Red Snapper, Vermilion Snapper, Yellowtail Snapper

Lutjanus campechanus, Rhomboplites aurorubens, Ocyurus chrysurus

Gulf of Mexico/South Atlantic

Vertical Line: Hydraulic/Electric Reel, Rod and Reel, Hand Line

January 9, 2013

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Final Seafood Recommendation

Although there are many snappers caught in the U.S., only the three most commercially important species relative to landed weight and value (red snapper (*Lutjanus campechanus*), vermilion snapper (*Rhomboplites aurorubens*), and yellowtail snapper (*Ocyurus chrysurus*) are discussed here. This report discusses snapper caught in the South Atlantic (SA) and Gulf of Mexico (GOM) by vertical gear types including hydraulic/electric reel, rod and reel, and handline. Snapper caught by bottom longline in the GOM and SA will not be discussed since it makes up a statistically insignificant proportion of the total snapper catch in the GOM and in the SA bottom longline fishing in waters shallower than 50 fathoms, where snapper are generally caught, is prohibited.

Scoring note – scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Stock	Fishery	Impacts on the Stock Rank (Score)	Impacts on Other Species Lowest scoring species Rank*, (Subscore, Score)	Manage-ment Rank (Score)	Habitat and Ecosystem Rank (Score)	Overall Recommendation (Score)
Red Snapper	Vertical Line, South Atlantic	Red (1.41)	Red Grouper, Red Snapper Red ((1.41,1.41))	Yellow (3)	Yellow (2.92)	**AVOID ((2.04))**
Red Snapper	Vertical Line, Gulf of Mexico	Yellow (2.71)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.45)**
Vermilion Snapper	Vertical Line, Gulf of Mexico	Green (3.83)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.68)**
Vermilion Snapper	Vertical Line, South Atlantic	Yellow (3.05)	Red Grouper, Red Snapper Red (1.41,1.41)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.48)**
Yellowtail Snapper	Vertical Line, Gulf of Mexico	Green (4.47)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.78)**
Yellowtail Snapper	Vertical Line, South Atlantic	Green (4.47)	Red Grouper, Red Snapper Red (1.41,1.41)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.73)**

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Executive Summary

Although there are many snappers caught in the U.S., only the three most commercially important species relative to landed weight and value (red snapper (*Lutjanus campechanus*), vermilion snapper (*Rhomboplites aurorubens*), and yellowtail snapper (*Ocyurus chrysurus*) are discussed here. This report discusses snapper caught in the South Atlantic (SA) and Gulf of Mexico (GOM) by vertical gear types including hydraulic/electric reel, rod and reel, and handline. Snapper caught by bottom longline in the GOM and SA will not be discussed since they makes up a statistically insignificant proportion of the total snapper catch, and bottom longline fishing in waters less than 50 fathoms deep where snapper are generally caught , is prohibited.

Based on the FishBase vulnerability ranking, red and vermilion snapper have a moderate vulnerability to fishing pressure while yellowtail snapper has a high vulnerability. The 2013 stock assessment for GOM red snapper indicated that the stock was overfished but increasing, and overfishing was no longer occurring. The 2010 SA red snapper stock assessment update indicated that the SA red snapper stock was overfished and continues to experience overfishing despite managers' efforts to improve the fishery. The GOM vermilion snapper biomass appears to be above biological thresholds and fishing at a reasonable level, despite a moderate degree of uncertainty. The SA vermilion snapper stock is not classified as overfished, but the stock is at risk for overfishing based on the uncertainty in the most recent stock assessment update coupled with the fact that biomass is showing decreasing trends while fishing mortality (F) continues to increase. Yellowtail snapper in the SA and GOM have maintained a healthy biomass and a sustainable level of fishing pressure.

A wide variety of fish and invertebrate species are caught in the GOM and SA snapper fisheries. Species caught include greater amberjack, Florida pompano, golden tilefish, black seabass, red porgy, white grunt, and a variety of other fish, sharks, and invertebrates. Many of these species are not of conservation concern and therefore are not assessed in further detail in this report. Retained and bycatch species that are analyzed in this assessment have been chosen based on either the percent of the catch they make up in the snapper fishery or their conservation status (endangered, threatened, overfished, etc.). These species include speckled hind *(Epinephelus drummondhayi),* Warsaw grouper (*Hyporthodus nigritus*), gag grouper *(Mycteroperca microlepis),* loggerhead sea turtles (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*), snowy grouper (*Hyporthodus niveatus or Epinephelus niveatus),* Atlantic bluefin tuna (*Thynnus thynnus*), and blacknose shark (*Carcharhinus acronotus*. These species have been selected for discussion because they either limit the score for this criterion or they are a main catch in the fishery.

Management of the U.S. Gulf of Mexico and South Atlantic snapper fisheries is deemed moderately effective because while it has addressed diminishing stocks and regularly assesses red, vermilion, and yellowtail snapper stocks, fishery independent data are lacking and managers have not maintained stock productivity of red and vermilion snapper. Management

of bycatch is also deemed moderately effective since managers respond with regulatory action in regard to increases in bycatch and bycatch mortality, but data are lacking on the impact of the GOM and SA snapper fisheries on GOM gag grouper and snowy grouper stocks.

Vertical line gear in the GOM and SA including hydraulic/electric reel, rod and reel, and handlines have low impact on the ecosystem and there have been some minimal measures implemented to mitigate the impacts of fishing through the implementation of marine protected areas (MPAs) that cover a very small representation of habitat including less than 0.5% in the GOM. Whether removal of snapper biomass has an effect on the ecosystem in general is questionable, but it is reasonable to assume there are moderate ecosystem effects associated with the volume of biomass removal (4,137 mt/year for GOM red snapper alone).

Introduction

Scope of the analysis and ensuing recommendation

Although many snapper species are caught in the U.S., only the three most commercially important species relative to landed weight and value (red snapper (*Lutjanus campechanus*), vermilion snapper (*Rhomboplites aurorubens*), and yellowtail snapper (*Ocyurus chrysurus*) are discussed here. This report discusses snapper caught in the South Atlantic (SA) and Gulf of Mexico (GOM) by vertical gear types including hydraulic/electric reel, rod and reel, and handline. Snapper caught by bottom longline in the GOM and SA will not be discussed since they make up a statistically insignificant proportion of the total snapper catch and longline fishing in waters less than 50 fathoms deep, where snapper are generally caught, is prohibited.

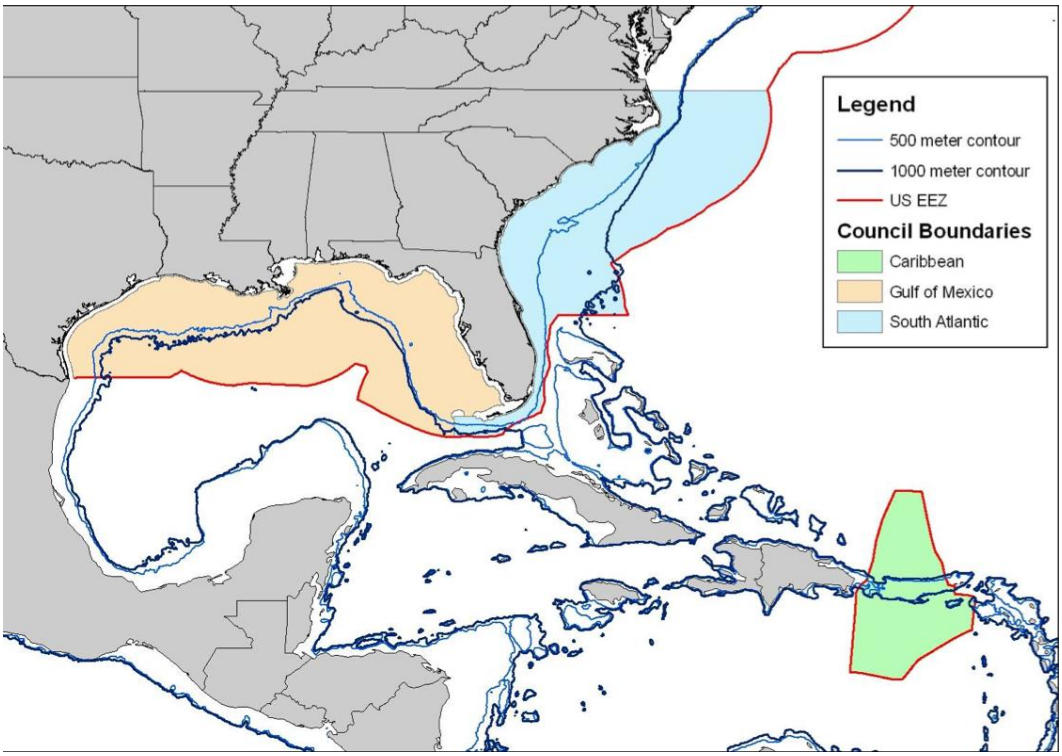

Figure 1. South Atlantic and Gulf of Mexico management extent (Figure from SEDAR 2008)

Overview of the Species and Management Bodies

Red snapper inhabit the continental shelves of the GOM and northwest Atlantic Ocean from the Bay of Campeche, Mexico, to Massachusetts (Rivas 1966, Wilson and Nieland 2001). The species is said to be replaced farther south in the Caribbean Sea by the Caribbean red snapper (*Lutjanus purpureus*) (Wilson and Nieland 2001), although there is new genetic research to suggest that *L. campechanus* and *L. purpureus* may be the same species (Gomes et al. 2008). Vermilion snapper range from North Carolina to the GOM and south to Brazil (Grimes 1978). Yellowtail snapper in the south Atlantic range from North Carolina to southeastern Brazil, and are most abundant off southern Florida and the Bahamas (Manooch 1987). In the U.S., fishermen target snapper using hydraulic/electric reel in deeper water, and rod and reel and

handline gear in shallow water (NMFS 2012c).

Domestic red, vermilion, and yellowtail snapper management is divided between the Gulf of Mexico Fishery Management Council (GMFC) and South Atlantic Fishery Management Council (SAFMC).

The GMFMC began managing these species in 1983 with the development of the Reef Fish Fishery Management Plan (FMP). Red snapper is arguably one of the most important snapper in the GOM multispecies reef fish fishery, with catch worth an average of US$11 million annually (NMFS 2012c). Although 31 species are managed in the Reef Fish FMP, red snapper has been a large focus of the GMFMC's efforts due to its commercial importance and declined stocks (GMFMC 1981, 2012b). The NMFS has implemented a number of regulations on red, vermilion, and yellowtail snapper to ensure rebuilding (when necessary) and the continued viability of the stocks (GMFMC 1981, 2012b). More than 20 amendments to the FMP have addressed red snapper management including the establishment of minimum size limits, quotas, limited entry programs, seasonal closures, and stock rebuilding plans (GMFMC 2012a). Few amendments to the FMP have addressed vermilion and yellowtail snapper management, but those that do, include a vermilion snapper rebuilding plan as well as limited entry programs and minimum size limits for both vermilion and yellowtail snapper (GMFMC 2012a, 2012b). The GMFMC has also established gear restrictions and closed areas as part of the fisheries' management.

The SAFMC began managing red, vermilion, and yellowtail snapper in 1984 with the development of the snapper grouper FMP. The FMP identifies 73 species including various protected species, such as the goliath grouper (*Epinephelus itajar*a) and Nassau grouper (*Epinephelus striatus*), that are also included in the snapper grouper management complex (SAFMC 2012g). The snapper grouper FMP has been amended a number of times to establish limited entry programs, minimum size requirements, quotas, and other management measures for the red, vermilion, and yellowtail fisheries (SAFMC 2012e). In addition to management actions directly related to each species, SAFMC prohibited the use of bottom longline gear in water shallower than 50 fathoms in 1991 and established MPAs in 2007 to help deep-water species through rebuilding overfished stocks, and protecting important habitat (SAFMC 1991, 2009, 2012b). In response the poor outcome of the 2008 SA red snapper stock assessment, the SAFMC established Amendment 17A of the FMP, which prohibited all take of SA red snapper until further notice (Southeast Data, Assessment, and Review (SEDAR) 2008a, NOAA 2010d, SEDAR 2010b). Although the 2010 SA red snapper stock assessment indicated that the red snapper population had improved, SAFMC decided to keep the fishery closed until higher densities of larger, older fish were present in the population (NOAA 2010d, SEDAR 2010b).

Production Statistics

In the continental United States, red snapper accounts for 35% of commercial snapper landings (1,618 metric tons (mt) in 2011, with most commercial landings originating in the GOM); vermilion snapper accounts for approximately 40% of commercial snapper landings (approximately 1,870 mt in 2011 with more than 1,430 mt landed in the GOM and 440 mt landed in the SA); and yellowtail snapper accounts for 18% of total commercial snapper

landings (approximately 855 mt in 2011 with more than 760 mt landed in the GOM and 95 mt landed in the SA) (Figure 2)(NMFS 2012c).

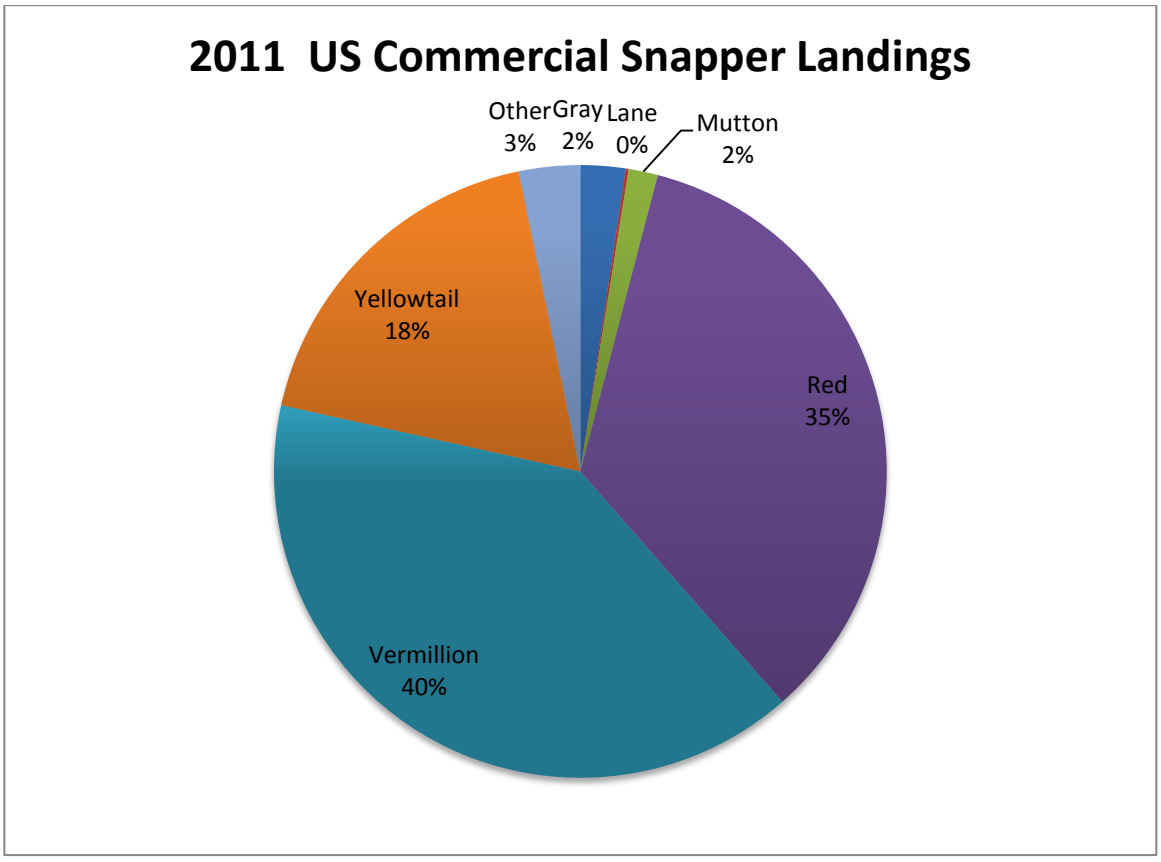

Figure 2. US commercial snapper landings by species, 2011 (Data from NMFS 2012c)

Landings for domestic snapper have remained consistent for the last decade but appear to be showing declines in Louisiana in recent years (Figure 3)(NMFS 2012c). In 2009, 2010, and 2011, Florida was responsible for approximately 64%–65% of all snapper landings (between 2,249 and 2,939 mt per year) with 90% of those landings coming from the west coast of Florida (Figure 3 and Figure 4).

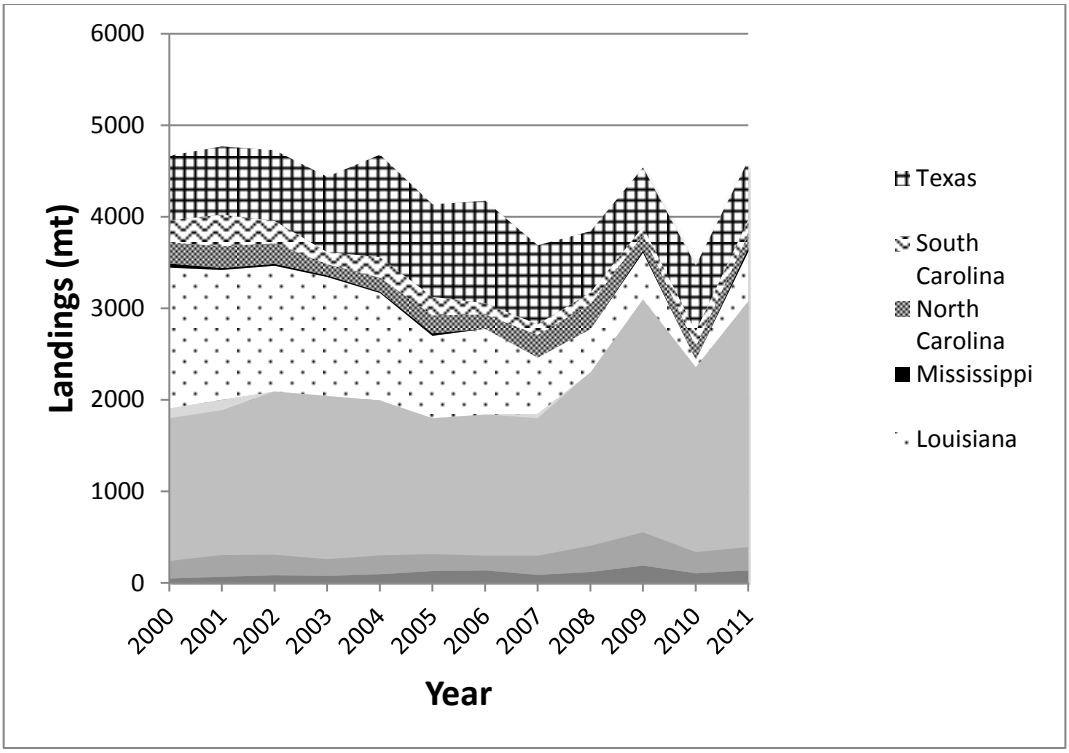

Figure 3. US commercial snapper landings by state, 2000-2011 (Data from NMFS 2012c)

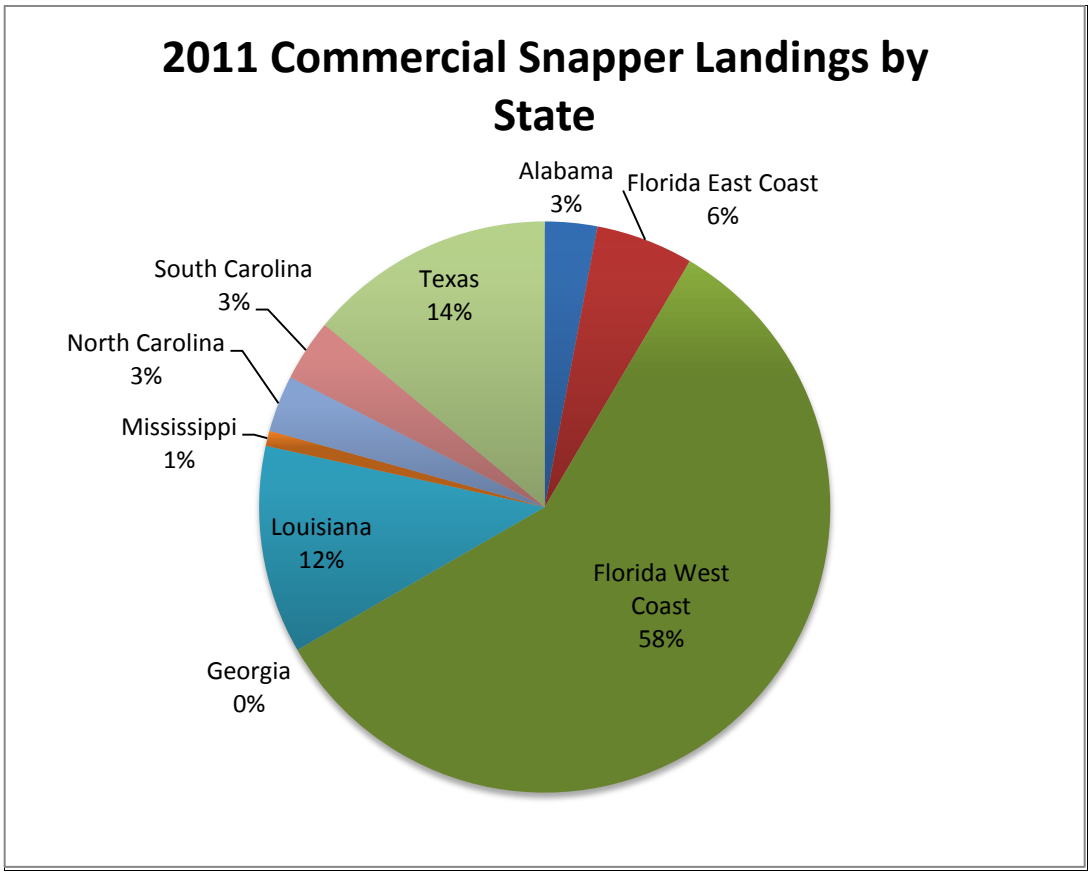

Figure 4. Percent of US commercial snapper landings by state 2011 (Data from NMFS 2012c)

Importance in the US/North American Market

It does not appear that the U.S. exports snapper (NMFS 2012f, 2012d), indicating the domestic catch is sold solely in the U.S. market. Domestic red, vermilion, and yellowtail snapper catch was worth more than US$10 million, US$7.8 million, and US$4.4 million in 2010 (respectively) (NMFS 2012c). The combination of imports and domestic catch resulted in more than 19,000 mt of snapper product available to the U.S. market in 2010 with more than one-third of the product originating from domestic landings (NMFS).

Imports of snapper rose from 1999 until 2007 (Figure 5) (NMFS 2012f), signaling an increasing demand for this group of fish in the U.S. market. In 1999 almost 900 mt was imported; in 2011 nearly 14,000 mt of snapper were imported from various countries, most notably Brazil, Mexico, Nicaragua, and Panama (Figure 6) (NMFS 2012f). Since 2007, imports have decreased. However, the cause of this decrease is unclear and can be attributed to various factors including a decrease in demand or supply. Red snapper is also often mislabeled in the marketplace; therefore, improvements in labeling in the marketplace could explain some of these decreases in imports. Key sources of imported snapper will be analyzed and discussed in further detail in a separate report.

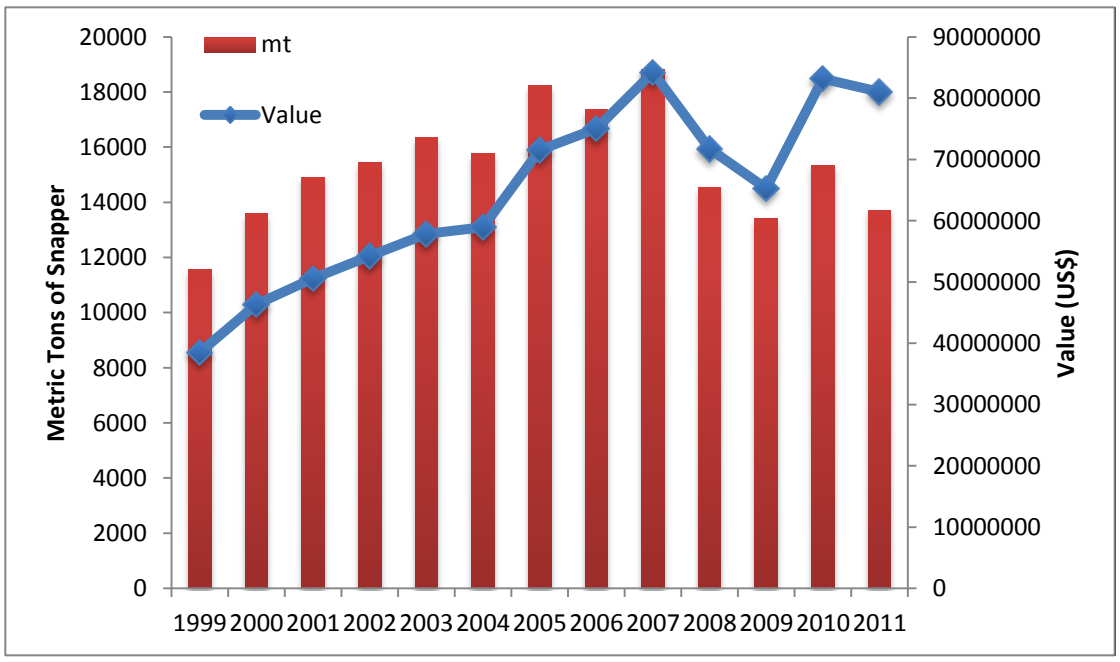

Figure 5. US snapper imports, 1999-2011 (Data from NMFS 2012c).

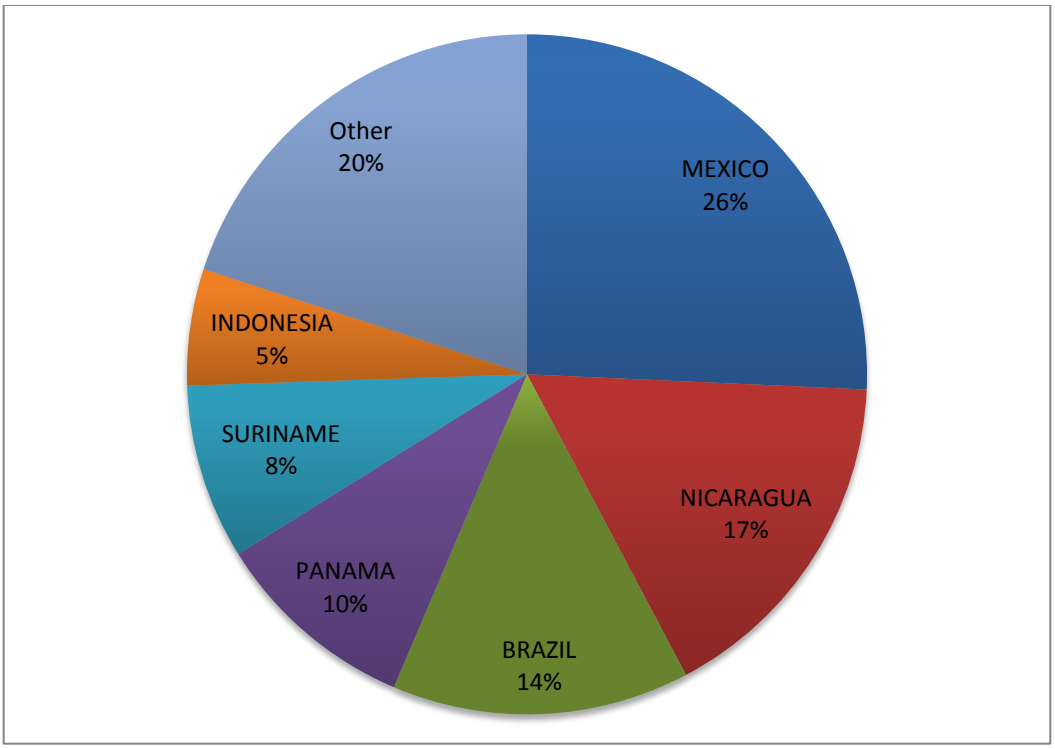

Figure 6. 2011 U.S. snapper imports by country. "Other" includes Australia, Bahamas, Barbados, Belize, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Fiji, Guatemala, Guyana, Honduras, India, Italy, New Zealand, S. Africa, Thailand, Tonga, Trinidad & Tobago, United Arab Emirates, Venezuela, and Vietnam (Data from NMFS 2012c).

Common and Market Names

Common names for snapper species often differ among regions, sometimes making snapper identification difficult. The common name "red snapper" applies to at least three species of snapper around the globe; only one of which is the *L. campechanus* found in the Western Atlantic and approved by the FDA to bear the authentic "red snapper" label (FDA 2012). *L. campechanus* is also referred to as huachinango or pargo in Mexico. Hawaiian red snapper, or "ehu," is *Etelis carbunculus* (WPRFMC 2000). Caribbean red snapper or southern red snapper caught off the coasts of Venezuela and Brazil is *L. purpureus* (Charuau et al. 2000). Other names for red snapper include sow, rat (northwest coast of Florida), mule, chicken (northeast coast of Florida), northern red snapper, and American red snapper (Moran 1988). When used for sushi or sashimi, red snapper is commonly sold as *tai.* Vermilion snappers are often referred to as beeliners and night snappers (Manooch 1984). Yellowtail snapper is distinctive in color and therefore has no additional common or market names.

Primary Product Forms

Snapper is available both fresh (whole, dressed, headed-and-gutted (H&G), fillets) and frozen (dressed, H&G, fillets) (Frimodt 1995, Business 1999) in the U.S. market. Most fillets are sold with their skin still attached to assist with species identification.

Analysis

Scoring Guide

- All scores result in a zero to five final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of five indicates high performance.
- The full Seafood Watch Fisheries Criteria that the following scores relate to are available on our website at www.seafoodwatch.org.

Criterion 1: Stock for Which You Want a Recommendation

Guiding Principles

- The stock is healthy and abundant. Abundance, size, sex, age and genetic structure should be maintained at levels that do not impair the long-term productivity of the stock or fulfillment of its role in the ecosystem and food web.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given current abundance and inherent resilience to fishing while accounting for scientific uncertainty, management uncertainty, and non-fishery impacts such as habitat degradation.

Summary

Stock	**Fishery**	**Inherent Vulnerability** Rank	**Stock Status** Rank (Score)	**Fishing Mortality** Rank (Score)	**Criterion 1** Rank (Score)
Red Snapper	Vertical Line, South Atlantic	Medium	High Concern (2)	High Concern (1)	Red (1.41)
Red Snapper	Vertical Line, Gulf of Mexico	Medium	High Concern (2)	Low Concern (3.67)	Yellow (2.71)
Vermilion Snapper	Vertical Line, Gulf of Mexico	Medium	Low Concern (4)	Low Concern (3.67)	Green (3.83

Vermilion Snapper	Vertical Line, South Atlantic	Medium	Low Concern (4)	Moderate Concern (2.33)	Yellow (3.05)
Yellowtail Snapper	Vertical Line, Gulf of Mexico	High	Low Concern (4)	Very Low Concern (5)	Green (4.47)
Yellowtail Snapper	Vertical Line, South Atlantic	High	Low Concern (4)	Very Low Concern (5)	Green (4.47)

Justification of Ranking

Red Snapper (GOM)

Factor 1.1 Inherent Vulnerability: Medium

Key relevant information:
The FishBase vulnerability score for red snapper is 55.

Factor 1.2 Stock Status: High Concern

Key relevant information:
The B_{2011} to B_{MSY} ratio for red snapper caught in the GOM is 0.18 (NMFS 2012d). While biomass is showing signs of increasing, it remains below minimum stock size threshold (MSST) according to the 2013 stock assessment (SEDAR 2013).

Detailed rationale:
Commercial landings of red snapper in the GOM peaked at approximately 6,000 mt in the mid-1960s, and exhibited a general declining trend from the mid-1960s to the mid-1970s. Landings reached an all time low in 1990; they have been relatively stable since 1995 (Figure 7) (NMFS 2012c). A quota was enacted for the commercial fishery in 1990, lowered in 1991, raised in 1993 and 1996, and lowered in 2007 and 2008 (GMFMC 2012b). The quota has since been modified, and commercial landings remained at or above the quota until the implementation of the Individual Fishing Quota (IFQ) program in 2007 (Figure 8) (NMFS 2008b, 2012a). Since the IFQ program was adopted, GOM red snapper landings have remained at or below the quota (NMFS 2012a). However, the recreational fishery has been known to regularly exceed its quota (NOAA Fisheries Service 2012). Although spawning stock biomass (SSB) has declined steeply since about the 1950s, it is currently predicted to be increasing, due to large recruitment pulses that occurred in the early 2000s (Figure 9)(SEDAR 2013). Biomass remains well below MSST, but the stock is expected to rebuild by 2032 (SEDAR 2013).

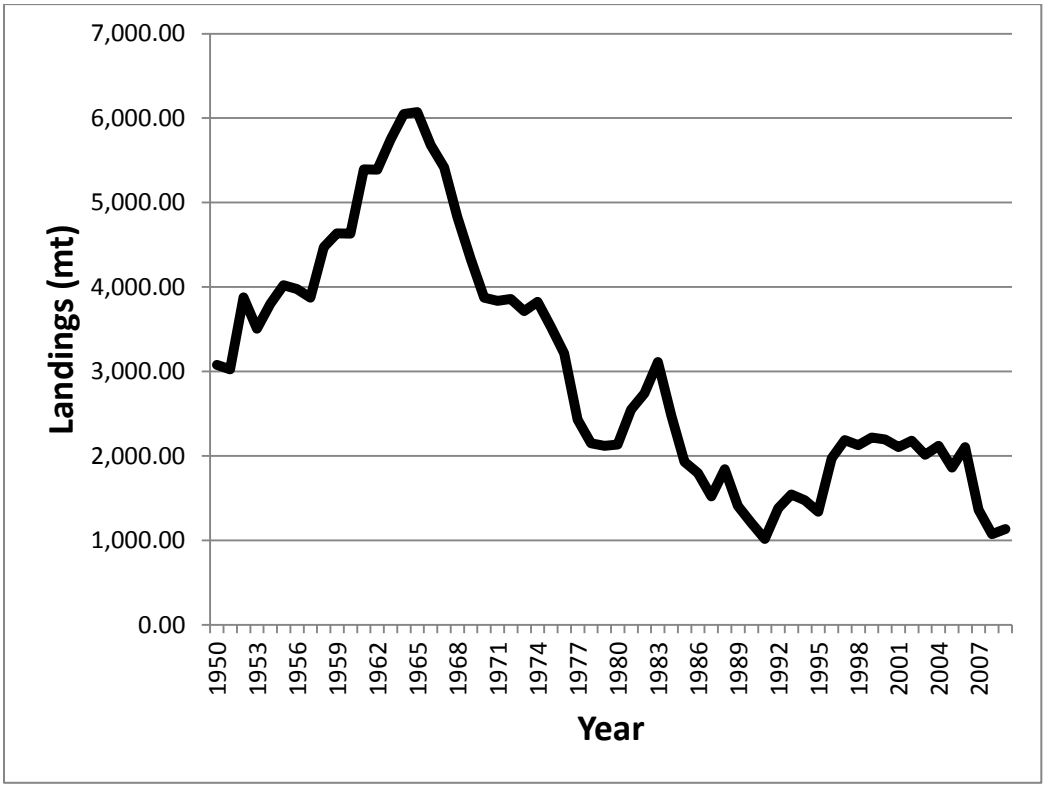

Figure 7. U.S. commercial landings of red snapper in the Gulf of Mexico, 1950-2009 (Data from NMFS 2012b)

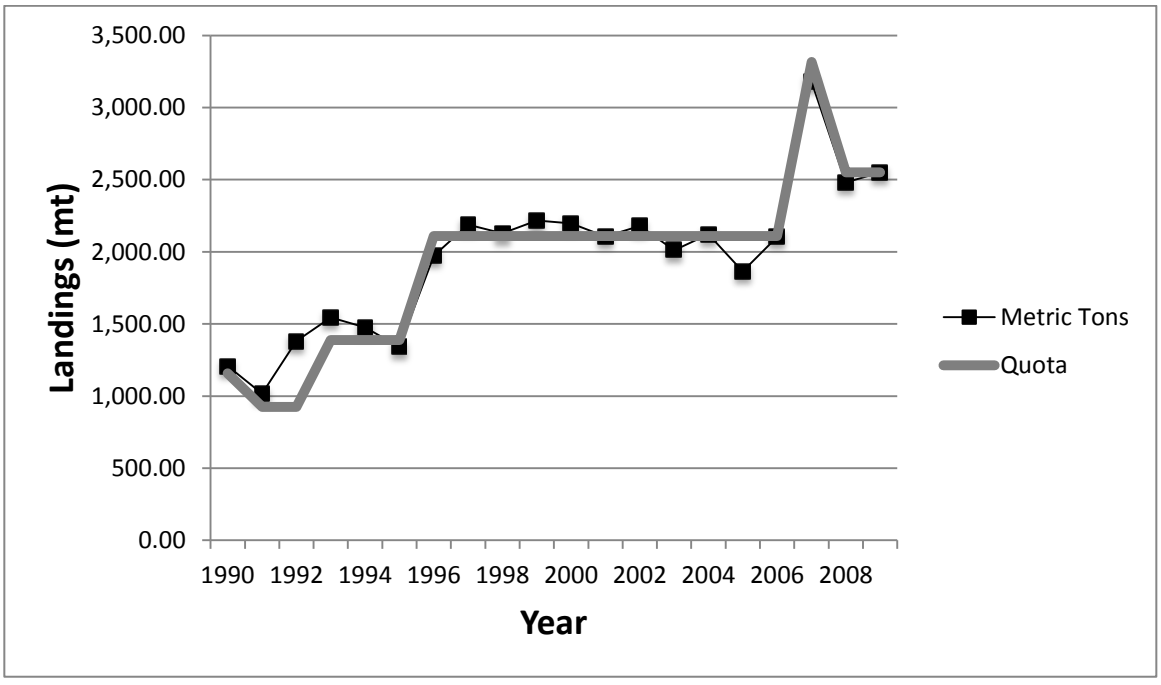

Figure 8. U.S. commercial red snapper landings vs. commercial quota in the Gulf of Mexico 1990-2010 (Data from GMFMC 2012b, GMFMC 2011, and NMFS 2012b)

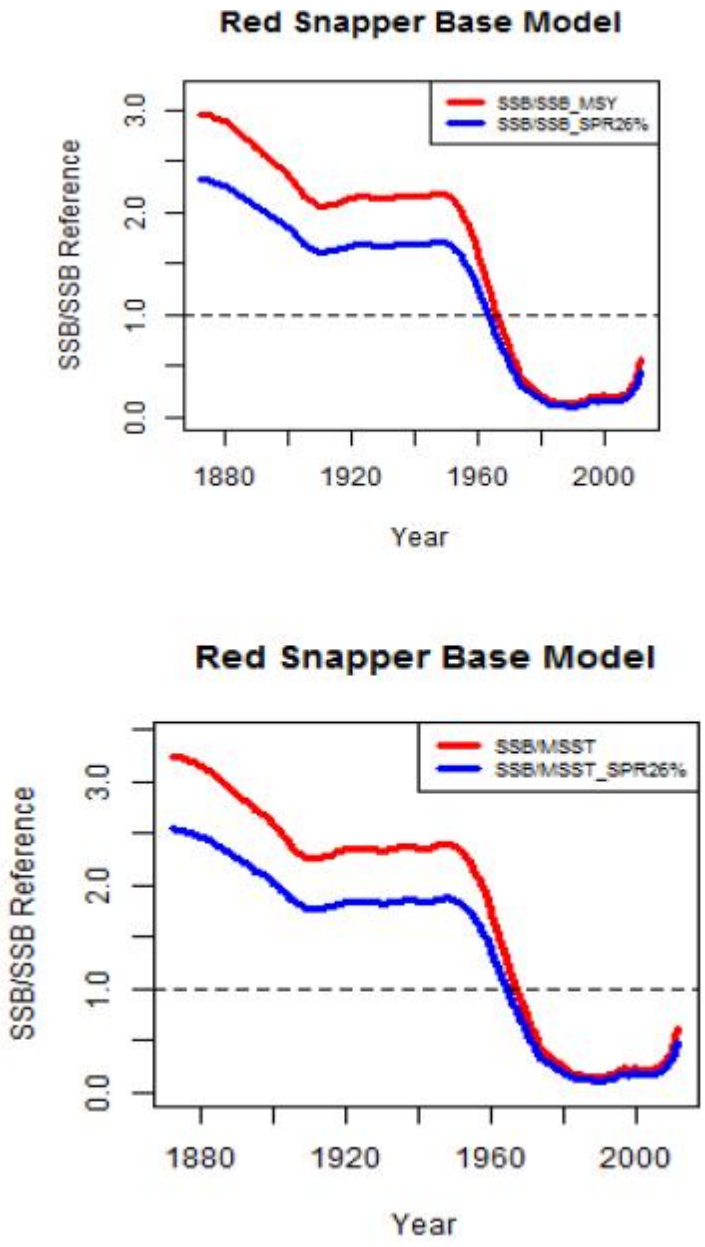

Figure 9. Estimated red snapper spawning stock biomass benchmarks for two MSRA scenarios (MSST at FMAX and MSST at F26%SPR). (SEDAR 2013)

Complicating the recovery of GOM red snapper is the high bycatch mortality of juveniles in GOM shrimp trawling which is believed to be a greater source of snapper mortality than the directed fishery (SEDAR 2007). Shrimp fishermen operating in the U.S. South Atlantic and western GOM have been required to use bycatch reduction devices (BRDs) since 1996 and 1998, respectively. These devices were expected to reduce bycatch of red snapper and other finfish species by as much as 60% after 5 years and up to 80% after 10 years (Watson 2001). The Texas Parks and Wildlife Commission also implemented a regulation requiring the use of BRDs

in all commercial trawls operating in state waters and targeting shrimp for consumption (TP&W 2002). Observer data showed that BRDs were not performing as well as expected and were not sufficiently reducing snapper bycatch to ensure timely recovery of the stock (NMFS 2004). In response, in 2012, the NMFS announced that by May 2012 only two BRDs designs, as indicated in the regulations, may be used in the GOM and SA shrimp fisheries (Federal Register, 2012). Because the shrimp effort in the GOM has been reduced by 75%−85% in recent years, due to hurricane damage to fishing infrastructure, rising fuel costs, and declining prices due to the influx of less-expensive imported farmed shrimp, red snapper populations are realizing some benefits of reduced bycatch in shrimp trawls (Keithly and Roberts 2000, Haby et al. 2003, SEDAR 2009a, Hart et al. 2012).

Factor 1.3 Fishing Mortality: Low Concern

Key relevant information:

The 2009 GOM red snapper stock assessment update indicated that the GOM stock had a $F_{2006-2008}$ to F_{MSY} ratio of 1.9 (SEDAR 2009a). However, based on an updated population assessment (Linton 2011, NOAA 2012b) managers concluded that the stock is no longer experiencing overfishing (Linton 2011, NOAA 2012b, NMFS 2012d). The 2013 stock assessment confirmed that overfishing of the GOM red snapper was not occurring (SEDAR 2013). Still, some concerns about the long-term prognosis of the stock remain. Overfishing is currently not occurring due to increases in numbers and biomass as a result of strong recruitment in 2004 and 2006, but there is concern that the high quotas set in response to this population increase will slow the rebuilding process and will necessitate quota cuts in the future, particularly when these year classes age out of the population (Cowan, pers. comm. 2013).

Detailed rationale:

To better account for area-specific life history characteristics, catch statistics, and survey indices, the assessment divides the stock into an eastern and western component (SEDAR 2005a). For the eastern and western components, F_{2003}/F_{MSY} was estimated at 2.6 and 2.2, respectively (2.3 combined estimate) (SEDAR 2005a). According to the accepted reference points, GOM red snapper have been overfished since 1988, but managers believe that the tide is shifting (SEDAR 2005a, GMFMC 2011, Linton 2011, NOAA 2012b). Stock abundance and commercial landings have exhibited declines in the long-term; in the short-term, trends are increasing due to high recruitment and the presence of strong year classes produced between 2004 and 2006 especially in the western component of the fishery (SEDAR 2009a). Although red snapper begin reproductive maturity at 2 years, they do not reach full reproductive potential until about 15 years (Schirripa and Legault 1999, Cowan et al. 2010). Strong fishing pressure on younger year classes has resulted in a truncated age distribution relative to the natural condition of the stock (SEDAR 2009a, Cowan 2011). Scientists argue that if fisheries managers protect strong year classes, stock recovery rates could be accelerated as evidenced by other fisheries, including Mid-Atlantic and Chesapeake Bay striped bass and Georges Bank haddock (Richards and Deuel 1987, Secor 2000, Fogarty et al. 2001, Hartman and Margraf 2003, Sundermeyer et al. 2005).

The 2009 update stock assessment indicated that F_{2008}:F_{MSY} is 1.9 and that overfishing was no longer occurring in the western GOM, but was still an issue in the eastern GOM (SEDAR 2009a, Cowan 2011). The assessment also indicated overfishing in the GOM was likely to end in 2009 due to strong recruitment in recent years (SEDAR 2009a, GMFMC 2011). Managers responded by increasing the quota to a level that was projected to be 25% below the overfishing threshold to allow for continued stock rebuilding (GMFMC 2011). However, in April 2010, the Deepwater Horizon oil rig exploded and sank off the coast of Louisiana causing a large oil spill in the GOM. Managers do not believe that adult snapper were adversely impacted by the spill, but the impacts of the oil spill on recruitment and on the 2010-year class are unknown (GMFMC 2011).

The stock was fully reassessed in 2013, and the assessment found that overfishing was not occurring, and that F was below Fmsy and F was at SPR26% for all sensitivity runs of the model as well as of the base model (SEDAR 2013).

The recreational fishery has exceeded its quota regularly since the management measure was first enacted (NOAA Fisheries Service 2012). In an attempt to prevent such overages, managers continue to modify the recreational season so that recreational harvest remains at the designated quota (NOAA Fisheries Service 2012). Still, in 2011, the recreational fishery again exceeded its quota. It is unclear what, if any, impact these overages are having on the overall stock since the quota is calculated in pounds and the stock has been realizing larger fish (NOAA Fisheries Service 2012, SEDAR 2005a, 2009a)

Red Snapper (SA)

Factor 1.1 Inherent Vulnerability: Medium

Key relevant information:
The FishBase vulnerability score for red snapper is 55.

Factor 1.2 Stock Status: High Concern

Key relevant information:
The B_{2011} to B_{MSY} ratio for red snapper caught in the SA is 0.13 (NMFS 2012d) and the SSB_{2009}/MSST ratio is 0.09 (SEDAR 2008b).

Detailed rationale:
Commercial red snapper landings peaked in 1968 at 473.1 mt in the southeastern Atlantic; in 2009 landings totaled 152.4 mt, comprising approximately 12% of total U.S. commercial landings (the remaining 88% of landings originated from the GOM) (Figure 10) (NMFS 2012c).

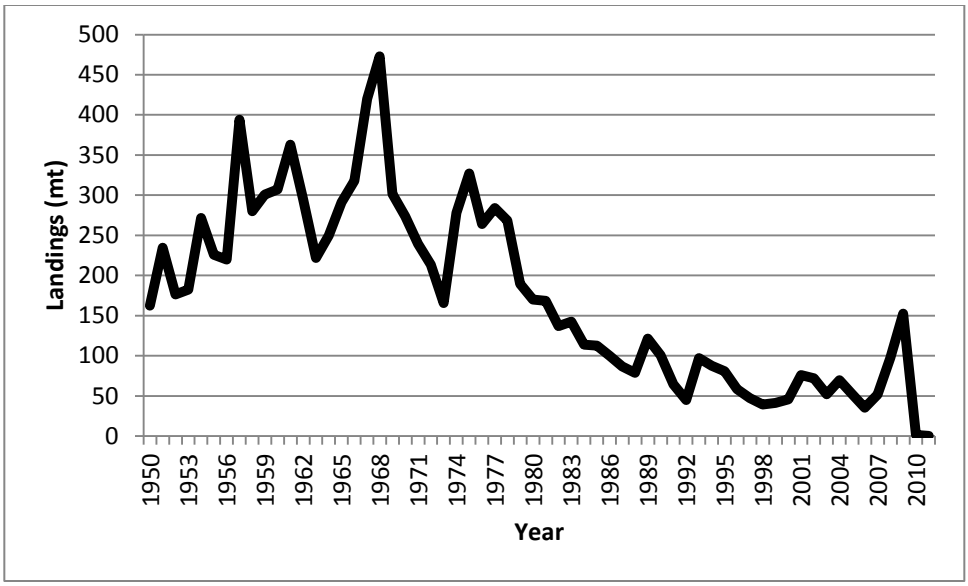

Figure 10. U.S. commercial landings of red snapper in the South Atlantic, 1950-2011 (data from NMFS 2012c).

The SA red snapper stock was fully assessed in 2008 (SEDAR 2008a) and an updated assessment was completed in 2010 (SEDAR 2010b). Age structure appears to be truncated with strong recent year classes and fewer older year classes (SEDAR 2010b). According to the assessment, the ratio of the SSB to the MSST showed steep declines until the late 1980s and since that time have shown static, but low, spawning potential rates (SEDAR 2010b)(Figure 11). The stock status in 2009 was estimated to be SSB_{2009}/MSST=0.09 (SEDAR 2010b). The assessment found that although fish stock projections were highly uncertain, there is strong certainty surrounding the current status of the stock (SEDAR 2010b).

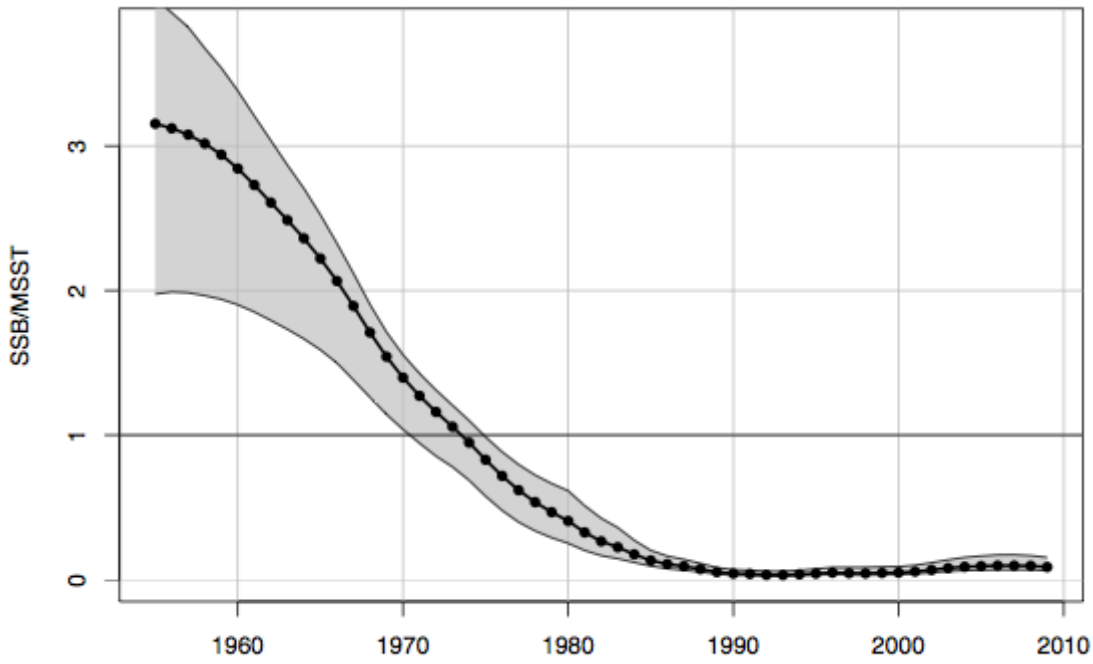

Figure 11. Spawning biomass relative to the minimum stock size threshold. The solid line indicates benchmark estimates from the assessment model (SEDAR 2010b).

Factor 1.3 Fishing Mortality: High Concern

Key relevant information:

The 2010 SA red snapper stock assessment update indicated that the SA stock had a $F_{2007\text{-}2009}$ to F_{MSY} ratio of 4.12 (SEDAR 2010b) and NOAA Fisheries' 2012 Third Quarter Report to Congress stated that the stock was experiencing overfishing (NMFS 2012d). There is management in place to try to end overfishing; therefore, fishing mortality on the stock is not a critical concern.

Detailed rationale:

Through the 1970s, estimated fishing mortality rates steadily increased and have been widely variable in the past few decades (SEDAR 2010b)(Table 12). The 2008 SA red snapper stock assessment indicated that the SA red snapper stock was overfished and undergoing overfishing (SEDAR 2008b). In response to this assessment fishery managers began developing Amendment 17A to the snapper grouper FMP that would draw out long-term stock rebuilding measures (SAFMC 2010). The 2010 SA red snapper stock assessment indicated that any mortality in the directed fishery along with additional mortality in the indirect fisheries would cause overfishing to continue (SEDAR 2010b). Therefore, managers implemented a moratorium on all red snapper landings until further notice (NOAA 2010c). In 2012, the moratorium was lifted and a commercial "mini-season" was opened with a quota set for 20,818lbs (NOAA 2012, SAFMC 2012d). Managers assess the fishery on a yearly basis using fishery dependent and independent data to modify the harvest limits and to ensure F does not exceed F_{MSY} (SAFMC 2012d).

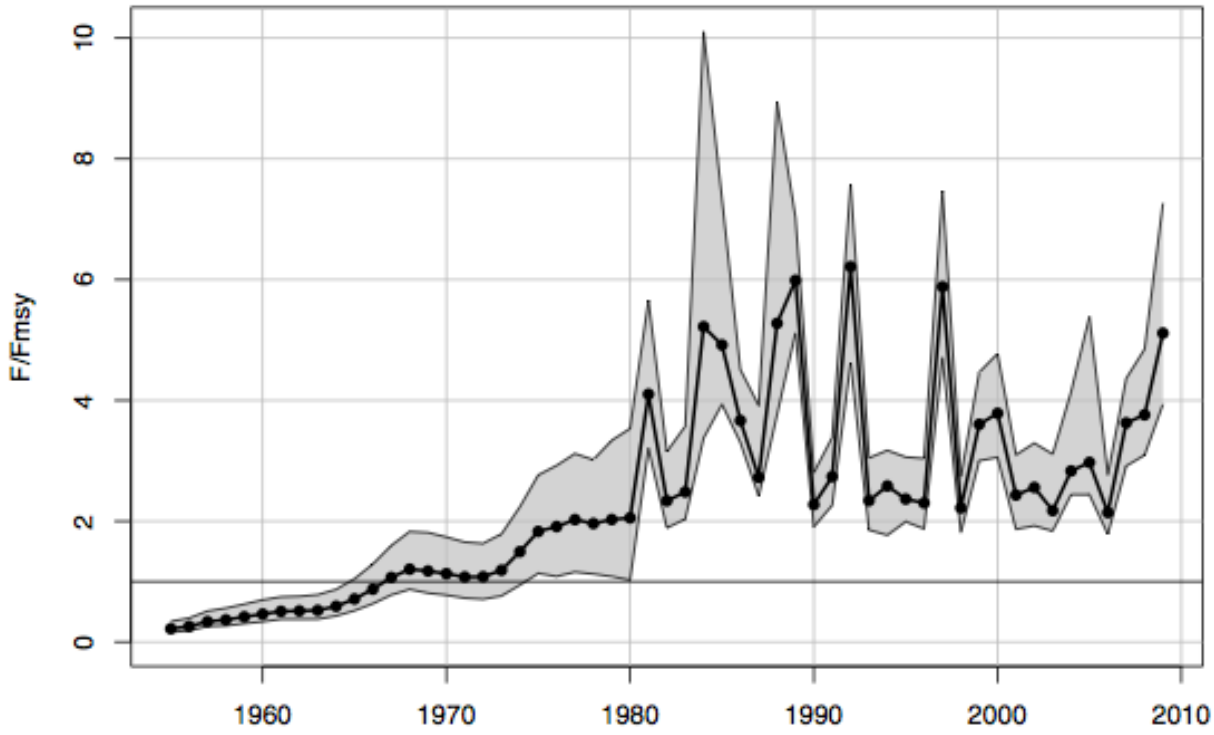

Figure 12. F relative to F_{MSY} in the SA red snapper fishery. The solid line indicates benchmark estimates from the assessment model (SEDAR 2010b).

Vermilion Snapper (GOM)

Factor 1.1 Inherent Vulnerability: Medium

Key relevant information:
The FishBase vulnerability score for vermilion snapper is 50. Therefore, the inherent vulnerability of vermilion snapper is deemed medium.

Factor 1.2 Stock Status: Low Concern

Key relevant information:
B_{2011}:B_{MSY} = 0.92 (NMFS 2012d). Vermilion snapper is above the limit reference point but remains below the target reference point of Bmsy, and there is some uncertainty in the model used for assessment.

Detailed rationale:
The GOM vermilion snapper stock was first assessed in 1991 (GMFMC 2012b). By the 1996 assessment, a decrease in landings, CPUE, and mean fish size indicated that the stock was showing signs of overfishing (Porch and Cass-Calay 2001). The 2001 assessment concluded that the GOM vermilion snapper stock was overfished with overfishing occurring. However, using

new models, the most recent stock assessment (2006) and assessment update (2011), concluded that the stock is neither overfished nor undergoing overfishing. SSB_{2010} relative to the spawning potential ratio of 30% ($SSB_{SPR30\%}$) is 1.55 and SSB_{2010}/MSST is 2.07, indicating that the population is not overfished (Figure 13) (SEDAR 2011a). The biomass has decreased since the 1950 assessment and the assessment update indicated that the stock was not overfished, but biomass was still below Bmsy. However, the models used for these assessments are new and their results are uncertain.

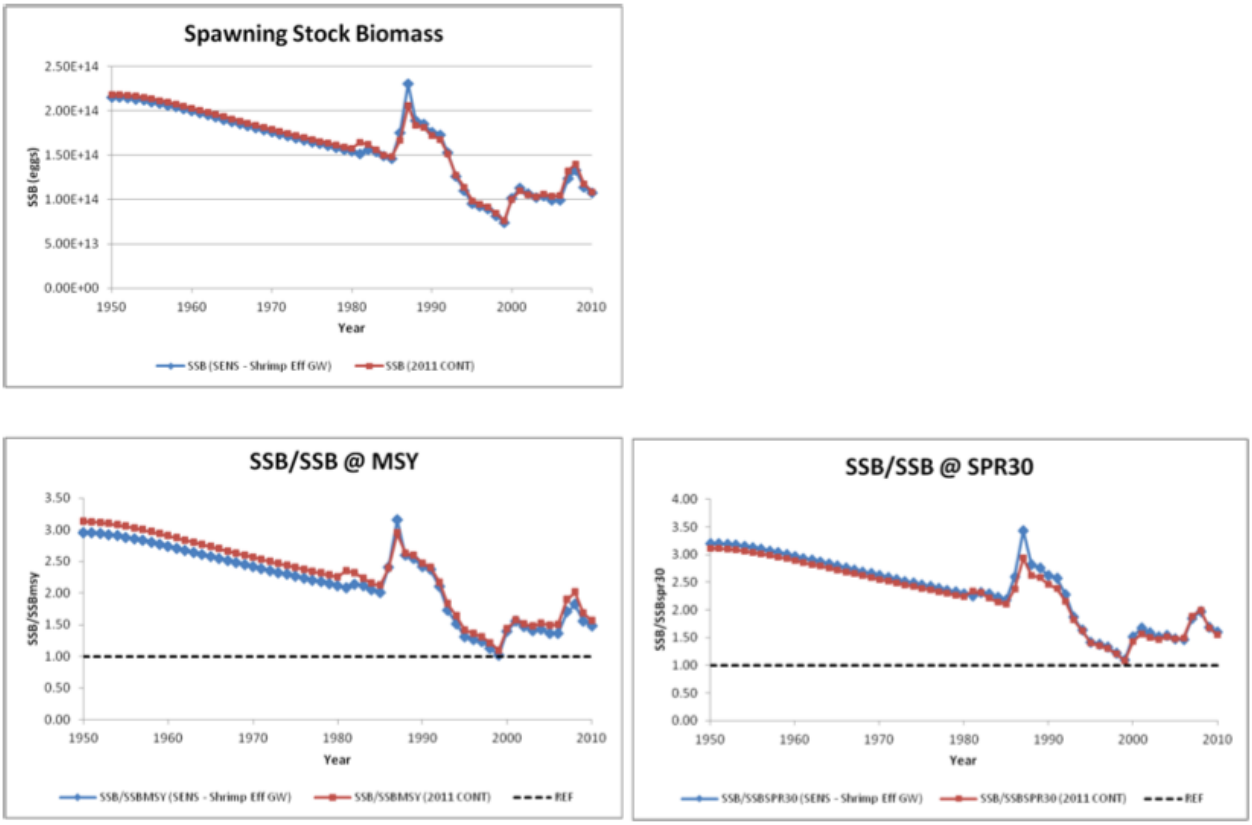

Figure 13. Comparison of annual estimates of SSB relative to SSB at MSY and SPR 30%. The two colors represent different assessment models (SEDAR 2011).

Factor 1.3 Fishing Mortality: Low Concern

Key relevant information:

F_{2010}:$F_{SPR30\%}$ for GOM vermilion snapper is 0.61 (SEDAR 2011a) indicating that the population is currently not experiencing overfishing. However, the model used for the 2006 stock assessment is new and uncertain.

Detailed rationale:

The most recent stock assessment indicated that fishing mortality (F) relative to F_{MSY} and $F_{SPR30\%}$ is 0.76, indicating that the population is currently not experiencing overfishing (Figure 14) (SEDAR 2011a). An acceptable biological catch (ABC) has been set by the Scientific Statistical

Council (SSC) for GOM vermilion snapper such that when commercial landings reach an acceptable target set by the GMFMC, the fishery is closed (SEDAR 2011a, FishWatch 2013). In the 2011 stock assessment update, the SSC concluded the ABC could be increased (SEDAR 2011a). At this time, the GMFMC has opted not to increase the annual catch limit of GOM vermilion snapper.

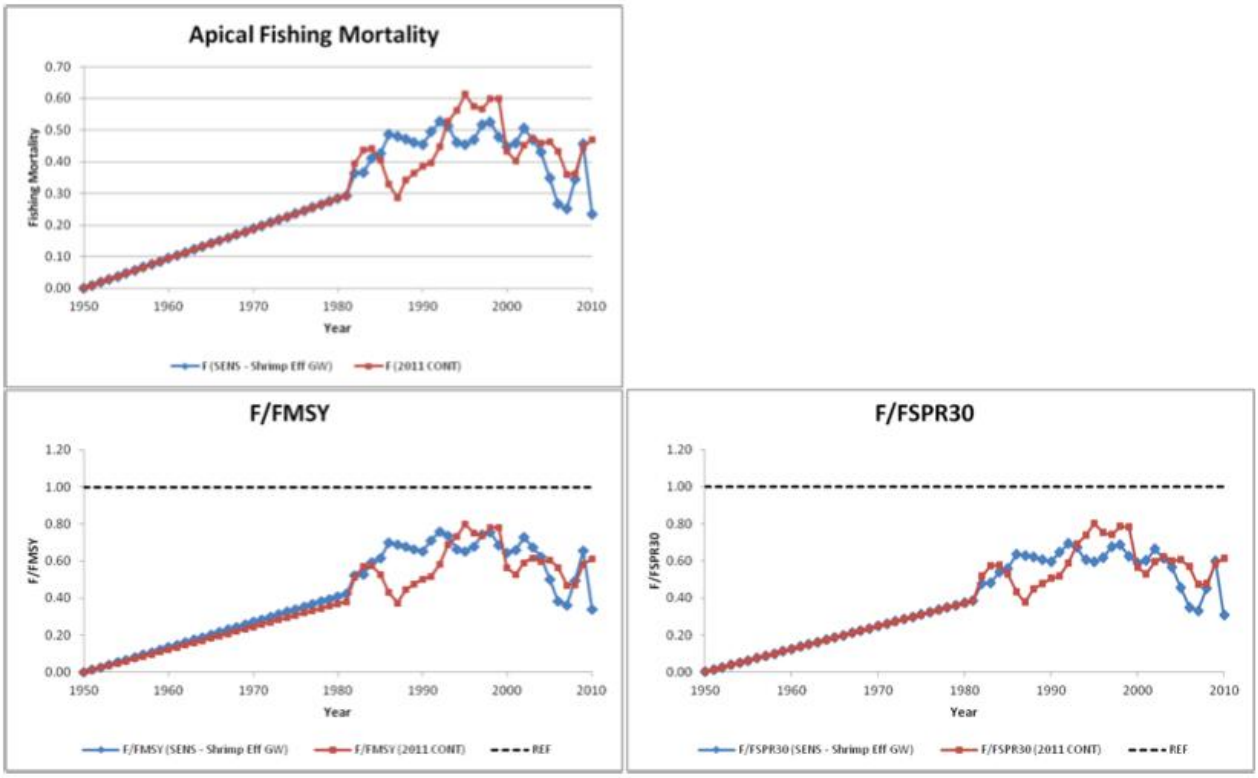

Figure 14. Comparison of annual estimates of F relative to MSY and SPR 30%. The two colors represent different assessment models (SEDAR 2011a).

Vermilion Snapper (SA)

Factor 1.1 Inherent Vulnerability: Medium

Key relevant information:
The FishBase vulnerability score for vermilion snapper is 50.

Factor 1.2 Stock Status: Low Concern

Key relevant information:
Based on the 2008 and 2012 SA vermilion stock assessments $B_{current}$:B_{MSY} = 0.86 (NMFS 2012d) and SSB_{2011}/MSST=1.26 and SSB_{2011}:SSB_{MSY}=0.98 (NMFS 2012e), respectively. Despite the high confidence in the historical biomass values, there is a great deal of uncertainty surrounding the most recent biomass values.

Detailed rationale:
This stock was first assessed in 1998 and the authors reported spawning potential ratio (SPR) values of 21% to 27% in 1996, indicating the stock was overfished (SEDAR 2003). This assessment considered selectivity, maturity, and fecundity as functions of age, instead of functions of length, which is believed to be the more accurate approach. The most recent assessment used up-to-date life history and fishery data (dependent and independent) and considered selectivity, maturity, and fecundity as functions of length (SEDAR 2008b, NMFS 2012e). Under this new model, SSB increased slightly between 1995 and 1999, but has since steadily declined (Figure 15) (SEDAR 2008b). The 2012 Status of the Fisheries Report and the 2012 stock assessment update both indicate that the SA vermilion snapper stock is not overfished (NMFS 2012d, 2012e), but remains below the target reference point. In addition, there is significant uncertainty surrounding the model used for the 2008 and 2012 stock assessments and the biomass estimates in the terminal years of the assessments.

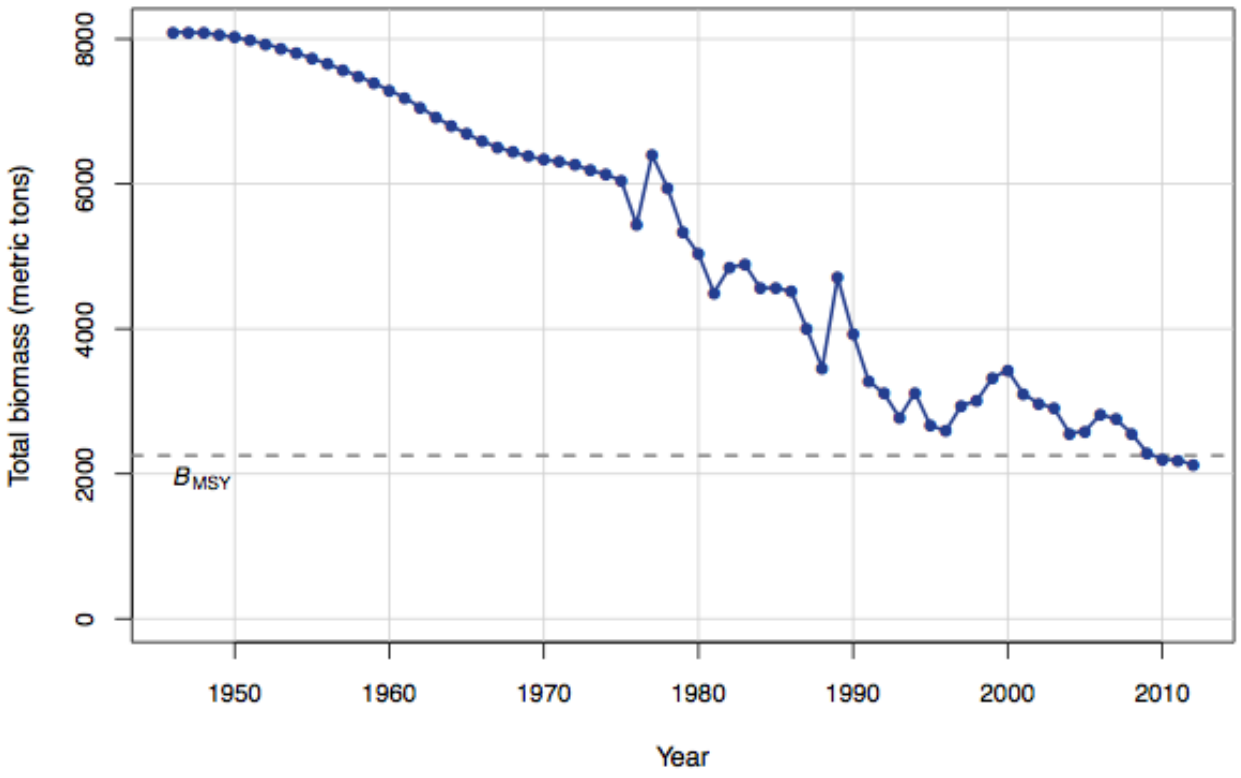

Figure 15. Trajectory of estimated total biomass for the southeastern vermilion snapper stock (NMFS 2012e)

Factor 1.3 Fishing Mortality: Moderate Concern

Key relevant information:
$F_{2009\text{-}2011}$:F_{MSY} for SA vermilion snapper is 0.67 (NMFS, 2012e), indicating that the population is not currently experiencing overfishing. However, due to the high degree of uncertainty in the

value of F and the inherent risk of overfishing due to trends in decreasing biomass and increasing F (NMFS 2012e), the stock is considered to be a moderate concern.

Detailed rationale:
The 2008 and 2012 stock assessment and assessment update used new models to assess the SA vermilion snapper stock. Although some of the models were inconclusive with respect to stock status, there was confidence that the stock was experiencing overfishing since the early 1980s (SEDAR 2008b). Previous assessments showed that SA vermilion snapper stocks had experienced overfishing (SEDAR 2008b). However, the most recent stock assessment indicates that overfishing is not occurring and has been rare throughout the assessment period (Figure 16) (NMFS 2012e). This change in status has been attributed to changes in the fit to the assessment model due to changes in assumptions and not due to historical data updates or modifications to the model (NMFS 2012e). The assessment also directs managers to use caution when interpreting these results due to the high level of uncertainty and the fact that trends of decreasing biomass and increasing F are underway such that the current status indicators cannot hold in the long-term (NMFS 2012e).

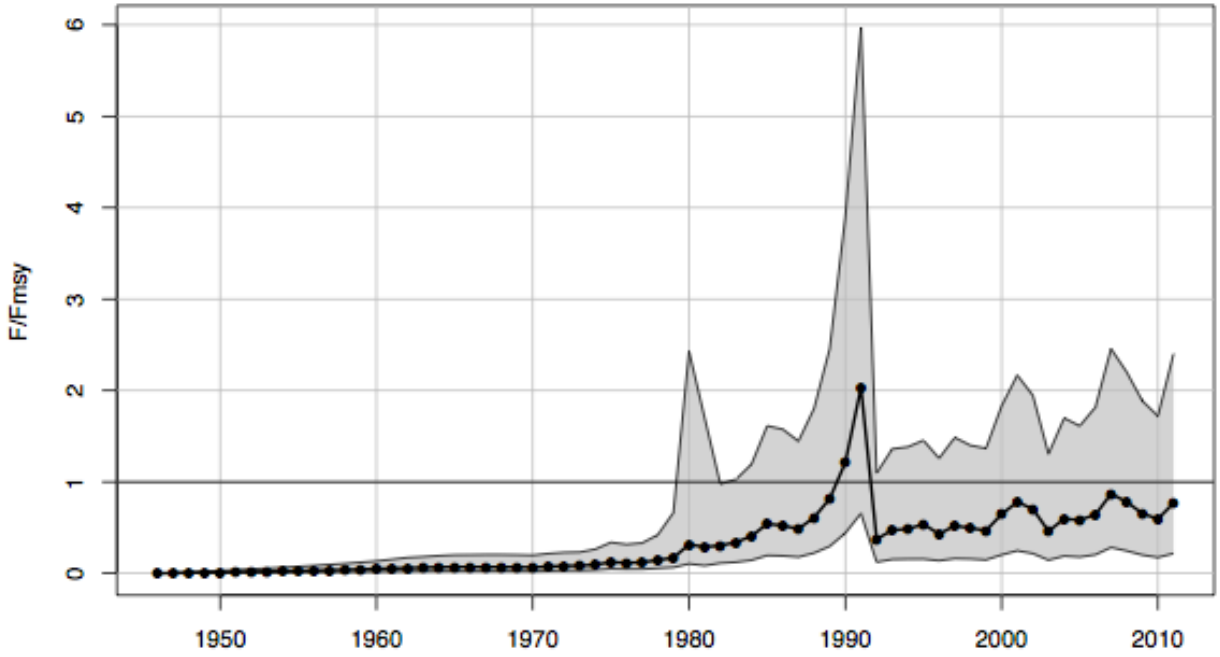

Figure 16. Estimates of fishing mortality (F) relative to F_{MSY} for the southeastern vermilion snapper stock. The solid line indicates estimates calculated in the assessment model; the gray bands indicate error (NMFS 2012e).

Yellowtail Snapper (GOM and SA)

Factor 1.1 Inherent Vulnerability: High

Key relevant information:
The FishBase vulnerability score for yellowtail snapper is 59.

Factor 1.2 Stock Status: Low Concern

Key relevant information:
Yellowtail snapper in the SA and GOM have a B_{2011} to B_{MSY} ratio of 1.21 (NMFS 2012d). Additionally, a 2012 stock assessment update for GOM and SA yellowtail snapper indicate that the stock is not overfished, but has experienced some decline in abundance, which is projected to continue (FWC 2012a).

Detailed rationale:
A full stock assessment was initiated in 2002 over concerns that this species was experiencing overfishing. Assessment biologists used fisheries-dependent (catch/effort indices) and fisheries-independent data (visual surveys, life history studies) to determine stock abundance and condition (SEDAR 2003). Using age-structured data in population analyses, the assessment team found signs of a relatively healthy population. For example, recruitment has been high since 1999 and not particularly dependent upon SSB, and the abundance of older (4+ years of age) individuals increased (Figure 17) (SEDAR 2003). A stock assessment update was completed in 2012 and indicated that recruitment continues to remain high but stock abundance, especially for the yellowtail snapper in the age-12 group, has declined in recent years (FWC 2012a). Spawning biomass has continued to increase slightly since 1985 (Figure 18) (SEDAR 2003, FWC 2012a) and B:B_{MSY} has recently been estimated at 1.21 {NMFS, 2012 #23). Since the SSB ratio was calculated to be 3.357, the assessors concluded that the yellowtail snapper was not overfished.

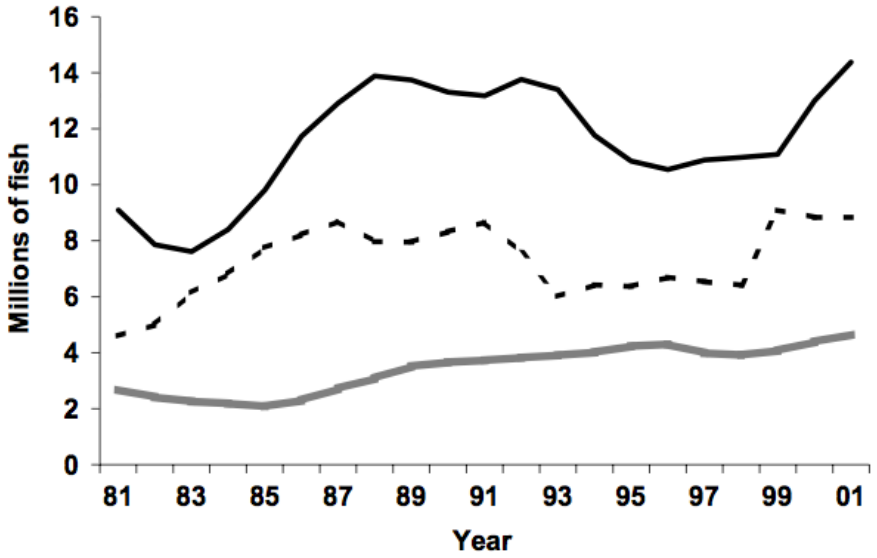

Figure 17. Estimated average annual abundance of age-0 (dashed line) and age-1 (solid line), and ages 4+ (heavy stippled line) yellowtail snapper during 1981-2001 (Figure from SEDAR 2003b).

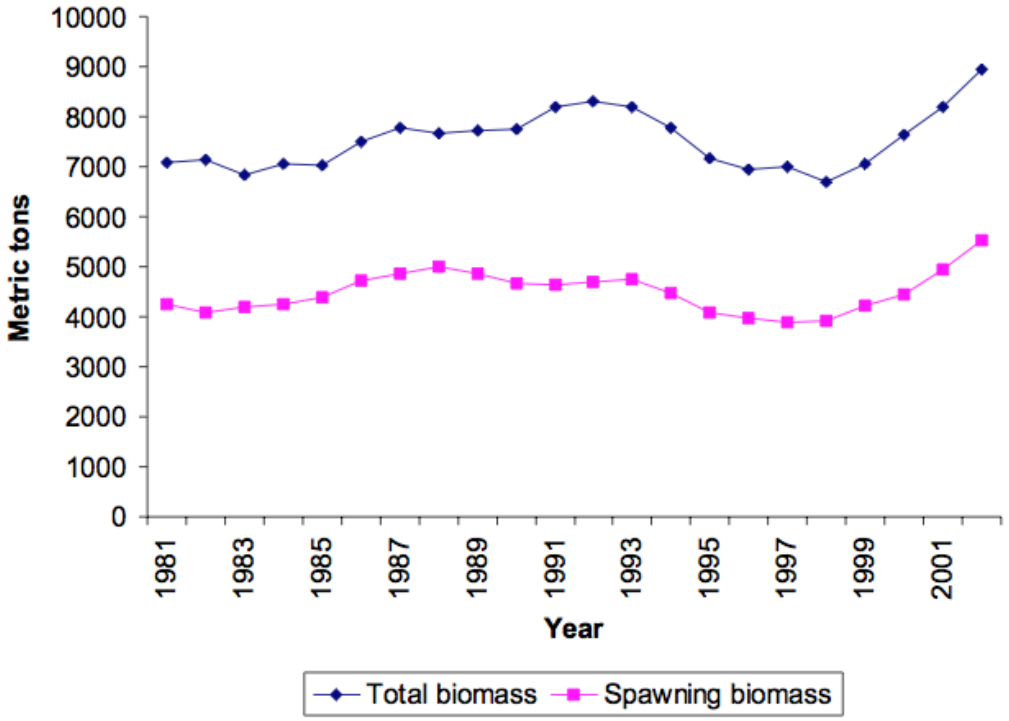

Figure 18. Estimated total and spawning biomass of yellowtail snapper in metric tons, 1981-2001 (Data from SEDAR 2003)

Factor 1.3 Fishing Mortality: Very Low Concern

Key relevant information:

F_{2010}:$F_{30\%SPR}$ for SA and GOM yellowtail snapper is 0.154 (FWC 2012a) indicating that the population is currently not experiencing overfishing. Landings have remained relatively stable in the last 10 years since the last full stock assessment and the 2012 stock assessment update indicates a decreasing trend for the yellowtail snapper fishing mortality rate.

Detailed rationale:

In the 2002 yellowtail stock assessment for the GOM and SA, fishing mortality was determined to be below F_{MSY} for at least 3 years (SEDAR 2003). The estimated MSY for yellowtail was between 1,342 – 1,965 mt; the harvest in 2002 was approximately 850 – 1,000 mt (including discards) (SEDAR 2003). Recent data shows that landings of commercial yellowtail snapper have remained relatively consistent over the last decade indicating that overfishing is likely not occurring (Figure 19). The 2012 stock assessment update indicates that the fishing mortality rate on the fully recruited age-5 fish increased in the 1990s but has continued a downward trajectory in recent years (Figure 20)(FWC 2012a).

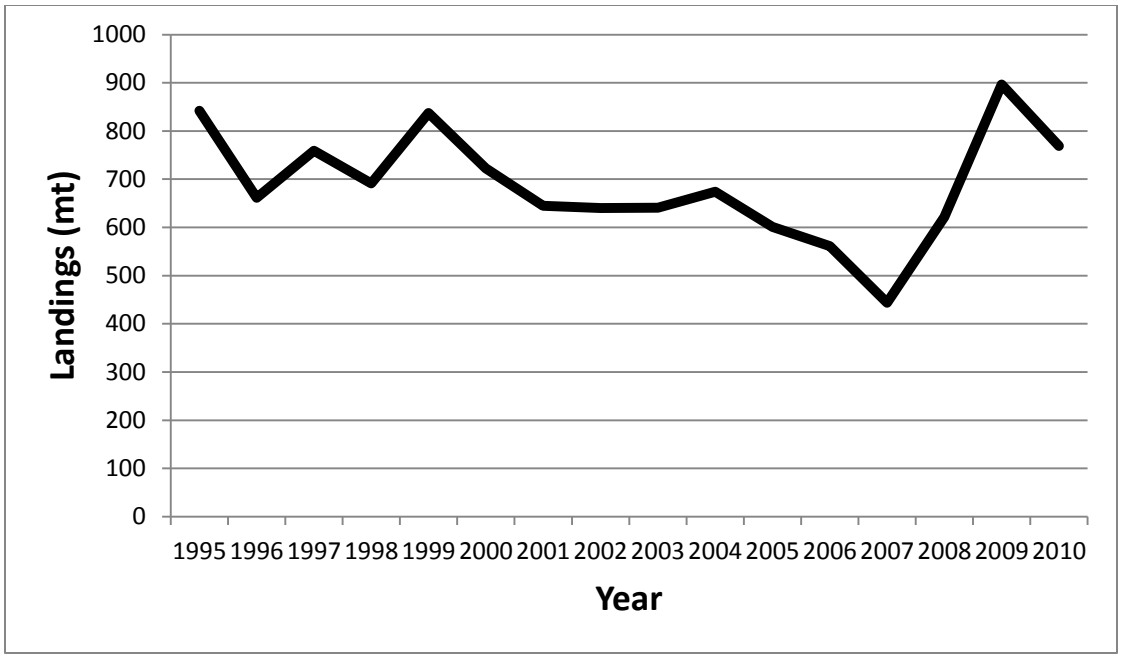

Figure 19. U.S. commercial landings of yellowtail snapper in U.S., 1995-2010 (data from NMFS 2012b).

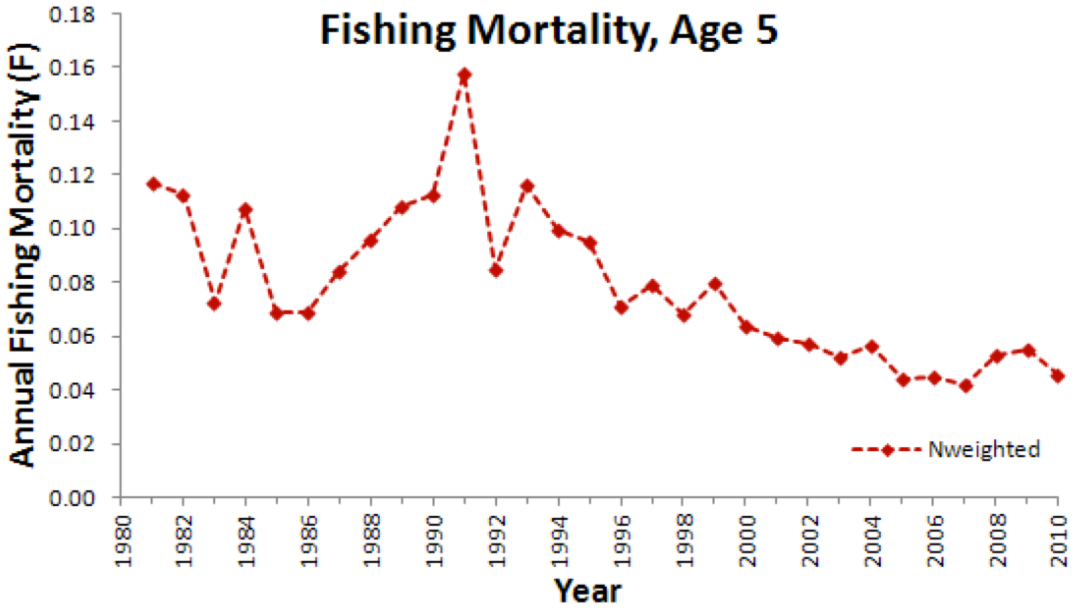

Figure 20. Total fishing mortality on fully recruited-aged yellowtail snapper by year (FWC 2012a)

Criterion 2: Impacts on Other Retained and Bycatch Stocks

Guiding Principles

- The fishery minimizes bycatch. Seafood Watch® defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, pre-catch mortality and ghost fishing. All discards, including those released alive, are considered bycatch unless there is valid scientific evidence of high post-release survival and there is no documented evidence of negative impacts at the population level.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given each impacted species' abundance and productivity, accounting for scientific uncertainty, management uncertainty and non-fishery impacts such as habitat degradation.

Summary

Vertical Line, GOM

Stock	**Inherent Vulnerability** Rank	**Stock Status** Rank (Score)	**Fishing Mortality** Rank (Score)	**Subscore**	**Score** (subscore*discard modifier)	**Rank** (based on subscore)
Speckled Hind	High	Very High Concern (1)	Moderate Concern (2.33)	1.53	1.53	Red
Warsaw Grouper	High	Very High Concern (1)	Moderate Concern (2.33)	1.53	1.53	Red
Red Snapper	Medium	High Concern (2)	Low Concern (3.67)	2.71	2.71	Yellow
Gag	High	High Concern (2)	Moderate Concern (2.33)	2.16	2.16	Red
Loggerhead Sea Turtle	High	Very High Concern (1)	Very Low Concern (5)	2.24	2.24	Yellow
Green Sea Turtle	High	Very High Concern (1)	Very Low Concern (5)	2.24	2.24	Yellow
Leatherback Sea Turtle	High	Very High Concern (1)	Very Low Concern (5)	2.24	2.24	Yellow
Gray Triggerfish	Low	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.64	Yellow

Red Grouper	High	Low Concern (4)	Moderate Concern (2.33)	3.05	3.05	Yellow
Sand Tiger Shark	High	High Concern (2)	Very Low Concern (5)	3.16	3.16	Yellow
Sandbar Shark	High	High Concern (2)	Very Low Concern (5)	3.16	3.16	Yellow
Greater Amberjack	Medium	High Concern (2)	Very Low Concern (5)	3.16	3.16	Yellow
Vermilion Snapper	Medium	Low Concern (4)	Low Concern (3.67)	3.83	3.83	Green
Yellowtail Snapper	High	Low Concern (4)	Very Low Concern (5)	4.47	4.47	Green

Vertical Line, SA

Stock	**Inherent Vulnerability** Rank	**Stock Status** Rank (Score)	**Fishing Mortality** Rank (Score)	**Subscore**	**Score** (subscore*discard modifier)	**Rank** (based on subscore)
Red Grouper	High	High Concern (2)	High Concern (1)	1.41	1.41	Red
Red Snapper	Medium	High Concern (2)	High Concern (1)	1.41	1.41	Red
Speckled Hind	High	Very High Concern (1)	Moderate Concern (2.33)	1.53	1.53	Red
Warsaw Grouper	High	Very High Concern (1)	Moderate Concern (2.33)	1.53	1.53	Red
Snowy Grouper	High	High Concern (2)	Moderate Concern (2.33)	2.16	2.16	Red
Atlantic Bluefin Tuna	High	Very High Concern (1)	Very Low Concern (5)	2.24	2.24	Yellow
Gray Triggerfish	Low	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.64	Yellow
Vermilion Snapper	Medium	Low Concern (4)	Moderate Concern (2.33)	3.05	3.05	Yellow
Gag	High	Low Concern (4)	Moderate Concern (2.33)	3.05	3.05	Yellow

Black Sea Bass	High	Low Concern (4)	Moderate Concern (2.33)	3.05	3.05	Yellow
Florida Pompano	Medium	Low Concern (4)	Moderate Concern (2.33)	3.05	3.05	Yellow
Blacknose Shark (SCS Complex)	High	High Concern (2)	Very Low Concern (5)	3.16	3.16	Yellow
Golden Tilefish	High	Low Concern (4)	Very Low Concern (5)	4.47	4.47	Green
Yellowtail Snapper	High	Low Concern (4)	Very Low Concern (5)	4.47	4.47	Green

A wide variety of fish and invertebrate species are caught in the GOM and SA snapper fisheries. The tables above are merely a small sample of the diversity of species caught, which include greater amberjack, Florida pompano, golden tilefish, black seabass, red porgy, white grunt, and a variety of other fish, sharks, and invertebrates. Many of these species are not of conservation concern and therefore are not assessed in further detail in this report. Retained and bycatch species that are analyzed in this assessment have been chosen based on either the percent of the catch they make up in the snapper fishery or their conservation status (endangered, threatened, overfished, etc.) These species include speckled hind *(Epinephelus drummondhayi),* Warsaw grouper (*Hyporthodus nigritus*), gag grouper *(Mycteroperca microlepis),* loggerhead sea turtles (*Caretta caretta*), green sea turtle (*Chelonia mydas*), and leatherback sea turtle (*Dermochelys coriacea*), snowy grouper (*Hyporthodus niveatus or Epinephelus niveatus),* Atlantic bluefin tuna (*Thynnus thynnus*), and blacknose shark (*Carcharhinus acronotus*. These species have been selected for discussion because they either limit the score for this criterion or they are a main catch in the fishery.

Justification of Ranking

Speckled Hind (GOM and SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
Speckled hind has a FishBase vulnerability score of 60.

Factor 2.2 Stock Status: Very High Concern

Key relevant information:
NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d) indicated that the stock status for speckled hind in the GOM and SA are unknown. However, the stocks are listed as

"critically endangered" according to the IUCN Red List, based on the fact that little is known about the population structure of the fishery and it is threatened by fishing mortality (Ng Wai and Huntsman 2006a).

Factor 2.3 Fishing Mortality: Moderate Concern

Key relevant information:
According to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), in the SA of speckled hind overfishing is occurring, but fishing mortality in the GOM is unknown. Since the contribution of the GOM and SA snapper fisheries on the overall fishing mortality of speckled hind is unclear, Seafood Watch® deems fishing mortality of speckled hind in the GOM and SA snapper fisheries as a moderate concern.

Warsaw Grouper (GOM and SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
Warsaw grouper has a FishBase vulnerability score of 68.

Factor 2.2 Stock Status: Very High Concern

Key relevant information:
NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d) indicated that the stock status for Warsaw grouper in the GOM and SA is unknown. However, the stocks are listed as "critically endangered" according to the IUCN Red List, based on the fact that status of the species is ambiguous and it is threatened by fishing mortality (Ng Wai and Huntsman 2006b). Seafood Watch ® considers any stock that is listed as a "threatened species" or similar proxy to be a very high conservation concern.

Factor 2.3 Fishing Mortality: Moderate Concern

Key relevant information:
According to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), overfishing of Warsaw grouper is occurring in the SA, but fishing mortality in the GOM is unknown. Since the contribution of the GOM and SA snapper fisheries on the overall fishing mortality of Warsaw grouper is unclear, Seafood Watch® deems fishing mortality of Warsaw grouper in the GOM and SA snapper fisheries as a moderate concern.

Gag Grouper (GOM)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
Gag grouper has a FishBase vulnerability score of 68.

Factor 2.2 Stock Status: High Concern

Key relevant information:
According to NOAA Fisheries' 2012 Third Quarter Report to Congress B_{2012}:B_{MSY} for GOM gag grouper is 0.4 (NMFS 2012d). While trends in size, sex, and age distribution are unknown, managers have deemed gag grouper to be overfished (SEDAR 2006b, 2009b).

Detailed rationale:
In the past, the status of the gag stock has been a topic of substantial debate between managers and in the scientific community (Aparicio and Horn 1999, F et al. 1999, Koenig and Chapman 1999, Lessard 1999). The most recent GOM gag grouper stock assessment concluded that estimated spawning stock biomass was below the MSST with SSB_{2008}/MSST ranging from 0.47-0.54 (Figure 21)(SEDAR 2009b). They also showed that recruitment levels estimated for the mid- to late-1990s were unusual, and harvest rates occurring before 2001 were unsustainable (SEDAR 2006b, 2009b).

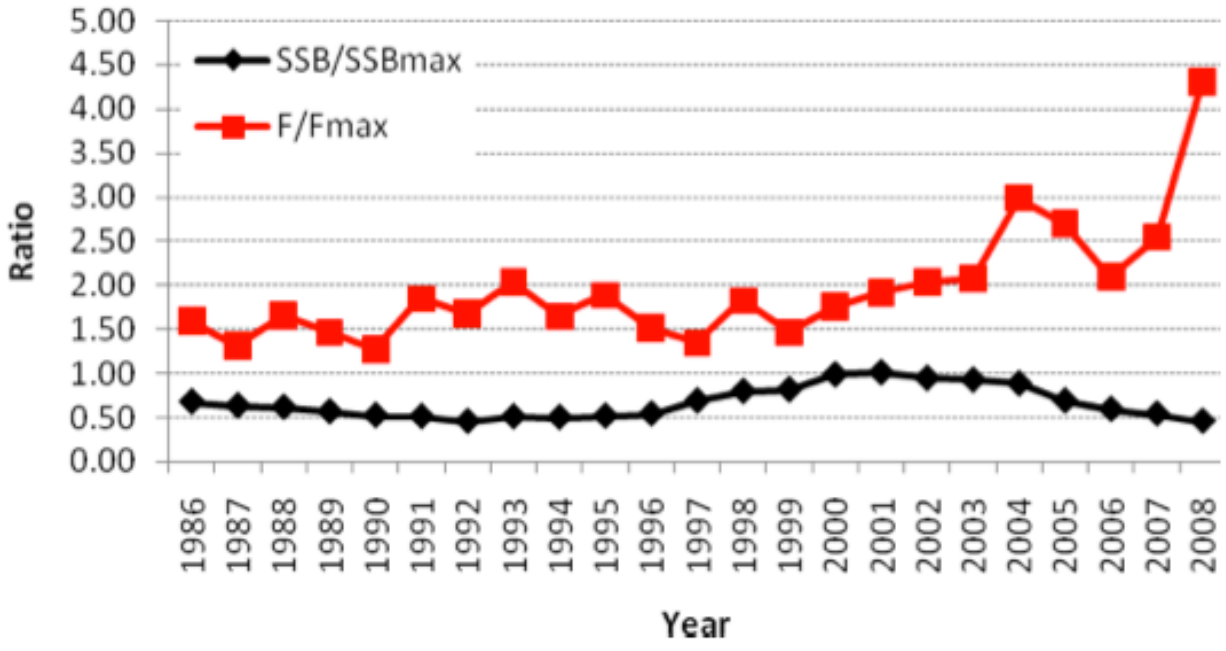

Figure 21. GOM gag grouper stock and fishery status. F_{Max}=F_{MSY} (SEDAR 2009b)

Factor 2.3 Fishing Mortality: Moderate Concern

Key relevant information:
F_{2004}:F_{MSY} was estimated at 1.96 (SEDAR 2006b) and according to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), in the GOM overfishing of gag grouper is occurring. However, the amount of gag grouper caught in the GOM as a result of the directed red, vermilion, and yellowtail snapper fisheries is unknown.

Detailed rationale:
Gag grouper are commonly targeted with shallow-water groupers, such as red grouper, and reef snappers such as red and vermilion snapper (SEDAR 2006b). However, the amount of gag grouper caught as a result of the directed GOM snapper fisheries is unknown. Overall, fishing mortality for GOM gag grouper has increased in recent years and has been estimated at F_{2008}/F_{MSY}= 2.20-2.47 indicated that the GOM stocks are experiencing overfishing (Figure 21)(SEDAR 2009b). In response, fishery managers have limited gag grouper catch in the GOM in both the commercial and recreational sectors to limit pressure in the directed fishery (FWC 2012b, GMFMC 2012b). The impacts of these management measures are unknown until the fishery is reassessed at the end of 2013 (SEDAR 2012).

Gag Grouper (SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
Gag grouper has a FishBase vulnerability score of 68.

Factor 2.2 Stock Status: Low Concern

Key relevant information:
According to NOAA Fisheries' 2012 Third Quarter Report to Congress $B_{current}$:B_{MSY} for gag grouper is 0.94 (NMFS 2012d), below the target reference point, but above the limit reference point.

Factor 2.3 Fishing Mortality: Moderate Concern

Key relevant information:
F_{2004}:F_{MSY} was estimated at 1.3 (SEDAR 2006c) in the SA, and according to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), overfishing of gag grouper is occurring. The most recent stock assessment conducted in 2006 indicates that with the current level of fishing, the stock is most likely approaching an overfished condition (SEDAR 2006c). However, the impact of gag grouper in the SA as a result of the directed red, vermilion, and yellowtail snapper fisheries is unclear.

Loggerhead Sea Turtle, Green Sea Turtle, Leatherback Sea Turtle (GOM)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
Loggerhead sea turtles, green sea turtles, and leatherback sea turtles are of high vulnerability (Seafood Watch 2012).

Factor 2.2 Stock Status: Very High Concern

Key relevant information:
Loggerhead sea turtles and leatherback sea turtles are listed as threatened in the Atlantic Northwest (NOAA 2012c, NOAA 2012d). Green sea turtles have been listed on the U.S. Endangered Species Act list in since 1978 as endangered or threatened depending on the source of the breeding populations (NOAA 2012d).

Detailed rationale:
Loggerhead populations have been in decline over the last decade (TEWG 2009). From 1989 through 2008, nesting assemblages in the area decreased by 26% and again by 41% from 1998 to 2008 (GMFMC 2009). There was an overall nest decrease of 37% in the Peninsular Florida population between 1989 and 2007 (TEWG 2009). The nesting assemblages in the northern GOM decreased 6% annually from 1989 through 2008. Data now show that this decreasing trend is reversing and annual nest counts have been generally increasing in recent years (FWC 2012c). Still, it is unclear whether these increases are sufficient to contribute to the species' recovery or if overall fishing pressure from the GOM directed snapper fisheries remains too high.

Green sea turtles have experienced extensive population declines in all major ocean basins over the last approximately hundred years (IUCN 2012). During this same time, the mean annual number of nesting females declined by 48% to 67% (IUCN 2012). However, a 2007 report indicated that green sea turtles are showing signs of recovery in the GOM (NMFS and USFWS 2007). The report indicated that over a six year period (from 2001 to 2007) green sea turtles nesting in Florida increased an average of 5,039 nests annually (NMFS and USFWS 2007).

Leatherback sea turtle populations have decreased more than 80% worldwide in the last 30 years (Sarti Martinez 2012, NOAA 2012c). Nesting on U.S. beaches and in the Carribbean has been increasing in recent years (NOAA 2012c). International cooperation is needed though, to ensure the worldwide recovery of the leatherback populations (Sarti Martinez 2012).

Factor 2.3 Fishing Mortality: Low Concern

Key relevant information:
Green and leatherback sea turtle catch rates in the GOM vertical line fisheries are low and do not appear to be adversely impacting the populations (SEDAR, 2005a, NOAA 2010d, NOAA

2012c). Although loggerhead sea turtle populations continue to decline, interactions are rare in the GOM vertical fisheries (NMFS 2009b).

Detailed rationale

Although GOM hydraulic/electric reel, rod and reel, and handline have documented interactions with loggerhead, green, and leatherback sea turtles, it is believed that many of the turtles captured by these gear types are released alive (NMFS 2009b). The 2009 BioOp estimated that within a three-year period approximately 96 sea turtles were captured using vertical gears (bandit, rod and reel, handline, and buoy gear types) including 65 loggerhead, 13 hawksbill, 9 green, and 9 leatherback sea turtles (NMFS 2009b). Of these interactions, it is estimated that 31 turtles were killed, including 20 loggerhead, 4 hawksbill, 3 green, and 9 leatherback sea turtles (NMFS 2009b). The BioOp concluded that there was a low incidence of sea turtle interactions and mortality in the GOM handline, hydraulic/electric reel, and rod and reel fisheries (NMFS 2009b). It also concluded that GOM Reef Fish vertical line fishing is not likely to jeopardize the continued existence of loggerhead, green, and leatherback sea turtles (NMFS 2009b).

Red Grouper (SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:

The FishBase vulnerability score for red grouper is 63.

Factor 2.2 Stock Status: High Concern

Key relevant information:

B_{2011}:B_{MSY} = 0.79 (NMFS 2012d) and SSB_{2008}:MSST= 0.920 (SEDAR 2010a).

Detailed rationale:

Red grouper in the SA are often targeted with red and vermilion snapper (SEDAR 2010a). In 2000, NMFS declared the SA red grouper overfished, with overfishing occurring based on declining CPUE trends (SEDAR 2010a). In 2010, SA red grouper stock was formally assessed (SEDAR 2010a). The assessment used widely accepted reference points for the stock and fishing status, including spawning stock biomass (SSB), the MSST, and fishing mortality (F). The assessment concluded that the stock had been overfished since the 1970s (Table 2 and Figure 22) and estimated the SSB_{2008} to MSST ratio for red grouper at 0.920. Sensitivity analyses suggest that the stock status results contain some uncertainty (SEDAR 2010a). Projections of future stock were also included in the stock assessment. It was predicted that in a scenario with no fishing (F=0), there is a 50% chance that the stock could be fully rebuilt by 2028 (SEDAR 2010a). In July 2012, Amendment 24 to the SA Snapper Grouper FMP that established a red grouper rebuilding plan was approved and implemented (SAFMC 2012a).

Table 2. Summary of stock status determination criteria (Table from SEDAR 2010a)

Criteria	Recommended Values from SEDAR 19	
	Definition	Value
M (Instantaneous natural mortality; per year)	Average of Lorenzen M (if used)	0.14
F_{2008} (per year)	Apical Fishing mortality in 2008	0.340
$F_{current}$ (per year)	Geometric mean of the directed fishing mortality rates in 2006 - 2008	0.298
F_{MSY} (per year)	F_{MSY}	0.221
B_{MSY} (metric tons)	Biomass at MSY	3680
SSB_{2008} (metric tons)	Spawning stock biomass in 2008	2051
SSB_{MSY} (metric tons)	SSB_{MSY}	2592
MSST (metric tons)	$(1-M)*SSB_{MSY}$	2229
MFMT (per year)	F_{MSY}	0.221
MSY (1000 pounds)	Yield at MSY	1110
OY (1000 pounds)	Yield at F_{OY}	OY (65% F_{MSY})= 1064 OY (75% F_{MSY})= 1089 OY (85% F_{MSY}= 1103
F_{OY} (per year)	F_{OY} = 65%,75%, 85% F_{MSY}	65% F_{MSY}= 0.144 75% F_{MSY}= 0.166 85% F_{MSY}= 0.188
Biomass Status	SSB_{2008}/MSST	0.920
Exploitation Status	$F_{current}/F_{MSY}$	1.35

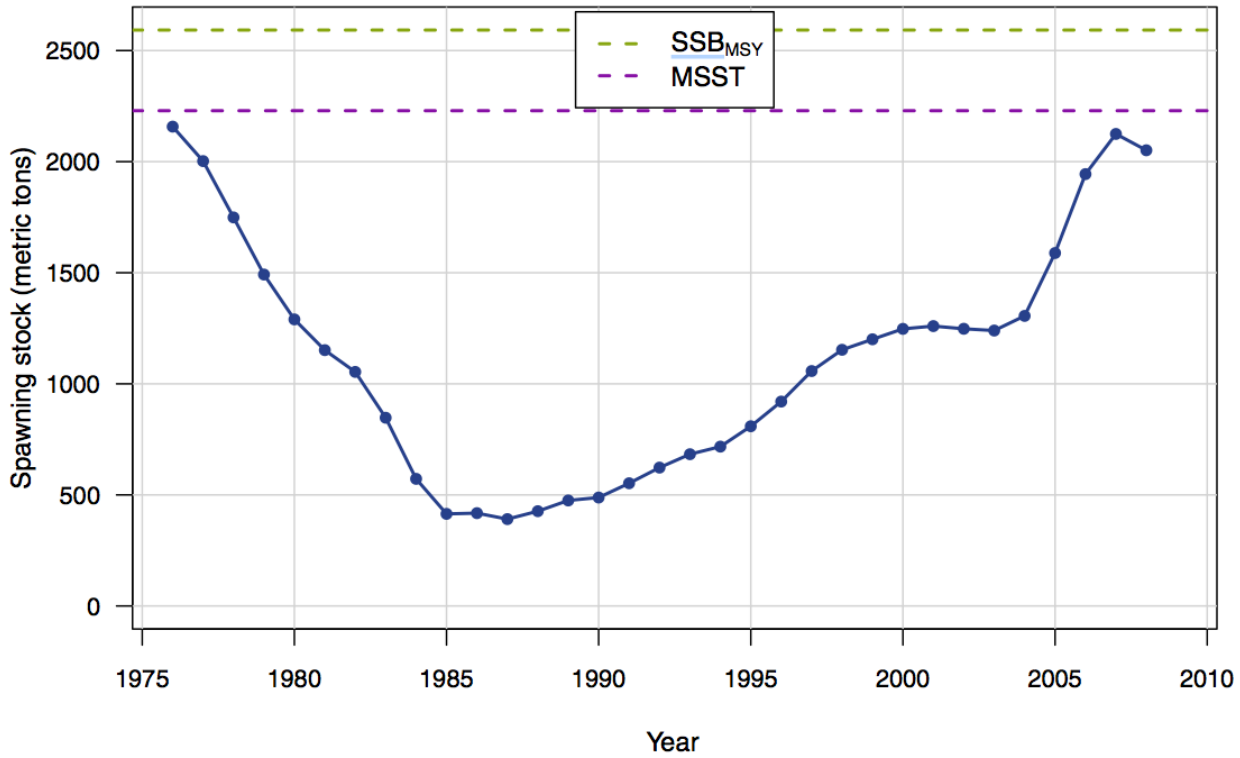

Figure 22. Atlantic red grouper stock status (1976-present). Estimated spawning (mature) biomass at time of peak spawning (Figure from SEDAR 2010a)

Factor 2.3 Fishing Mortality: High Concern

Key relevant information:
Relative fishing mortality (F_{2008}:F_{MSY}) for red grouper in the SA was estimated at 1.35 and according to NOAA Fisheries 2012 Third Quarter Report to Congress, overfishing is occurring (NMFS 2012d). Although management is currently in place to alleviate fishing pressure, the stock is overfished and continues to experience overfishing; therefore, Seafood Watch® deems fishing mortality of SA red grouper as a high concern.

Detailed rationale:
Red grouper are managed concurrently with SA vermilion snapper through the SAFMC's snapper grouper FMP. Since vermilion snapper are often targeted with red grouper in the shallow-water fishery, the SA vermilion snapper fishery is assumed to be contributing to the fishing pressure on SA red grouper. The value of the vermilion snapper catch was more than three times the red grouper catch in 2010 (NMFS 2012c); therefore, it is logical to assume that the vermilion snapper fishery is having a greater impact on the red grouper fishery than the red grouper fishery is having on the vermilion snapper fishery.

Fishing mortality of red grouper in the SA peaked in the 1980s and is currently at its lowest level in more than 30 years (Figure 23). However, the 2010 stock assessment indicated that overfishing is occurring (F_{2008}:F_{MSY} = 1.35) (Table 2) (SEDAR 2010a). In response to the assessment, NMFS will implement Amendment 24 to the snapper grouper FMP that will establish a rebuilding plan to address overfishing and improve the status of the red grouper stock (SAFMC 2011). In 2011, the SAFMC established recreational annual catch limits (ACLs) and seasonal closure to alleviate and manage fishing pressure on SA red grouper (SAFMC 2012e). ACLs/quotas have also been implemented in the commercial fishery and will be adjusted on annually based on the most recent data available (SAFMC 2012a), but the effectiveness of these new management measures is unclear.

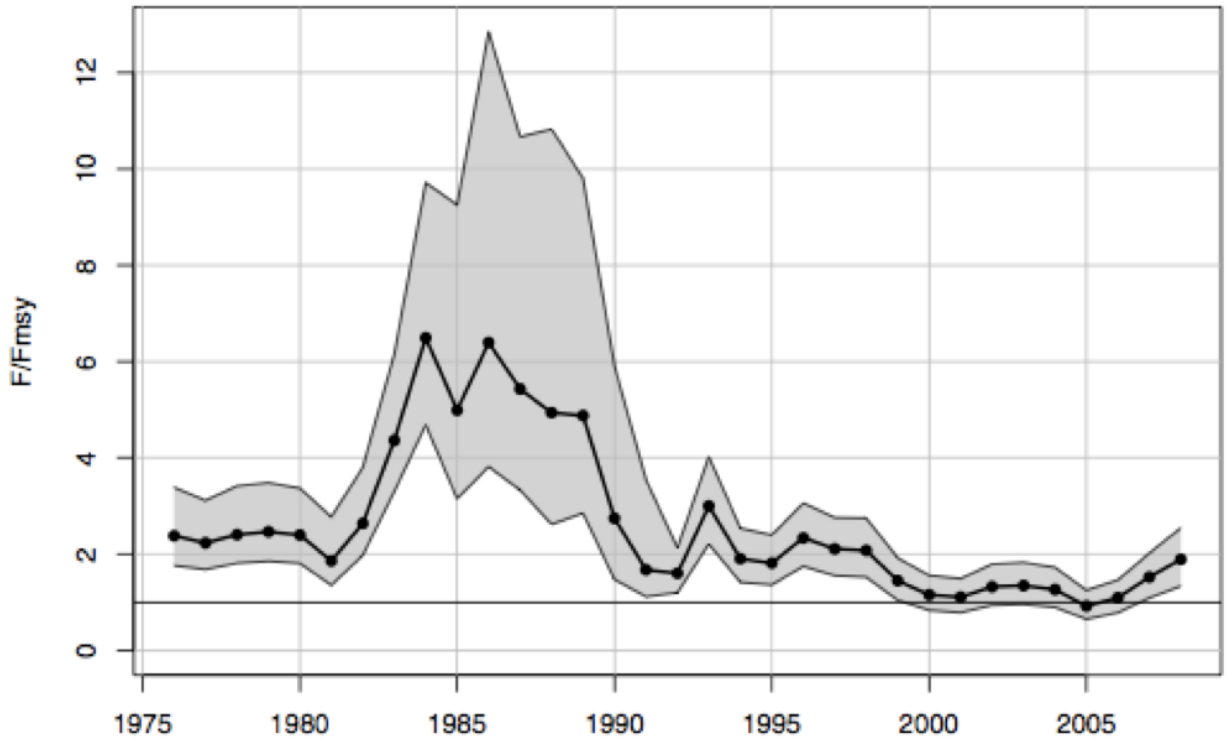

Figure 23. SA red grouper fishing mortality relative to F_{MSY} (horizontal lines). Gray error bands indicate 5th and 95th percentiles (Figure from SEDAR 2010a)

Snowy Grouper (SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
The FishBase vulnerability score for snowy grouper is 64.

Factor 2.2 Stock Status: High Concern

Key relevant information:
Snowy grouper are listed as vulnerable according to the IUCN Red List, based on an assessment conducted in 2008 (Thierry et al. 2008).

Detailed rationale:
A 2000 study conducted on the stock status of snowy grouper in the SA indicated an SPR ranging from 5% to 15% (Wyanski et al. 2000). Additional studies indicate that the distribution parameters for Atlantic snowy grouper are skewed. Wyanski et al. (Wyanski et al.) studied the Atlantic stock and found that the proportion of males has significantly decreased, with males comprising only 1% of the surveyed population in the 1990s. The study also found that the mean length of landed fish has decreased from 65-80 cm in the early 1980s to 50-60 cm in the mid 1990s (Wyanski et al. 2000). Long-term and short-term trends in biomass are unknown.

However, landings in the SA have exhibited declining long-term and stable short-term trends (Figure 24) (NMFS 2012c).

According to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), the SA stock of snowy grouper is considered overfished ($B_{current}$:B_{MSY} = 0.18) with overfishing occurring.

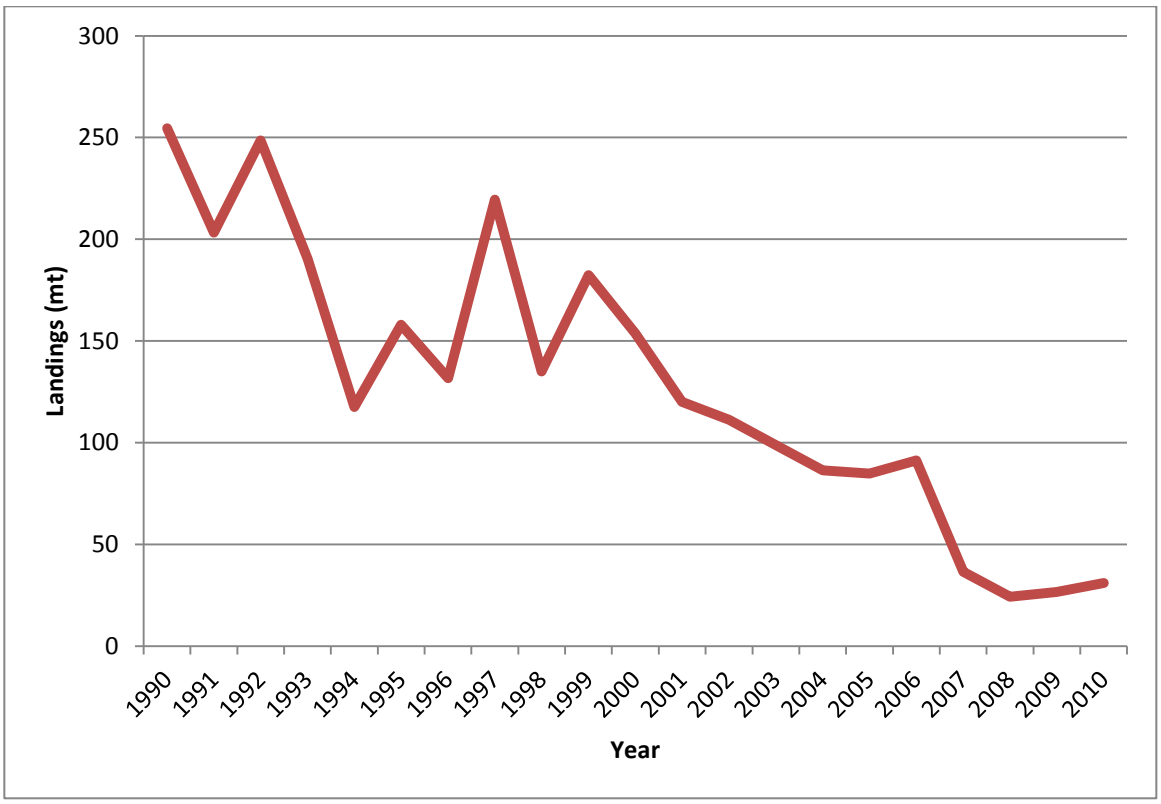

Figure 24. Snowy grouper landings for commercial fisheries in the SA (Data from NMFS 2012b)

Factor 2.3 Fishing Mortality: Moderate Concern

Key relevant information:
According to NOAA Fisheries' 2012 Third Quarter Report to Congress (NMFS 2012d), snowy grouper overfishing is occurring in the SA. However, it is unclear how much impact the SA snapper fisheries have on the mortality rate of snowy grouper.

Detailed rationale:
Snowy grouper in the SA are caught primarily with hydraulic/electric reel and handlines and, to a lesser extent, rod and reel. Between 2001 and 2005, landings of snowy grouper in the SA averaged 0.288 million pounds worth an average of more than half a million dollars (SAFMC 2009). Of commercial fishermen that landed at least one pound of snowy grouper, 1.41 million pounds of other species were also landed (SAFMC 2009). Although snowy grouper is often caught as a secondary source of revenue in vermilion snapper trips, only 9% of all trips using vertical line gear in the SA snapper grouper fishery landed snowy grouper (SAFMC 2009). Since there are no recent stock assessments for snowy grouper it is unclear what impact the SA

snapper grouper fishery has had on snowy grouper stocks.

Bluefin Tuna (SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
The FishBase vulnerability score for bluefin tuna is 82.

Factor 2.2 Stock Status: Very High Concern

Key relevant information:
B_{2007}:B_{MSY} = 0.57 (SCRS 2010) and bluefin tuna are listed as endangered by the IUCN (Collette 2011).

Factor 2.3 Fishing Mortality: Very Low Concern

Key relevant information:
Relative fishing mortality rate for Western Atlantic bluefin tuna is between 1.27 and 2.18. However, the SA snapper grouper handline fishery does not appear to be not a substantial contributor to the overall fishing pressure on Atlantic bluefin tuna (SAFMC 2009).

Detailed rationale:
Overfishing has been occurring for over 20 years on Atlantic bluefin tuna, with the current fishing mortality rate estimated at 1.27 under the low recruitment scenario and 2.18 under the high recruitment scenario (SCRS 2008). Stock assessments on Western Atlantic bluefin tuna indicate that heavy fishing in the 1960s and 1970s resulted in declines of Western Atlantic bluefin tuna (Sissenwine 1998). In some fisheries, such as the U.S. longline fishery in the GOM, the catch of large Atlantic bluefin tuna has declined since the mid-1990s (Diaz 2006). However, the snapper grouper handline fishery is not a large contributor to the decline. Bluefin tuna is caught by approximately 5% of snapper grouper fishermen in any given month and accounts for 1% of the total landings by weight in the SA snapper grouper fishery (SAFMC 2009, NOAA 2011a). More than 288,000 lbs. of tuna are caught as bycatch each year (NOAA 2011). It is unclear how much of that bycatch is attributed to the snapper fishery, but it is likely to be substantially less than the catch of the directed bluefin fishery.

Blacknose Shark (SA)

Factor 2.1 Inherent Vulnerability: High

Key relevant information:
The FishBase vulnerability score for blacknose shark of the small coastal shark complex is 70.

Factor 2.2 Stock Status: High Concern

Key relevant information:
Blacknose sharks are deemed as near threatened by the IUCN (Morgan 2009) and $B_{current}$:B_{MSY} is 0.43-0.64 {NMFS 2012d).

Detailed rationale:
Spawning stock fecundity (SSF) in 2005 relative to SSF_{MSY} was 0.48 indicating that the population is overfished (Figure 25)(SEDAR 2007, SEDAR 2011b). The population was assessed in 2006 as being at 25% of virgin levels since the 1950s (Figure 16)(Siegfried and Brooks 2007). Projections indicate that if there were zero fishing and bycatch mortality of blacknose sharks beginning in 2006, the stock would be expected to recover in 2019 (SEDAR 2007). If fishing mortality were reduced by 78% across all fisheries, the population could rebuild in 2027 (SEDAR 2007, NOAA 2009).

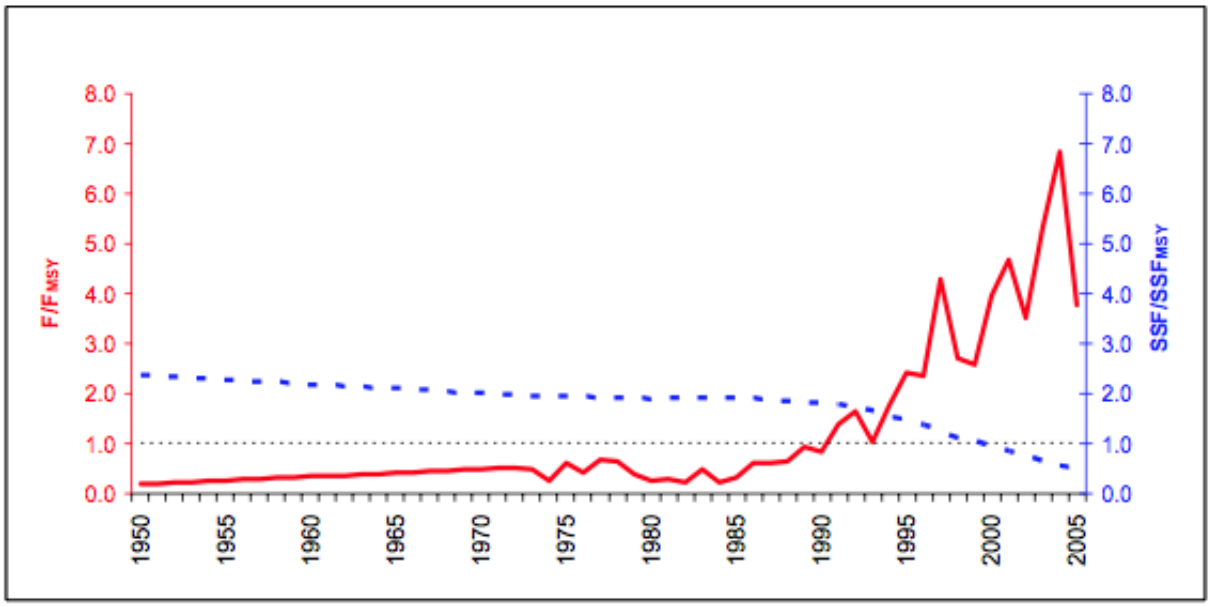

Figure 25. Estimated stock status (blue dashed line) and fishing mortality (red line) for blacknose sharks. SSF_{MSY} and F_{MSY} is the dashed line at 1.0. (Figure from SEDAR 2007)

Factor 2.3 Fishing Mortality: Very Low Concern

Key relevant information:
F_{2005}:F_{MSY} is 3.77 indicating that the SA blacknose shark population is currently experiencing overfishing. However, interactions in the SA snapper grouper vertical line fishery are rare (SAFMC 2009) and the fishery does not appear to be not a substantial contributor to the overall fishing pressure on blacknose sharks.

Detailed rationale:
Depending on the time of year, blacknose sharks are often targeted with GOM and SA snapper (NOAA 2007). These sharks have experienced increased fishing pressure since 1993 and were

deemed overfished in 1996 (Figure 25)(SEDAR 2007). Juveniles are regularly caught as shrimp trawl bycatch in the South Atlantic (Morgan 2009), but are not regularly caught in the vertical line fisheries (SAFMC 2009).

Factor 2.4 Overall Discard Rate

Key relevant information:
The discard to landings ratios for the snapper fisheries is as follows:

- South Atlantic:
  - Bottom Longline 1% (MRAG 2005)
  - Hydraulic/Electric Reel 1% (MRAG 2005)
  - Rod and Reel 1% (MRAG 2005)
  - Handline 1% (MRAG 2005)
- Gulf of Mexico
  - Bottom Longline 8.5% (MRAG 2005)
  - Hydraulic/Electric Reel 8.5% (MRAG 2005)
  - Rod and Reel 8.5% (MRAG 2005)
  - Handline 8.5% (MRAG 2005)

Detailed rationale:
The amount and quality of discard and bycatch data in the commercial SA, GOM, and imported fisheries are limited. The bulk of the discards are considered regulatory discards, which include fish that are too small to be retained or that are prohibited due to closures or quotas (Stephen and Harris 2010). Some of the stock assessments on domestic fisheries contain some discard data that are attributed to a single species rather than the whole fishery (SEDAR, 2010b). NOAA released a report on bycatch in 2011, however, the application of this report to determine discard rates in the fisheries is limited because the metrics used for discards (individuals) versus landings (pounds) are not comparable. Therefore, earlier reports have been used to determine or extrapolate discard rates for the commercial SA, GOM, and imported fisheries (Kelleher 2005, MRAG 2005).

Criterion 3: Management Effectiveness

Guiding Principle

- The fishery is managed to sustain the long-term productivity of all impacted species. Management should be appropriate for the inherent resilience of affected marine life and should incorporate data sufficient to assess the affected species and manage fishing mortality to ensure little risk of depletion. Measures should be implemented and enforced to ensure that fishery mortality does not threaten the long-term productivity or ecological role of any species in the future.

Summary

Fishery	**Management: Harvest Strategy** Rank (Score)	**Management: Bycatch** Rank (Score)	**Criterion 3** Rank (Score)
Vertical Line, Gulf of Mexico	Moderate Concern (3)	Moderate Concern (3)	Yellow (3)
Vertical Line, South Atlantic	Moderate Concern (3)	Moderate Concern (3)	Yellow (3)

Management of the U.S. fisheries is deemed a moderate concern because, while it has addressed diminishing stocks and regularly assesses red, vermilion, and yellowtail snapper stocks, fishery independent data are lacking and managers have not maintained stock productivity of red and vermilion snapper. Management of bycatch is also deemed a moderate concern since managers respond with regulatory action in regard to increases in mortality of co-caught and managed species such as gag grouper and snowy grouper, but data are lacking on the impact of the GOM and SA snapper fisheries on these stocks.

Justification of Ranking

Gulf of Mexico Vertical Line

Factor 3.1 Management of Fishing Impacts on Retained Species: Moderate Concern

Key relevant information:
Various attempts to control effort and improve the condition of red snapper stocks have been made through limited entry programs, gear restrictions, minimum size limits, area closures, quotas, closed areas and artificial reefs (Table 3)(GMFMC 2012b, Stephan et al. 2012).

Despite these efforts, there continue to be considerable debate over the science behind GOM red snapper management decisions and the status of the stocks (Cowan et al. 2010, Campbell et al. 2011). Conversely, management has been effective at managing other snapper stocks. Vermilion snapper showed signs of decline in 2001 but, after implementing a rebuilding plan and performing a new stock assessment in 2006 and assessment update in 2011, vermilion snapper may be improving (GMFMC 2004, SEDAR 2006a, 2011, GMFMC 2012b). Management appears to have maintained yellowtail snapper stocks (SEDAR 2005b, FWC 2012a).

Management Strategy and Implementation: **Moderately Effective**

Red, vermilion, and yellowtail snapper are managed as two separate stocks with management of these species divided between the GMFMC and the SAFMC. The GMFMC began managing these species in 1983 with the development of the Reef Fish Fishery Management Plan (FMP). The goal of the FMP was to rebuild declining fish stocks, improve quantity of data available, and address overcapitalization of the fisheries (GMFMC 1981). To accomplish these goals, managers have used limited entry programs, gear restrictions, minimum size limits, area closures, ACLs, quotas, accountability measures, IFQ programs, closed areas and artificial reefs (Table 3)(GMFMC 2012b, Stephan et al. 2012). While red snapper management has been met with a great deal of controversy, these management strategies appear to be benefiting vermilion and yellowtail snapper stocks (Cowan et al. 2010, Cowan 2011). The use of artificial reefs, in particular, as an effective tool to manage red snapper, is under debate (Shipp and Bortone 2009, Cowan et al. 2010, Campbell et al. 2011) and additional measures are needed to improve the condition of red snapper stocks. For example, managers tend to allow increases to fishing pressure during times of high catch rates while limiting it in leaner times, as evidenced by the GOM red snapper fishery (SEDAR 2009a, Cowan 2011, GMFMC 2011). Scientists suggest that fishery managers could improve stock recovery rates by limiting fishing effort so as to protect strong year classes until the abundance of older, more fecund fish are present in the stock (Cowan 2011). This argument indicates that perhaps quotas are not currently set at appropriate levels, especially for the GOM red snapper fishery.

Fishery/ Management Jurisdiction	Commercial Regulations
Red Snapper, GMFMC	**Min. Size Limit**: 13 in **Commercial Quota**: 4.121 MP **Gear Restrictions**: yes. non-stainless steel circle hooks must be used Venting tools must be used as necessary **Closures**: commercial fishery is closed after quota met; recreational closure from January 1- May 31 **Limited Entry Program:** yes **Other:** IFQ program, closed areas
Red Snapper, SAFMC	"Mini-seasons" may open as determined by the ACL when available.
Vermilion Snapper, GMFMC	**Min. Size Limit**: 10 in total length **Annual Catch Limit**: 3.42 MP (comm. and rec.) **Gear Restrictions**: yes **Closures**: after ACL is met **Limited Entry Program:** yes **Other:** closed areas
Vermilion Snapper, SAFMC	**Min. Size Limit**: 12 in **Quota**: yes. commercial is divided into two 6-month fishing seasons: 315,523 lbs. gutted Jan-Jun; 302,523 lbs. gutted Jul-Dec. **Gear Restrictions**: yes **Closures**: after quota is met **Limited Entry Program:** yes **Other:** 1,500 lb., gutted weight trip limit
Yellowtail Snapper, GMFMC	**Min. Size Limit**: 12 in **Annual Catch Limit**: 725,000 lbs. (com & rec) **Gear Restrictions**: yes. **Closures**: after ACL is met **Limited Entry Program:** yes
Yellowtail Snapper, SAFMC	**Min. Size Limit**: 12 in **Quota**: 1,596,510 lbs. **Gear Restrictions**: yes **Closures**: after the quota is met **Limited Entry Program:** yes **Other:** trip limits

Table 3. Commercial catch management measures for red, vermilion, and yellowtail snapper caught domestically (SEDAR 2003, NOAA 2010a, SAFMC 2010, 2012b).

Recovery of Stocks of Concern: Moderately Effective
The first GOM red snapper stock assessment, conducted in 1988, indicated that red snapper was significantly overfished, and determined that a 60%−70% reduction in fishing mortality would be required to rebuild the stock to the recommended SPR20% (SEDAR 2005a). Management responded in 1990 by establishing a quota of 2,268 mt (NMFS, GMFMC). In 1991, management established a target date of 2007 for the rebuilding of the stock (GMFMC 2012b). This date continued to be extended until 2001 when the target rebuild date was set at 2032, where it currently stands (GMFMC 2012b).

Since their establishment, GOM red snapper fisheries have regularly exceeded their allocated quotas (NMFS, 2012c). Historically, management has responded to landings in excess of their quota by implementing size limits, bag limits, and trip limits (SEDAR 2005a). While these management efforts were intended to rebuild stocks, they instead created a "derby-style" fishery, in which fishers race to catch as much red snapper as they can during the short fishing season (averaging 77 days from 1996 to 2003). According to Baker et al. (Baker et al. 1998), this resulted in "supply gluts, depressed prices, wasteful disposal of red snapper bycatch during the off-season, increased pressure on other reef fish, danger to fishers, and damage to the long-term viability of the stock." In 2007, an individual fishing quota (IFQ) program for red snapper was implemented to address these concerns (NOAA 2010b). The IFQ program abolished seasons and trip limits to allow commercial fishers to fill their quotas at the rate they see fit (NMFS 2010). Since the IFQ program was adopted in 2007, GOM red snapper landings have remained at or below the quota (NMFS 2012a).

In addition to the IFQ program, managers added Amendments 27 and 14 to the GOM reef fish and shrimp FMPs in an attempt to adhere to the 2032 target rebuilding date (GMFMC 2012a). These amendments reduced the minimum size of red snapper, required the use of non-stainless steel circle hooks, and aimed to reduce shrimp trawl bycatch mortality of red snapper with the use of time-area closures (GMFMC 2012b).

Managers have continued to use bycatch reduction techniques and artificial reefs as tools to rebuild red snapper stocks (Cowan et al. 2010). In 2012, NMFS mandated additional controls on the GOM and SA shrimp fisheries that should help reduce red snapper bycatch in shrimp trawls (Federal Register, 2012). Additionally, managers continue to place a great deal of value on the habitat created from artificial reefs (SEDAR 2005a, Shipp and Bortone 2009). The belief is that artificial reefs are an important source of red snapper recruits and they support snapper populations in the GOM (Shipp, 2009}. However, this belief is contested and some scientists disagree with management (Cowan et al. 2010, Campbell et al. 2011). Overfishing has recently ended in the red snapper fishery, but scientists are concerned that this is a result of the unusually strong year classes in 2004 and 2006 increasing the population size, and that unless quotas are set more conservatively, there is a risk of overfishing in the future as these strong year classes age out of the population (Cowan, pers. comm. 2013). Since management has a rebuilding plan in place, but the effectiveness of the plan is debatable, Seafood Watch® deems recovery of stocks of concern as moderately effective.

Scientific Research and Monitoring: Moderately Effective

Red, vermilion, and yellowtail snapper have been assessed at irregular intervals using the best available fishery dependent data (landings, CPUE, etc.) and fishery independent surveys, including visual surveys by the NMFS and the University of Miami, Southeast Area Monitoring and Assessment Program (SEAMAP) reef fish video surveys, SEAMAP ichthyoplankton surveys, and SEAMAP bottom trawl surveys (SEDAR 2003, 2005a, 2006a, 2009a). Vermilion and yellowtail snapper were recently assessed in 2011 and 2012, respectively, while red snapper in the GOM has been assessed approximately every 3-4 years (SEDAR 2005a, 2009a, 2012). In the 2009 GOM red snapper update assessment, NMFS bottom longline surveys were used for the first time. The data from these sources were used to determine biomass, fishing level targets, to provide estimates of relative stock abundance and structure, to provide predictions for future years, and to characterize uncertainties in estimates (SEDAR 2003, 2005a, 2006a, 2009a). The most recent assessment of red snapper used a continuity model that allowed streamlined comparisons between previous years while allowing new, better quality data to be incorporated into the assessment (SEDAR 2009a, Cowan 2011). However, the assessment also indicates that better and more abundant fishery independent data are needed (SEDAR 2009a). The stock assessments for vermilion and yellowtail snapper came to similar conclusions and recommended that additional fishery independent data be collected to better inform the assessments (SEDAR 2011, FWC 2012a). Because assessments are not regularly performed for each stock, and due to the uncertainty surrounding previous assessments and the lack of available fishery independent data, scientific research and monitoring for GOM vertical line fisheries is considered moderate.

Scientific Advice: Moderately Effective

Quotas in the GOM reef fish fishery are established based on scientific advice, but management in the GOM has a track record of exceeding quotas (Figure 8)(NMFS 2008b, 2012c). Stock assessments are performed through the Southeast Data, Assessment, and Review (SEDAR) process, which requires data reviews, assessment workshops, and assessment reviews before delivery to the GMFMC (SEDAR 2003, 2006a, 2009a, Cowan 2011). Regular assessments have been performed for red snapper while less frequent assessments are available for vermilion and yellowtail snapper. While managers have been generally known to follow the advice and recommendations in the stock assessments, there is debate over the recommended management measures (Cowan et al. 2010, Cowan 2011). Since management has been responsive to the scientific advice of the SEDAR process, despite continued debate in the scientific community, Seafood Watch® considers management's following of scientific advice to be moderately effective.

Enforcement: Highly Effective

Monitoring and enforcement of the reef fish fishery has improved over the years. Before 1993, only 20% of Florida's commercial vessels (reef fish permit holders) were required to provide logbook catch data; reporting is now mandatory (Porch and Cass-Calay 2001). Amendment 22

of the reef fish FMP mandated observer coverage in the reef fish fishery to monitor bycatch and discard rates (GMFMC 2004, Scott-Denton et al. 2011). More recently, an electronic reporting system was developed so that managers could track landings in real-time and respond more rapidly to overages in quotas (NMFS 2009, 2012a). Lastly, all vessels participating in the GOM reef fish fishery are required to have vessel monitoring systems (VMS) onboard to prevent the incidence of fishing in closed areas (NMFS 2007). Therefore, effectiveness of enforcement is deemed highly effective.

Track Record: Moderately Effective

Management has a mixed track record in regards to red, vermilion, and yellowtail management. Red snapper was first declared overfished in the 1980s and this condition continues despite various approaches and attempts to end overfishing and to rebuild the stock (SEDAR 2009a, Cowan 2011). Management has employed a variety of tools including IFQs, quotas, artificial reefs, size limits and area closures to improve the condition of the stock, but the effectiveness of these tools has been debated (Coleman et al. 2000, Nieland et al. 2007, Stephen and Harris 2010).

Vermilion snapper were characterized as overfished and undergoing overfishing in a 2001 assessment (GMFMC 2004, SEDAR 2006a). In response, the GMFMC established a rebuilding plan for GOM vermilion and established a quota (GMFMC 2004, SEDAR 2006a, GMFMC 2012a). The 2006 and 2011 stock assessments indicated that the stock had improved, and determined that the stock was neither overfished nor undergoing overfishing; however, the assessment relies on highly uncertain reference points and the stock is still considered to be experiencing overfishing by the NOAA Fisheries' 2012 Third Quarter Report to Congress (SEDAR 2006a, NMFS 2012d). While the 2011 stock assessment update recommended an increase in catch limits for GOM vermilion snapper, managers chose not to increase limits based on concerns expressed by fishermen (GMFMC 2013)

Empirical evidence from the 2012 stock assessment update indicates that yellowtail snapper are abundant and not experiencing overfishing (FWC 2012).

Due to these mixed results, management's track record is deemed moderate.

Stakeholder Inclusion: Highly Effective

Management decisions by the GMFMC are made through a public process that allows stakeholder engagement (GMFMC 2012a). Members of the public are permitted to observe council meetings and provide public testimony during meetings for which a final action is scheduled. The GMFMC draws upon the expertise of stakeholders, state and federal agencies, universities and the public, and request that they serve on advisory panels and committees. A calendar of meetings is posted on their website (http://www.gulfcouncil.org/council_meetings/index.php). Because the management process is transparent and includes stakeholder input, Seafood Watch® deems stakeholder inclusion as highly effective.

South Atlantic Vertical Line

Factor 3.1 Management of Fishing Impacts on Retained Species: Moderately Effective

Key relevant information:
The SAFMC employs a variety of management tools to improve declining stocks. Management has a mixed track record of improving and maintaining fish stocks. Red snapper are overfished and continue to experience overfishing despite a moratorium and, in recent years, extremely limited seasons on the fishery (SEDAR 2010b, NMFS 2012d, SAFMC 2012d). Vermilion snapper are overfished and overfishing may continue to occur despite management's attempts to control effort through quotas and trip limits (SEDAR 2008b, NMFS 2012d, 2012e, SAFMC 2012g). Conversely, yellowtail snapper appear to be underexploited with a maintained fishing pressure (SEDAR 2003, FWC 2012a). Assessments of vermilion and yellowtail fisheries are irregular and fishery independent data are wanting. Although logbook reporting is required in the SA snapper grouper fishery, electronic reporting has not yet been implemented, which inhibits managers ability to enforce quotas in a timely manner (SEDAR 2008b, SAFMC 2012b). For these reasons, management of SA vertical line fisheries that catch red, vermilion, and yellowtail snapper is considered moderate.

Management Strategy and Implementation: **Moderately Effective**
SAFMC began managing red, vermilion, and yellowtail snapper species in 1984 with the development of the snapper grouper FMP. The goal of the FMP is to rebuild declining fish stocks, improve quantity of available data, and address overcapitalization of the fisheries (SAFMC 1983). To accomplish these goals, managers have used limited entry programs, gear restrictions, minimum size limits, area closures, quotas, and trip limits (Table 3). Additionally, to reduce habitat loss and fishing mortality, the SAFMC prohibited the use of bottom longlines in depths shallower than 50 fathoms (SAFMC 2009). These management measures are deemed moderately effective because additional measures are needed, including increased protection of stocks of concern, processes for monitoring and conducting assessments outside irregular stock assessments, and further modification of rules to maintain stock productivity.

Recovery of Stocks of Concern: Moderately Effective
Vermilion snapper has been overfished since 1996 and despite a high level of uncertainty surrounding recent stock assessments, many believe that overfishing persists (SEDAR 2003, SAFMC 2008, SEDAR 2009a). To address these issues, SAFMC implemented Amendment 13 to the snapper grouper FMP that established an annual commercial fishing quota of 1.1 million pounds (SAFMC 2003). Although the quota was not exceeded in 2007, managers decreased the quota again in 2009 over concerns that overfishing was still occurring (SAFMC 2009, NMFS 2012c). Amendment 16 to the snapper grouper FMP decreased the quota to 315,523 lbs. gutted weight (January–June); 302,523 lbs. gutted weight (July–December) (SAFMC 2009). The quota was exceeded in 2010 by more than 315,000 lbs. (NMFS 2012c).

SA red snapper stocks continue to remain in a poor condition, despite the extreme measures taken by the SAFMC to improve the SA red snapper stock. A 2008 stock assessment indicated

that SA red snapper were overfished and that overfishing had been occurring (SEDAR 2008a). In 2009, the SAFMC closed the commercial and recreational SA red snapper fishery until further notice (NOAA 2010c) and awaited the results of the 2010 stock assessment. In 2010, red snapper were still considered to be overfished and undergoing overfishing (SEDAR 2010b). As a result, the fishery remained closed to all fishing (NOAA 2010c). Despite the fact that low numbers of older, more productive fish are still lacking in the stock, managers temporarily lifted the moratorium in 2012 and a commercial "mini-season" was opened with a quota set for 20,818lbs (NOAA 2010d, 2012, SAFMC 2012d). Managers plan to assess the fishery on a yearly basis using fishery- dependent and -independent data to modify the harvest limits and to ensure F does not exceed F_{MSY} (SAFMC 2012d). However, the impacts of the "mini-season" on the fishery are unknown.

While management should be improved for one stock of concern (red snapper), another stock of concern (vermilion snapper) may be improving. These factors contribute to a moderate rating for the SAFMC's management of stocks of concern.

Scientific Research and Monitoring: Moderately Effective

Red, vermilion, and yellowtail snapper are assessed sporadically using the best available fishery dependent data (landings, CPUE, etc.) and fishery independent surveys including visual surveys by the NMFS and the University of Miami, Marine Resources Monitoring, Assessment, and Prediction (MARMAP) fishery independent monitoring program (SEDAR 2003, 2008b). The data from these sources were used to determine biomass, fishing level targets, provide estimates of relative stock abundance and structure, provide predictions for future years, and characterize uncertainties in estimates (SEDAR 2003, 2008b). The most recent assessments use a forward projecting model that relies heavily on forecasts and projections, but there is a great deal of uncertainty associated with previous models (SEDAR 2003, 2010b, FWC 2012a, NMFS 2012e). Stock assessments for red, vermilion, and yellowtail snapper were last performed in 2010, 2012, and 2012, respectively (SEDAR 2010b, FWC 2012a, NMFS 2012e). All of these assessments recommended that additional fishery-independent data be collected to better inform the assessments (SEDAR 2003, 2008b, 2010b, FWC 2012a, NMFS 2012e). Since assessments are not regularly performed for each stock, and because of the uncertainty surrounding previous assessments and the lack of available fishery independent data, scientific research and monitoring for SA vertical line fisheries is considered moderate.

Scientific Advice: Highly Effective

Stock assessments are performed through the SEDAR process, which requires data reviews, assessment workshops, and assessment reviews before delivery to the SAFMC (SEDAR 2008b, 2010b, Cowan 2011). Regular assessments have been performed for red snapper and less frequent assessments are performed for vermilion and yellowtail snapper. Managers have been generally known to follow the advice and recommendations in the stock assessments (Cowan 2011). Therefore, Seafood Watch considers management's following of scientific advice to be highly effective.

Enforcement: Moderately Effective
A logbook reporting system began in the SA snapper grouper fishery in 1992 (SEDAR 2008b). The program is not yet electronic although SAFMC is in the process of considering whether to implement electronic logbook reporting (SAFMC 2012f). In 2010, the vermilion snapper quota was exceeded by more than 315,000 lbs. (SAFMC 2009, NMFS 2012c). Electronic reporting tools may have helped managers respond to catch limits quicker. Commercial observer coverage for the SA snapper grouper fishery is performed by the Southeast Fisheries Center (SEFC) observer program (Poffenberger 2004, NMFS 2012b). Effectiveness of enforcement is deemed moderate since there are some measures in place, but there is evidence that quotas have not been promptly enforced.

Track Record: Moderately Effective
Management has a mixed track record in regards to status of snapper stocks in the SA. Red snapper stocks are overfished and continue to experience overfishing despite management's efforts to improve stocks (SEDAR 2010b, NMFS 2012d). Vermilion was first declared overfished in 1996 (SEDAR 2003). Since then, biomass has continued to decline and overfishing has persisted (SEDAR 2003, 2008b). However, a new stock assessment indicates that the stock may be improving (NMFS 2012e). To date, management has used a variety of tools to improve vermilion snapper's population including limited entry programs, gear restrictions, minimum size limits, area closures, quotas, and trip limits. It is too early to ascertain the effectiveness of these tools on meeting their goals. On the other hand, there have been very few regulations placed on yellowtail snapper. The population appears to be maintained at a healthy level (SEDAR 2003, FWC 2012a). For these reasons Seafood Watch® considers management's track record to be moderate.

Stakeholder Inclusion: Highly Effective
The SAFMC meets four times a year. Public scoping meetings, public hearings, and public input at council meetings are carried out prior to final action on any proposed rule changes (SAFMC 2012e). The SAFMC draws upon the expertise of stakeholders, scientists, state and federal agencies, universities, and the public, and requests that they serve on advisory panels, the Scientific and Statistical Committee, and Stock Assessment Panels. A calendar of meetings is posted on their website (http://www.safmc.net/Meetings/CouncilMeetings/tabid/400/Default.aspx). Since the management process is transparent and includes stakeholder input, Seafood Watch® deems stakeholder inclusion as highly effective.

Factor 3.2 Management of Fishing Impacts on Bycatch Species

Key relevant information:
Observer programs and logbooks are in place to monitor bycatch mortality and interaction rates (GMFMC 2004, Poffenberger 2004, Scott-Denton et al. 2011, NMFS 2012b). Additional management measures are also in place to reduce mortality on bycatch species and highly

vulnerable co-caught managed species, including use of more selective fishing gear (SAFMC 2008, GMFMC 2009), seasonal closures (NMFS 2011), and quotas (GMFMC 2012a). Even with these programs in place, the degree of impact of the GOM snapper fisheries on gag grouper is unknown and the impacts of management on SA snowy grouper and red grouper are unknown. For these reasons, and due to the implementation of observer programs and the use of more selective fishing gear (GMFMC 2009, SAFMC 2012b), management of fishing impact on bycatch species in the GOM and SA is deemed a moderate concern.

Management Strategy and Implementation: Moderately Effective
The GMFMC and SAFMC are required by the Magnuson-Stevens Fishery Conservation Act to "minimize bycatch and bycatch mortality to the extent practical" (SAFMC 2008, GMFMC 2012a). Managers have taken measures to reduce bycatch and bycatch mortality through the use of selective gear, observer coverage, and seasonal closures. Snapper fisheries in the GOM and SA are required to use non-stainless steel circle hooks to increase survival of incidentally caught species and allow for selective catch of larger fish (SAFMC 2008, GMFMC 2009). Regulations also require the use of venting tools and dehooking devises to reduce discards, discard mortality, and the incidental catch of undersized fish.

In the GOM, fishery managers have limited gag grouper catch in both the commercial and recreational sectors to account for pressure on the stocks as a result of indirect catch (FWC 2012b, GMFMC 2012b). The impacts of these management measures are unknown until the fishery is reassessed at the end of 2013 (SEDAR 2012).

To improve red grouper stocks, the SAFMC put a moratorium on the commercial and recreational harvest of the species from January 1, 2012 until April 30, 2012 (NMFS 2011). It is unclear what management measures, if any, are in place to reduce snowy grouper bycatch aside from the establishment of ACLs and gear restrictions.

The effectiveness of management on the catch of GOM gag grouper, SA snowy grouper and SA red grouper are unknown. For these reasons, management strategies are moderate.

Scientific Monitoring and Research: Moderately Effective
In the last two decades, logbook reporting in the GOM has increased (Porch and Cass-Calay 2001). Amendment 22 of the GOM Reef Fish FMP mandated observer coverage in the reef fish fishery to monitor bycatch and discard rates (GMFMC 2004, Scott-Denton et al. 2011). Commercial observer coverage for the SA snapper grouper fishery is performed by the SEFC observer program (Poffenberger 2004, NMFS 2012b). Data collected from these programs are regularly analyzed and are the basis for various annual reports by managers. However, data indicating bycatch rates of incidental species within the red, vermilion, and yellowtail snapper fisheries in the GOM and SA is lacking. Therefore, Seafood Watch® considers scientific research and monitoring to be 'Moderate.'

Scientific Advice: Highly Effective

There is no indication that scientific advice is not followed.

Enforcement: Highly Effective

Logbook reporting, electronic reporting tools, the use of observers, VMS, and other tools in the GOM and SA have allowed mangers to enforce regulations in a timely manner (Poffenberger 2004, NMFS 2012b, SEDAR 2008b, GMFMC 2004, Scott-Denton et al. 2011).

Criterion 4: Impacts on the habitat and ecosystem

Guiding Principles

- The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.
- Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity.

Summary

Fishery	**Impact of gear on the substrate** Rank (Score)	**Mitigation of gear impacts** Rank (Score)	**EBFM** Rank (Score)	**Criterion 4** Rank (Score)
Vertical Line, Gulf of Mexico	Very Low Concern (4)	Minimal mitigation (0.25)	High Concern (2)	Yellow (2.92)
Vertical Line, South Atlantic	Very Low Concern (4)	Minimal mitigation (0.25)	High Concern (2)	Yellow (2.92)
Bottom Longline, Gulf of Mexico	Moderate Concern (2)	Moderate mitigation (0.5)	High Concern (2)	Yellow (2.24)
Bottom Longline, South Atlantic	Moderate Concern (2)	Moderate mitigation (0.5)	High Concern (2)	Yellow (2.24)

Vertical line gear in the GOM and SA including hydraulic/electric reel, rod and reel, and handlines, have a very low impact on the ecosystem and there have been some minimal measures implemented to mitigate the impacts of fishing through the implementation of MPAs that cover a very small representation of habitat including less than 0.5% in the GOM. Whether removal of snapper biomass has an effect on the ecosystem in general is questionable, but it is reasonable to assume there are moderate ecosystem effects associated with the volume of biomass removal (4,137 mt/year for GOM red snapper alone).

Justification

GOM and SA

Factor 4.1 Impact of the Fishing Gear on the Substrate: Very Low Concern

Key relevant information:
Red, vermilion, and yellowtail snapper are caught with vertical hook and line gear including hydraulic/electric reel, rod and reel, and handlines on hard bottom substrates in the SA and GOM (SAFMC 2009, Scott-Denton et al. 2011). These gear types contact the seafloor where red, vermilion, and yellowtail snapper are observed (SAFMC 2009, Scott-Denton et al. 2011).

Detailed rationale:
Fishing gear used to catch snapper in the GOM and SA is mainly hook and line based (rod/reel, handline, bandit gear, etc.), which, compared with more invasive trawling gears, shows minimal signs of impacting habitat (SAFMC 2009, Scott-Denton et al. 2011). Nearshore and inner shelf hard bottom habitat is important nursery and settlement habitat for a host of snapper species (SAFMC 2009). For this reason, most of the fishing for these species is performed over rocky substrates including rocky bottoms, coral, and artificial reefs (SAFMC 2009, Scott-Denton et al. 2011).

Factor 4.2 Modifying Factor: Mitigation of Fishing Gear Impacts: Minimal Mitigation

Key relevant information:
Managers have closed several areas in the GOM and SA to all fishing (NOAA 2011, GMFMC 2012a, SAFMC 2012b). Approximately 40% of the GOM is declared an MPA but, only 0.5% of GOM is closed to fishing (NOAA 2011). In the SA a small proportion of habitat in the SA has been closed to protect spawning aggregations and deep-water grouper species (SAFMC 2012c). These efforts have reduced the spatial footprint of fishing to a small degree, and, therefore the fishery is deemed to have 'Minimal Mitigation' measures in place.

Detailed rationale:
Various area closures have been established throughout the GOM and SA to protect spawning aggregation sites (Figures 26 and 27)(GMFMC 2012b). Areas include, but are not limited to, the Dry Tortugas off of Florida and the Florida Keys National Marine Sanctuary (NOAA 2011, GMFMC 2012a). These areas are part of a large network of 295 MPAs that cover 40% of the GOM and prohibit fishing in 0.5% of the GOM (NOAA 2011).

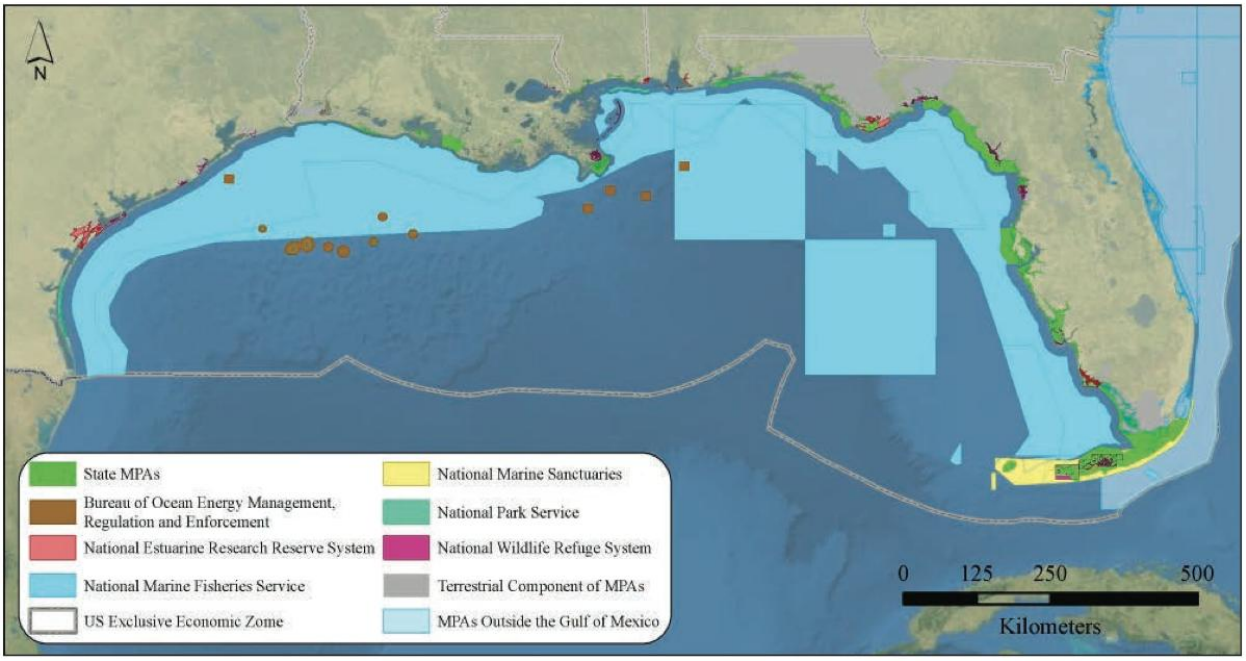

Figure 26. Map of marine protected areas in the GOM (Figure from NOAA 2011a)

Amendment 14 of the SA Snapper Grouper FMP established a network of 8 MPAs (SAFMC 2012e). The MPAs range in size from 2x4 nautical miles and 10x15 nautical miles off the coasts of North Carolina, South Carolina, Georgia, and Florida (Figure 26)(SAFMC 2012c) and are intended to provide protection for long-lived, deep-water snapper grouper species (SAFMC 2012c).

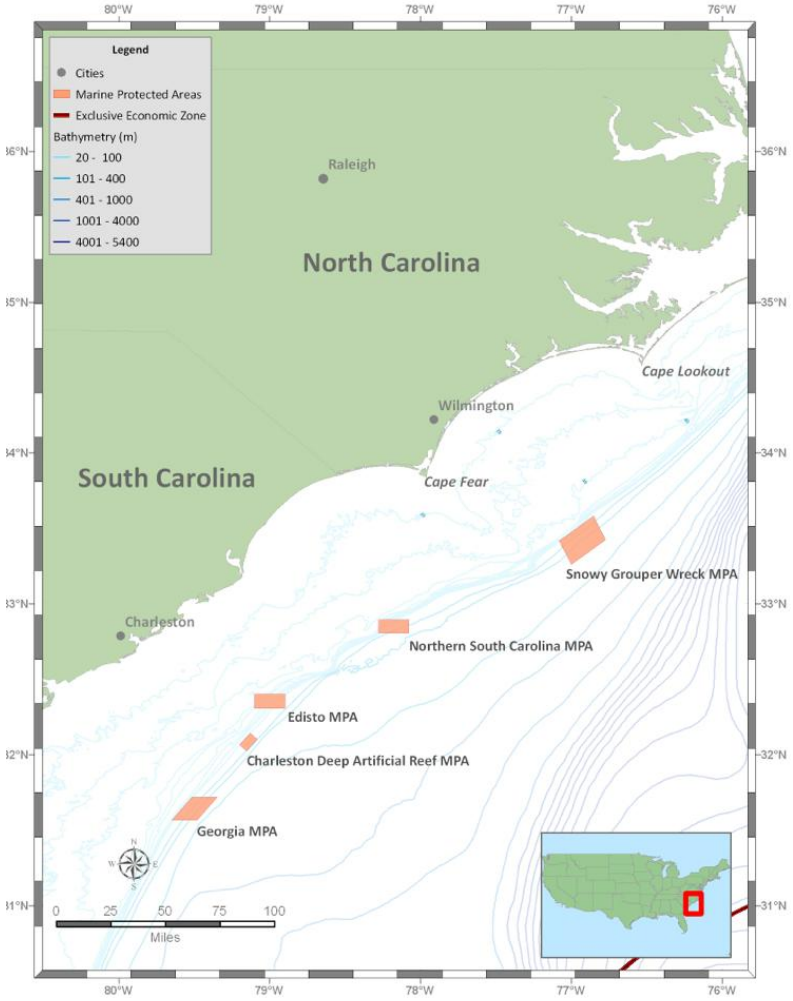

Figure 27. Map of the MPAs off the coast of North Carolina, South Carolina, and Georgia (Figure from SAFMC 2012b)

(NMFS 2012c)

Factor 4.3 Ecosystem and Food Web Considerations: High Concern

Key relevant information:

Although the ecosystem-level effects of reduced snapper biomass remain uncertain, a few studies that include other top predators also impacted by this fishery (e.g., groupers; Serranidae) provide evidence that reductions can have important direct and indirect impacts. For example, Stallings (2008) experimentally demonstrated that reduced abundances of an intensively fished predatory reef fish (Nassau grouper) resulted in a strong trophic cascade, with drastic negative effects on entire communities and populations of reef fishes. As management moves towards a more ecosystem-level approach, more researchers are calling for maintenance of the functional components (e.g., top level predators) of the food and interaction webs (NOAA 2012). Given their roles as top predators, it is possible that reduced biomass of snappers could have substantial impacts on the marine systems in which they live.

Managers have taken measures to improve and grow red, vermilion, and yellowtail snapper stocks through various management approaches (GMFMC 2012a, SAFMC 2012g) however, there is little understanding of trophic cascades associated with snapper fishing and little directed research on this issue. For these reasons, because snapper and other top predators caught in this fishery are considered “exceptional species” and there are no explicit efforts to incorporate their ecological role into management, management of the ecosystem and food web impacts of the fishery is deemed a high concern.

Overall Recommendation

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

- **Best Choice** = Final Score between 3.2 and 5, **and** no Red Criteria, **and** no Critical scores
- **Good Alternative** = Final score between 2.2 and 3.199, **and** Management is not Red, **and** no more than one Red Criterion other than Management, **and** no Critical scores
- **Avoid** = Final Score between 0 and 2.199, **or** Management is Red, **or** two or more Red Criteria, **or** one or more Critical scores

Stock	Fishery	Impacts on the Stock Rank (Score)	Impacts on Other Species Lowest scoring species Rank*, (Subscore, Score)	Manage-ment Rank (Score)	Habitat and Ecosystem Rank (Score)	Overall Recommendation (Score)
Red Snapper	Vertical Line, South Atlantic	Red (1.41)	Red Grouper, Red Snapper Red ((1.41,1.41))	Yellow (3)	Yellow (2.92)	**AVOID ((2.04))**
Red Snapper	Vertical Line, Gulf of Mexico	Yellow (2.71)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.45)**
Vermilion Snapper	Vertical Line, Gulf of Mexico	Green (3.83)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.68)**
Vermilion Snapper	Vertical Line, South Atlantic	Yellow (3.05)	Red Grouper, Red Snapper Red (1.41,1.41)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.48)**
Yellowtail Snapper	Vertical Line, Gulf of Mexico	Green (4.47)	Speckled Hind, Warsaw Grouper Red (1.53,1.53)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.78)**
Yellowtail Snapper	Vertical Line, South Atlantic	Green (4.47)	Red Grouper, Red Snapper Red (1.41,1.41)	Yellow (3)	Yellow (2.92)	**GOOD ALTERNATIVE (2.73)**

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Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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References

Aparicio, P., and R. Horn. 1999. Minority report in disagreement with the proposed Regulatory Amendment to the Gulf of Mexico Reef Fish Fishery Management Plan to Set 1999 Gag/Black Grouper Management Measures.: 4.

Baker, P., F. Cox, and P. Emerson. 1998. Managing the Gulf of Mexico Commercial Red Snapper Fishery. *in* Presented to the Committee to Review Individual Fishing Quotas Ocean Studies Board, National Research Council (NRC). New Orleans Louisiana. http://apps.edf.org/documents/550_RedSnapper.PDF.

Botsford, L., J. Castilla, and C. Peterson. 1997. The management of fisheries and marine ecosystems. . Science 277:509–515.

Buck, E. 1995. Atlantic bluefin tuna: international management of a shared resource.

Business, S. 1999. Seafood Handbook.

Campbell, M., K. Rose, K. Boswell, and J. Cowan, Jr. 2011. Individual-based modeling of an artificial reef fish community: Effects of habitat quantity and degree of refuge. Ecological Modelling:3895-3909.

CBD. 2010. Petition to list the Atlantic bluefin tuna (Thunnus thynnus) as Endangered under the United States Endangered Species Act. Center for Biological Diversity. 24 May 2010.

Charuau, A., K. Cochrane, D. Die, A. Larez, L. Marcano, T. Philips, S. Soomai, R. Souza, S. Wiggins, and M. IJspol. 2000. Regional assessment of red snapper, *Lutjanus purpureus*. Regional Reviews and National Management Reports - Fourth Workshop on the Assessment and Management of Shrimp and Groundfish Fisheries on the Brazil-Guianas Shelf. *in* FAO Fisheries Report. http://www.fao.org/DOCREP/003/Y1715E/y1715e05.htm - bm5.2.

Coleman, F. C., C. C. Koenig, G. R. Huntsman, J. A. Musick, A. M. Eklund, J. C. McGovern, G. R. Sedberry, R. W. Chapman, and C. B. Grimes. 2000. Long-lived Reef Fishes: The Grouper-Snapper Complex. Fisheries 25(3):14-21.

Collette, B., A. F. Amorim, A. Boustany, K. E. Carpenter, N. de Oliveira Leite Jr., A. Di Natale, D. Die, W. Fox, F. L. Fredou, J. Graves, F. H. Viera Hazin, M. Hinton, M. Juan Jorda, O. Kada, C. Minte Vera, N. Miyabe, R. Nelson, H. Oxenford, D. Pollard, V. Restrepo, J. Schratwieser, R. P. Teixeira Lessa, P. E. Pires Ferreira Travassos, and Y. Uozumi. 2011. Thunnus thynnus. *in* IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. www.iucnredlist.org.

Cowan, J., Jr. 2011. Red Snapper in the Gulf of Mexico and U.S. South Atlantic: Data, Doubt, and Debate. Fisheries 36:319-331.

Cowan, J., Jr, C. Grimes, W. Patterson, C. Walters, A. Jones, W. Lindberg, D. Sheehy, W. Pine, J. Powers, M. Campbell, K. Lindeman, S. Diamond, R. Hilborn, H. Gibson, and K. Rose. 2010. Red snapper management in the Gulf of Mexico: science- or faith-based? Reviews in Fish Biology and Fisheries 21:187-204. http://www.springerlink.com/content/8838622k166g7g43/.

Cowan, James, Jr. 2013. Professor, Department of Oceanography and Coastal Sciences, Louisiana State University. Personal communication with Robin Pelc.

Diaz, G., and S. Turner. 2006. Size frequency distribution analysis, age composition, and maturity for western bluefin tuna in the Gulf of Mexico from the U.S. (1981-2005) and Japanese (1975-1981) longline fleets.

F, M., J. Claverie, and A. Jernigan. 1999. Minority report asking you to modify or reject parts of the proposed Regulatory Amendment to the Gulf of Mexico Reef Fish Fishery Management Plan to Set 1999 Gag/Black Grouper Management Measures.: 5.

FAO. 2010. Report of the third FAO expert advisory panel for the assessment of proposals to amend appendices I and II of CITES concerning commercially-exploited aquatic species. Rome. 7-12 December 2009.

FDA. 2012. Regulatory Fish Encyclopedia. Accessed March 20, 2012. http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/RegulatoryFishEncyclopediaRFE/ucm088817.htm.

FishWatch. 2013. FishWatch- U.S. Seafood Facts. Accessed January 2, 2013. http://www.fishwatch.gov/index.htm.

Fogarty, M., R. Myers, and K. Bowen. 2001. Recruitment of cod and haddock in the North Atlantic: a comparative analysis ICES Marine Science Symposia 58:952–961.

Frimodt, C. 1995. Multilingual illustrated guide to the world's commercial coldwater fish.

FWC. 2012a. The 2012 Stock Assessment Report for Yellowtail Snapper in the South Atlantic and Gulf of Mexico. *in* F. F. a. W. C. Commission, editor., St. Petersburg, Florida. http://www.sefsc.noaa.gov/sedar/download/YTS_FWC_SAR.pdf?id=DOCUMENT.

FWC. 2012b. Gulf of Mexico Grouper Management. Accessed December 31, 2012. http://myfwc.com/fishing/saltwater/recreational/groupers/gulf-grouper/.

FWC. 2012c. Trends in Nesting by Florida Loggerheads. Accessed January 1, 2013. http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/.

GMFMC. 1981. Fishery Management Plan for the Reef Fish Fishery of the Gulf of Mexico. GMFMC, Tampa.

GMFMC. 2004. FINAL AMENDMENT 23 TO THE REEF FISH FISHERY MANAGEMENT PLAN TO SET VERMILION SNAPPER SUSTAINABLE FISHERIES ACT TARGETS AND THRESHOLDS AND TO ESTABLISH A PLAN TO END OVERFISHING AND REBUILD THE STOCK. Tampa, Florida. http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/VS 23 Oct Final 10-21-04 with Appendix E.pdf.

GMFMC. 2009. FINAL AMENDMENT 31 TO THE FISHERY MANAGEMENT PLAN FOR REEF FISH RESOURCES IN THE GULF OF MEXICO- ADDRESSES BYCATCH OF SEA TURTLES IN THE BOTTOM LONGLINE COMPONENT OF THE GULF OF MEXICO REEF FISH FISHERY. Tampa, FL. http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/Final Draft RF Amend 31 6-11-09.pdf.

GMFMC. 2011. REGULATORY AMENDMENT TO THE REEF FISH FISHERY MANAGEMENT PLAN TO SET 2011 TOTAL ALLOWABLE CATCH FOR RED SNAPPER. http://www.gulfcouncil.org/docs/amendments/Red Snapper 2011 Regulatory Amendment - 1-11.pdf.

GMFMC. 2012a. Reef Fish Management Plans. http://www.gulfcouncil.org/fishery_management_plans/reef_fish_management.php.

GMFMC. 2012b. Reef Fish Regulatory Amendments. Accessed 2012. http://www.gulfcouncil.org/fishery_management_plans/reef_fish_management_archives.php.

GMFMC. 2013. Gulf of Mexico Fishery Management Council. Accessed January 2, 2012. http://www.gulfcouncil.org/index.php.

Gomes, G., H. Schneider, M. Vallinoto, S. Santos, G. Orti, and I. Sampaio. 2008. Can Lutjanus purpureus (South red snapper) be “legally” considered a red snapper (Lutjanus campechanus)? Genetics and Microbiology 31:372-376. http://www.scielo.br/pdf/gmb/v31n1s0/35.pdf.

Grimes, C. B. 1978. Age ,growth, and length relationship of vermilion snapper, Rhomboplites aurorubens, from North Carolina and South Carolina from North Carolina and South Carolina waters. Trans. Am. Fish. Soc 107.

Haby, M., R. Miget, L. Falconer, and G. Graham. 2003. A review of current conditions in the Texas shrimp industry, an examination of contributing factors, and suggestions for remaining competitive in the global shrimp market. Tex. A&M Univ. Sea Grant Coll. Rep. TAMU-SG-03-701, 26 p.

Hart, R., J. Nance, and J. Primrose. 2012. The U.S. Gulf of Mexico Pink Shrimp, Farfantepenaeus duorarum, Fishery:

50 Years of Commercial Catch Statistics. Marine Fisheries Review 74(1). http://spo.nmfs.noaa.gov/mfr741/mfr7411.pdf.

Hartman, K., and F. Margraf. 2003. U.S. Atlantic coast striped bass: issues with a recovered population Fisheries Management and Ecology 10:309–312.

IUCN. 2012. Green Turtle (Chelonia mydas). http://iucn-mtsg.org/about-turtles/species/green/.

Keithly, W., and K. Roberts. 2000. Economics: contrast with wild catch fisheries. *in* R. R. Stickney, editor. Encyclopedia of aquaculture. John Wiley & Sons, Inc. p. 261-277, NY.

Kelleher, K. 2005. Discards in the World's Marine Fisheries: An Update. *in* FAO FISHERIES TECHNICAL PAPER 470. http://www.fao.org/docrep/008/y5936e/y5936e00.htm.

Koenig, C., and R. Chapman. 1999. The effects of shelf-edge fishing on the demographics of the gag, Mycteroperca microlepis, population of the southeastern United States, Institute for Fishery Ecology, Florida State University.

Lessard, K. 1999. Minority report in disagreement with the proposed Regulatory Amendment to the Gulf of Mexico Reef Fish Fishery Management Plan to Set 1999 Gag/Black Grouper Management Measures.: 4.

Linton, B. 2011. Population projections for Gulf of Mexico red snapper with preliminary 2011 landings estimates. Accessed January 1, 2013. ftp://ftp.gulfcouncil.org/Archived%20meetings/AP%20meetings/Red%20Snapper%20AP%20meeting%20-%202012%20-%2001/04a.%20Updated%20red%20snapper%20projections%2012-28-2011-REVISED.pdf.

Ludwig, D., R. Hilborn, and C. Walters. 1993. Uncertainty, resource exploitation, and conservation: lessons from history. Science 260:17,36.

Manooch, C. S. I. 1987. Age and growth of snappers and groupers. *in* P. J.J. and R. S., editors. Tropical snappers and groupers: biology and fisheries management. Ocean Resour. Mar. Policy Ser. Westview Press, Inc., Boulder and London.

Morgan, M., J. Carlson, P. M. Kyne, and R. Lessa. 2009. Carcharhinus acronotus. *in* IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. http://www.iucnredlist.org/apps/redlist/details/161378/0.

MRAG. 2005. Wasted Resources: Bycatch and discards in U. S. Fisheries. MRAG Americas, Inc. For Oceana.

Ng Wai Chuen & Huntsman, G. (Grouper & Wrasse Specialist Group) 2006a. *Epinephelus drummondhayi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 07 January 2013.

Ng Wai Chuen & Huntsman, G. (Grouper & Wrasse Specialist Group) 2006b. *Hyporthodus nigritus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 07 January 2013.

Nieland, D., A. Fisher, M. J. Basker, and C. I. Wilson. 2007. Red snapper in the northern Gulf of Mexico: age and size compo- sition of the commercial harvest and mortality of regulatory discards. *in* W. I. Patterson, J. J. Cowan, G. Fitzhugh, and D. Nieland, editors. Red snapper ecology and fisheries in the U.S. Gulf of Mexico, p. 301– 310. Am. Fish. Soc. Symp. 60, Bethesda, Md.

NMFS. 2004. Status of Bycatch Reduction Device (BRD) Performance and Research in North-Central and Western Gulf of Mexico. SEDAR 7 SEDAR7-DW-38.

NMFS. 2007. Vessel Monitoring System Program. Gulf of Mexico Commercial Reef Fish- Frequently Asked Questions. Accessed January 2, 2013. http://sero.nmfs.noaa.gov/vms/VMSFAQs041707_2.pdf.

NMFS, and USFWS. 2007. GREEN SEA TURTLE (CHELONIA MYDAS): 5-YEAR REVIEW: SUMMARY AND EVALUATION. http://www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5yearreview.pdf.

NMFS. 2008a. 2007 Annual Red Snapper IFQ Program Report. Accessed 2008. http://sero.nmfs.noaa.gov/sf/pdfs/2007 Annual Red Snapper IFQ Rep ort%20Oct%208%202008.pdf.

NMFS. 2008b. Gulf of Mexico Red Snapper Frequently Asked Questions March 2008. Accessed 2012. http://sero.nmfs.noaa.gov/sf/pdfs/red snapper general FAQs 032508.pdf.

NMFS. 2009a. Gulf of Mexico Red Snapper. *in* Catch Share Spotlight No. 6. http://www.nmfs.noaa.gov/sfa/domes_fish/catchshare/docs/gom_redsnapper.pdf.

NMFS. 2009b. Endangered Species Act – Section 7 consultation on the continued authorization of reef fish fishing under the Gulf of Mexico Reef Fish Fishery Management Plan and Proposed Amendment 23. Biological Opinion, February 15.

NMFS. 2010. Gulf of Mexico Red Snapper: Fequently Asked Questions. http://sero.nmfs.noaa.gov/sf/pdfs/red snapper general FAQs 032410.pdf.

NMFS. 2011a. Reminder of Seasonal Closure for Shallow Water Grouper in the South Atlantic. *in* Southeast Fishery Bulletin. NMFS, St. Petersburg, FL. http://www.safmc.net/LinkClick.aspx?fileticket=mnZ%2b83bmmc8%3d&tabid=313.

NMFS. 2011b. Status review report of Atlantic Bluefin Tuna (Thunnus thynnus). http://www.nmfs.noaa.gov/stories/2011/05/docs/bft_srr_final.pdf.

NMFS. 2012a. Gulf of Mexico 2011 Red Snapper Individual Fishing Quota Annual Report. *in* S. F. S. C. National Marine Fisheries Service, editor., St. Petersburg, FL. http://sero.nmfs.noaa.gov/sf/ifq/2011_RS_AnnualReport_Final.pdf.

NMFS. 2012b. National Observer Program. Accessed March 20, 2012. http://www.st.nmfs.noaa.gov/st4/nop/.

NMFS. 2012c. NMFS Commercial Fishery Landings Data. http://www.st.nmfs.noaa.gov/st1/commercial/index.html.

NMFS. 2012d. Status of U.S. Fisheries. http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm.

NMFS. 2012e. Stock Assessment of Vermilion Snapper off the Southeastern United States: SEDAR Update Assessment.

NMFS. 2012f. U.S. Foreign Trade. NOAA Fisheries: Office of Science and Technology. Accessed March 20, 2012. http://www.st.nmfs.noaa.gov/st1/trade/index.html.

NOAA. 2007. CHARACTERIZATION OF THE SHARK BOTTOM LONGLINE FISHERY: 2007. Panama City, FL. http://www.sefsc.noaa.gov/turtles/TM_564_Hale_etal.pdf.

NOAA. 2009. NOAA Proposes Measures to Rebuild Blacknose and Other Shark Populations. http://www.noaanews.noaa.gov/stories2009/20090724_sharks.html.

NOAA. 2010a. Gulf of Mexico 2010 Red Snapper Individual Fishing Quota Annual Report. Accessed March 20, 2012. http://sero.nmfs.noaa.gov/sf/pdfs/2010_RS_AnnualReport_Final 10-28-11.pdf.

NOAA. 2010b. Gulf of Mexico Red Snapper Frequently Asked Questions, March 2010. http://sero.nmfs.noaa.gov/sf/pdfs/red snapper general FAQs 032410.pdf.

NOAA. 2010c. Interim Rule for South Atlantic Red Snapper: Frequently Asked Questions, May 2010. Accessed March 20, 2012. http://sero.nmfs.noaa.gov/sf/pdfs/Extension_Red_Snapper_FAQs _051810.pdf.

NOAA. 2010d. NOAA Extends Fishing Ban for South Atlantic Red Snapper, Area closure to prevent snapper bycatch temporarily delayed. *in* National Oceania and Atmospheric Administration. NOAA. http://www.noaanews.noaa.gov/stories2010/20101203_redsnapper.html.

NOAA. 2011a. U.S. National Bycatch Report, First Edition. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-F/SPO-117C, 508 p. http://www.nmfs.noaa.gov/by_catch/bycatch_nationalreport.htm.

NOAA. 2011b. Snapshot of Gulf of Mexico MPAs. Accessed March 20, 2012. http://www.mpa.gov.

NOAA. 2012a. NOAA briefly opens red snapper fishing in South Atlantic: Agency sets limited recreational and commercial seasons for September 2012. NOAA,

NOAA. 2012b. NOAA increases Gulf of Mexico red snapper catch limit: Population rebounds as overfishing ends. Accessed January 1, 2013. http://www.noaanews.noaa.gov/stories2012/20120529_redsnapper.html.

NOAA. 2012c. Leatherback Turtle (Dermochelys coriacea). Accessed May 8, 2012. http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm.

NOAA. 2012d. Green Sea Turtle (Chelonia mydas). Accessed May 8, 2012. http://www.nmfs.noaa.gov/pr/species/turtles/green.htm.

NOAA Fisheries Service. 2012. 2012 Recreational Red Snapper Quota Closure Analysis. SERO-LAPP-2012-01 .April 12, 2012 http://sero.nmfs.noaa.gov/sf/GrouperSnapperandReefFish.htm.

Poffenberger, J. 2004. A Report on the Discard Data from the Southeast Fisheries Science Center's Coastal Fisheries Logbook Program.

Porch, C., and S. Cass-Calay. 2001. Status of the vermilion snapper fishery in the Gulf of Mexico., 75 Virginia Beach Dr., Miami FL 33149-1099. http://www.sefsc.noaa.gov/PDFdocs/as2001verm.pdf.

Richards, R., and D. Deuel. 1987. Atlantic striped bass: stock status and the recreational fishery Marine Fisheries Review 49:58–66.

Rivas, L. 1966. Snappers of the western Atlantic. Commercial Fisheries Review 32(1):41-44.

SAFMC. 1983. Fishery Management Plan, Regulatory Impact Review, and Final Environmental Impact for the Snapper Grouper Fishery of the South Atlantic Region. http://www.safmc.net/Portals/6/Library/FMP/SnapGroup/SnapGroupFMP.pdf.

SAFMC. 1991. Amendment Number 4, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Managment Plan for the Snapper Grouper Fishery of the South Atlantic. Charleston, NC. http://www.safmc.net/Portals/6/Library/FMP/SnapGroup/SGAmend4.pdf.

SAFMC. 2003. AMENDMENT 13A TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION INCLUDING AN ENVIRONMENTAL ASSESSMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, REGULATORY IMPACT REVIEW AND SOCIAL IMPACT ASSESSMENT/ FISHERY IMPACT STATEMENT. *in*, Charleston, SC. http://www.safmc.net/Library/SnapperGrouper/tabid/415/Default.aspx.

SAFMC. 2008. FINAL SNAPPER GROUPER AMENDMENT 16 (GAG AND VERMILION SNAPPER) INCLUDING A FINAL ENVIRONMENTAL IMPACT STATEMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, FINAL REGULATORY IMPACT REVIEW, AND FINAL SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT. North Charleston, South Carolina. http://www.safmc.net/Portals/6/Library/FMP/SnapGroup/SnapGroupAmend16FINAL.pdf.

SAFMC. 2009. 5.2.2 Snapper Grouper. *in* NOAA, editor. FISHERY ECOSYSTEM PLAN OF THE SOUTH ATLANTIC REGION, VOLUME III: SOUTH ATLANTIC HUMAN AND INSTITUTIONAL ENVIRONMENT, North Charleston, SC. http://www.safmc.net/Portals/0/FEP/VolIII_SG fishery description.pdf.

SAFMC. 2010. Amendment 17a to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Final Environmental Impact Statement, Initial Regulatory Flexibility Act Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement. http://www.safmc.net/Portals/6/Library/FMP/SnapGroup/Amend17Afinal071910.pdf.

SAFMC. 2011. Amendment 24 to the Snapper Grouper Fishery Management Plan of the South Atlantic Region with Environmental Assessment, Initial Regulatory Flexibility Act Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement. *in*. http://www.safmc.net/Library/SnapperGrouper/tabid/415/Default.aspx.

SAFMC. 2012a. Amendment 24 to the Snapper Grouper Fishery Management Plan of the South Atlantic Region: Red Grouper Rebuilding Plan. Accessed December 28, 2012. http://www.safmc.net/LinkClick.aspx?fileticket=nln%2bCSli5Uk%3d&tabid=415.

SAFMC. 2012b. Federal Fishing Regulations for South Atlantic Waters. Accessed March 20, 2012. http://www.safmc.net/FishIDandRegs/RegulationsbySpecies/tabid/248/Default.aspx.

SAFMC. 2012c. MPA Information Page. Accessed March 20, 2012. http://www.safmc.net/MPAInformationPage/tabid/469/Default.aspx.

SAFMC. 2012d. News Release: Council Requests Emergency Rule to Allow Red Snapper Harvest This Year. Limited harvest proposed through recreational three-day weekends and commercial mini-season. *in* SAFMC, editor.

SAFMC. 2012e. Reef Fish Management Plans. http://www.gulfcouncil.org/fishery_management_plans/reef_fish_management.php.

SAFMC. 2012f. SAFMC Options Paper March 2012- Comprehensive Ecosystem-Based Amendment 3. http://www.safmc.net/LinkClick.aspx?fileticket=MprlZe3PJNI%3D&tabid=725.

SAFMC. 2012g. Snapper Grouper. http://www.safmc.net/Library/SnapperGrouper/tabid/415/Default.aspx.

Sarti Martinez, A. 2012. Dermochelys coriacea. *in* IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. http://www.iucnredlist.org/apps/redlist/details/6494/0.

Schirripa, M., and C. Legault. 1999. Status of red snapper in US waters of the Gulf of Mexico updated through 1998. Sustainable Fisheries Division, Miami Laboratory, National Marine Fisheries Service, Miami FL. https://grunt.sefsc.noaa.gov/P_QryLDS/download/SFD76_SFD-99_00-75A.pdf?id=LDS.

Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, D. Kinsella, J. Pulver, R. Smith, and J. Williams. 2011. Descriptions of the U.S. Gulf of Mexico Reef Fish Bottom Longline and Vertical Line Fisheries Based on Observer Data. Marine Fisheries Review 73(2).

SCRS. 2008. Report of the 2006 Atlantic Bluefin Tuna Stock Assessment Session. International Commission for the Conservation of Atlantic Tunas Standing Committee on Research and Statistics. *in* Madrid, Spain. September 29-October 3, 2008, 238 pp. http://www.iccat.int/Documents/SCRS/DetRep/DET_BFT_EN.pdf.

SCRS. 2010. Report of the 2008 Atlantic Bluefin Tuna Stock Assessment Session. . Madrid, Spain. http://www.iccat.es/Documents/Meetings/Docs/2010_BFT_ASSESS_REP_ENG.pdf.

Secor, D. 2000. Longevity and resilience of Chesapeake Bay striped bass ICES Journal of Marine Science 57:808–815.

SEDAR. 2003. SEDAR 3- Stock Assessment Report 1- Yellowtail Snapper in the Southeastern United States. http://www.sefsc.noaa.gov/sedar/download/SEDAR3_SAR1_Final.pdf?id=DOCUMENT.

SEDAR. 2005a. SEDAR 07- Gulf of Mexico Red Snapper Assessment Report. http://www.sefsc.noaa.gov/sedar/download/S7SAR_FINALreduce.pdf?id=DOCUMENT.

SEDAR. 2005b. SEDAR 08A- Stock Assessment Report 1- Caribbean Yellowtail Snapper. http://www.sefsc.noaa.gov/sedar/download/S8SAR1_CaribYTSfinal.pdf?id=DOCUMENT.

SEDAR. 2006a. SEDAR 9- Stock Assessment Report- Gulf of Mexico Vermilion Snapper. http://www.sefsc.noaa.gov/sedar/download/S9SAR3 VS full 2.pdf?id=DOCUMENT.

SEDAR. 2006b. SEDAR 10: Stock Assessment Report- Gulf of Mexico Gag Grouper. SouthEast Data, Assessment, and Review.

SEDAR. 2006c. SEDAR 10: Stock Assessment Report- Atlantic Gag Grouper. SouthEast Data, Assessment

and Review.
SEDAR. 2007. SEDAR 13: Stock Assessment Report- Small Coastal Shark Complex, Atlantic Sharpnose, Blacknose, Bonnethead, and Finetooth Shark. Silver Spring, MD. http://www.sefsc.noaa.gov/sedar/download/SAR_complete_2.pdf?id=DOCUMENT.
SEDAR. 2008a. SEDAR 15- Stock Assessment Report 1 (SAR 1) South Atlantic Red Snapper. North Charleston, SC. http://www.sefsc.noaa.gov/sedar/download/S15 SAR 1 Revised 3-09.pdf?id=DOCUMENT.
SEDAR. 2008b. SEDAR 17- Stock Assessment Report- South Atlantic Vermilion Snapper. *in* SEDAR, editor. http://www.sefsc.noaa.gov/sedar/download/S17 VS SAR 2.pdf?id=DOCUMENT.
SEDAR. 2009a. SEDAR 7 Update- Stock Assessment of Red Snapper in the Gulf of Mexico: SEDAR Update Assessment. http://www.sefsc.noaa.gov/sedar/download/Red Snapper Update 2009 5.0.pdf?id=DOCUMENT.
SEDAR. 2009b. Stock Assessment of Gag in the Gulf of Mexico. *in*, Miami, Florida.
SEDAR. 2010a. SEDAR 19: Stock Assessment Report- South Atlantic Red Grouper. North Charelston, SC. http://www.sefsc.noaa.gov/sedar/download/Red_grouper_SAR_FINAL.pdf?id=DOCUMENT.
SEDAR. 2010b. SEDAR 24: Stock Assessment Report- South Atlantic Red Snapper. http://www.sefsc.noaa.gov/sedar/download/SEDAR 24_SAR_October 2010_26.pdf?id=DOCUMENT.
SEDAR. 2011a. SEDAR 9 Update Stock Assessment Report: Gulf of Mexico Vermilion Snapper.
SEDAR. 2011b. SEDAR 21- Stock Assessment Report: HMS Atlantic Blacknose Shark. SEDAR. http://www.sefsc.noaa.gov/sedar/download/Atl_Blacknose_SAR.pdf?id=DOCUMENT.
SEDAR. 2012. SouthEast Data, Assessment, and Review. Accessed 2012. http://www.sefsc.noaa.gov/sedar/.
SEDAR. 2013. SEDAR 31 – Gulf of Mexico Red Snapper Stock Assessment Report. SEDAR, North Charleston SC. 1103 pp. Available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=31
Shipp, R. L., and S. A. Bortone. 2009. A Prospective of the Importance of Artificial Habitat on the Management of Red Snapper in the Gulf of Mexico. Reviews in Fisheries Science 17:41-47.
Siegfried, K., and Brooks. 2007. Assessment of Blacknose, Bonnethead, and Atlantic Sharpnose Sharks with a State- Space, Age-Structured Production Model. Southeast Data, Assessment, and Review Document 13-AW-03. Panama City, Florida.
Sissenwine, M., P. Mace, J. Powers, and G. Scott. 1998. A commentary on Western Atlantic bluefin tuna assessments. Trans. Am. Fish. Soc 127:838-855.
Stephan, D., B. Dansby, H. Osburn, G. Matlock, R. Riechers, and R. Rayburn. 2012. Texas Artificial Reef Fishery Management Plan. Accessed March 20, 2012. http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_pl_v3400_0332.pdf.
Stephen, J. A., and P. J. Harris. 2010. Commercial catch composition with discard and immediate release mortality proportions off the southeastern coast of the United States. Fisheries Research 103:18-24.
Sundermeyer, M., B. Rothschild, and A. Robinson. 2005. Using commercial landings data to identify environmental correlates with distributions of fish stocks. Fisheries Oceanography 14:47–63.
TEWG. 2009. A Report of the Turtle Expert Working Group: AN ASSESSMENT OF THE LOGGERHEAD TURTLE POPULATION IN THE WESTERN NORTH ATLANTIC OCEAN. Miami, FL.
Thierry, C., Y. Sadovy, J. H. Choat, A. A. Bertoncini, L. H. Rocha, B. Ferreira, and M. Craig. 2008. Hyporthodus nigritus. *in* I. V. 2011.2, editor. IUCN Red List of Threatened Species. http://www.iucnredlist.org/apps/redlist/details/7861/0.
TP&W. 2002. The Texas Shrimp Fishery- A Report to the Governor and the 77th Legislature. http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_rp_v3400_857.pdf.

Watson, J. 2001. BRD effectiveness. National Marine Fisheries Service. Pascagoula Laboratory, PO Drawer 1207, Pascagoula, MS 39567-4112.

Wilson, C., and D. Nieland. 2001. Age and growth of red snapper, Lutjanus campechanus, from the northern Gulf of Mexico off Louisiana. Fishery Bulletin 99:653-664. http://fishbull.noaa.gov/994/wil.pdf.

Wyanski, D. M., W. D.B., and C. A. Barans. 2000. Growth, population age structure, and aspects of the reproductive biology of snowy grouper, Ephinephelus niveatus , off North Carolina and South Carolina. Fishery Bulletin 98:199-218.

Appendix A: Review Schedule

An SA red snapper benchmark stock assessment is scheduled for 2014. The SA red snapper management continues to change regularly. It is unclear when a new mini-season will be established. Therefore, periodic review of the SAFMC website is highly recommended.

The impacts of the Deepwater Horizon oil spill on snapper and other GOM fisheries will be assessed in 2013. Additional information can be found at: http://www.noaa.gov/deepwaterhorizon/publications_factsheets/index.html

A GOM gag grouper stock assessment is scheduled to be completed by the end of 2013.

The GMFMC and SAFMC will continue to monitor and reduce bycatch. As plans are developed they will be made available at: http://www.gulfcouncil.org/ and http://www.safmc.net/.

About Seafood Watch®

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

Disclaimer

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Guiding Principles

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished1 or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following **guiding principles** illustrate the qualities that capture fisheries must possess to be considered sustainable by the Seafood Watch program:

- *Stocks are healthy and abundant.*
- *Fishing mortality does not threaten populations or impede the ecological role of any marine life.*
- *The fishery minimizes bycatch.*
- *The fishery is managed to sustain long-term productivity of all impacted species.*
- *The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.*
- *Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts, or reduction of genetic diversity.*

Based on these guiding principles, Seafood Watch has developed a set of four sustainability **criteria** to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Impacts on the species/stock for which you want a recommendation
2. Impacts on other species
3. Effectiveness of management
4. Habitat and ecosystem impacts

Each criterion includes:

- Factors to evaluate and rank
- Evaluation guidelines to synthesize these factors and to produce a numerical score
- A resulting numerical score and **rank** for that criterion

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

Best Choices/Green: Are well managed and caught or farmed in environmentally friendly ways.

1 "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates.

Good Alternatives/Yellow: Buy, but be aware there are concerns with how they're caught or farmed.

Avoid/Red: Take a pass on these. These items are overfished or caught or farmed in ways that harm other marine life or the environment.