Status Determination Criteria for Penaeid Shrimp and Adjustments to the Shrimp Framework Procedure

Amendment 15 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters Public Hearing Draft

Including Draft Environmental Assessment, Fishery Impact Statement, Regulatory Impact Review, and Regulatory Flexibility Act Analysis

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ENVIRONMENTAL ASSESSMENT COVER SHEET

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Type of Action

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

Summary/Abstract
## ABBREVIATIONS USED IN THIS DOCUMENT

<table>
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<tr>
<th>Abbreviation</th>
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<tr>
<td>ABC</td>
<td>acceptable biological catch</td>
</tr>
<tr>
<td>ACL</td>
<td>annual catch limit</td>
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<td>ACT</td>
<td>annual catch target</td>
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<td>AMs</td>
<td>accountability measures</td>
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<tr>
<td>Bi Op</td>
<td>biological opinion</td>
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<td>BRD</td>
<td>bycatch reduction device</td>
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<td>Council</td>
<td>Gulf of Mexico Fishery Management Council</td>
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<tr>
<td>CMP</td>
<td>coastal migratory pelagics</td>
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<tr>
<td>DPS</td>
<td>distinct population segment</td>
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<td>DWH</td>
<td>Deepwater Horizon MC 252</td>
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<tr>
<td>EA</td>
<td>environmental assessment</td>
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<tr>
<td>EEZ</td>
<td>exclusive economic zone</td>
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<td>EFH</td>
<td>essential fish habitat</td>
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<td>EJ</td>
<td>environmental justice</td>
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<td>ELB</td>
<td>Electronic Logbook Program</td>
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<td>EIS</td>
<td>environmental impact statement</td>
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<td>ESA</td>
<td>Endangered Species Act</td>
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<tr>
<td>F</td>
<td>instantaneous rate of fishing mortality</td>
</tr>
<tr>
<td>FEIS</td>
<td>Final environmental impact statement</td>
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<tr>
<td>FMP</td>
<td>fishery management plan</td>
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<td>GMFMC</td>
<td>Gulf of Mexico Fishery Management Council</td>
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<tr>
<td>Gulf</td>
<td>Gulf of Mexico</td>
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<tr>
<td>HAPC</td>
<td>habitat area of particular concern</td>
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<tr>
<td>Magnuson-Stevens Act</td>
<td>Magnuson-Stevens Fishery Conservation and Management Act</td>
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<tr>
<td>MFMT</td>
<td>maximum fishing mortality threshold</td>
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<tr>
<td>mp</td>
<td>million pounds</td>
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<td>MSST</td>
<td>minimum stock size threshold</td>
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<td>MSY</td>
<td>maximum sustainable yield</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>NMFS</td>
<td>National Marine Fisheries Service</td>
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<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<tr>
<td>OFL</td>
<td>overfishing level</td>
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<tr>
<td>OY</td>
<td>optimum yield</td>
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<tr>
<td>PBR</td>
<td>potential biological removal</td>
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<tr>
<td>RA</td>
<td>Regional Administrator</td>
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<tr>
<td>RQ</td>
<td>regional quotient</td>
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<tr>
<td>Secretary</td>
<td>Secretary of Commerce</td>
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<td>SEFSC</td>
<td>Southeast Fisheries Science Center</td>
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<tr>
<td>SEIS</td>
<td>supplemental environmental impact statement</td>
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<td>SERO</td>
<td>Southeast Regional Office</td>
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<td>Shrimp FMP</td>
<td>Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U. S. Waters</td>
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<tr>
<td>SPGM</td>
<td>federal Gulf shrimp moratorium permit</td>
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<tr>
<td>SSC</td>
<td>Scientific and Statistical Committee</td>
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TED  turtle excluder device
USCG  United States Coast Guard
VOOP  Vessel of Opportunity Program
VPA  Virtual Population Analysis
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FISHERY IMPACT STATEMENT

[This section is completed after selection of all preferred alternatives.]
CHAPTER 1. INTRODUCTION

1.1 Background

National Standard 1 in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery. The Magnuson-Stevens Act defines OY as the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, while taking into account the protection of marine ecosystems. Each fishery management plan (FMP) must specify objective and measurable status determination criteria for identifying when the fishery is overfished and undergoing overfishing. Overfishing occurs whenever the rate of removal (fishing mortality rate) is too high. A stock or stock complex is considered overfished when its population abundance (biomass) is too low.

The maximum fishing mortality threshold (MFMT) is the maximum rate of fishing mortality above which the stock is considered to be undergoing overfishing. The minimum stock size threshold (MSST) is the level of biomass below which the stock is considered to be overfished. By evaluating the fishing mortality rate and biomass of a stock in relation to MFMT and MSST, fishery managers can determine the status of a fishery and assess whether management measures are maintaining healthy stocks and achieving OY.

These parameters (MSST and MFMT) are difficult to apply to penaeid shrimp (brown, *Farfantepenaeus aztecus*; pink, *Farfantepenaeus duorarum*; and white, *Litopenaeus setiferus*)

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**Maximum Sustainable Yield**

The largest average catch that can continuously be taken from a stock under existing environmental conditions.

**Optimum Yield**

The harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations.

**Maximum Fishing Mortality Threshold**

One of the status determination criteria. It will usually be equivalent to the fishing mortality corresponding to the maximum sustainable yield. If current fishing mortality rates are above the fishing mortality threshold, overfishing is occurring.

**Minimum Stock Size Threshold**

Another of the status determination criteria. The minimum stock size at which rebuilding will occur within 10 years while fishing at the maximum fishing mortality threshold. If current stock size is below the stock size threshold the stock is overfished.
because they are short-lived shrimp populations are influenced by environmental factors in addition to effort and catch rates. For penaeid shrimp stocks, Amendment 13 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters (Shrimp FMP) (GMFMC 2005a) established MSST as the minimum parent stock size known to have produced maximum sustainable yield (MSY) the following year. The MSY is the largest long-term average catch that can be taken from a stock under prevailing conditions. The MSY for penaeid shrimp is difficult to apply and calculate because shrimp data are collected on a monthly basis. In addition, shrimp stock assessment model outputs are summations of monthly values while MSY is usually regarded as an annual index. Amendment 13 to the Shrimp FMP also established MFMT for each of the three penaeid species in terms of a parent stock level.

Historically, Gulf of Mexico (Gulf) shrimp stocks were assessed with a virtual population analysis (VPA), which reported output in terms of number of parents. The National Marine Fisheries Service (NMFS) has monitored the stock levels for all three penaeid species since 1970. The parent stock numbers for these species remained higher the than the overfished or overfishing thresholds throughout this monitoring period; therefore, these stocks were not considered overfished or undergoing overfishing. However, scientists working for NMFS began investigating new stock assessment models for assessing the Gulf shrimp stocks (Hart and Nance 2010) after the 2007 pink shrimp stock assessment VPA incorrectly determined pink shrimp were undergoing overfishing because the model could not accommodate low effort (Nance 2008). The stock assessment analysts concluded that the Stock Synthesis model (Methot 2009) was the best choice for modeling Gulf shrimp. The Stock Synthesis model outputs parent stock size in terms of spawning biomass and also calculates a fishing mortality rate (Methot and Wetzel 2013).

The Gulf of Mexico Fishery Management Council’s (Council) Scientific and Statistical Committee (SSC) accepted this new model, but the outputs were not comparable to the established overfished and overfishing thresholds. This resulted in an unknown status for the three species relative to overfished and overfishing. Thus, with the acceptance of a new assessment modeling approach, MFMT and MSST must now be revised to be comparable to the model outputs and determine the status of the stocks.

Framework procedures for a fishery management plan allow changes in specific management measures and parameters, such as overfished and overfishing thresholds, that can be made more efficiently than changes made through a full plan amendment. These changes are generally considered routine updates based on a new stock assessment, survey results, or other similar information. Three framework procedures have been developed for the Shrimp FMP through

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Who’s Who?

- Gulf of Mexico Fishery Management Council – Engages in a process to determine a range of actions and alternatives, and recommends action to the National Marine Fisheries Service
- National Marine Fisheries Service and Council staffs – Develop alternatives based on guidance from the Council, and analyze the environmental impacts of those alternatives
- Secretary of Commerce – Will approve, disapprove, or partially approve the amendment as recommended by the Council.
various amendments, the most recent of which was implemented through the Generic Annual Catch Limit/Accountability Measures Amendment\textsuperscript{1} (GMFMC 2011). Subsequent to that amendment, the Council determined that modifications to accountability measures should be included in the frameworks for their FMPs; therefore, the reef fish framework procedure was modified in Amendment 38 to the Reef Fish FMP (GMFMC 2012) and the coastal migratory pelagics (CMP) framework was modified in Amendment 20B to the CMP FMP (GMFMC/SAFMC 2013). Amendment 15 to the Shrimp FMP would make the same modifications to the recent shrimp framework\textsuperscript{2}. In addition, this amendment would update language in that framework procedure that is now out of date.

\textsuperscript{1} Full title: Final Generic Annual Catch Limits/Accountability Measures Amendment for the Gulf of Mexico Fishery Management Council’s Red Drum, Reef Fish, Shrimp, Coral and Coral Reefs Fishery Management Plans.

\textsuperscript{2} Accountability measures are only established for royal red shrimp; penaeid shrimp are exempt from the requirement for accountability measures because they have annual lifecycles.
1.2 Purpose and Need

**Purpose for Action**
The purpose of this amendment is to adjust stock status determination criteria to be consistent with the new population metrics for penaeid shrimp and modify the framework procedure for the shrimp FMP.

**Need for Action**
The needs for the proposed actions are to determine the overfished and overfishing status of each penaeid shrimp stock while using the best available science, and to streamline the management process for Gulf shrimp stocks.
1.3 History of Management

The Shrimp FMP, supported by an environmental impact statement (EIS), was implemented on May 15, 1981. The FMP defined the shrimp fishery management unit to include brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), royal red shrimp (*Pleoticus robustus*), seabobs (*Xiphopenaeus kroyeri*), and brown rock shrimp (*Sicyonia brevirostris*). Seabobs and rock shrimp were subsequently removed from the FMP. The actions implemented through the FMP and its subsequent amendments, have addressed the following objectives:

1. Optimize the yield from shrimp recruited to the fishery.
2. Encourage habitat protection measures to prevent undue loss of shrimp habitat.
3. Coordinate the development of shrimp management measures by the Gulf of Mexico Fishery Management Council (GMFMC) with the shrimp management programs of the several states, where feasible.
5. Minimize the incidental capture of finfish by shrimpers, when appropriate.
6. Minimize conflict between shrimp and stone crab fishermen.
7. Minimize adverse effects of obstructions to shrimp trawling.
8. Provide for a statistical reporting system.

The purpose of the plan was to enhance yield in volume and value by deferring harvest of small shrimp to provide for growth. The main actions included: 1) establishing a cooperative Tortugas Shrimp Sanctuary with the state of Florida to close a shrimp trawling area where small pink shrimp comprise the majority of the population most of the time; 2) a cooperative 45-day seasonal closure with the state of Texas to protect small brown shrimp emigrating from bay nursery areas; and 3) a seasonal closure of an area east of the Dry Tortugas to avoid gear conflicts with stone crab fisherman.

**Amendment 1 ENVIRONMENTAL ASSESSMENT (EA)(1981)** provided the Regional Administrator (RA) of the NMFS Southeast Regional Office (SERO) with the authority (after conferring with the Council) to adjust by regulatory amendment the size of the Tortugas Sanctuary or the extent of the Texas closure, or to eliminate either closure for one year.

**Amendment 2 EA (1983)** updated catch and economic data in the FMP.


**Amendment 4 EA (1988)** identified problems that developed in the fishery and revised the objectives of the FMP accordingly. The annual review process for the Tortugas Sanctuary was simplified, and the Council and RA review for the Texas closure was extended to February 1. A provision that white shrimp taken in the exclusive economic zone (EEZ) be landed in accordance with a state's size/possession regulations to provide consistency and facilitate enforcement with the state of Louisiana was to have been implemented at such time when Louisiana provided for
an incidental catch of undersized white shrimp in the fishery for seabobs. This provision was disapproved by the NMFS with the recommendation that it be resubmitted under the expedited 60-day Secretarial review schedule after Louisiana provided for a bycatch of undersized white shrimp in the directed fishery for seabobs. This resubmission was made in February of 1990 and applied to white shrimp taken in the EEZ and landed in Louisiana. It was approved and implemented in May of 1990.

In July 1989, the NMFS published revised guidelines for FMPs that interpretatively addressed the Magnuson-Stevens Act (then called the Magnuson Fishery Conservation and Management Act) National Standards (50 CFR Part 602). These guidelines required each FMP to include a scientifically measurable definition of overfishing and an action plan to arrest overfishing should it occur.

In 1990, Texas revised the period of its seasonal closure in Gulf waters from June 1 to July 15 to May 15 to July 15. The FMP did not have enough flexibility to adjust the cooperative closure of federal waters to accommodate this change, thus an amendment was required.

**Amendment 5/EA (1991)** defined overfishing for Gulf brown, pink, and royal red shrimp and provided measures to restore overfished stocks if overfishing should occur. Action on the definition of overfishing for white shrimp was deferred, and seabobs and rock shrimp were deleted from the management unit. The duration of the seasonal closure to shrimping off Texas was adjusted to conform with the changes in state regulations.

**Amendment 6/EA (1992)** eliminated the annual reports and reviews of the Tortugas Shrimp Sanctuary in favor of monitoring and an annual stock assessment. Three seasonally opened areas within the sanctuary continue to open seasonally, without need for annual action. A proposed definition of overfishing of white shrimp was rejected by NMFS because it was not based on the best available data.

**Amendment 7/EA (1994)** defined overfishing for white shrimp and provided for future updating of overfishing indices for brown, white, and pink shrimp as new data become available. A total allowable level of foreign fishing for royal red shrimp was eliminated; however, a redefinition of overfishing for this species was disapproved.

**Amendment 8/EA (1995),** implemented in early 1996, addressed management of royal red shrimp. It established a procedure that would allow total allowable catch for royal red shrimp to be set up to 30% above MSY for no more than two consecutive years so that a better estimate of MSY could be determined. This action was subsequently negated by the 1996 Sustainable Fisheries Act amendment to the Magnuson-Stevens Act that defined overfishing as a fishing level that jeopardizes the capacity of a stock to maintain MSY, and does not allow OY to exceed MSY.

**Amendment 9,** supported by a Supplemental Environmental Impact Statement (SEIS) (1997), required the use of a NMFS certified bycatch reduction device (BRD) in shrimp trawls used in the EEZ from Cape San Blas, Florida (85°30' W. Longitude) to the Texas/Mexico border, and provided for the certification of BRDs and specifications for the placement and construction.
The purpose of this action was to reduce the bycatch mortality of juvenile red snapper by 44% from the average mortality for the years 1984 through 1989. This amendment exempted shrimp trawls fishing for royal red shrimp seaward of the 100-fathom contour, as well as groundfish and butterfish trawls. It also excluded small try nets and no more than two ridged frame roller trawls of limited size. Amendment 9 also provided mechanisms to change the bycatch reduction criterion and to certify additional BRDs.

**Amendment 10/EA** (2002) required BRDs in shrimp trawls used in the Gulf east of Cape San Blas, Florida. Certified BRDs for this area are required to demonstrate a 30% reduction by weight of finfish.

**Amendment 11/EA** (2001) required owners and operators of all vessels harvesting shrimp from the EEZ of the Gulf to obtain a federal commercial vessel permit. This amendment also prohibited the use of traps to harvest royal red shrimp from the Gulf and prohibited the transfer royal red shrimp at sea.

**Amendment 12/EA** (2001) was included as part of the Generic Essential Fish Habitat (EFH) Amendment that established EFH for shrimp in the Gulf.

**Amendment 13/EA** (2005) established an endorsement to the existing federal shrimp vessel permit for vessels harvesting royal red shrimp; defined the overfishing threshold and the overfished condition for royal red shrimp; defined MSY and OY for the penaeid shrimp stocks in the Gulf; established bycatch reporting methodologies and improved collection of shrimping effort data in the EEZ; required completion of a Gulf Shrimp Vessel and Gear Characterization Form; established a moratorium on the issuance of commercial shrimp vessel permits; and required reporting and certification of landings during the moratorium.

**Amendment 14/EIS** (2007) was a joint amendment with Reef Fish Amendment 27. It established a target red snapper bycatch mortality goal for the shrimp fishery in the western Gulf and defined seasonal closure restrictions that can be used to manage shrimp fishing efforts in relation to the target red snapper bycatch mortality reduction goal. It also established a framework procedure to streamline the management of shrimp fishing effort in the western Gulf.

**The Generic ACL/Accountability Measures Amendment/EIS** (2011) set ACLs and accountability measures for royal red shrimp. Penaeid shrimp were not included in this amendment because their annual lifecycle exempts them from the Magnuson-Stevens Act requirement for ACLs and AMs.

**The Shrimp Electronic Logbook Framework** (2013) established a cost-sharing system for the electronic logbook program, and described new equipment and procedures for the program.
CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 – Modify Stock Status Determination Criteria for Penaeid Shrimp Stocks (Brown, White, and Pink)

Action 1.1 – Modify the Overfishing Threshold for Penaeid Shrimp

Alternative 1: No Action – The overfishing threshold is defined as a rate of fishing that results in the parent stock number being reduced below the maximum sustainable yield (MSY) minimum levels listed below:
   a. Brown shrimp- 125 million individuals, age 7+ months during the November through February period
   b. White shrimp- 330 million individuals, age 7+ months during the May through August period
   c. Pink shrimp- 100 million individuals, age 5+ months during the July through June period

Preferred Alternative 2: The maximum fishing mortality threshold (MFMT) for each penaeid shrimp stock is defined as the maximum apical fishing mortality rate (F) computed for the fishing years 1984 to 2012 plus the 95% confidence limits. Species specific MFMT values will be recomputed during updated assessments, but only among the years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
   a. Brown shrimp: the apical F value of the model output (3.54) plus the confidence limit (0.14); effective F: 3.68
   b. White shrimp: the apical F value of the model output (0.76) plus the confidence limit (0.01); effective F: 0.77
   c. Pink shrimp: the apical F value of the model output (0.20) plus the confidence limit (0.03); effective F: 0.23

Alternative 3: The maximum fishing mortality threshold (MFMT) for each penaeid shrimp stock is defined as the maximum apical fishing mortality rate (F) computed for the fishing years 1984 to 2012. Species specific MFMT values will be recomputed during updated assessments, but only among the years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
   a. Brown shrimp: 3.54
   b. White shrimp: 0.76
   c. Pink shrimp: 0.20

Response to Possible Overfishing
If overfishing occurs for two consecutive years, the appropriate committees and/or panels (e.g. stock assessment panels, AP, SSC) would convene to review changes in apparent stock size, changes in fishing effort, potential alterations in habitat or other environmental conditions. Fishing mortality and other factors that may have contributed to the decline. If excess fishing is
determined to be the source of, or a contributor to, a fishing mortality rate that exceeds MFMT, reduction in fishing pressure should be recommended.

Discussion:
Historically, under optimum environmental conditions and maximum effort the maximum probable catch for penaeid (brown, white, and pink) shrimp has been estimated using virtual population analysis (VPA). Recently, NMFS has changed their model from VPA to the Stock Synthesis model to determine Gulf shrimp status, after the VPA was determined inadequate to account for the low fishing effort for pink shrimp (Nance 2008; Hart and Nance 2010) designating the stock as undergoing overfishing, when later determinations were that the stock was not undergoing overfishing. Evaluations of new stock assessment models determined that the Stock Synthesis model was the best available model. The new Stock Synthesis model produces overfishing estimates as fishing mortality rates (F), which are incompatible with current overfishing thresholds (Alternative 1).

The guidelines for National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) require one of two thresholds be developed to determine if a stock is undergoing overfishing: the MFMT or the overfishing limit (OFL). The MFMT is the maximum rate of fishing mortality above which the stock is considered to be undergoing overfishing. The OFL is the catch level associated with fishing at MFMT. Because the model produces outputs in terms of fishing mortality rates, MFMT is the appropriate threshold to use for penaeid shrimp species. The Gulf of Mexico Fishery Management Council’s (Council) Scientific and Statistical Committee (SSC) approved the use of MFMTs for the overfishing thresholds (Figures 2.1.1-2.1.3).

![Figure 2.1.1. Brown shrimp F-values modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean F-value calculated for brown shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.1a, the highest F-value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.](image)
Figure 2.1.2. White shrimp F-values modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean F-value calculated for white shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.1b, the highest F-value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.

Figure 2.1.3. Pink shrimp F-values modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean F-value calculated for pink shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.1c, the highest F-value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.
**Alternative 1** would continue to use overfishing thresholds based on parent stock levels that are incompatible with current population metrics produced by model assessments and are based on the estimated number of individuals harvested. This would leave the overfishing status as unknown.

**Preferred Alternative 2** would establish the MFMTs as the highest F for each species currently produced by the Stock Synthesis model. The apical F is the largest value of fishing mortality estimated by the model over the course of the model data years. The model is stochastic - when new data are added, the apical F may change slightly. Using the 95% confidence limits to define a range about the highest F is intended to address this variation and reduce the risk of model-driven overfishing designations. Additionally, the values for each species and subsequent range should be re-evaluated periodically because of this variation in the model when new data are added. This re-evaluation would ensure the MFMT is reflective of the most current data.

**Alternative 3** is similar to **Preferred Alternative 2**, but does not take into account the variability of the model (confidence limits). With this alternative, the MFMTs may need to be re-evaluated by the Council and SSC more often than every five years if the F-value of a year exceeds the F-value stated in the document. Because the alternative does not account for the sensitivity of the model parameters to new data, it is more likely to result in an overfishing determination than **Preferred Alternative 2**.

Penaeid shrimp stocks are influenced primarily by environmental conditions and are annual crops, and the model is parameterized with monthly inputs, thus, MSY is difficult to predict. The Shrimp Advisory Panel recommended that values exceeding F for two years in a row designate the stock as undergoing overfishing, as a solitary year exceeding F might be indicative of productive stocks and not necessarily overfishing. In the SFA Amendment (GMFMC 1999), the response to possible overfishing was set to trigger only when overfishing persisted for two consecutive years. This was primarily in response to the biology of the shrimp stocks and the environmental influence on the stocks; penaeid shrimp rarely live longer than 18 months and stock size is driven by annual variability in environmental conditions. Therefore, this same provision for responding to overfishing was continued in the current amendment. In Amendment 13 (GMFMC 2005a), MSY was defined as the highest and lowest landings values taken annually from 1990-2000 because a true numerical value cannot be calculated.

The biological characteristics that affect sustainable yields for penaeid shrimp are unusual. They are an annual crop. There is no demonstrable stock-recruitment relationship and currently it is not feasible that too many shrimp will be taken to provide an adequate supply for the following year. Because of these characteristics, fishing mortality and yield in one year do not affect yield in the following year.
Action 1.2 – Modify the Overfished Threshold for Penaeid Shrimp

Alternative 1: No Action - An overfished condition would result when a parent stock number falls below one-half of the overfishing definition listed below.
   a. Brown Shrimp - 63 million individuals, age 7+ months during the November through February period
   b. White Shrimp - 165 million individuals, age 7+ months during the May through August period
   c. Pink Shrimp - 50 million individuals, age 5+ months during the July through June period

Preferred Alternative 2: The minimum sustainable stock threshold (MSST) for each penaeid shrimp stock is defined as the minimum total annual spawning biomass minus the 95% confidence limit for the fishing years 1984 to 2012. Species specific MSST values will be recomputed during the updated assessments, but only among the fishing years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
   a. Brown shrimp: the MSST value of the model output (11,166) minus the confidence limit (222); effective MSST value: 10,944 metric tons of tails
   b. White shrimp: the MSST value of the model output (125,535) minus the confidence limit (306); effective MSST value: 125,229 metric tons of tails
   c. Pink shrimp: the MSST value of the model output (17,502) minus the confidence limit (3,467); effective MSST value: 14,035 metric tons of tails

Alternative 3: The minimum sustainable stock threshold (MSST) for each penaeid shrimp stock is defined as the minimum total annual spawning biomass for the fishing years 1984 to 2012. Species specific MSST values will be recomputed during the updated assessments, but only among the fishing years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
   a. Brown shrimp: 11,166 metric tons of tails
   b. White shrimp: 125,535 metric tons of tails
   c. Pink shrimp: 17,502 metric tons of tails

Discussion:
In October, the SSC approved setting the overfished thresholds at the minimum spawning biomass annual data points (from 1984-2011) or MSST (Preferred Alternative 2 and Alternative 3), and the Council accepted the updated values based on data through 2012 at its October 2013 meeting (Figures 2.2.1 - 2.2.3). The MSST is the level of biomass below which the stock is considered to be overfished. The MSST is a value based on the landings of the parent stock, while the MFMT is based on F. Fishery managers can determine the status of a fishery at any given time and assess whether management measures are maintaining healthy stocks and achieving OY by evaluating the biomass of a stock in relation to MSST.
**Figure 2.2.1.** Brown shrimp MSST modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for brown shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the lowest MSST value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.

**Figure 2.2.2.** White shrimp MSST modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for white shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the lowest MSST value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.
Figure 2.2.3. Pink shrimp MSST modeled using the Stock Synthesis Model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for pink shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the lowest MSST value was used (Preferred Alternative 2 and 3) with the corresponding confidence limits (Preferred Alternative 2). Only for six months of data were available for 2012, not the full year.

**Alternative 1** would continue to use an overfished threshold that is incompatible with current model outputs and would leave the overfished condition of the three penaeid shrimp species unknown.

**Preferred Alternative 2** would be the lowest MSST value for each species currently produced by the Stock Synthesis model minus the 95% confidence limit. Because the model has slight fluctuations in values when new data are added, the use of the 95% confidence limits to define a range less than the least MSST value is intended to reduce the risk of model-driven overfished designations. Because this value and subsequent range may fluctuate with the addition of data, it is appropriate that the MSST values and 95% confidence limits be re-assessed periodically.

**Alternative 3** is similar to Preferred Alternative 2, but does not take into account the variability of the model. Because this alternative does not take into account the sensitivity of the model when new data are added, it is more likely that a stock could be determined to be overfished.

The Shrimp advisory panel recommended that values below MSST for two years in a row designate the stock as overfished, as a solitary year below MSST might be indicative of environmental conditions and not necessarily an overfished condition. Unlike for overfishing, the SFA did not have a two year provision for responding to an overfished determination (GMFMC 1999). In Magnuson-Stevens Act, if a stock is determined to be overfished, the Council needs to be notified and begin implementing conservation and management measures to rebuild the stock. The Council is required to implement management measures within two years.
of being notified. Because of the biology of shrimp stock, variability in environmental conditions and the two-year timeframe to implement these measures, the stock may no longer be considered overfished. However, if the spawning biomass is consistently below MSST, then the Council will already have management measures in development.
2.2 Action 2 – Modify the Shrimp Fishery Management Plan (FMP) Framework Procedure

Alternative 1. No Action – Do not modify the shrimp management measures framework procedure adopted through the Generic Annual Catch Limits (ACL)/Accountability Measures Amendment.

Preferred Alternative 2. Modify the shrimp management measures framework procedure to include changes to accountability measures for the royal red shrimp fishery through the standard documentation process for open framework actions, and make editorial changes to the framework procedure to reflect changes to the Council advisory committees and panels. Accountability measures that could be implemented or changed would include:

In-season accountability measures
- Closure and closure procedures
- Trip limit implementation or change
- Implementation of gear restrictions

Post-season accountability measures
- Adjustment of season length
- Implementation of closed seasons/time periods
- Adjustment or implementation of trip or possession limits
- Reduction of the ACL/Annual Catch Target (ACT) to account for the previous year overage
- Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year
- Implementation of gear restrictions
- Reporting and monitoring requirements

Alternative 3. Modify the shrimp management measures framework procedure to include changes to accountability measures for the royal red shrimp fishery through the standard documentation process for open framework actions, and make editorial changes to the framework procedure to reflect changes to the Council advisory committees and panels. Accountability measures that could be changed would include:

In-season accountability measures
- Closure procedures
- Trip limit reductions or increases

Post-season accountability measures
- Adjustment of season length
- Adjustment of trip or possession limits

*Note: The portions of the framework procedure regarding ACL, ACTs, and AMs currently apply only to royal red shrimp because penaeid shrimp species have annual lifecycles and, therefore, are not required to have these management measures.
Discussion:
The Council currently has three different regulatory vehicles for addressing fishery management issues. First, they may develop a fishery management plan or plan amendment to establish management measures. The amendment process can take one to three years depending on the analysis needed to support the amendment actions. Second, the Council may vote to request an interim or emergency rule that could remain effective for 180 days with the option to extend it for an additional 186 days. Interim and emergency rules are only meant as short-term management tools while permanent regulations are developed through an amendment. Third, the Council may prepare a framework action based on a predetermined procedure that allows changes to specific management measures and parameters. Typically, framework actions take less than a year to implement and, like plan amendments, are effective until amended.

Three framework procedures have been developed for the shrimp FMP: 1) Amendment 9 (GMFMC 1997) established a framework procedure for modifying bycatch reduction criteria, bycatch reduction device (BRD) certification and decertification criteria, and testing protocols for certifying BRDs; 2) Amendment 14 (GMFMC 2007) established a framework procedure for adjusting shrimp target effort and closed seasons relative to red snapper; and 3) the Generic ACL/Accountability Measures Amendment (GMFMC 2011) established a framework procedure to change other management measures. Subsequent to the last amendment, the Council determined that modifications to accountability measures should be included in the frameworks for all of their FMPs; therefore, the reef fish framework procedure was modified in Amendment 38 to the Reef Fish FMP and the coastal migratory pelagics (CMP) framework was modified in Amendment 20B to the CMP FMP. The current action proposes to make those same changes to the shrimp framework established in the Generic ACL/Accountability Measures Amendment as indicated in the highlighted sections below. The other two framework procedures would remain unchanged. The accountability measure provisions currently apply only to royal red shrimp because penaeid shrimp are not required to have accountability measures.

Proposed Language for Updated Framework Procedure

This framework procedure provides standardized procedures for implementing management changes pursuant to the provisions of the fishery management plan (FMP). There are two basic processes, the open framework process and the closed framework process. Open frameworks address issues where there is more policy discretion in selecting among various management options developed to address an identified management issue, such as changing a size limit to reduce harvest. Closed frameworks address much more specific factual circumstances, where the FMP and implementing regulations identify specific action to be taken in the event of specific facts occurring, such as closing a sector of a fishery after their quota has been harvested.

Open Framework:

1. Situations under which this framework procedure may be used to implement management changes include the following:
   a. A new stock assessment resulting in changes to the overfishing limit, acceptable
biological catch, or other associated management parameters. 

*In such instances the Gulf of Mexico Fishery Management Council (Council) may, as part of a proposed framework action, propose an annual catch limit (ACL) or series of ACLs and optionally an annual catch target (ACT) or series of ACTs, as well as any corresponding adjustments to maximum sustainable yield (MSY), optimum yield (OY), and related management parameters.*

b. New information or circumstances.

*The Council will, as part of a proposed framework action, identify the new information and provide rationale as to why this new information indicates that management measures should be changed.*

c. Changes are required to comply with applicable law such as Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), Endangered Species Act (ESA), Marine Mammal Protection Act, or are required as a result of a court order. 

*In such instances the Regional Administrator (RA) will notify the Council in writing of the issue and that action is required. If there is a legal deadline for taking action, the deadline will be included in the notification.*

2. Open framework actions may be implemented in either of two ways, abbreviated documentation, or standard documentation process.

a. Abbreviated documentation process. Regulatory changes that may be categorized as a routine or insignificant may be proposed in the form of a letter or memo from the Council to the RA containing the proposed action, and the relevant biological, social and economic information to support the action. If multiple actions are proposed, a finding that the actions are also routine or insignificant must also be included. If the RA concurs with the determination and approves the proposed action, the action will be implemented through publication of appropriate notification in the Federal Register. Actions that may be viewed as routine or insignificant include, among others:

i. Reporting and monitoring requirements,
ii. Permitting requirements,
iii. Gear marking requirements,
iv. Vessel marking requirements,
vi. Restrictions relating to maintaining fish in a specific condition (whole condition, filleting, use as bait, etc.),
vii. Size limit changes of not more than 10% of the prior size limit,
vii. Vessel trip limit changes of not more than 10% of the prior trip limit,
viii. Closed seasons of not more than 10% of the overall open fishing season,
ix. Restricted areas (seasonal or year-round) affecting no more than a total of 100 square nautical miles,
x. Respecification of ACL, ACT or quotas that had been previously approved as part of a series of ACLs, ACTs or quotas,
xii. Specification of MSY, OY, and associated management parameters (such as overfished and overfishing definitions) where new values are calculated based on previously approved specifications,
xii. Gear restrictions, except those that result significant changes in the fishery,
such as complete prohibitions on gear types,

xiii. Quota changes of not more than 10%, or retention of portion of an annual quota in anticipation of future regulatory changes during the same fishing year,

b. Standard documentation process. Regulatory changes that do not qualify as a routine or insignificant may be proposed in the form of a framework document with supporting analyses. Non-routine or significant actions that may be implemented under a framework action include:

i. Specification of ACTs or sector ACTs, and modifications to ACL/ACT control rule,

ii. Specification of acceptable biological catch (ABC) and ABC control rules,

iii. Rebuilding plans and revisions to approved rebuilding plans,

iv. Changes specified in section 4(a) that exceed the established thresholds.

v. Changes to accountability measures including:

<table>
<thead>
<tr>
<th>In-season accountability measures</th>
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<tbody>
<tr>
<td>1. Closures and closure procedures</td>
</tr>
<tr>
<td>2. Trip limit changes</td>
</tr>
<tr>
<td>3. Implementation of gear restrictions</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Post-season accountability measures</th>
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<tbody>
<tr>
<td>4. Adjustment of season length</td>
</tr>
<tr>
<td>5. Implementation of closed seasons/time periods</td>
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<tr>
<td>6. Adjustment or implementation of trip or possession limits</td>
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<tr>
<td>7. Reduction of the ACL/ACT to account for the previous year overage</td>
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<tr>
<td>8. Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year</td>
</tr>
<tr>
<td>9. Implementation of gear restrictions</td>
</tr>
<tr>
<td>10. Reporting and monitoring requirements</td>
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</tbody>
</table>

3. The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issues. The framework process will include the development of documentation and public discussion during at least one Council meeting.

4. Prior to taking final action on the proposed framework action, the Council may convene its advisory committees and panels, as appropriate, to provide recommendations on the proposed actions.

5. For all framework actions, the Council will provide the letter, memo, or the completed framework document along with proposed regulations to the RA in a timely manner following final action by the Council.

6. For all framework action requests, the RA will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the Magnuson-Stevens Act and other applicable law.
Closed Framework:

1. Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following framework actions through appropriate notification in the Federal Register:
   a. Close or adjust harvest any sector of the fishery for a species, sub-species, or species group that has a quota or sub-quota at such time as projected to be necessary to prevent the sector from exceeding its sector-quota for the remainder of the fishing year or sub-quota season,
   b. Reopen any sector of the fishery that had been prematurely closed,
   c. Implement accountability measures, either in-season or post-season.

Alternative 1 would retain the current shrimp management measures framework procedure without any changes. This framework procedure was established in the Generic ACL/Accountability Measures Amendment (GMFMC 2011) and provides the Council and NMFS the flexibility to respond quickly to changes in the shrimp fishery. The framework has both open and closed components. The open components provide more policy discretion, whereas the closed components address more specific, well-defined circumstances. Measures that can be changed under the procedure are identified, as well as the appropriate process needed for each type of change.

Preferred Alternative 2 and Alternative 3 would allow changes to accountability measures under the standard documentation process of the open framework procedure, and would amend language in the framework that refers to the Socioeconomic Panel, which no longer exists under that name due to reorganization of the SSC. Each alternative contains a list of the specific accountability measures that could be changed through the process. Preferred Alternative 2 is a more comprehensive list that includes all accountability measures currently in place. Alternative 3 would limit the types of accountability measures that could be changed through a framework action. The accountability measures provisions in Preferred Alternative 2 and Alternative 3 currently apply only to royal red shrimp because penaeid shrimp are not required to have accountability measures.

It is important to note that some items included in Preferred Alternative 2 and Alternative 3 are currently listed in the abbreviated process section of the open framework procedure as management measures. Although similar, accountability measures differ from management measures because they are tied in some way to the ACL. For example, through the abbreviated process, the Council and NMFS may implement closed seasons of not more than 10% of the overall open fishing season. The reason for the closed season may be to protect spawning populations or to extend a fishing season later into the year. This is a management measure and would remain in effect until changed through another framework action. On the other hand, Preferred Alternative 2 would allow the Council and NMFS to implement a measure through the standard process whereby the RA has the authority to set a closed season in the year following a year in which the ACL is exceeded. In this case, the reason for the closed season is to prevent another overage of the ACL. This is an accountability measure, and the closed season would only be in effect temporarily. Therefore, the current framework allows changes to
management measures, but the proposed alternatives would allow changes to accountability measures, including adding new accountability measures to the existing suite.
CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Description of the Fishery

The Final Environmental Impact Statement (FEIS) for the original shrimp fishery management plan (FMP) and the FMP as revised in 1981 contain a description of the Gulf of Mexico (Gulf) shrimp fishery. This material is incorporated by reference and is not repeated here in detail. Amendment 9 (GMFMC 1997) with supplemental environmental impact statement (SEIS) updated this information. The management unit of this FMP consists of brown, white, pink, and royal red shrimp. Seabobs and rock shrimp occur as incidental catch in the fishery.

Brown shrimp is the most important species in the U.S. Gulf fishery with most catches made from June through October. Annual commercial landings in 2003 through 2013 have ranged from about 45 to 88 million pounds (mp) of tails (Table 3.1.1). The fishery is prosecuted to about 40 fathoms and is highly dependent on environmental factors such as temperature and salinity.

White shrimp are found in nearshore waters to about 20 fathoms from Texas through Alabama. The majority are taken from August through December though there is a small spring and summer fishery. From 2003 through 2013, annual commercial landings have ranged from approximately 55 to 87 mp of tails.

Pink shrimp are found off all Gulf states but are most abundant off Florida's west coast, particularly in the Tortugas grounds off the Florida Keys. Annual commercial landings in 2003 through 2013 have ranged from approximately 3 to 11 mp of tails (Table 3.1.1); most landings are made from October through May in 30 fathoms of water. In the northern and western Gulf states, pink shrimp are sometimes mistakenly counted as brown shrimp.

The commercial fishery for royal red shrimp is most abundant on the continental shelf from about 140 to 275 fathoms east of the Mississippi River. Thus far, landings have not reached the maximum sustainable yield (MSY) estimate of 392,000 pounds (lbs) of tails in the year 2003 through 2013 and have ranged from approximately 130,000 to 353,000 lbs of tails (Table 3.1.1).
### Table 3.1.1. Landings (tails) of shrimp from the Gulf of Mexico, 2003-2013.

<table>
<thead>
<tr>
<th></th>
<th>All Species</th>
<th>Brown</th>
<th>White</th>
<th>Pink</th>
<th>Royal R</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>161,010,611</td>
<td>84,077,981</td>
<td>61,029,451</td>
<td>9,992,981</td>
<td>279,013</td>
<td>5,631,185</td>
</tr>
<tr>
<td>2004</td>
<td>162,372,773</td>
<td>74,512,744</td>
<td>72,992,775</td>
<td>10,245,766</td>
<td>278,519</td>
<td>4,342,969</td>
</tr>
<tr>
<td>2005</td>
<td>135,418,633</td>
<td>58,658,224</td>
<td>65,399,784</td>
<td>8,784,798</td>
<td>150,316</td>
<td>2,425,511</td>
</tr>
<tr>
<td>2006</td>
<td>182,981,364</td>
<td>87,471,753</td>
<td>86,229,598</td>
<td>7,691,431</td>
<td>163,323</td>
<td>1,425,259</td>
</tr>
<tr>
<td>2007</td>
<td>139,962,049</td>
<td>70,675,513</td>
<td>64,350,692</td>
<td>3,459,355</td>
<td>229,024</td>
<td>1,247,465</td>
</tr>
<tr>
<td>2008</td>
<td>120,209,917</td>
<td>50,344,159</td>
<td>63,738,475</td>
<td>4,919,903</td>
<td>138,116</td>
<td>1,069,264</td>
</tr>
<tr>
<td>2010</td>
<td>110,491,956</td>
<td>44,951,233</td>
<td>59,032,638</td>
<td>5,243,681</td>
<td>127,358</td>
<td>1,137,046</td>
</tr>
<tr>
<td>2011</td>
<td>136,543,421</td>
<td>72,387,001</td>
<td>57,969,171</td>
<td>4,070,606</td>
<td>195,354</td>
<td>1,921,289</td>
</tr>
<tr>
<td>2012</td>
<td>136,717,883</td>
<td>64,674,384</td>
<td>67,787,889</td>
<td>3,213,402</td>
<td>177,658</td>
<td>864,550</td>
</tr>
<tr>
<td>2013</td>
<td>123,471,746</td>
<td>62,475,827</td>
<td>55,869,792</td>
<td>3,241,638</td>
<td>103,076</td>
<td>1,781,413</td>
</tr>
<tr>
<td>Average</td>
<td>142,165,699</td>
<td>67,781,958</td>
<td>66,257,393</td>
<td>5,907,048</td>
<td>183,166</td>
<td>2,036,134</td>
</tr>
</tbody>
</table>


The three principal species (penaeids) are short-lived and provide annual crops; royal red shrimp live longer, and several year classes may occur on the grounds at one time. Penaeid shrimp are not required to have annual catch limits (ACL) or accountability measures (AMs) because of their annual life cycle; royal red shrimp are the only shrimp species in the Gulf that currently have an ACL and AMs. The condition of each penaeid shrimp stock is monitored annually, and none has been overfished for more than 40 years.

Cooperative management of penaeid shrimp species include: simultaneous closure in both state and federal waters off the coast of Texas, the Tortugas Shrimp Sanctuary, and seasonally closed zones for the shrimp and stone crab fisheries off the coast of Florida. The royal red shrimp fishery is only in the exclusive economic zone (EEZ) in deeper water. As of May 16, 2014, there were 1,495 federal Gulf shrimp permits for shrimp and 292 endorsements for royal red shrimp. There has been a moratorium on the issuance of new Gulf of Mexico shrimp permits since 2007. Permits are fully transferrable and renewal of the moratorium permits is contingent upon compliance with recordkeeping and reporting requirements. State licenses may vary and vessels may have more than one state license. If selected, a vessel with a Gulf shrimp permit must carry a National Marine Fisheries Service (NMFS) approved observer. The size of the shrimp industry and its total effort has been substantially reduced since the benchmark 2001-2003 time period. This effort reduction reflects both a reduction in the number of vessels estimated to be participating in the fishery, and a reduction in the level of activity for those vessels remaining in the fishery.

Commercial shrimp vessels are classified by NMFS as either a nearshore or an offshore fleet. Size categories range from under 25 feet to over 85 feet. More than half of commercial shrimp vessels fall into a size range from 56 to 75 feet. The number of vessels in the fishery at any one time varies because of economic factors such as the price and availability of shrimp and cost of fuel. In addition to the federal shrimp vessel permits, NMFS maintains two types of vessel files, both of which are largely dependent on port agent records. One is for vessels that are recorded as landing shrimp, the shrimp landings file; the other is the vessel operating units file that lists...
vessels observed at ports. In the past, NMFS estimated fishing effort independently from the number of vessels fishing. NMFS used the number of hours actually spent fishing from interview data with vessel captains to develop reports as 24-hour days fished. NMFS currently uses the electronic logbook program from the selected number of vessels fishing and the number of hours spent towing to calculate effort.

A recreational shrimp trawl fishery occurs seasonally inside state waters. However, not all states have a permitting system for shrimping in state waters and not all states track the amount of bait shrimp used. In 2012, there were approximately 4,000 permits for Texas, Louisiana and Mississippi; Florida and Alabama do not require special shrimp permits. There are about 3,500 small boats participating using trawls up to 16 feet in width. More than 75% of the licenses are in Louisiana.

Bait landings of juvenile brown, pink, and white shrimp, occur in all states. Estimates from 2012 suggest landings of at least 2.5 MP (whole weight). Values for this component of the fishery cannot be calculated as not all states estimate values.

Various types of gear are used to capture shrimp including but not limited to cast nets, haul seines, stationary butterfly nets, wing nets, skimmer nets, traps, and beam trawls. The otter trawl with various modifications, is the dominant gear used in offshore waters, and there has been a decline in the number of otter trawls in recent years (NMFS 2014). Details about the specifics of each gear type as well as the historical evolution of the fishery can be found in Shrimp Amendment 14 (GMFMC 2007).

Although the industry continuously works to develop more efficient gear designs and fishing methods, the quad rig is still the primary gear used in federal waters; each gear type is well outlined in Shrimp Amendment 13 and 14 (GMFMC 2005a, 2007). In recent years, the skimmer trawl has become a major gear in the inshore shrimp fishery in the northern Gulf. All trawls used in federal waters are required to have bycatch reduction devices (BRDs) unless: it is fishing for and catching more than 90% royal red shrimp; the vessel is using a try net; it is a rigid frame roller trawl; it is trawling within the tow-time restrictions; it is testing the efficacy of a BRD (under an authorization by NMFS).

### 3.2 Description of the Physical Environment

The FEIS for the original Shrimp FMP and the FMP as revised in 1981 contain a description of the physical environment. The physical environment for penaeid shrimp is also detailed in the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2005b). This material is incorporated by reference and is not repeated here in detail.

The Gulf is a semi-enclosed oceanic basin of approximately 600,000 square miles (Gore, 1992). It is connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel. Oceanic conditions are primarily influenced by the Loop Current, the discharge of freshwater into the Northern Gulf, and a semi-permanent, anticyclonic gyre in the western Gulf. Gulf water temperatures range from 12º C to 29º C (54º F to 84º F) depending of
depth and season. In the Gulf, adult penaeid shrimp are found in nearshore and offshore on silt, mud, and sand bottoms; juveniles are found in estuaries.

Several area closures, including gear restrictions, may affect targeted and incidental harvest of penaeid shrimp species in the Gulf. These are described in detail in Amendment 13 (GMFMC 2005a) and incorporated by reference. The areas include:

- Cooperative Texas Shrimp Closure
- Tortugas Shrimp Sanctuary
- Southwest Florida Seasonal Closure
- Central Florida Seasonal Closure
- Longline/Buoy Gear Area Closure
- Madison-Swanson and Steamboat Lumps Marine Reserves
- The Edges Marine Reserve
- Tortugas North and South Marine Reserves
- Tortugas Shrimp Sanctuary
- Alabama Special Management Zone

Reef and bank areas designated as Habitat Areas of Particular Concern (HAPCs) in the northwestern Gulf 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, Florida Middle Grounds HAPC and Pulley Ridge HAPC. There is one site listed in the National Register of Historic Places in the Gulf. This is the wreck of the U.S.S. Hatteras, located in federal waters off Texas.

Generic Amendment 3 addresses EFH requirements (GMFMC 2005b) and established that a weak link in the tickler chain is required on bottom trawls for all habitats throughout the Gulf EEZ. A weak link is defined as a length or section of the tickler chain that has a breaking strength less than the chain itself and is easily seen as such when visually inspected. The amendment established an education program on the protection of coral reefs when using various fishing gears in coral reef areas for recreational and commercial fishermen.

The Deepwater Horizon MC252 oil spill affected at least one-third of the Gulf from western Louisiana east to the Florida Panhandle and south to the Campeche Bank of Mexico. Oil flowed from the ruptured wellhead at a rate of 52,700 – 62,200 barrels/day with a total of 4,928,100 barrels spilled (www.restorethegulf.gov 2010). The impacts of the Deepwater Horizon MC252 oil spill on the physical environment may be significant and long-term. Oil was dispersed on the surface, and because of the heavy use of dispersants (both at the surface and at the wellhead), oil was also suspended within the water column (Camilli et al. 2010; Kujawinski et al. 2011). Floating and suspended oil washed onto coastlines in several areas of the Gulf along with non-floating tar balls. Suspended and floating oil degrades over time, but tar balls are persistent in the environment and can be transported hundreds of miles (Goodman 2003).

Surface or submerged oil during the Deepwater Horizon MC252 oil spill event could have restricted the normal processes of atmospheric oxygen mixing into and replenishing oxygen concentrations in the water column affecting the long-standing hypoxic zone located west of the Mississippi River on the Louisiana continental shelf (NOAA 2010). Microbial biodegradation of
hydrocarbons in the water column may have occurred without substantial oxygen drawdown (Hazen et al. 2010). Residence time of hydrocarbons in sediments is also a concern. The indices developed for past oil spills (Harper 2003) and oil spill scenarios (Stjernholm et al. 2011) such as the “oil residence index” do not appear to have been used during the assessment of the Deepwater Horizon MC252 oil spill.

3.3 Description of the Biological/Ecological Environment

The FEIS for the original Shrimp FMP and the FMP as revised in 1981 contain a description of the biology of the shrimp species. In its appendix, the FEIS of February 1981 includes the habitats, distribution, and incidental capture of sea turtles. This material is incorporated by reference and is not repeated here in detail. Amendment 9 (GMFMC 1997) updated this information.

Brown, white, and pink shrimp use a variety of habitats as they grow from planktonic larvae to spawning adults (GMFMC 1981). Brown shrimp eggs are demersal and occur offshore. Post-larvae migrate to estuaries through passes on flood tides at night mainly from February until April; there is another a minor peak in the fall. Post-larvae and juveniles are common in all U.S. estuaries from Apalachicola Bay, Florida to the Mexican border. Brown shrimp post-larvae and juveniles are associated with shallow, vegetated estuarine habitats, but may occur on silt, sand and non-vegetated mud bottoms. Adult brown shrimp occur in marine waters extending from mean low tide to the edge of the continental shelf and are associated with silt, muddy sand, and sandy substrates. More detailed discussion on habitat associations of brown shrimp is provided in Nelson (1992) and Pattillo et al. (1997).

White shrimp eggs are demersal and larval stages are planktonic in nearshore marine waters. Postlarvae migrate through passes mainly from May until November with peaks in June and September. Juveniles are common in all Gulf estuaries from Texas to the Suwannee River in Florida. Postlarvae and juveniles commonly occur on bottoms with large quantities of decaying organic matter or vegetative cover such as mud or peat. Juvenile migration from estuaries occurs in late August and September and is related to juvenile size and environmental conditions (e.g., sharp temperature drops in fall and winter). Adult white shrimp are demersal and inhabit nearshore Gulf waters to depths of 16 fathoms on soft bottoms. More detailed information on habitat associations of white shrimp is available from Nelson (1992) and Pattillo et al. (1997).

Pink shrimp eggs are demersal, and early planktonic larval are planktonic, and postlarvae are demersal in marine waters. Juveniles inhabit almost every U.S. estuary in the Gulf but are most abundant in Florida. Juveniles are commonly found in estuarine areas with seagrass where they burrow into the substrate by day and emerge at night. Adults inhabit offshore marine waters with the highest concentrations in depths of 5 to 25 fathoms.

Royal red shrimp occur exclusively in the EEZ, live longer and many year classes may be on the grounds at one time. The fishery occurs in water depths of 80 to 300 fathoms.
3.3.1 Status of the Shrimp Stocks

The three species of penaeid shrimp harvested by the shrimp fishery are short-lived and provide annual crops; royal reds live longer (2-5 years) and multiple year classes can be found on the same fishing grounds. The condition of each shrimp stock is monitored annually, and none has been classified as overfished or undergoing overfishing (Hart 2013). Specific landings values and are available in Table 3.1.1.

3.3.2 Protected Species

Species in the Gulf protected under the Endangered Species Act (ESA) include: seven marine mammal species (blue, sei, fin, humpback, sperm, North Atlantic right whales and manatees); five sea turtles (Kemp’s ridley, loggerhead, green, leatherback, and hawksbill); two fish species (Gulf sturgeon, and smalltooth sawfish); and two coral species (elkhorn coral, staghorn coral) though several (lobed star coral, mountainous coral, knobby star coral, rough cactus coral, Lamarck’s sheet coral, and elliptical star coral) additional coral species have been proposed as threatened or endangered recently. Twelve species of fish and invertebrates in the Gulf are currently listed as species of concern.

Otter trawls may directly affect smalltooth sawfish that are foraging within or moving through an active trawling location via direct contact with the gear. The long, toothed rostrum of the smalltooth sawfish causes this species to be particularly vulnerable to entanglement in any type of netting gear, including the netting used in shrimp trawls.

Green, hawksbill, Kemp’s ridley, leatherback, and loggerhead sea turtles are all highly migratory and are known to occur in areas subject to shrimp trawling. Incidental bycatch of the species by commercial fisheries is a major contributor to past declines and threat to future recovery (NMFS and USFWS 1991, 1992a, 1992b, 2008a, 2008b; NMFS et al. 2011a, 2011b). Historically, southeastern U.S. shrimp fisheries (both Gulf and South Atlantic) have been the largest fishery threat to benthic sea turtles. Regulations required turtle excluder devices (TEDs) have made significant improvements on the effects of trawl fisheries on sea turtles.

The biological opinion prepared for continued authorization of the U.S. Shrimp fisheries in federal waters (NMFS 2014) evaluated the effects of all fishing activity authorized under the FMP on threatened and endangered species in accordance with section 7 of the ESA. The biological opinion, which was based on the best available commercial and scientific data, concluded the continued operation of the Gulf shrimp fishery is not likely to jeopardize the continued existence of threatened or endangered species (NMFS 2014). However, measures are needed to ensure any sea turtle or smalltooth sawfish incidentally caught by the fishery is handled in such a way as to minimize stress to the animal and increase its survival rate.

The shrimp fishery is classified in the 2014 List of Fisheries as a Category II fishery (79 FR 14418, March 14, 2014). This classification indicates the annual mortality and serious injury of a marine mammal stock is greater than 1% but less than 50 % of the stocks potential biological removal (PBR), not including natural mortalities, that may be removed from a marine mammal
stock while allowing that stock to reach or maintain its optimum sustainable population. This fishery was elevated to Category II from Category III (mortality or serious injury to <1% of the PBR) in 2011 based on increased interactions reported by observers, strandings, and fisheries research data.

Determination Criteria for Penaeid Shrimp stock while allowing that stock to reach or maintain its optimum sustainable population. This fishery was elevated to Category II from Category III (mortality or serious injury to <1% of the PBR) in 2011 based on increased interactions reported by observers, strandings, and fisheries research data.


3.4 Description of the Economic Environment

Descriptions of the Gulf shrimp fishery are contained in previous amendments and NMFS regulatory actions, and are incorporated herein by reference [see Shrimp Amendment 13 (GMFMC 2005a); Shrimp Amendment 14/Reef Fish Amendment 27 (GMFMC 2007); Regulatory Impact Review and Regulatory Flexibility Act Analysis for Making Technical Changes to TEDs to Enhance Turtle Protection in the Southeastern United States Under Sea Turtle Conservation Regulations (NMFS 2002); Regulatory Impact Review and Regulatory Flexibility Act Analysis, and Social Impact Assessment for the Proposed Rule to Revise the Gulf/South Atlantic Bycatch Reduction Device Testing Manual and Modify the Bycatch Reduction Criterion for Bycatch Reduction Devices Used in the Penaeid Shrimp Fishery West of Cape San Blas, Florida (NMFS 2006), Framework Action to Establish Funding Responsibilities for the Electronic Logbook Program in the Shrimp Fishery of the Gulf of Mexico (GMFMC 2013]. The following discusses certain key characteristics of the Gulf shrimp fishery.

Total Landings and Dockside Revenues

The Gulf shrimp fishery consists of three major sectors: harvesting sector, dealer/wholesaler sector, and processing sector. The following discussion focuses on the harvesting sector, primarily because the current amendment would directly affect vessels participating in the Gulf shrimp fishery.

The harvesting sector is composed of two types of fleet: 1) an inshore segment, mostly active in state waters and very diverse; and 2) an offshore segment, largely active in federal waters and almost always using trawl gear. In 2003, a federal shrimp permit was instituted requiring vessels to possess the permit when fishing for penaeid shrimp in the Gulf EEZ. A moratorium on the issuance of new federal shrimp permits was established in 2007. Currently, vessels must possess a shrimp moratorium permit (SPGM) when fishing for penaeid shrimp in the Gulf EEZ. In addition, a royal red shrimp endorsement, which is an open access permit for those holding a SPGM, is required for harvesting royal red shrimp in the Gulf. As of May 9, 2014, there were 1,397 SPGM permits and 290 royal red shrimp permits.

Total landings of shrimp from 2006 through 2013 average at about 138 mp, heads off, with a dockside value of approximately $391 million in 2011 dollars (Table 3.3.1). Current values were adjusted for inflation using the consumer price index³. It is noted that these shrimp landings exclude shrimp for bait.

On average (2006-2013), brown shrimp accounted for about 47.8% of total shrimp landings and 45.4% of total dockside revenues; white shrimp accounted for 47.9% of total shrimp landings and 50.0% of total dockside revenues; pink shrimp accounted for 3.3% of total shrimp landings and 3.9% of dockside revenues; royal red shrimp accounted for less than 1% of total shrimp landings and dockside revenues; and, other shrimp species accounted for about 1.4% of total shrimp landings and less than 1% of dockside revenues.

**Table 3.3.1.** Landings and dockside revenues from the Gulf of Mexico shrimp fishery, 2003-2013, and their percent distribution by species.

<table>
<thead>
<tr>
<th></th>
<th>All Species</th>
<th>Brown (%)</th>
<th>White (%)</th>
<th>Pink (%)</th>
<th>Royal R (%)</th>
<th>Others (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Landings (lbs heads off)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>182,981,364</td>
<td>47.8%</td>
<td>47.1%</td>
<td>4.2%</td>
<td>0.1%</td>
<td>0.8%</td>
</tr>
<tr>
<td>2007</td>
<td>139,962,049</td>
<td>50.5%</td>
<td>46.0%</td>
<td>2.5%</td>
<td>0.2%</td>
<td>0.9%</td>
</tr>
<tr>
<td>2008</td>
<td>120,209,917</td>
<td>41.9%</td>
<td>53.0%</td>
<td>4.1%</td>
<td>0.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>2009</td>
<td>154,642,342</td>
<td>48.7%</td>
<td>48.1%</td>
<td>2.7%</td>
<td>0.1%</td>
<td>0.4%</td>
</tr>
<tr>
<td>2010</td>
<td>110,491,956</td>
<td>40.7%</td>
<td>53.4%</td>
<td>4.7%</td>
<td>0.1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>2011</td>
<td>136,543,421</td>
<td>53.0%</td>
<td>42.5%</td>
<td>3.0%</td>
<td>0.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td>2012</td>
<td>136,717,883</td>
<td>47.3%</td>
<td>49.6%</td>
<td>2.4%</td>
<td>0.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>2013</td>
<td>123,471,746</td>
<td>50.6%</td>
<td>45.2%</td>
<td>2.6%</td>
<td>0.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>138,127,585</td>
<td>47.8%</td>
<td>47.9%</td>
<td>3.3%</td>
<td>0.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td><strong>Dockside Revenues (2011 dollars)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>$437,800,995</td>
<td>44.7%</td>
<td>48.2%</td>
<td>6.4%</td>
<td>0.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>2007</td>
<td>$384,551,411</td>
<td>48.3%</td>
<td>48.0%</td>
<td>3.1%</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>2008</td>
<td>$375,675,082</td>
<td>40.0%</td>
<td>55.4%</td>
<td>4.1%</td>
<td>0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>2009</td>
<td>$325,291,215</td>
<td>45.4%</td>
<td>50.3%</td>
<td>3.9%</td>
<td>0.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>2010</td>
<td>$335,419,683</td>
<td>41.8%</td>
<td>52.8%</td>
<td>4.8%</td>
<td>0.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>2011</td>
<td>$425,064,112</td>
<td>46.8%</td>
<td>48.7%</td>
<td>3.2%</td>
<td>0.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td>2012</td>
<td>$389,487,270</td>
<td>47.1%</td>
<td>49.5%</td>
<td>2.9%</td>
<td>0.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>2013</td>
<td>$452,413,685</td>
<td>47.8%</td>
<td>48.4%</td>
<td>2.9%</td>
<td>0.2%</td>
<td>0.8%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>$390,712,931</td>
<td>45.4%</td>
<td>50.0%</td>
<td>3.9%</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Source: James Primrose, pers. comm., 2014; Rick Hart, pers. comm., 2014.

**Selected Characteristics of Participating Vessels in the Shrimp Fishery**

Selected characteristics of participation in the Gulf shrimp fishery in 2006 through 2010 are summarized in Table 3.3.2. The number of permitted and non-permitted active vessels (i.e., vessels reporting landings in the Gulf shrimp fishery) has generally been above 4,000. About 23% to 30% of active vessels are permitted vessels (vessels with SPGM permit). Despite being fewer in number, permitted vessels have accounted for the majority of shrimp landings (63% to 70%) and revenues (74% to 79%) by all active vessels. Of all the vessels with federal shrimp permits, 65% to 85% have been active in the Gulf shrimp fishery between 2006 and 2011.
Table 3.3.2. Selected characteristics of participation in the Gulf shrimp fishery, 2006-2011.

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of active vessels</td>
<td>4,889</td>
<td>4,678</td>
<td>4,121</td>
<td>4,725</td>
<td>4,495</td>
<td>5,237</td>
</tr>
<tr>
<td>Permitted vessels (%)</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>26%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>Non-permitted vessels (%)</td>
<td>70%</td>
<td>70%</td>
<td>70%</td>
<td>74%</td>
<td>75%</td>
<td>77%</td>
</tr>
<tr>
<td>Number of permitted vessels*</td>
<td>1,919</td>
<td>1,915</td>
<td>1,890</td>
<td>1,707</td>
<td>1,628</td>
<td>1,578</td>
</tr>
<tr>
<td>Active (%)</td>
<td>85%</td>
<td>72%</td>
<td>65%</td>
<td>71%</td>
<td>70%</td>
<td>75%</td>
</tr>
<tr>
<td>Inactive (%)</td>
<td>15%</td>
<td>28%</td>
<td>35%</td>
<td>29%</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Total shrimp landings (million lbs, heads off)</td>
<td>182</td>
<td>141</td>
<td>119</td>
<td>157</td>
<td>112</td>
<td>139</td>
</tr>
<tr>
<td>Total revenues (million 2011 dollars)</td>
<td>$436</td>
<td>$388</td>
<td>$374</td>
<td>$329</td>
<td>$340</td>
<td>$432</td>
</tr>
<tr>
<td>Permitted vessels (% landings)</td>
<td>70%</td>
<td>66%</td>
<td>68%</td>
<td>69%</td>
<td>63%</td>
<td>68%</td>
</tr>
<tr>
<td>Permitted vessels (% revenues)</td>
<td>78%</td>
<td>77%</td>
<td>78%</td>
<td>77%</td>
<td>74%</td>
<td>79%</td>
</tr>
</tbody>
</table>

*The number of permitted vessels each year was based on permit counts in the year the survey was undertaken. These numbers would slightly differ from what is currently known about the number of permits issued for those survey years.


Key Economic and Financial Characteristics of Federally Permitted Shrimp Vessels

The following descriptions are solely based on a series of annual reports on the economics of the federal Gulf shrimp fishery for the years 2006 through 2011 (Liese 2011, 2013; Liese and Travis 2010; Liese et al. 2009a, 2009b). These reports present the results of the Annual Economic Survey of Federal Gulf Shrimp Permit Holders. The first survey, which was administered in 2007, collected data for the 2006 fishing year. The 2012 report is yet to be completed and the 2013 data are presently being collected and processed.

The type of economic data the survey collects is based on an accounting framework of money flows and values associated with the productive activity of commercial shrimping. With these data, three financial statements, the balance sheet, the cash flow statement, and the income statement, are prepared to give a comprehensive overview of the financial and economic situation of the offshore shrimp fishery4. Table 3.3.3 shows a summary of these three financial statements. In this table, the column heading 2010D indicates inclusion of DWH-related costs and revenues as explained below. Parentheses indicate negative values and all dollar values are averages in 2011 dollars.

The year 2010 was unique for the operations of many shrimp vessels in the Gulf because of the Deepwater Horizon MC252 (DWH) oil spill. The DWH oil spill and BP’s responses had a confounding effect on the economics of the Gulf shrimp fishery in 2010. The majority of vessels (66%) reported receiving oil spill-related revenue. The two primary sources of this revenue are damage claims (passive income) and revenue generated by participation in BP's vessel of

opportunity program (VOOP) where vessels were hired to clean up oil. Of the surveyed vessels, 28% participated in the VOOP. Both sources provided substantial revenue for participating vessels, thereby obscuring the economics of the fishery. Further, vessels participating in VOOP incurred non-negligible costs unrelated to commercial fishing. To address this issue, two financial statements are presented for 2010, one (2010C) focuses only on commercial fishing and the other (2010D) includes DWH-related costs and revenues.

It is noted that some shrimp vessels continued to receive DWH-related revenues in 2011 and possibly later, but the amount in 2011 was small relative to that received in 2010. On average, DWH-related revenues in 2010 were about $132,388 per vessel whereas those in 2011 were $7,816 per vessel. Both figures are in 2011 dollars. For this reason, only one financial statement for 2011 was prepared.

The average vessel shows a fair amount of equity that, except for a dip in 2007, rose through the years (Table 3.3.3). This resulted from a combination of an increasing market value of the asset (vessel being the main asset) and declining liabilities (mainly loans).

Except for 2007, the average vessel shows positive net cash flows. The absolute amount of net cash flows may be relatively low in general, but it does indicate a certain level of solvency for continued operation in the shrimp fishery, at least in the short term. Excluding 2010 with DWH-related revenues, 2011 recorded the highest cash flow for the years 2006 through 2011. This holds true even if DWH-related revenues were removed from the 2011 financial statement. Revenues from shrimp were the major source of cash inflows, and fuel and labor (crew and hired captain) costs were the top sources of cash outflows.

The income statement reflects the relatively fragile financial condition of an average permitted shrimp vessel. Net revenues from fishing operations were generally negative, except for 2009 and 2011. As is true of most averages, many shrimp vessels deviated from the average and were profitable. With the exception of 2006, net receipts from non-operating (non-fishing) activities did not materially reverse the losses from fishing operations. Variable costs accounted for a majority of expenses, and within the variable cost category, about two-thirds were non-labor costs (mainly fuel cost).

A very different financial scenario characterized the average shrimp vessel when including DWH-related activities, as depicted in the second to the last column (2010D) of Table 3.3.3. These activities materially affected the cash flow and income statement of the average vessel. Net cash flow was significantly positive — about 2.8 times the highest net cash flow which occurred in 2011. In addition, the bottom line profit (net revenue before tax) was about 3.5 times the highest profit which also occurred in 2011.

Excluding 2010 with DWH-related revenues and costs (2010D), the year 2011 was a banner year for the shrimp fishery. An average shrimp vessel in 2011 recorded the highest equity, net cash flow, net revenue from operations, and profits during the 2006-2011 period. While it remains to be validated by results of the economic surveys for 2012 and 2013, it appears that 2012 and 2013 were also financially good years for shrimp vessels. Shrimp imports fell as a result of diseases (early mortality syndrome) that affected cultured shrimp in some major exporting countries,
allowing domestic prices for shrimp to increase. Fuel prices, however, have remained at elevated levels which could partially dampen the bright prospects from shrimp price increases.

Table 3.3.3. Economic and financial characteristics of an average vessel with federal shrimp permit (SPGM), 2006-2011. Column 2010D includes DWH-related costs and revenues. Parentheses indicate negative values and all dollar values are averages in 2011 dollars.

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010C</th>
<th>2010D</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations</td>
<td>484</td>
<td>505</td>
<td>497</td>
<td>427</td>
<td>429</td>
<td>429</td>
<td>456</td>
</tr>
<tr>
<td>Balance Sheet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assets</td>
<td>198,234</td>
<td>218,225</td>
<td>213,952</td>
<td>219,459</td>
<td>237,504</td>
<td>237,504</td>
<td>292,467</td>
</tr>
<tr>
<td>Liabilities</td>
<td>103,267</td>
<td>92,588</td>
<td>74,325</td>
<td>64,189</td>
<td>51,440</td>
<td>51,440</td>
<td>41,219</td>
</tr>
<tr>
<td>Equity</td>
<td>94,966</td>
<td>125,638</td>
<td>139,627</td>
<td>155,270</td>
<td>186,065</td>
<td>186,065</td>
<td>251,248</td>
</tr>
<tr>
<td>Cash Flow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflow</td>
<td>256,753</td>
<td>212,460</td>
<td>224,311</td>
<td>222,434</td>
<td>214,489</td>
<td>346,878</td>
<td>316,425</td>
</tr>
<tr>
<td>Outflow</td>
<td>237,210</td>
<td>218,732</td>
<td>219,782</td>
<td>213,765</td>
<td>212,457</td>
<td>248,378</td>
<td>281,146</td>
</tr>
<tr>
<td>Net cash flow</td>
<td>19,542</td>
<td>(6,272)</td>
<td>4,530</td>
<td>8,670</td>
<td>2,033</td>
<td>98,500</td>
<td>35,280</td>
</tr>
<tr>
<td>Income Statement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue (commercial fishing operations)</td>
<td>243,856</td>
<td>205,103</td>
<td>221,574</td>
<td>217,868</td>
<td>212,568</td>
<td>--------</td>
<td>301,438</td>
</tr>
<tr>
<td>Expenses</td>
<td>246,743</td>
<td>224,033</td>
<td>226,624</td>
<td>217,109</td>
<td>214,256</td>
<td>249,295</td>
<td>287,633</td>
</tr>
<tr>
<td>Variable costs – Non-labor</td>
<td>124,852</td>
<td>110,896</td>
<td>121,697</td>
<td>108,772</td>
<td>102,843</td>
<td>105,701</td>
<td>137,488</td>
</tr>
<tr>
<td>Variable costs – Labor</td>
<td>63,906</td>
<td>56,456</td>
<td>57,336</td>
<td>58,837</td>
<td>61,920</td>
<td>81,270</td>
<td>92,042</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>57,985</td>
<td>56,904</td>
<td>47,591</td>
<td>49,501</td>
<td>49,493</td>
<td>62,324</td>
<td>58,103</td>
</tr>
<tr>
<td>Net revenue from operations</td>
<td>(2,886)</td>
<td>(18,931)</td>
<td>(5,050)</td>
<td>759</td>
<td>(1,688)</td>
<td>--------</td>
<td>13,805</td>
</tr>
<tr>
<td>Net receipts from non-operating activities</td>
<td>5,848</td>
<td>860</td>
<td>(2,124)</td>
<td>479</td>
<td>--------</td>
<td>12,417</td>
<td></td>
</tr>
<tr>
<td>Net revenue before tax (profit or loss)</td>
<td>2,961</td>
<td>(18,071)</td>
<td>(7,174)</td>
<td>1,238</td>
<td>(2,480)</td>
<td>94,279</td>
<td>26,222</td>
</tr>
</tbody>
</table>


3.5 Description of the Social Environment

Regional Quotients by Community

Descriptions of the social environment associated with the Gulf shrimp fishery have been provided in previous amendments and documents (GMFMC 2005a, 2007) and will be incorporated herein by reference where appropriate. However, recent descriptions of the Gulf shrimp fishery social environment are dated; therefore, more recent figures for regional quotient of several shrimp species are provided below.

The regional quotient (RQ) is a way to measure the relative importance of a given species across all communities in the region and represents the proportional distribution of commercial landings of a particular species. This proportional measure does not provide the number of pounds or the value of the catch, data which might be confidential at the community level for many places. The RQ is calculated by dividing the total pounds (or value) of a species landed in a given community, by the total pounds (or value) for that species for all communities in the region.
Depending upon which shrimp species is being targeted, the volume and value for RQ varies considerably by community. In Figure 3.5.1, except for Bayou LaBatre, Alabama, the top five communities are in Texas. In fact, Texas and Louisiana communities dominate brown shrimp landings. Louisiana communities tend to have higher landings but lower value which may be indicative of size differentiation, with smaller sizes being landed from inshore fisheries in Louisiana and Texas being a primarily offshore fishery.

![Figure 3.5.1. Top twenty communities based upon pounds and value regional quotient (RQ) for brown shrimp in the Gulf. Source: Southeast Regional Office, Accumulated Landings System 2011.](image)

Pink shrimp are primarily landed in Florida with the majority of landings in Fort Myers Beach (Figure 3.5.2). Tampa, Tarpon Springs, and Key West follow, with Bayou LaBatre, Alabama placing fifth. There are several Texas communities within the top twenty, although pink shrimp landed in Texas may have been harvested elsewhere since the majority of pink shrimp are harvested off the west coast of Florida and may be transported back to Texas by large freezer vessels.
White shrimp landings (Figure 3.5.3) are primarily in the northern and western Gulf with Port Arthur, Texas having the highest regional quotient in terms of value. Other communities have comparable RQs with regard to pounds landed but not near the value quotient found in Port Arthur.

Figure 3.5.3. Top twenty communities based upon pounds and value regional quotient (RQ) for white shrimp in the Gulf. Source: Southeast Regional Office, Accumulated Landings System 2011.
Figure 3.5.4. Top twenty communities based upon pounds and value regional quotient for total shrimp in the Gulf. Source: Southeast Regional Office, Accumulated Landings System 2011.

When total shrimp landings and value RQ are combined in Figure 3.5.4, the top five communities include four from Texas and Bayou La Batre, AL. The next five communities are primarily in Louisiana and have a much higher pounds RQ than many of the top five communities with high value RQ. Again, this is likely due to price differences for smaller shrimp that are harvested by a large inshore fleet in Louisiana.

**Demographics and Fleet Characteristics**

While we can characterize the fleet landings with regard to those communities that have high RQs for landings and value, it is more difficult to characterize the fleet and its labor force regarding demographics and places of residence for captains and crew of vessels. There is little to no information on captains and crew, including demographic makeup of crew, so we are left with descriptions regarding the engagement and reliance of fishing communities and their social vulnerability.

To better understand how Gulf shrimp fishing communities are engaged and reliant on fishing overall, several indices composed of existing permit and landings data were created to provide a more empirical measure of fishing dependence (Colburn and Jepson 2012; Jacob et al. 2012). Fishing engagement uses the absolute numbers of permits, landings, and value, while fishing reliance includes many of the same variables as engagement, but divides by population to give an indication of the per capita impact of this activity.
Using a principal component and single solution factor analysis each community receives a factor score for each index to compare to other communities. Factor scores of both engagement and reliance on commercial fishing for the top 20 communities from Figure 3.5.4 were plotted onto radar graphs (Figure 3.5.5). Each community’s factor score is located on the axis radiating out from the center of the graph to its name. Factor scores are connected by colored lines and are standardized, therefore the mean is zero. Two thresholds of 1 and ½ standard deviation above the mean are plotted onto the graphs to help determine a threshold for significance. Because the factor scores are standardized, a score above 1 is also above 1 standard deviation.

In Figure 3.5.5, all communities exceed either one or both of the thresholds of ½ or 1 standard deviation, which means they are highly engaged or reliant on commercial fishing. Those that exceed thresholds for both indices have a substantial component of their local economy dependent upon commercial fishing. The ten communities that exceed both thresholds are: Bayou LaBatre, AL; Fort Myers Beach, FL; Chauvin, LA; Dulac, LA; Golden Meadow, LA; Grand Isle, LA; Lafitte, LA; Bootheville-Venice, LA; Port Isabel, TX; and Palacios, TX. More in-depth profiles of some of these communities appear in previous amendments (GMFMC 2005a, 2007).

![Figure 3.5.5. Commercial fishing engagement and reliance indices for top twenty communities in terms of pounds and value regional quotient for total shrimp in the Gulf. Source: Southeast Regional Office, Social Indicator Database](image)

There have been relatively few, if any, recent descriptions of the social characteristics of the Gulf shrimp fishery. Liese and Travis (2010) have provided the most recent analysis of fleet-wide economic performance, but there is little information concerning the demographic makeup or characterization of the fleet. While we do not have demographics for captains and crew, we can identify a proxy for the number of vessels that may have minorities associated with the vessel by looking at surnames from the permit file and counting those that are Indochinese in their origin. This technique was first utilized in a memorandum from Gulf of Mexico Fishery Management
In that memorandum, Dr. Swingle indicated that of the 1,836 federally permitted shrimp vessels, 524 (or 28.7%) had owners with Indochinese surnames or corporate names. A similar count conducted by the Southeast Regional Office (SERO) in 2009 resulted in 484 out of 1853\(^5\) (or 26.1\%) of permit owners with Indochinese surnames. Unfortunately, we do not know if these are active vessels and whether the crew is also of Indochinese ethnicity. We cannot say that 26\% of the active Gulf fleet owners and crew are of Indochinese descent nor are we able to suggest what percentage of participation in all aspects of the Gulf shrimp fishery is by individuals of Indochinese descent. However, this does give a rough indication of the participation rate of Indochinese within the Gulf shrimp fishery. With regard to other minorities, there are a considerable number of Hispanic or Latinos that participate in the fishery, but no similar attempt has been made to derive a number of participants.

With regard to fleet characteristics, as mentioned earlier, Liese and Travis (2010) provide the most recent measurement of fleet economic performance for the Gulf fleet. Miller and Isaacs (2011) conducted similar research on the Gulf inshore shrimp fishery. A slight improvement in the economics of the overall shrimp fleet in 2008 was reported; however, many vessels still report negative rates of return for both the 2008 and 2009 fishing years (Liese and Travis 2010; updated in 2011). Miller and Isaacs (2011) described the shrimpers’ situation as “economically unsustainable.” In 2009, there were more vessels reporting positive returns, yet this rate of return varied considerably by state and whether inshore or offshore fishing. In any case, the overall economic performance of the Gulf shrimp fleet is still dire and has been following a downward trend for some time with no sign of overall recovery (Thomas et al. 1995, NMFS 2011). It may be assumed that the economic stressors experienced by shrimpers correspond with decreased well-being. Although this financial situation has been repeatedly called unsustainable, this does not take into consideration other types of financial income households may have relied on during these stressful economic times for the shrimp fleet. Although vessels are often considered business entities, many fishing households have multiple wage and income earners who contribute to an overall household economy that may be able to withstand downward economic trends. Because we do not have information from fishing households we are unable to project whether this is the case or whether the resilience of some sectors of the shrimping fleet may be due to these circumstances.

### 3.5.1 Environmental Justice Considerations

Executive Order 12898 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. This executive order is generally referred to as environmental justice (EJ).

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\(^5\) This is a snapshot of permits at one point in time and not exclusive to shrimp vessels, so numbers may vary at different points in time. This is a very rough estimate of the number of vessels with owners of Indochinese background. It is not a precise count of persons involved in the fishery who may be of Indochinese descent or other minorities.
To assess whether a community may be experiencing EJ issues, a suite of indices created to examine the social vulnerability of coastal communities (Colburn and Jepson 2012; Jacob et al. 2012) is presented in Figure 3.5.1.1. The three indices are poverty, population composition, and personal disruptions. The variables included in each of these indices have been identified through the literature as being important components that contribute to a community’s vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households and children under the age of 5, disruptions such as higher separation rates, higher crime rates, and unemployment all are signs of vulnerable populations. These indicators are closely aligned to previously used measures of EJ which used thresholds for the number of minorities and those in poverty. Again, for those communities that exceed the threshold, it would be expected that they would exhibit vulnerabilities to sudden changes or social disruption that might accrue from regulatory change.

Figure 3.5.1.1. Social vulnerability indices for top twenty communities in terms of pounds and value regional quotient for total shrimp in the Gulf. Source: SERO Social Indicator Database.

In terms of social vulnerabilities, several of the top shrimp fishing communities exhibit medium to high vulnerabilities. In fact, only four communities are below the thresholds for two or more indices and do not exhibit vulnerabilities. Those that exceed both thresholds for two or more indices are: Bayou LaBatre, Alabama; Abbeville, Chauvin, Dulac, Golden, Meadow, and Boothville-Venice in Louisiana; Aransas Pass, Brownsville, Freeport, Galveston, Port Isabel, and Palacios in Texas. It would be expected that these communities would be especially vulnerable to any social or economic disruption because of regulatory change, depending upon their engagement and reliance upon commercial fisheries. Because most of these communities are either highly engaged or reliant on commercial fishing, it is likely that any negative social effects from regulatory changes will have an impact. Whether that impact will be long-term or short-term would depend upon the regulatory change.
3.6 Description of the Administrative Environment

3.6.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ, an area extending 200 nautical miles from the seaward boundary of each of the coastal states, and authority over U.S. anadromous species and continental shelf resources that occur beyond the EEZ.

Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act, and with other applicable laws summarized in Appendix B. In most cases, the Secretary has delegated this authority to NMFS.

The Gulf of Mexico Fishery Management Council (Council) is responsible for fishery resources in federal waters of the Gulf. These waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the states of Florida and Texas, and the three-mile seaward boundary of the states of Alabama, Mississippi, and Louisiana. The Council consists of 17 voting members: 11 public members appointed by the Secretary; one each from the fishery agencies of Texas, Louisiana, Mississippi, Alabama, and Florida; and one from NMFS. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard (USCG), and Gulf States Marine Fisheries Commission.

The Council uses their Science and Statistical Committee to review data and science used in assessments and fishery management plans/amendments. Regulations contained within FMPs are enforced through actions of the NMFS’ Office for Law Enforcement, the USCG, and various state authorities.

The public is involved in the fishery management process through participation at public meetings, on advisory panels and through Council meetings that, with few exceptions for discussing personnel matters, are open to the public. The regulatory process is in accordance with the Administrative Procedures Act, in the form of “notice and comment” rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.
3.6.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments have the authority to manage their respective state fisheries including enforcement of fishing regulations. Each of the five states exercises legislative and regulatory authority over their state’s natural resources through discrete administrative units. Although each agency listed below is the primary administrative body with respect to the state’s natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources. The states are also involved through the Gulf States Marine Fisheries Commission in management of marine fisheries. This commission was created to coordinate state regulations and develop management plans for interstate fisheries.

NMFS’ State-Federal Fisheries Division is responsible for building cooperative partnerships to strengthen marine fisheries management and conservation at the state, inter-regional, and national levels. This division implements and oversees the distribution of grants for two national (Inter-jurisdictional Fisheries Act and Anadromous Fish Conservation Act). Additionally, it works with the Gulf States Marine Fisheries Commission to develop and implement cooperative State-Federal fisheries regulations.

More information about these agencies can be found from the following web pages:
Texas Parks & Wildlife Department - http://www.tpwd.state.tx.us
Louisiana Department of Wildlife and Fisheries http://www.wlf.state.la.us/
Mississippi Department of Marine Resources http://www.dmr.state.ms.us/
Alabama Department of Conservation and Natural Resources http://www.dcnr.state.al.us/
Florida Fish and Wildlife Conservation Commission http://www.myfwc.com
CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

4.1 Action 1: Modify Stock Status Determination Criteria for Penaeid Shrimp Stocks (Brown, White, and Pink)

Action 1.1 – Modify the Overfishing Threshold for Penaeid Shrimp

Alternative 1: No Action – The overfishing threshold is defined as a rate of fishing that results in the parent stock number being reduced below the maximum sustainable yield (MSY) minimum levels listed below:

a. Brown shrimp- 125 million individuals, age 7+ months during the November through February period
b. White shrimp- 330 million individuals, age 7+ months during the May through August period
c. Pink shrimp- 100 million individuals, age 5+ months during the July through June period

Preferred Alternative 2: The maximum fishing mortality threshold (MFMT) for each penaeid shrimp stock is defined as the maximum apical fishing mortality rate (F) computed for the fishing years 1984 to 2012 plus the 95% confidence limits. Species specific MFMT values will be recomputed during updated assessments, but only among the years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.

a. Brown shrimp: the apical F value of the model output (3.54) plus the confidence limit (0.14); effective F: 3.68
b. White shrimp: the apical F value of the model output (0.76) plus the confidence limit (0.01); effective F: 0.77
c. Pink shrimp: the apical F value of the model output (0.20) plus the confidence limit (0.03); effective F: 0.23

Alternative 3: The maximum fishing mortality threshold (MFMT) for each penaeid shrimp stock is defined as the maximum apical fishing mortality rate (F) computed for the fishing years 1984 to 2012. Species specific MFMT values will be recomputed during updated assessments, but only among the years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.

a. Brown shrimp: 3.54
b. White shrimp: 0.76
c. Pink shrimp: 0.20

Response to Possible Overfishing

If overfishing occurs for two consecutive years, the appropriate committees and/or panels (e.g. stock assessment panels, AP, SSC) would convene to review changes in apparent stock size,
changes in fishing effort, potential alterations in habitat or other environmental conditions. Fishing mortality and other factors that may have contributed to the decline. If excess fishing is determined to be the source of, or a contributor to, a fishing mortality rate that exceeds MFMT, reduction in fishing pressure should be recommended.

**Action 1.2 – Modify the Overfished Threshold for Penaeid Shrimp**

**Alternative 1:** No Action - An overfished condition would result when a parent stock number falls below one-half of the overfishing definition listed below.
  a. Brown Shrimp - 63 million individuals, age 7+ months during the November through February period
  b. White Shrimp - 165 million individuals, age 7+ months during the May through August period
  c. Pink Shrimp - 50 million individuals, age 5+ months during the July through June period

**Preferred Alternative 2:** The minimum sustainable stock threshold (MSST) for each penaeid shrimp stock is defined as the minimum total annual spawning biomass minus the 95% confidence limit for the fishing years 1984 to 2012. Species specific MSST values will be recomputed during the updated assessments, but only among the fishing years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
  a. Brown shrimp: the MSST value of the model output (11,166) minus the confidence limit (222); effective MSST value: 10,944 metric tons of tails
  b. White shrimp: the MSST value of the model output (125,535) minus the confidence limit (306); effective MSST value: 125,229 metric tons of tails
  c. Pink shrimp: the MSST value of the model output (17,502) minus the confidence limit (3,467); effective MSST value: 14,035 metric tons of tails

**Alternative 3:** The minimum sustainable stock threshold (MSST) for each penaeid shrimp stock is defined as the minimum total annual spawning biomass for the fishing years 1984 to 2012. Species specific MSST values will be recomputed during the updated assessments, but only among the fishing years 1984-2012. The values for each species will be updated every 5 years through the framework procedure, unless changed earlier by the Gulf of Mexico Fishery Management Council.
  a. Brown shrimp: 11,166 metric tons of tails
  b. White shrimp: 125,535 metric tons of tails
  c. Pink shrimp: 17,502 metric tons of tails

**4.1.1 Direct and Indirect Effects on the Physical Environment and the Biological/Ecological Environment**

Both Action 1.1 and Action 1.2 are in response to a change in the model used to predict overfishing and overfished designations, respectively. Because these actions are not in response
to a change in the fishery, there will likely be little change in the effect to either the physical, biological or ecological environment.

Trawling is recognized for its impacts to benthic environments because the heavy doors drag along the bottom and the tickler chains scrape along the sea floor. The shrimp fishery is prosecuted primarily over soft substrates such as mud or silt that are more resilient to disturbance than other bottom types. Areas that have been closed to shrimp trawling seasonally, such as the Texas closure, are not physically altered relative to areas continuously open to shrimp trawling, and longer term parameters such as currents and storms may have more effects on the physical characteristics of an area (Sheridan and Doerr 2005). The proposed actions will not modify the way the fishery is prosecuted, but will update the status determination criteria to be consistent with model outputs that have been accepted. Alternative 1 in both Action 1.1 and Action 1.2 would leave the status of the penaeid shrimp stocks unknown. This unknown status could result in detrimental effects on the shrimp stocks as stocks could undergo overfishing or become overfished and the metrics used to determine these statuses are incompatible with metrics used to evaluate the stock.

If the shrimp fishery begins to expand, it is unlikely that $F$ will exceed historical levels or that the spawning biomass be below MSST. If the permit moratorium is allowed to expire in 2016, red snapper and other bycatch may be affected if that results in the issuance of more permits and an expansion in the shrimping industry. However, trends such as effort and fishing mortality have decreased over time and the number of permit renewals has been decreasing since the institution of the permit moratorium, it is unlikely that effort will resume to historical levels. Therefore, none of the proposed alternatives in Actions 1.1 and Action 1.2 are likely to have significant physical, biological and ecological effects.

**Action 1.1 Modify the Overfishing Threshold for Penaeid Shrimp**

The effort in the fishery is currently well below historical levels. With the shrimp permit moratorium, increased fuel costs, and decreased number of vessels prosecuting the fishery, it is unlikely that the fishing mortality rate ($F$) proposed in Action 1.1 for either Preferred Alternative 2 or Alternative 3 will result in additional physical impacts unless the number of permitted vessels and effort increases to those observed in the 1990s (see Figures 2.1.1, 2.1.2, and 2.1.3).

Preferred Alternative 2 incorporates the variability in the model and is less likely to result in an overfishing designation. Both Preferred Alternative 2 and Alternative 3 provide metrics to determine if overfishing is occurring which may have direct benefits to the stocks because overfishing can be defined and managed. The response to overfishing is explained in Section 2 and takes into account that the status of the shrimp stock if heavily influenced by environmental factors and fishing mortality and yield are unlikely to create overfishing conditions two years in a row.

**Action 1.2 Modify the Overfished Threshold for Penaeid Shrimp**

In Action 1.2, it is unlikely that Preferred Alternative 2 or Alternative 3 will result in additional physical, biological or ecological impacts for the same reasons stated for Action 1.1.
Preferred Alternative 2 offers the greatest management flexibility because it takes into account variability in the model by including the lower 95% confidence interval; this will be less likely to result in an overfished designation than Alternative 3. Both Preferred Alternative 2 and Alternative 3 provide metrics to determine if a stock is overfished which may have indirect benefits to the stocks because an overfished designation would be defined and could be managed.
4.1.3 Direct and Indirect Effects on the Economic Environment

Action 1.1 Modify the Overfishing Threshold for Penaeid Shrimp

Modifications to overfishing thresholds for penaeid shrimp stocks considered in this action would allow for the definition of thresholds compatible with the models currently used in stock assessments. **Alternative 1**, no action, would continue to use overfishing thresholds based on parent stock levels and would not affect the harvest and other customary uses of penaeid shrimp resources. Therefore, **Alternative 1** would not be expected to result in direct economic effects. However, the overfishing status of penaeid shrimp would continue to be listed as unknown because **Alternative 1** would maintain overfishing thresholds that are incompatible with the models currently used to assess penaeid shrimp stocks. As a result, overfishing could occur and remain undetected, potentially resulting in adverse effects to the stocks and associated indirect adverse economic effects.

**Preferred Alternative 2** and **3** would establish overfishing thresholds which are compatible with the current stock assessment models. Direct economic effects are not expected to result from these alternatives because neither **Preferred Alternative 2** nor **3** would affect the harvest or customary uses of penaeid shrimp. Maximum fishing mortality thresholds (MFMT) defined in **Preferred Alternative 2** and **3** would allow for the determination of overfishing status of penaeid shrimp stocks. Current stock assessment methods in conjunction with the pre-determined MFMTs would allow NMFS to determine whether overfishing is occurring. Should overfishing occur, mitigating management measures could be established in a timely manner. The establishment of corrective measures is expected to be beneficial to the penaeid stocks and result in indirect benefits to the economic environment. **Preferred Alternative 2** accounts for the stochastic nature of the MFMT estimate and sets a higher overfishing threshold compared to **Alternative 3**. Compared to the overfishing threshold set in **Alternative 3**, the higher MFMT allowed under **Preferred Alternative 2** could potentially benefit shrimpers in the short-term, and result in greater indirect benefits to the economic environment.

Action 1.2 Modify the Overfished Threshold for Penaeid Shrimp

Changes to overfished thresholds for penaeid shrimp proposed in this action would allow for the definition of thresholds compatible with the models currently used in stock assessments. **Alternative 1**, no action, would maintain the use of overfished thresholds based on parent stock levels and would not affect the harvest and other customary uses of penaeid shrimp resources. Therefore, **Alternative 1** would not be expected to result in direct economic effects. However, the overfished status of penaeid shrimp would continue to be listed as unknown because **Alternative 1** would maintain overfished thresholds that are not compatible with models currently used to assess penaeid shrimp stocks. As a result, overfished could occur and remain undetected, potentially resulting in adverse effects to the stocks and associated indirect adverse economic effects.

**Preferred Alternative 2** and **3** would establish overfished thresholds which are compatible with the current stock assessment models. Direct economic effects are not expected to result from these alternatives because neither **Preferred Alternative 2** nor **3** would affect the harvest or
customary uses of penaeid shrimp resources. Minimum stock size thresholds (MSST) defined in Preferred Alternative 2 and 3 would allow for the determination of overfished status of penaeid shrimp stocks. Current stock assessment methods in conjunction with the pre-determined MSSTs would allow NMFS to determine whether a given penaeid stock, e.g., brown shrimp stock, is overfished. If a given stock is overfished, corrective management measures could be designed and implemented in a timely manner. The establishment of corrective measures is expected to benefit the penaeid stocks and result in indirect benefits to the economic environment. Preferred Alternative 2 accounts for the stochastic nature of the MSST estimate and sets a lower overfished threshold compared to Alternative 3. Compared to the overfished threshold set in Alternative 3, the lower MSST allowed under Preferred Alternative 2 could potentially benefit shrimpers in the short-term, and result in greater indirect benefits to the economic environment.

4.1.4 Direct and Indirect Effects on the Social Environment

Action 1.1 Modify the Overfishing Threshold for Penaeid Shrimp

Modifications to the overfishing threshold for penaeid shrimp stocks considered in this action would allow for the definition of thresholds compatible with the models currently used in stock assessments. Alternative 1, no action, would continue to use overfishing thresholds based on parent stock levels and would not affect the harvest and other customary uses of penaeid shrimp resources. Therefore, Alternative 1 would not be expected to result in direct effects. However, the overfishing status of penaeid shrimp would continue to be listed as unknown because Alternative 1 would maintain overfishing thresholds that are incompatible with the models currently used to assess penaeid shrimp stocks. As a result, overfishing could occur and remain undetected, potentially resulting in adverse effects to the stocks and associated indirect adverse social effects to individuals and businesses. Those adverse social effects would likely stem from economic loss and the ensuing repercussions as a result of lost income and changes in fishing strategies. Because of the tenuous economic status of the shrimp fishery, this might entail exit from the fishery if the losses were significant. However, this is only speculation as at this time we are unable to calculate how those losses would translate into adverse social effects.

Preferred Alternative 2 and 3 would establish overfishing thresholds which are compatible with the current stock assessment models. Direct social effects are not expected to result from these alternatives because neither Preferred Alternative 2 nor 3 would affect the harvest or customary uses of penaeid shrimp. MFMT defined in Preferred Alternative 2 and 3 would allow for the determination of overfishing status of penaeid shrimp stocks, after two consecutive years of exceeding the threshold. Current stock assessment methods in conjunction with the pre-determined MFMTs would allow NMFS to determine whether overfishing is occurring. Should overfishing occur, mitigating management measures could be established in a timely manner. The establishment of corrective measures is expected to be beneficial to the penaeid stocks and result in indirect benefits to the social environment. Those indirect benefits may result from a better economic environment which would have positive social effects in mitigating losses that the industry has been experiencing and provide stability for the industry in the long term.
Preferred Alternative 2 accounts for the stochastic nature of the MFMT estimate and sets a higher overfishing threshold compared to Alternative 3. Compared to the overfishing threshold set in Alternative 3, the higher MFMT allowed under Preferred Alternative 2 could potentially benefit shrimpers in the short-term, and result in greater indirect benefits to the social environment. In either case, the provision to allow for exceeding the threshold for two consecutive years allows for the environmental variability that is found with shrimp stocks.

Action 1.2 Modify the Overfished Threshold for Penaeid Shrimp

Modifications to the overfished threshold for penaeid shrimp stocks considered in this action would allow for the definition of thresholds compatible with the models currently used in stock assessments. Alternative 1, no action, would continue to define an overfished condition based on parent stock levels and would not affect the harvest and other customary uses of penaeid shrimp resources. Therefore, Alternative 1 would not be expected to result in direct effects. However, the overfished status of penaeid shrimp would continue to be unknown because Alternative 1 would maintain the overfished thresholds that are incompatible with the models currently used to assess penaeid shrimp stocks. As a result, an overfished condition could occur and remain undetected, potentially resulting in adverse effects to the stocks and associated indirect adverse social effects.

Preferred Alternative 2 and 3 would establish overfished thresholds which are compatible with the current stock assessment models. Direct social effects are not expected to result from these alternatives because neither Preferred Alternative 2 nor 3 would affect the harvest or customary uses of penaeid shrimp. MSST defined in Preferred Alternative 2 and 3 would allow for the determination of overfished status of penaeid shrimp stocks after two consecutive years, as with the overfishing determination. Current stock assessment methods in conjunction with the pre-determined MSSTs would allow NMFS to determine whether a penaeid stock is overfished. Should overfished status occur, mitigating management measures could be established in a timely manner. The establishment of corrective measures would be expected to be beneficial to the penaeid stocks and result in indirect benefits to the social environment.

Preferred Alternative 2 accounts for the stochastic nature of the MSST estimate and sets a lower threshold for overfished status compared to Alternative 3. Compared to the overfished threshold set in Alternative 3, the lower MSST allowed under Preferred Alternative 2 could potentially benefit shrimpers in the short-term and result in greater indirect benefits to the social environment.

4.1.5 Direct and Indirect Effects on the Administrative Environment

The Magnuson-Stevens Fishery Conservation and Management Act requires that a fishery management plan specify objective and measurable criteria, or reference points, for determining when a stock is subject to overfishing or overfished. Since 1996, NMFS has reported on the status of stocks quarterly (http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/).
Alternative 1 for each action would not allow for a determination of the overfished or overfishing status of these shrimp stocks. Therefore, the status of the stock would be reported as “unknown.” Preferred Alternative 2 and Alternative 3 for each action would allow the actual status to be known and reported. Any change in status requires an update to the status report; therefore, Preferred Alternative 2 would be less burdensome than Alternative 3 because inclusion of the confidence limit would reduce the probability of an inappropriate overfished or overfishing determination.

4.2 Action 2: Modify the Shrimp Fishery Management Plan (FMP) Framework Procedure

Alternative 1. No Action – Do not modify the shrimp management measures framework procedure adopted through the Generic Annual Catch Limits (ACL)/Accountability Measures (AM) Amendment.

Preferred Alternative 2. Modify the shrimp management measures framework procedure to include changes to accountability measures for the royal red shrimp fishery through the standard documentation process for open framework actions, and make editorial changes to the framework procedure to reflect changes to the Council advisory committees and panels. Accountability measures that could be implemented or changed would include:

- In-season accountability measures
  - Closure and closure procedures
  - Trip limit implementation or change
  - Implementation of gear restrictions

- Post-season accountability measures
  - Adjustment of season length
  - Implementation of closed seasons/time periods
  - Adjustment or implementation of trip or possession limits
  - Reduction of the ACL/acceptable biological catch (ACT) to account for the previous year overage
  - Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year
  - Implementation of gear restrictions
  - Reporting and monitoring requirements

Alternative 3. Modify the shrimp management measures framework procedure to include changes to accountability measures through the standard documentation process for open framework actions, and make editorial changes to the framework procedure to reflect changes to the Council advisory committees and panels. Accountability measures that could be changed would include:

- In-season accountability measures
  - Closure procedures
  - Trip limit reductions or increases

- Post-season accountability measures
  - Adjustment of season length
• Adjustment of trip or possession limits

*Note: The portions of the framework procedure regarding ACL, ACTs, and AMs currently apply only to royal red shrimp because penaeid shrimp species have annual lifecycles and, therefore, are not required to have these management measures.

4.2.1 Direct and Indirect Effects on the Physical Environment and the Biological/Ecological Environment

The impacts on the physical environment from shrimp fishing are detailed in Section 4.1.1. No direct physical or biological effects would be expected from modifications of the framework procedure. Changes in harvest levels would change effort levels, either increasing or decreasing the impact on the physical and biological environments. If modifications increase the ease with which regulations can be implemented as needed, long-term benefits would increase.

Preferred Alternative 2 and Alternative 3 offer greater management flexibility and, therefore, are expected to offer greater long-term benefits than Alternative 1. Preferred Alternative 2 has a larger range of actions that can be taken through a framework procedure and therefore offers more flexibility than Alternatives 1 and 3. Therefore, Preferred Alternative 2 offers the greatest efficiency and effectiveness of management change and the largest expected long-term indirect benefit to the physical and biological environments.

4.2.2 Direct and Indirect Effects on the Economic Environment

Modifications to the framework procedure considered herein are administrative actions. Other than Alternative 1, the proposed alternatives would expand the range of management measures that the Council can implement without a full plan amendment but are not expected to directly affect the harvest and other customary uses of the resource. Therefore, management measures considered under this action are not expected to result in direct effects on the economic environment. However, the proposed changes to the framework procedure could result in a speedier implementation of management measures that may be beneficial to the stocks, with associated economic benefits, or otherwise result in increased economic benefits to fishermen and associated businesses. These would be indirect positive economic effects of the proposed changes. Preferred Alternative 2 would add a broader array of changes to the framework procedure compared to Alternative 3 and, as a result, is expected to result in greater indirect economic benefits than Alternative 3. A quantitative evaluation of alternatives considered under this action would require additional information on the specific management measures to be implemented, expected changes to the stocks and/or participants in the fishery, and anticipated time savings that would result from the use of the framework procedure. While unknown, the relative speed at which beneficial regulatory changes can be implemented under Preferred Alternative 2 and Alternative 3 would determine the magnitude of the anticipated indirect economic benefits.

4.2.3 Direct and Indirect Effects on the Social Environment
The proposed modifications to the framework procedure for the shrimp fishery would not be expected to result in any direct impacts. Rather, indirect effects would be expected and would result in broad, long-term social benefits, and minimal negative social effects. Any effects from this action would be limited to royal red shrimp harvesters only, as penaeid shrimp stocks do not require AMs.

Accountability measures for shrimp are not included in the framework procedure currently in place (Alternative 1). To adopt or change an AM requires following the full plan amendment process, which is lengthier than the standard documentation process for open framework actions. Alternatives 2 and 3 propose to add in-season and post-season AMs to the list of management measures that may be modified through the standard documentation process for open framework actions. This would enable the Council to respond to management needs in a more timely fashion. The relative speed at which beneficial regulatory changes can be implemented under Alternatives 2 or 3, would determine the magnitude of the anticipated indirect social benefits which would be a transparent process and timely management to address problems in the fishery, thereby minimizing any delays that may constrain fishing activities or reduce business flexibility and profitability. Public participation and the review process would continue as part of the framework procedure under all alternatives.

Alternative 3 includes a shorter list of AMs that may be modified through the open framework action compared to Preferred Alternative 2. Thus, compared to Alternative 1, Preferred Alternative 2 would be expected to result in greater potential indirect benefits than Alternative 3, by including a greater range of AMs that may be modified through the open framework action process.

Alternatives 2 and 3 would also make editorial changes to the framework procedure to accommodate name changes of the Council advisory committees and panels. The names of some advisory groups have changed and certain management processes invoke participation of these groups by name. The proposed changes would allow the Council to continue to receive the information and advice from these groups, regardless of their current name or future name change, necessary to support better informed management decisions. Absent the proposed change, these and future groups may have reduced opportunity for participation in the management process. This may adversely affect the quality of resultant management decisions, with associated reduction in social benefits arising from the lack of input from these advisory groups. As a result, these proposed editorial changes of Alternatives 2 and 3 would be expected to result in increased indirect benefits compared to Alternative 1.

4.2.4 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would be the most administratively burdensome of the alternatives being considered, because any modifications to accountability measures would need to be implemented through a plan amendment, which is a more laborious and time consuming process than a framework action. Preferred Alternative 2 and Alternative 3 would give NMFS and the Council flexibility by allowing for an adjustment of AMs through a framework action. Framework actions generally require less time and staff effort than plan amendments and would lessen the administrative burden on the agency. Preferred Alternative 2 and Alternative 3
would also reduce the administrative burden because the updated language is generic enough to incorporate future changes in the name of a committee or panel. Thus, development of a plan amendment and the associated time and work associated with it would be avoided. Preferred Alternative 2 would provide the most flexibility, resulting in the least administrative burden on the agency.

### 4.3 Cumulative Effects Analysis

As directed by the National Environmental Policy Act (NEPA), federal agencies are mandated to assess not only the indirect and direct impacts, but cumulative impacts of actions as well. The 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 CFR 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect occurs when the combined effects are greater than the sum of the individual effects. The following are some past, present, and future actions that could impact the environment in the area where the Gulf shrimp fishery is prosecuted.

#### Past Actions

In 2003, regulations were instituted requiring vessels to possess a federal shrimp permit when fishing for penaeid shrimp in the Gulf exclusive economic zone (EEZ). Subsequently, a moratorium on the issuance of new federal shrimp permit was established in 2007. Currently, vessels must possess a federal Gulf shrimp moratorium permit (SPGM) when fishing for shrimp in the Gulf EEZ. During 2006 through 2010, an average of 4,582 vessels fished for shrimp in the Gulf, of which 20% were permitted vessels and the rest, non-permitted vessels. Despite being fewer in number, permitted vessels accounted for an average of 67% of total shrimp landings and 77% of total ex-vessel revenues. As of May 16, 2014, there were 1,495 valid or renewable SPGMs, which is a significant decline from the 2,385 vessels encompassed by the previous open-access Gulf of Mexico federal shrimp permit and the 1,933 that qualified for a permit when the moratorium was implemented. As of the same date, there were 292 valid or renewable endorsements for royal red shrimp.

Joint Reef Fish Amendment 27/Shrimp Amendment 14 (effective 2008) established a target effort-reduction goal of 74% less than the benchmark years of 2001-2003 as a proxy for juvenile red snapper mortality reduction. The amendment established a closure procedure for the northern and western Gulf within the 10- to 30-fathom zone in conjunction with the beginning of the annual Texas closure if fishing effort does not meet the reduction target. However, effort has remained below the target level and NMFS was able to relax the effort restrictions to a 67% reduction in 2012 because the red snapper stock was rebuilding on schedule. This change was estimated to allow shrimpers to fish an additional 5,800 days.

On April 20, 2010, an explosion occurred on the Deepwater Horizon MC252 (DWH) oil rig, resulting in the release of an estimated 4.9 million barrels of oil into the Gulf. In addition, 1.84 million gallons of Corexit 9500A dispersant were applied as part of the effort to constrain the
spill. The cumulative effects from the oil spill and response may not be known for years. The oil spill affected more than one-third of the Gulf area from western Louisiana east to the Panhandle of Florida and south to the Campeche Bank in Mexico. The impacts of the DWH oil spill on the physical environment are expected to be significant and may be long-term. Oil was dispersed on the surface, and because of the heavy use of dispersants, oil was also documented as being suspended within the water column, some even deeper than the location of the broken well head. Floating and suspended oil washed onto shore in several areas of the Gulf as well as non-floating tar balls. Whereas suspended and floating oil degrades over time, tar balls are more persistent in the environment and can be transported hundreds of miles. In a study conducted during the summer of 2011, University of South Florida researchers found more unhealthy fish in the area of the 2010 oil spill compared to other areas. Although some scientists have suggested that these incidences of sick fish may be related to the spill, others have pointed out that there is no baseline from which to judge the prevalence of sick fish, and no connection has been determined. Studies are continuing to check whether the sick fish suffer from immune system and fertility problems (Tampa Bay Times 2012).

Indirect and inter-related effects on the biological and ecological environment of the shrimp fishery in concert with the DWH oil spill are not well understood. Changes in the population size structure could result from shifting fishing effort to specific geographic segments of populations, combined with any anthropogenically induced mortality that may occur from the impacts of the oil spill. The impacts on the food web from phytoplankton, to zooplankton, to mollusks, to top predators may be significant in the future. Impacts to shrimp from the oil spill may impact other species that prey upon shrimp.

Sections of the Gulf were closed to all fishing during the oil spill event. These areas were opened after the well was capped and testing determined seafood from each area was safe for human consumption. In November 2010, a fisherman reported tarballs in his net while trawling for royal red shrimp in an area opened five days before. NMFS reclosed the area and conducted additional seafood sampling. NMFS re-opened the area in February after testing shrimp and finfish from the area and finding that all seafood samples passed both sensory and chemical testing.

The DWH oil spill and BP’s responses had a confounding effect on the economics of the Gulf shrimp fishery in 2010. The majority of vessels (66%) reported receiving oil spill-related revenue. The two primary sources of this revenue are damage claims (passive income) and revenue generated by participation in BP’s vessel of opportunity program (VOOP) where vessels were hired to clean up oil. Of the surveyed vessels, 28% participated in the VOOP. Both sources provided substantial revenue for participating vessels, thereby obscuring the economics of the fishery. Further, vessels participating in VOOP incurred non-negligible costs unrelated to commercial fishing.

Bycatch reduction devices (BRDs) have been required for use since 1998 in the western Gulf and 2004 in the eastern Gulf. Since 2010, some new BRDs were certified, while others were decertified. The intent of these modifications to BRD regulations was to provide additional flexibility to the fishery. BRDs may have different capabilities according to different fishing conditions, and having a wider variety of BRDs for use in the fisheries allows fishermen greater
flexibility to choose the most effective BRD for the specific local fishing conditions. Regulations for turtle excluder devices were first implemented in 1987, and have been expanded in the years since then.

Since 2001, there has been a decrease in effort in southeast U.S. shrimp fishery. The decline has been attributed to low shrimp prices, rising fuel costs, competition with imported products, and the impacts of 2005 and 2006 hurricanes in the Gulf of Mexico. This was exacerbated by the financial meltdown and consequent recession in the U.S. economy in 2007-2008. The economy has started to recover, though slowly, in the last few years. In addition, shrimp prices have increased in the last two years, partly due to reductions in shrimp imports as shrimp farms in some of the major exporting countries were hit with diseases. Reductions in shrimp imports, however, may be just temporary and imports could recover to their previous high levels in the future. Given that the shrimp fishery still faces many of the challenges that contributed to the effort declines, effort is not expected to increase substantially in the near future.

Present Actions

The most recent biological opinion (Bi Op) for the Southeast U.S. shrimp fisheries was completed in April 2014 (NMFS 2014). The Bi Op determined that continuation of the fishery is not likely to adversely affect any listed whales or acroporid corals, is not likely to adversely affect designated critical habitats for Gulf sturgeon and elkhorn and staghorn corals, and will have no effect on designated critical habitats for North Atlantic right whale or smalltooth sawfish. The Bi Op determined that the level of anticipated take associated with the southeastern shrimp fishery is likely to adversely affect green, hawksbill, leatherback, Kemp’s ridley, and loggerhead (Northwestern Atlantic distinct population segment [DPS]) sea turtles, Atlantic sturgeon (any DPS), and smalltooth sawfish (U.S. DPS); however, the fishery is not likely to jeopardize the continued existence of these species.

In December 2013, NMFS implemented a rule outlining a cost share plan between NMFS and shrimp vessel permit holders to support the electronic logbook (ELB) program. The ELB program provides data on Gulf shrimp fishing effort that is critical to both the Council and NMFS in performing annual assessments of the status of shrimp stocks, obtaining accurate estimates of juvenile red snapper mortality attributable to the shrimp fishery, and generating mortality estimates on a number of other species captured as bycatch in the shrimp fishery. The cost per vessel is approximately $240 per year. Because the average vessel in the Gulf shrimp fishery has been in poor financial condition, an additional cost item that would not improve the vessel’s operations could have a material adverse impact on the operations and solvency of an average vessel. The Southeast Fisheries Science Center has selected 500 vessels to participate in the program for 2014 and is in the process of distributing and activating the ELB units.

The shrimp fishery is closed annually in state waters off Texas to allow brown shrimp to reach a larger and more valuable size prior to harvest, and to prevent waste of brown shrimp that might otherwise be discarded due to their small size. The closing and opening dates of the Texas closure are based on the results of biological sampling by the Texas Parks and Wildlife Department. Historically, the closure is from about May 15 to July 15. NMFS closes federal waters off Texas concurrent with this action each year, at the request of the Council.
Reasonably Foreseeable Future Actions

The Council has two actions in development.

- Amendment 16 would adjust the ACL and AMs for royal red shrimp. Inconsistencies in the federal regulations between measures established in the Generic ACL/AM Amendment and previous regulations must be resolved.
- Amendment 17 will address the expiration of the shrimp permit moratorium in October 2016. The Council will need to determine if the moratorium should be extended, allowed to lapse, or converted to a permanent limited access system.

The Environmental Protection Agency’s climate change webpage (http://www.epa.gov/climatechange/) provides basic background information on measured or anticipated effects from global climate change. A compilation of scientific information on climate change can be found in the United Nations Intergovernmental Panel on Climate Change’s Fourth Assessment Report (Solomon et al. 2007). Those findings are incorporated here by reference and are summarized. Global climate change can affect marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, sea level rise, and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic carbon dioxide emissions may impact a wide range of organisms and ecosystems, particularly organisms that absorb calcium from surface waters, such as corals and crustaceans. These influences could affect biological factors such as migration, range, larval and juvenile survival, prey availability, and susceptibility to predators. These climate changes could have significant effects on southeastern fisheries; however, the extent of these effects is not known at this time (IPCC 2007).

In the southeast, general impacts of climate change have been predicted through modeling, with few studies on specific effects to species. Warming sea temperature trends in the southeast have been documented, and animals must migrate to cooler waters, if possible, if water temperatures exceed survivable ranges (Needham et al. 2012). Higher water temperatures may also allow invasive species to establish communities in areas they may not have been able to survive previously. An area of low oxygen, known as the dead zone, forms in the northern Gulf each summer. Climate change may contribute to this dead zone by increasing rainfall that in turn increases nutrient input from rivers. This increased nutrient load causes algal blooms that, when decomposing, reduce oxygen in the water (Kennedy et al. 2002; Needham et al. 2012). Other potential impacts of climate change in the southeast include increases in hurricanes, decreases in salinity, altered circulation patterns, and sea level rise. The combination of warmer water and expansion of salt marshes inland with sea-level rise may increase productivity of estuarine-dependent species in the short term. However, in the long term, this increased productivity may be temporary because of loss of fishery habitats due to wetland loss (Kennedy et al. 2002). Actions from this amendment are not expected to significantly contribute to climate change through the increase or decrease in the carbon footprint from fishing.

Hurricane season is from June 1 to November 30, and accounts for 97% of all tropical activity affecting the Atlantic Basin. These storms, although unpredictable in their annual occurrence,
can devastate areas when they occur. However, while these effects may be temporary, those fishing-related businesses whose profitability is marginal may go out of business if a hurricane strikes.

The cumulative biological, social, and economic effects of past, present, and future actions as described above may be described as limiting fishing opportunities in the short-term, with some exceptions of actions that alleviate some negative social and economic impacts. The intent of this amendment is to improve prospects for sustained participation in the respective fisheries over time and the proposed actions in this amendment are expected to result in some important long-term benefits to the commercial fleet, as well as fishing communities and associated businesses. The proposed changes in management for the Gulf shrimp fishery are not related to other actions with individually insignificant but cumulatively significant impacts.

**Monitoring**

The effects of the proposed action are, and will continue to be, monitored through collection of landings data by NMFS, annual stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations.

The proposed action relates to the harvest of an indigenous species in the Gulf and Atlantic, and the activity being altered does not itself introduce non-indigenous species, and is not reasonably expected to facilitate the spread of such species through depressing the populations of native species. Additionally, it does not propose any activity, such as increased ballast water discharge from foreign vessels, which is associated with the introduction or spread on non-indigenous species.
CHAPTER 5. REGULATORY IMPACT REVIEW

[This analysis is completed after selection of all preferred alternatives.]
CHAPTER 6. REGULATORY FLEXIBILITY ACT
ANALYSIS

[This analysis is completed after selection of all preferred alternatives.]
# CHAPTER 7. LIST OF PREPARERS

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GMFMC = Gulf of Mexico Fishery Management Council; NMFS= National Marine Fisheries Service; NOAA GC= National Oceanic and Atmospheric Administration General Counsel; SEFSC= Southeast Fishery Science Center; SERO = Southeast Regional Office of the National Marine Fisheries Service
CHAPTER 8. LIST OF AGENCIES, ORGANIZATIONS AND PERSONS CONSULTED

National Marine Fisheries Service
- Southeast Fisheries Science Center
- Southeast Regional Office
- Office for Law Enforcement
NOAA General Counsel

Environmental Protection Agency
United States Coast Guard
United States Fish and Wildlife Services
Texas Parks and Wildlife Department
Alabama Department of Conservation and Natural Resources/Marine Resources Division
Louisiana Department of Wildlife and Fisheries
Mississippi Department of Marine Resources
Florida Fish and Wildlife Conservation Commission
CHAPTER 9. REFERENCES


http://www.gulfcouncil.org/docs/amendments/SHRIMP%20FMP%20Final%201981-11.pdf


http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/Shrimp%20Amend%2013%20Final%20805.pdf

GMFMC. 2005b. Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico, and South Atlantic, Stone Crab Fishery of the Gulf of Mexico, Spiny Lobster in the Gulf of Mexico and South Atlantic, and Coral and Coral Reefs of the Gulf of Mexico.
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Determination Criteria for Penaeid Shrimp


Liese, C. 2011. 2009 Economics of the Federal Gulf Shrimp Fishery Annual Report. NOAA Fisheries, Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.

Liese, C. 2013. 2010 Economics of the Federal Gulf Shrimp Fishery Annual Report. NOAA Fisheries, Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.


Appendix A. Other Applicable Law

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for fishery management in federal waters of the Exclusive Economic Zone. 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 that support those fisheries. Major laws affecting federal fishery management decision-making include the Endangered Species Act (Section 4.5), E.O. 12866 (Regulatory Planning and Review, Chapter 5) and E.O. 12898 (Environmental Justice, Section 3.5). Other applicable laws are summarized below.

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, the National Marine Fisheries Service (NMFS) 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 waiting period from the time a final rule is published until it takes effect. Proposed and final rules will be published before implementing the actions in this amendment.

Coastal Zone Management Act
Section 307(c)(1) of the federal Coastal Zone Management Act of 1972 (CZMA), as amended, requires federal activities that affect 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. According to these regulations and CZMA Section 307(c)(1), when taking an action that affects any land or water use or natural resource of a state’s coastal zone, NMFS is required to provide a consistency determination to the relevant state agency at least 90 days before taking final action.

Upon submission to the Secretary, NMFS will determine if this plan amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. The determination will then be submitted to the responsible state agencies under Section 307 of the CZMA administering approved Coastal Zone Management programs for these states.

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. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions).
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.

Scientific information and data are key components of fishery management plans (FMPs) and amendments and the use of best available information is the second national standard under the Magnuson-Stevens Act. To be consistent with the Magnuson-Stevens Act, FMPs and amendments must be based on the best information available. They should also properly reference all supporting materials and data, and be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data presented in this amendment has undergone quality control prior to being used by the agency and will be subject to a pre-dissemination review.

Executive Orders

E.O. 12630: Takings
The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights that became effective March 18, 1988, requires 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. The NOAA Office of General Counsel will determine whether a Taking Implication Assessment is necessary for this amendment.

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 actions that they authorize, fund, or carry out do not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

Regulations are already in place to limit or reduce habitat impacts within the Flower Garden Banks National Marine Sanctuary. Additionally, NMFS approved and implemented Generic Amendment 3 for Essential Fish Habitat, which established additional HAPCs and gear restrictions to protect corals throughout the Gulf of Mexico. There are no implications to coral reefs by the actions proposed in this amendment.
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 that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendments given the overlapping authorities of NMFS, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate state, tribes and local entities (international too). No Federalism issues have been identified relative to the action proposed in this amendment. Therefore, consultation with state officials under Executive Order 12612 is not necessary.