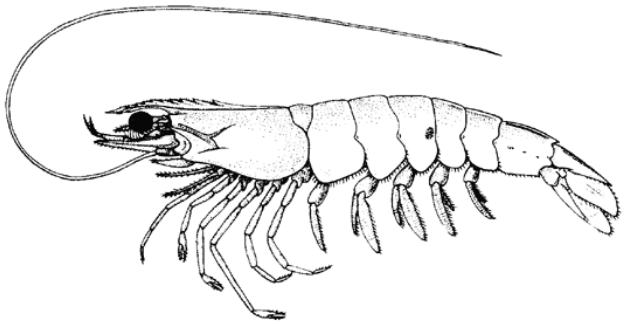
# Status Determination Criteria for Penaeid Shrimp and Adjustments to the Shrimp Framework Procedure



# Amendment 15

## to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters

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

**June 2015**

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

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# ABBREVIATIONS USED IN THIS DOCUMENT

| | |
|---|---|
| ABC | acceptable biological catch |
| ACL | annual catch limit |
| ACT | annual catch target |
| AM | accountability measure |
| APA | Administrative Procedure Act |
| BRD | bycatch reduction device |
| Council | Gulf of Mexico Fishery Management Council |
| CMP | coastal migratory pelagics |
| CZMA | Coastal Zone Management Act |
| DQA | Data Quality Act |
| DWH | Deepwater Horizon MC 252 |
| EA | environmental assessment |
| EEZ | exclusive economic zone |
| EFH | essential fish habitat |
| EJ | environmental justice |
| ELB | Electronic Logbook Program |
| EIS | environmental impact statement |
| ESA | Endangered Species Act |
| F | instantaneous rate of fishing mortality |
| $F_{MSY}$ | rate of fishing mortality at maximum sustainable yield |
| FIS | Fishery impact statement |
| FEIS | Final environmental impact statement |
| FMP | fishery management plan |
| GMFMC | Gulf of Mexico Fishery Management Council |
| Gulf | Gulf of Mexico |
| GSS | Gulf Shrimp System |
| HAPC | habitat area of particular concern |
| Magnuson-Stevens Act | Magnuson-Stevens Fishery Conservation and Management Act |
| MFMT | maximum fishing mortality threshold |
| mp | million pounds |
| MSST | minimum stock size threshold |
| MSY | maximum sustainable yield |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| OFL | overfishing level |
| OMB | Office of Management and Budget |
| OY | optimum yield |
| PBR | potential biological removal |
| RA | Regional Administrator |
| RFA | Regulatory Flexibility Act |

| | |
|---|---|
| RFAA | Regulatory Flexibility Act analysis |
| RIR | regulatory impact review |
| RQ | regional quotient |
| Secretary | Secretary of Commerce |
| SEFSC | Southeast Fisheries Science Center |
| SEIS | supplemental environmental impact statement |
| SERO | Southeast Regional Office |
| Shrimp FMP | Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U. S. Waters |
| SPGM | federal Gulf shrimp moratorium permit |
| $SSB_{MSY}$ | spawning stock biomass at maximum sustainable yield |
| SSC | Scientific and Statistical Committee |
| 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

The Magnuson-Stevens Fishery Conservation and Management Act requires that a fishery impact statement (FIS) be prepared for all amendments to fishery management plans. The FIS contains an assessment of the likely biological, social, economic, and administrative effects of the conservation and management measures on fishery participants and their communities. It also considers participants in the fisheries conducted in adjacent areas under the authority of another regional fishery management council, and the safety of human life at sea.

Amendment 15 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U. S. Waters consists of four management actions developed by the Gulf of Mexico Fishery Management Council (Council). The first action (Action 1.1) addresses the maximum sustainable yield for penaeid shrimp stocks (brown, white, and pink shrimp). The second action (Action 1.2) addresses the overfishing threshold for penaeid shrimp stocks. The third action (Action 1.3) addresses the overfished threshold for penaeid shrimp stocks. The fourth action (Action 2) addresses changes to the framework procedure by removing obsolete terms and adjusting how accountability measures for royal red shrimp can be changed or implemented.

Biological Effects

The proposed modifications are anticipated to have little to no effect on the physical and biological environment. The first three actions are in response to a change in the model used to assess penaeid shrimp stocks. The shrimp fishery will continue to affect the surrounding environment by both trawling and bycatch; however, these actions are not expected to modify how the fishery is prosecuted. Because there is a moratorium on new permits, effort in the shrimp fishery may remain at levels similar to present conditions, but the permit moratorium will expire in 2016 unless the Council takes action. The fourth action would make editorial changes to the framework procedure, adjust how accountability measures (AMs) could be implemented and what changes could be made to AMs; currently, accountability measures only apply to royal red shrimp. This action allows for more management flexibility and is expected to increase the efficiency of management which can indirectly benefit the physical and biological environments.

Economic Effects

Economic effects are not expected to result from any of the first three actions because no changes to harvest levels or to other customary uses of penaeid shrimp are anticipated. The fourth action is expected to result in indirect economic benefits by affording a swifter response to implementation of management measures that may be beneficial to the stock with associated economic benefits.

Social Effects

Direct social effects are not expected to result from any of the first three actions, as these actions would not affect fishing behavior or harvest levels. The actions could indirectly benefit the fishery because they provide status determination criteria for the penaeid shrimp fishery that can enable management measures to be implemented in a timely manner.

Positive social impacts may be expected from the fourth action because it incorporates more changes that could be implemented using a framework procedure. This increases management flexibility to respond to changes and, therefore, minimizes delays that may constrain fishing activities or negatively affect business activities.

Safety at Sea

None of the actions in this amendment are anticipated to require vessels to participate in the fishery under adverse weather or ocean conditions. Therefore, no additional safety-at-sea issues would arise.

# CHAPTER 1. INTRODUCTION

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.

The Magnuson-Stevens Act establishes maximum sustainable yield (MSY) as the basis for fishery management. Each fishery management plan (FMP) must specify MSY, which is the largest long-term average catch that can be taken from a stock under prevailing conditions.

Each FMP must also 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.

### *Optimum Yield*

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

### *Maximum Sustainable Yield*

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

### *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.

These parameters (OY, MSY, MSST, and MFMT) are difficult to apply to penaeid shrimp (brown, *Farfantepenaeus aztecus*; pink, *Farfantepenaeus duorarum*; and white, *Litopenaeus setiferus*) because they are short-lived shrimp populations influenced by environmental factors in addition to effort and catch rates. For Gulf of Mexico (Gulf) 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 MSY the following year. Amendment 13 to the Shrimp FMP also established MFMT for each of the three penaeid species in terms of a parent stock level. The MSY was set based on the lowest and highest landings taken annually from 1990-2000 and is equal to the OY.

Historically, 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 threshold and lower than the overfishing threshold 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 stock status parameters. 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, MSY, MFMT, and MSST must now be revised to be comparable to the model outputs and determine the status of the stocks.

### 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.

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 various amendments, the most recent of which was implemented through the Generic Annual

Catch Limit/Accountability Measures Amendment[1] (GMFMC 2011). Subsequent to that amendment, the Council determined that modifications to accountability measures (AMs) 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.[2] In addition, this amendment would update language in that framework procedure that is now out of date.

## 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 Shrimp FMP defined the shrimp fishery management unit to include brown shrimp, white shrimp, pink shrimp, 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, when feasible.

[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.
[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.

4. Promote consistency with the Endangered Species Act and the Marine Mammal Protection Act.
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 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 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 3/EA** (1984) resolved a shrimp-stone crab gear conflict on the west-central coast of Florida.

**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 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 NMFS with the recommendation that it be resubmitted 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, 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 602). These guidelines required each FMP to include a scientifically measurable definition of overfishing and an action plan to arrest overfishing should it occur.

**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 to 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, from the BRD requirement. 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 of 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 by vessels with federal shrimp permits; established a moratorium on the issuance of federal 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 Annual Catch Limits (ACL)/Accountability Measures (AMs) Amendment/EIS** (2011) set ACLs and AMs for royal red shrimp. Penaeid shrimp were not included in this amendment because their annual lifecycles exempt them from the Magnuson-Stevens Act requirement for these management measures.

**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.

**Amendment 16/Supplemental EIS** (2015) eliminated duplicative accountability measures and the quota for royal red shrimp. It set the ACL equal to the acceptable biological catch and established a post-season accountability measure.

# 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 Maximum Sustainable Yield (MSY) for Penaeid Shrimp

**Alternative 1.** No Action. The MSY values for the penaeid shrimp stocks fall within the range of values defined by the lowest and highest landings taken annually from 1990-2000 that does not result in recruitment overfishing as defined herein:

- Brown shrimp: MSY is between 67,000,000 and 104,000,000 lbs of tails
- White shrimp: MSY is between 35,000,000 and 71,000,000 lbs of tails
- Pink shrimp: MSY is between 6,000,000 and 19,000,000 lbs of tails

**Preferred Alternative 2.** The MSY values for the penaeid shrimp stocks are values produced by the stock synthesis model approved by the Science and Statistical Committee (SSC). Species specific MSY 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 (Council).
Currently, the stock synthesis model produces the following values:

- Brown shrimp: MSY is 146,923,100 lbs of tails
- White shrimp: MSY is 89,436,907 lbs of tails
- Pink shrimp: MSY is 17,345,130 lbs of tails

**Discussion:**
Historically, the penaeid (brown, white, and pink) shrimp stock has been assessed using a virtual population analysis (VPA) model. Recently, the National Marine Fisheries Service (NMFS) changed the model from VPA to the Stock Synthesis model to determine Gulf of Mexico (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). The Council's SSC determined that the Stock Synthesis model was the best available model. One value estimated by the stock synthesis model is MSY. Penaeid shrimp stocks are influenced primarily by environmental conditions and are annual crops, but the model is parameterized with monthly inputs, thus, MSY is difficult to predict. The Council has two options: to maintain MSY in terms of the old model, or to update MSY to reflect values of the new model. Any other alternatives would be arbitrary.

**Alternative 1** would continue to use MSY values based on the VPA model which is not the model that has been accepted as the best available science by the SSC. These values are ranges and do not coincide with the values produced by the stock synthesis model. Amendment 13 (GMFMC 2005a) established these MSY values for each species. The MSY values were defined as the highest and lowest landings values taken annually from 1990-2000 because a true numerical value could not be calculated. The biological characteristics that affect sustainable

yields for penaeid shrimp are unusual. They live for only one year, 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.

**Preferred Alternative 2** would establish MSY in terms of the current model, the Stock Synthesis model. The new Stock Synthesis model produces MSY in monthly time steps for pink shrimp and white shrimp, and is an annual model with seasons for brown shrimp. Therefore, the outputs of the model for pink shrimp and white shrimp are multiplied by 12 to get an annual MSY. For brown shrimp, an annual MSY is produced, so no multiplication factor is used (Hart et al. 2014). This alternative is based on the best available science and was supported by the SSC.

**Council Conclusions:**

The Council chose **Preferred Alternative 2** because it based on the best assessment model for the shrimp fishery as determined by the Council's SSC. The Council did not choose **Alternative 1** because that would leave MSY in terms of an outdated assessment model.

## Action 1.2 – 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 MSY minimum levels listed below:

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

**Alternative 2:** The overfishing threshold is defined as the maximum fishing mortality threshold (MFMT). The 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 Council.

- Brown shrimp: the apical F value of the model output (3.54) plus the confidence limit (0.14); effective F: 3.68
- White shrimp: the apical F value of the model output (0.76) plus the confidence limit (0.01); effective F: 0.77
- 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 overfishing threshold is defined as the MFMT. The MFMT for each penaeid shrimp stock is defined as the maximum apical 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 Council.

- Brown shrimp: 3.54
- White shrimp: 0.76
- Pink shrimp: 0.20

**Preferred Alternative 4.** The overfishing threshold is defined as the MFMT. The MFMT for each penaeid shrimp stock is defined as the fishing mortality rate at MSY ($F_{MSY}$). Species specific $F_{MSY}$ 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 Council.

Currently, the values are:

- Brown shrimp: 9.12
- White shrimp: 3.48
- Pink shrimp: 1.35

**NOTE: It is not appropriate to compare values from **Alternatives 2** and **3** with those presented in **Preferred Alternative 4**. **Preferred Alternative 4** is MSY based and is derived from an annual computation. **Alternatives 2** and **3** are model based that are derived from the apical monthly*

*computation. Further, it is not appropriate to multiply values from **Alternatives 2** and **3** by twelve and compare with **Preferred Alternative 4** because the apical F is not a mean. Therefore, the methods of calculation should be compared, rather than the resulting numbers.*

**Response to Possible Overfishing**

If the MFMT is exceeded for two consecutive years, the appropriate committees and/or panels (e.g. stock assessment panels, advisory panels, SSCs) 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.

**Discussion:**

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 Council's SSC approved the use of MFMTs for the overfishing thresholds (Figures 2.1.1-2.1.3). However, the new Stock Synthesis model produces overfishing estimates as fishing mortality rates (F) which are not comparable with current overfishing thresholds which are based on parent stock numbers.

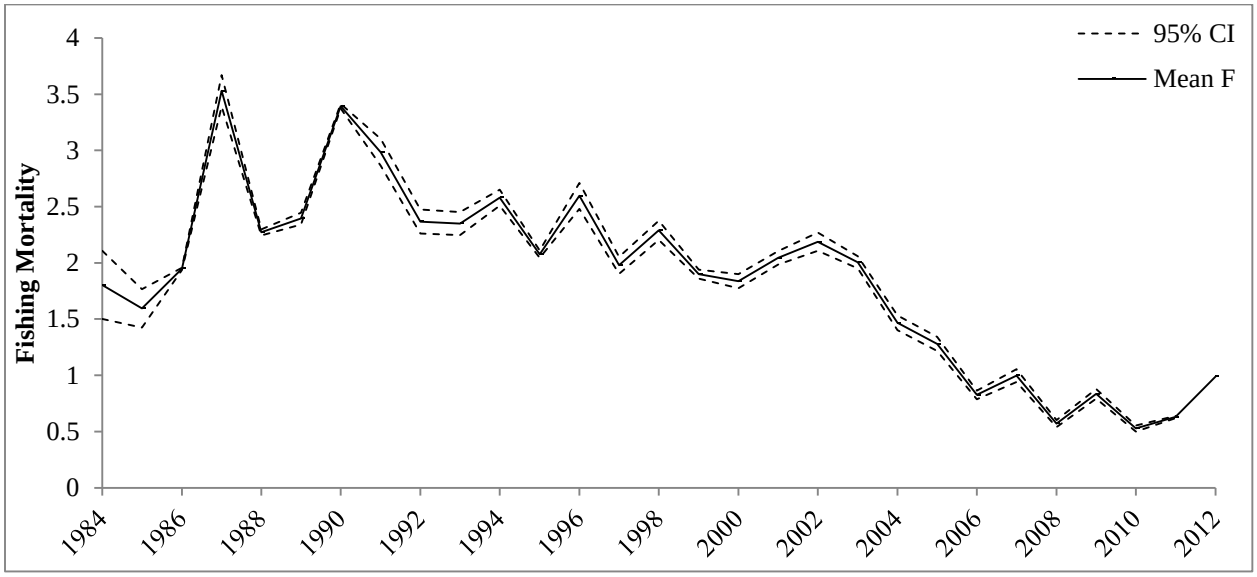


**Figure 2.1.1.** Brown shrimp F-values modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean F-value calculated for brown shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the highest F-value was used (**Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Alternative 2**).

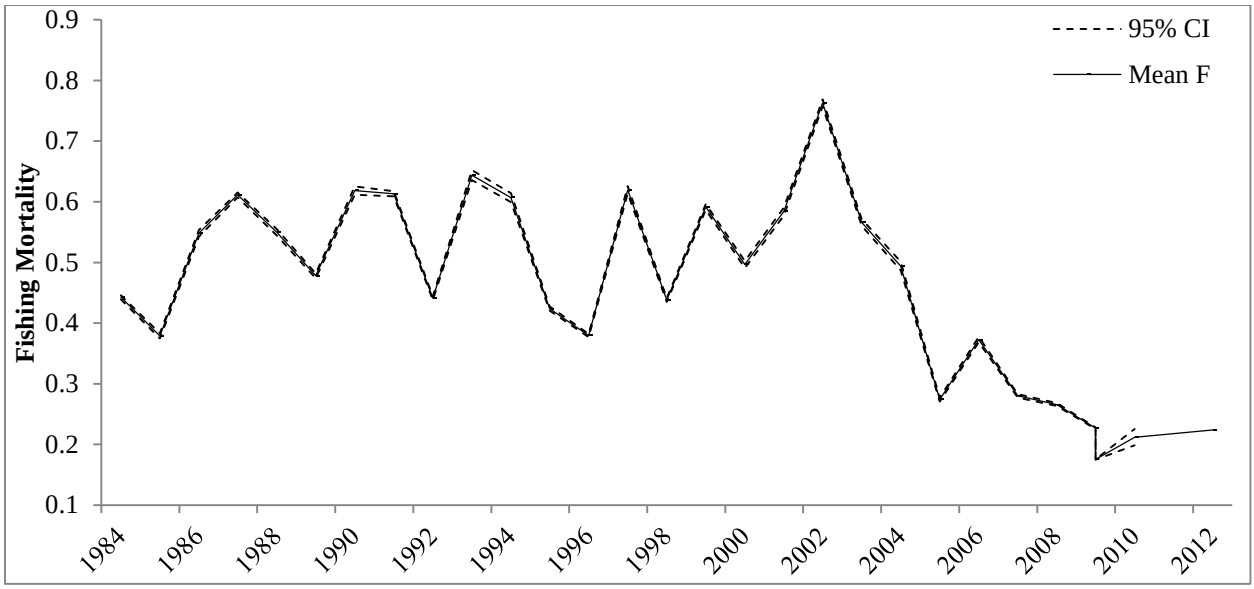


**Figure 2.1.2.** White shrimp F-values modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean F-value calculated for white shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the highest F-value was used (**Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Alternative 2**).

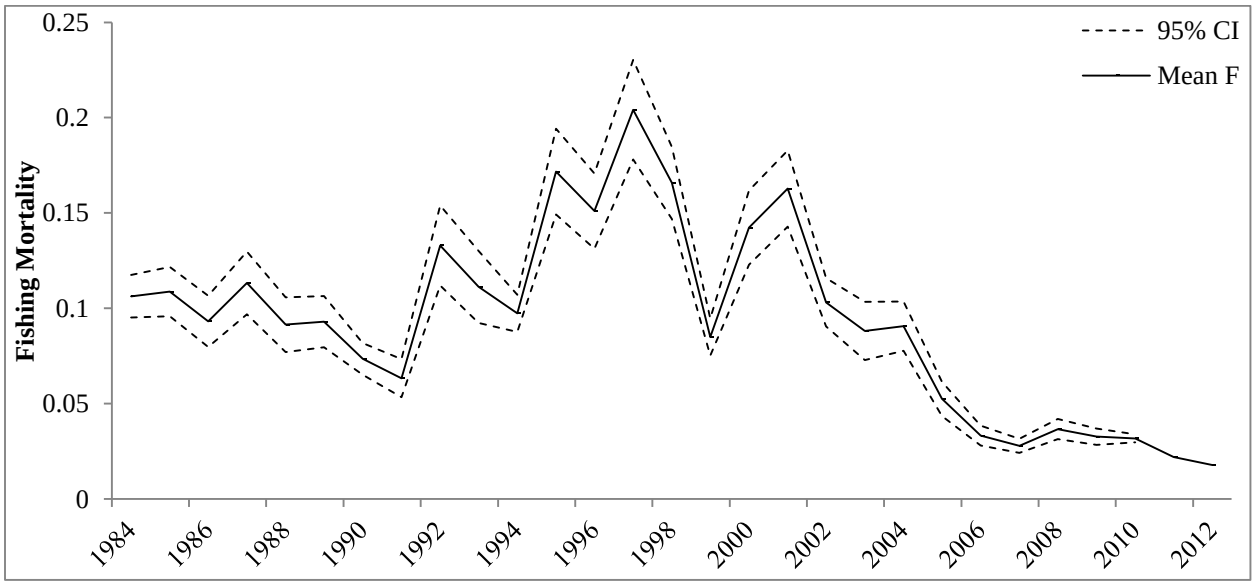


**Figure 2.1.3.** Pink shrimp F-values modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean F-value calculated for pink shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.2, the highest F-value was used (**Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Alternative 2**). Only 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. The VPA model defines overfishing in terms of the number of sexually mature

individuals during the reproductive period of each stock. Brown and white shrimp are sexually mature at 7 + months of age; pink shrimp are sexually mature at 5+ months of age. This alternative is contingent upon using the VPA model to assess penaeid stocks; the VPA model is no longer used to assess penaeid stocks.

**Alternative 2** would establish each MFMT 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 produces monthly F values, and the maximum (or apical) monthly output is what is used for **Alternative 2** and **Alternative 3**. Because the values are the absolute maximum monthly values over a twenty-eight year period, it would be inappropriate to multiply the values by twelve; this would result in an unrealistic MFMT. The model is stochastic - when new data are added, the apical F may change slightly. Using the 95% confidence limit 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 ranges should be re-evaluated periodically because of variation in the model when new data are added. This re-evaluation would ensure the MFMT is reflective of the most current data. The MFMT is a rate, and therefore a numerical value of the yield cannot be calculated during the season. This rate is derived after the effort and landings have been reported for the fishing season.

**Alternative 3** is similar to **Alternative 2**, but does not take into account the variability of the model (confidence limits). With this alternative, the MFMTs may need to be revaluated by the Council and SSC more often than every five years if the F-value for 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 **Alternative 2**.

**Preferred Alternative 4** would establish F in terms of MSY produced by the Stock Synthesis model. For pink and white shrimp, a monthly output is multiplied by twelve to calculate the yearly $F_{MSY}$. It is appropriate to multiply by 12 to convert the value from a monthly output to an annual value for the $F_{MSY}$ because this is the $F_{MSY}$ for all years, not the highest value; thus, such a multiplication would not artificially inflate the $F_{MSY}$. Brown shrimp had a seasonal output, so no multiplication factor was used. These values are not comparable to **Alternatives 2** and **3** as those are based on the apical monthly outputs of the stock synthesis model. Additionally, **Alternatives 2** and **3** are based on the highest monthly outputs from the time series. Just as in **Alternatives 2** and **3**, the $F_{MSY}$ value should be re-evaluated periodically to account for variability in the model.

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. However, this would be inconsistent with the requirements of the Magnuson-Stevens Act as explained in the National Standard 1 guidelines. In the Sustainable Fisheries Act 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 is continued in the current amendment.

**Council Conclusions:**

The Council chose **Preferred Alternative 4** because it is an MSY-based fishing mortality rate and is based on the best assessment model as determined by the Council's SSC. The Council did not choose **Alternative 1** because that would leave the overfishing threshold of the fishery as unknown under the current stock assessment model. The Council did not choose **Alternatives 2** or **3** because these alternatives were based on the apical monthly value and not on MSY.

## Action 1.3 – 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.

- Brown shrimp - 63 million individuals, age 7+ months during the November through February period
- White shrimp - 165 million individuals, age 7+ months during the May through August period
- Pink shrimp - 50 million individuals, age 5+ months during the July through June period

**Alternative 2:** The overfished threshold is defined as the minimum stock size threshold (MSST). The 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 Council.

- Brown shrimp: the MSST value of the model output (24,616,232) minus the confidence limit (490,210); effective MSST value: 24,126,023 lbs of tails
- White shrimp: the MSST value of the model output (277,054,011) minus the confidence limit (1,275,673); effective MSST value: 275,796,338 lbs of tails
- Pink shrimp: the MSST value of the model output (37,593,545) minus the confidence limit (7,642,354); effective MSST value: 29,951,191 lbs of tails

**Alternative 3:** The overfished threshold is defined as the MSST. The 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 Council.

- Brown shrimp: 24,616,232 lbs of tails
- White shrimp: 277,054,011 lbs of tails
- Pink shrimp: 37,593,545 lbs of tails

**Preferred Alternative 4:** The overfished threshold is defined as the MSST. The MSST for each penaeid shrimp stock is defined as the minimum spawning stock biomass at MSY ($SSB_{MSY}$). $SSB_{MSY}$ values for the penaeid shrimp stocks are values produced by the stock synthesis model. Species specific $SSB_{MSY}$ 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 Council. Currently, the stock synthesis model produces the following values:

- Brown shrimp: $SSB_{MSY}$ is 6,098,824 lbs of tails
- White shrimp: $SSB_{MSY}$ is 365,715,146 lbs of tails
- Pink shrimp: $SSB_{MSY}$ is 23,686,906 lbs of tails

**NOTE: It is not appropriate to compare values from **Alternatives 2** and **3** with those presented in **Preferred Alternative 4**. **Preferred Alternative 4** is MSY based and is derived from an annual*

*computation.* ***Alternatives 2*** *and* ***3*** *are model based that are derived from the apical monthly computation. Further, it is not appropriate to multiply values from* ***Alternatives 2*** *and* ***3*** *by twelve and compare with* ***Preferred Alternative 4*** *because the minimum total annual spawning biomass is not a mean. Therefore, the methods of calculation should be compared, rather than the resulting numbers*.

**Discussion:**

In October 2013, the SSC approved setting the overfished thresholds at the MSST (Figures 2.2.1-2.2.3), defined as the minimum spawning biomass from annual data points (from 1984-2011) (**Alternative 2** and **Alternative 3**), and the Council accepted the updated values based on data through 2012 at its October 2013 meeting. The MSST is the level of biomass below which the stock is considered to be overfished. 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.

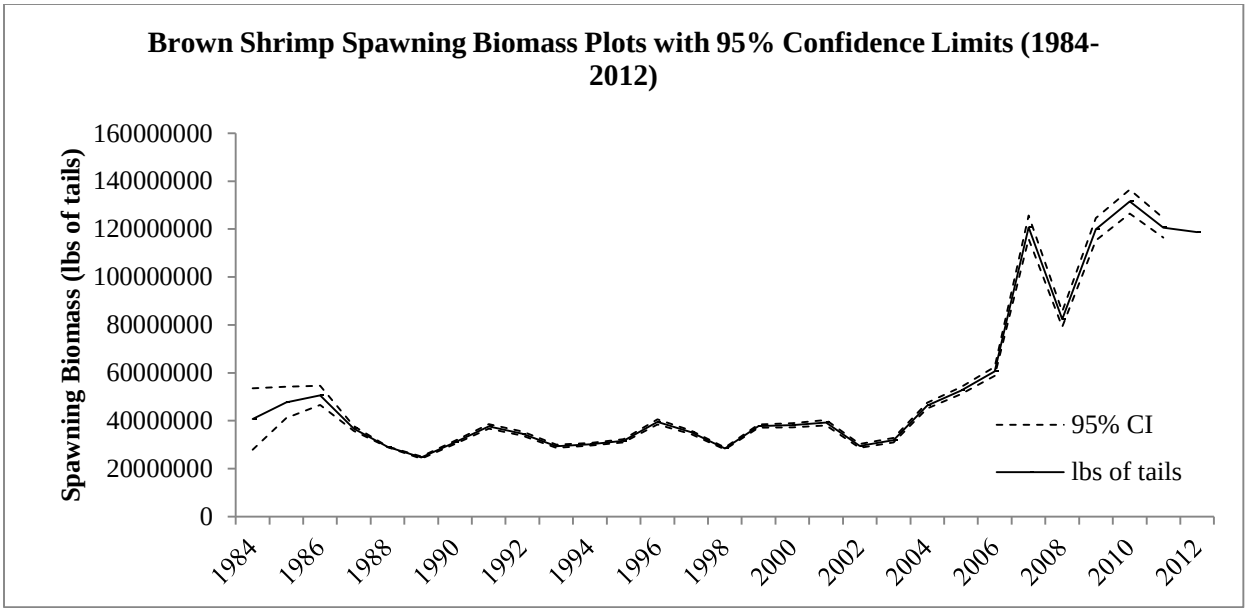


**Figure 2.2.1.** Brown shrimp MSST modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for brown shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.3, the lowest MSST value was used (**Preferred Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Preferred Alternative 2**).

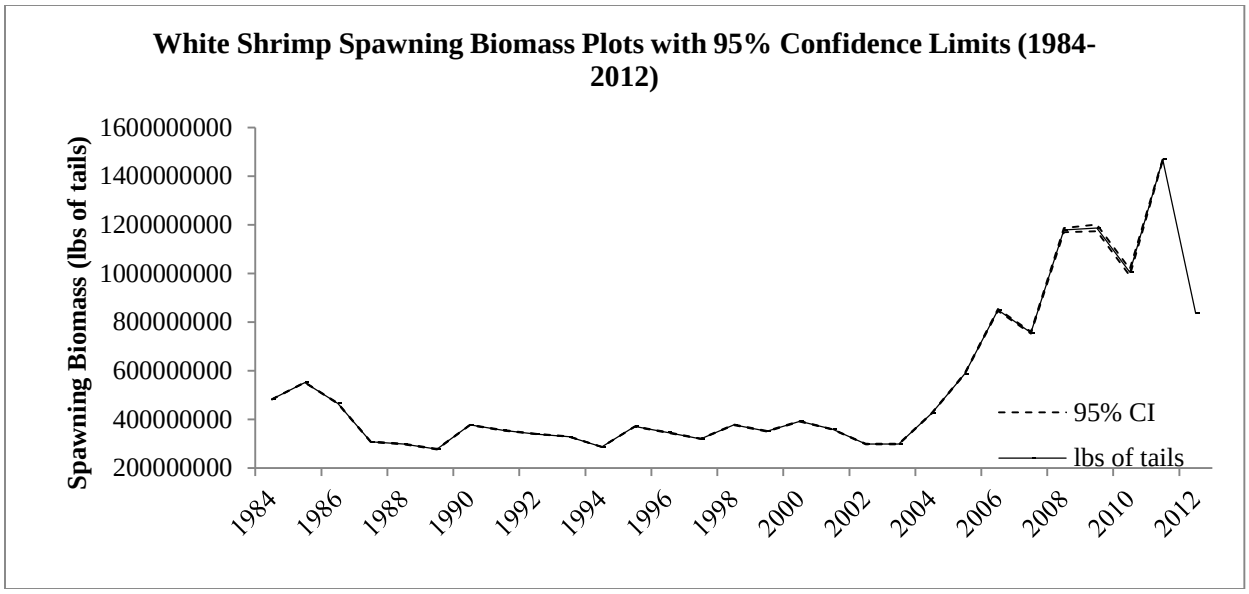


**Figure 2.2.2.** White shrimp MSST modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for white shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.3, the lowest MSST value was used (**Preferred Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Preferred Alternative 2**).

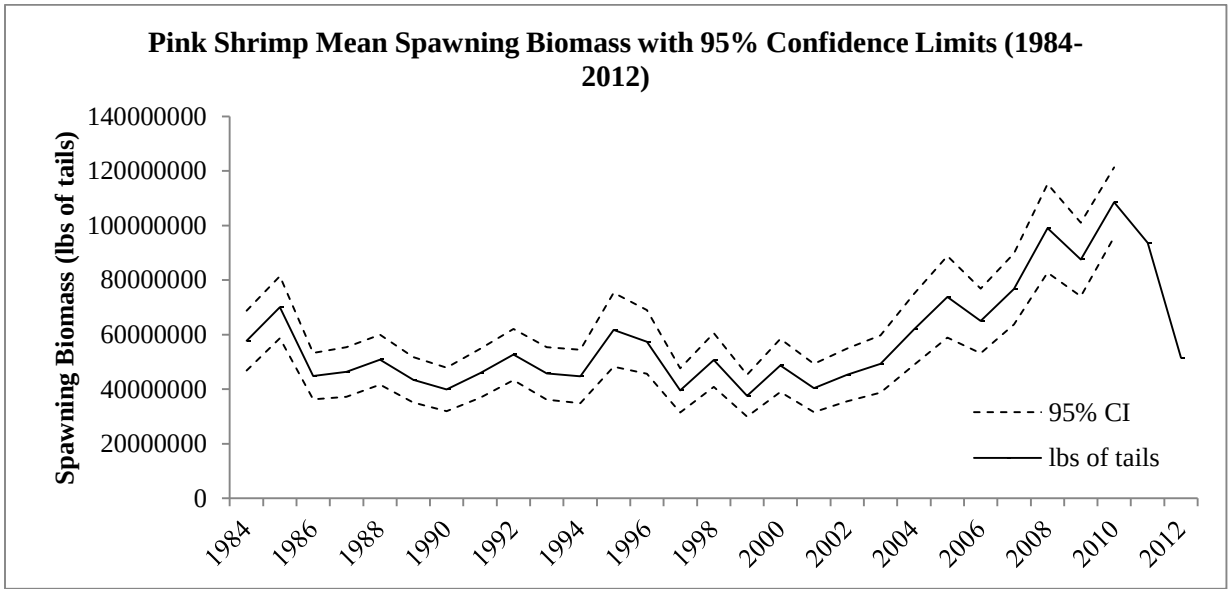


**Figure 2.2.3.** Pink shrimp MSST modeled using the Stock Synthesis model with data 1984-2012. The solid line is the mean spawning stock biomass calculated for pink shrimp and the dashed lines are the 95% confidence limits about the mean. For Action 1.3, the lowest MSST value was used (**Preferred Alternative 2** and **Alternative 3**) with the corresponding confidence limits (**Preferred Alternative 2**). Only 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. The VPA model defines overfished in terms of the number of sexually mature individuals during the reproductive period of each stock. Brown and white shrimp are sexually mature at 7 + months of age; pink shrimp at 5+ months of age. This alternative is contingent upon using the VPA model to assess penaeid stocks; the VPA model is no longer used to assess penaeid stocks.

**Alternative 2** would be the lowest MSST value for each species currently produced by the Stock Synthesis model minus the 95% confidence limit. The MSST outputs are monthly and the values for **Alternative 2** and **Alternative 3** are the absolute lowest values produced by the model from the years 1984-2012; multiplying these values by twelve to produces an "annual" value would artificially depress the MSST and would be more likely to result in an overfished status. 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. The MSST is an index derived after the effort and landings have been reported for the fishing season and is calculated using the Stock Synthesis model after the fishing season has concluded.

**Alternative 3** is similar to **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.

**Preferred Alternative 4** would establish the overfished threshold in terms of spawning stock biomass based on the MSY produced by the stock synthesis model. For pink and white shrimp a monthly output is multiplied by twelve to calculate the yearly $SSB_{MSY}$. An annual $SSB_{MSY}$ is appropriate because it is a number based on all years of data, not based on the minimum monthly value from all years of data. Brown shrimp had a seasonal output, so no multiplication factor was used. These values are not comparable to **Alternatives 2** and **3** as those are based on the minimum monthly outputs of the stock synthesis model. Additionally, **Alternatives 2** and **3** are based on the lowest monthly outputs from the time series. Just as in **Alternatives 2** and **3**, the $SSB_{MSY}$ value should be re-evaluated periodically to account for variability in the model.

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 the Magnuson Stevens Act, if a stock is determined to be overfished, NMFS must notify the Council, and the Council must begin developing 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 the shrimp stock, variability in environmental conditions, and the two-year timeframe to implement these measures, the stock may no longer be considered overfished by the time management measures are in effect.

However, if the spawning biomass is below MSST for second consecutive year, then the Council would already have management measures in development.

**Council Conclusions:**

The Council chose **Preferred Alternative 4** because it is consistent with an MSY-based metric for measuring stock status and is based on a yearly value instead of a minimum monthly value. The Council did not choose **Alternative 1** because that would leave the overfished threshold of the fishery as unknown under the current stock assessment model. The Council did not choose **Alternative 2 or 3** because they were not based on MSY.

## 2.2 Action 2 – Modify the Shrimp Fishery Management Plan (Shrimp 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 (AMs)* Amendment.

**Preferred Alternative 2.** Modify the shrimp management measures framework procedure to include changes to AMs* 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 AMs

- Closure and closure procedures
- Trip limit implementation or change
- Implementation of gear restrictions

Post-season AMs

- 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 AMs* 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 AMs

- Closure procedures
- Trip limit reductions or increases

Post-season AMs

- Adjustment of season length
- Adjustment of trip or possession limits

**Note: The portions of the current framework procedure regarding ACLs, ACTs, and AMs 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, it 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/AM Amendment (GMFMC 2011) established a framework procedure to change other management measures. Subsequent to the last amendment, the Council determined that modifications to AMs 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/AM Amendment as indicated in the highlighted sections below. The other two framework procedures would remain unchanged. The AM provisions currently apply only to royal red shrimp because penaeid shrimp are not required to have AMs.

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**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,
      v. Restrictions relating to maintaining fish in a specific condition (whole condition, filleting, use as bait, etc.),
      vi. 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,
      xi. 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 AMs including:

In-season AMs

1. Closures and closure procedures
2. Trip limit changes
3. Implementation of gear restrictions

Post-season AMs

4. Adjustment of season length
5. Implementation of closed seasons/time periods
6. Adjustment or implementation of trip or possession limits
7. Reduction of the ACL/ACT to account for the previous year overage
8. Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year
9. Implementation of gear restrictions
10. Reporting and monitoring requirements

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 AMs, either in-season or post-season.

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**Alternative 1** would retain the current shrimp management measures framework procedure without any changes. This framework procedure was established in the Generic ACL/AM 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 AMs 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 AMs that could be changed through the process. **Preferred Alternative 2** is a more comprehensive list that includes all AMs currently in place. **Alternative 3** would limit the types of AMs that could be changed through a framework action. The AM provisions in **Preferred Alternative 2** and **Alternative 3** currently apply only to royal red shrimp because penaeid shrimp are not required to have AMs. Both alternatives would also allow changes to the portion of the regulations detailing the framework procedures which would clarify the procedures and remove outdated terminology.

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, AMs 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 AM, and the closed season would only be in effect temporarily. Therefore, the current framework (**Alternative 1**) allows changes to management measures, but the **Preferred**

**Alternative 2** and **Alternative 3** would also allow changes to AMs, including adding new accountability measures to the existing suite.

**Council Conclusions:**

The Council chose **Preferred Alternative 2** to allow maximum flexibility and timeliness in making adjustments to management and AMs that may be needed as a result of a new stock assessment or other new information or circumstances. The Council did not choose **Alternative 1** because that would require a plan amendment to modify AMs and would leave inaccurate terminology in the framework. The Council did not choose **Alternative 3** because the Council determined it did not supply enough flexibility in the AMs that could be modified through a framework.

# CHAPTER 3. AFFECTED ENVIRONMENT

## 3.1 Description of the Fishery

The Environmental Impact Statement (EIS) 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 EIS 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 shrimp 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 (240 feet) and is highly dependent on environmental factors such as temperature and salinity.

White shrimp are found in nearshore waters to about 20 fathoms (120 feet) 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 (Table 3.1.1).

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 (180 feet) 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 current maximum sustainable yield (MSY) estimate of 392,000 lbs of tails in the years 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 (pounds of tails) of shrimp from the Gulf, 2003-2013. Other shrimp include seas bobs, rock shrimp, and other shrimp that are not federally managed.

| Year | All Species | Brown | White | Pink | Royal Red | Others |
|---|---|---|---|---|---|---|
| 2003 | 161,010,611 | 84,077,981 | 61,029,451 | 9,992,981 | 279,013 | 5,631,185 |
| 2004 | 162,372,773 | 74,512,744 | 72,992,775 | 10,245,766 | 278,519 | 4,342,969 |
| 2005 | 135,418,633 | 58,658,224 | 65,399,784 | 8,784,798 | 150,316 | 2,425,511 |
| 2006 | 182,981,364 | 87,471,753 | 86,229,598 | 7,691,431 | 163,323 | 1,425,259 |
| 2007 | 139,962,049 | 70,675,513 | 64,350,692 | 3,459,355 | 229,024 | 1,247,465 |
| 2008 | 120,209,917 | 50,344,159 | 63,738,475 | 4,919,903 | 138,116 | 1,069,264 |
| 2009 | 154,642,342 | 75,372,722 | 74,431,059 | 4,113,970 | 173,065 | 551,526 |
| 2010 | 110,491,956 | 44,951,233 | 59,032,638 | 5,243,681 | 127,358 | 1,137,046 |
| 2011 | 136,543,421 | 72,387,001 | 57,969,171 | 4,070,606 | 195,354 | 1,921,289 |
| 2012 | 136,717,883 | 64,674,384 | 67,787,889 | 3,213,402 | 177,658 | 864,550 |
| 2013 | 123,471,746 | 62,475,827 | 55,869,792 | 3,241,638 | 103,076 | 1,781,413 |
| Average | 142,165,699 | 67,781,958 | 66,257,393 | 5,907,048 | 183,166 | 2,036,134 |

Source: NMFS Gulf Shrimp Survey, J. Primrose, SEFSC pers. comm., 2014; R. Hart, SEFSC, pers. comm. 2013.

The three species of penaeid shrimp are short-lived and provide annual crops; royal red shrimp live longer, and several year classes may occur on the fishing grounds at one time. Penaeid shrimp are not required to have annual catch limits (ACLs) 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 component of the fishery is only prosecuted in deeper waters of the exclusive economic zone (EEZ). As of May 7, 2015, there were 1,468 valid or renewable federal Gulf shrimp permits and 289 endorsements for royal red shrimp. There has been a moratorium on the issuance of new Gulf shrimp permits since 2007. Permits are fully transferrable, and renewal of the permit 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 or electronic logbook. 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 part of either a nearshore or an offshore fleet. Vessel size categories range from under 25 feet to over 85 feet. More than half of the 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, the shrimp

landings file, is for vessels that have been recorded as landing shrimp; 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 number of hours spent towing from selected vessels with electronic logbooks to calculate effort.

A 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 landed. In 2012, there were approximately 4,000 shrimp permits for Texas, Louisiana and Mississippi; Florida and Alabama do not require special shrimp permits for state waters. There are about 3,500 small boats participating using trawls up to 16 feet in width. More than 75% of the state licenses are from 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). Total 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 development 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 Amendments 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: the vessel is fishing for and catching more than 90% royal red shrimp; the vessel is using a try net; the trawl is a rigid frame roller trawl; the vessel is trawling within the tow-time restrictions; or the vessel is testing the efficacy of a BRD under an authorization by NMFS.

## 3.2 Description of the Physical Environment

The EIS for the original Shrimp FMP and the FMP as revised in 1981 contains 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.

Generic Amendment 3 addressed 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 in 2010 affected at least one-third of the Gulf from western Louisiana east to the Florida Panhandle and south to the Campeche Bank of Mexico. Millions of barrels of oil flowed from the ruptured wellhead (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 persist 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 EIS for the original Shrimp FMP and the FMP as revised in 1981 contains a description of the biology of the shrimp species. In its appendix, the EIS 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 which has essentially remain unchanged, except with respect to protected species as discussed below.

### 3.3.1 Target Species

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 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. Post-larvae 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. Post-larvae 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 larvae are planktonic, and post-larvae 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 than penaeid shrimp and many year classes may be present on fishing grounds at one time. Fishing occurs in water depths of 80 to 300 fathoms (480-1,800 feet).

### 3.3.2 Bycatch

Between 2007 and 2010, 185 species were observed as bycatch in the shrimp fishery (Scott-Denton et al. 2012). By weight, approximately 57% of the catch was finfish, 29% was commercial shrimp, and 12% was invertebrates. The species composition is spatially and bathymetrically dependent, but for the Gulf overall, Atlantic croaker, sea trout, and longspine porgy are the dominant finfish species taken in trawls (approximately 26% of the total catch by weight). Other commonly occurring species include portunid crabs, mantis shrimp, spot, inshore lizardfish, searobins, and Gulf butterfish. Although red snapper comprise a very small percentage (0.3% by weight) of overall bycatch, the mortality associated with this bycatch affects the recruitment of older fish (age 2 and above) to the directed fishery and ultimately the recovery of the red snapper stock.

To address finfish bycatch issues, especially bycatch of red snapper, the Gulf of Mexico Fishery Management Council (Council) initially established regulations requiring BRDs specifically to reduce the bycatch of juvenile red snapper. In 1998, all shrimp trawlers operating in the EEZ, inshore of the 100-fathom contour, west of Cape San Blas, Florida were required to use BRDs. Only two Gulf states (Florida and Texas) require the use of BRDs in state waters. Shrimp trawls fishing for royal red shrimp seaward of the 100-fathom contour are exempt from the requirement for BRDs. The shrimp fishery is also a source of bycatch mortality on sea turtles (see Section 3.3.3). Bycatch is currently considered to be reduced to the extent practicable in the Gulf shrimp fishery. The actions in this amendment are not likely to change bycatch in the shrimp fishery. Bycatch levels and associated implications will continue to be monitored and issues will be addressed based on new information.

### 3.3.3 Protected Species

Species in the Gulf protected under the Endangered Species Act (ESA) include: five marine mammal species (sei, fin, humpback, sperm whales, and manatees); five sea turtles (Kemp's ridley, loggerhead, green, leatherback, and hawksbill); two fish species (Gulf sturgeon and smalltooth sawfish); and four coral species (elkhorn coral, lobed star coral, boulder star coral, and mountainous star coral). Seven 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. Bycatch of the species by commercial fisheries is a major contributor to past declines and a potential threat to future recovery (NMFS and USFWS 1991, 1992a, 1992b, 2008; NMFS et al. 2011). Historically, southeastern U.S. shrimp fisheries (both Gulf and South Atlantic) have been the largest threat to benthic sea turtles. Regulations requiring turtle excluder devices (TEDs) have reduced

mortalities from trawl fisheries on sea turtles. During a four year study period, 55 sea turtles were captured in shrimp trawls; 80% were released alive and conscious (Scott-Denton et al 2012).

The most recent biological opinion evaluated the continued implementation of the sea turtle conservation regulations under the ESA and the continued authorization of the Southeast U.S. shrimp fisheries in federal waters (NMFS 2014). The Gulf shrimp fishery was considered specifically as part of this larger consultation. The biological opinion, which was based on the best available commercial and scientific data, concluded the continued authorization of the Southeast U.S. shrimp fisheries in federal waters (including the Gulf shrimp fishery) is not likely to jeopardize the continued existence of threatened or endangered species (NMFS 2014). The biological opinion recommended measures to minimize the impacts of incidental take to sea turtle or smalltooth sawfish. After the completion of the biological opinion, NMFS designated new critical habitat for the Northwestern Atlantic distinct population segment of loggerhead sea turtles defined by five specific habitat types. Two of those habitat types (nearshore reproductive and *Sargassum)* occur within the Council's jurisdiction. NMFS determined that all federal Gulf fisheries operate outside the nearshore reproductive habitat and will not affect it. Gulf fisheries (including the shrimp fishery) could overlap with the *Sargassum* habitat. However, NMFS determined any effects from those fisheries would be insignificant and were not likely to adversely affect the *Sargassum* habitat unit.

The shrimp fishery is classified in the 2015 List of Fisheries as a Category II fishery (79 FR 77919; January 28, 2015). 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, which 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.[3]

### 3.3.4 Status of the Shrimp Stocks

The three species of penaeid shrimp harvested by the shrimp fishery are short-lived and provide annual crops; royal red shrimp 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 and values are provided in Table 3.1.1.

## 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

[3] http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/southeastern_us_atlantic_gulf_shrimp_trawl.pdf).

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), Shrimp Amendment 16 (GMFMC 2014)]. 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 fleets: 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 2006. 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 April 20, 2015, there were 1,339 valid SPGM permits and 288 valid royal red shrimp endorsements.

Total landings of shrimp from 2006 through 2013 averaged about 138 mp, heads off, with a dockside value of approximately $399 million in 2012 dollars (Table 3.4.1). Current values were adjusted for inflation using the consumer price index.[4] The year 2012 is chosen for converting nominal revenues to real revenues so that inflation adjustment in Table 3.4.1 would be consistent with that in Tables 3.4.2 and 3.4.3. Landings estimates include shrimp catches from inshore and offshore waters in the Gulf. 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 1.4% of total shrimp landings and less than 1% of dockside revenues.

[4] U.S. Department of Labor, Bureau of Labor Statistics. Consumer Price Index: all urban consumers, all goods, U.S. average [Available from http://www.bls.gov/cpi/].

**Table 3.4.1.** Landings and dockside revenues from the Gulf of Mexico shrimp fishery, 2006-2013, and their percent distribution by species.

| | All Species | Brown (%) | White (%) | Pink (%) | Royal R (%) | Others (%) |
|---|---|---|---|---|---|---|
| **Landings (lbs heads off)** | | | | | | |
| 2006 | 182,981,364 | 47.8% | 47.1% | 4.2% | 0.1% | 0.8% |
| 2007 | 139,962,049 | 50.5% | 46.0% | 2.5% | 0.2% | 0.9% |
| 2008 | 120,209,917 | 41.9% | 53.0% | 4.1% | 0.1% | 0.9% |
| 2009 | 154,642,342 | 48.7% | 48.1% | 2.7% | 0.1% | 0.4% |
| 2010 | 110,491,956 | 40.7% | 53.4% | 4.7% | 0.1% | 1.0% |
| 2011 | 136,543,421 | 53.0% | 42.5% | 3.0% | 0.1% | 1.4% |
| 2012 | 136,717,883 | 47.3% | 49.6% | 2.4% | 0.1% | 0.6% |
| 2013 | 123,471,746 | 50.6% | 45.2% | 2.6% | 0.1% | 1.4% |
| Average | 138,127,585 | 47.8% | 47.9% | 3.3% | 0.1% | 0.9% |
| **Dockside Revenues (2012 dollars)** | | | | | | |
| 2006 | $446,861,067 | 44.7% | 48.2% | 6.4% | 0.2% | 0.4% |
| 2007 | $392,509,509 | 48.3% | 48.0% | 3.1% | 0.3% | 0.3% |
| 2008 | $383,449,489 | 40.0% | 55.4% | 4.1% | 0.2% | 0.3% |
| 2009 | $332,022,953 | 45.4% | 50.3% | 3.9% | 0.3% | 0.2% |
| 2010 | $342,361,026 | 41.8% | 52.8% | 4.8% | 0.2% | 0.4% |
| 2011 | $433,860,601 | 46.8% | 48.7% | 3.2% | 0.3% | 1.0% |
| 2012 | $397,547,514 | 47.1% | 49.5% | 2.9% | 0.3% | 0.2% |
| 2013 | $461,776,160 | 47.8% | 48.4% | 2.9% | 0.2% | 0.8% |
| Average | $398,798,540 | 45.4% | 50.0% | 3.9% | 0.2% | 0.5% |

Note: Landings are estimates from inshore and offshore water catches in the Gulf.
Source: J. Primrose, pers. comm., SEFSC, 2014; R. Hart, SEFSC, pers. comm., 2014.

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

Selected characteristics of participation in the Gulf shrimp fishery in 2006 through 2012 are summarized in Table 3.4.2. Estimates of the total number of active shrimp vessels are based on the number of unique vessels landing shrimp as recorded in the Gulf Shrimp System (GSS) database. The number of active permitted vessels was generated by cross referencing GSS landings data with SPGM permit list. The number of active vessels (permitted and non-permitted) is likely to be underestimates of the "actual" number of active vessels/permits based on other research (Travis 2010). However, this determination of active vessels provides a means of standardizing active participation in the Gulf shrimp fishery over a longer time frame.

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 (Table 3.4.2). Approximately 22% to 30% of active vessels are federally permitted vessels (vessels with SPGM permit). Despite being fewer in number, federally 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 76% have been active in the Gulf shrimp fishery between 2006 and 2012.

**Table 3.4.2.** Selected characteristics of participation in the Gulf shrimp fishery, 2006-2012.

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Number of active vessels | 4,889 | 4,678 | 4,121 | 4,725 | 4,495 | 5,237 | 5,152 |
| Federally permitted vessels (%) | 30% | 30% | 30% | 26% | 25% | 23% | 22% |
| Non-permitted vessels (%) | 70% | 70% | 70% | 74% | 75% | 77% | 78% |
| | | | | | | | |
| Number of federally permitted vessels* | 1,919 | 1,915 | 1,890 | 1,707 | 1,628 | 1,578 | 1,527 |
| Active (%) | 76% | 72% | 65% | 71% | 70% | 75% | 75% |
| Inactive (%) | 24% | 28% | 35% | 29% | 30% | 25% | 25% |
| | | | | | | | |
| Total shrimp landings (mp, heads off) | 182 | 141 | 119 | 157 | 112 | 139 | 137 |
| Total revenues (million 2012 dollars) | $436 | $388 | $374 | $329 | $340 | $432 | $399 |
| Federally permitted vessels (% landings) | 70% | 66% | 68% | 69% | 63% | 68% | 64% |
| Federally permitted vessels (% revenues) | 78% | 77% | 78% | 77% | 74% | 79% | 74% |

*The number of federally 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. "Active" vessels are those landing shrimp as recorded in the GSS database.
Source: Liese, 2011, 2013, 2014; Liese and Travis, 2010; Liese et al., 2009a, 2009b. The Annual Economic Survey of Federal Gulf Shrimp Permit Holders, NMFS-SEFSC.

**Key Economic and Financial Characteristics of Federally Permitted Shrimp Vessels**

The following descriptions are based on a series of annual reports on the economics of the federal Gulf shrimp fishery for the years 2006 through 2012 (Liese 2011, 2013, 2014; 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 2013 report is yet to be completed and the 2014 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 fishery.[5] Table 3.4.3 shows a summary of these three financial statements. In this table, financial statements for 2010 and onward include costs and revenues related to the Deepwater Horizon MC 252 (DWH) oil spill. Dollar values are averages in 2012 dollars.

The year 2010 was unique for the operations of many shrimp vessels in the Gulf because of the DWH oil spill. This oil spill and BP's responses had a confounding effect on the economics of

[5] For more detailed descriptions of these three financial statements, see Liese et al. 2009a. The Annual Economic Survey of Federal Gulf Shrimp Permit Holders: Report on the Design, Implementation, and Descriptive Results for 2006. NOAA Technical Memorandum NMFS-SEFSC-584.

the Gulf shrimp fishery in 2010 and onward. In 2010, the majority of vessels (66%) reported receiving oil spill-related revenues. The two primary sources of this revenue were 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 in 2010, 28% participated in the VOOP. Both sources provided substantial revenue for participating vessels, thereby obscuring the economics of the Gulf shrimp fishery. Further, vessels participating in VOOP incurred non-negligible costs unrelated to commercial fishing. For more details on DWH-related revenues, see Liese (2011, 2013, and 2014).

It is noted that some shrimp vessels continued to receive DWH-related revenues in 2011 and 2012, but the amounts in these later years were small relative to that received in 2010. On average, DWH-related revenues per vessel were approximately $132,388 in 2010, $7,816 in 2011, and $58,167 in 2012. All dollar figures are in 2012 dollars.

The average vessel shows a fair amount of equity that rose through the years (Table 3.4.3). This resulted from a combination of an increasing market value of the assets (vessel being the main asset) and declining liabilities (mainly loans) , except for a dip in 2008.

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. Cognizant of the importance of the DWH-related revenues, the three years after the DWH oil spill recorded the three highest net cash flows for the years 2006 through 2012. Revenues from shrimp were the major source of cash inflows while fuel and labor (crew and hired captain) costs were the top sources of cash outflows.

The income statement generally reflects the relatively fragile financial condition of an average permitted shrimp vessel. Before the occurrence of DWH-related activities, net revenues from fishing operations were generally negative, except for 2009. As is true of most averages, many shrimp vessels deviated from the average and were profitable. A very different financial scenario characterized the average shrimp vessel when including DWH-related activities, as in the years 2010 and thereafter. These activities materially affected the cash flow and income statement of the average vessel. Net cash flows were significantly positive for these years relative to those of the previous years. In addition, the bottom line profits (net revenue before tax) were also relatively high for these years.

The future economic and financial prospects for the shrimp industry could revert to those of the previous years as DWH-related activities dwindle. It may only be noted that shrimp imports have fallen in recent years as a result of diseases (early mortality syndrome) that affected cultured shrimp in some major exporting countries, allowing domestic prices for shrimp to increase. In addition, fuel prices, a major cost item for shrimp vessel operation, have fallen in recent months, but it is not known if prices would rebound to their previous high levels in the near future.

**Table 3.4.3.** Economic and financial characteristics of an average vessel with federal shrimp permit (SPGM), 2006-2012. DWH-related costs and revenues are included for 2010, 2011, and 2012. Dollar values are averages in 2012 dollars.

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Number of observations | 484 | 505 | 497 | 427 | 429 | 456 | 442 |
| | | | | | | | |
| Assets | $202,336 | $222,741 | $218,380 | $224,001 | $242,419 | $298,519 | $290,047 |
| Liabilities | $105,404 | $94,504 | $75,863 | $65,517 | $52,505 | $42,072 | $49,619 |
| Equity | $96,931 | $128,238 | $142,517 | $158,483 | $189,916 | $256,447 | $240,428 |
| | | | | | | | |
| Inflow | $262,066 | $216,857 | $228,953 | $227,037 | $354,056 | $322,973 | $374,742 |
| Outflow | $242,119 | $223,259 | $224,330 | $218,189 | $253,518 | $286,964 | $305,427 |
| Net cash flow | $19,946 | -$6,402 | $4,624 | $8,849 | $100,538 | $36,010 | $69,315 |
| | | | | | | | |
| Revenue (commercial fishing operations) | $248,902 | $209,348 | $226,159 | $222,377 | --------- | $307,676 | $310,890 |
| Expenses | $251,849 | $228,669 | $231,314 | $221,602 | $254,454 | $293,585 | $306,962 |
| *Variable costs – Non-labor* | $127,436 | $113,191 | $124,215 | $111,023 | $107,888 | $140,333 | $159,620 |
| *Variable costs – Labor* | $65,229 | $57,624 | $58,523 | $60,055 | $82,952 | $93,947 | $86,563 |
| *Fixed costs* | $59,185 | $58,082 | $48,576 | $50,525 | $63,614 | $59,305 | $60,778 |
| Net revenue from operations | -$2,946 | -$19,323 | -$5,155 | $775 | --------- | $14,091 | $3,929 |
| Net receipts from non-operating activities | $5,969 | $878 | -$2,168 | $489 | --------- | $12,674 | $60,846 |
| Net revenue before tax (profit or loss) | $3,022 | -$18,445 | -$7,322 | $1,264 | $96,230 | $26,765 | $64,775 |

Source: Liese, 2011, 2013, 2014; Liese and Travis, 2010; Liese et al., 2009a, 2009b. The Annual Economic Survey of Federal Gulf Shrimp Permit Holders, NMFS-SEFSC.

## 3.5 Description of the Social Environment

Descriptions of the social environment associated with the Gulf shrimp fishery have been provided in previous amendments (GMFMC 2005a, 2007) and are incorporated herein by reference. These descriptions are updated here using recent community information on penaeid shrimp landings.

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 pounds and value for RQ vary considerably by community. As shown in Figure 3.5.1, except for Bayou LaBatre, Alabama, the top five ranking communities are in Texas. In fact, communities in Texas and Louisiana dominate brown shrimp landings and thus, have higher RQ scores. Louisiana communities tend to have higher landings but lower value. This may be indicative of size differentiation, with smaller shrimp sizes landed by inshore vessels in Louisiana, and Texas vessels primarily targeting penaeid shrimp offshore.

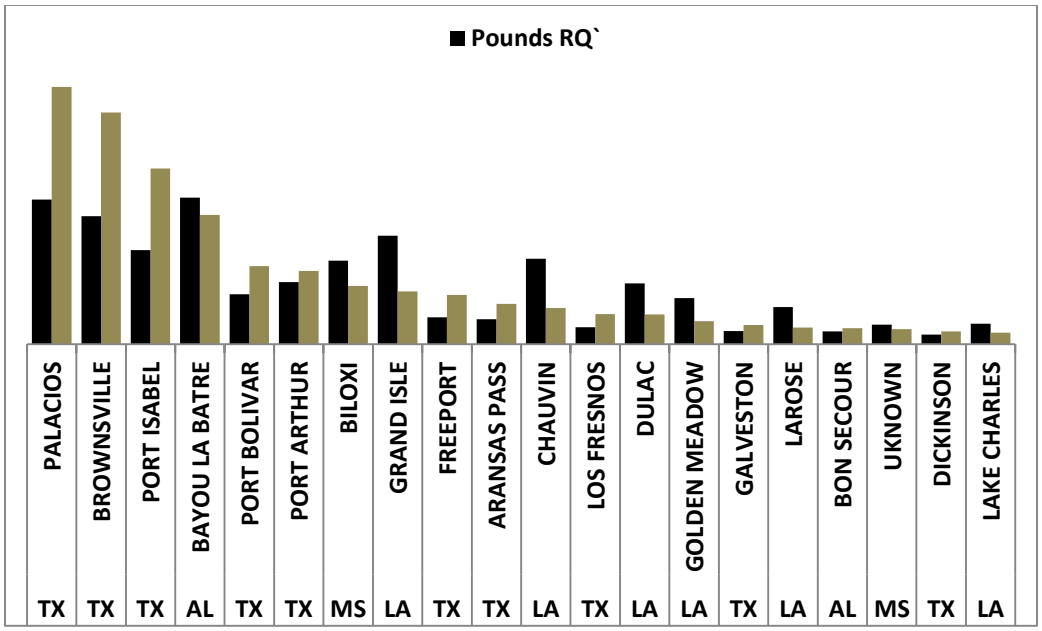


**Figure 3.5.1.** Top twenty brown shrimp communities based on the RQ for pounds and value, Gulf-wide.
Source: Southeast Regional Office, Accumulated Landings System 2011.

Pink shrimp are primarily landed in Florida with the majority landed 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 as the majority of pink shrimp are harvested off the west coast of Florida and may be transported back to Texas by large freezer vessels.

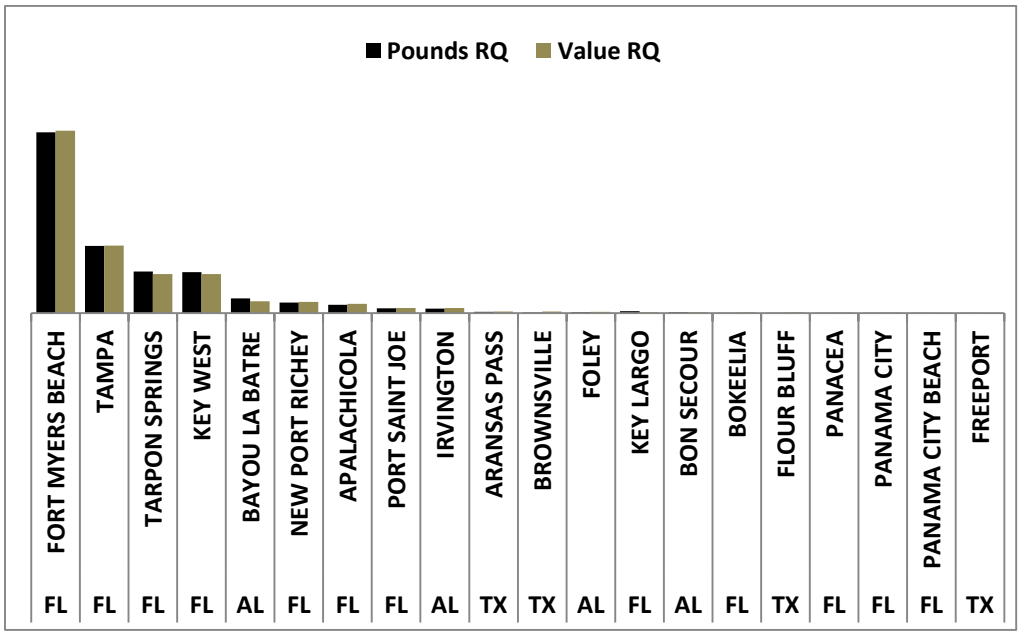


**Figure 3.5.2.** Top twenty pink shrimp communities based on the RQ for pounds and value, Gulf-wide.
Source: Southeast Regional Office, Accumulated Landings System 2011.

White shrimp (Figure 3.5.3) are primarily landed in the northern and western Gulf with Port Arthur, Texas having the highest RQ in terms of value. Although other communities have comparable RQs with regard to volume (pounds landed), the proportional value of white shrimp Gulf-wide is highest in Port Arthur.

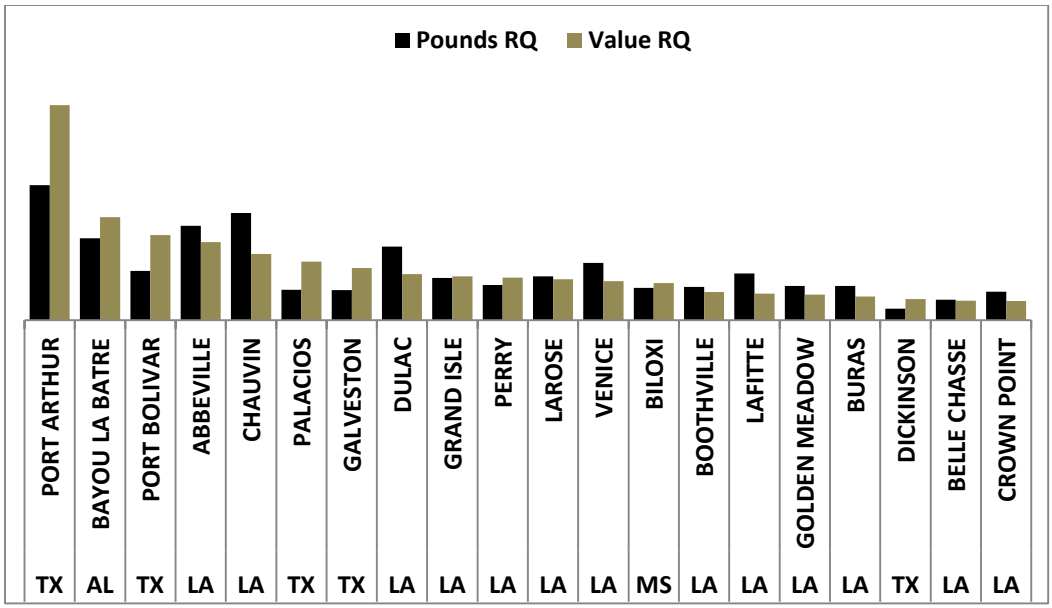


**Figure 3.5.3.** Top twenty white shrimp communities based on the RQ for pounds and value, Gulf-wide.
Source: Southeast Regional Office, Accumulated Landings System 2011.

Figure 3.5.4 provides the RQ in pounds and value for penaeid shrimp landings, combined. The five communities with the highest RQ for pounds and value of combined penaeid shrimp landings include four communities from Texas and Bayou La Batre, Alabama. The next five communities, all of which are in Louisiana except one, rank higher for pounds RQ than the value RQ, which is the opposite for the top five Texas communities. Again, this is likely due to price differences for smaller shrimp that are harvested by a large inshore fleet in Louisiana.

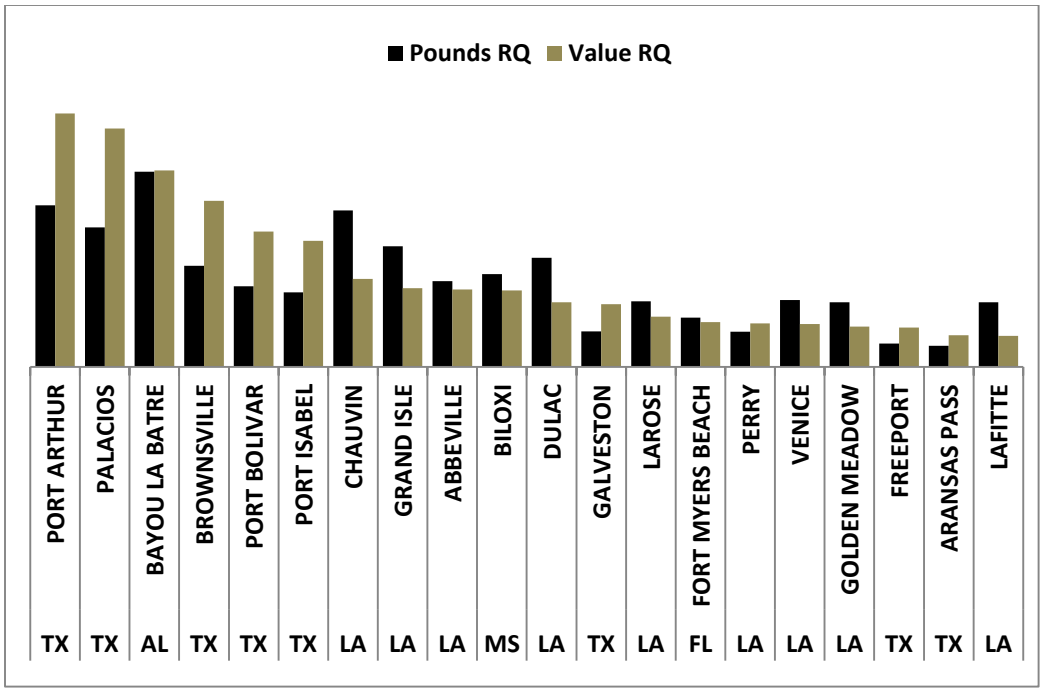


**Figure 3.5.4.** Top twenty shrimp communities based on the RQ for pounds and value for all penaeid shrimp, Gulf-wide.
Source: Southeast Regional Office, Accumulated Landings System 2011.

**Demographics and Fleet Characteristics**

While fleet landings can be characterized with regard to those communities that have high RQs for pounds landed and value, it is more difficult to characterize the fleet in terms of its labor force, specifically 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. Thus, a description regarding the engagement and reliance of fishing communities and their social vulnerability is provided.

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 an 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, Alabama; Fort Myers Beach, Florida; Chauvin, Dulac, Golden Meadow, Grand Isle, Lafitte, and Bootheville-Venice, Louisiana; and Port Isabel and Palacios, Texas. More in-depth profiles of some of these communities are included in previous amendments (GMFMC 2005a, 2007).

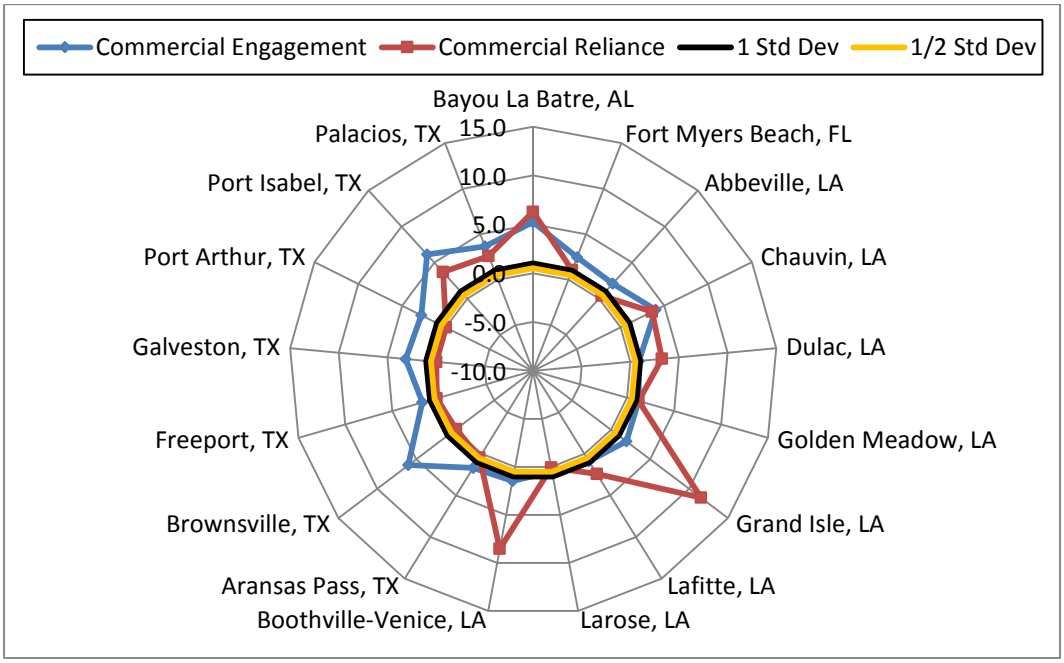


**Figure 3.5.5.** Commercial fishing engagement and reliance indices for the top twenty communities in terms of pounds and value RQ for penaeid shrimp Gulf-wide.
Source: Southeast Regional Office, Social Indicator Database.

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. Without demographic information for captains and crew, a technique has previously been used as a proxy for estimating the number of vessels that may have minorities of southeast Asian descent, which entails counting the surnames from the vessel permit file that appear to be of southeast Asian origin. For example, in a memorandum to the Shrimp Management Committee dated March 28, 2003, Dr. Wayne Swingle indicated that of the 1,836 federally permitted shrimp vessels, 524 (or 28.7%) had owners with southeast Asian surnames or corporate names. A similar count conducted by the Southeast Regional Office (SERO) in 2009 resulted in 484 out of 1853[6] (or 26.1%) of permit owners with southeast Asian

[6] 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.

surnames. Unfortunately, it is not possible to know if these are active vessels, whether the crew is also of southeast Asian ancestry, and how those individuals identified as southeast Asian based on their last names actually self-identify. We cannot say that 26% of the active Gulf fleet owners and crew are of southeast Asian descent nor are we able to suggest what percentage of participation in all aspects of the Gulf shrimp fishery is by individuals who identify as being of southeast Asian descent. However, this provides a very rough indication of the participation rate of southeast Asian immigrants within the Gulf shrimp fishery. With regard to other minorities, there are a considerable number of Hispanic or Latinos that participate in the fishery, especially as crew on Texas shrimp vessels, but no similar attempt has been made to derive a number or proportion of participants.

As mentioned above, 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 remains precarious, except when examined alongside the economic benefits realized by the fleet following the DWH oil spill. (Thomas et al. 1995; NMFS 2011). Any future hazard, whether human induced or ecologically induced could exacerbate any stability that has currently halted the downward trend. 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 shrimping households may have relied on, including VOOP funds, during these stressful economic times. 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 cope with these downward economic trends. However, without information on shrimping households, it is not possible to determine household resilience or decreasing well-being at the individual or household level.

### 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).

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 3.5.6. 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.

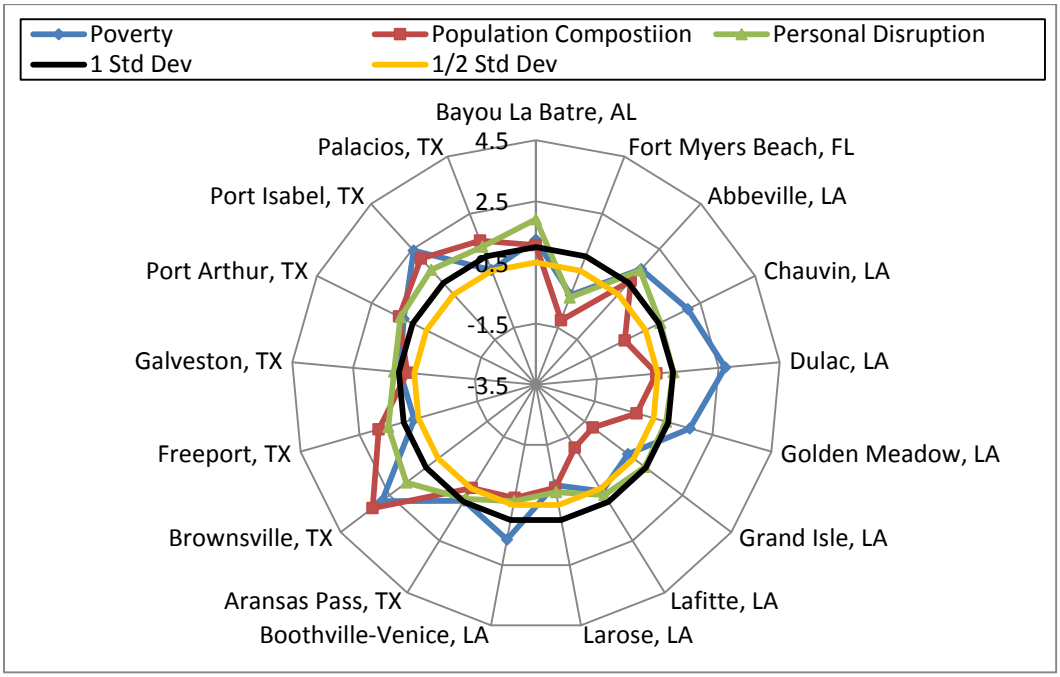


**Figure 3.5.6.** Social vulnerability indices for top twenty communities in terms of pounds and value RQ for penaeid shrimp Gulf-wide.
Source: SERO Social Indicator Database.

In terms of social vulnerabilities, several of the top shrimping 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, Louisiana; and Aransas Pass, Brownsville, Freeport, Galveston, Port Isabel, and Palacios, 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 A. In most cases, the Secretary has delegated this authority to NMFS.

The 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 its 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.

Texas Parks & Wildlife Department - http://www.tpwd.state.tx.us
Louisiana Department of Wildlife and Fisheries http://www.wlf.louisiana.gov/fishing
Mississippi Department of Marine Resources http://www.dmr.state.ms.us/
Alabama Department of Conservation and Natural Resources
http://www.outdooralabama.com/fishing-alabama
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 Maximum Sustainable Yield (MSY) for Penaeid Shrimp

**Alternative 1.** No Action. The MSY values for the penaeid shrimp stocks fall within the range of values defined by the lowest and highest landings taken annually from 1990-2000 that does not result in recruitment overfishing as defined herein:

- Brown shrimp: MSY is between 67,000,000 and 104,000,000 lbs of tails
- White shrimp: MSY is between 35,000,000 and 71,000,000 lbs of tails
- Pink shrimp: MSY is between 6,000,000 and 19,000,000 lbs of tails

**Preferred Alternative 2.** The MSY values for the penaeid shrimp stocks are values produced by the stock synthesis model approved by the Science and Statistical Committee (SSC). Species specific MSY 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 (Council).
Currently, the stock synthesis model produces the following values:

- Brown shrimp: MSY is 146,923,100 lbs of tails
- White shrimp: MSY is 89,436,907 lbs of tails
- Pink shrimp: MSY is 17,345,130 lbs of tails

### Action 1.2 – 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 MSY minimum levels listed below:

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

**Alternative 2:** The overfishing threshold is defined as the maximum fishing mortality threshold (MFMT). The 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 Council.

- Brown shrimp: the apical F value of the model output (3.54) plus the confidence limit (0.14); effective F: 3.68
- White shrimp: the apical F value of the model output (0.76) plus the confidence limit (0.01); effective F: 0.77
- 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 overfishing threshold is defined as the MFMT. The MFMT for each penaeid shrimp stock is defined as the maximum apical 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 Council.

- Brown shrimp: 3.54
- White shrimp: 0.76
- Pink shrimp: 0.20

**Preferred Alternative 4.** The overfishing threshold is defined as the MFMT. The MFMT for each penaeid shrimp stock is defined as the $F_{MSY}$. Species specific $F_{MSY}$ 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 Council.

Currently, the values are:

- Brown shrimp: 9.12
- White shrimp: 3.48
- Pink shrimp: 1.35

**NOTE: It is not appropriate to compare values from **Alternatives 2** and **3** with those presented in **Preferred Alternative 4**. **Preferred Alternative 4** is MSY based and is derived from an annual computation. **Alternatives 2** and **3** are model based that are derived from the apical monthly computation. Further, it is not appropriate to multiply values from **Alternatives 2** and **3** by twelve and compare with **Preferred Alternative 4** because the apical F is not a mean. Therefore the methods of calculation should be compared, rather than the resulting numbers.*

**Response to Possible Overfishing**

If the MFMT is exceeded for two consecutive years, the appropriate committees and/or panels (e.g. stock assessment panels, advisory panels, SSCs) 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.

## Action 1.3 – 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.

- Brown shrimp - 63 million individuals, age 7+ months during the November through February period

- White shrimp - 165 million individuals, age 7+ months during the May through August period
- Pink shrimp - 50 million individuals, age 5+ months during the July through June period

**Alternative 2:** The overfished threshold is defined as the minimum stock size threshold (MSST). The 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 Council.

- Brown shrimp: the MSST value of the model output (24,616,232) minus the confidence limit (490,210); effective MSST value: 24,126,023 lbs of tails
- White shrimp: the MSST value of the model output (277,054,011) minus the confidence limit (1,275,673); effective MSST value: 275,796,338 lbs of tails
- Pink shrimp: the MSST value of the model output (37,593,545) minus the confidence limit (7,642,354); effective MSST value: 29,951,191 lbs of tails

**Alternative 3:** The overfished threshold is defined as the MSST. The 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 Council.

- Brown shrimp: 24,616,232 lbs of tails
- White shrimp: 277,054,011 lbs of tails
- Pink shrimp: 37,593,545 lbs of tails

**Preferred Alternative 4:** The overfished threshold is defined as the MSST. The MSST for each penaeid shrimp stock is defined as the minimum spawning stock biomass at MSY ($SSB_{MSY}$). $SSB_{MSY}$ values for the penaeid shrimp stocks are values produced by the stock synthesis model. Species specific $SSB_{MSY}$ 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 Council. Currently, the stock synthesis model produces the following values:

- Brown shrimp: $SSB_{MSY}$ is 6,098,824 lbs of tails
- White shrimp: $SSB_{MSY}$ is 365,715,146 lbs of tails
- Pink shrimp: $SSB_{MSY}$ is 23,686,906 lbs of tails

**NOTE: It is not appropriate to compare values from **Alternatives 2** and **3** with those presented in **Preferred Alternative 4**. **Preferred Alternative 4** is MSY based and is derived from an annual computation. **Alternatives 2** and **3** are model based that are derived from the apical monthly computation. Further, it is not appropriate to multiply values from **Alternatives 2** and **3** by twelve and compare with **Preferred Alternative 4** because the minimum total annual spawning biomass is not a mean. Therefore, the methods of calculation should be compared, rather than the resulting numbers.*

### 4.1.1 Direct and Indirect Effects on the Physical Environment and the Biological Environment

Action 1.1, Action 1.2 and Action 1.3 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 or biological environment. Additionally, it is unlikely to affect how the fishery is prosecuted and how much shrimp is caught at the current time because both actions are setting status determination criteria (i.e. overfishing and overfished thresholds) in response to a change in model not a change in the fishery.

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. For Action 1.1, **Alternative 1** would leave MSY in terms of an outdated assessment model, the virtual population analysis (VPA) model. The MSY value for brown shrimp and white shrimp produce by the VPA model is less than that produced by the stock synthesis model. However, the MSY produced for pink shrimp by the VPA model is more than that produced by the stock synthesis model. Neither alternative in Action 1.1 would leave the MSY unknown, but one is based on the best available science (stock synthesis model) while the other is based on a model that has been replaced. Currently, the shrimp fishery is operating well below MSY and with the limited permits available, it is unlikely that this will change. Additionally, effort in the shrimp fishery is closely monitored to not exceed bycatch limits, so if the number of permits were to change, this monitoring will effectively limit how the fishery is prosecuted to keep bycatch to acceptable levels. **Alternative 1** in both Action 1.2 and Action 1.3 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 fishing mortality will exceed historical levels or that the spawning biomass be below the threshold. If the permit moratorium is allowed to expire in 2016, red snapper and other bycatch (as described in Section 3.3) may be affected if the expiration of the permit moratorium 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, 1.2 and 1.3 is likely to have significant physical, biological and ecological effects.

**Action 1.1 Modify the Maximum Sustainable Yield (MSY) 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 MSY proposed in Action 1.1 to values consistent with the current stock synthesis models will affect the physical environment differently than how the fishery is currently prosecuted. This may change if the effort resumes to level observed historically (in the 1990s), but this is unlikely with the current state of the fishery. Vessels are ageing, fuel prices are inconstant, and shrimp imports have increased. **Preferred Alternative 2** increases the MSY for both brown shrimp and white shrimp, but decreases the maximum MSY for pink shrimp. Ultimately, **Preferred Alternative 2** decreases ambiguity because it provides for a maximum number (not a range) and is produced by the stock assessment model that currently assesses the status of penaeid shrimp. MSY values of the fishery for all shrimp species have been below the proposed MSY values in **Preferred Alternative 2** since 2000, which was before the implementation of the shrimp permit moratorium.

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

It is unlikely that the MFMT proposed in Action 1.2 for either **Alternative 2**, **Alternative 3,** or **Preferred Alternative 4** 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). If the permit moratorium is allowed to expire and effort resumed to that observed in the 1990s, there could be greater impacts to the environment as a result of increased effort, such as habitat disturbance and higher landings. These impacts will be analyzed in Amendment 17, and if such is the case, the Council may decide to initiate action to prevent overfishing from occurring. Additionally, the overfishing threshold was based on historical effort, so the impacts to the environment are not likely to be unprecedented as fishing effort was much higher in the past.

**Alternative 2** incorporates the variability in the model and is less likely to result in an overfishing designation. Both **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. Compared to the overfishing threshold set in **Alternative 2**, the lower MFMT allowed under **Alternative 3** could potentially benefit the stock in the short-term if overfishing is actually occurring. However, the threshold set in **Alternative 3** does not take into account the variability in the model and is more likely to falsely produce an overfishing designation. **Preferred Alternative 4** sets the upper fishing mortality in terms of MSY and is based on an annual value. **Preferred Alternative 4** addresses the overfishing threshold in terms of an annual MSY and is not directly comparable to **Alternative 2** nor **Alternative 3** because both are monthly values. Additionally, compared to **Alternatives 2** and **3**, this value is the least likely to affect the stock. Theoretically, the fishery could operate at or just below the F values produced by both **Alternatives 2** and **3** for every month of the year, but would still not be undergoing overfishing, because no single month exceeded the MFMT value. This is unlikely to occur, but with increased fishery activity it is possible. 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 1.3 Modify the Overfished Threshold for Penaeid Shrimp**

In Action 1.3, it is unlikely that **Alternative 2, Alternative 3** or **Preferred Alternative 4** will result in additional physical, or biological impacts for the same reasons stated for Action 1.2. **Alternative 2** offers the greater 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 **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. **Preferred Alternative 4** addresses the overfished threshold in terms of an annual MSY and is not directly comparable to **Alternative 2** nor **Alternative 3** because both are monthly values.

### 4.1.2 Direct and Indirect Effects on the Economic Environment

**Action 1.1. Modify the Maximum Sustainable Yield (MSY) for Penaeid Shrimp**

Modifications to the MSY values for penaeid shrimp stocks proposed in this action would set MSY values compatible with the models currently used in stock assessments. **Alternative 1**, no action, would not be accepted as best available science because it would continue to rely on an outdated modelling approach to define MSY values. However, **Alternative 1** 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. **Preferred Alternative 2** would establish MSY values which are compatible with the current stock assessment models. Direct economic effects are not expected to result from **Preferred Alternative 2** because it would not affect the harvest or customary uses of penaeid shrimp. In addition, **Preferred Alternative 2** would likely not be expected to result in indirect economic effects because penaeid shrimp landings have consistently been well below the MSY values considered in this action.

**Action 1.2 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.

**Alternatives 2** and **3** and **Preferred Alternative 4** 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 **Alternatives 2** or **3** nor **Preferred Alternative 4** would affect the harvest or customary uses of penaeid shrimp. The MFMTs defined in **Alternatives 2** and **3** and **Preferred Alternative 4** 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. **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 **Alternative 2** could potentially benefit shrimpers in the short-term, and result in greater indirect benefits to the economic environment. **Preferred Alternative 4** is the least likely to affect the stock because it establishes the overfishing threshold based on an annual MSY. In contrast, **Alternatives 2** and **3** are based on monthly values.

**Action 1.3 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, an overfished condition could occur and remain undetected, potentially resulting in adverse effects to the stocks and associated indirect adverse economic effects.

**Alternatives 2** and **3** and **Preferred Alternative 4** would establish overfished thresholds which are compatible with the current stock assessment models. **Alternative 2** accounts for the stochastic nature of the MSST estimate. Direct economic effects are not expected to result from these alternatives because neither **Alternative 2** nor **3** or **Preferred Alternative 4** would affect the harvest or customary uses of penaeid shrimp resources. 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 economic benefits.

### 4.1.3 Direct and Indirect Effects on the Social Environment

**Action 1.1. Modify the Maximum Sustainable Yield (MSY) for Penaeid Shrimp**

Although additional effects would not be expected from retaining **Alternative 1**, the model used to provide the MSY values under **Alternative 1** has been inadequate for incorporating periods of low effort. The new model used for providing MSY values under **Preferred Alternative 2,**

approved by the Council's SSC as the best available science, has been shown to better incorporate changes in fishing behavior, thus more accurately reflecting stock status.

Compared with **Alternative 1**, the MSY values resulting from the model runs are greater under **Preferred Alternative 2** for brown shrimp and white shrimp. For pink shrimp, the MSY value under **Preferred Alternative 2** is within the range of MSY values under **Alternative 1**. Generally, larger catch allowances are associated with benefits to the social environment as more fishing activity is allowed to take place, provided the catch limits are not exceeded. Thus, the increased MSY values, improved accuracy of the model, and the adoption of a more expedient process (**Preferred Alternative 2**) would be expected to result in greater social benefits than **Alternative 1**.

**Action 1.2 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 (see Section 3.5), 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.

**Alternatives 2-4** 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 none of these alternatives would affect the harvest or customary uses of penaeid shrimp. The MFMTs defined in **Alternatives 2, 3,** and **Preferred Alternative 4** would allow for the determination of overfishing status of penaeid shrimp stocks after one year, but a response by the Council only 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, through the framework procedure. 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.

**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 MFMTs allowed under **Alternative 2** could potentially benefit shrimpers in the short-term, resulting in greater benefits to the social environment. In either case, the provision to respond only after the threshold is exceeded for two consecutive years allows for the environmental variability that is found with shrimp stocks. Compared with the approaches of **Alternatives 2** and **3**, the values derived for **Preferred Alternative 4** are not comparable as they are based on different temporal calculations. **Preferred Alternative 4** is MSY-based and is derived from the Stock Synthesis assessment model, recommended by the SSC as the best available science. Broad social benefits would be expected from adopting **Preferred Alternative 4**, as the model responds better to changes in fishing practice and behavior, than the model used for **Alternatives 2** and **3**.

**Action 1.3 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.

**Alternatives 2**, **3**, and **Preferred Alternative 4** 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 none of the three alternatives would affect the harvest or customary uses of penaeid shrimp. The MSSTs defined in these alternatives 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 penaeid stock is overfished. Under the Magnuson-Stevens Act, a rebuilding plan must be developed within two years should overfished status occur. If the rebuilding plan development takes over two years, it may not be established before the following year's determination is available. If the biomass does not drop below the MSST in the second year, the rebuilding plan could be suspended, but would be in development if the overfished determination remains for the second year. The establishment of corrective measures would be expected to be beneficial to the penaeid stocks and result in indirect benefits to the social environment.

**Alternative 2** accounts for the stochastic nature of the MSST estimate and sets a lower threshold for overfished status compared to **Alternative 3**. Thus, **Alternative 2** could potentially benefit shrimpers in the short-term and result in greater indirect benefits to the social environment when compared with **Alternative 3**. As noted, the overfished threshold values under **Preferred Alternative 4** are not comparable with **Alternatives 2** and **3**, which are based on monthly computations. In contrast to **Alternatives 2** and **3**, **Preferred Alternative 4** bases the overfished threshold on MSY, and is consistent with the approaches selected as preferred in Actions 1.1 and 1.2, reflecting the best available science.

### 4.1.4 Direct and Indirect Effects on the Administrative Environment

The Magnuson-Stevens 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 Action 1.1-1.3 do not account for changes in the stock assessment model from VPA to stock synthesis and would not be using the best available science. **Alternative 1** for Action 1.2 and Action 1.3 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** in Action 1.1 redefines MSY using the stock synthesis model which has been determined by the Council's SSC as the best available science. **Alternative 2**, **Alternative 3**, and **Preferred Alternative 4** for Actions 1.2 and 1.3 would also account for the new model and allow the actual status of the stocks to be known and reported. **Preferred Alternatives 4** in Actions 1.2 and 1.3 are based on the MSY established in Action 1.1, which is the best available science.

## 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 AMs* 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 AMs

- Closure and closure procedures
- Trip limit implementation or change
- Implementation of gear restrictions

Post-season AMs

- 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 AMs* 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 AMs

- Closure procedures
- Trip limit reductions or increases

Post-season AMs

- Adjustment of season length
- Adjustment of trip or possession limits

**Note: The portions of the current framework procedure regarding ACLs, ACTs, and AMs 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 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 by allowing a more timely response to new information 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 thus offers more flexibility than **Alternatives 1** and **3** to respond to changes in the stock. 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 social effects. 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 relative to accountability measures would be limited to royal red shrimp harvesters only, as penaeid shrimp stocks do not require accountability measures.

Accountability measures for shrimp are not included in the framework procedure currently in place (**Alternative 1**). To adopt or change an accountability measure requires following the full plan amendment process, which is lengthier than the standard documentation process for open framework actions. **Preferred Alternative 2** and **Alternative 3** propose to add in-season and post-season accountability measures 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 **Preferred Alternative 2** or **Alternative 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. With this added flexibility, minimizing any delays that may constrain fishing activities or reduce business flexibility and profitability may be minimized. Public participation and the review process would continue as part of the framework procedure under all alternatives.

**Alternative 3** includes a shorter list of accountability measures 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 accountability measures that may be modified through the open framework action process.

**Preferred Alternative 2** and **Alternative 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 **Preferred**

**Alternative 2** and **Alternative 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 accountability measures 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 of Mexico (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 federally permitted vessels and the rest, non-permitted vessels. Despite being fewer in number, federally permitted vessels accounted for an average of 67% of total shrimp landings and 77% of total ex-vessel revenues. As of May 7, 2015, there were 1,468 valid or renewable SPGMs, which is a significant decline from 1,933 that qualified for a permit when the moratorium was implemented. As of the same date, there were 289 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.

In April 2010, an explosion occurred on the Deepwater Horizon MC 252 (DWH) oil rig, resulting in the release of millions of barrels of oil into the Gulf. In addition, over a 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 persist in the environment and can be transported hundreds of miles.

In a study by Murawski et al. (2014), researchers found a higher frequency of skin lesions on fish in the northern Gulf in the area of the 2010 oil spill compared to other areas. Studies are continuing to check whether the sick fish suffer from immune system and fertility problems. 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. Effects on shrimp from the oil spill may affect 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 since 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.

To address sea turtle bycatch and associated mortality, NMFS implemented regulations requiring turtle excluder devices (TEDs) in 1987, which were phased in over 20 months. Originally, TEDs were required on a seasonal basis, and no TEDs were required if the fisherman followed restricted tow times. Subsequent rulemaking in 1992 required TEDs in all shrimp trawls from North Carolina to Texas, but phased in these requirements to the inshore fishery over a two-year period. Over time, TED regulations have been modified to change the allowable configurations with the intent of improving turtle exclusion. TEDs are required in both state and federal waters. Royal red shrimp trawls are not required to have TEDs if the catch is 90% or greater royal red shrimp because the fishery is prosecuted in depths that are unlikely to capture sea turtles.

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. 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**

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 (see Section 3.3). 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 selected 500 vessels to participate in the program for 2014 and is in the process of validating the program.

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 one action in development.

- 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 Council may also consider eliminating the royal red shrimp endorsement.

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 Fifth Assessment Report (IPCC 2013). 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 organism 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 2014).

In the southeast, general impacts of climate change have been predicted through modeling, with few studies on species specific effects. 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 by ensuring management is alerted to changes in the status of the stock; however, the proposed actions in this amendment are expected to not significantly impact the environment as they do not impose any changes to the impacts of the fishery. . 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 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

## 5.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; 2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, 3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866. This RIR analyzes the impacts this action would be expected to have on the Gulf of Mexico shrimp fishery.

## 5.2 Problems and Objectives

The problems and objectives addressed by this framework action are discussed in Section 1.2.

## 5.3 Description of Fisheries

A description of the Gulf of Mexico shrimp fishery is provided in Section 3.4.

## 5.4 Impacts of Management Measures

### 5.4.1 Action 1: Modify Stock Status Determination Criteria for Penaeid Shrimp Stocks

#### 5.4.1.1 Action 1.1 – Modify the Maximum Sustainable Yield (MSY) for Penaeid Shrimp

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.1.3 and is incorporated herein by reference. **Preferred Alternative 2** would establish maximum sustainable yield (MSY) values which are compatible with the current stock assessment models. Direct economic effects are not expected to result from **Preferred Alternative 2** because it would not affect the harvest or customary uses of penaeid shrimp. In addition, **Preferred Alternative 2** would likely not be expected to result in indirect economic effects because penaeid shrimp landings have consistently been well below the MSY values considered in this action.

#### 5.4.1.2 Action 1.2 – Modify the Overfishing Threshold for Penaeid Shrimp

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.1.3 and is incorporated herein by reference. **Preferred Alternative 4** would establish overfishing thresholds which are compatible with the current stock assessment models. Direct

economic effects are not expected to result from **Preferred Alternative 4** because it would not affect the harvest or customary uses of penaeid shrimp. Maximum fishing mortality thresholds (MFMT) defined in **Preferred Alternative 4** 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 4** is the least likely to affect the stock because it establishes the overfishing threshold based on an annual MSY.

#### 5.4.1.3 Action 1.3 Modify the Overfished Threshold for Penaeid Shrimp

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.1.3 and is incorporated herein by reference. **Preferred Alternative 4** would establish an overfished threshold compatible with the current stock assessment models. **Preferred Alternative 4** would not be expected to result in direct economic effects because **Preferred Alternative 4** would affect the harvest or customary uses of penaeid shrimp resources. Current stock assessment methods in conjunction with the pre-determined MSSTs would allow to determine whether a given penaeid 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 would be expected to benefit the penaeid stocks and result in indirect economic benefits.

### 5.4.2 Action 2: Modify the Shrimp Fishery Management Plan Framework Procedure

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.2.3 and is incorporated herein by reference. **Preferred Alternative 2** would expand the range of management measures that the Gulf of Mexico Fishery Management Council (Council) can implement without a full plan amendment but is not expected to directly affect the harvest and other customary uses of the resource. Therefore, **Preferred Alternative 2** is not expected to result in direct effects on the economic environment. However, **Preferred Alternative 2** could result in a speedier implementation of management measures that may be beneficial to the stocks, with associated economic benefits, resulting in increased indirect economic benefits to fishermen and associated businesses.

## 5.5 Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs associated with this action include:

Council costs of document preparation, meetings, public hearings, and information dissemination…….. $25,000

NMFS administrative costs of document preparation, meetings and review ….....$15,000

TOTAL ….....$40,000

The estimate provided above does not include any law enforcement costs. Any enforcement duties associated with this action would be expected to be covered under routine enforcement costs rather than an expenditure of new funds.

## 5.6 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: 1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, this action has been determined to not be economically significant for the purposes of E.O. 12866.

# CHAPTER 6. REGULATORY FLEXIBILITY ACT ANALYSIS

## 6.1 Introduction

The purpose of the Regulatory Act Analysis (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the fishery management plan (FMP) or amendment (including framework management measures and other regulatory actions) and to ensure the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

The RFA requires agencies to conduct a Regulatory Flexibility Act Analysis (RFAA) for each proposed rule. The RFAA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An RFAA is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." The RFAA provides: 1) A description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for, the proposed rule; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; 5) an identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule; 6) a description and estimate of the expected economic impacts on small entities; and 7) an explanation of the criteria used to evaluate whether the rule would impose "significant economic impacts".

## 6.2 Statement of the need for, objective of, and legal basis for the proposed action

The need for and objective of this proposed action are provided in Chapter 1. The purpose of this action 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. The needs 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 of Mexico (Gulf) shrimp stocks. The Magnuson-Stevens Fishery Conservation and Management Act provides the statutory basis for this proposed action.

## 6.3 Description and estimate of the number of small entities to which the proposed action would apply

This proposed rule is expected to directly affect commercial fishermen with valid or renewable federal Gulf shrimp permits. The Small Business Administration established size criteria for all major industry sectors in the U.S. including fish harvesters and for-hire operations. A business involved in shellfish harvesting is classified as a small business if independently owned and operated, is not dominant in its field of operation (including its affiliates), and its combined annual receipts are not in excess of $5.5 million (NAICS code 114112, shellfish fishing) for all of its affiliated operations worldwide.

The federal shrimp permit for the commercial harvest of penaeid shrimp in the Gulf exclusive economic zone has been placed under a moratorium since 2007. At the start of moratorium, 1,933 vessels qualified and received the shrimp permits, and over time the number of shrimp permitted vessels declined. According to the Southeast Regional Office Website, the Constituency Services Branch (Permits) unofficially listed 1,339 holders of valid shrimp permits (SPGM) as of April 20, 2015.

During 2006-2012, an average of 4,757 vessels fished for shrimp in the Gulf, of which 27% were federally permitted vessels and the rest, non-federally permitted vessels. Despite being fewer in number, federally permitted vessels accounted for an average of 67% of total shrimp landings and 77% of total ex-vessel revenues. An average federally permitted vessel in the Gulf shrimp fishery generated revenues from commercial fishing of approximately $254,000 annually.

Based on the revenue figures above, all federally permitted shrimp vessels expected to be directly affected by this proposed rule are determined for the purpose of this analysis to be small business entities.

## 6.4 Description of the projected reporting, record-keeping and other compliance requirements of the proposed action, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

The proposed rule is not expected to change current reporting, record-keeping and other compliance requirements.

## 6.5 Identification of all relevant federal rules, which may duplicate, overlap or conflict with the proposed action

No duplicative, overlapping, or conflicting Federal rules have been identified with this proposed rule.

## 6.6 Significance of economic impacts on a substantial number of small entities

**Substantial number criterion**

This proposed action would be expected to directly affect all shrimp vessels that possess a valid or renewable Gulf shrimp permit. As a result, this proposed action is determined to meet the substantial number criterion

**Significant economic impacts criterion**

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities that are expected to be affected by this proposed rule are considered small entities, so the issue of disproportional effects on small versus large entities does not presently arise.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities?

Modifying the maximum sustainable yield, overfishing threshold, and overfished threshold for penaeid shrimp would make the definition of these parameters consistent with the models currently used in stock assessment for penaeid shrimp species. Because modifications of these parameters would not affect the harvest of shrimp or restrict the operations of shrimp vessels, no direct economic effects would ensue from this action. Modifying the framework procedure for the Shrimp FMP would streamline the process for changing certain regulations affecting the shrimp fishery. This action would improve the administrative aspects of developing regulations for the shrimp fishery but would have no direct economic effects on the operations of affected shrimp vessels.

In essence, the measures contained in this proposed rule would have no effects on the profits of all directly affected shrimp vessels. Therefore, it is concluded the proposed rule would not have significant economic impacts on a substantial number of small entities in the Gulf shrimp harvesting sector.

## 6.7 Description of the significant alternatives to the proposed action and discussion of how the alternatives attempt to minimize economic impacts on small entities

Because the measures contained in this proposed rule are not expected to have any adverse economic impacts on a substantial number of small entities, the issue of significant alternatives to the proposed action is not pertinent.

# CHAPTER 7. LIST OF PREPARERS

| Name | Expertise | Responsibility | Agency |
|---|---|---|---|
| Morgan Kilgour | Fishery Biologist | Co-Team Lead - Amendment development, biological analyses | GMFMC |
| Susan Gerhart | Fishery Biologist | Co-Team Lead - Amendment development, biological analyses, cumulative effects analysis | SERO |
| Assane Diagne | Economist | Economic analyses | GMFMC |
| Tony Lamberte | Economist | Economic analyses | SERO |
| Ava Lasseter | Anthropologist | Social analyses | GMFMC |
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| Carrie Simmons | Fishery biologist | Reviewer | GMFMC |
| Mara Levy | Attorney | Legal review | NOAA GC |
| Noah Silverman | Natural Resource Management Specialist | NEPA review | NMFS |
| Steve Branstetter | Fisheries Biologist | Reviewer | SERO |
| Rick Hart | Fisheries Biologist | Statistical analyses, reviewer | SEFSC |

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
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

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# 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 3.3 and 4.3), 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 CF.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.

**National Historic Preservation Act**

The National Historic Preservation Act (NHPA) of 1966, (Public Law 89-665; 16 U.S.C. 470 *et seq.*) is intended to preserve historical and archaeological sites in the United States of America. Section 106 of the NHPA requires federal agencies to evaluate the impact of all federally funded or permitted projects for sites on listed on, or eligible for listing on, the National Register of Historic Places and aims to minimize damage to such places.

Historical research indicates that over 2,000 ships have sunk on the Federal Outer Continental Shelf between 1625 to 1951; thousands more have sunk closer to shore in state waters during the same period. Only a handful of these have been scientifically excavated by archaeologists for the benefit of generations to come. Further information can be found at: http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx

The proposed action does not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places nor is it expected to cause loss or destruction of significant scientific, cultural, or historical resources. In the Gulf, the *U.S.S. Hatteras*, located in federal waters off Texas, is listed in the National Register of Historic Places. Fishing activity already occurs in the vicinity of this site, but the proposed action would have no additional adverse impacts on listed historic resources, nor would they alter any regulations intended to protect them.

**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.

# Appendix B. Summary of Public Hearing Comments

**Summary Public Hearings**

August 27, 2014- Gulf of Mexico Fishery Management Council Meeting, Biloxi, Mississippi, Public Comment

No comments.

October 22, 2014- Gulf of Mexico Fishery Management Council Meeting, Mobile, Alabama, Public Comment

No comments.

June 10, 2015- Gulf of Mexico Fishery Management Council Meeting, Key West, Florida, Public Comment

No comments.

**Summary of written comments**

No written comments were received.