action specifies the duration of an aquaculture permit, with options for 1 year, (Alternative 1), 5 years (Alternative 2(a)), 10 years (Preferred Alternative 2(b)), 20 years (Alternative 2(c)) or indefinitely (Alternative 2(d)). Of those alternatives specifying permits of limited duration (Alternatives 1, 2(a), 2(b) and 2(c)), only Alternatives 1 and 2(b) give the possibility of renewal. Therefore, it is possible that Alternatives 2(a) and 2(c) would not provide for opportunities for renewal and would require existing operations to apply for a new permit. Alternative 1 could impose the greatest time and costs on those engaged in offshore aquaculture operations because they would have to apply and reapply for a continuous series of permits and renewals in order to have an ongoing commercial offshore aquaculture operation. At the same time, Alternative 1 would offer the least amount of time that an offshore aquaculture permit holder could exclude others from use of its particular site. Alternative 2(d) would impose the least time and costs on those engaged in ongoing offshore aquaculture operations because they would only have to apply for and be issued a permit once. However, Alternative 2(d) would also prevent others from benefiting from the use of a particular site for the purpose of aquaculture and/or other purposes for an indefinite period of time, which essentially encloses and privatizes an area of Federal waters that historically has been managed under the public trust doctrine. Preferred Alternative 2(b) offers renewal in 5-year increments after the initial 10-years of permit issuance. Consequently, of the alternatives with permits of limited duration, it imposes the least time and costs associated with permit application and renewals, while offering the greatest amount of time that an offshore aquaculture operation can have exclusive use of a particular site.

7.5.4 Action 4: Species Allowed for Aquaculture and Included in the Aquaculture Fishery Management Unit

7.5.4.1 Alternative 1: No Action, do not specify the species allowed for aquaculture or develop an Aquaculture Fishery Management Unit.

This is the status quo alternative. Currently, there is no Aquaculture Fishery Management Unit, and there are no regulations that specify the species allowed for aquaculture in the Gulf of Mexico EEZ. Consequently, this alternative would allow a commercial operation to culture species that are not native to the Gulf of Mexico or any other waters in the country (if allowed under other federal laws), which could have significant adverse impacts on the biological, economic and social environments.

The three applications for EFPs for offshore aquaculture projects in the Gulf EEZ offer insights into what species would likely be considered for future aquaculture operations. All three EFP applications proposed to aquaculture finfish species native to the Gulf of Mexico, and the species were cobia, mahi-mahi, greater amberjack, Florida pompano, red snapper and cubera snapper. However, without specifying the particular species that may be cultured in the Gulf EEZ and that would be included in the Aquaculture Fishery Management Unit, cultured species may include non-native species. NOAA Fisheries Service ability to regulate cultured species is severely limited by reliance on historical fishery management units and regulations designed to manage wild, traditional fisheries in the Gulf.

7.5.4.2 Alternative 2: Allow the aquaculture of all finfish species native to the Gulf of Mexico in the reef fish, red drum, and coastal migratory pelagics FMPs and include these species in the Aquaculture Fishery Management Unit. It would prohibit the aquaculture of all species that are not native to the Gulf of Mexico and those species native but not within the reef fish, red drum and coastal migratory pelagics FMPs.

This alternative offers less uncertainty than Alternative 1 in regards to the range of species that would be allowed to be cultured in the Gulf EEZ. Consequently, it offers the benefit of greater transparency than the first alternative and decreases the time and costs required by applicants and the public to consult with NOAA Fisheries Service and learn which species would be allowed to be cultured.

7.5.4.3 Alternative 3: Allow the aquaculture of all species native to the Gulf of Mexico that are managed by the Council and included in an FMP management unit, except goliath grouper, Nassau grouper, and those species in the shrimp and coral fishery management units, and include these species in the Aquaculture Fishery Management Unit. It would prohibit the aquaculture of any species that is not native to the Gulf of Mexico and the following native species: goliath groper, Nassau grouper, and those in the shrimp and coral fishery management units.

This alternative offers less uncertainty than Alternative 1 in regards to the range of species that would be allowed to be cultured in the Gulf EEZ. It also provides a greater range of allowed species than Alternative 2, as Alternative 2 does not allow non-finfish species native to the Gulf. Consequently, Alternative 3 offers the benefit of the same or similar transparency of Alternative 2 with less time and costs required by applicants and the public to consult with NOAA Fisheries Service and learn which species would be allowed to be cultured. Alternative 3 also gives commercial offshore aquaculture operations the benefit of more options than Alternative 2 in terms of species that can be cultured over the life of a particular operation.

7.5.4.4 Preferred Alternative 4: Allow the aquaculture of all species native to the Gulf of Mexico that are managed by the Council included in an

FMP management unit, except those species in the shrimp and coral FMP management units, and include these species in the Aquaculture Fishery Management Unit. The Council will send a letter to NOAA Fisheries Service requesting development of concurrent rulemaking to allow aquaculture of highly migratory species.

This alternative offers less uncertainty than Alternative 1 in regards to the range of species that would be allowed to be cultured in the Gulf EEZ. It also provides a greater range of species than allowed by either Alternatives 2 or 3. Preferred Alternative 4 would allow non-finfish species native to the Gulf, unlike Alternative 2. Preferred Alternative 4 would also allow goliath grouper or Nassau grouper, unlike Alternative 3.

Preferred Alternative 4 offers the benefit of the same or similar transparency of Alternatives 2 and 3 with less time and costs required by applicants and the public to consult with NOAA Fisheries Service and learn which species would be allowed to be cultured. Preferred Alternative 4 also gives commercial offshore aquaculture operations the benefit of more options than Alternatives 2 or 3 in terms of species that can be cultured over the life of a particular operation.

7.5.4.5 Comparison of Alternatives of Action 4

Alternative 1 does not limit what species can be cultured in the Gulf EEZ. Hence, both native and non-native species of the Gulf EEZ could potentially be cultured, with significant adverse impacts on the biological, economic and social environments potentially arising from the release of non-native species into Federal waters. Alternatives 2-4 limit allowable species to native Gulf species and specify which of those species would be allowed and included in the FMU. Alternatives 2-4 offer the benefit of greater transparency that derives from the identification of which species are acceptable to NOAA Fisheries Service for offshore aquaculture in the Gulf EEZ. Among the three alternatives that limit what can be cultured, Preferred Alternative 4 offers the benefit of the largest range of native Gulf species allowable for aquaculture in the Gulf EEZ.

7.5.5 Action 5: Allowable Marine Aquaculture Systems

7.5.5.1 Alternative 1: No Action, do not specify allowable systems for marine aquaculture in the Gulf EEZ.

This is the status quo alternative, and current regulations do not specify the systems allowed for a project requiring an EFP. Presumably, permittees could use any type of system regardless of whether or not it was capable of withstanding the physical stresses of the marine environment. However, such a system would still need to be reviewed to ensure it does not violate other federal laws (e.g., ESA or EFH requirements under the MSFCMA). Additionally, if an EFP is required (not the preferred alternative in Action 1) for aquaculture, an applicant must identify each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. NOAA Fisheries Service uses this information to assess the impact of

the gear and harvesting practices of the proposed project on the environment and protected species. Hence, it is more likely that applicants and the public would have to consult with NOAA Fisheries Service and search for additional information to determine which systems would be acceptable.

This is the least transparent of the alternatives in this action. Consequently, it has the greatest time and costs associated with obtaining the information necessary to determine which systems would be acceptable and later identifying the range of systems actually in use. It also requires the greatest amount of time and costs to identify and estimate the potential and realized impacts of systems, as well as adequately enforcing Federal laws.

7.5.5.2 Alternative 2: Allow only cages and net pens for marine aquaculture in the Gulf EEZ.

This alternative limits the range of allowable systems and is more transparent than the first alternative. As written, this alternative appears to allow the use of any types, quantities and combinations of cages and net pens wherever and whenever the aquaculturist wants regardless of the potential adverse environmental impacts and/or non-compliance with existing Federal laws. However, NOAA Fisheries Service would not allow gears that adversely impact the environment or violate other existing Federal laws.

This alternative is more transparent than Alternative 1, but fails to inform potential applicants and the public of which types, quantities and combinations of cages and net pens may be unacceptable because of likely and significant adverse impacts on the environment or violations of existing Federal laws. Consequently, both applicants and the public would have to consult with NOAA Fisheries Service and obtain additional information in order to predict which types, quantities, and combinations of cages and net pens would be prohibited.

7.5.5.3 Preferred Alternative 3: NOAA Fisheries will evaluate each proposed aquaculture system on a case-by-case basis and approve or deny use of the proposed system (see Section 4.5 for additional requirements pertaining to this alternative).

This alternative would not limit what systems are allowed, so it would not be as transparent as Alternative 2. It would allow NOAA Fisheries Service authority to conduct case-by-case reviews of proposed systems to determine structural integrity and whether such systems pose a significant risk to public health, safety, or marine resources. The written comment process discussed in Action 1 would provide the public an opportunity to comment on the potential impacts of proposed systems that could improve the RA's evaluation of the risk of a system being proposed for a particular area.

Preferred Alternative 3 does not specify the types of systems that would be allowed, but explicitly states that a proposed system would not be allowed if it were evaluated to pose a significant risk to EFH, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health or safety. Consequently, Preferred

Alternative 3 could impose the least costs in terms of potential damages to and greatest benefits from protection of EFH, protected species, wild fish or invertebrate stocks, public health and safety than the other alternatives. However, Preferred Alternative 3 is not as transparent as Alternative 2 and increases time and costs incurred by applicants and the public to assess which systems have been and tend to be acceptable and what criteria the RA uses and has used to evaluate a system's risk.

Preferred Alternative 3 would help NOAA Fisheries Service evaluate the potential risk of a proposed system because the applicant would be required to identify and describe the particular system(s) to be used at a particular site. The permit applicant would also have to submit documentation for determining the structural integrity of a proposed system.

7.5.5.4 Comparison of Alternatives of Action 5

Neither Alternative 1 nor Alternative 3 specify the types of systems that would be allowed for offshore aquaculture in the Gulf, and Alternative 1, as written, suggests it could allow any type of system to be used regardless of its impacts on EFH, endangered or threatened marine species, marine mammals, wild fish and invertebrate stocks, public health, or safety. Alternative 2 allows cages and net pens, and, as written, appears to allow any type or use of a cage or net pen regardless of its impacts on the marine environment, public health, or safety. Preferred Alternative 3 does not identify the types of systems that would be allowed, but instead, states that a proposed system would not be allowed if it were evaluated to pose a significant risk to marine resources, public health, or safety.

Consequently, Preferred Alternative 3 could impose the least costs and greatest benefits in terms of potential damages to EFH, protected species, wild fish and invertebrate stocks, public health or safety. However, Preferred Alternative 3 is not as transparent as Alternative 2 and increases time and costs incurred by applicants and the public to assess which systems have been and tend to be acceptable and what criteria the RA uses and has used to evaluate a system's risk. Under all three alternatives, the public would be afforded an opportunity to comment on a proposed aquaculture permit, including systems allowed, using the written notice and public comment process discussed in Action 1 (see Section 4.1).

7.5.6 Action 6: Marine Aquaculture Siting Requirements and Conditions

7.5.6.1 Alternative 1: No Action, do not designate areas in the Gulf of Mexico EEZ where aquaculture would be allowed. NMFS and the Council would continue to review and comment on Army Corps of Engineers siting permits.

This alternative is the status quo alternative. Current regulations do not designate areas of the Gulf EEZ where offshore aquaculture is allowed; however, there are existing fishing prohibitions in designated areas, such as in marine protected areas and marine reserves.

Alternative 1 does not explicitly address the need or desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. It also fails to inform potential applicants and the public of which areas of the Gulf EEZ may be unacceptable for aquaculture operations because of likely and significant adverse impacts on the environment and protected species or violations of existing Federal laws. Nonetheless, Alternative 1 would still provide NOAA Fisheries Service an opportunity to comment on a proposed ACOE permit. Public transparency would be reduced based on the extent that NOAA Fisheries Service's criteria for siting a facility differ from the ACOE's siting criteria. Alternative 1 would result in significant time and costs to the applicant and the public to determine criteria acceptable by the ACOE and NOAA Fisheries Service for siting a facility.

7.5.6.2 Alternative 2: Establish marine aquaculture zones within which individual sites would be permitted. Marine aquaculture facilities may only be sited in the zones specified in Figure 4.6.1. Coordinates for these areas are specified in Table 4.6.1.

Alternative 2 would designate marine aquaculture zones for siting facilities within the Gulf EEZ. The benefit of designating zones is that with little time and cost both applicants and the public learn the locations where aquaculture operations are allowed. However, the strict focus on zones in geographic space ignores physical, chemical, biological and other characteristics that differentiate one location from another within the same zone. Alternative 2 also ignores the differing risks and associated costs of locating an aquaculture operation within a particular zone. Despite the designation of aquaculture zones by NOAA Fisheries Service, the ACOE would still have authority to issue a siting permit within a particular zone.

7.5.6.3 Preferred Alternative 3 establishes prohibitions on where marine aquaculture facilities may be sited, requires facilities to be sited at least 1.6 nm apart, specifies that permitted sites must be twice as large as the area encompassed by the allowable aquaculture systems, requires permittees to submit a benthic video survey of the proposed site, and allows for case-by-case review by NOAA Fisheries Service (see Section 4.6 for more information on siting requirements).

Preferred Alternative 3 explicitly addresses the need and desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. Consequently, it has the least potential for environmental damages and costs associated with those damages. However, it would impose significant time and costs on applicants and the public to determine what sites are or are not acceptable.

Preferred Alternative 3 would explicitly prohibit aquaculture from occurring in marine reserves, HAPCs, and other ecologically important areas. This alternative would also require a permitted site to be twice as large as the area encompassed by allowable aquaculture systems. If the permit holder has exclusive access to and use of the site under this alternative, it could essentially privatize larger areas of the Gulf EEZ relative

to the other two alternatives. Preferred Alternative 3 would also create areas around an existing facility, such that no future marine aquaculture facility could be sited within 1.6 nautical miles of another marine aquaculture facility. This restriction would limit the number of facilities that are located in areas that are highly desirable for offshore aquaculture operations, giving early entrants a significant competitive advantage by denying future aquaculturists access to and use of areas of the EEZ around pre-existing facilities. The benefit of this restriction is it does not allow the concentration of facilities, which may increase the spread of pathogens. Lastly, Preferred Alternative 3 would require a benthic video survey of the site. Such a survey would result in additional time and costs to the applicant, but would provide NOAA Fisheries Service necessary information for appropriately siting a facility.

7.5.6.4 Comparison of Alternatives of Action 6

Alternatives 1 and 3 do not designate marine aquaculture zones, and therefore do not explicitly limit the geographic areas where an applicant can propose to locate an aquaculture operation. Alternative 2 does designate marine aquaculture zones. The benefit of designating zones is that with little time and cost both applicants and the public learn the locations where aquaculture operations are allowed. However, the strict focus on zones in geographic space ignores physical, chemical, biological and other characteristics that differentiate one location from another within the same zone. It also ignores differing risks and associated costs of locating an aquaculture operation within a zone. Consequently, Alternative 2 has the greatest potential for environmental damages and the costs associated with those damages.

Alternative 1 does not explicitly address the need or desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. Therefore, Alternative 1 is the least transparent of the three alternatives and would create the largest time and financial expenses incurred by both applicants and the public to consult with NOAA Fisheries Service and the ACOE to obtain additional information necessary for determining acceptable locations for offshore aquaculture sites. Preferred Alternative 3 explicitly addresses the need and desire to assess the potential risks and associated costs of locating an aquaculture operation in a proposed location. Consequently, it has the least potential for environmental damages and costs associated with those damages. However, it would impose larger time and costs on applicants and the public to obtain information to assess what sites are acceptable than Alternative 2, but less than Alternative 1.

7.5.7 Action 7: Restricted Access Zones for Marine Aquaculture Facilities

7.5.7.1 Alternative 1: No Action, Do not establish restrict access zones around marine aquaculture facilities.

This alternative is the status quo alternative. At present, regulations do not create restricted access zones around an EFP-permitted facility, and the permit holder does not have exclusive access to and use of restricted access zones around its facility for purposes of exempted or non-exempted fishing. Consequently, the owner of a facility and anyone

else benefits from the shared ability to operate fishing vessels in the areas immediately surrounding an offshore aquaculture facility. A potential cost of the unrestricted access around an aquaculture facility, however, is that operation of a fishing vessel close to an aquaculture facility could result in accidental damages to the facility, vessel, and/or personnel caused by use of fishing gear or other equipment or a vessel strike.

7.5.7.2 Preferred Alternative 2: Create a restricted access zone for each aquaculture facility. The size of an aquaculture facility's restricted access zone shall correspond with the coordinates on the approved ACOE siting permit. No recreational or commercial fishing may occur in the restricted access zone, and no fishing vessels may operate in or transit through the restricted access zone unless they have a copy of the facilities' aquaculture permit onboard.

This alternative would create restricted access zones around offshore aquaculture facilities. Access to and use of areas around facility for purposes of fishing would be prohibited. Specifically, it would prohibit recreational and commercial fishing in the restricted access zones by anyone and limit access to those zones to fishing vessels that have a copy of the facility's Gulf Aquaculture Permit onboard. The benefit of this alternative is that it reduces the risk and associated costs of damages caused by fishing gear, other equipment or vessel strike. However, a cost to the facility owner and others who fish is the loss of potential revenue and/or pleasure that would derive from engaging in traditional fishing (recreational or commercial fishing) in the restricted access zone. Also, fishing vessels (federally permitted or not) that do not have a copy of the facility's aquaculture permit would be prohibited from transiting through the restricted access zone. The cost to a vessel for operating in or transit through a restricted access zone would equal the costs associated with an unspecified penalty or fine.

Preferred Alternative 2 is not as transparent as the other two alternatives as it does not define the size(s) of these restricted access zones beyond it corresponding with an approved ACOE siting permit. Unless the restricted access zone is marked with buoys, fishing vessel operators would not know where a restricted access zone begins and ends around a facility because there would be no size standard.

7.5.7.3 Alternative 3: Prohibit recreational and commercial fishing and the operation or transit of federally permitted fishing vessels without a copy of the facility's aquaculture permit within:

(a) 100 feet (30 meters) of allowable marine aquaculture systems.
(b) 500 feet (152 meters) of allowable marine aquacultures systems.
(c) 1,640 feet (500 meters) of allowable marine aquaculture systems.

This alternative would create restricted access zones around offshore aquaculture systems, such as cages, net pens and other containing technologies. It would also create uniform restricted access zones, which offers the greatest transparency among the alternatives that establish a restricted access zone. Consequently, applicants and the public would incur the least time and costs of the three alternatives to find the sizes and locations of these zones.

Like Alternative 2, this alternative would prohibit recreational and commercial fishing in the restricted access zones by anyone. It would also limit access to those zones to federally permitted fishing vessels that have a copy of the facility's Gulf Aquaculture Permit onboard. However, as written, unlike Alternative 2, fishing vessels that are not federally permitted and do not have a copy of the permit would be allowed to transit through the zone. The benefit of this alternative is that it reduces the risk and associated costs of damages caused by fishing gear, other equipment, or vessel strike.

A cost to the facility owner and others who fish is the loss of potential revenue and/or pleasure that would derive from engaging in traditional fishing (recreational or commercial fishing) in the restricted access zone surrounding the facility. Also, federally permitted fishing vessels that do not have a copy of the facility's aquaculture permit would be prohibited from transiting through the restricted access zone. The cost to a vessel operator that did operate or transit through the zone would be equal to costs associated with an unspecified penalty or fine.

7.5.7.4 Comparison of Alternatives of Action 7

Alternative 1 would not limit access and use of areas of the Gulf EEZ to recreational and commercial fishing, whereas Alternatives 2 and 3 would. Consequently, Alternative 1 would benefit traditional fishermen by not limiting how close their vessels operate around and transit to aquaculture facilities. This alternative poses the greatest risk of damages to a facility, fishing vessel and/personnel caused by use of fishing gear and equipment, or a fishing vessel strike.

Alternative 3 would establish well-defined boundaries to create restricted access zones and is the most transparent of the three alternatives. Applicants and the public would incur the least time and costs to learn the criteria used by NOAA Fisheries Service to determine the sizes and locations of particular restricted access zones. Anyone in a restricted access zone, whether aboard a vessel or not, would be denied the benefit of engaging in recreational or commercial fishing. Federally permitted fishing vessels without a copy of the aquaculture permit would be prohibited from operating in or transiting through a restricted access zone.

Alternative 2 uses the coordinates of the approved ACOE siting permit. Applicants and the public would incur greater time and costs than Alternative 3 to learn the size and dimensions of various restricted access zones, since their size would not be standardized. Also, like Alternative 3, anyone in a restricted access zone, whether aboard a vessel or not, would be denied the benefit of engaging in recreational or commercial fishing. Unlike Alternative 3, all fishing vessels without a copy of the aquaculture permit would be prohibited from operating in or transiting through the zone. Thus, the potential risk of and costs associated with damages to facilities, vessels, systems, and personnel caused by fishing vessel gear, equipment, or strikes is the least under Alternative 2.

7.5.8 Action 8: Recordkeeping and Reporting

7.5.8.1 Alternative 1: No Action, the Regional Administrator has authority to specify recordkeeping and reporting requirements in an EFP (50 CFR 600.745).

Alternative 1 does not describe recordkeeping and reporting requirements, unless specified by the RA through an EFP, while Preferred Alternative 2 does. NOAA Fisheries Service has previously specified recordkeeping and reporting conditions for an EFP proposed for aquaculture in the Gulf EEZ. In a *Federal Register* notice published on July 30, 2003, proposed terms and conditions for an offshore aquaculture project in the Gulf were specified (see 68 FR 44745). These terms and conditions included quarterly reports for: a) any disease occurrence; b) any use of chemotherapeutants approved by FDA or prescribed by a qualified veterinarian; c) outcome of any events requiring immediate notification; d) changes in faunal composition of the area around the experimental site; e) substrate and water quality monitoring; and f) harvests of maricultured fish species.

If an EFP is not required in Action 1 of this FMP, it is unclear what recordkeeping and reporting requirements applicants would have to meet. Consequently, the lack of transparency would cause applicants and the public to incur significant time and costs to consult with NOAA Fisheries Service and obtain other information in order to determine what the potential recordkeeping and reporting requirements would be for operation.

7.5.8.2 Preferred Alternative 2 establishes 17 reporting and recordkeeping requirements for aquaculture permittees (see Section 4.10 for a list of these requirements)

This alternative more explicitly states recordkeeping and reporting requirements specific to offshore aquaculture operations than Alternative 1. Consequently, it offers greater transparency than the first alternative, which requires less time and costs incurred by applicants and the public to consult with NOAA Fisheries Service and obtain recordkeeping and reporting information. However, because Preferred Alternative 2 would require permittees to meet 17 recordkeeping and reporting requirements, it would result in additional costs to an operation to complete paperwork and maintain records.

Of the two alternatives, Preferred Alternative 2 offers the least long-term risks and associated damages caused by actual or suspected events, such as entanglements with protected species or major escapements, by requiring timely reporting and responses in order to mitigate damages.

7.5.8.3 Comparison of Alternatives of Action 8

Preferred Alternative 2 is the most transparent of the two alternatives and would likely produce the least risks and associated damages caused by actual or suspected events, such

as major escapements, entanglements with protected species and disease outbreaks, because it has reporting and recordkeeping requirements specific to offshore aquaculture.

7.5.9 Action 9: Biological Reference Points and Status Determination Criteria

7.5.9.1 Alternative 1. No Action. Do not establish biological reference points (maximum sustainable yield [MSY], optimum yield [OY]) or status determination criteria (maximum fishing mortality threshold [MFMT], minimum stock size threshold [MSST]) specific to aquaculture in the Gulf of Mexico EEZ.

Biological reference points are necessary to sustainable fisheries management and without these reference points for Gulf aquaculture, NOAA Fisheries Service is unable to manage this fishery. Consequently, the benefits derived from scientific management of this fishery would be unrealized under Alternative 1.

7.5.9.2 Alternative 2. Establish the following new biological reference points and status determination criteria for aquaculture in the Gulf of Mexico EEZ:

7.5.9.2.a The proxy for MSY is:
a) the total yield harvested by all aquaculture operations in a given year within the management regime established in this amendment.
b) equal to OY (Preferred Alternative).

MSY suboption 2(a) equates MSY to whatever the total yield is for a particular year. Given fluctuations in total production due to a multitude of reasons, many of them not biological, Alternative 2(a) creates a weaker biological standard than Alternative 2(b). Hence, the potential benefits of Alternative 2(b) derive from a stronger biological standard.

7.5.9.2.b The proxy for OY is the total yield harvested by all permitted aquaculture operations annually, but not to exceed:
a. 16 million pounds.
b. 32 million pounds.
c. 36 million pounds.
d. 64 million pounds (Preferred Alternative).
e. 190 million pounds.

Among the alternatives under the OY suboption, the fourth and preferred alternative allows the benefit of the second highest amount of production of cultured organisms in the Gulf EEZ and the greatest entry into the fishery. Only OY suboption 2(e) would allow for greater production (190 mp). However, this latter alternative may result in it highest costs in terms of reduced market shares and prices for traditional commercial fishermen who may be in competition with Gulf aquaculturists.

7.5.9.2.c No individual, corporation, or other entity can produce more than:

a. 5 percent of OY.

b. 10 percent of OY.

c. 20 percent of OY (Preferred Alternative).

This action limits the amount that an individual, corporation or other entity could produce as a percentage of OY, which would be 64 mp under the above preferred alternative. Thus, a single individual, corporation or other entity could produce up to 12.8 mp of cultured organisms in the Gulf EEZ annually. None of these alternatives limit the market share of an individual, corporation or other entity because at present there are no entities producing cultured organisms in the Gulf EEZ and the first one that does will have a market share of 100 percent.

Preferred Suboption (c) offers the greatest benefit to aquaculture facility owners because it would allow them to increase the scale of production, produce larger quantities, and potentially experience greater economies of scale than the other two alternatives.

Also, under Preferred Alternative 2, if planned aquaculture production exceeds the preferred OY specified in Preferred Alternative 2, the Council would initiate review of the OY proxy and aquaculture program, and NOAA Fisheries Service would publish a control date, after which entry into the aquaculture industry may be limited or restricted. The existing overfished (i.e., MSST) and overfishing (i.e., MFMT) definitions contained in the various FMPs to manage wild stocks will be used as proxies for assessing the status of those wild stocks potentially affected by excessive production in aquaculture operations.

7.5.9.3 Comparison of Alternatives of Action 9

Alternative 1 would not establish biological reference points, necessary to reap the benefits of scientific management of a fishery, and is the least beneficial and most costly of the alternatives. Preferred Alternative 2, MSY suboption (a) creates a weaker biological standard than Preferred Alternative, MSY suboption (b) and would generate lesser benefits and higher costs that derive from a weaker standard. Among the Preferred Alternative 2 OY suboptions, Suboption (d) would provide the second highest amount of production of the alternatives considered. Among the alternatives considered for capping a single entity's production, Preferred Alternative Suboption (c) allows the benefit of the highest amount of production allowed by a single entity.

7.5.10 Action 10: Framework Procedures

7.5.10.1 Alternative 1: No Action. Do not specify framework procedures for modifying aquaculture management measures, status determination criteria or biological reference points.

Alternative 1 would not establish framework procedures for modifying aquaculture regulations or biological reference points. Each time the Council amended their regulations, a full plan amendment would have to be developed. Development of a plan

amendment is considerably slower than development of a regulatory amendment or *Federal Register* notice, and therefore would result in the greatest economic costs to permittees, applicants, the Council and NOAA Fisheries Service.

7.5.10.2 Alternative 2 specifies framework procedures for modifying biological reference points (MSY, OY) for offshore marine aquaculture in the Gulf of Mexico EEZ.

Alternatives 2 would establish an organizational framework for the Council and NOAA Fisheries Service to effectively manage the fishery. Alternative 2 provides limited authority for making changes, only allowing modifications to MSY/OY. The Council would appoint an Aquaculture Advisory Panel under Alternative 2. Costs incurred by NOAA Fisheries Service under Alternative 2 would include participating in AP meetings, review of AP and Council recommendations, and preparation of a *Federal Register* notice. Alternative 2 would benefit or impact permittees depending on how quickly changes to MSY/OY are made. If MSY/OY are reduced in a more timely fashion, then permittees would be negatively affected by lower maximum production levels. Similarly, permittees would benefit from higher production levels if MSY/OY are increased in a more timely fashion. Alternative 2 would also bring greater transparency through a public review process of the aquaculture program.

7.5.10.3 Preferred Alternative 3: Specify the following framework procedures for modifying biological reference points (MSY, OY) and management measures for offshore marine aquaculture in the Gulf EEZ.

Like Alternatives 2, Preferred Alternative 3 would establish an organizational framework for the Council and NOAA Fisheries Service to effectively manage the fishery. Preferred Alternative 3 provides a process for adjusting MSY/OY, as well as other regulatory measures, such as permit application requirements, operational requirements and restrictions, and monitoring requirements. Preferred Alternative 3 would include the same costs as Alternative 2, plus there would be additional economic costs for preparing a regulatory amendment.

7.5.10.4 Comparison of Alternatives of Action 10

Alternative 1 would not specify framework procedures for aquaculture, and therefore would not provide either a review process for the aquaculture program or a process for implementing certain regulations and biological reference points in a more timely fashion. Alternative 2 provides limited authority for making changes to biological reference points, while Preferred Alternative 3 allows for both changes to MSY/OY and various regulatory measures. For both alternatives, the Council would appoint an Aquaculture Advisory Panel. Preferred Alternative 3 is expected to result in greater economic costs to the Council and NOAA Fisheries Service than Alternative 2, but less economic costs than Alternative 1. Overall, Preferred Alternative 3 is expected to provide the best balance between timely review of the aquaculture program, timely

implementation of regulatory measures, and public opportunities for proposed regulatory changes.

7.6 Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any Federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs associated with this FMP include, but are not limited to Council costs of documentation preparation, meeting, public hearings, and information dissemination; NMFS administration costs of document preparation, meetings and review, and annual law enforcement costs.

7.7 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order.

Based on the information provided above, this action is expected to not be economically significant. However, the action has been determined to be significant for purposes of E.O. 12866.

8.0 Initial Regulatory Flexibility Analysis

8.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of the alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the RIR, the initial regulatory flexibility analysis provides: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for the proposed rule; (3) an identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; (4) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; (5) a description of the projected reporting, record-keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and (6) a description of significant alternatives to the proposed rule which accomplish the stated objectives of applicable statues and which minimize any significant economic impact of the proposed rule on small entities.

8.2 Statement of Need for, Objectives of, and Legal Basis for the Proposed Rule

The purpose and need, issues, problems, and objectives of the proposed FMP are presented in Sections 1, 2, and 3, and are incorporated herein by reference.

8.3 Identification of Federal Rules which may Duplicate, Overlap, or Conflict with the Proposed Rule

The preferred alternative for Action 1 of the Gulf Aquaculture FMP states that a Gulf Aquaculture Permit entitles a person to "land allowable aquaculture species cultured in the Gulf of Mexico EEZ at a U.S. port". According to 46 CFR 67.21(a) "a fishery endorsement entitles a vessel to land its catch, wherever caught, in the United States."

Action 2 also includes several provisions referencing regulations of other agencies, but regulatory requirements specified in this FMP would not necessarily be duplicative of those requirements. No other potentially duplicative, overlapping or conflicting rules have been identified.

8.4 Description of the Projected Reporting, Record-keeping and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities which will be Subject to the Requirement and the Type of Professional Skills Necessary for the Preparation of the Report or Records.

This proposed rule would require small entities that seek to locate offshore aquaculture operations in the Gulf of Mexico EEZ to apply for a Gulf of Mexico Aquaculture Permit (Action 1, Preferred Alternative 2) and, if approved, to comply with operational requirements and restrictions of that permit (Action 2, Preferred Alternative 3). As stated in Action 2, Alternative 3, a completed application would have to be submitted by the owner of the aquaculture facility at least 120 days prior to the desired date of deployment of any proposed aquaculture system (cages, net pens, and/or other container technologies). The following information would be required to complete the application:

i. Applicant's name, address, and telephone number.
ii. Business name, address, telephone number, and date the business was formed.
iii. A description of the exact location (e.g., GPS coordinates) and dimensions of the proposed aquaculture facility, including a site map to scale.
iv. A list of the species to be cultured and the estimated total annual poundage of each species to be harvested from the aquaculture facility.
v. Name and address or specific location of each hatchery that would provide juvenile organisms for grow-out in allowable aquaculture systems located within the Gulf of Mexico EEZ a copy of any relevant, valid state or federal aquaculture permits issued to the hatchery. Only U.S. hatcheries may provide juvenile organisms for grow-out allowable aquaculture systems located within the Gulf EEZ.
vi. A copy of all currently valid federal permits applicable to the proposed aquaculture site, facilities, or operations.
vii. A description of the allowable aquaculture systems to be used, including, but not limited to the size and dimensions of allowable aquaculture systems, a description of the mooring system(s) used to secure the allowable aquaculture system(s), and documentation of the allowable aquaculture system's ability to withstand physical stress, such as hurricanes, wave energy, etc.
viii. A description of the equipment and methods necessary for feeding, transporting, maintaining, and removing cultured species from allowable aquaculture systems.
ix. A description of endangered and threatened species, critical habitat, wild marine fishes and invertebrates, and migratory birds present at the proposed aquaculture site, including their abundance and distribution.
x. A copy of the valid USCG certificate of documentation or, if not documented, a copy of the valid state registration certificate for each vessel involved in the aquaculture operation; documentation or identification numbers for any aircraft

involved; and names, addresses, and phone numbers of the operators of such vessels or aircraft;

xi. Documentation certifying the applicant executed a performance bond, which is executed with the signature of a third party as a surety.

xii. Certification by the applicant that all broodstock used to provide juveniles to the aquaculture facility were originally harvested from U.S. waters of the Gulf of Mexico, were from the same population or sub-population of fish or invertebrates (based on best available science) where the aquaculture facility is located, and that each individual broodstock was marked or tagged at the hatchery to allow for identification of those individuals used in spawning.

xiii. Certification by the applicant that no genetically modified organisms or transgenic organisms are used or possessed in the aquaculture facility. A GMO is an organism that has been transformed by the insertion of one or more transgenes (an isolated gene sequence often, but not always, derived from a different species than that of the recipient). A transgenic animal is an animal whose genome contains a nucleotide sequence that has been intentionally modified in vitro, and the progeny of such an animal.

xiv. Identification of an aquatic animal health expert that provides services to the aquaculture facility. An aquatic animal health expert is defined as a licensed doctor of veterinary medicine or certified by the American Fisheries Society, Fish Health Section, as a "Fish Pathologist" or "Fish Health Inspector".

xv. A copy of an emergency disaster plan that includes, but is not limited to, procedures for preparing allowable aquaculture systems, offshore aquaculture equipment, and cultured organisms in the event of a disaster (e.g., hurricane, tsunami, harmful algal bloom, chemical or oil spill, etc).

xvi. Any other information concerning the aquaculture facility or its operations or equipment, as specified on the application form.

xvii. Any other information that may be necessary for the issuance or administration of the permit, as specified on the application form.

One of the conditions within the application form is the requirement of financial assurances in the form of a performance bond, which would be used to mitigate future damages caused by the permittee's default. This condition would require the signature of an additional entity as a bond surety who agrees to ensure performance in the event that permittee defaults, such as abandoning a facility or system. The size of the bond would likely be directly proportional to the size of an operation, with smaller scale commercial operations having to make less financial assurances than larger scale commercial operation.

A small entity would also have to comply with operational requirements and restrictions (See Action 2, Alternative 3) and recordkeeping and reporting requirements (See Action 8, Alternative 2). No time or cost estimates to comply with these requirements are available at this time.

It will also require any small business that intends to purchase cultured organisms from the Gulf EEZ to apply for and be issued an Annual Dealer Permit (OMB No. 0648-0205) for receiving cultured organisms.

At present, an Annual Dealer Permit is required to receive the following species harvested in the Gulf EEZ: reef fish, sharks and swordfish. This proposed rule would add cultured organisms to the above list of species. All applications must include a payment of a non-refundable application fee of $50.00 for the first fishery and $12.50 for each additional fishery requested on the application. It is estimated that the time required to complete the average application for an Annual Dealer Permit is 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing the collection of information (Page 4 of Federal Permit Application for an Annual Dealer Permit). Hence, the cost and time incurred by entity that seeks to purchase cultured organisms from the Gulf EEZ will be either $50.00 or $12.50 annually and 20 minutes, respectively. The dealer will also be required to report as specified in Table 4.1.2, resulting in additional costs and time incurred by the dealer.

8.5 Description and Estimate of the Number of Small Entities to which the Proposed Rule will Apply.

This proposed rule would affect small entities that seek to locate offshore aquaculture operations in the Gulf of Mexico EEZ and purchase cultured organisms from the Gulf EEZ at the first point of sale. At present, there are no entities, large or small, that have offshore aquaculture operations in the U.S. Gulf of Mexico EEZ Therefore, there are also no entities, large or small, that presently purchase cultured organisms from the Gulf EEZ.

This proposed rule would also create restricted access zones that would affect small entities that engage in recreational and commercial fishing by prohibiting their vessels from operating in or transiting through these zones. It is expected that these zones would not be created in historical or increasingly used fishing areas (see Action 6), and, consequently, are expected to affect a relatively small number of small businesses engaged in commercial and recreational fishing.

The entities that would be affected by this proposed rule would be found in the following industries: Finfish Farming and Fish Hatcheries (NAICS 112511), Shellfish Farming and Shellfish Hatcheries (NAICS 112512), Other Aquaculture (NAICS 112519), Fish and Seafood Merchant Wholesalers (NAICS 424460), Finfish Fishing (NAICS 114111), 114112 (Shellfish Fishing), 114119 (Other Marine Fishing) and 487210 (Scenic and Sightseeing Transportation that includes charter boat fishing). The first three industries have the same SBA size standard of $0.75 million in annual receipts, and the size standard for the fourth (Wholesalers) is 100 employees. The size standard for the three fishing industries is $4.0 million in annual receipts and $6.5 million for charter-boat fishing.

Posadas and Bridger's (2004) estimate of the costs of entering the offshore aquaculture industry in the Gulf greatly exceeds the $0.75 million size standard of businesses in marine farming and hatcheries. Their model for a 6-cage operation, which is considered to be the smallest that is economically viable, requires an initial fixed investment of $2.89 million. This suggests entrants into the fishery will not be small businesses unless they enter in collaboration with larger entities.

8.6 Substantial Number of Small Entities Criterion

The proposed rule being considered is not expected to regulate a substantial number of small businesses because of the: 1) significant start-up costs necessary to engage in offshore aquaculture operations, 2) the limit on production specified in Action 9, and 3) the location of restricted access zones is expected to be outside historical and increasingly used areas for traditional fishing.

8.7 Economic Impact Significance Criterion

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Does the proposed rule place a substantial number of small entities at a significant competitive disadvantage to large entities?

Profitability: Does the proposed rule significantly reduce profit for a substantial number of small entities?

The proposed rule is not expected to have a significant adverse economic impact because, at present, there are no small or large businesses engaged in offshore aquaculture in the Gulf EEZ and the start-up costs necessary to enter the fishery are estimated to be substantial. The application fee for dealers would be no more than $50 annually, which does not represent a significant adverse impact on small businesses in the industry.

There would be an adverse impact on traditional Gulf of Mexico fishermen whose vessels would be denied access and use of waters within restricted access zones; however, it is expected that the zones will not include waters traditionally fished by fishing businesses (see Action 6).

If this proposed rule encourages the development of offshore aquaculture in the Gulf, landings of farmed Gulf species could increase local and regional market supplies of those species, which could result in lower ex-vessel prices received by Gulf fishing firms, all of which have been historically classified by NOAA Fisheries Service in RFA analyses as small businesses. However, the most likely species to be cultured in the Gulf is cobia, which is not a species typically targeted by commercial fishermen. From 1987 through 2006, U.S. annual commercial landings for cobia ranged from a high of 429,378 pounds in 1996 to a low of 165,682 pounds in 2005. During this same time period, Gulf annual landings ranged from a high of 263,969 pounds in 1996 to a low of 93,609 pounds

in 2006. Since 1997, there has been a declining trend in landings. It is more likely that those who raise cobia in the Gulf will compete more directly with those who raise cobia in foreign waters.

8.8 Description of Significant Alternatives

This proposed rule is not expected to have a significant adverse economic impact on a substantial number of small entities. Consequently, no significant alternatives, as defined by the RFA, have been considered; however, discussion of the expected impacts of the alternatives considered for each of the proposed actions as required by E.O. 12866 is contained in Section 7.

9.0 Fishery Impact Statement – Social Impact Analysis

This integrated document contains all elements of the fishery management plan, DPEIS, Initial Regulatory Flexibility Analysis (IRFA), Regulatory Impact Review (RIR), and Social Impact Assessment (SIA)/Fishery Impact Statement (FIS). A table of contents for the SIA/FIS is provided separately to aid reviewers in referencing corresponding sections of the FMP.

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Introduction

Mandates to conduct SIA come from both the National Environmental Policy Act (NEPA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). NEPA requires federal agencies to consider the interactions of natural and human environments by using a "...systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making" [NEPA section 102 (2) (a)]. Under the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA, a clarification of the terms "human environment" expanded the interpretation to include the relationship of people with their natural and physical environment (40 CFR 1508.14). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects which may be direct, indirect, or cumulative (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994).

The MSFCMA require FMPs address the impacts of any management measures on the participants in the affected fishery and those participants in other fisheries that may be affected directly or indirectly through the inclusion of a fishery impact statement [MSFCMA section 303(a)(9)]. National Standard 8 requires FMPs consider the impacts upon fishing communities to the extent practicable to assure their sustained participation and minimize adverse economic impacts upon those communities [MSFCMA section 301(a)(8)]. Consideration of social impacts is a growing concern as fisheries experience increased participation and/or declines in stocks. With an increasing need for management action, the consequences of such changes need to be examined to minimize the negative impacts experienced by the populations concerned to the extent practicable.

Data Limitations and Methods

Social impacts are generally the consequences to human populations that follow from some type of public or private action. Those consequences may include alterations to "...the ways in which people live, work or play, relate to one another, organize to meet their needs and generally cope as members of a society..." (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994). In addition, included under this interpretation are cultural impacts that may involve changes in values and beliefs, which affect the way people identify themselves within their occupation, communities and society in general. Social impacts analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Therefore, it is important that as much information as possible concerning a fishery and its participants be gathered for an assessment.

It is important to identify any foreseeable adverse effects on the human environment. With quantitative data often lacking, qualitative data can be used to provide an estimate of some of the impacts based on the best available science. In addition, when there is a body of empirical findings available from the social science literature, it needs to be summarized and referenced in the analyses.

In attempting to assess the social impacts of the proposed fishery management plan (FMP), it must be noted that there is an overall lack of literature and data available regarding the social impacts of offshore aquaculture in the Gulf of Mexico. The lack of data makes it difficult for this analysis to provide a comprehensive overview of the social impacts that could result from developing new offshore aquaculture permits; therefore, this analysis cannot predict all social impacts. To better understand the social impacts that result from this action, baseline information on each Gulf Coast fishing community would be required before the action is implemented. That information could then be compared to similar types of data collected from those communities after the aquaculture industry has had time to develop. Collecting those types of detailed baseline data require social scientists to spend adequate time in each community to collect the necessary information that would provide more insight into the impacts the proposed regulations have on communities and their residents.

Aquaculture firms that could develop under this FMP simply do not currently exist. Therefore, there is no information to assess whether Gulf coastal communities will benefit or be harmed by their existence. Information that is available pertains primarily to the commercial harvesting sector and imports from outside the Gulf of Mexico region. The available commercial data are records of landing reports and permit data. Those data provide general background information to use as a starting point for analysis of the impacts on commercial harvesters and their communities. The commercial fisheries, and their participants, that are most likely to be impacted by this action are discussed in Sections 5.4 and Section 7. However, there is not enough data on communities that may be dependent on these fisheries to fully describe the impacts aquaculture production will have on any one community. It is unrealistic to make these projections of impacts at the community level until aquaculture firms are created and there is information on their

locations. The social impacts on non-commercial harvesters, the processing sector, the consumer, fishing communities, and society as a whole are not as thoroughly addressed as would be if more information were available. The fishery impact statement consists of the description of the commercial fishery and the social impacts associated with the proposed actions. Data to define or determine impacts upon fishing communities are still very limited. However, these impacts have been analyzed and based on available fishery data.

E.O. 12898: Environmental Justice. Federal agencies are required to conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, national origin, or income level. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence.

Section 5.4.3 describes five fishing communities along the Gulf of Mexico coast. These communities were identified as key communities involved in the fishing industry based on fishing permit and employment data. The demographic information reported for these communities were derived from census data. Census data describes community-wide demographics and cannot be partitioned into just those populations that rely on federally managed Gulf fisheries. A key reason for this is the census data combines fishing occupations with farming and forestry occupations under the occupation category, and with agriculture, forestry, and hunting under the industry category. For this reason, demographic information on fishing communities is not available for use in evaluating the effects of the proposed actions on low-income and minority populations. Nevertheless, although demographics of these fishing communities are unknown, these actions would apply to all participants in the fishery, regardless of their race, color, national origin, or income level and, as a result are not considered discriminatory. The current demographic make-up of the respective fishing communities is assumed to be the result of historic cultural and economic conditions and not the result of specific historic or current management action that favored or discriminated against minority or low-income participants. Therefore, no environmental justice issues are anticipated and no modifications to any proposed actions have been made to address environmental justice issues. Additionally, none of the proposed actions are expected to affect any existing subsistence consumption patterns or raise any issues.

Summary of Social Impact Assessment

When considering the social impacts of the proposed FMP it is important to realize that the main objective of the FMP is to develop a permitting structure that would allow persons to grow and harvest species raised from the Gulf of Mexico EEZ. Numerous other important objectives have also been identified by the Council in Section 3.0. Current NOAA Fisheries Service permitting regulations, which require an exempted fishing permit to conduct offshore aquaculture, have impeded the

development of domestic aquaculture in the EEZ. Therefore, implementation of this FMP is expected to provide a workable framework for aquaculture to develop.

Implementation of the Aquaculture FMP would allow persons to apply for a permit; however, the number of applicants and the impacts are difficult to estimate. It is expected that under the status quo the supply of seafood would come from Gulf of Mexico commercial fishermen or close substitutes through imports. Those imports could be from wild stocks, but more likely would come from foreign aquaculture. The increased supply of cultured fish from the Gulf could potentially decrease the ex-vessel price commercial harvesters receive for their catch if one of the following does not occur: the increased supply does not come on the market slowly, new markets for products are not created, or the demand for seafood does not increase. If the total allowable catches of affected species are stable, the commercial harvesters will earn lower revenues. Less revenue will mean that they have less income to spend in communities where they live or purchase supplies, which would negatively affect commercial harvesters, crew, support industries, and local tax bases.

Competition in a global market place will not go away if domestic aquaculture production is increased. With over 80 percent of U.S. seafood imported, increases in U.S. domestic aquaculture production in the Gulf EEZ are not likely to significantly affect prices unless a large volume of supply comes all at once. The major competition is imports and other sources of protein (chicken, pork, and beef). The challenge for U.S. fishermen is to use aquaculture as another technology to produce seafood.

Development of domestic aquaculture could generate additional supplies of fish in markets or simply displace foreign imports. If foreign imports are displaced, the commercial harvesters and their communities of residence and operation will be unchanged, and the communities that develop or support the aquaculture industry will potentially be better off economically. The additional supplies of fish in the U.S. market, could reduce the commercial ex-vessel prices. However, the economic activity from aquaculture may potentially generate greater community economic benefits than those lost through reduced commercial prices. The exact magnitude of the impacts cannot be projected until the industry is developed and additional research is conducted on the social impacts. However, a report by Kona Blue Water Farms (2003) indicated that about 25 percent of their recurring costs would be spent on labor and management with six full-time positions being created. Similar impacts could be expected for a similar-sized firm that begins operating in the Gulf[12].

Offshore aquaculture using submerged nets or pens for finfish or other techniques for shellfish would be more aesthetically pleasing than nearshore operations. It is expected that people in the communities adjacent to the aquaculture facilities will not see the facilities. Boaters may see markers required for each facility, but the pens,

[12] Posadas (2003) estimated the recurring costs would be about $1.3 million annually for a similarly sized facility in the Gulf of Mexico.

cages, and other allowable aquaculture systems will most likely be submerged with limited visibility from passing vessels.

The social impacts of the program in general were discussed above. To the extent possible, the social impacts of the ten actions being considered in this FMP are summarized below. In some cases the social impacts for a specific alternative are limited.

Action 1: Aquaculture Permit Requirements, Eligibility, and Transferability – **Alternative 1** would require aquaculture firms operate under an exempted fishing permit (EFP), but no firms have been successfully developed under that structure to date. The expected result is that the offshore aquaculture industry would not develop in the Gulf of Mexico. Commercial fishers and their communities would compete with imports to maintain their market prices and shares; however, imports would be expected to erode both. **Preferred Alternatives 2** and **Alternative 3** would establish aquaculture permits. **Preferred Alternative 2** would require only an aquaculture permit authorizing numerous activities to operate a facility, while **Alternative 3** would require both an operational permit and a siting permit. Activities authorized by **Preferred Alternative 2** include: deployment and operation of allowable aquaculture systems, operation of a hatchery in the EEZ, harvest of broodstock, possession, transport, and landing of allowable aquaculture species, and sale. **Preferred Alternative 2** would also allow transfer of permits, require a dealer permit for receiving cultured organisms, and prohibit landing of cultured species at a non-U.S. port. Under **Preferred Alternative 2** or **Alternative 3**, the aquaculture industry is more likely to develop. The increased supply of fish could negatively impact commercial harvesters if the species grown directly compete with their catch or could positively benefit commercial harvesters if they participate in aquaculture activities. Depending on where aquaculture firms operate, fishing communities could also benefit. Seafood processors, consumers of seafood products, restaurants, and support industries in the local communities would also benefit from a stable, fresh supply of quality seafood.

Action 2: Application Requirements, Operational Requirements, and Restrictions – Requirements generally fall into two categories: (a) those pertaining to permit applications and (b) those pertaining to the operation of a facility**. Alternative 1** would not specify application or operational requirements for marine aquaculture. **Alternative 2** would specify the same application and permitting requirements as specified for EFPs at 50 CFR 600.745(b). EFP regulations require specific information from permit applicants when applying for an EFP. Additionally, the NOAA Fisheries Service's Regional Administrator (RA) has authority to attach "terms and conditions" to the EFP consistent with the purpose of the exempted fishing. However, EFP regulations do not specifically pertain to aquaculture and there is significant discretion given to the RA when specifying terms and conditions for exempted fishing activities. If insufficient information is collected, the public and government will not have enough information to make an informed decision regarding the impacts of a proposed facility. **Preferred Alternative 3(a)(1)** would require the owner of an aquaculture firm submit an application for an aquaculture permit at least 120 days prior to the desired date of

deployment of any proposed aquaculture system. **Preferred Alternative 3(a)(2)** would require applicants to submit information to NOAA Fisheries Service when applying for a permit. This would include contact information, the location of the proposed facility, a list of species to be cultured, hatchery information, copies of other federal permits, a description of proposed aquaculture systems and equipment, documentation for vessels and aircraft, an assurance bond, certification that broodstock used to provide juveniles are from the Gulf of Mexico, certification that no genetically modified organisms or transgenic animals are used or possessed at the aquaculture facility, identification of an aquatic animal health expert, an emergency disaster plan, and other information necessary for issuance and administration of a permit. **Preferred Alternative 3(b)** would specify a use it or lose it provision for permits, require documentation from hatcheries that broodstock are marked or tagged, require a health certificate of inspection prior to stocking of fingerlings, require locating devices be maintained on cages, require permittees monitor feed usage and protected resource and migratory bird interactions/entanglements, require permittees comply with drug, pesticide, and biologic regulations from other federal agencies, require permittees comply with monitoring and reporting requirements specified by the Army Corps of Engineers and the Environmental Protection Agency, require cultured fish be maintained with head and fins intact, prohibit possession of wild fish, except when harvesting broodstock, and allow NOAA Fisheries Service employees access to facilities.

These are standard provisions of aquaculture regulations in many U.S. states (e.g., Maine and Washington) and in other countries and are likely to be areas of concern to the general public. Collecting and reporting this information will assist managers when issuing/denying permits and will help inform the public of the impacts aquaculture has on the ecosystem. These requirements are intended to protect and conserve wild Gulf resources, while still allowing a viable regional aquaculture permitting program.

Action 3: Duration of the Permit – The duration of the permit is expected to affect the amount of capital invested in aquaculture firms and the species that are raised**.** **Alternative 1** would retain the EFP structure that would issue permits for one-year with the possible renewal of the permit. This time frame is too short to provide time to recover fixed and variable investment costs. Aquaculture firms would have difficulty in finding investors. The lack of investment would limit the growth of the industry. Fewer jobs would be created in the aquaculture industry and support industries would not realize increased sales. **Alternatives 2(a-d)** would issue permits ranging from 5 years to an indefinite period. The longer the permit duration the more likely firms are to obtain investments and produce slower growing species. **Preferred Alternative 2(b)** is a 10-year permit, which some persons have indicated is the minimum permit duration necessary to attract investment at reasonable rates of return. Regardless of the permit duration selected as the preferred by the Council, all aquaculture permits could be revoked, suspended, or modified pursuant to subpart D of 15 CFR part 904 for non-compliance with applicable aquaculture regulatory requirements.

Action 4: Species Allowed for Aquaculture and Included in the Aquaculture Fishery Management Unit – Only **Alternative 1**, the no action alternative, would allow permit

holders to raise non-indigenous species. If escapement were to occur, the costs and impacts on society may be high or may be negligible depending upon the species, ecosystem, whether or not the fish/shellfish is sterile, number of escapes, and other factors. **Alternative 2** would allow for the aquaculture of most species managed by the Gulf of Mexico Fishery Management Council. Four primary species – spiny lobster, stone crab, corals, and shrimp – would be excluded. **Alternative 3** is somewhat more flexible than **Alternative 2** in that it would also allow for EEZ aquaculture of spiny lobster and stone crab. However, it would preclude the aquaculture of shrimp, corals, and goliath and Nassau grouper. **Preferred Alternative 4** would allow the aquaculture of all marine species managed by the Council native to the Gulf of Mexico, except shrimp and corals. The Council would also request NOAA Fisheries Service develop concurrent rulemaking to allow aquaculture of highly migratory species. For all of the alternatives, the aquaculture of live rock would continue to be regulated through existing management measures approved in Amendments 2 and 3 to the Coral and Coral Reefs FMP. Under **Alternatives 2-4**, all species approved for aquaculture would also be included in the Aquaculture FMP's fishery management unit. The more flexibility firms are given the more likely they are to develop a viable industry that would benefit local communities. Additionally, requiring aquaculture firms culture only species native to the Gulf of Mexico will provide additional safeguards and protection to domestic fisheries in the event of escape.

Action 5: Allowable Marine Aquaculture Systems – **Alternative 1** would not specify marine aquaculture systems allowed for culturing marine organisms. **Alternatives 2** would allow cages and nets pens for marine aquaculture in the Gulf EEZ. **Preferred Alternative 3** would provide NOAA Fisheries Service authority to review aquaculture grow-out systems on a case-by-case basis to ensure reliable offshore growing system technology is used. Proposed systems would be evaluated based on potential risks to EFH, endangered and threatened species, wild fish stocks, and public health and safety. To assist the RA in determining the structural integrity of a system, applicants would be required to submit documentation, such as computer and oceanographic model results, sufficient to evaluate the ability of an aquaculture system to withstand physical stresses associated with major storm events. Benefits to society under **Alternatives 1** and **3** are expected to exceed those under **Alternative 2,** because they allow for a greater number of potential systems in which to conduct aquaculture and therefore would provide aquaculture firms with greater diversity of systems to culture the wide array of native Gulf species. The systems used will all need to be able to withstand weather conditions that exist in the Gulf of Mexico. **Preferred Alternative 3** would provide the greatest overall benefits to society, because it would provide NOAA Fisheries Service authority to thoroughly review a proposed aquaculture system before deciding whether or not to allow its use.

Action 6: Marine Aquaculture Siting Requirements and Conditions – Alternative 1*,* would not designate areas in the Gulf EEZ where aquaculture would be allowed. **Alternative 2** would establish marine aquaculture areas that are pre-permitted. Thirteen proposed zones would be created encompassing 5 percent of the Gulf EEZ. Aquaculture operations would be limited to those zones designated for marine aquaculture. Siting

within a zone may still require site specific data and information. **Preferred Alternative 3** would establish criteria for siting marine aquaculture facilities. Facilities would be prohibited from being sited within marine protected areas, marine reserves, HAPCs, Special Management Zones, permitted artificial reef areas, and coral areas. In addition, no facility could be sited within 1.6 nautical miles of another facility to diminish the spread of pathogens. Sites would also have to be twice as large as the total area encompassed by the allowable aquaculture systems to allow for fallowing and rotation of allowable systems and permit applicants would have to provide NOAA Fisheries Service with a video survey of benthic habitat at the proposed marine aquaculture facility site. Lastly, NOAA Fisheries could evaluate additional criteria, such as site depth, current speeds, etc., on a case by case basis. **Alternative 1** would provide the greatest flexibility for siting aquaculture facilities, while **Alternative 2** would provide the least. **Alternative 1** is expected to result in the greatest benefits to permit applicants, but would potentially provide the least protection to habitat, protected and endangered species, and wild fish stocks. **Preferred Alternative 3** provides a balance by protecting important marine resources, while still allowing some flexibility in the siting process through case by case review.

Action 7: **Establish Restricted Access Zones for Marine Aquaculture Facilities** – If created, restricted access zones would limit access to areas around aquaculture facilities. **Alternative 1** would not restrict access around an aquaculture facility. **Preferred Alternative 2** would restrict access around a marine aquaculture facility. Fishing and the operation in and transit through of fishing vessels would be prohibited within the restricted access zone. The size of the zones would correspond to the coordinates of the site on the approved ACOE siting permit. **Alternative 3** would restrict access within a certain distance of marine aquaculture systems (100, 500, or 1,640 feet). Similar to **Preferred Alternative 2,** fishing and the operation in and transit through of fishing vessels would be prohibited. Restricting access around marine aquaculture facilities to provide protection for the firm (including reducing the risk of damage to allowable aquaculture systems) would impact other users of the area. Restricted access zones may be perceived by many fishermen as a form of marine protected area that limits where they can fish. If restricted access zones are established, it will be important to site aquaculture facilities in areas where there are not important fishing grounds and where user conflicts would be low.

Action 8: Recordkeeping and Reporting – This action would define specific pieces of information that would be required from aquaculture firms. Under **Alternative 1** the RA has authority to specify recordkeeping and reporting requirements in an EFP. Members of the public would rely on NOAA Fisheries Service to protect their interests without specific direction beyond that included in the EFP requirements. **Preferred Alternative 2** would establish specific reporting requirements that must be met to obtain and keep aquaculture permits. That information will help keep regulatory agencies informed and allow them to make decisions regarding the impacts of aquaculture facilities. Information would include: submitting an annual report to NOAA Fisheries Service, providing copies of aquaculture related permits from other federal agencies, notifying NOAA Fisheries Service of major escapement, pathogen outbreaks, or entanglements and

interactions with marine mammals, protected resources, and migratory birds; and numerous other reporting and recordkeeping requirements. Some organizations and the general public are concerned that aquaculture firms are using a public resource to operate their businesses, and that those businesses could impact habitat and the wild stocks of fish in the Gulf. This action would allow NOAA Fisheries Service to be informed of activities that occur at marine aquaculture facilities that could impact the overall health of the ecosystem. If problems are discovered, then NOAA Fisheries Service could also take corrective action.

Action 9: Biological Reference Points and Status Determination Criteria – Alternative 1 would not establish biological reference points or status determination criteria for aquaculture in the Gulf of Mexico. Biological reference points and status criteria would continue to be specified for wild species managed by the Council, but similar criteria and reference points would not be established for aquaculture. This alternative would not satisfy MSFCMA legal requirements, making NOAA Fisheries Service vulnerable to legal challenges. **Preferred Alternative 2** would establish biological reference points and status determination criteria for aquaculture in the Gulf of Mexico. MSY would either be equivalent to the total annual production capacity of all aquaculture operations in the Gulf of Mexico EEZ, or set equal to optimum yield. The Council's preferred alternative is to set MSY equal to OY. Optimum yield would be specified as the total yield harvested by all permitted aquaculture operations annually, but could not exceed 64 mp annually. Other OYs considered by the Council included 16, 32, 36, and 190 mp annually. Establishing a proxy for OY allows the Council to take a more precautionary approach to management while the aquaculture industry develops and more becomes known about offshore aquaculture. The OY proxies are likely substantially less than the yield that can be achieved by aquaculture operations over the long-term. However, if planned production does exceed OY, then the Council would initiate review of the aquaculture program and OY proxy, and NOAA Fisheries Service would publish a control date, after which entry into the industry may be limited or restricted. Existing definitions for overfished and overfishing status used for wild stocks would be used as proxies to assess the effects of aquaculture production on these stocks. Additionally, individuals, corporations, or other entities would have a cap on production of 5, 10, or 20 percent of OY. This provision is necessary to ensure entities do not obtain an excessive share of the allowable OY. The Council's preferred alternative is to cap production for a single entity at 20 percent of OY. Benefits to permittees and industry would be greater the higher OY is set, while benefits to the biological environment would be greater if OY is set more conservatively until more is known about the impacts of offshore aquaculture.

Action 10: Framework Procedures – This action includes three alternatives. **Alternative 1** would not establish a framework procedure for making modifications to aquaculture regulatory requirements. Each time the Council needs to revise or change regulations in the future a plan amendment would have to be developed. **Alternatives 2** and **3** propose a framework procedure for developing or revising regulations. Both alternatives would utilize an Aquaculture Advisory Panel, which would meet annually to review the aquaculture program. Under **Alternative 2**, the Panel would provide recommendations to the Council only on MSY and OY levels. If the Council supported

the Panel's recommendations, it could then submit the recommendations to the NOAA Fisheries RA for further consideration. The RA would have the authority to approve or deny the proposed changes to MSY and OY. If the RA approved the changes, then they would be published in the *Federal Register*. **Preferred Alternative 3** is similar to **Alternative 2**, except it provides the Panel with broader authority. In addition to allowing the Panel to recommend MSY and OY levels, the Panel could also recommend changes to application and operational requirements, siting requirements, allowable aquaculture system requirements, and recordkeeping and reporting requirements. Any recommendations would be provided to the Council, who would then have to develop a regulatory amendment for proposed regulatory changes. The framework procedures described in **Alternative 2** and **3** are both intended to allow timelier implementation of regulatory measures necessary to prevent or mitigate impacts to the physical, biological, social, economic, and administrative environments. Because **Alternative 1** would not specify a framework procedure, it is expected to have the greatest negative effects on the social environment. Negative effects could include delays in establishing operational requirements or regulatory requirements for monitoring aquaculture operations.

10.0 Other Applicable Laws

The MSFCMA (16 U.S.C. 1801 et seq.) provides the authority for fishery management in federal waters of the EEZ. However, fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems within which those fisheries are conducted. This Aquaculture FMP is an integrated document that includes analyses necessary for the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), and Executive Order 12866.

NEPA requires all federal actions to evaluate environmental impacts of proposed actions, and for those impacts to be assessed and reported to the public. For this FMP, the Council conducted a EIS. The primary purpose of an EIS is "to provide full and fair discussion of significant environmental impacts to inform decision makers and the public of reasonable alternatives, which would avoid or minimize adverse impacts or enhance the quality of the human environment (Part 1502.1 CEQ)." Part 1502.2 of the CEQ regulations specifies how agencies should prepare an EIS to achieve the above stated purpose.

The RFA requires federal agencies to assess the impacts of regulatory actions implemented through notice and comment rulemaking procedures on small businesses, small organizations, and small governmental entities, with the goal of minimizing adverse impacts of burdensome regulations and record-keeping requirements on those entities. These analyses, which describe the type and number of small businesses affected, are provided in Section 8.0. These analyses are published in the *Federal Register* in full or in summary for public comment and submitted to the chief counsel for advocacy of the Small Business Administration.

To comply with E.O. 12866, NOAA Fisheries prepares an RIR for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. These analyses can be found in Section 7.0 of this FMP.

Other major laws affecting federal fishery management decision-making are summarized below.

10.1 Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NOAA Fisheries is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider and respond to public comment on those rules before

they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect.

10.2 Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) of 1972, as amended, requires federal activities affecting any land or water use or natural resource of a state's coastal zone be conducted in a manner consistent, to the maximum extent practicable, with approved state coastal management programs. The requirements for such a consistency determination are set forth in NOAA regulations at 15 C.F.R. part 930, subpart C. When proposing an action determined to directly affect coastal resources managed under an approved coastal zone management program, NOAA Fisheries is required to provide the relevant state agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. Once this FMP is approved and submitted to the Secretary of Commerce, NOAA Fisheries, in cooperation with the Council, will determine if this action is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. This determination will be submitted to the responsible state agencies under Section 307 of the CZMA.

10.3 Data Quality Act

The Data Quality Act (DQA) (Public Law 106-443), effective October 1, 2002, requires the government to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Specifically, the Act directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and disseminate agency-specific standards to: (1) ensure information quality and develop a pre-dissemination review process; (2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and (3) report periodically to OMB on the number and nature of complaints received. Pursuant to Section 515 of Public Law 106-554, this information document has undergone a pre-dissemination review by the Southeast Regional Office Sustainable Fisheries Division and is available from the agency.

10.4 Endangered Species Act

The Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. Section 1531 et seq.) requires that federal agencies use their authorities to conserve endangered and threatened species. The ESA requires NOAA Fisheries, when proposing a fishery action that "may affect" critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the USFWS for all remaining species) to determine the potential impacts of the proposed action.

Consultations are concluded informally when proposed actions "may affect, but are not likely to adversely affect" endangered or threatened species or designated critical habitat. Formal consultations, including a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" endangered or threatened species or adversely modify designated critical habitat. If jeopardy or adverse modification is found, the consulting agency is required to suggest reasonable and prudent alternatives.

10.5 Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act (33 U.S.C 403) prohibits the creation of structures not authorized by Congress that obstruct navigable waters of the United States. The Act provides the Chief of Engineers and Secretary of War authority to authorize the building of structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established. Title 33 CFR Section 322 prescribes the policies, practices, and procedures the Corps of Engineers follows when reviewing permits to authorize certain structures or work affecting navigable waters of the United States.

10.6 Clean Water Act

The Clean Water Act (CWA) (33 *U.S.C.* 1251-1387) is intended to maintain and restore waters of the United States. The CWA authorizes water quality and pollution research, provides grants for sewage treatment facilities, sets pollution discharge and water quality standards, addresses oil and hazardous substances liability, and establishes permit programs for water quality, point source pollutant discharges, ocean pollution discharges, and dredging or filling of wetlands or waters of the United States. The U.S. ACOE and the EPA both have permitting authority under the CWA.

Title 40 CFR Parts 122-124 implement the EPA's National Pollutant Discharge Elimination System (NPDES) Program under sections 318, 402, and 405 of the CWA. Water quality and effluent standards and criteria for the NPDES are described in 40 CFR, Parts 125, 129, 133, 136, 400-471, and 503. The EPA also published a final rule on August 23, 2004 (69 F.R. 162) establishing CWA effluent limitations, guidelines, and new point source pollution standards for concentrated aquatic animal production facilities, including facilities that produce 100,000 pounds or more per year of aquatic animals in net pens or submerged cage systems.

Pursuant to Section 404 of the CWA, the ACOE has authority to issue permits regulating the discharge of dredged or fill material into U.S. waters. Title 33 CFR Section 323 prescribes the policies, practices, and procedures the ACOE follows when reviewing permits to authorize the discharge of dredged or fill material. The intent of the CWA Section 404 program and its 404(b)(1) guidelines is to prevent destruction of aquatic ecosystems unless the action will not individually or cumulatively adversely affect the ecosystem. NOAA Fisheries may provide comments to the ACOE regarding impacts to marine resources of proposed activities and can recommend methods for avoiding such impacts.

10.7 National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA) (16 U.S.C. 1431 et seq.) directs the Secretary of Commerce to designate and manage areas of the marine environment with nationally significant aesthetic, ecological, historical, or recreational values as national marine sanctuaries. Regulations implementing the NMSA can be found at 15 CFR Part 922. These regulations serve to safeguard resources within sanctuary boundaries and include prohibitions or limitations on some activities, such as discharge and disturbance of the seabed. These regulations also provide the National Marine Sanctuary Program with authority to issue permits to allow certain activities beneficial to sanctuaries that would otherwise be prohibited.

10.8 National Invasive Species Act

This act reauthorized and amended the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646). The act was originally passed in response to the zebra mussel invasion of the Great Lakes and required ships heading for the Great Lakes to exchange their ballast water at sea. In 1996, the act was reauthorized and all vessels arriving from outside the 200-mile U.S. EEZ were encouraged to exchange their ballast water. The Act requires all ships report whether or not they exchanged their ballast water.

10.9 National Aquaculture Act

The National Aquaculture Act was implemented in 1980. The purpose of the Act was to promote aquaculture in the United States by: 1) declaring a national aquaculture policy; 2) establishing and implementing a national aquaculture development plan; 3) establishing the Department of Agriculture as the lead Federal agency with respect to the coordination and dissemination of national aquaculture information; and 4) encouraging aquaculture activities and programs in both the public and private sectors of the economy. The act states "aquaculture has the potential for reducing the United States trade deficit in fisheries products, for augmenting existing commercial and recreational fisheries and for producing other renewable resources, thereby assisting the United States in meeting its future food needs and contributing to the solution of world resource problems." The act also established the Joint Subcommittee on Aquaculture (JSA). The JSA coordinates federal government activities relating to aquaculture. The National Aquaculture Improvement Act amended this Act in 1985 and designated the Secretary of Agriculture as the permanent chair of the JSA. The secretaries of Commerce, Agriculture, and Interior comprise the JSA Executive Committee.

10.10 Outer Continental Shelf Lands Act

The Outer Continental Shelf Lands Act was created in 1953. The Act defined the Outer Continental Shelf (OCS) as all submerged lands between the seaward extent of state coastal waters and the seaward extent of federal jurisdiction. The purpose of the Act was to assure national security and reduce dependence on foreign sources. The Secretary of

the Interior is responsible for the administration of mineral exploration and development of the OCS. The Act provides the Secretary of the Interior authority to grant leases through competitive bids and to promulgate regulations consistent with the provisions of the Act. The 1978 amendments to the Act provided for cancellation of leases or permits if continued activity is likely to cause serious harm to life, including aquatic life. These amendments also stipulated that economic, social, and environmental values of renewable and nonrenewable resources are to be considered in managing the OCS.

10.11 National Sea Grant College and Program Act

The National Sea Grant College and Program Act was established in 1966, and has been subsequently amended several times. The act authorized the establishment of Sea Grant colleges and programs. The intent of the Act was to initiate and support educational and research programs related to the development of marine resources. Aquaculture was one of the few fields of research specifically identified by the Act and Sea Grant has provided more support to aquaculture than any other area of research. The Act declared that aquaculture could substantially benefit the U.S. by providing greater economic opportunities, new sources of food, and new means for the development of marine resources. In 1976, the Act was amended and Sea Grant became a part of NOAA.

10.12 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 *U.S.C.* 661-666c) requires wildlife, including fish, receive equal consideration and be coordinated with other aspects of water resource development. This is accomplished via consultation with the U.S. Fish and Wildlife Service, NOAA Fisheries and appropriate state agencies, whenever any body of water is proposed to be modified in any way and a Federal permit or license is required. These agencies determine: (1) the possible harm to fish and wildlife resources; (2) the measures needed to both prevent the damage to and loss of these resources; and (3) the measures needed to develop and improve the resources, in connection with water resource development.

10.13 Executive Orders

10.13.1 E.O. 11987: Exotic Organisms

This Executive Order requires Federal agencies, to the extent permitted by law, to: 1) restrict the introduction of exotic species into the natural ecosystems on lands and waters owned or leased by the United States; 2) encourage states, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the U.S.; 3) restrict the importation and introduction of exotic species into any natural U.S. ecosystems as a result of activities they undertake, fund, or authorize; and 4) restrict the use of Federal funds, programs, or authorities to export native species for introduction into ecosystems outside the U.S. where they do not occur naturally. The Secretaries of Agriculture and Interior are authorized to allow the importation of exotics and the export of native species if natural ecosystems will not be adversely affected.

10.13.2 E.O. 12866: Regulatory Planning and Review

Executive Order 12866: Regulatory Planning and Review, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. Section 5.0 herein, provides a comprehensive analysis of the costs and benefits to society of proposed action.

10.13.3 E.O. 12630: Takings

The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights that became effective March 18, 1988, requires that each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment. A takings implication assessment will be prepared at the appropriate time.

10.13.4 E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure that actions that they authorize, fund or carry out do not degrade the condition of that ecosystem. This FMP identifies numerous areas where coral reefs occur and is intended to ensure proposed actions do not degrade these coral reef areas (see Action 6).

10.13.5 E.O. 13112: Invasive Species

The Executive Order on invasive species established an Invasive Species Council and specified the duties of federal agencies whose actions may affect the status of invasive species. The Order requires federal agencies to use relevant programs and authorities to 1) prevent the introduction of invasive species, 2) detect and respond rapidly to control the spread of such species, 3) monitor invasive species populations accurately and reliably, 4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded, 5) conduct research to prevent introduction, and 6) promote education on invasive species. The Invasive Species Council oversees the implementation of the order, has prepared an invasive species management plan, develops guidance to federal agencies, and encourages planning and action at local, regional, and national levels.

10.13.6 E.O. 13132: Federalism

The Executive Order on Federalism requires agencies in formulating and implementing policies, to be guided by the fundamental Federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states. No Federalism issues have been identified relative to the proposed action. Therefore, preparation of a Federalism assessment under Executive Order 13132 is not necessary.

10.13.7 E.O. 13158: Marine Protected Areas

This Executive Order requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area. This action would prohibit aquaculture in marine reserves and marine protected areas.

10.13.8 E.O. 12898: Federal Actions to Address Environmental Justice in Minority and Low-Income Populations

This Executive Order requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. Impacts of aquaculture and commercial fishing on subsistence fishing are a concern in fisheries management; however, there are no such implications from the action proposed in this FMP.

10.14 Marine Mammal Protection Act

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and on the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea and marine otters, polar bears, manatees, and dugongs.

Part of the responsibility that NOAA Fisheries has under the MMPA involves monitoring populations of marine mammals to make sure they stay at optimum levels. If a population falls below its optimum level, it is designated as “depleted,” and a conservation plan is developed to guide research and management actions to restore the population to healthy levels.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction, development and implementation of take reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries, and studies of pinniped-fishery interactions.

10.15 Paperwork Reduction Act

The Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NOAA Fisheries to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public.

10.16 Small Business Act

The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j), 637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the Small Business Administration. Because most businesses associated with fishing are considered small businesses, NOAA Fisheries, must make an assessment of how those regulations will affect small businesses. Implications to small businesses are discussed in Section X, herein.

10.17 Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Provisions

The amended MSFCMA requires adverse effects to EFH caused by fishing be minimized to the extent practicable and identify other actions to encourage the conservation and enhancement of that EFH. Each existing, and any new FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH. Under separate action, the Council approved a Generic EFH Amendment, including an EIS, during January 2005. The EFH Amendment describes and identifies EFH for Gulf fisheries; (2) identifies other actions to encourage the conservation and enhancement of such EFH; and (3) identify measures to minimize to the extent practicable the adverse effects of fishing on such EFH. The actions proposed within this FMP that effect EFH will be reviewed on a case-by-case basis to determine the range of potential impacts on EFH as indicated in Section 4 and 6 under siting criteria (Action 6).

10.18 Animal Health Act of 2002

The Animal Health Act of 2002 (7 U.S.C. 8301 et seq.) provides the authority to the Secretary of Agriculture to administer and promulgate animal health regulations for the prevention, control, and management of infectious diseases for all animals, except humans. The focus of the Act is the management of diseases in cultured animals but the scope also includes diseases management in wildlife that have the potential to impact cultured/farmed animals.

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13.0 List of Agencies, Organizations, and Persons to Whom Copies of the Statement Are Sent

Gulf of Mexico Fishery Management Council

Law Enforcement Advisory Panel
Standing Scientific and Statistical Committee (SSC)
Ad Hoc Aquaculture Advisory Panel

Other Agencies, Organizations, or Persons

Alabama Cooperative Extension Service
Alabama Department of Conservation and Natural Resources
Florida Fish and Wildlife Conservation Commission
Florida Sea Grant
Louisiana Cooperative Extension Service
Louisiana Department of Wildlife and Fisheries
Mineral Management Service
Mississippi Cooperative Extension Service
Mississippi Department of Marine Resources
NOAA Fisheries Service Southeast Regional Office
NOAA Fisheries Service Southeast Fisheries Science Center
NOAA Fisheries Service Silver Spring Office
NOAA Fisheries Service Law Enforcement
Texas Cooperative Extension Service
Texas Parks and Wildlife Department
United States Coast Guard
United States Environmental Protection Agency
United States Fish and Wildlife Service
United States Food and Drug Administration

14.0 Public Hearing Locations and Dates

July 9, 2007	Best Western	7921 Lamar Poole Rd	Biloxi	MS	39532	228-875-7111
July 9, 2007	Doubletree Beach Resort	17120 Gulf Blvd.	N. Reddington Beach	FL	33708	727-391-4000
July 10, 2007	W Hotel New Orleans	333 Poydras St	New Orleans	LA	70130	504-525-9444
July 10, 2007	City of Orange Beach Rec. Ctr	27235 Canal Rd	Orange Beach	AL	36561	251-981-6028
July 11, 2007	San Luis	5222 Seawall Blvd.	Galveston	TX	77550	409-744-1500
July 11, 2007	Embassy Suites Hotel	570 Scenic Gulf Drive	Destin	FL	32550	850-337-7000
July 12, 2007	Best Western Marina Grand	300 N. Shoreline Blvd.	Corpus Christi	TX	78401	361-883-5111

December 10, 2007	Comfort Inn North	2260 54th Ave. N.	St. Petersburg	FL	33714	727-362-0075
December 10, 2007	Hilton Hobby Airport	8181 Airport Blvd.	Houston	TX	77061	713-645-3000
December 11, 2007	Hilton Airport	901 Airline Drive	New Orleans	LA	70062	504-469-5000
December 12, 2007	Wingate Inn	12009 Indian River Rd.	Biloxi	MS	39540	228-396-0036
December 13, 2007	Ashbury Hotel	600 S. Beltline Hwy.	Mobile	AL	36608	251-344-8030
February 19, 2008	The Islander	82100 Overseas Hwy.	Islamorada	FL	33036	305-664-2031
July 21, 2008	Radisson Hotel	3820 N. Roosevelt Blvd.	Key West	FL	33040	305-294-5511

15.0 Index

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APPENDIX A - NMFS EXEMPTED FISHING PERMIT (50CFR 600.745)

Sec. 600.745 Scientific research activity, exempted fishing, and exempted educational activity.

(a) Scientific research activity. Nothing in this section is intended to inhibit or prevent any scientific research activity conducted by a scientific research vessel. Persons planning to conduct scientific research activities in the EEZ are encouraged to submit to the appropriate Regional Administrator, Director, or designee, 60 days or as soon as practicable prior to its start, a scientific research plan for each scientific cruise. The Regional Administrator, Director, or designee will acknowledge notification of scientific research activity by issuing to the operator or master of that vessel, or to the sponsoring institution, a letter of acknowledgment. This letter of acknowledgment is separate and distinct from any permit required by any other applicable law. If the Regional Administrator, Director, or designee, after review of a research plan, determines that it does not constitute scientific research but rather fishing, the Regional Administrator, Director, or designee will inform the applicant as soon as practicable and in writing. The Regional Administrator, Director, or designee may also make recommendations to revise the research plan to make the cruise acceptable as scientific research activity or recommend the applicant request an EFP. In order to facilitate identification of activity as scientific research, persons conducting scientific research activities are advised to carry a copy of the scientific research plan and the letter of acknowledgment on board the scientific research vessel. Activities conducted in accordance with a scientific research plan acknowledged by such a letter are presumed to be scientific research activity. The presumption may be overcome by showing that an activity does not fit the definition of scientific research [[Page 83]] activity or is outside the scope of the scientific research plan.

(b) Exempted fishing.--(l) General. A NMFS Regional Administrator or Director may authorize, for limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. Exempted fishing may not be conducted unless authorized by an EFP issued by a Regional Administrator or Director in accordance with the criteria and procedures specified in this section. The Regional Administrator or Director may charge a fee to recover the administrative expenses of issuing an EFP. The amount of the fee will be calculated, at least annually, in accordance with procedures of the NOAA Handbook for determining administrative costs of each special product or service; the fee may not exceed such costs. Persons may contact the appropriate Regional Administrator or Director to find out the applicable fee. (2) Application. An applicant for an EFP shall submit a completed application package to the appropriate Regional Administrator or Director, as soon as practicable and at least 60 days before the desired effective date of the EFP. Submission of an EFP application less than 60 days before the desired effective date of the EFP may result in a delayed effective date because of review requirements.

The application package must include payment of any required fee as specified by paragraph (b)(1) of this section, and a written application that includes, but is not limited to, the following information: (i) The date of the application. (ii) The applicant's name, mailing address, and telephone number. (iii) A statement of the purposes and goals of the exempted fishery for which an EFP is needed, including justification for issuance of the EFP. (iv) For each vessel to be covered by the EFP, as soon as the information is available and before operations begin under the EFP: (A) A copy of the USCG documentation, state license, or registration of each vessel, or the information contained on the appropriate document. (B) The current name, address, and telephone number of the owner and master, if not included on the document provided for the vessel. (v) The species (target and incidental) expected to be harvested under the EFP, the amount(s) of such harvest necessary to conduct the exempted fishing, the arrangements for disposition of all regulated species harvested under the EFP, and any anticipated impacts on marine mammals or endangered species. (vi) For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. (vii) The signature of the applicant. (viii) The Regional Administrator or Director, as appropriate, may request from an applicant additional information necessary to make the determinations required under this section. An incomplete application or an application for which the appropriate fee has not been paid will not be considered until corrected in writing and the fee paid. An applicant for an EFP need not be the owner or operator of the vessel(s) for which the EFP is requested. (3) Issuance. (i) The Regional Administrator or Director, as appropriate, will review each application and will make a preliminary determination whether the application contains all of the required information and constitutes an activity appropriate for further consideration. If the Regional Administrator or Director finds that any application does not warrant further consideration, both the applicant and the affected Council(s) will be notified in writing of the reasons for the decision. If the Regional Administrator or Director determines that any application warrants further consideration, notification of receipt of the application will be published in the *Federal Register* with a brief description of the proposal, and the intent of NMFS to issue an EFP. Interested persons will be given a 15- to 45-day opportunity to comment and/or comments will be requested during public testimony at a Council meeting. The notification may establish a cut-off date for [[Page 84]] receipt of additional applications to participate in the same, or a similar, exempted fishing activity. The Regional Administrator or Director also will forward copies of the application to the Council(s), the USCG, and the appropriate fishery management agencies of affected states, accompanied by the following information: (A) The effect of the proposed EFP on the target and incidental species, including the effect on any TAC. (B) A citation of the regulation or regulations that, without the EFP, would prohibit the proposed activity. (C) Biological information relevant to the proposal, including appropriate statements of environmental impacts, including impacts on marine mammals and threatened or endangered species. (ii) If the application is complete and warrants additional consultation, the Regional Administrator or Director may consult with the appropriate Council(s) concerning the permit application during the period in which comments have been requested. The Council(s) or the Administrator or Regional Administrator shall notify the applicant in advance of any meeting at which the application will be considered, and offer the applicant the opportunity to appear in support of the application. (iii) As soon as practicable after receiving responses from the agencies

identified in paragraph (b)(3)(i) of this section, and/or after the consultation, if any, described in paragraph (b)(3)(ii) of this section, the Regional Administrator or Director shall notify the applicant in writing of the decision to grant or deny the EFP, and, if denied, the reasons for the denial. Grounds for denial of an EFP include, but are not limited to, the following: (A) The applicant has failed to disclose material information required, or has made false statements as to any material fact, in connection with his or her application; or (B) According to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect the well-being of the stock of any regulated species of fish, marine mammal, or threatened or endangered species in a significant way; or (C) Issuance of the EFP would have economic allocation as its sole purpose; or (D) Activities to be conducted under the EFP would be inconsistent with the intent of this section, the management objectives of the FMP, or other applicable law; or (E) The applicant has failed to demonstrate a valid justification for the permit; or (F) The activity proposed under the EFP could create a significant enforcement problem. (iv) The decision of a Regional Administrator or Director to grant or deny an EFP is the final action of NMFS. If the permit, as granted, is significantly different from the original application, or is denied, NMFS may publish notification in the *Federal Register* describing the exempted fishing to be conducted under the EFP or the reasons for denial. (v) The Regional Administrator or Director may attach terns and conditions to the EFP consistent with the purpose of the exempted fishing, including, but not limited to: (A) The maximum amount of each regulated species that can be harvested and landed during the teuii of the EFP, including trip limitations, where appropriate. (B) The number, size(s), name(s), and identification number(s) of the vessel(s) authorized to conduct fishing activities under the EFP. (C) The time(s) and place(s) where exempted fishing may be conducted. (D) The type, size, and amount of gear that may be used by each vessel operated under the EFP. (E) The condition that observers, a vessel monitoring system, or other electronic equipment be carried on board vessels operated under an EFP, and any necessary conditions, such as pre-deployment notification requirements. (F) Reasonable data reporting requirements. (G) Other conditions as may be necessary to assure compliance with the purposes of the EFP, consistent with the objectives of the FMP and other applicable law. (H) Provisions for public release of data obtained under the EFP that are [[Page 85]] consistent with NOAA confidentiality of statistics procedures at set out in subpart E. An applicant may be required to waive the right to confidentiality of information gathered while conducting exempted fishing as a condition of an EFP. (4) Duration. Unless otherwise specified in the EFP or a superseding notice or regulation, an EFP is effective for no longer than 1 year, unless revoked, suspended or modified. EFPs may be renewed following the application procedures in this section. (5) Alteration. Any permit that has been altered, erased, or mutilated is invalid. (6) Transfer. EFPs issued under this section are not transferable or assignable. An EFP is valid only for the vessel(s) for which it is issued. (7) Inspection. Any EFP issued under this section must be carried on board the vessel(s) for which it was issued. The EFP must be presented for inspection upon request of any authorized officer. (8) Sanctions. Failure of a permittee to comply with the terns and conditions of an EFP may be grounds for revocation, suspension, or modification of the EFP with respect to all persons and vessels conducting activities under the EFP. Any action taken to revoke, suspend, or modify an EFP for enforcement purposes will be governed by 15 CFR part 904, subpart D. (c) Reports. (1) Persons conducting scientific research activity are requested to

submit a copy of any cruise report or other publication created as a result of the cruise, including the amount, composition, and disposition of their catch, to the appropriate Science and Research Director. (2) Persons fishing under an EFP are required to report their catches to the appropriate Regional Administrator or Director, as specified in the EFP. (d) Exempted educational activities--(l) General. A NMFS Regional Administrator or Director may authorize, for educational purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. The decision of a Regional Administrator or Director to grant or deny an exempted educational activity authorization is the final action of NMFS. Exempted educational activities may not be conducted unless authorized in writing by a Regional Administrator or Director in accordance with the criteria and procedures specified in this section. Such authorization will be issued without charge. (2) Application. An applicant for an exempted educational activity authorization shall submit to the appropriate Regional Administrator or Director, at least 15 days before the desired effective date of the authorization, a written application that includes, but is not limited to, the following information: (i) The date of the application. (ii) The applicant's name, mailing address, and telephone number. (iii) A brief statement of the purposes and goals of the exempted educational activity for which authorization is requested, including a general description of the arrangements for disposition of all species collected. (iv) Evidence that the sponsoring institution is a valid educational institution, such as accreditation by a recognized national or international accreditation body. (v) The scope and duration of the activity. (vi) For each vessel to be covered by the authorization: (A) A copy of the U.S. Coast Guard documentation, state license, or registration of the vessel, or the information contained on the appropriate document. (B) The current name, address, and telephone number of the owner and master, if not included on the document provided for the vessel. (vii) The species and amounts expected to be caught during the exempted educational activity. (viii) For each vessel covered by the authorization, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used. (ix) The signature of the applicant. (x) The Regional Administrator or Director may request from an applicant additional information necessary to make the determinations required [[Page 86]] under this section. An incomplete application will not be considered until corrected in writing. (3) Issuance. (i) The Regional Administrator or Director, as appropriate, will review each application and will make a determination whether the application contains all of the required information, is consistent with the goals, objectives, and requirements of the FMP or regulations and other applicable law, and constitutes a valid exempted educational activity. The applicant will be notified in writing of the decision within 5 working days of receipt of the application. (ii) The Regional Administrator or Director may attach terms and conditions to the authorization, consistent with the purpose of the exempted educational activity, including, but not limited to: (A) The maximum amount of each regulated species that may be harvested. (B) The time(s) and place(s) where the exempted educational activity may be conducted. (C) The type, size, and amount of gear that may be used by each vessel operated under the authorization. (D) Reasonable data reporting requirements. (E) Such other conditions as may be necessary to assure compliance with the purposes of the authorization, consistent with the objectives of the FMP or regulations. (F) Provisions for public release of data obtained under the authorization, consistent with NOAA confidentiality of statistics procedures in subpart E. An applicant may be required to waive

the right to confidentiality of information gathered while conducting exempted educational activities as a condition of the authorization. (iii) The authorization will specify the scope of the authorized activity and will include, at a minimum, the duration, vessel(s), species and gear involved in the activity, as well as any additional terms and conditions specified under paragraph (d)(3)(ii) of this section. (4) Duration. Unless otherwise specified, authorization for an exempted educational activity is effective for no longer than 1 year, unless revoked, suspended, or modified. Authorizations may be renewed following the application procedures in this section. (5) Alteration. Any authorization that has been altered, erased, or mutilated is invalid. (6) Transfer. Authorizations issued under this paragraph (d) are not transferable or assignable. (7) Inspection. Any authorization issued under this paragraph (d) must be carried on board the vessel(s) for which it was issued or be in possession of the applicant to which it was issued while the exempted educational activity is being conducted. The authorization must be presented for inspection upon request of any authorized officer. Activities that meet the definition of fishing, despite an educational purpose, are fishing. An authorization may allow covered fishing activities; however, fishing activities conducted outside the scope of an authorization for exempted educational activities are illegal. [61 FR 32540, June 24, 1996, as amended at 63 FR 7075, Feb. 12, 1998].

APPENDIX B – NATIONAL OFFSHORE AQUACULTURE ACT OF 2007 SUMMARY AND H.R. 2010 IH APRIL 24, 2007 INTRODUCED BILL

The National Oceanic and Atmospheric Administration (NOAA), an agency within the U.S. Department of Commerce, is working to enhance/increase domestic seafood supply to meet the growing demand for all seafood products. Currently, over 80 percent of the seafood Americans consume is imported, and at least half of those imports are farmed seafood. Additional U.S. aquaculture can help the nation reduce its $8 billion seafood trade deficit, provide additional jobs and revenue for coastal communities, and meet the growing consumer demand for safe, healthy seafood.

Right now, most U.S. marine aquaculture products come from shellfish, which are grown onshore or in coastal areas. However, new technology and equipment, and the promising results of open ocean aquaculture demonstration projects in state waters, are leading to opportunities for seafood farming further from the coast, in federal waters three to 200 miles off shore. The federal waters of the U.S. Exclusive Economic Zone cover 3.4 million square miles of ocean and hold promise for this new type of aquaculture.

While there are many potential benefits to offshore aquaculture, there are also barriers blocking the expansion of aquaculture into federal waters. Currently, there is no clear authority for the permitting of offshore aquaculture in federal waters. To address this challenge, the Administration will propose the *National Offshore Aquaculture Act of 2007* early in the 110th Congress. If enacted, the Act will establish the legal framework regarding permits, enforcement, and monitoring of aquaculture in federal waters.
Specifically, the bill will:

- Authorize the Secretary of Commerce to issue offshore aquaculture permits.
- Require the Secretary of Commerce to establish environmental requirements.
- Require the Secretary of Commerce to work with other federal agencies to develop and implement a streamlined and coordinated permitting process for offshore aquaculture.
- Exempt permitted offshore aquaculture from fishing regulations that restrict size, season and harvest methods.
- Authorize the establishment of a research and development program for marine aquaculture.
- Authorize funding to carry out the Act and provide for enforcement of the Act.

The 2007 proposal includes requirements to ensure that offshore aquaculture proceeds in an environmentally responsible manner that is consistent with stated policy to protect wild stocks and the quality of marine ecosystems and is compatible with other uses of the marine environment. The intent of the Act is to complement rather than supersede

existing resource management authorities, so it specifically provides for coordination and consultation with other federal agencies, Fishery Management Councils, and coastal states.

In addition, the research and development provision of the act would authorize NOAA to fund the scientific research and the technology development necessary to help all types of domestic marine aquaculture to expand.

On a broad scale, the proposal will provide the necessary regulatory certainty to facilitate expansion of aquaculture in federal waters, where there is significant potential for development of the U.S. aquaculture industry. New technologies have been developed to better withstand extreme conditions of the offshore ocean environment, allowing this expansion to occur. By adopting these technologies, the United States can boost production of valuable marine species while creating jobs that contribute to economic development and the revitalization of depressed coastal communities. Additional domestic supplies of nutritious seafood can reduce pressure on wild fisheries. By adopting rigorous environmental standards for aquaculture, the United States can establish its leadership in development of sustainable uses of marine ecosystems, as an example for our trade partners, while leveling the playing field for U.S. fishery products.
Because of competing uses, community interest, and ocean conditions, offshore aquaculture will be better suited to some areas of the country than others. However, the most immediate challenge is to establish clear rules to allow this type of aquaculture and, ultimately, allow the nation to take advantage of this new opportunity for seafood production in federal waters. At the same time, the federal government must ensure that human health, the marine environment, and wild stocks are protected.

Source: www.noaa.gov/aquaculture

HR 2010 IH

110th CONGRESS
1st Session
H. R. 2010

To provide the necessary authority to the Secretary of Commerce for the establishment and implementation of a regulatory system for offshore aquaculture in the United States Exclusive Economic Zone, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES
April 24, 2007

Mr. RAHALL (for himself and Ms. BORDALLO) (both by request): introduced the following bill; which was referred to the Committee on Natural Resources, and in addition to the Committees on Ways and Means and Foreign Affairs, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

A BILL

To provide the necessary authority to the Secretary of Commerce for the establishment and implementation of a regulatory system for offshore aquaculture in the United States Exclusive Economic Zone, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the `National Offshore Aquaculture Act of 2007'.

SEC. 2. FINDINGS.

(a) It is the policy of the United States to:

(1) Support an offshore aquaculture industry that will produce food and other valuable products, protect wild stocks and the quality of marine ecosystems, and be compatible with other uses of the Exclusive Economic Zone;

(2) Encourage the development of environmentally responsible offshore aquaculture by authorizing offshore aquaculture operations and research;

(3) Establish a permitting process for offshore aquaculture that encourages private investment in aquaculture operations and research, provides opportunity for public comment, and addresses the potential risks to and impacts (including cumulative impacts) on marine ecosystems, human health and safety, other ocean uses, and coastal communities from offshore aquaculture;

(4) Promote, through public-private partnerships, research and development in marine aquaculture science, technology, and related social, economic, legal, and environmental management disciplines that will enable marine aquaculture operations to achieve operational objectives while protecting marine ecosystem quality.

(b) Offshore aquaculture activities within the Exclusive Economic Zone of the United States constitute activities with respect to which the United States has proclaimed sovereign rights and jurisdiction under Presidential Proclamation 5030 of March 10, 1983.

SEC. 3. DEFINITIONS.

As used in this Act--

(a) The term `coastal State' means a state of the United States in, or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, or Long Island Sound. The term also includes Puerto Rico, the Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, the Trust Territories of the Pacific Islands, and American Samoa.

(b) The term `coastline' means the line of ordinary low water along that portion of the coast that is in direct contact with the open sea and the line marking the seaward limit of inland waters.

(c) The term `Exclusive Economic Zone' means, unless otherwise specified by the President in the public interest in a writing published in the *Federal Register*, a zone, the outer boundary of which is 200 nautical miles from the baseline from which the breadth of the territorial sea is measured, except as established by a maritime boundary treaty in force, or being provisionally applied by the United States or, in the absence of such a treaty where the distance between the United States and another nation is less than 400 nautical miles, a line equidistant between the United States and the other nation. Without affecting any Presidential Proclamation with regard to the establishment of the United States territorial sea or Exclusive Economic Zone, the inner boundary of that zone is--

(1) a line coterminous with the seaward boundary of each of the several coastal States, as defined in 43 U.S.C. 1312;

(2) a line three marine leagues from the coastline of the Commonwealth of Puerto Rico;

(3) a line three geographical miles from the coastlines of American Samoa, the United States Virgin Islands, and Guam;

(4) for the Commonwealth of the Northern Mariana Islands--

(A) its coastline, until such time as the Commonwealth of the Northern Mariana Islands is granted authority by the United States to regulate all fishing to a line seaward of its coastline, and

(B) upon the United States' grant of such authority, the line established by such grant of authority; and

(5) for any possession of the United States not referred to in subparagraph (2), (3), or (4), the coastline of such possession.

Nothing in this definition shall be construed as diminishing the authority of the Department of Defense, the Department of the Interior or any other Federal department or agency.

(d) The term `lessee' means any party to a lease, right-of-use and easement, or right-of-way, or an approved assignment thereof, issued pursuant to the Outer Continental Shelf Lands Act, 43 U.S.C. 1331 et seq.

(e) The term `marine species' means finfish, mollusks, crustaceans, marine algae, and all other forms of marine life, excluding marine mammals and birds.
(f) The term `offshore aquaculture' means all activities, including the operation of offshore aquaculture facilities, involved in the propagation and rearing, or attempted propagation and rearing, of marine species in the United States Exclusive Economic Zone.
(g) The term `offshore aquaculture facility' means: 1) an installation or structure used, in whole or in part, for offshore aquaculture; or 2) an area of the seabed or the subsoil used for offshore aquaculture of living organisms belonging to sedentary species.
(h) The term `offshore aquaculture permit' means an authorization issued under section 4(b) to raise specified marine species in a specific offshore aquaculture facility within a specified area of the Exclusive Economic Zone.
(i) The term `person' means any individual (whether or not a citizen or national of the United States), any corporation, partnership, association, or other non-governmental entity (whether or not organized or existing under the laws of any State), and State, local or tribal government or entity thereof, and, except as otherwise specified by the President in writing, the Federal Government or an entity thereof, and, to the extent specified by the President in writing, a foreign government or an entity thereof.
(j) The term `Secretary' means the Secretary of Commerce.

SEC. 4. OFFSHORE AQUACULTURE PERMITS.

(a) General-

(1) The Secretary shall establish, through rulemaking, in consultation as appropriate with other relevant Federal agencies, coastal States, and regional fishery management councils established under section 302 of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1852), a process to make areas of the Exclusive Economic Zone available to eligible persons for the development and operation of offshore aquaculture facilities, which shall include:

(A) Procedures and criteria necessary to issue and modify permits under this Act;
(B) Procedures to coordinate the offshore aquaculture permitting process, and related siting, operations, environmental protection, monitoring, enforcement, research, and economic and social activities, with similar activities administered by other Federal agencies and coastal States;
(C) Consideration of the potential environmental, social, economic, and cultural impacts of offshore aquaculture and inclusion, where appropriate, of permit conditions to address negative impacts;
(D) Public notice and opportunity for public comment prior to issuance of offshore aquaculture permits;
(E) Procedures to monitor and evaluate compliance with the provisions of offshore aquaculture permits, including the collection

of biological, chemical and physical oceanographic data, and social, production, and economic data; and

(F) Procedures for transferring permits from the original permit holder to a person meeting the eligibility criteria in section 4(b)(2)(A) and able to satisfy the requirements for bonds or other guarantees prescribed under section 4(c)(3).

(2) The Secretary shall prepare an analysis under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) with respect to the process for issuing permits.

(3) The Secretary shall periodically review the procedures and criteria for issuance of offshore aquaculture permits and modify them as appropriate, in consultation as appropriate with other Federal agencies, the coastal States, and regional fishery management councils, based on the best available science.

(4) The Secretary shall consult as appropriate with other Federal agencies and coastal States to identify the environmental requirements that apply to offshore aquaculture under existing laws and regulations. The Secretary shall establish through rulemaking, in consultation with appropriate Federal agencies, coastal States, and regional fishery management councils established under section 302 of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1852), additional environmental requirements to address environmental risks and impacts associated with offshore aquaculture, to the extent necessary. The environmental requirements shall address, but are not limited to:

(A) risks to and impacts on natural fish stocks and fisheries, including safeguards needed to conserve genetic resources, to prevent or minimize the transmission of disease or parasites to wild stocks, and to prevent the escape of marine species that may cause significant environmental harm;

(B) risks to and impacts on marine ecosystems; biological, chemical and physical features of water quality and habitat; marine species, marine mammals and birds;

(C) cumulative effects of the aquaculture operation and other aquaculture operations in the vicinity of the proposed site;

(D) environmental monitoring, data archiving, and reporting by the permit holder;

(E) requirements that marine species propagated and reared through offshore aquaculture be species native to the geographic region unless a scientific risk analysis shows that the risk of harm to the marine environment from the offshore culture of non-indigenous or genetically modified marine species is negligible or can be effectively mitigated; and

(F) maintaining record systems to track inventory and movement of fish or other marine species in the offshore aquaculture facility or harvested from such facility, and, if necessary, tagging,

marking, or otherwise identifying fish or other marine species in the offshore aquaculture facility or harvested from such facility.

(5) The Secretary, in cooperation with other Federal agencies, shall:

(A) Collect information needed to evaluate the suitability of sites for offshore aquaculture; and

(B) Monitor the effects of offshore aquaculture on marine ecosystems and implement such measures as may be necessary to protect the environment. Measures may include, but are not limited to, temporary or permanent relocation of offshore aquaculture sites, a moratorium on additional sites within a prescribed area, and other appropriate measures as determined by the Secretary.

(b) Permits- Subject to the provisions of subsection (e), the Secretary may issue offshore aquaculture permits under such terms and conditions as the Secretary shall prescribe. Permits issued under this Act authorize the permit holder to conduct offshore aquaculture consistent with the provisions of this Act, regulations issued under this Act, any specific terms, conditions and restrictions applied to the permit by the Secretary, and other applicable law.

(1) PROCEDURES FOR ISSUANCE OF PERMITS-

(A) The applicant for an offshore aquaculture permit shall submit an application to the Secretary specifying the proposed location and type of operation, the marine species to be propagated or reared, or both, at the offshore aquaculture facility, and other design, construction, and operational information, as specified by regulation.

(B) Within 120 days after determining that a permit application is complete and has satisfied all applicable statutory and regulatory requirements, as specified by regulation, the Secretary shall issue or deny the permit. If the Secretary is unable to issue or deny a permit within this time period, the Secretary shall provide written notice to the applicant indicating the reasons for the delay and establishing a reasonable timeline for issuing or denying the permit.

(2) PERMIT CONDITIONS-

(A) An offshore aquaculture permit holder must (i) be a resident of the United States, (ii) be a corporation, partnership or other entity organized and existing under the laws of a State or the United States, or (iii) if neither (i) or (ii) applies, to the extent required by the Secretary by regulation after coordination with the Secretary of State, waive any immunity, and consent to the jurisdiction of the United States and its courts, for matters arising in relation to such permit, and appoint and maintain agents within the United States who are authorized to receive and respond to any legal process issued in the United States with respect to such permit holder.

(B) Subject to the provisions of subsection (e), the Secretary shall establish the terms, conditions, and restrictions that apply to

offshore aquaculture permits, and shall specify in the permits the duration, size, and location of the offshore aquaculture facility.

(C) Except for projects involving pilot-scale testing or farm-scale research on aquaculture science and technologies and offshore aquaculture permits requiring concurrence of the Secretary of the Interior under subsection 4(e)(1), the permit shall have a duration of 20 years, renewable thereafter at the discretion of the Secretary in up to 20-year increments. The duration of permits requiring concurrence of the Secretary of the Interior under subsection 4(e)(1) shall be developed in consultation as appropriate with the Secretary of the Interior, except that any such permit shall expire no later than the date that the lessee, or the lessee's operator, submits to the Secretary of the Interior a final application for the decommissioning and removal of an existing facility upon which an offshore aquaculture facility is located.

(D) At the expiration or termination of an offshore aquaculture permit for any reason, the permit holder shall remove all structures, gear, and other property from the site, and take other measures to restore the site as may be prescribed by the Secretary.

(E) Failure to begin offshore aquaculture operations within a reasonable period of time, or prolonged interruption of offshore aquaculture operations, may result in the revocation of the permit.

(3) If the Secretary determines that issuance of a permit is not in the national interest, the Secretary may decline to issue such a permit or may impose such conditions as necessary to address such concerns.

(c) Fees and Other Payments-

(1) The Secretary is authorized to establish, through regulations, application fees and annual permit fees. Such fees shall be deposited as offsetting collections in the Operations, Research, and Facilities (ORF) account. Fees may be collected and made available only to the extent provided in advance in appropriation Acts.

(2) The Secretary may reduce or waive applicable fees or other payments established under this section for facilities used primarily for research.

(3) The Secretary shall require the permit holder to post a bond or other form of financial guarantee, in an amount to be determined by the Secretary as sufficient to cover any unpaid fees, the cost of removing an offshore aquaculture facility at the expiration or termination of an offshore aquaculture permit, and other financial risks as identified by the Secretary.

(d) Compatibility With Other Uses-

(1) The Secretary shall consult as appropriate with other Federal agencies, coastal States, and regional fishery management councils to ensure that offshore aquaculture for which a permit is issued under this section is compatible with the use of the Exclusive Economic Zone for navigation, fishing, resource protection, recreation, national defense (including military readiness), mineral exploration and development, and other activities.

(2) The Secretary shall not authorize permits for new offshore aquaculture facilities within 12 miles of the coastline of a coastal State if that coastal State has submitted a written notice to the Secretary that the coastal State opposes such activities. This provision will not apply to permit applications received by the Secretary prior to the date the notice is received from a coastal State. A coastal State that transmitted such notice to the Secretary under this paragraph may revoke that notice in writing at any time.

(3) Federal agencies implementing this Act, persons subject to this Act, and coastal States seeking to review permit applications under this Act shall comply with the applicable section of the Coastal Zone Management Act (i.e., 16 U.S.C. 1456(c)(1), (c)(3)(A), (c)(3)(B) or (d)) and its corresponding Federal regulations.

(4) Offshore aquaculture conducted in accordance with permits issued pursuant to this Act is excluded from the definition of `fishing' in the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1802(15)). The Secretary shall ensure, to the extent practicable, that offshore aquaculture does not interfere with conservation and management measures promulgated under the Magnuson-Stevens Fishery Conservation and Management Act.

(5) The Secretary may promulgate regulations that the Secretary finds to be reasonable and necessary to protect offshore aquaculture facilities, and, where appropriate, shall request that the Secretary of the department in which the Coast Guard is operating establish navigational safety zones around such facilities. In addition, in the case of any offshore aquaculture facility described in section 4(e)(1), the Secretary of the department in which the Coast Guard is operating shall consult with the Secretary of the Interior before designating such a zone.

(6) After consultation with the Secretary, the Secretary of State, and the Secretary of Defense, the Secretary of the department in which the Coast Guard is operating may designate a zone of appropriate size around and including any offshore aquaculture facility for the purpose of navigational safety. In such a zone, no installations, structures, or uses will be allowed that are incompatible with the operation of the offshore aquaculture facility. The Secretary of the department in which the Coast Guard is operating may define, by rulemaking, activities that are allowed within such a zone.

(7)(A) Subject to paragraph (B), if the Secretary, after consultation with Federal agencies as appropriate and after affording the permit holder notice and an opportunity to be heard, determines that suspension, modification, or revocation of a permit is in the national interest, the Secretary may suspend, modify, or revoke such permit.

(B) If the Secretary determines that an emergency exists that poses a risk to the safety of humans, to the marine environment or marine species, or to the security of the United States and that requires suspension, modification, or

revocation of a permit, the Secretary may suspend, modify, or revoke the permit for such time as the Secretary may determine necessary to meet the emergency. The Secretary shall afford the permit holder a prompt post-suspension or post-modification opportunity to be heard regarding the suspension, modification, or revocation.

(8) Permits issued under this Act do not supersede or substitute for any other authorization required under applicable Federal or State law or regulation.

(e) Actions Affecting the Outer Continental Shelf-

(1) The Secretary shall obtain the concurrence of the Secretary of the Interior on permits for offshore aquaculture facilities located:

(A) on leases, right-of-use and easements, or rights of way authorized or permitted under the Outer Continental Shelf Lands Act, as amended (43 U.S.C. 1331, et seq.), or

(B) within 1 mile of any other facility permitted or for which a plan has been approved under the Outer Continental Shelf Lands Act.

(2) Offshore aquaculture may not be located on facilities subject to section 4(e)(1)(A) without the prior consent of the lessee, its designated operator, and owner of the facility.

(3) The Secretary of the Interior shall review and approve any agreement between a lessee, designated operator, and owner of a facility subject to this subsection and a prospective aquaculture operator to ensure that it is consistent with the Federal lease terms, Department of the Interior regulations, and the Secretary of the Interior's role in the protection of the marine environment, property, or human life or health. An agreement under this subsection shall be part of the information reviewed pursuant to the Coastal Zone Management Act review process described in subsection 4(e)(4) and shall not be subject to a separate Coastal Zone Management Act review.

(4) Coordinated Coastal Zone Management Act review

(A) If the applicant for an offshore aquaculture facility that will utilize a facility subject to this subsection is required to submit to a coastal State a consistency certification for its aquaculture application under section 307(c)(3)(A) of the Coastal Zone Management Act (16 U.S.C. 1456(c)(3)(A)), the coastal State's review under the Coastal Zone Management Act and corresponding Federal regulations shall also include any modification to a lessee's approved plan or other document for which a consistency certification would otherwise be required under applicable Federal regulations, including changes to its plan for decommissioning any facilities, resulting from or necessary for the issuance of the offshore aquaculture permit, provided that information related to such modifications or changes is received by the coastal State at the time the coastal State receives the offshore

aquaculture permit applicant's consistency certification. In this case, lessees are not required to submit a separate consistency certification for any such modification or change under section 307(c)(3)(B) of the Coastal Zone Management Act (16 U.S.C. 1456(c)(3)(B)) and the coastal State's concurrence or objection, or presumed concurrence, under section 307(c)(3)(A) of the Coastal Zone Management Act (16 U.S.C. 1456(c)(3)(A)) in a consistency determination for the offshore aquaculture permit, shall apply to both the offshore aquaculture permit and to any related modifications or changes to a lessee's plan approved under the Outer Continental Shelf Lands Act.

(B) If a coastal State is not authorized by section 307(c)(3)(A) of the Coastal Zone Management Act (16 U.S.C. 1456(c)(3)(A)) and corresponding Federal regulations to review an offshore aquaculture application submitted under this Act, then any modifications or changes to a lessee's approved plan or other document requiring approval from the Department of the Interior, shall be subject to coastal State review pursuant to the requirements of section 307(c)(3)(B) of the Coastal Zone Management Act (16 U.S.C. 1456(c)(3)(B)), if a consistency certification for those modifications or changes is required under applicable Federal regulations.

(5) For offshore aquaculture located on facilities subject to this subsection, the aquaculture permit holder and all parties that are or were lessees of the lease on which the facilities are located during the term of the offshore aquaculture permit shall be jointly and severally liable for the removal of any construction or modifications related to aquaculture operations if the aquaculture permit holder fails to do so and bonds established under this Act for aquaculture operations prove insufficient to cover those obligations. This subsection does not affect obligations to decommission facilities under the Outer Continental Shelf Lands Act.

(6) For aquaculture projects or operations subject to this subsection, the Secretary of the Interior is authorized to:

(A) Promulgate such rules and regulations as are necessary and appropriate to carry out the provisions of this subsection;

(B) Require and enforce such additional terms or conditions as the Secretary of the Interior deems necessary to protect the marine environment, property, or human life or health to ensure the compatibility of aquaculture operations with all activities for which permits have been issued under the Outer Continental Shelf Lands Act;

(C) Issue orders to the offshore aquaculture permit holder to take any action the Secretary of the Interior deems necessary to ensure safe operations on the facility to protect the marine environment, property, or human life or health. Failure to comply with the

Secretary of the Interior's orders will be deemed to constitute a violation of the Outer Continental Shelf Lands Act; and
(D) Enforce all requirements contained in such regulations, lease terms and conditions and orders pursuant to the Outer Continental Shelf Lands Act.

SEC. 5. RESEARCH AND DEVELOPMENT.

(a) In consultation as appropriate with other Federal agencies, the Secretary may establish and conduct an integrated, multidisciplinary, scientific research and development program to further marine aquaculture technologies that are compatible with the protection of marine ecosystems.
(b) The Secretary is authorized to conduct research and development in partnership with offshore aquaculture permit holders.
(c) The Secretary, in collaboration with the Secretary of Agriculture, shall conduct research to reduce the use of wild fish in aquaculture feeds, including but not limited to the substitution of seafood processing wastes, cultured marine algae and microbial sources of nutrients important for human health and nutrition, agricultural crops, and other products.

SEC. 6. ADMINISTRATION.

(a) The Secretary shall promulgate such regulations as are necessary and appropriate to carry out the provisions of this Act. The Secretary may at any time amend such regulations, and such regulations shall, as of their effective date, apply to all operations conducted pursuant to permits issued under the provisions of this Act, regardless of the date of the issuance of such permit.
(b) The Secretary shall have the authority to enter into and perform such contracts, leases, grants, or cooperative agreements as may be necessary to carry out the purposes of this Act and on such terms as the Administrator of the National Oceanic and Atmospheric Administration deems appropriate.
(c) For purposes related to the enforcement of this Act, the Secretary is authorized to use, with their consent and with or without reimbursement, the land, services, equipment, personnel, and facilities of any department, agency or instrumentality of the United States, or of any state, local government, Indian tribal government, Territory or possession, or of any political subdivision thereof, or of any foreign government or international organization.
(d) Authority to Utilize Grant Funds

(1) Except as provided in paragraph (2), the Secretary is authorized to apply for, accept, and obligate research grant funding from any Federal source operating competitive grant programs where such funding furthers the purpose of this Act.
(2) The Secretary may not apply for, accept, or obligate any grant funding under paragraph (1) for which the granting agency lacks authority to grant funds to Federal agencies, or for any purpose or subject to conditions that are prohibited by law or regulation.

(3) Appropriated funds may be used to satisfy a requirement to match grant funds with recipient agency funds, except that no grant may be accepted that requires a commitment in advance of appropriations.
(4) Funds received from grants shall be deposited in the National Oceanic and Atmospheric Administration account that serves to accomplish the purpose for which the grant was awarded.

(e) Nothing in this Act shall be construed to displace, supersede, or limit the jurisdiction, responsibilities or rights of any Federal or State agency, or Indian Tribe or Alaska Native organization, under any Federal law or treaty.

(f) The Constitution, laws, and treaties of the United States shall apply to an offshore aquaculture facility located in the Exclusive Economic Zone for which a permit has been issued or is required under this Act and to activities in the Exclusive Economic Zone connected, associated, or potentially interfering with the use or operation of such facility, in the same manner as if such facility were an area of exclusive Federal jurisdiction located within a State. Nothing in this Act shall be construed to relieve, exempt, or immunize any person from any other requirement imposed by an applicable Federal law, regulation, or treaty. Nothing in this Act shall be construed to confer citizenship to a person by birth or through naturalization or to entitle a person to avail himself of any law pertaining to immigration, naturalization, or nationality.

(g) The law of the nearest adjacent coastal State, now in effect or hereafter adopted, amended, or repealed, is declared to be the law of the United States, and shall apply to any offshore aquaculture facility for which a permit has been issued pursuant to this Act, to the extent applicable and not inconsistent with any provision or regulation under this Act or other Federal laws and regulations now in effect or hereafter adopted, amended, or repealed. All such applicable laws shall be administered and enforced by the appropriate officers and courts of the United States. For purposes of this subsection, the nearest adjacent coastal State shall be that State whose seaward boundaries, if extended beyond 3 nautical miles, would encompass the site of the offshore aquaculture facility. State taxation laws shall not apply to offshore aquaculture facilities in the Exclusive Economic Zone.

SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Secretary $4,052,000 in fiscal year 2008 and thereafter such sums as may be necessary for purposes of carrying out the provisions of this Act.

SEC. 8. UNLAWFUL ACTIVITIES.

It is unlawful for any person--

(a) to falsify any information required to be reported, communicated, or recorded pursuant to this Act or any regulation or permit issued under this Act, or to fail to submit in a timely fashion any required information, or to fail to report to the Secretary immediately any change in circumstances that has the effect of rendering any such information false, incomplete, or misleading;

(b) to engage in offshore aquaculture within the Exclusive Economic Zone of the United States or operate an offshore aquaculture facility within the Exclusive Economic Zone of the United States, except pursuant to a valid permit issued under this Act;
(c) to refuse to permit an authorized officer to conduct any lawful search or lawful inspection in connection with the enforcement of this Act or any regulation or permit issued under this Act;
(d) to forcibly assault, resist, oppose, impede, intimidate, or interfere with an authorized officer in the conduct of any search or inspection in connection with the enforcement of this Act or any regulation or permit issued under this Act;
(e) to resist a lawful arrest or detention for any act prohibited by this section;
(f) to interfere with, delay, or prevent, by any means, the apprehension, arrest, or detection of another person, knowing that such person has committed any act prohibited by this section;
(g) to import, export, sell, receive, acquire or purchase in interstate or foreign commerce any marine species in violation of this Act or any regulation or permit issued under this Act;
(h) upon the expiration or termination of any aquaculture permit for any reason, fail to remove all structures, gear, and other property from the site, or take other measures, as prescribed by the Secretary, to restore the site;
(i) to violate any provision of this Act, any regulation promulgated under this Act, or any term or condition of any permit issued under this Act; or
(j) to attempt to commit any act described in subsections (a), (b), (g), (h) or (i).

SEC. 9. ENFORCEMENT PROVISIONS.

(a) Duties of Secretaries- Subject to sections 4(e)(6)(B) and (D), this Act shall be enforced by the Secretary and the Secretary of the department in which the Coast Guard is operating.

(b) Powers of Enforcement-

(1) Any officer who is authorized pursuant to subsection (a) of this section by the Secretary or the Secretary of the department in which the Coast Guard is operating to enforce the provisions of this Act may--

(A) with or without a warrant or other process--

(i) arrest any person, if the officer has reasonable cause to believe that such person has committed or is committing an act prohibited by section 8 of this Act;
(ii) search or inspect any offshore aquaculture facility and any related land-based facility;
(iii) seize any offshore aquaculture facility (together with its equipment, records, furniture, appurtenances, stores, and cargo), and any vessel or vehicle, used or employed in aid of, or with respect to which it reasonably appears that such offshore aquaculture facility was used or employed in aid of, the violation of any provision of this Act or any regulation or permit issued under this Act;

(iv) seize any marine species (wherever found) retained, in any manner, in connection with or as a result of the commission of any act prohibited by section 8 of this Act;
(v) seize any evidence related to any violation of any provision of this Act or any regulation or permit issued under this Act;

(B) execute any warrant or other process issued by any court of competent jurisdiction; and

(C) exercise any other lawful authority.

(2) Any officer who is authorized pursuant to subsection (a) of this section by the Secretary or the Secretary of the department in which the Coast Guard is operating to enforce the provisions of this Act may make an arrest without a warrant for (i) an offense against the United States committed in his presence, or (ii) for a felony cognizable under the laws of the United States, if he has reasonable grounds to believe that the person to be arrested has committed or is committing a felony. Any such authorized person may execute and serve a subpoena, arrest warrant or search warrant issued in accordance with Rule 41 of the Federal Rules of Criminal Procedure, or other warrant of civil or criminal process issued by any officer or court of competent jurisdiction for enforcement of the Act, or any regulation or permit issued under this Act.

(c) Issuance of Citations- If any authorized officer finds that a person is engaging in or has engaged in offshore aquaculture in violation of any provision of this Act, such officer may issue a citation to that person.

(d) Liability for Costs- Any person who violates this Act, or a regulation or permit issued under this Act, shall be liable for the cost incurred in storage, care, and maintenance of any marine species or other property seized in connection with the violation.

SEC. 10. CIVIL ENFORCEMENT AND PERMIT SANCTIONS.

(a) Civil Administrative Penalties-

(1) Any person who is found by the Secretary, after notice and opportunity for a hearing in accordance with section 554 of Title 5, United States Code, to have violated this Act, or a regulation or permit issued under this Act, shall be liable to the United States for a civil penalty. The amount of the civil penalty under this paragraph shall not exceed $200,000 for each violation. Each day of a continuing violation shall constitute a separate violation.

(2) COMPROMISE OR OTHER ACTION BY THE SECRETARY- The Secretary may compromise, modify, or remit, with or without conditions, any civil administrative penalty which is or may be imposed under this section and that has not been referred to the Attorney General for further enforcement action.

(b) Civil Judicial Penalties- Any person who violates any provision of this Act, or any regulation or permit issued thereunder, shall be subject to a civil penalty not to exceed $250,000 for each such violation. Each day of a continuing violation

shall constitute a separate violation. The Attorney General, upon the request of the Secretary, may commence a civil action in an appropriate district court of the United States, and such court shall have jurisdiction to award civil penalties and such other relief as justice may require. In determining the amount of a civil penalty, the court shall take into account the nature, circumstances, extent, and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior violations and such other matters as justice may require. In imposing such penalty, the district court may also consider information related to the ability of the violator to pay.

(c) Permit Sanctions-

(1) In any case in which--

(A) an offshore aquaculture facility has been used in the commission of an act prohibited under section 8 of this Act;

(B) the owner or operator of an offshore aquaculture facility or any other person who has been issued or has applied for a permit under section 4 of this Act has acted in violation of section 8 of this Act; or

(C) any amount in settlement of a civil forfeiture imposed on an offshore aquaculture facility or other property, or any civil penalty or criminal fine imposed under this Act or imposed on any other person who has been issued or has applied for a permit under any fishery resource statute enforced by the Secretary, has not been paid and is overdue, the Secretary may--

(i) revoke any permit issued with respect to such offshore aquaculture facility or applied for by such a person under this Act, with or without prejudice to the issuance of subsequent permits;

(ii) suspend such permit for a period of time considered by the Secretary to be appropriate;

(iii) deny such permit; or

(iv) impose additional conditions and restrictions on such permit.

(2) In imposing a sanction under this subsection, the Secretary shall take into account--

(A) the nature, circumstances, extent, and gravity of the prohibited acts for which the sanction is imposed; and

(B) with respect to the violator, the degree of culpability, any history of prior violations, and such other matters as justice may require.

(3) Transfer of ownership of an offshore aquaculture facility, by sale or otherwise, shall not extinguish any permit sanction that is in effect or is pending at the time of transfer of ownership. Before executing the transfer of ownership of an offshore aquaculture facility, by sale or otherwise, the owner shall disclose in writing to the prospective transferee the existence of any permit sanction that will be in effect or pending with respect to the offshore aquaculture facility at the time of the transfer. The Secretary may

waive or compromise a sanction in the case of a transfer pursuant to court order.

(4) In the case of any permit that is suspended under this subsection for nonpayment of a civil penalty or criminal fine, the Secretary shall reinstate the permit upon payment of the penalty or fine and interest thereon at the prevailing rate.

(5) No sanctions shall be imposed under this subsection unless there has been prior opportunity for a hearing on the facts underlying the violation for which the sanction is imposed, either in conjunction with a civil penalty proceeding under this section or otherwise.

(d) Injunctive Relief- Upon the request of the Secretary, the Attorney General of the United States is authorized to commence a civil action for appropriate relief, including a permanent or temporary injunction, for any violation of any provision of this Act, or regulation or permit issued under this Act.

(e) Hearing- For the purposes of conducting any investigation or hearing under this section or any other statute administered by the National Oceanic and Atmospheric Administration which is determined on the record in accordance with the procedures provided for under section 554 of Title 5, the Secretary may issue subpoenas for the attendance and testimony of witnesses and the production of relevant papers, books, and documents, and may administer oaths. Witnesses summoned shall be paid the same fees and mileage that are paid to witnesses in the courts of the United States. In case of contempt or refusal to obey a subpoena served upon any person pursuant to this subsection, the district court of the United States for any district in which such person is found, resides, or transacts business, upon application by the United States and after notice to such person, shall have jurisdiction to issue an order requiring such person to appear and give testimony before the Secretary or to appear and produce documents before the Secretary, or both, and any failure to obey such order of the court may be punished by such court as a contempt thereof. Nothing in this Act shall be construed to grant jurisdiction to a district court to entertain an application for an order to enforce a subpoena issued by the Secretary of Commerce to the Federal Government or any entity thereof.

(f) Jurisdiction- The United States district courts shall have original jurisdiction of any action under this section arising out of or in connection with the construction or operation of aquaculture facilities, and proceedings with respect to any such action may be instituted in the judicial district in which any defendant resides or may be found, or in the judicial district of the adjacent coastal State nearest the place where the cause of action arose. For the purpose of this section, American Samoa shall be included within the judicial district of the District Court of the United States for the District of Hawaii. Each violation shall be a separate offense and the offense shall be deemed to have been committed not only in the district where the violation first occurred, but also in any other district as authorized by law.

(g) Collection- If any person fails to pay an assessment of a civil penalty after it has become a final and unappealable order, or after the appropriate court has entered final judgment in favor of the Secretary, the matter may be referred to the

Attorney General, who may recover the amount (plus interest at currently prevailing rates from the date of the final order). In such action the validity, amount and appropriateness of the final order imposing the civil penalty shall not be subject to review. Any person who fails to pay, on a timely basis, the amount of an assessment of a civil penalty shall be required to pay, in addition to such amount and interest, attorney's fees and costs for collection proceedings and a quarterly nonpayment penalty for each quarter during which such failure to pay persists. Such nonpayment penalty shall be in an amount equal to 20 percent of the aggregate amount of such persons penalties and nonpayment penalties which are unpaid as of the beginning of such quarter.

(h) Nationwide Service of Process- In any action by the United States under this title, process may be served in any district where the defendant is found, resides, transacts business or has appointed an agent for the service of process, and for civil cases may also be served in a place not within the United States in accordance with Rule 4 of the Federal Rules of Civil Procedure.

SEC. 11. CRIMINAL OFFENSES.

(a) Any person (other than a foreign government or any entity of such government) who knowingly commits an act prohibited by subsections 8(c), (d), (e), or (f) of the Act, shall be imprisoned for not more than five years or shall be fined not more than $500,000 for individuals or $1,000,000 for an organization, or both; except that if in the commission of any such offense the individual uses a dangerous weapon, engages in conduct that causes bodily injury to any officer authorized to enforce the provisions of this title, or places any such officer in fear of imminent bodily injury, the maximum term of imprisonment is not more than ten years.

(b) Any person (other than a foreign government or any entity of such government) who knowingly violates any other provision of section 8, except subsections 8(c), (d), (e) or (f), of the Act, or any provision of any regulation promulgated pursuant to this title or any permit issued under this title, shall be imprisoned for not more than five years, or shall be fined not more than $500,000 for an individual or $1,000,000 for an organization, or both.

(c) The United States district courts shall have original jurisdiction of any action arising under this section out of or in connection with the construction or operation of aquaculture facilities, and proceedings with respect to any such action may be instituted in the judicial district in which any defendant resides or may be found. For the purpose of this section, American Samoa shall be included within the judicial district of the District Court of the United States for the District of Hawaii. Each violation shall be a separate offense and the offense shall be deemed to have been committed not only in the district where the violation first occurred, but also in any other district as authorized under law.

SEC. 12. FORFEITURES.

(a) Criminal Forfeiture- A person who is convicted of an offense in violation of section 11 of this Act shall forfeit to the United States--

(1) any property, real or personal, constituting or traceable to the gross proceeds obtained, or retained, as a result of the offense including, without limitation, any marine species (or the fair market value thereof) taken or retained in connection with or as a result of the offense; and

(2) any property, real or personal, used or intended to be used to commit or to facilitate the commission of the offense, including, without limitation, any offshore aquaculture facility or vessel, including its structure, equipment, furniture, appurtenances, stores, and cargo, and any vehicle or aircraft.

Pursuant to title 28, United States Code, section 2461(c), the provisions of section 413 of the Controlled Substances Act (21 U.S.C. 853) with the exception of subsection (d) of that section, shall apply to criminal forfeitures under this section.

(b) Civil Forfeiture- The following shall be subject to forfeiture to the United States and no property right shall exist in them:

(1) any property, real or personal, constituting or traceable to the gross proceeds obtained, or retained, as a result of a violation of any provision of section 8 or subsection 4(b)(2)(D) of this Act, including, without limitation, any marine species (or the fair market value thereof) taken or retained in connection with or as a result of the violation; and

(2) any property, real or personal, used or intended to be used to commit or to facilitate the commission of any such violation, including, without limitation, any offshore aquaculture facility or vessel, including its structure, equipment, furniture, appurtenances, stores, and cargo, and any vehicle or aircraft.

Civil forfeitures under this section shall be governed by the procedures set forth in title 18, United States Code, Chapter 46.

(c) Rebuttable Presumption- In any criminal or civil forfeiture proceeding under this section, there is a rebuttable presumption that all marine species found within an offshore aquaculture facility and seized in connection with a violation of section 8 of this Act were taken or retained in violation of this Act.

SEC. 13. SEVERABILITY AND JUDICIAL REVIEW.

(a) Severability- If any provision of this chapter or the application thereof to any person or circumstances is held invalid, the validity of the remainder of this chapter and of the application of such provision to other persons and circumstances shall not be affected thereby.

(b) Judicial Review-

(1) IN GENERAL- Judicial review of any action taken by the Secretary under this chapter shall be in accordance with sections 701 through 706 of Title 5, except that--

(A) review of any final agency action of the Secretary taken pursuant to section 11(a) or (c) of this title may be had only by the filing of a complaint by an interested person in the United States District Court for the appropriate district; any such complaint must be filed within 30 days of the date such final agency action is taken; and

(B) review of all other final agency actions of the Secretary under this chapter may be had only by the filing of a petition for review by an interested person in the Circuit Court of Appeals of the United States for the Federal judicial district in which such person resides or transacts business which is directly affected by the action taken; such petition shall be filed within 120 days from the date such final action is taken.

(2) LIMITATION OF JUDICIAL REVIEW- Final agency action with respect to which review could have been obtained under paragraph (1)(B) of this subsection shall not be subject to judicial review in any civil or criminal proceeding for enforcement.

(3) AWARDS OF LITIGATION COSTS- In any judicial proceeding under paragraph (1) of this subsection, the court may award costs of litigation (including reasonable attorney and expert witness fees) to any prevailing party whenever it determines that such award is appropriate.

END

APPENDIX C - GULF COUNCIL'S MARINE AQUACULTURE POLICY

The Gulf of Mexico Fishery Management Council (Council) defines marine aquaculture as the cultivation of marine plants or animals for food or other purposes. Recognizing that marine aquaculture presents both potential benefits as well as potential negative impacts, it is the policy of the Council to encourage environmentally responsible marine aquaculture; the Council encourages consideration of the following guidelines:

a. Cultured Species:

The Council recommends that genetic stocks native to the Gulf of Mexico and the geographic area in which they would be cultured receive priority as candidate culture species. Non-native species should be used only after thorough investigation has demonstrated no detrimental impacts on native species. The Council opposes use of non-native species in marine aquaculture systems unless demonstrated there would be no detrimental impacts on native species. The Council particularly opposes use of non-native species in open water environments where escapement can occur. The Council opposes the collection of juvenile native species for grow out.

Collection of native wild brood stock should be regulated in order to prevent overfishing cultured species stocks, and provision should be made to aid enforceability of possession, landing, and marketing of fish that would be illegal if wild caught fish.

Strategies should be adopted to minimize the potential that the genetic fitness (including both genetic variation and genetic composition) of wild populations would be diminished by marine aquaculture activities and escapement from marine aquaculture activities.

An invoice should accompany all cultured species through each sales transaction, including transactions at the place of the final sale to the consumer to verify the origin of the cultured species.

b. Habitat:

To ensure that marine aquaculture activities are environmentally responsible, the following considerations should be made with respect to habitat in that:

(1) Existing inland and offshore habitats important to marine fisheries should be protected from physical alterations or degradation;

(2) A baseline assessment should be conducted as part of the permitting process; and

(3) Sensitive areas, including habitat areas of particular concern, should be avoided.

c. Research:

The Council recommends the marine aquaculture industry demonstrate, in part, its stewardship of Gulf waters by:

(1). Actively educating its member institutions about necessary regulations and permits;

(2). Actively participating in research and monitoring to improve the understanding of marine aquaculture's relationship to coastal and marine ecosystems; and

(3). Participating in cooperative research to enhance knowledge of cultured species.

d. Location, Design, and Operation:

Marine aquaculture operations should be located, designed, operated, and monitored to prevent adverse impacts to estuaries, marine habitats and native fishery stocks. Impacts that cannot be prevented must be fully mitigated in-kind.

Conditions should be maintained to sustain healthy, diverse, native biological communities without the production of nuisance, toxic, or oxygen-demanding conditions.

Standard operating procedures should contain methods to prevent escapement, accidental transport, or release of cultured organisms.

Marine aquaculture operations should be conducted in accordance with a management plan that incorporates a routine monitoring program. The plan should be approved prior to the beginning of operations as part of the permitting process and modified as needed in accordance with adaptive management principles and based on the results of the monitoring program.

Marine aquaculture operations should develop an "emergency plan" that covers natural disasters such as tropical stouiis, floods, and hurricanes.

Ingress and egress of native wild organisms in natural and public waters should not be impeded by physical or water quality barriers.

Marine aquaculture operations in the EEZ should minimize disruption of navigation in natural or public waters.

Marine aquaculture facility locations should avoid areas of high commercial and recreational fishing activities.

Marine aquaculture facilities should avoid or at least minimize conflicts with or restrictions on recreational, for-hire, or commercial fishing activities.

When designing land-based marine aquaculture facilities, settling ponds, man-made wetlands, or other appropriate technologies should be used to allow for suspended solids

to settle out, allow the nutrient load to dissipate, and reduce overall discharge velocities prior to being discharged into the receiving water body.

As part of the permit process, measures should be established to deal with intentional or unintentional facility or property abandonment or other environmental liability to ensure that sites can be reclaimed without public expense and with minimal risk of long-term impact.

As part of the permitting process procedures should be established to deal with: removal of damaged equipment from the permitted site; recovery of equipment that may be unintentionally transported from the permitted site; and restoration of habitats that may be damaged by marine aquaculture activities, whether at the permitted site or elsewhere.

Mechanisms should be developed to ensure that marine aquaculture facilities and operations avoid harmful effects to both wild aquatic and terrestrial organisms.

e. Water Quality:

Marine aquaculture facilities should be designed, maintained, and operated in such a manner that avoids impacts to the local environment by utilizing water conservation practices and discharging effluent that protects existing designated use of receiving water and meets applicable state and federal water quality guidelines.

Marine aquaculture facilities should develop, implement, and monitor best management practices to conserve water and improve effluent water quality.

Comprehensive marine aquaculture facility waste management practices should be required to minimize negative impacts of discharge from the facility.

f. Health Management and Disease Control:

Marine aquaculture activities should:

1. Minimize impacts of disease outbreaks if they occur;

2. Create and implement health evaluation programs and policies that prevent the importation or release of disease pathogens or parasites of regulatory concern. These policies should support development and utilization of technologies to identify and control disease organisms;

3. Develop effective disease control, quarantine, and inventory destruction procedures to prevent the spread of disease to public waterways, native species, and other marine aquaculture facilities;

4. Create and implement health management strategies for marine aquaculture organisms in cooperation with states, federal agencies, industry, veterinarians, and scientists; and

5. Use only FDA approved therapeutic and chemical treatments as part of best management practices.

APPENDIX D – ALTERNATIVES CONSIDERED DURING THE SCOPING AND PUBLIC REVIEW PROCESS, BUT REJECTED FROM DETAILED STUDY IN THE FISHERY MANAGEMENT PLAN.

1. Require all permit applicants to indicate the actions they will take to comply with the provisions of the Council's Marine Aquaculture Policy that are applicable to offshore aquaculture.

Discussion: Actions and preferred alternatives considered in this FMP are consistent with the Council's Marine Aquaculture Policy. Permittees will be required to abide by numerous requirements outlined in the Council's Aquaculture Policy, including: using species native to the Gulf of Mexico, minimizing impacts of disease outbreaks, conducting routine monitoring, appropriately siting facilities, and protecting important habitat. In addition, Action 3 includes additional plans permittees must submit to NOAA Fisheries Service in order to ensure animal health is appropriately managed, genetic impacts on wild stocks are limited, environmental impacts are monitored, plans are in place for emergencies, and practices for collecting and spawning of broodstock.

2. Require permits for both persons (or firms) spawning brood stock and those raising fingerlings or juveniles in the EEZ.

Discussion: Action 1 discusses the types of permits that would be required for conducting aquaculture in the EEZ. The Council's preferred alternative (Alternative 2) would only require an operating permit, while Alternative 3 (Action 1) would require both an operating and a siting permit. The permit for operating a facility in the EEZ would authorize collection of broodstock. Additionally, numerous application and operational requirements in Action 2 would place the onus on the permit applicant/permittee to certify that hatchery broodstock are tagged, fin clips or other genetic material from broodstock are submitted to NOAA Fisheries Service, and juveniles used for growout are certified as native, non-genetically modified and non-transgenic species. The applicant or permittee would also be required to submit contact information pertaining to hatcheries.

3. Permits should be issued 3 years or 7 years.

Discussion: Action 2 discusses the various permit durations considered by the Council. These range from 1 year (EFP) to an indefinite time period. The Council also considered permit durations of 5, 10 and 20 years. Permit durations of 3 and 7 years are within the range of possible permit durations considered within this FMP.

4. All fish landed or harvested from the facility should be reported quarterly to NMFS (by species and pounds) or the permit will not be renewed.

Discussion: Action 8 requires aquaculture permittees to maintain and make available to NOAA Fisheries during inspection or upon request harvest and sale records. There is no timeframe for providing this information, although such information would be a part of

the annual report submitted to NOAA Fisheries Service. Additionally, Action 2, requires NOAA Fisheries Service be notified prior to harvest, transport, and landing of cultured fish. Requiring quarterly reports was deemed unnecessary since most fish species will require greater than three months to grow to marketable sizes.

5. Require a program approved by NMFS and EPA to monitor the dissolved oxygen, carbon dioxide, ammonia and other water quality parameters around the marine aquaculture facility.

Discussion: Water quality standards and monitoring requirements are required by the EPA and NOAA Fisheries Service does not have the authority to require water quality monitoring for aquaculture facilities. Action 8 requires permittees to provide NOAA Fisheries Service with copies of monitoring reports from other federal agencies. Action 2 requires operations to conduct feed management and monitoring practices in compliance with EPA regulations at 40 CFR 451.21. Standards and monitoring requirements will be specified in the NPDES permit issued by the EPA, in consultation with NOAA Fisheries Service and other state and federal agencies.

6. Require each permittee to specify their operational plans for dealing with hurricanes, vessel collision, fire, and structure damage.

Discussion: Action 2 requires permittees to submit to NOAA Fisheries Service a copy of their emergency disaster plan. The plan shall include, but is not limited to: procedures for preparing allowable aquaculture systems, offshore aquaculture equipment, and cultured organisms in the event of a disaster.

7. Prohibit the use of species that are threatened, endangered, candidates for threatened species or species for which wild harvest is prohibited.

Discussion: No species currently managed by the Council and proposed for aquaculture are threatened or endangered or considered candidates for threatened or endangered status. Nassau grouper and speckled hind are listed as a Species of Concern by NOAA Fisheries Service and the harvest of red drum, goliath grouper, and Nassau grouper in the Gulf of Mexico EEZ is prohibited. Red drum is abundant in state waters and marine stock enhancement of this species has been occurring in Texas and Florida for many years. Goliath grouper is no longer overfishing, but its overfished status is unknown. This species was removed from NOAA Fisheries Service' Species of Concern list in 2006. Nassau grouper is not undergoing overfishing and its overfished status is unknown. The Council did not want to prohibit species that are suitable for aquaculture, but that are currently prohibited from harvest (in particular red drum). To ensure wild stocks of these species are not illegally harvested, the Council developed numerous operational, reporting, and recordkeeping requirements (see Actions 2 and 8) that permittees would have to abide by. Regardless of what species is or is not allowed for harvest, NOAA Fisheries will need to conduct consultations under the ESA to determine if aquaculture operations will adversely affect endangered or threatened species.

8. Quarterly reports will be filed with NOAA Fisheries Service on:

- **substrate and water quality monitoring;**
- **disease outbreak;**
- **any use of medicinal therapeutics;**
- **summaries of events related to escapement of fish, damage to cages or pens and marine mammal and endangered species interaction during that quarter.**

Discussion: Action 8 requires permittees to report all incidents of suspected disease episodes with 24 hours of diagnosis to NOAA Fisheries Service. Similarly, permittees must report major escapement and entanglements or interactions with endangered species and marine mammals within 24 hours of discovery. Major escapement is defined as the escape of 5 percent or more of the cultured organisms in a seven consecutive day period. For all other reporting requirements an annual standardized report will be required for each aquaculture facility. Requiring an annual, rather than quarterly report, was deemed more appropriate since the amount of time to raise most cultured species to marketable size is greater than three months and NOAA Fisheries Service will be notified immediately (within 24 hours) if major escapement, disease outbreaks, or entanglements and interactions occur. Additionally, facilities will be required to abide by FDA regulations when using medicinal therapeutics and EPA standards for pollution discharge and monitoring. These requirements fall outside the authority of NOAA Fisheries Service.

9. Describe plans for one or more of the following:

- **physical maintenance of the facility;**
- **preventing localized biological oxygen demand (BOD)**
- **localized hypoxic conditions.**

Discussion: The EPA establishes standards for water pollution discharge and monitoring. Requiring plans for preventing BOD and localized hypoxic conditions is outside the authority of NOAA Fisheries Service. However, Action 2 does require permittees to comply with EPA feed management and monitoring practices. Standards and monitoring requirements will be specified in the NPDES permit issued by the EPA, in consultation with NOAA Fisheries Service and other state and federal agencies.

Physical maintenance of facilities is considered a normal business practice. Proper maintenance will potentially increase productivity of a facility and minimize the risk of system failure and fish escapement. Requiring a plan for physically maintaining a facility was deemed unnecessary, since it will be to the benefit of the operator/permittee to properly maintain their facility.

10. Allow the aquaculture of all marine species native to the Gulf of Mexico, except highly migratory species.

Discussion: The Council believed it was important to include highly migratory species for use in aquaculture. Although the Council does not have the authority to regulate

highly migratory species, Action 4, Alternative 4 states that the Council will send a letter to NOAA Fisheries Service requesting development of concurrent rulemaking to allow aquaculture of highly migratory species.

11. Allow the aquaculture of all marine species managed by the Council.

Discussion: The Council concluded that shrimp would not be cultured in the EEZ since they are normally raised in coastal ponds in jurisdiction of the states, e.g., about 1 million pounds are raised annually in Texas waters. The regional fishery management councils in the Southeast all prohibit harvest of corals except for scientific purposes. Allowance for aquaculture would increase the likelihood that coral will be illegally harvested for the aquarium trade.

12: Describe plans for the following:

i. **Limit genetic impacts on wild Gulf stocks. Required components of the plan would include: 1) the source of brood fish for fingerling production by geographic area, 2) the frequency broodstock are replaced, and 3) whether any cultured fish will be raised to sexual maturity.**
ii. **Aquatic animal health management. Required components of the aquatic health management plan would include: 1) identification of an animal health management expert and frequency of visits, 2) procedures for notifying NOAA of reportable disease, 3) procedures for pre-stocking health inspections of aquatic animals, and 4) freezing or refrigerating diseased animals so they are available for inspection. "Diseased" animals are those infested with parasites and/or infected by bacteria or virus.**
iii. **Collecting and spawning brood stock and rearing fingerlings. Required components of the plan would include: 1) a description of the culture facility; 2) the number, species, and size of broodstock proposed to be captured and the methods/gears used for capturing, holding, and transporting broodstock; 3) anticipated size to which fingerlings will be raised; and 4) a list of names and addresses for spawning and rearing facilities used to obtain fingerlings and any relevant aquaculture permit numbers.**
iv. **Environmental monitoring. Required components of the plan would include: 1) a plan for interactions with threatened or endangered species, 2) a description of how environmental impacts would be monitored, and 3) compliance with EPA standards.**

Discussion: The above plans have been replaced with specific regulatory requirements in Actions 2 and 8 in response to NOAA General Counsel and public comments. The above plans did not include any criteria for determining adequacy and there was concern that these plans would greatly vary in quality and content from one applicant/permittee to the next. Specific regulatory requirements now identified in the FMP will allow for greater standardization during review of permit applications.

13. Allow cages and net pens for finfish, spiny lobster, and stone crab culture and floating longlines and ropes for shellfish, algae, and sponge culture in the Gulf of Mexico EEZ.

Discussion: Allowable species proposed for aquaculture include finfish, spiny lobster, and stone crabs. None of these species could be grown on longlines or ropes; therefore, this alternative was rejected by the Council.

14. Prohibit marine aquaculture within X feet (X meters) of oil and gas platforms.

Discussion: The Council discussed this alternative at their April 2008 meeting. Comments during public hearings expressed concerns about mercury contamination resulting from aquaculture occurring at or near oil and gas platforms. Because oil and gas platforms will likely serve as an important infrastructure for many offshore aquaculture operations, the Council moved this alternative to considered, but rejected. Although there is much debate and disagreement about the effects of oil and gas platforms on marine fish and mercury contamination, the results of research to date indicate oil and gas platforms do not generally elevate levels of mercury in fish and other seafood. The following is an excerpt from the MMS website at: http://www.gomr.mms.gov/homepg/regulate/environ/mercury.html.

Mercury is a naturally occurring element that exists in sediments, rocks, oil, and coal. Mercury also occurs naturally in very small quantities in barite, a major component of drilling fluids used by the offshore oil and gas industry. However, this mercury is locked in the barite grains and not easily transferred to the marine life, which live around the platforms. Methylmercury is primarily created from mercury by a chemical process controlled by bacteria and only occurs when the right conditions exist. There is no evidence that mercury from drilling muds changes into methylmercury. Disposal of drilling fluids only occurs during drilling operations. Oil companies cannot discharge drilling fluids without a discharge permit from EPA. In the barite used to make drilling fluids, the EPA requires that the concentration of mercury be no more than one part per million (see estimate of annual discharge). This reduces the addition of mercury to the environment to values similar to the concentration of mercury found in marine sediments throughout the Gulf of Mexico.

The MMS study, Gulf of Mexico Offshore Operations Monitoring Experiment (GOOMEX), was completed in 1995. In 1996 the results of this study were published in a peer reviewed dedicated volume of the Canadian Journal of Fisheries and Aquatic Sciences. This study examined three OCS platforms and included the analyses of over 700 sediment samples and over 800 tissue samples from shrimp, crabs, marine worms, clams, fish livers, and fish stomach contents. Results of the analyses documented that total mercury is not concentrated to any greater extent in organisms living near the platforms (less than 100 meters away) when compared to those living far away from the platforms (over 3000 meters). From these results the scientists concluded that platforms do not contribute to higher mercury levels in marine organisms.

The Minerals Management Service, MMS, recognizes that mercury (and specifically methylmercury) in the environment is a global issue and a global problem. While the issue of mercury in seafood in the Gulf of Mexico is the subject of an increasing amount of research particularly because of global and regional inputs, the results of research to date generally supports the conclusion that oil and gas platforms do not play a significant role in elevating levels of mercury in fish and other seafood.

15. Establish general siting criteria to be applied on a case-by-case basis for siting marine aquaculture facilities. Siting criteria would include, but not be limited to the items in Table 6.7-1, and the requirements of ACOE, MMS, EPA, NOAA Fisheries Service, and other regulatory agencies with authority in the EEZ as applied to aquaculture.

Discussion: These alternatives were replaced with more specific siting requirements in the Council's preferred alternative in Action 6. In particular, aquaculture operations can not be sited in marine reserves, marine protected areas, HAPCs, NOS marine sanctuaries, coral areas, SMZs, and permitted artificial reef zones. Additionally, aquaculture operations must be sited at least 1.6 nautical miles apart and the size of the aquaculture site must be twice as large as the area encompassed by all allowable aquaculture systems to allow fallowing and rotation of cages. Lastly, NOAA Fisheries Service would be provided authority to conduct case-by-case reviews of proposed marine aquaculture sites. These siting requirements are in addition to any requirements considered by the ACOE.

16. The proxy for MSY should be equal to: a) 4 million pounds, b) 8 million pounds

Discussion: These MSY proxies were considered to low to develop a viable aquaculture industry in the Gulf of Mexico. MSY will likely be set equal to OY. Proxies for OY range from 16-190 million pounds annually. It is estimated OY levels less than 64 million pounds would support 5-20 aquaculture operations over the next 10 years.

17. The proxy for MSY is equal to X million pounds. MSY will be estimated by first using GIS to determine the allowable areas for aquaculture in the Gulf of Mexico EEZ given the siting criteria specified in Action 6. Next, the maximum number of aquaculture operations that could be sited in this area will be determined. The resulting value will then be multiplied by the average expected production of each facility to determine MSY. GIS analyses are currently underway to estimate MSY.

Discussion: The Council discussed this alternative at the April 2008 meeting and did not consider this a reasonable approach for estimating MSY. The Council believed the estimate of MSY generated from this alternative would have been far greater than the level of production they would initially like to authorize in the Gulf of Mexico. Therefore, the Council moved this alternative to considered but rejected in favor of more precautionary alternatives for setting MSY and OY.

18. Major escapement is defined as the escape of 5 percent or more of the cultured organisms in a seven consecutive day period. A permittee shall provide NOAA

Fisheries Service with the following information if major escapement occurs or is suspected of having occurred: permit number, contact person and phone number, location of escapement, reason(s) for escapement and the number, type of species, size, and percent of cultured organisms that escaped, and actions being taken to address the escapement.

Discussion: During the June 2008 Council meeting, the Council revised the definition for major escapement. The above definition for major escapement was replaced by the definition now contained within Action 8, Preferred Alternative 2(c)(1). The new preferred escapement definition contained in this FMP pertains to both escapement from individual allowable aquaculture systems, as well as escapement from all allowable aquaculture systems at an aquaculture site. The above definition pertained only to the cumulative escapement of cultured organisms from all allowable aquaculture systems at a specific site. The timeframes for determining escapement was also longer (7 days vs. 24 hours) for the above definition when compared with the newly preferred definition.

APPENDIX E – EXPLANATION OF ECONOMIC TERMS

Cointegrated variables: These are pairs of nonstationary variables that wander in such a way that they do not drift too far apart because they share a common trend. Examples are imports and exports, prices and wages, spot and future prices, and the price of cod and prices of other groundfish species. The common trend may cause strong multicollinearity, which may motivate a researcher to ignore one of the variables despite the loss of useful information. Nonstationary variables are variables that do not have a fixed mean and constant variance.

Cointegration analysis: A statistical analysis used to test for and estimate the co-movement of cointegrated variables. This co-movement is interpreted as a long-run equilibrium relationship.

Common property: Property that is owned by two or more individuals. Every member of the group that owns the property has equal right of ownership and can exclude non-members from use or consumption of that property.

Compensation principle: The amount that those who gain from a change could pay those who lose to fully compensate them for their losses.

Complementary goods: Goods (commodities) that are used together, like coffee and cream. A positive cross-price flexibility means the two goods are complementary goods; a percentage increase in the supply of coffee causes a percentage increase in the price of cream. Similarly, a negative cross-price elasticity of demand means the two goods are complementary goods; a percentage decrease in the price of coffee causes a percentage increase in the quantity demanded of cream.

Constant returns to scale: Output changes in the same proportion as inputs. For example, when a firm doubles inputs and, in so doing, doubles output, there are constant returns to scale.

Consumer surplus: The difference between the maximum a person (consumer) is willing and able to pay for a good (commodity) and the amount the person actually pays to acquire that good. It also represents the difference between the maximum amount that persons (consumers) are willing and able to pay for a good and the amount they actually pay to acquire that good.

Cross price elasticity of demand: The sensitivity of a change in the quantity demanded for a good (commodity) to a change in the price of another good. It is expressed as the percentage change in the quantity demanded for a good caused by a percentage change in the price of another good.

Cross-price flexibility: The sensitivity of a change in the price of a commodity for a change in the supply of another commodity. It is expressed as the percentage change in

the price of a commodity caused by a percentage change in the supply of another commodity.

Decreasing returns to scale: Output changes in a smaller proportion than inputs. For example, when a firm doubles inputs and, in so doing, output less than doubles, there are decreasing returns to scale.

Differentiated products: Products that are similar, but not identical, and satisfy the same need.

Economic efficiency: Economic efficiency is achieved when the cost of producing a particular level of output is as low as possible.

Economic profit: A firm's total revenue less its total explicit and implicit costs.

Economic rent: The difference between what a resource is paid for its use in production and the payment that was necessary to bring that resource into production.

Explicit costs: Explicit costs are accounting costs, such as wages, bait, diesel fuel, and depreciation of a fishing vessel.

External benefits: Beneficial side effects borne by those not directly involved in the production or consumption of a commodity.

External costs: Harmful side effects borne by those not directly involved in the production or consumption of a commodity.

Externality: An unintended cost or benefit that is imposed on people and that results from the economic activity of another. An unintended cost is called a negative externality, while an unintended benefit is called a positive externality.

Goods: Commodities of which more is preferred to less.

Implicit costs: Implicit costs are related to foregone benefits and are often referred to as opportunity costs. For example, an implicit cost of using a vessel to target a particular species is the revenue that could have been earned by targeting a different species.

Increasing returns to scale: Output changes at a larger portion than inputs. For example, when a firm doubles inputs and, in so doing, more than doubles output, there are increasing returns to scale.

Inputs: Factors of production or resources that are used to produce goods and services. Examples of inputs are labor, cages, and fish feed.

Internal or private costs: The costs imposed by an entity on itself.

Internal or private benefits: The benefits that an entity bestows upon itself.

Long run: The duration of time in which all inputs can be varied.

Market failure: The inability of a market to allocate resources efficiently. The market is unable to maximize social net benefits. Social costs may be greater than private costs.

Net National Benefits: Without externalities, it is the sum of consumer surplus plus producer surplus, which is a measure of the aggregate net benefits to both consumers and producers. However, with externalities, it is the sum of consumer surplus plus producer surplus plus third-party surplus.

Opportunity cost: The opportunity cost of supplying a production input, such as one's labor, for a particular use is the lost benefit of supplying that input to the next best alternative.

Own-price elasticity of demand: The sensitivity of a change in the quantity demanded for a good (commodity) to a change in the price of that good. It is expressed as the percentage change in the quantity demanded for a good caused by a percentage change in the price of that good.

Price elasticity of demand: The sensitivity of a change in the quantity demanded for a good (commodity) to a change in the price. It is expressed as the percentage change in the quantity demanded for a good caused by a percentage change in the price.

Price elasticity of supply: The sensitivity of a change in the quantity supplied of a good for a change in price. It is expressed as the percentage change in the quantity supplied caused by a percentage change in the price.

Price flexibility: The sensitivity of a change in the price of a commodity for a change in supply. It is expressed as the percentage change in the price of a commodity caused by a percentage change in supply.

Private benefits: See internal benefits.

Private costs: See internal costs.

Private good: A good or service for which consumption by one or more individuals excludes others from consuming that same good and reduces the amount available for others to consume.

Private property: Property owned by an individual who has the right to exclude others from using it. In law, private property is defined as property protected from public appropriation – over which the owner has exclusive and absolute rights.

Producer surplus: The difference between the price that a producer actually receives and the minimum price that the producer would have to receive to supply a given level of output. It also represents the difference between the price that producers receive for selling a given level of output and the minimum amount that they would have to receive to supply that level of output.

Property: A resource, good or service that can be used or consumed. In law, property is defined as the right to possess, use, and enjoy a determinate thing.

Property right: A bundle of rules that convey certain powers to the owner of the right. A property right has *exclusivity* if the owner can prevent others from using the property. It has *flexibility* if the owner can change the mode or purpose of using the resource. It has *divisibility* if the owner can subdivide the property. It has *transferability* if the owner can sell or give others all or a portion of the property. It has *durability* (or duration) if the owner permanently owns the property; and it has *enforceability* when the owner's property right is protected by government.

Public good: A commodity or service for which consumption by some individuals neither: 1) excludes others from consuming that good or service, nor 2) reduces the amount available for others to consume. Climate is an example of a public good.

Public property: Property that is owned by a local, state or federal government, and whose use cannot be restricted to any one individual.

Public trust doctrine: This is the principle that the government must preserve certain resources, such as navigable waters, for public use and maintain those resources for the public's use.

Pure property right: A bundle of rules that grant the owner of the property the exclusive authority to determine how a resource is used and

Quasi-property rights: Quasi-property rights are limited property rights, such as Individual Transfer Quotas (ITQs) and enterprise allocations. In law, quasi is defined as seemingly but not actually; in some sense; resembling; nearly.

Risk: When there is risk, one's choice of action does not determine the outcome with certainty. Instead there is a set of random possible outcomes. In other words, risk is the possibility of different outcomes occurring when the probability of different outcomes is known.

Short run: The duration of time in which the quantity of at least one input cannot be varied.

Social benefits: The sum of internal benefits and external benefits. These are the benefits borne by society as a whole.

Social costs: The sum of internal costs plus external costs. These are the costs incurred by society as a whole.

Social welfare function: A hypothetical relationship that weighs each individual's well-being or utility in some fashion, then adds up the utilities to obtain an aggregate (social welfare) function that is used to compare alternative equilibria.

Social welfare optimization: It is assumed that the social optimum or social welfare maximization is the equilibrium price and output level that maximizes the sum of consumer surplus plus producer surplus.

Strong cross-price flexibility: Occurs when a one percentage change in the supply of a commodity causes a large percentage change in the price of another commodity.

Strong property rights: Property rights that rank high in exclusivity, flexibility, divisibility, transferability, durability, and enforceability. See property rights for definitions of these terms.

Substitute goods: Goods (commodities) that replace each other, such as farmed raised shrimp and wild shrimp. A negative cross-price flexibility means the two goods are substitute goods; a percentage increase in the supply of farmed raised shrimp causes a percentage decrease in the price of wild shrimp. Similarly, a positive cross-price elasticity of demand means the two goods are substitutes; a percentage decrease in the price of farmed shrimp causes a percentage decrease in the quantity demanded of wild shrimp.

Third party: A person whom is unintentionally affected by an externality produced by the economic activity of another. For example, a person that owns a house on a river is a third party when the value of that person's house is affected by the pollution produced by a firm upstream.

Third-party surplus: Surplus that is experienced by a third party (or third parties), which is created by positive and negative externalities and therefore not captured in the market.

Total domestic surplus: The sum of consumer surplus of domestic consumers and producer surplus of domestic firms. It is the surplus that occurs when the level of domestic production of a good or service exceeds the level of domestic consumption of that good or service.

Total surplus: The sum of consumer surplus plus producer surplus plus third-party surplus.

Technical efficiency: Technical efficiency is achieved when the amount produced with a particular combination of inputs is the maximum amount that can be produced with that combination of inputs.

Utility: The ability of a good or service to satisfy a want.

Utility function: A hypothetical mathematical relationship that expresses the levels of satisfaction that a person receives from consuming combinations of goods and services, including leisure time.

Weak cross-price flexibility: Occurs when a one percentage change in the supply of a commodity causes a small percentage change in the price of another commodity.

Weak property rights: Property rights that rank low in exclusivity, flexibility, divisibility, transferability, durability, and enforceability. See property rights for definitions of these terms.

APPENDIX F - STOCKS MANAGED IN COUNCIL FMPs

Reef Fish FMP

Species in the Management Unit

Snappers - Lutjanidae Family

Queen Snapper	*Etelis oculatus*
Mutton Snapper	*Lutjanus analis*
Schoolmaster	*Lutjanus apodus*
Blackfin Snapper	*Lutjanus buccanella*
Red Snapper	*Lutjanus campechanus*
Cubera Snapper	*Lutjanus cyanopterus*
Gray (Mangrove) Snapper	*Lutjanus griseus*
Dog Snapper	*Lutjanus jocu*
Mahogany Snapper	*Lutjanus mahogoni*
Lane Snapper	*Lutjanus synagris*
Silk Snapper	*Lutjanus vivanus*
Yellowtail Snapper	*Ocyurus chrysurus*
Wenchman	*Pristipomoides aquilonaris*
Vermilion Snapper	*Rhomboplites aurorubens*

Groupers - Serranidae Family

Rock Hind	*Epinephelus adscensionis*
Speckled Hind	*Epinephelus drummondhayi*
Yellowedge Grouper	*Epinephelus flavolimbatus*
Red Hind	*Epinephelus guttatus*
Goliath Grouper	*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*
Yellowfin Grouper	*Mycteroperca venenosa*

Tilefishes - Malacanthidae (Branchiostegidae) Family

Goldface Tilefish	*Caulolatilus crysops*
Blackline Tilefish	*Caulolatilus cyanops*
Anchor Tilefish	*Caulolatilus intermedius*
Blueline Tilefish	*Caulolatilus microps*
Tilefish	*Lopholatilus chamaeleonticeps*

Jacks - Carangidae Family

Greater Amberjack	*Seriola dumerili*
Lesser Amberjack	*Seriola fasciata*
Almaco Jack	*Seriola rivoliana*
Banded Rudderfish	*Seriola zonata*

Triggerfishes - Balistidae Family

Gray Triggerfish	*Balistes capriscus*

Wrasses - Labridae Family

Hogfish	*Lachnolaimus maximus*

Species in the Management Unit for Data Collection Only

Sand Perches - Serranidae Family

Dwarf Sand Perch	*Diplectrum bivattatum*
Sand Perch	*Diplectrum formosum*

Red Drum FMP

Species in the Management Unit

red drum	*Sciaenops ocellatus*

Coastal Migratory Pelagics FMP

Species in the Management Unit

King Mackerel	*Scomberomorus cavalla*
Spanish Mackerel	*Scomberomorus maculatus*
Cobia	*Rachycentron canadum*

Species in the Management Unit for Data Collection Only

Cero	*Scomberomorus regalis*
Little Tunny	*Euthynnus alletteratus*
Dolphin	*Coryphaena hippurus*
Bluefish	*Pomatomus saltatrix*

Species that may be added to the Management Unit

Wahoo	*Acanthocybium solandri*
Blackfin tuna	*Thunnus atlanticus*
Blue runner	*Caranx crysos*

Shrimp FMP

Species in the Management Unit

Brown Shrimp	*Farfontepenaeus aztecus*

White Shrimp	*Litopenaeus setiferus*
Pink Shrimp	*Farfontepenaeus duorarum*
Royal Red Shrimp	*Hymenopenaeus robustus*

Spiny Lobster FMP

Species in the Management Unit

Spiny Lobster	*Panulirus argus*
Slipper Lobster	*Scyllarides nodifer*

Species in the Management Unit for Data Collection Only

Spotted Spiny Lobster	*Panulirus argus*
Smooth Tail Lobster	*Panulirus laevicauda*
Spanish Slipper Lobster	*Scyllarides aequinoctialis*

Stone Crab FMP

Species in the Management Unit

Stone Crab	*Menippe mercenaria*
Stone Crab (Cedar Key north)	*Menippe adina*

Coral FMP

Species in the Management Unit (330)

Corals of the Class *Hydrozoa*

Corals of the Class *Anthozoa*

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APPENDIX G - ILLUSTRATIONS OF CAGES AND PENS

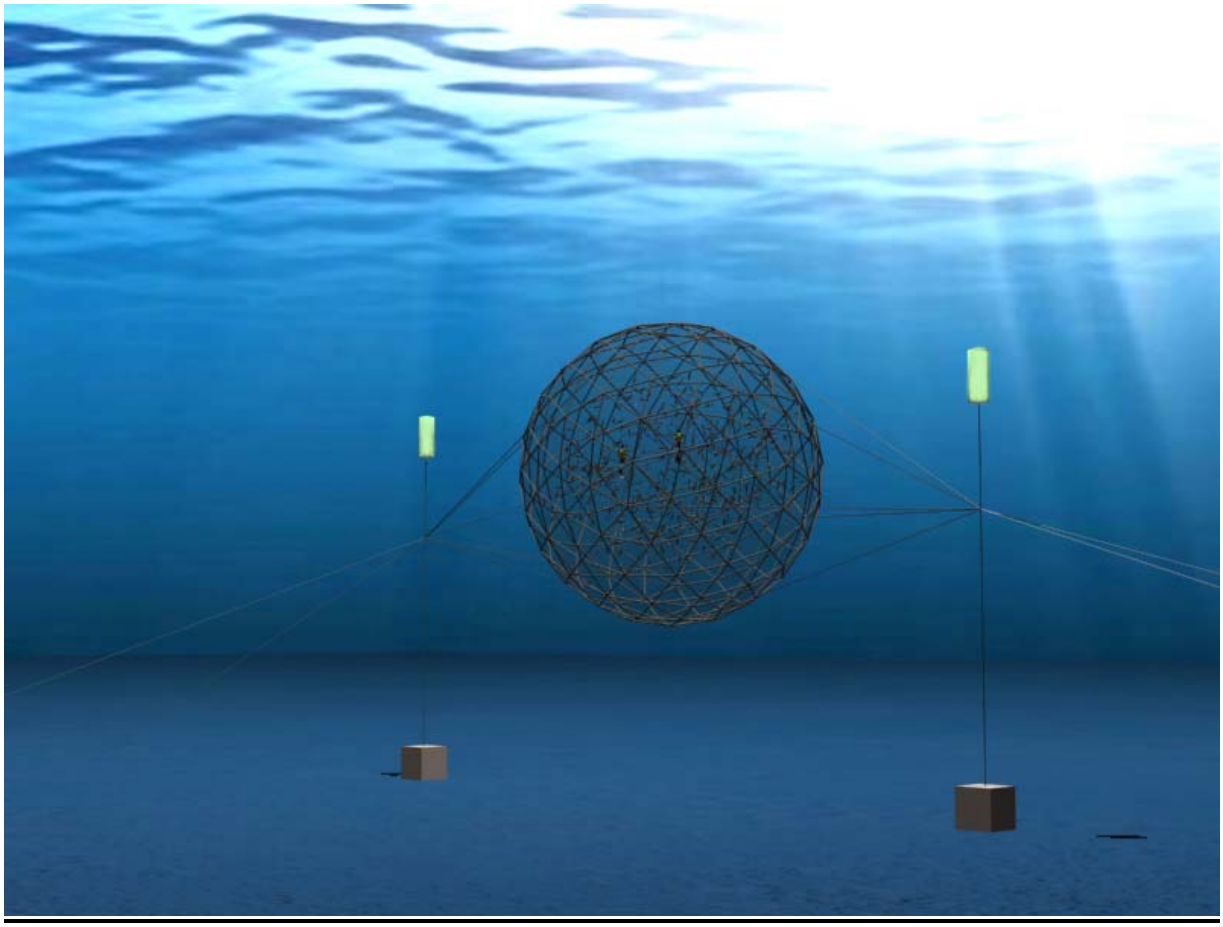

Figure 1. Illustration of an Aquapod designed by Ocean Farm Technologies, www.oceanfarmtech.com

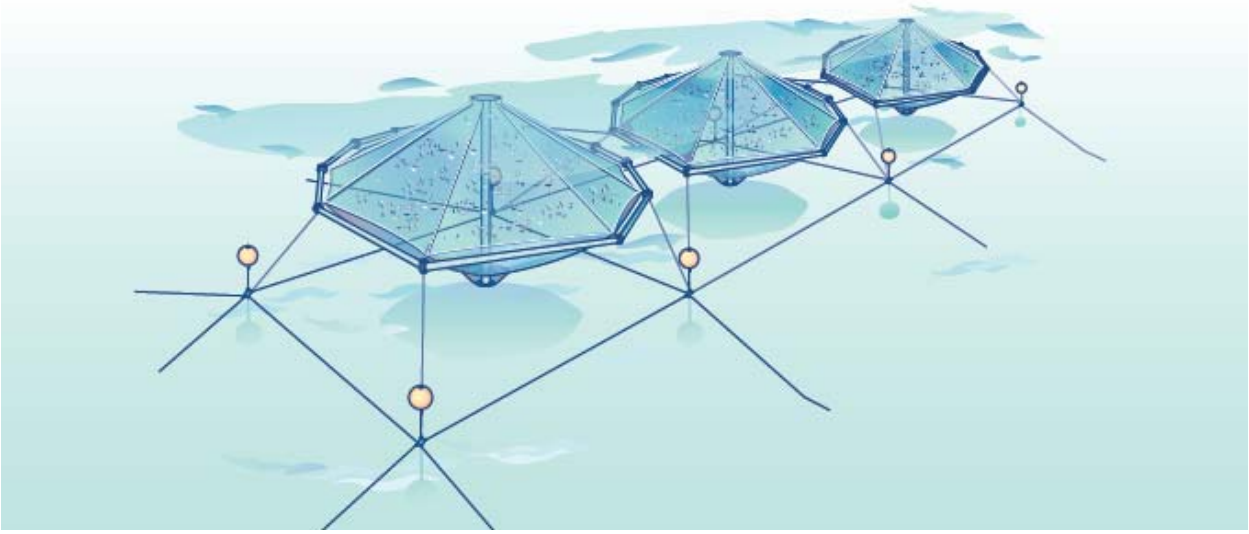

Figure 2. Illustration of Open Ocean Sea Station by Ocean Spar, www.oceanspar.com

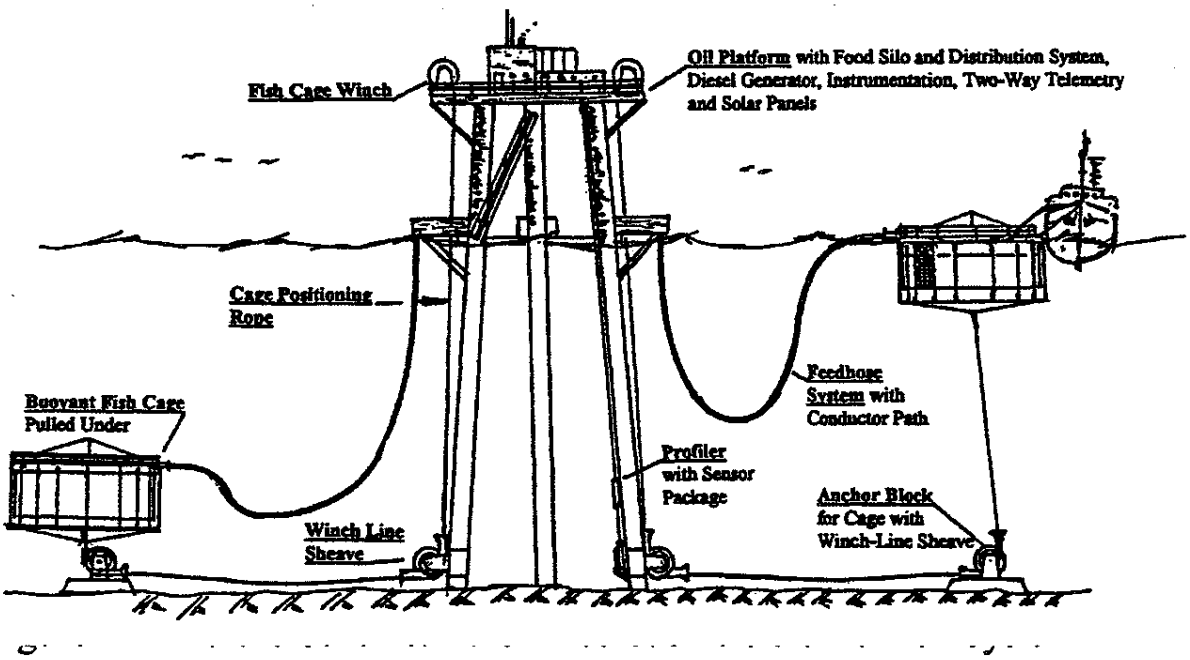

Figure 3: Oil platform with food silo and distribution system, diesel generator, instrumentation, two-way telemetry and solar panels. Source: Offshore Mariculture in the Gulf of Mexico: A Feasibility Report published by the Louisiana Sea Grant College Program, Sea Grant Building, Louisiana State University, Baton Rouge, Louisiana.

APPENDIX H - EPA EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE CONCENTRATED AQUATIC ANIMAL PRODUCTION POINT SOURCE CATEGORY

C. What Are the Requirement for the Net Pen Subcategory?

The following discussion explains the BPT/BAT/BCT limitations and NSPS EPA is promulgating for Net Pen Systems.

1. BPT
After considering the technology options described in the proposal and the factors specified in Section 304(b)(1)(B) of the Clean Water Act, EPA is establishing nationally applicable effluent limitations for net pen facilities producing 100,000 pounds or more of aquatic animals per year. Today's BPT regulations requires CAAP net pen systems, like CAAP flow-through and recirculating systems, to comply with specified operational practices and management requirements. These requirements are non-numeric effluent limitations based on technologies EPA has evaluated and determined are cost-reasonable, available technologies.

Based on the detailed survey results, EPA estimates that such programs are currently in use at most or all the net pen systems. As a result, the cost to facilities of meeting the BPT requirements is very low. To EPA's knowledge, all existing net pen facilities that are currently covered by NPDES permits are subject to permit requirements comparable to today's limitations. Therefore, EPA concludes that the BPT limits are both technically available and cost reasonable for the
net pen subcategory.

EPA rejected the establishment of numeric effluent limitations for net pens for obvious reasons. Because of the nature of the facilities, net pens cannot use physical wastewater control systems except at great cost. Located in open waters, nets are suspended from a floating structure to contain the crop of aquatic animals. Nets are periodically changed to increase the mesh size as the fish grow in order to provide more water circulating inside the pen. The pens are anchored to the water body floor and sited to benefit from tidal and current action to move wastes away from, and bring oxygenated water to, the pen. As a result, these CAAP facilities experience a constant in- and out-flow of water. Development of a system to capture the water and treat the water within the pen would be prohibitively expensive. EPA, therefore, rejected physical treatment systems as the basis for BPT limitations. Instead, EPA is promulgating narrative effluent limitations.

As was the case with flow-through and recirculating systems, feed management programs are a key element of the promulgated requirements for the reasons explained above and in the proposal at 67 FR 57872, 57887. Consequently, for the control of solids, the final regulation requires that net pen CAAP facilities minimize the accumulation of uneaten feed beneath the pen through the use of active feed monitoring and management practices. Sec. 451.21(a). These strategies may include either real-time monitoring (e.g., the use of video monitoring, digital scanning sonar, or upweller systems); monitoring of

sediment quality beneath the pens; monitoring of the benthic community beneath the pens; capture of waste feed and feces; or the adoption of other good husbandry practices, subject to the permitting authority's approval.

As noted, feed management systems are effective in reducing the quantity of uneaten feed. Facilities should limit the feed added to the pens to the amount reasonably necessary to sustain an optimal rate of fish growth. In determining what quantity of feed will result in minimizing the discharge of uneaten feed while at the same time sustaining optimal growth, a facility should consider, among others, the following factors: The types of aquatic animals raised, the method used to feed the aquatic animals, the facility's production and aquatic animal size goals, the species, tides and currents, the sensitivity of the benthic community in the vicinity of the pens, and other relevant factors. In some areas, deep water and/or strong tides or currents may prevent significant accumulation of uneaten feed such that active feed monitoring is not needed. Several states with significant numbers of net pens (e.g., Washington, Maine) already require feed management practices, which may include active feed monitoring, to minimize accumulation of feed beneath the pens. Facilities will need to ensure that whatever practices they adopt are consistent with the requirements of their state NPDES program.

In order to implement a feed management system, the facility must also track feed inputs by maintaining records documenting feed and estimates of the numbers and weight of aquatic animals in order to calculate representative feed conversion ratios. Sec. 451.21(g). As previously explained, development of feed conversion ratios are a necessary element in any effective feed management system.

Real-time monitoring represents a widely-used business practice that is employed by many salmonid net pen facilities to reduce feed costs. Net pen systems do not present the same opportunities for solids control as do flow-through or recirculating systems for the obvious reason that ocean water is continuously flowing in and out of the net pens. Therefore, in EPA's view, feed monitoring, including real time monitoring and other practices is an important and cost reasonable practice to control solids discharges.

The final rule includes a narrative limitation requiring CAAP net pen facilities to collect, return to shore, and properly dispose of all feed bags, packaging materials, waste rope and netting. Sec. 451.21(b). This will require that net pen facilities have the equipment (e.g., trash receptacles) to store empty feed bags, packaging materials, waste rope and netting until they can be transported for disposal. EPA is also requiring that net pens minimize any discharges associated with the transporting or harvesting of fish, including the discharge of blood, viscera, fish carcasses or transport water containing blood. Sec. 451.21(c). During stocking or harvesting of fish, some may die. The final limitations require facilities to remove and dispose of dead fish properly on a regular basis to prevent discharge. Discharge of dead fish represents an environmental concern because they may spread disease and attract predators, which could imperil the structural integrity of the containment system. The wastes and wastewater associated with the transport or harvest of fish have high BOD and nutrient concentrations and should be disposed of at a location where they may be properly treated.

The final regulations also require net pen facilities to ensure the proper storage of drugs, pesticides, and feed to avoid spilling these materials and subsequent discharge. See Sec. 451.21(e)(1) of this rule. Facilities must also implement procedures for properly containing, cleaning and disposing of any spilled material. See Sec. 451.21(e)(2) of this rule. As previously discussed, excess feed may present a number of different environmental problems. Preventing spills of feed is consequently important. Additionally, net pens may use different pesticides and drugs in fish production. Preventing their release is similarly important. The final regulation also includes a narrative limitation, similar to that for CAAP flow-through and recirculating systems, requiring that net pen facilities adequately train facility personnel in how to respond to spills and proper clean- up and disposal of spilled material. See Sec. 451.21(h) of this rule.

Next, the final regulation requires regular inspection and maintenance of the net pen Sec. 451.21(f). This would include any system to prevent predators from entering the pen. Net pens are vulnerable to damage from predator attack or accidents that result in the release of the contents of the nets, including fish and fish carcasses. Given the economic incentive to prevent the loss of production, EPA assumes facilities will conduct routine inspections of the nets to ensure they are not damaged and make repairs as soon as any damage is identified. Most net pen facilities are already doing these inspections. However, in evaluating this technology option, EPA estimated costs for increased inspections at every net pen facility in order to ensure that costs are not underestimated.

Like the final BPT limitations for flow-through and recirculating systems, the BPT limitations for net pens do not include any requirements specifically addressing the release of non-native species. The final regulation, however, includes a narrative effluent limitation that requires facilities to implement operational controls that will ensure the production facilities and wastewater treatment structures are being properly maintained. Facilities must conduct routine inspections and promptly repair damage to the production systems or wastewater treatment units. EPA included this requirement to ensure achievement of the other BPT limitations for net pens such as the prohibition on the discharge of feed bags, packaging materials, waste rope and netting at net pens, and the requirement to minimize release of solids, fish carcasses and viscera. This requirement will also aid in preventing the release of other materials including live fish.

2 BAT

EPA is establishing BAT at a level equal to BPT for the net pen subcategory. For this subcategory, EPA did not identify any available technologies that are economically achievable that would achieve more stringent effluent limitations than those considered for BPT. Because of the nature of the wastes generated from CAAP net pen facilities, EPA did not identify any advanced treatment technologies or practices to remove additional toxic and nonconventional pollutants that would be economically achievable on a national basis beyond those already considered.

3. BCT

EPA evaluated conventional pollutant control technologies and did not identify a more stringent technology for the control of conventional pollutants for BCT limitations than the final requirements considered. Consequently, EPA has not promulgated BCT limitations or standards based on a different technology from that used as the basis for BPT limitations and standards.

4. NSPS

After considering the technology requirements described previously under BPT, and the factors specified in section 306 of the CWA, EPA is promulgating standards of performance for new sources equal to BPT, BAT, and BCT. There are no more stringent best demonstrated technologies available. Because of the nature of the wastes generated and the production system used, EPA has not identified advanced treatment technologies or practices that would be generally affordable beyond those already considered.

Although siting is not specifically addressed with today's standards, proper siting of new facilities is one component of feed management strategies designed to minimize the accumulation of uneaten feed beneath the pens and any associated adverse environmental effects. When establishing new net pen CAAP facilities, consideration of location is critical in predicting the potential impact the net pen will have on the environment. Net pens are usually situated in areas which have good water exchange through tidal fluctuations or currents. Good water exchange ensures good water quality for the animals in the nets. It also minimizes the concentration of pollutants below the nets. In implementing today's rule for new net pen operations, facilities and permit authorities should give careful consideration to siting prior to establishing a new net pen facility.

EPA has concluded that NSPS equal to BAT does not present a barrier to entry. The overall impacts from the effluent limitations guidelines on new source net pens are no more severe than those on existing net pens. The costs faced by new sources generally should be the same as, or lower than, those faced by existing sources. It is generally less expensive to incorporate pollution control equipment into the design at a new facility than it is to retrofit the same pollution control equipment in an existing facility.

Although EPA is not establishing standards of performance for new sources for small cold water facilities (i.e., those producing between 20,000 and 100,000 pounds of aquatic animals per year), such facilities would be subject to existing NPDES regulations and BPT/BAT/BCT permit limits developed using the permit writer's ``best professional judgment'' (BPJ). EPA, based on its analysis of existing data, determined that new facilities would most often produce 100,000 pounds of aquatic animals or more per year because of the expense of producing the aquatic animals. Generally, the species produced are considered of high value and are produced in such quantities to economically justify the production. For example, one net pen typically holds 100,000 pounds of aquatic animals or more. In reviewing USDA's Census of Aquaculture and EPA's detailed surveys, EPA has not identified any existing commercial net pen facilities producing fewer than 100,000 pounds of aquatic animals per year.

Offshore aquatic animal production is an area of potential future growth. As these types of facilities start to produce aquatic animals, those with 100,000 pounds or more per year will be subject to the new source requirements established for net pens as well as NPDES permitting.

D. What Monitoring Does the Final Rule Require?

The final rule does not require any effluent monitoring. In the case of net pen facilities, however, it does require CAAPs to adopt active feed monitoring and management practices that will most often include measures to observe the addition of feed to the pen. Net pen facilities subject to today's rule must develop and implement active feed monitoring and management strategies to minimize the discharge of solids and the accumulation of uneaten feed beneath the pen. Many existing net pen facilities use a real-time monitoring system such as video cameras, digital scanning sonar, or upweller systems to accomplish this. With a real-time monitoring system, when uneaten feed is observed falling beneath the pen feeding should stop. Depending on the location and other site-specific factors at the facility, a facility may adopt other measures in lieu of real time monitoring. These may include monitoring of sediment or the benthic community quality beneath the pens, capture of waste feed and feces or other good husbandry practices that are approved by the permitting authority.

E. What Are the Final Rule's Notification, Recordkeeping, and Reporting Requirements?

The final rule establishes requirements for reporting the use of spilled drugs, pesticides or feed that result in a discharge to waters of the U.S. by CAAP facilities. This provision ensures that, any release of spilled drugs, pesticides and feed to waters of the U.S. are reported to the permitting authorities to provide them with necessary information for any responsive action that may be warranted. This will allow regulatory authorities to reduce or avoid adverse impacts to receiving waters associated with these spills. EPA is requiring that any spill of material that results in a discharge to waters of the U.S. be reported orally to the permitting authority within 24 hours of its occurrence. A written report shall be submitted within 7 days. Facilities are required to report the identity of the material spilled and an estimated amount.

EPA is retaining for the final rule the proposed requirement that CAAP facilities report to the Permitting Authority whenever they apply certain types of drugs under the following conditions. First, the permittee must report drugs prescribed by a veterinarian to treat a species or a disease when prescribed for a use which is not an FDA- approved use (referred to as ``extralabel drug use'') as described further below. Second, the permittee must report drugs being used in an experimental mode under controlled conditions, known as Investigative New Animal Drugs (INADs). In EPA's view, notifying the Permitting Authority is necessary to ensure that any potential risk to the environment resulting from the use of these drugs can be addressed with site-specific remedies where appropriate. EPA strongly encourages reporting prior to use where feasible, as this provides the Permitting Authority with the opportunity to monitor or control the

discharge of the drugs while the drugs are being applied. EPA has not made this an absolute requirement, however, in recognition of the fact that swift action on the part of veterinarians and operators is sometimes necessary to respond to and contain disease outbreaks.

The reporting requirement applies to the permittee and imposes no obligation on the prescribing veterinarian. The reporting requirement for extralabel drug use is not in any way intended to interfere with veterinarians' authority to prescribe extralabel drugs to treat aquatic animals or other animals in accordance with FFCDA and 40 CFR Part 530. This reporting requirement is promulgated to ensure that permitting authorities are aware of the use at CAAPs of extralabel drugs when such use may result in the release of the drug to waters of the U.S. Because the use is likely to involve adding the drug directly to the rearing unit, EPA believes there is a probability that these drugs may be released to waters of the U.S.

The regulation requires that a permittee must provide a written report to the permitting authority within seven days of agreeing to participate in an INAD study and an oral report preferably in advance of use, but in no event later than seven days after starting to use the INAD. The first written report must identify the drug, method of application, the dosage and what it is intended to treat. The oral report must also identify the drug, method of application, and the reason for its use. Within 30 days after the use of the drug at the facility, the permittee must provide another written report to the permitting authority describing the drug, reason for treatment, date and time of addition, method of addition and total amount added.

EPA has similar reporting requirements for extralabel drug use except that EPA is not requiring a written report in advance of use.

The reporting requirement applies only to those drugs that have not been previously approved for their intended use. Reporting would not be required for EPA registered pesticides and FDA approved drugs for aquatic animal uses when used according to label instructions. Reporting would only be required for INAD drugs and drugs prescribed by a veterinarian for extralabel uses. Because these classes of drugs have not been fully evaluated by FDA for the potential environmental consequences of the use being made of them EPA considers reporting ensures the permitting authority has enough information to make an informed response if environmental problems do occur. EPA has included an exception to the reporting requirement for cases where the INAD or extralabel drug has already been approved under similar conditions for use in another species or to treat another disease and is applied at a dosage that does not exceed the approved dosage. The requirement that the use be under similar conditions is intended to limit the exception to cases where the INAD or extralabel drug use would be expected to produce significantly different environmental impacts from the previously approved use. For example, use of a drug that had been previously approved for a freshwater application, as an INAD in a marine setting would not be considered a similar condition of use, since marine ecosystems may have markedly different vulnerabilities than freshwater ecosystems. Similarly, the use of a drug approved to treat terrestrial animals used as an INAD or

extralabel drug to treat aquatic animals would not be considered a similar condition of use. In contrast, the use of a drug to treat fish in a freshwater system that was previously approved for a different freshwater species would be considered use under similar conditions. EPA has concluded that when a drug is used under similar conditions it is unlikely that the environmental impacts would be different than those that were already considered in the prior approval of the drug.

The reporting requirements with respect to INADs are not burdensome. FDA regulations require that the sponsor of a clinical investigation of a new animal drug submit to the Food and Drug Administration certain information concerning the intended use prior to its use. Therefore, this information will be readily available to any CAAP facility that participates in an INAD investigation. Having advance information will enable the permitting authority to determine whether restrictions should be imposed on the release of such drugs.

EPA is also requiring all CAAP facilities subject to today's regulation to develop and maintain a Best Management Practices plan on site. This plan must describe how the permittee will achieve the required narrative limitations. The plan must be available to the permitting authority upon request. Upon completion of the plan, the permittee must certify to the permitting authority that a plan has been developed.

The proposal included a requirement to implement escape prevention practices at facilities where non-native species are being produced. EPA received comments supporting such controls to prevent the release of non-native species. EPA also received comments arguing against controls in this regulation because other authorities are already dealing with non-native species, and because of the complexities of determining what is a non-native species and when such species may become invasive. For example, species raised by Federal and State authorities for stocking may not be ``native," but would not generally impose a threat if escapes occurred.

Today's regulation does not include any requirements specifically addressing the release of non-native species. The regulation, however, includes a requirement for facilities to develop and implement BMPs to ensure the production and wastewater treatment systems are regularly inspected and maintained. Facilities are required to conduct routine inspections and perform repairs to ensure proper functioning of the structures. EPA included this requirement to promote achievement of BPT/BAT limitations on the discharge of feed bags, packaging materials, waste rope and netting at net pens, and on the discharge of solids, including fish carcasses and viscera at all facilities. This requirement, described in more detail in Section VI.D, will also aid in preventing the release of other materials, including live fish.

The final regulation also includes a requirement for facilities to report failures and damage to the structure of the aquatic animal containment system leading to a material discharge of pollutants. EPA realizes that most CAAP facilities take extensive measures to ensure structural integrity is maintained. Nonetheless, failures do occur with potentially serious consequences to the environment. The failure of the containment

system can result in the release of sediment, fish and fish carcasses which, depending on the magnitude of the release, can have significant impacts on the environment. For net pen systems, failures include physical damage to the predator control nets or the nets containing the aquatic animals, which result in a discharge of the contents of the nets. Damage includes abrasion, cutting or tearing of the nets and breakdown of the netting due to rot or ultra-violet exposure. For flow-through and recirculating systems, a failure includes a collapse or damage of a rearing unit or wastewater treatment structure; damage to pipes, valves, and other plumbing fixtures; and damage or malfunction to screens or physical barriers in the system, which would prevent the unit from containing water, sediment, and the aquatic animals. In the event of a reportable failure as defined in the NPDES permit, EPA is requiring CAAP facilities to report to the permit authority orally within 24 hours of discovering a failure and to follow the oral report with a written report no later than seven days after the discovery of the failure. The oral report must include the cause of the failure and the materials that have likely been released. The written report must include a description of the cause of the failure, the time elapsed until the failure was repaired, an estimate of the types and amounts of materials released and the steps that will be taken to prevent a recurrence. Because the determination of what constitutes damage resulting in a ``material'' discharge varies from one facility to the next, EPA encourages permitting authorities to include more specific reporting requirements defining these terms in the permit. Such conditions might recognize variations in production system type and environmental vulnerability of the receiving waters.

Today's regulation requires record-keeping in conjunction with implementation of a feed management system. As previously explained, EPA is requiring flow-through, recirculating and net pen CAAP facilities subject to today's regulation to keep records on feed amounts and estimates of the numbers and weight of aquatic animals in order to calculate representative feed conversion ratios. The feed amounts should be measured at a frequency that enables the facility to estimate daily feed rates. The number and weight of animals contained in the rearing unit may be recorded less frequently as appropriate. Flow-through and recirculating facilities subject to today's requirements must record the dates and brief descriptions of rearing unit cleaning, inspections, maintenance and repair. Net pen facilities must keep the same types of feeding records as described above and record the dates and brief descriptions of net changes, inspections, maintenance and repairs to the net pens.