

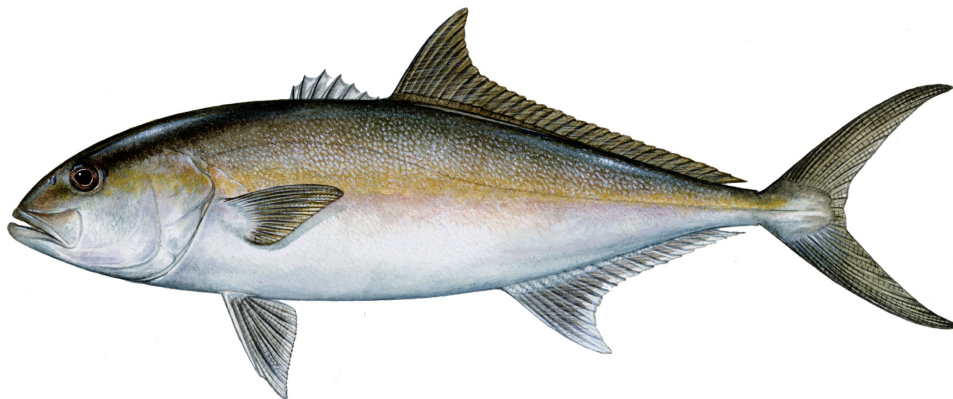
The Safina Center  
at Stony Brook University

AND

# Monterey Bay Aquarium Seafood Watch®

## Greater Amberjack

*Seriola dumerili*



©Diane Rome Peebles

**United States: Gulf of Mexico & Southeast Atlantic**

**Handline, Diver**

Fisheries Standard Version F2

*May 1, 2017*

*The Safina Center Seafood Analysts*

### Disclaimer

Seafood Watch and The Safina Center strive to ensure that all our Seafood Reports and recommendations contained therein are accurate and reflect the most up-to-date evidence available at the time of publication. All our reports are peer-reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science or aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch program or of The Safina Center or their recommendations on the part of the reviewing scientists. Seafood Watch and The Safina Center are solely responsible for the conclusions reached in this report. We always welcome additional or updated data that can be used for the next revision. Seafood Watch and Seafood Reports are made possible through a grant from the David and Lucile Packard Foundation and other funders.

## **Table of Contents**

About The Safina Center .....	3
About Seafood Watch .....	4
Guiding Principles .....	5
Summary .....	6
Final Seafood Recommendations .....	7
Introduction .....	8
Assessment .....	11
<i>Criterion 1: Impacts on the species under assessment</i> .....	11
<i>Criterion 2: Impacts on other species</i> .....	15
<i>Criterion 3: Management Effectiveness</i> .....	25
<i>Criterion 4: Impacts on the habitat and ecosystem</i> .....	36
Acknowledgements .....	40
References .....	41
Appendix A: Extra By Catch Species .....	52
Appendix B: Review Schedule .....	68

## **About The Safina Center**

The Safina Center (formerly Blue Ocean Institute) translates scientific information into language people can understand and serves as a unique voice of hope, guidance, and encouragement. The Safina Center (TSC) works through science, art, and literature to inspire solutions and a deeper connection with nature, especially the sea. Our mission is to inspire more people to actively engage as well-informed and highly motivated constituents for conservation.

Led by conservation pioneer and MacArthur fellow, Dr. Carl Safina, we show how nature, community, the economy and prospects for peace are all intertwined. Through Safina's books, essays, public speaking, PBS television series, our Fellows program and Sustainable Seafood program, we seek to inspire people to make better choices.

The Safina Center was founded in 2003 by Dr. Carl Safina and was built on three decades of research, writing and policy work by Dr. Safina.

### **The Safina Center's Sustainable Seafood Program**

The Center's founders created the first seafood guide in 1998. Our online seafood guide now encompasses over 160-wild-caught species. All peer-reviewed seafood reports are transparent, authoritative, easy to understand and use. Seafood ratings and full reports are available on our website under *Seafood choices*. tsc's sustainable seafood program helps consumers, retailers, chefs and health professionals discover the connection between human health, a healthy ocean, fishing and sustainable seafood.

- Our online guide to sustainable seafood is based on scientific ratings for more than 160 wild-caught seafood species and provides simple guidelines. Through our expanded partnership with the Monterey Bay Aquarium, our guide now includes seafood ratings from both The Safina Center and the Seafood Watch® program.
- We partner with Whole Foods Market (WFM) to help educate their seafood suppliers and staff, and provide our scientific seafood ratings for WFM stores in the US and UK.
- Through our partnership with Chefs Collaborative, we created *Green Chefs/Blue Ocean*, a free, interactive, online sustainable seafood course for chefs and culinary professionals.
- Our website features tutorials, videos, blogs, links and discussions of the key issues such as mercury in seafood, bycatch, overfishing, etc.

Check out our Fellows Program, learn more about our Sustainable Seafood Program and Carl Safina's current work at [www.safinacenter.org](http://www.safinacenter.org) .

The Safina Center is a 501 (c) (3) nonprofit organization based in the School of Marine & Atmospheric Sciences at Stony Brook University, Long Island, NY. [www.safinacenter.org](http://www.safinacenter.org) [admin@safinacenter.org](mailto:admin@safinacenter.org) | 631.632.3763

## **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](http://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.

## **Guiding Principles**

The Safina Center and Seafood Watch define sustainable seafood as originating from sources, whether fished<sup>1</sup> or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Based on this principle, Seafood Watch and the Safina Center have developed four sustainability **criteria** for evaluating wild-catch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and **rating**

Once a rating has been assigned to each criterion, we develop an overall recommendation. Criteria ratings and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide and the Safina Center's online guide:

**Best Choice/Green:** Are well managed and caught in ways that cause little harm to habitats or other wildlife.

**Good Alternative/Yellow:** Buy, but be aware there are concerns with how they're caught.

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

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<sup>1</sup> "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

## **Summary**

This report provides recommendations for greater amberjack (*Seriola dumerili*) captured in the U.S. Gulf of Mexico and Southeast Atlantic. Greater amberjack are caught with handlines and by divers in both regions.

The species is found worldwide in tropical and temperate oceans, including the East Coast of the U.S., Gulf of Mexico, and Caribbean. Adults are strongly associated with hard structure including wrecks, rocky reefs, and oil platforms; juveniles are associated with floating algae and debris. Greater amberjack is overfished in the Gulf of Mexico but abundant in the Southeast Atlantic.

The Gulf of Mexico handline fishery catches some species of concern, such as Warsaw grouper and red snapper, while the diver fishery generally targets species that are moderately abundant. Both the handline and diver fisheries in the Southeast Atlantic catch some species that are overfished and/or experiencing overfishing, including hogfish, red snapper, gray triggerfish, and red porgy.

Greater amberjack is managed separately by the Gulf of Mexico and South Atlantic Fishery Management Councils. Regulations in both regions include annual catch limits (ACLs), minimum sizes, and bag limits. Recent increases in the minimum size, decreased commercial catch trip limits, and decreased total ACL in the Gulf of Mexico were introduced to rebuild the population.

The handline and diver fisheries have limited contact with bottom substrates. Managers are working toward the development of ecosystem-based management policies, and these fisheries are not expected to have large negative effects on the Gulf and Southeast ecosystems.

Overall, greater amberjack caught in the handline and diver fisheries in the Southeast Atlantic and the Gulf of Mexico are rated **Yellow/Good Alternative**.

## Final Seafood Recommendations

SPECIES/FISHERY	CRITERION 1: IMPACTS ON THE SPECIES	CRITERION 2: IMPACTS ON OTHER SPECIES	CRITERION 3: MANAGEMENT EFFECTIVENESS	CRITERION 4: HABITAT AND ECOSYSTEM	OVERALL RECOMMENDATION
Greater amberjack United States Gulf of Mexico, Diving, United States	Yellow (2.709)	Yellow (2.644)	Yellow (3.000)	Green (3.571)	<b>Good Alternative (2.959)</b>
Greater amberjack United States Gulf of Mexico, Handlines and hand-operated pole and lines, United States	Yellow (2.709)	Red (2.051)	Yellow (3.000)	Green (3.571)	<b>Good Alternative (2.777)</b>
Greater amberjack United States Western Central Atlantic, Diving, United States	Green (3.831)	Red (1.414)	Yellow (3.000)	Green (3.571)	<b>Good Alternative (2.760)</b>
Greater amberjack United States Western Central Atlantic, Handlines and hand-operated pole and lines, United States	Green (3.831)	Red (1.343)	Yellow (3.000)	Green (3.571)	<b>Good Alternative (2.724)</b>

### Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

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

- **Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern<sup>2</sup>, and no more than one Red Criterion, and no Critical scores
- **Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

<sup>2</sup> Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

# **Introduction**

## **Scope of the analysis and ensuing recommendation**

This report assesses the U.S. Gulf of Mexico and Southeast Atlantic fisheries for greater amberjack (*Seriola dumerili*). Most fish are caught in the handline fishery, with a small percentage caught in the diver fishery in both regions.

## **Species Overview**

Greater amberjack (*Seriola demerili*) is found worldwide in tropical to temperate oceans, including the East Coast of the U.S., Gulf of Mexico, and Caribbean (Froese and Pauly 2016). In the U.S., greater amberjack is managed within two fisheries: the Gulf of Mexico reef fish fishery and the Southeast Atlantic snapper-grouper fishery, with the Florida Keys representing the boundary between regions. Catches north of North Carolina are uncommon (NMFS 2016a), so greater amberjack is not managed in the U.S. Mid-Atlantic or Northeast regions. Greater amberjack genetic studies suggest that there are subpopulations: one in the northern Gulf of Mexico and one in the South Atlantic (Gold and Richardson 1998).

Greater amberjack belongs to the family Carangidae, which are marine fish that are commonly referred to as "jacks." Greater amberjack is large, has a streamlined body and forked caudal fin, and is a favorite of recreational anglers for its fighting ability (Manooch and Potts 1997). Adult greater amberjacks are found associated with the seaward sides of coral reefs, also with rocky reefs, wrecks, and oil platforms, ranging in depths from 60 to 240 ft, while juveniles may be found in shallower water or associated with floating algae and debris (Gold and Richardson 1998) (GMFMC 2015a). It reaches maturity at approximately 90 cm in the Gulf of Mexico or 65–70 cm in the Southeast Atlantic (Murie and Parkyn 2008) (Harris et al. 2007). It lives to 15 years (Murie and Parkyn 2008) and grows to 81 kg (Froese and Pauly 2016).

## **Production Statistics**

Between 2005 and 2014, 68% of all U.S. commercial-landed greater amberjack were landed in the Gulf of Mexico, with the remainder landed in the South Atlantic (NMFS 2016a). The commercial fishery is centered around Florida (NMFS 2016a). Handline gear is the primary method of capture for greater amberjack in the U.S., with 92% of commercial landings coming from this gear type, and approximately 7% coming from diver-based methods (NMFS 2016a). Commercial diver landings are small but represent approximately equal catches between the regions (40,000 lbs per year) (NMFS 2016a). Most greater amberjack are captured on trips that capture vermilion snapper, as well as red snapper, in the Gulf of Mexico (TIP 2015).

Total commercial landings of greater amberjack ranged from 1.1 to 2.7 million lbs between 1985 and 2014 (NMFS 2016a). Between 2010 and 2015, greater amberjack was valued at around \$1.6 million annually in the U.S. (NMFS 2016a). Recreational landings tend to be larger than commercial landings in both the Gulf of Mexico (Figure 1) and the South Atlantic (Figure 2) (NMFS 2016a) (NMFS 2016b). Commercial fisheries caught an average of 874,500 lbs and 406,500 lbs in the Gulf of Mexico and South Atlantic, respectively, from 2005 to 2014 (NMFS 2016a). Note that Gulf of Mexico landings are significantly greater than what is used in the SEDAR stock assessment, likely as a result of factoring in amberjack that are not properly characterized by species (SEDAR 2014a). A yearly average of 2,117,000 lbs of greater amberjack were caught in U.S. recreational fisheries from 2006 to 2015 (NMFS 2016b).



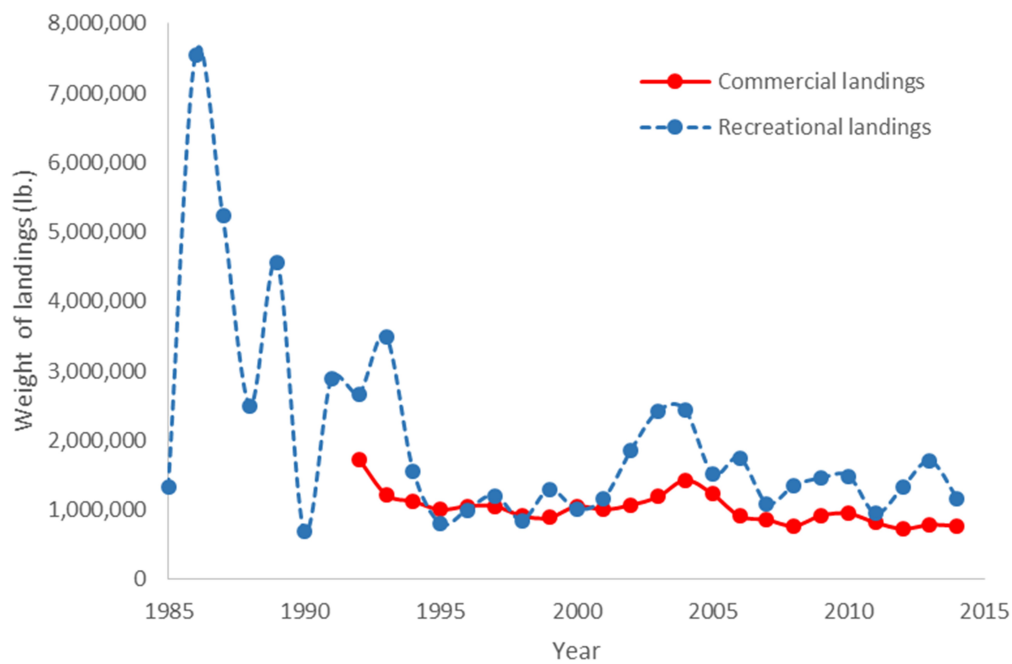


Figure 1 Commercial (red) and recreational (blue) landings of greater amberjack from the Gulf of Mexico.

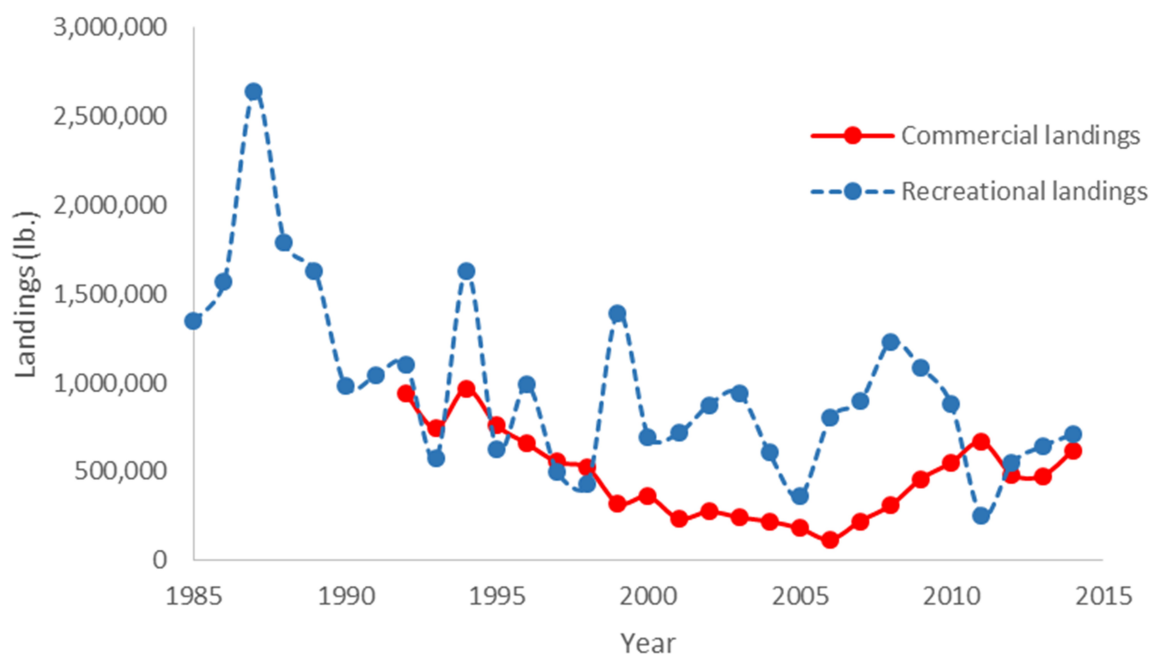


Figure 2 Commercial (red) and recreational (blue) landings of greater amberjack from the South Atlantic.

### Importance to the US/North American market.

Greater amberjack is not reported as an imported or exported species in the U.S. (NOAA 2014).

### Common and market names.

Greater amberjack may be marketed as amberjack, Atlantic amberjack, yellowtail, madregal, and bonito (FDA

2015). Other common names include greater amberfish, jenny lind, and rock salmon (Froese and Pauly 2016).

### **Primary product forms**

Greater amberjack is sold fresh (whole or filleted), frozen, or smoked (filetting) in the U.S. (Berry and Burch 1978) (Diversified Business Communications 2009).

## Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Criteria for Fisheries, available at <http://www.seafoodwatch.org>.

### Criterion 1: Impacts on the species under assessment

*This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.*

*The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:*

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

*Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical*

#### Criterion 1 Summary

GREATER AMBERJACK				
Region / Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
United States/Gulf of Mexico Diving	2.00: Medium	2.00: High Concern	3.67: Low Concern	Yellow (2.709)
United States/Gulf of Mexico Handlines and hand-operated pole and lines	2.00: Medium	2.00: High Concern	3.67: Low Concern	Yellow (2.709)
United States/Western Central Atlantic Diving	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.831)
United States/Western Central Atlantic Handlines and hand-operated pole and lines	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.831)

#### Criterion 1 Assessment

##### SCORING GUIDELINES

##### Factor 1.1 - Inherent Vulnerability

- *Low—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).*
- *Medium—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing, (e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle*

of food chain).

- *High*—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make it particularly vulnerable to fishing, (e.g., long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator). Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g., schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

## Factor 1.2 - Abundance

- *5 (Very Low Concern)*—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.
- *4 (Low Concern)*—Population may be below target abundance level, but it is considered not overfished
- *3 (Moderate Concern)*—Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.
- *2 (High Concern)*—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.
- *1 (Very High Concern)*—Population is listed as threatened or endangered.

## Factor 1.3 - Fishing Mortality

- *5 (Very Low Concern)*—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible ( $\leq 5\%$  of a sustainable level of fishing mortality).
- *3.67 (Low Concern)*—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).
- *2.33 (Moderate Concern)*—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.
- *1 (High Concern)*—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.
- *0 (Critical)*—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.

## GREATER AMBERJACK

### Factor 1.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Medium

FishBase has assigned a medium vulnerability rating (54 out of 100) to greater amberjack (Froese and Pauly 2016). Greater amberjack (*Seriola dumerili*) is a large, widely distributed jack belonging to the family Carangidae, with a streamlined body, forked caudal fin, bluish-gray to olive coloration, and a prominent dark stripe running from the eye to the base of the second dorsal fin (Berry and Burch 1978) (Manooch and

Haimovici 1983) (GMFMC 2015a). The species is found worldwide in tropical and temperate oceans, including the East Coast of the U.S., Gulf of Mexico, and Caribbean (Manooch and Potts 1997). Genetic studies suggest that there are subpopulations in the Southeast U.S.: one in the northern Gulf of Mexico and one in the South Atlantic (Gold and Richardson 1998). Greater amberjack can live to at least 15 years and attain a maximum size of 128 cm for females and 120 cm for males (Murie and Parkyn 2008). In the Gulf of Mexico, most fish reach sexual maturity at 4 years of age and 90 cm fork length (FL) (Murie and Parkyn 2008), but maturity is reached earlier in the Southeast Atlantic, at around 1.3 years and 64–73 cm FL (Harris et al. 2007). Peak spawning off the Southeastern Atlantic coast occurs primarily off south Florida and the Florida Keys during April and May; size at 50% maturity is 64.4 cm FL for males and 73.3 cm FL for females in this region (Harris et al. 2007). Adult greater amberjack are found associated with the seaward sides of coral and rocky reefs, wrecks, and oil platforms, ranging in depths from 18 to 73 m, while juveniles may be found in shallower water or associated with floating algae and debris (Berry and Burch 1978) (GMFMC 2015a). Spawning takes place in the summer and the eggs are pelagic. Greater amberjack feeds on fish, squid, and crustaceans (Manooch and Haimovici 1983) (Carpenter 2002).

## Factor 1.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### High Concern

Gulf of Mexico greater amberjack is overfished (NOAA 2015a) (Cummings 2014). The most recent 2014 stock assessment for Gulf of Mexico greater amberjack was initially unable to determine the status of this population because of variable and inconsistent results in the assessment model (SEDAR 2014a). But additional analyses requested by the assessment workshop review panel concluded that spawning stock biomass was well below the limit and target abundance reference points ( $SSB_{CURRENT}/SSB_{MSST} = 0.65$ ;  $SSB/SSB_{MSY} = 0.47$ ), indicating overfished status (Cummings 2014) (GMFMC 2014). Greater amberjack has been overfished since the 1990s. The first rebuilding plan for greater amberjack was put in place in 2003, but was unsuccessful at recovering the population (SEDAR 2014a). A new 3-year rebuilding plan was recently established (NOAA 2016). Because of the overfished status of greater amberjack, we have rated its abundance as "high" concern.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Greater amberjack along the South Atlantic Coast is managed by the South Atlantic Fisheries Management Council (SAFMC) under the Snapper-Grouper Fishery Management Plan. The most recent stock assessment in 2008 evaluated greater amberjack in the South Atlantic as not overfished as of 2006, with the spawning stock biomass near the target level of biomass at maximum sustainable yield and well above the limit reference point of minimum sustainable stock size ( $B/B_{MSY} = 1.10$ ,  $B/MSST = 1.46$ ) (SEDAR 2008). South Atlantic greater amberjack has not been assessed or further analyzed since 2008, so the last stock assessment (SEDAR 2008) continues to be the best available scientific information (pers. comm., Erik Williams 2016). Because of the abundance of this stock in 2006 but the lack of a recent stock assessment, we have awarded "low" concern for abundance.

## Factor 1.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Gulf of Mexico greater amberjack is not currently undergoing overfishing (NOAA 2015a) (SISPP 2015). The most recent stock assessment report demonstrated that overfishing was likely occurring as of 2012 (SEDAR 2014a) (Cummings 2014) and has likely been occurring since the 1990s (SEDAR 2011a). But analyses requested by the assessment review workshop panel indicated that overfishing was occurring, but would be ended as of 2014 (SISPP 2015) (Cummings 2014) (GMFMC 2014). In 2015, managers instituted recreational size limits and seasons as well as commercial trip limits to ensure an end to overfishing (GMFMC 2015e). Taking these reductions into account, additional analyses following the 2014 assessment confirmed that overfishing was no longer occurring (pers. comm., Nancie Cummings 2016).

Greater amberjack is commonly targeted by commercial and recreational fishers using vertical lines and by divers using spears. Landings for the Gulf of Mexico were 771,260 lbs for the commercial fishery and 1,161,242 lbs for the recreational fishery in 2014, with the majority of landings from the west coast of Florida (NMFS 2016a) (NMFS 2016b). Because of the recent removal from overfishing status, we have awarded "low" concern.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Greater amberjack along the South Atlantic Coast is not subject to overfishing (NOAA 2015a). In the most recent 2008 stock assessment, fishing mortality was estimated to be 53% of the target level of fishing at maximum sustainable yield ( $F/F_{MSY} = 0.53$ ), and fishing mortality had consistently declined over the years 1999 to 2006 (SEDAR 2008). Greater amberjack is commonly targeted by commercial and recreational fishers using vertical lines and by divers using spears. Landings for the South Atlantic in 2014 were 615,986 lbs for the commercial fishery and 709,290 lbs for the recreational fishery, with the majority of landings from the east coast of Florida (NMFS 2016a) (NMFS 2016b). Because of the low fishing mortality in 2006 but the lack of a more recent stock assessment, we have awarded "low" concern for fishing mortality.

## Criterion 2: Impacts on other species

All main retained and bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. Seafood Watch® defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing.

To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch. The Criterion 2 rating is determined as follows:

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2=Red or High Concern

Rating is Critical if Factor 2.3 (Fishing Mortality) is Critical

### Criterion 2 Summary

Only the lowest scoring main species is/are listed in the table and text in this Criterion 2 section; a full list and assessment of the main species can be found in Appendix A.

GREATER AMBERJACK - UNITED STATES/GULF OF MEXICO - DIVING					
<b>Subscore:</b>	<b>2.644</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>2.644</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Gray snapper	2.00:Medium	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.644)	
Hogfish	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.831)	
Gag grouper	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.873)	
Red grouper	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	
Mutton snapper	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.000)	

GREATER AMBERJACK - UNITED STATES/GULF OF MEXICO - HANDLINES AND HAND-OPERATED POLE AND LINES					
<b>Subscore:</b>	<b>2.159</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>2.051</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Warsaw grouper	1.00:High	2.00:High Concern	2.33:Moderate Concern	Red (2.159)	

Snowy grouper	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.644)
Red snapper	1.00:High	2.00:High Concern	3.67:Low Concern	Yellow (2.709)
Gag grouper	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.873)
Red grouper	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)
Vermilion snapper	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.000)
Yellowtail snapper	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.000)

#### GREATER AMBERJACK - UNITED STATES/WESTERN CENTRAL ATLANTIC - DIVING

<b>Subscore:</b>	<b>1.414</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>1.414</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Hogfish	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.414)	
Red snapper	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.414)	
Scamp	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.318)	
Gag grouper	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.831)	

#### GREATER AMBERJACK - UNITED STATES/WESTERN CENTRAL ATLANTIC - HANDLINES AND HAND-OPERATED POLE AND LINES

<b>Subscore:</b>	<b>1.414</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.343</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Red snapper	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.414)	
Almaco jack	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.644)	
Gray triggerfish	2.00:Medium	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.644)	



Red porgy	1.00:High	2.00:High Concern	3.67:Low Concern	Yellow (2.709)
Scamp	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.318)
Gag grouper	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.831)
Vermilion snapper	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)

The Gulf of Mexico greater amberjack handline fishery captures yellowedge, snowy, Warsaw, red, and gag grouper, and red, vermilion, and yellowtail snapper; the diver fishery targets hogfish, red, and gag grouper, and gray and mutton snapper. Total discards to landings ratio for the handline fishery is approximately 34%, while nearly all species targeted in the diver fishery are retained. Warsaw grouper is the lowest scoring species for the handline fishery because of high concerns over abundance and moderate concerns over fishing mortality. There is also moderate concern over the status of yellowedge and snowy grouper and red snapper. Gray snapper is the lowest scoring species for the diver fishery because of moderate concern over abundance and fishing mortality. Data used to assess Gulf of Mexico bycatch species caught with greater amberjack include Trip Interview Program (TIP), commercial dealer reports for species caught on trips that catch greater amberjack (2005–2014), and scientific literature (which includes two compiled, observer program synthesis studies: Scott-Denton et al. 2011 and Scott-Denton and Williams 2013).

In the Southeast Atlantic, the commercial handline fishery captures almaco jack, gray triggerfish, vermilion and red snappers, scamp, red porgy, and gag grouper. Diver fisheries capture less than 5% of the total greater amberjack landings in the region with the primary targets of hogfish, red snapper, scamp, and gag. High concerns exist over abundance and fishing mortality of both hogfish and red snapper, which are the lowest scoring species in the diver fishery. Red snapper is the lowest scoring species for the handline fishery, but there is also moderate to high concern for several other species that are commonly landed with greater amberjack. The discards to landings ratio in the handline fishery is around 24%. Data used to assess South Atlantic bycatch species caught with greater amberjack include TIP data, commercial dealer reports synthesizing the top 10 species co-landed with greater amberjack (2010–2014), and scientific literature (which include several pilot observer program studies: GSAFFI 2008, 2010, and 2013).

## Criterion 2 Assessment

### SCORING GUIDELINES

#### **Factor 2.1 - Inherent Vulnerability**

*(same as Factor 1.1 above)*

#### **Factor 2.2 - Abundance**

*(same as Factor 1.2 above)*

#### **Factor 2.3 - Fishing Mortality**

*(same as Factor 1.3 above)*

## GRAY SNAPPER

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

#### Medium

Gray snapper (*Lutjanus griseus*) is considered moderately vulnerable to fishing, with a FishBase score of 40 out of 100 (Froese and Pauly 2016). Sexual maturity is reached at 9.1 inches FL (fork length) for females and 8.7 inches FL for males (Starck and Schroeder 1971) (Manooch and Matheson 1981). Maximum size is estimated to be approximately 90 cm TL (total length) (Bortone and Williams 1986) and individuals can reach at least 28 years of age (Fischer et al. 2005). Larger females produce more eggs, and several fecundity estimates (# of eggs) range from 600,000 to 6,000,000 per female (Bortone and Williams 1986); more recent updates on fecundity are unavailable. Differences in life history traits, such as size and age, between areas with different levels of fishing pressure (north Florida vs. south Florida) suggest that demography changed as a result of exploitation (Manooch and Matheson 1981) (Burton 2001) (Allman and Goetz 2009). Adults are found offshore, associated with reef structure and hard bottoms (Bortone and Williams 1986), while juveniles are estuarine-dependent and are commonly associated with seagrass and mangrove habitats (Flaherty et al. 2014).

### Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

#### Moderate Concern

The International Union for the Conservation on Nature considers gray snapper to be a species of "Least Concern" (Lindeman et al. 2016). Three genetically distinct gray snapper populations exist: the northwest Gulf, north central/northeastern Gulf, and the South Atlantic (east coast of Florida) (Gold et al. 2009). No formal stock assessments have been conducted for any population, though gray snapper is a species that has been well studied in recent years (FWRI 2011a)(FWRI 2011b) (Flaherty et al. 2014) (Flaherty-Walia et al. 2015). Despite research, no target abundance or reference points have been defined (NOAA 2016), but a formal stock assessment for the Gulf of Mexico is planned for 2018 (SEDAR 2015c). Some scientific studies had suggested that high fishing levels in south Florida had reduced biomass and spawning potential to low levels, and that gray snapper in this area was overfished (Ault et al. 1998) (Ault et al. 2005). The south Florida area likely includes fish from both the northeastern Gulf and South Atlantic populations because the Florida Keys represent a common boundary. Because the abundance level of gray snapper in the Gulf of Mexico is uncertain and this species has a moderate inherent vulnerability to fishing, abundance is rated a "moderate" concern.

### Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, DIVING

#### Moderate Concern

There have been no formal population assessments for any of the gray snapper populations, so fishing mortality for gray snapper in the Gulf of Mexico is unknown (NOAA 2016). But some reports suggested that fishing mortality on gray snapper is high in south Florida waters (Ault et al. 1998). The highest fishing pressure in both the commercial and recreational fisheries is centered around south Florida (FWRI 2014), but gray snapper is increasingly being targeted by handline fishers in Louisiana, after restrictions on red snapper (pers. comm., David Nieland 2015). Between 2005 and 2014, the U.S. commercial fishery was a substantial contributor to gray snapper mortality, with yearly average catches of 288,000 lbs. During the same period, the

recreational fishery catches averaged 1.8 million lbs annually (NMFS 2016a) (NMFS 2016b). A data-limited study in 2005 estimated fishing mortality on gray snapper in south Florida waters to be 2.5 times the fishing mortality at maximum sustainable yield ( $F_{MSY}$ ), indicating that overfishing was occurring (Ault et al. 2005). More recent information is unavailable. Because of the limited information, we have awarded a score of "moderate" concern for fishing mortality.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, DIVING

< 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2012).

## HOGFISH

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

**High**

FishBase has assigned a high vulnerability rating (67 out of 100) to hogfish (Froese and Pauly 2016). Hogfish (*Lachnolaimus maximus*) is a large wrasse with variable coloration ranging from gray to pink to mottled brownish red; it reaches a maximum length of 91 cm (Froese & Pauly 2016). Hogfish is recognized by three elongated, filamentous spines on the first dorsal fin, a dark spot at the base of the second dorsal fin, and elongated filaments on the upper and lower margins of the caudal fin. It is a monandric protogynous hermaphrodite (i.e., some of the solely juvenile females may change into terminal males), reaches sexual maturity at approximately 20 cm (females), and metamorphoses into males at approximately 35 cm or 3–5 years old. Hogfish are associated with coral reefs, rocky ledges, and wrecks to a depth of 30 m from North Carolina to the Gulf of Mexico, Bermuda, and northern South America, where they feed on clams, snails, urchins, and other invertebrates (Froese and Pauly 2016) (GMFMC 2015a).

### Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

**Low Concern**

The International Union for the Conservation of Nature (IUCN) has assessed hogfish as "Vulnerable" globally (Choat et al. 2010). Hogfish in the Gulf of Mexico is managed by the Gulf of Mexico Fishery Management Council under the Reef Fish Management Plan, and the most recent stock assessment was in 2013 (Cooper et al. 2013). This assessment indicated that the Western Florida (Eastern Gulf of Mexico) population was not overfished, and that abundance was well above the target abundance level or biomass at maximum sustainable yield ( $B/B_{MSY}$  = of 3.50). But there is concern over the abundance of the East Florida/Florida Keys population, a small proportion of which extends into the Gulf of Mexico management region (Cooper et al. 2013). Further, reviewers of the assessment point to concern over the fisheries-dependent and fisheries-independent measures of catch used to assess abundance (Cooper et al. 2013). Because it is unlikely that the Western Florida hogfish population is overfished but there is some uncertainty over the abundance estimate, abundance is rated a "low" concern.

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

##### High Concern

The International Union for the Conservation of Nature (IUCN) considers hogfish to be a "Vulnerable" species (Choat et al. 2010). Hogfish along the U.S. South Atlantic Coast is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper complex, and the most recent stock assessment was in 2013 (Cooper et al. 2013). This assessment separated hogfish into three separate regional stocks: Western Florida (Eastern Gulf of Mexico), Eastern Florida/Florida Keys, and Georgia/South and North Carolina. The hogfish stock in the Eastern Florida/Florida Keys region was evaluated as overfished with a spawning stock biomass at only 47% of the minimum sustainable stock threshold ( $SSB/MSST = 0.47$ ) (Cooper et al. 2013). Hogfish in the Georgia/C Carolinas region was assessed as not overfished, with spawning stock biomass well above the minimum sustainable stock size ( $SSB/MSST = 1.45$ ) (Cooper et al. 2013), but the assessment review panel considered the model results too uncertain and NOAA Fisheries lists the status of this population as unknown (NOAA 2016). We are considering hogfish as a bycatch species in the greater amberjack fishery, and 78% of the South Atlantic greater amberjack commercial landings came from Eastern Florida from 2010 to 2014 (NMFS 2015a), so the Eastern Florida/Florida Keys hogfish stock is the relevant stock for this ranking. Because of the overfished status of the Eastern Florida/Florida Keys population, we have rated abundance "high" concern.

### Factor 2.3 - Fishing Mortality

#### UNITED STATES/GULF OF MEXICO, DIVING

##### Low Concern

Hogfish in the Gulf of Mexico is unlikely to be experiencing overfishing. Fishing mortality is estimated to be well below the fishing mortality at maximum sustainable yield ( $F/F_{MSY} = 0.408$ ) (Cooper et al. 2013). But uncertainty around the data used in the assessment leads to some uncertainty around the fishing mortality estimate (Cooper et al. 2013). Hogfish is commonly targeted by both commercial and recreational fishers using spears, vertical lines, and pots/traps. Recreational catches by spearfishing are a majority of all hogfish landings (Cooper et al. 2013). Landings of hogfish by commercial fishers were 45,841 lbs in 2014, while recreational fishers took 239,260 lbs (NMFS 2016a) (NMFS 2016b). Because it is probable that fishing mortality on Gulf of Mexico hogfish is below a sustainable level, this results in a rating of "low" concern.

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

##### High Concern

NOAA Fisheries lists hogfish in the Eastern Florida region as subject to overfishing (NOAA 2016). In the most recent stock assessment, fishing mortality on hogfish in the Eastern Florida/Florida Keys region was well above the target level of fishing at maximum sustainable yield ( $F/F_{MSY} = 1.59$ ) (Cooper et al. 2013). Fishing mortality in the Georgia-C Carolinas region was estimated as only slightly above the target level ( $F/F_{MSY} = 1.17$ ) (Cooper et al. 2013); however, results were too uncertain for this population, so fishing mortality is considered unknown (NOAA 2016). Hogfish is commonly targeted by both commercial and recreational fishers using spears, vertical lines, and pots/traps. Commercial landings for this species in the South Atlantic region were 26,474 lbs in 2014, while recreational landings were 111,591 lbs (NMFS 2016a) (NMFS 2016b)). We are considering hogfish as a bycatch species in the greater amberjack fishery, and 78% of the South Atlantic greater amberjack commercial landings came from Eastern Florida from 2010 to 2014 (NMFS 2015a), so the Eastern Florida/Florida Keys hogfish stock is the relevant stock for this ranking. Because of the documented overfishing status of the Eastern Florida/Florida Keys population, we have rated fishing mortality a "high" concern.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, DIVING

**< 20%**

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2012).

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

**< 20%**

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2008).

## RED SNAPPER

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **High**

FishBase has assigned a high vulnerability rating (55 out of 100) to red snapper (Froese and Pauly 2016). Red snapper (*Lutjanus campechanus*) is a large snapper with pinkish-red to red coloration, ranging in size up to 100 cm (Froese and Pauly 2016). Red snapper reaches sexual maturity around 40 cm at age 2, and adults may live several decades, up to age 57 (Froese and Pauly 2016) (GMFMC 2015a). Adult red snapper are found over rocky bottoms, while juveniles inhabit shallow waters, including sandy and muddy bottoms. Red snapper is found in the Western North Atlantic from Massachusetts to Florida and throughout the Gulf of Mexico, but it is rare north of North Carolina (Froese and Pauly 2016). Red snapper feed on smaller fish, crustaceans, squid, other invertebrates, and some planktonic prey (Froese and Pauly 2016) (GMFMC 2015a).

### Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **High Concern**

Red snapper in the Gulf of Mexico is managed by the Gulf of Mexico Fisheries Management Council under the Reef Fish Management Plan, and the most recent stock assessment was published in 2015 (SEDAR 2015a). This assessment concluded that Gulf of Mexico red snapper is recovering, but remains overfished. The assessment estimated spawning stock biomass at 57% of the limit reference point or minimum stock size threshold, a point below which the population is considered overfished ( $SSB/MSST = 0.573$ ) (SEDAR 2015a). This is an improvement from the previous stock assessment, which found spawning stock biomass to be only 40% of the limit reference point (SEDAR 2013a). Red snapper is currently in year 11 of a 27-year rebuilding plan (NOAA 2016). Because of the overfished status of red snapper in the Gulf, we have awarded a "high" concern score.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### High Concern

Red snapper in the South Atlantic is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper Fishery Management Plan, and the most recent stock assessment was published in 2016 (SEDAR 2016c). This assessment concluded that South Atlantic red snapper is overfished, with spawning stock biomass in 2014 at only 22% of the limit reference point or minimum stock size threshold ( $SSB/MSST = 0.22$ ) (SEDAR 2016c). Red snapper is currently in year 5 of a 35-year rebuilding plan (NOAA 2016). Because of this highly depleted status of South Atlantic red snapper, we have awarded a "high" concern score.

## Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Red snapper in the Gulf of Mexico is not experiencing overfishing (NOAA 2016). Red snapper is commonly targeted by commercial fishers using vertical lines and longlines, and by headboat and private recreational fishers using vertical lines. Additionally, juvenile red snapper are caught as bycatch in the shrimp trawl fishery. Landings for the Gulf of Mexico in 2014 were 5,721,585 lbs by the commercial fishery and 2,873,120 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). The fishing mortality from 2011 to 2013 is estimated to be just below the fishing mortality at maximum sustainable yield ( $F/F_{MSY} = 0.995$ ) (SEDAR 2015a), which represents an increase since the last stock assessment ( $F/F_{MSY} = 0.695$  in 2009–2011) (SEDAR 2013a). Because fishing mortality has increased in recent years but remains below the overfishing limit, we have awarded a "low" concern score.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### High Concern

Red snapper in the South Atlantic is undergoing overfishing (NOAA 2016), with fishing mortality estimated to be two-and-a-half times the fishing mortality at maximum sustainable yield ( $F/F_{MSY} = 2.52$ ) over the years 2012–2014 (SEDAR 2016c). Red snapper is commonly targeted by commercial fishers using vertical lines and longlines, and by headboat and private recreational fishers using vertical lines. Because of the very high fishing levels on red snapper, managers closed the red snapper fishery from 2010 to 2012. There was a limited reopening of the fishery for 2013–2014, but the fishery was again closed in federal waters in 2015 (NOAA SERO 2015b) and remains closed for 2016. Because red snapper is caught as part of multispecies fisheries, fishing mortality does not drop to zero during the closure (SEDAR 2016c). Landings of red snapper in the Southeast Atlantic in 2014 were 59,625 lbs by the commercial fishery and 1,052,099 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). Because of the very high fishing mortality, we awarded a "high" concern rating.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al.

2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

##### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2008).

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

### WARSAW GROUPE

#### **Factor 2.1 - Inherent Vulnerability**

#### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **High**

FishBase has assigned a high vulnerability rating (68 out of 100) to Warsaw grouper (Froese and Pauly 2016). Warsaw grouper (*Hyporhamphus nigratus*) is a large-sized grouper with coloration ranging from reddish brown to black. It can grow to a size of 230 cm in length and 198 kg in weight (Froese and Pauly 2016), and can live to 41 years of age (Manooch and Mason 1987). Adult Warsaw grouper are typically found between 55 and 525 m associated with rocky bottoms, while juveniles may be found in similar inshore habitats (Froese and Pauly 2016); little else is known about their biology. Its distribution extends from Massachusetts to the southern coast of Brazil. It feeds on crabs and other crustaceans along with fishes (Froese and Pauly 2016).

#### **Factor 2.2 - Abundance**

#### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **High Concern**

The International Union for the Conservation of Nature (IUCN) considers Warsaw grouper to be a "Critically Endangered" species globally (Ng Wai Chuen and Huntsman 2006), but the Gulf of Mexico population is listed as "Near Threatened" (Cowan et al. 2015). Warsaw grouper is managed by the Gulf of Mexico Fishery Management Council within the Deep Water Grouper Complex (which includes speckled hind and snowy grouper), but no formal stock assessment has been completed for Warsaw grouper. Abundance and associated reference points are unknown for the Gulf of Mexico (NOAA 2016). Because of the uncertain abundance information and "Near Threatened" IUCN status for this population, we have rated abundance as

"high" concern.

### Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Moderate Concern

Warsaw grouper in the Gulf of Mexico is not considered to be undergoing overfishing (NOAA 2016), but no formal population assessment has been completed. Warsaw grouper is targeted by commercial and recreational fishers using vertical lines. Commercial landings for the Gulf of Mexico were 88,785 lbs in 2014, and landings were 48,621 lbs for the recreational fishery (NMFS 2016a) (NMFS 2016b). Because of the unknown fishing mortality, we have awarded a score of "moderate" concern.

### Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).



## Criterion 3: Management Effectiveness

Management is separated into management of retained species (harvest strategy) and management of non-retained species (bycatch strategy).

The final score for this criterion is the geometric mean of the two scores. The Criterion 3 rating is determined as follows:

- Score  $>3.2$ =Green or Low Concern
- Score  $>2.2$  and  $\leq 3.2$ =Yellow or Moderate Concern
- Score  $\leq 2.2$  or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = Red or High Concern

Rating is Critical if either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical.

### Criterion 3 Summary

Region / Method	Harvest Strategy	Bycatch Strategy	Score
United States / Gulf of Mexico / Diving	3.000	0.000	Yellow (3.000)
United States / Gulf of Mexico / Handlines and hand-operated pole and lines	3.000	3.000	Yellow (3.000)
United States / Western Central Atlantic / Handlines and hand-operated pole and lines	3.000	3.000	Yellow (3.000)
United States / Western Central Atlantic / Diving	3.000	0.000	Yellow (3.000)

Greater amberjack in the Southeast Atlantic and Gulf of Mexico is considered moderately well managed. Discards in the handline fisheries can exceed 20%, and some common bycatch and co-landed species are overfished, vulnerable, or near threatened. There are several discard measures in place, but the effectiveness of these are unknown.

Management measures for greater amberjack and other species caught in the fisheries include annual catch limits (ACL), bag limits, and size limits. Commercial ACLs are exceeded for some species in both regions {NOAA SERO 2016a,b}. Greater amberjack is relatively well researched, with the most recent stock assessment performed in 2014 for the Gulf of Mexico, but one has not been conducted for the Southeast Atlantic population since 2008 {SEDAR 2008} {SEDAR 2014a}. Recovery, research, enforcement, and track record are scored as "moderately effective," while other measures, such as following scientific advice and stakeholder inclusion, are scored as "highly effective."

### Criterion 3 Assessment

#### SCORING GUIDELINES

#### Factor 3.1 - Harvest Strategy

Seven subfactors are evaluated: Management Strategy, Recovery of Species of Concern, Scientific Research/Monitoring, Following of Scientific Advice, Enforcement of Regulations, Management Track Record, and Inclusion of Stakeholders. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.'

- 5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered
- 4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective.'
- 3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'
- 2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'
- 1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'
- 0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.

### Factor 3.1 Summary

FACTOR 3.1 - MANAGEMENT OF FISHING IMPACTS ON RETAINED SPECIES							
Region / Method	Strategy	Recovery	Research	Advice	Enforce	Track	Inclusion
United States / Gulf of Mexico / Diving	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately Effective	Highly Effective
United States / Gulf of Mexico / Handlines and hand-operated pole and lines	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately Effective	Highly Effective
United States / Western Central Atlantic / Handlines and hand-operated pole and lines	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately Effective	Highly Effective
United States / Western Central Atlantic / Diving	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately Effective	Highly Effective

#### Subfactor 3.1.1 – Management Strategy and Implementation

*Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? To achieve a highly effective rating, there must be appropriate management goals, and evidence that the measures in place have been successful at maintaining/rebuilding species.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Moderately Effective

Greater amberjack is managed by the Gulf of Mexico Fishery Management Council within the Reef Fish fishery in federal waters (SEDAR 2014a). State agencies (Texas, Louisiana, Alabama, and Florida) manage greater amberjack in nearshore waters with regulations similar to federal laws, including bag limits and minimum sizes (GMFMC 2015a)(FFWCC 2016). Greater amberjack was first managed in federal waters in 1990, after a

large rise in amberjack landings in the mid-1980s (SEDAR 2014a). After several assessments in the 1990s and in 2000 that determined that greater amberjack was overfished, a rebuilding program was established in 2003 to recover the population. But the rebuilding plan was unsuccessful and greater amberjack remain overfished (SEDAR 2014a). A new rebuilding plan for greater amberjack was recently established, and new regulations for greater amberjack were put into effect in January 2016, which include a decrease in the total annual catch limit (ACL) from 1,780,000 lbs ww (whole weight) to 1,720,000 lbs ww, a decrease in the commercial trip weight limit, and an increase in the minimum recreational size from 30" to 34" fork length (FL) (SFB 2015).

Management of other species in the fishery is mixed. There is high concern over the abundance of red snapper and moderate concern over the abundance of snowy, yellowedge, and gag groupers. Other species in the fishery are abundant, and no overfishing is occurring (NOAA 2016).

Because of greater amberjack's overfished status, which has persisted since the 1990s, and a recent increase in catch restrictions designed to end overfishing and rebuild the population but with unknown success at this point, we have awarded a score of "moderately effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES  
UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

### **Moderately Effective**

Greater amberjack is managed in federal waters by the South Atlantic Fishery Management Council (SAFMC) under the Snapper Grouper Fishery Management Plan. In state waters, it is managed by state agencies, such as the Florida Fish and Wildlife Conservation Commission and the South Carolina Division of Natural Resources. The state agencies of FL, GA, SC, and NC have adopted federal regulations for state waters. Most of the total landings are in federal waters. Greater amberjack is managed by a commercial total annual catch limit (ACL) of 769,388 lbs gw (gutted weight) and a recreational ACL of 1,167,837 lbs ww (whole weight) (NOAA SERO 2015a). Regulations for this species include a minimum size limit of 36" in the commercial fishery, seasonal closures in April, trip limits of 1,200 lbs, and limited access permitting (SAFMC 2015b). Size and bag limits, as well as seasonal closures, are in effect for state waters (SAFMC 2015b). Between 2007 and 2012, 46% to 88% of the ACL was met, increasing to more than 100% for 2012 to 2014 (NOAA SERO 2015a). The most recent assessment for greater amberjack was in 2008 and indicated that the stock was not overfished or undergoing overfishing, nor was it projected to undergo overfishing by 2016 if fishing mortality remained constant (SEDAR 2008).

Management of other species in the fishery is mixed. High concern exists over red snapper and hogfish abundance and fishing mortality, as well as moderate to high concern over the abundance of scamp, gray triggerfish, and red porgy (NOAA 2016). Other species in the fishery are well managed, with low concern over their abundance and fishing mortality. A lack of recent information on the status of greater amberjack and mixed management success of targeted and retained species result in a rating of "moderately effective."

### **Subfactor 3.1.2 – Recovery of Species of Concern**

*Considerations: When needed, are recovery strategies/management measures in place to rebuild overfished/threatened/ endangered species or to limit fishery's impact on these species and what is their likelihood of success? To achieve a rating of Highly Effective, rebuilding strategies that have a high likelihood of success in an appropriate timeframe must be in place when needed, as well as measures to minimize mortality for any overfished/threatened/endangered species.*

#### UNITED STATES / GULF OF MEXICO, DIVING

##### **Moderately Effective**

Greater amberjack is overfished, and has been since the 1990s (SEDAR 2006) (SEDAR 2014a). The first rebuilding plan for greater amberjack was established in 2003. This program was unsuccessful, and a new 3-year rebuilding plan was recently established. New regulations for greater amberjack, including a decrease in the annual catch limit and an increase in the recreational size limit, went into effect in January 2016 (SFP 2015). Diver fisheries tend to target other species, but will land greater amberjack if present (TIP 2015).

The diver fishery in the Gulf of Mexico does not target significant amounts of any other species that are overfished, threatened, or endangered. Given the lack of recovery of the greater amberjack population to date but recent new regulations that have ended overfishing on this species, we have awarded a score of "moderately effective."

#### UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderately Effective**

Greater amberjack is overfished and has been since the 1990s (SEDAR 2006) (SEDAR 2014a). The first rebuilding plan for greater amberjack was established in 2003. This program was unsuccessful, and a new 3-year rebuilding plan was recently established. New regulations for greater amberjack, including a decrease in the annual catch limit and an increase in the recreational size limit, went into effect in January 2016 (SFP 2015).

Other species of concern caught in the Gulf of Mexico handline fishery along with greater amberjack include gag grouper, yellowedge grouper, and red snapper (Scott-Denton and Williams 2013) (TIP 2015). Gag and yellowedge grouper have borderline overfished status (SEDAR 2011c) (SEDAR 2014b), while red snapper is overfished and in year 11 of a 27-year rebuilding plan (SEDAR 2015a). The latest red snapper assessment indicated an improvement in abundance (SEDAR 2015a). Other species caught in the fishery have been successfully rebuilt from a previous overfished state (e.g., red grouper) or have been maintained at healthy abundances (e.g., vermilion snapper).

Given the lack of recovery of the greater amberjack population to date but recent new regulations that have ended overfishing on this species, we have awarded a score of "moderately effective."

#### UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderately Effective**

Several overfished species are landed with greater amberjack in the handline fishery off the South Atlantic coast of Florida, including red snapper and red porgy, and gray triggerfish is potentially overfished (ACCSP 2016). Red snapper is both overfished and experiencing overfishing (NOAA 2016), and in 2014 the total allowable catch (TAC) was exceeded, resulting in a fishery closure for 2015 (SFSC 2015). Red snapper is in year 6 of a 35-year rebuilding plan (NOAA 2015a) in this region. Red porgy is in year 17 of an 18-year rebuilding plan (NOAA 2016). Given that some species are overfished but rebuilding plans are in place, we have awarded a score of "moderately effective."

#### UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

##### **Moderately Effective**

The diver fishery in the South Atlantic targets hogfish, scamp, gag grouper, and red snapper along with greater amberjack, which represents approximately 7% of the diver-based commercial catch (TIP 2015). Diver fisheries tend to target other species, but will land greater amberjack when it is present (TIP 2015). South Atlantic hogfish and red snapper are overfished and experiencing overfishing (SEDAR 2013b) (SEDAR 2015a). The southeast Florida population of hogfish, which is overfished, does not yet have a rebuilding plan in place, but red snapper is in year 6 of a 35-year rebuilding plan (NOAA 2016). Because commercial diving trips frequently capture several species of concern, and with mixed management concerning recovery plans, we have awarded a score of "moderately effective."

### **Subfactor 3.1.3 – Scientific Research and Monitoring**

*Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species? To achieve a Highly Effective rating, population assessments must be conducted regularly and they must be robust enough to reliably determine the population status.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

Available data for greater amberjack come from dealer reports (commercial catches), a small observer program, dockside interviews of fishers, and visual surveys (Stebbins et al. 2009) (NMFS 2015c) (SEDAR 2014a). Observer data for the Gulf of Mexico include catch per unit of fishing effort (CPUE), species composition, sizes, and fate (Scott-Denton et al. 2011). The first benchmark assessment of greater amberjack stock status occurred in 2006, with another benchmark assessment in 2013. In the most recent assessment, data used were deemed to be adequate, though several areas were mentioned throughout the report where additional monitoring and data collection, including more sampling from the commercial fishery and improved estimates of spawning frequency and fecundity, would allow for a more accurate assessment (SEDAR 2014a). Gulf of Mexico greater amberjack is scheduled to be assessed again in 2016 (SEDAR 2015c). Several species have been assessed within the past 5 years, but others have not been assessed (e.g., almaco jack) or assessments are considerably out of date (e.g., scamp, vermilion snapper). Overall research and monitoring is considered "moderately effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

#### **Moderately Effective**

Available data for greater amberjack come from commercial dealer reports, dockside interviews of fishers (Trip Interview Program, TIP), and visual surveys (Stebbins et al. 2009) (NMFS 2015c), along with scientific studies that address maturation and spawning, migration, and post-release mortality (SEDAR 2008). A limited number of preliminary observer studies also provides data for the region (GSAFFI 2008) (GSAFFI 2010) (GSAFFI 2013). Greater amberjack was last assessed in 2008 (SEDAR 2008), with no assessments published since. Nearly all species that are targeted and retained with greater amberjack in the region have been recently assessed (since 2011) or are currently under assessment (SEDAR 2016b), except for gray snapper. A lack of recent assessments for greater amberjack and gray snapper results in a "moderately effective" rating.

### **Subfactor 3.1.4 – Management Record of Following Scientific Advice**

*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g. do they set catch limits at recommended levels)? A Highly Effective rating is*

*given if managers nearly always follow scientific advice.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### **Highly Effective**

The Gulf of Mexico Fishery Management Council Scientific and Statistical Committee advises managers on acceptable biological catch, annual catch limits, and accountability measures (GMFMC 2015d). There is no evidence that managers do not follow scientific recommendations, resulting in a score of "highly effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

### **Highly Effective**

The South Atlantic Fishery Management Council Scientific and Statistical Committee advises managers on acceptable biological catch, annual catch limits, and accountability measures (SAFMC 2014). There is no evidence to suggest that managers do not follow scientific recommendations, resulting in a score of "highly effective."

## **Subfactor 3.1.5 – Enforcement of Management Regulations**

*Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### **Moderately Effective**

Greater amberjack commercial annual catch limits (ACLs) in the Gulf of Mexico are monitored through paper logbooks, electronic reporting by dealers, vessel monitoring systems (VMS), and observers. Additionally, a pilot study is underway to assess the feasibility of the use of e-logbooks for reef fish bycatch (NMFS 2015c). Small but measurable improvements in compliance have been reported since the introduction of individual fishing quotas (IFQs) for some species in the fishery (e.g., red snapper) (Porter et al. 2012). Greater amberjack commercial ACLs have been exceeded frequently in recent years, but ACLs of other species in the fishery (except for red snapper) are not routinely exceeded (NOAA SERO 2016a). Enforcement is therefore rated as "moderately effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

### **Moderately Effective**

Commercial annual catch limits (ACLs) for greater amberjack and other species in the Southeast Atlantic are monitored through paper logbooks and electronic reporting (NMFS 2015c), but no vessel monitoring system (VMS) or observer program currently exists (SAFMC 2014). ACLs for some species (e.g., red snapper, gag grouper, and triggerfish) have been exceeded in recent years, but landings for amberjack, vermilion snapper, and red porgy have remained around their respective ACLs (NOAA SERO 2016b). An improved dealer reporting amendment was implemented in 2014 (SAFMC 2014) and a pilot study is underway to assess the feasibility of the use of e-logbooks (NMFS 2015c). Because of routine monitoring but overages of ACL for

several species, enforcement is rated as "moderately effective."

### **Subfactor 3.1.6 – Management Track Record**

*Considerations: Does management have a history of successfully maintaining populations at sustainable levels or a history of failing to maintain populations at sustainable levels? A Highly Effective rating is given if measures enacted by management have been shown to result in the long-term maintenance of species overtime.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

Greater amberjack is managed within the Reef Fish Management Plan, which was enacted in 1984 and encompasses 42 species. Amendments over time have led to management measures that include annual catch limits, minimum sizes, bag limits, and use of circle hooks (Sauls and Ayala 2012) (Scott-Denton et al. 2011) (GMFMC 2015e). Greater amberjack abundance in the Gulf of Mexico is currently listed as overfished (SEDAR 2014a) (NOAA 2016), and it has been overfished since the 1990s and undergoing overfishing until quite recently (GMFMC 2014) (NOAA 2016). Despite reductions in allowable catches, reduction in minimum sizes, and redistribution of catch between commercial and recreational sectors, the population has shown little recovery (GMFMC 2015e). Commercial quotas have been met and exceeded (by 117%–149%) every year since 2009 (NOAA SERO 2016a). Other species managed within this fishery, such as red grouper, are considered rebuilt, while there is moderate concern over species such as red snapper and yellowedge grouper (NOAA 2016). No species that are currently undergoing overfishing are targeted within this fishery (GMFMC 2015b). Because of relatively little progress in rebuilding the greater amberjack population but no targeting of species that are undergoing overfishing in this fishery, we have awarded a "moderately effective" rating.

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

Greater amberjack is managed within the Snapper Grouper Fishery Management Plan, which was enacted in 1983 and includes 59 species. Amendments over time have led to management measures that include annual catch limits (ACLs), minimum sizes, bag limits, and use of circle hooks (Hawk 2012) (SAFMC 2014). As of 2006, greater amberjack abundance was high and the species is not overfished, nor is it experiencing overfishing (SEDAR 2008) (NOAA 2016). Catches of greater amberjack have not met or exceeded established ACLs in most years (NOAA SERO 2015a). But ACLs have been exceeded for several other species caught in the fishery (NOAA SERO 2015a) and there is high concern over the abundance of red snapper, red porgy, and gray triggerfish coupled with overfishing on red snapper (NOAA 2016). Improved electronic reporting of harvest is likely to improve enforcement of ACLs in this fishery. Successful management of greater amberjack but mixed management of other species caught in the fishery result in a "moderately effective" rating for track record.

UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

#### **Moderately Effective**

Greater amberjack is managed within the Snapper Grouper Fishery Management Plan, which was enacted in 1983 and includes 59 species. Amendments over time have led to management measures that include annual catch limits (ACLs), minimum sizes, bag limits, and use of circle hooks (Hawk 2012) (SAFMC 2014). As of 2006, greater amberjack abundance was high and the species is not overfished, nor is it experiencing



overfishing (SEDAR 2008) (NOAA 2016). Catches of greater amberjack have not met or exceeded established ACLs in most years. The diver fishery is small, and greater amberjack is not a primary target species. But greater amberjack is caught on diver trips that target several species that are overfished and/or experiencing overfishing, including hogfish and red snapper, and ACLs are routinely exceeded for several of these species (NOAA SERO 2016b). Improved electronic reporting of harvest will likely improve enforcement of ACLs for these species. Successful management of greater amberjack but mixed management of other species in the fishery result in a "moderately effective" rating for track record.

### Subfactor 3.1.7 – Stakeholder Inclusion

*Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent and includes stakeholder input.*

UNITED STATES / GULF OF MEXICO, DIVING

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Highly Effective

The Gulf of Mexico Fishery Management Council posts draft regulation notices for public viewing, has public comment periods for all proposed regulations, and holds regular public meetings. Stakeholder inclusion is therefore rated as "highly effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

#### Highly Effective

The South Atlantic Fishery Management Council posts draft regulation notices for public viewing, has public comment periods for all proposed regulations, and holds regular public meetings. Stakeholder inclusion is therefore rated as "highly effective."

## Factor 3.2 - Bycatch Strategy

### SCORING GUIDELINES

*Four subfactors are evaluated: Management Strategy and Implementation, Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.' Unless reason exists to rate Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations differently, these rating are the same as in 3.1.*

- 5 (Very Low Concern)—Rated as 'highly effective' for all four subfactors considered
- 4 (Low Concern)—Management Strategy rated 'highly effective' and all other subfactors rated at least 'moderately effective.'
- 3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'
- 2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy but some other factors rated 'ineffective.'
- 1 (Very High Concern)—Management exists, but Management Strategy rated 'ineffective.'
- 0 (Critical)—No bycatch management even when overfished, depleted, endangered or threatened species are known to be regular components of bycatch and are substantially impacted by the fishery



## FACTOR 3.2 - BYCATCH STRATEGY

Region / Method	All Kept	Critical	Strategy	Research	Advice	Enforce
United States / Gulf of Mexico / Diving	Yes					
United States / Gulf of Mexico / Handlines and hand-operated pole and lines	No	No	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective
United States / Western Central Atlantic / Handlines and hand-operated pole and lines	No	No	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective
United States / Western Central Atlantic / Diving	Yes					

### Subfactor 3.2.2 – Management Strategy and Implementation

*Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and how successful are these management measures? To achieve a Highly Effective rating, the primary bycatch species must be known and there must be clear goals and measures in place to minimize the impacts on bycatch species (e.g., catch limits, use of proven mitigation measures, etc.).*

#### UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderately Effective**

The most common discards in the commercial handline fishery in the Gulf of Mexico are red snapper, vermilion snapper, red grouper, and gag grouper (Scott-Denton et al. 2011). Changes to regulations, such as the introduction of individual fishing quotas (IFQs) in 2007, were implemented partly to reduce bycatch associated with "derby" fishing situations (NOAA 2011). There are regulatory requirements in place to reduce mortality to incidentally caught sawfish and sea turtles (NOAA 2011). All vessels in the reef fish fishery are required to use non-stainless steel circle hooks and have de-hooking tools aboard to minimize bycatch mortality (GMFMC 2015c). The effectiveness of circle hooks as a bycatch management tool remains uncertain and further study is required. Some studies have indicated that circle hooks have reduced bycatch and bycatch mortality of some species, but other studies have been inconclusive (Sauls and Ayala 2012) (Garner et al. 2014). There is some evidence that commercial, line-caught greater amberjack suffers high discard mortality (> 90%) (Stephen and Harris 2010), while discard mortality estimates used in recent stock assessment models averaged 20% (SEDAR 2014a). Bycatch management is scored as "moderately effective."

#### UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderately Effective**

The most frequently discarded species in the South Atlantic Snapper-Grouper Fishery include red snapper, scamp, red porgy, vermilion snapper, and Atlantic sharpnose shark (GSAFFI 2013). The handline fishery was not expected to contribute to significant mortality of any threatened or endangered species. Annual expected mortality of sea turtles is expected to be less than 30 individuals, and no mortality is expected for smalltooth sawfish (SAFMC 2014). All vessels in the fishery are required to use non-stainless steel circle hooks and have de-hooking tools aboard to minimize bycatch mortality (SAFMC 2015a). The effectiveness of circle hooks as a bycatch management tool remains uncertain and further study is required. Some studies have indicated that circle hooks have reduced bycatch and bycatch mortality of some species, but other studies have been inconclusive (Wilson and Diaz 2012) (Sauls and Ayala 2012) (Garner et al. 2014), There is conflicting evidence

regarding the discard mortality of greater amberjack, with estimates ranging from nearly zero (SEDAR 2008) to > 90% (Stephen and Harris 2010). Discard mortality estimates used in recent stock assessment models for the Gulf of Mexico averaged 20% (SEDAR 2014a). Bycatch management is scored as "moderately effective."

### **Subfactor 3.2.3 – Scientific Research and Monitoring**

*Considerations: Is bycatch in the fishery recorded/documented and is there adequate monitoring of bycatch to measure fishery's impact on bycatch species? To achieve a Highly Effective rating, assessments must be conducted to determine the impact of the fishery on species of concern, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are being met*

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

Discard logbooks are required for 20% of vessels in the reef fish fishery, with approximately 50% compliance (Batty and McElderry 2013). The observer program is small, covering just 1% of vessels (Scott-Denton et al. 2011), resulting in a score of "moderately effective."

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

Discard logbooks are required for 20% of vessels in the Snapper-Grouper Fishery, but no observer program currently exists (SAFMC 2014) (NMFS 2015). Some preliminary observer-based discard data provide estimates of discard mortality (GSAFFI 2008) (GSAFFI 2010) (GSAFFI 2013). This results in a score of "moderately effective."

### **Subfactor 3.2.4 – Management Record of Following Scientific Advice**

*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g., do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.*

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Highly Effective**

See subfactor 3.1.4 in the Harvest Strategy section for detailed information.

### **Subfactor 3.2.5 – Enforcement of Management Regulations**

*Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations? To achieve a Highly Effective rating, there must be consistent enforcement of regulations and verification of compliance.*

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Moderately Effective**

See subfactor 3.1.5 in the Harvest Strategy section for detailed information.

## Criterion 4: Impacts on the habitat and ecosystem

*This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment.*

*The final score is the geometric mean of the impact of fishing gear on habitat score (plus the mitigation of gear impacts score) and the Ecosystem Based Fishery Management score. The Criterion 2 rating is determined as follows:*

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

*Rating cannot be Critical for Criterion 4.*

### Criterion 4 Summary

Region / Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Score
United States / Gulf of Mexico / Diving	4.00: Very Low Concern	0.25: Minimal Mitigation	3.00: Moderate Concern	Green (3.571)
United States / Gulf of Mexico / Handlines and hand-operated pole and lines	4.00: Very Low Concern	0.25: Minimal Mitigation	3.00: Moderate Concern	Green (3.571)
United States / Western Central Atlantic / Handlines and hand-operated pole and lines	4.00: Very Low Concern	0.25: Minimal Mitigation	3.00: Moderate Concern	Green (3.571)
United States / Western Central Atlantic / Diving	4.00: Very Low Concern	0.25: Minimal Mitigation	3.00: Moderate Concern	Green (3.571)

### Criterion 4 Assessment

#### SCORING GUIDELINES

#### Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

- *5 (None) - Fishing gear does not contact the bottom*
- *4 (Very Low) - Vertical line gear*
- *3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (*
- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble*

or boulder)

- 0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)  
*Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

## Factor 4.2 - Mitigation of Gear Impacts

- +1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.
- +0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.
- +0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced
- 0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats

## Factor 4.3 - Ecosystem-Based Fisheries Management

- 5 (Very Low Concern)—Substantial efforts have been made to protect species' ecological roles and ensure fishing practices do not have negative ecological effects (e.g., large proportion of fishery area is protected with marine reserves, and abundance is maintained at sufficient levels to provide food to predators)
- 4 (Low Concern)—Studies are underway to assess the ecological role of species and measures are in place to protect the ecological role of any species that plays an exceptionally large role in the ecosystem. Measures are in place to minimize potentially negative ecological effect if hatchery supplementation or fish aggregating devices (FADs) are used.
- 3 (Moderate Concern)—Fishery does not catch species that play an exceptionally large role in the ecosystem, or if it does, studies are underway to determine how to protect the ecological role of these species, OR negative ecological effects from hatchery supplementation or FADs are possible and management is not place to mitigate these impacts
- 2 (High Concern)—Fishery catches species that play an exceptionally large role in the ecosystem and no efforts are being made to incorporate their ecological role into management.
- 1 (Very High Concern)—Use of hatchery supplementation or fish aggregating devices (FADs) in the fishery is having serious negative ecological or genetic consequences, OR fishery has resulted in trophic cascades or other detrimental impacts to the food web.

## Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

UNITED STATES / GULF OF MEXICO, DIVING  
UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

### Very Low Concern

Diver-based fishing (spearfishing) may result in some incidental contact with the bottom, but has little expected or observable impact on benthic coral habitat (Frisch et al. 2012). Diver-based fishing is therefore considered a "very low" concern.

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES  
UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Very Low Concern

Handlines used for reef-associated species are in limited contact with the substrate.

## Factor 4.2 - Mitigation of Gear Impacts

UNITED STATES / GULF OF MEXICO, DIVING  
UNITED STATES / WESTERN CENTRAL ATLANTIC, DIVING

### Minimal Mitigation

A small portion of Gulf of Mexico waters (0.5%) and eight marine protected areas (MPAs) in the Southeast Atlantic are designated no-take MPAs, where fishing activity is prohibited (SAFMC 2007) (OOCRM 2011). Contact between diver gear and the environment is minimal; however, little habitat is protected from fishing. This factor receives a score of "minimal mitigation."

UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES  
UNITED STATES / WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Minimal Mitigation

Circle hooks are required for use by all reef fish fishery vessels in both the reef fish and snapper grouper fisheries (Sauls and Ayala 2012) (GMFMC 2015c) (SAFMC 2015a). These hooks are expected to be less likely to snag the substrate (Cooke and Suski 2004), though limited data exist to substantiate this point. A small portion of Gulf of Mexico waters (0.5%) and eight marine protected areas (MPAs) in the Southeast Atlantic are designated no-take MPAs, where fishing activity is prohibited (SAFMC 2007) (OOCRM 2011). Contact between handline gear and the environment is minimal, and the gear type is suggested to minimize impact; however, little habitat is protected from fishing. This factor receives a score of "minimal mitigation."

## Factor 4.3 - Ecosystem-Based Fisheries Management

UNITED STATES / GULF OF MEXICO, DIVING  
UNITED STATES / GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Moderate Concern

The Gulf of Mexico Fishery Management Council (GMFMC) is in the planning phase of ecosystem-based management (EBM) development. The council has designated an Ecosystem-Based Fishery Management Working Group to develop objectives related to EBM implementation (ESMWG 2014). Additionally, NOAA commissioned a study to act as a framework from which ecosystem-based management of the Gulf of Mexico will be built (Karnauskas et al. 2013).

There is no indication that greater amberjack should be considered a species of exceptional importance. But red grouper (*Epinephelus morio*) may serve as a habitat modifier, potentially increasing biodiversity and abundance of economically and ecologically important species such as spiny lobster, sponges, and corals (Coleman et al. 2010). Yellowedge grouper is also considered a habitat modifier, creating burrows in soft sediments that provide habitat for other species such as snowy grouper (Coleman and Williams 2002). The GMFMC has not evaluated the potential food web or other ecological impacts of removal of these species from the ecosystem. This results in a score of "moderate" concern.

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### Moderate Concern

The South Atlantic Fishery Management Council is working toward adopting an ecosystem-based approach to management through a Fishery Ecosystem Plan. The plan addresses five key areas needed to implement this ecosystem approach: 1) an overview of the South Atlantic system; 2) species, habitats, and essential fish habitat; 3) information on coastal fishing communities; 4) threats to the system and recommendations; and 5) research and data needs (SAFMC 2009). The most recent adoption of the Comprehensive Ecosystem-Based Amendment 2 implements some goals of ecosystem-based management, including providing special management zones for snapper-grouper species in South Carolina and requiring the review of potential essential fish habitat closures in the future (NOAA 2011). There is no indication that greater amberjack and other species caught within the fishery are species of exceptional ecological importance. But the potential food web or other ecological effects related to removal of the species within this fishery have not been determined. This results in a score of "moderate" concern.

## **Acknowledgements**

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

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## **Appendix A: Extra By Catch Species**

### **ALMACO JACK**

#### **Factor 2.1 - Inherent Vulnerability**

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **High**

FishBase has assigned a high vulnerability rating (74 out of 100) to almaco jack (Froese & Pauly 2016). Almaco jack (*Seriola rivoliana*) is a large jack (Carangidae) with dark bluish-green to silvery or brassy coloration, reaching a maximum size of 160 cm and maximum weight of 60 kg (SAFMC 2015b) (Froese & Pauly 2016). Almaco jack is recognized by having long lobes on the second dorsal and anal fins (SAFMC 2015b). The size at maturity is unknown. Almaco jack is associated with pelagic habitats near outer reef slopes and offshore banks to a depth of 160 m, and is found worldwide in tropical and subtropical waters (SAFMC 2015b). Juveniles aggregate around floating debris. Almaco jack primarily feeds on fish, and has been known in coral reef areas to harbor ciguatera (Froese and Pauly 2016).

#### **Factor 2.2 - Abundance**

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderate Concern**

The International Union for the Conservation of Nature (IUCN) considers almaco jack to be a species of "Least Concern" (Smith-Vaniz et al. 2015). This fish has expanded its range along the European Coast with warming water temperatures (Quero 1998), but data for the East Coast of the United States are lacking. Almaco jack in the South Atlantic region is managed by the South Atlantic Fisheries Management Council (SAFMC) under the Snapper-Grouper Fishery. No formal stock assessment has been completed for almaco jack, but the population is currently under assessment in combination with other data-limited species (SEDAR 2016b). Almaco jack is managed under the South Atlantic Jacks Complex, for which NOAA Fisheries lists both overfishing and overfished status as unknown (NOAA 2016). Given the "Least Concern" assessment by the IUCN but unknown abundance in the U.S. South Atlantic, we are awarding "moderate" concern.

#### **Factor 2.3 - Fishing Mortality**

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Moderate Concern**

Fishing mortality status for almaco jack is unknown. Almaco jack in the South Atlantic region is commonly targeted by commercial fishers and headboats using vertical lines as part of a multispecies snapper-grouper fishery (Stephen and Harris 2010). NOAA reports that total commercial landings of jacks as a group declined from 1999 to 2002, while recreational catch increased during this period (NOAA SERO 2005) and almaco jack made up 6% of the total landings. Commercial landings of almaco jack in 2014 for the South Atlantic region were 170,148 lbs (NMFS 2016a), while recreational data were unavailable for this period. Given the unknown fishing mortality on almaco jack in the South Atlantic, we are awarding "moderate" concern.

#### **Factor 2.4 - Discard Rate**

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

## 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## GAG GROUPER

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### High

FishBase has assigned a high vulnerability rating (68 out of 100) to gag grouper (Froese and Pauly 2016). Gag grouper (*Mycteroperca microlepis*) is a large grouper with brownish-gray colorations and dark markings on the back and sides. It can reach 145 cm in length. Gag grouper is a protogynous hermaphrodite, reaching sexual maturity as a female at approximately 50 cm in length and later metamorphosing into a male. Adult gag grouper are found associated with coral reefs and rocky ledges from North Carolina to the Yucatan Peninsula and throughout the Gulf of Mexico, where they feed on smaller fish, crustaceans, and squid (Froese and Pauly 2016) (GMFMC 2015a). Along the South Atlantic coast, gag grouper spawn from December through May, with a peak in March and April (McGovern et al. 1998) (Brule et al. 2003). Juveniles aggregate in shallow seagrass beds (Casey et al. 2007) (Switzer et al. 2012) and aggregate in oyster shell habitat in South Carolina (Keener et al. 1988).

### Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Moderate Concern

The International Union for the Conservation of Nature considers gag grouper to be a species of "Least concern" (Bertoncini et al. 2008a). Gag grouper in the Gulf of Mexico is managed by the Gulf of Mexico Fisheries Management Council under the Reef Fish Management Plan, and the most recent stock assessment was published in 2014 (SEDAR 2014b). This assessment published two estimates of spawning stock biomass: one used female fish only and produced an estimate of spawning stock biomass at twice the limit reference point ( $SSB_{\text{FEMALES}}/MSST = 2.05$ ) (SEDAR 2014b), and the second used combined female and male fish and produced an estimate of combined spawning stock at below the limit reference point ( $SSB_{\text{COMBINED}}/MSST = 0.496$ ) (SEDAR 2014b). The first estimate (females only) indicates that this stock is not overfished, but the assessment review panel recommended using the second (combined females and males) because it is the more conservative estimate and does indicate that the stock is overfished (SEDAR 2014b). NOAA Fisheries reports Gulf of Mexico gag grouper as not overfished (NOAA 2016), which is based on the 2014 assessment but uses the less conservative estimate. Given the vastly different abundance estimates and uncertainty as to which estimate is more appropriate, we have rated abundance a "moderate" concern.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

The International Union for the Conservation of Nature considers gag grouper to be a species of "Least Concern" (Bertoncini et al. 2008a). Gag grouper along the South Atlantic Coast is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper Fishery Management Plan. The most recent stock assessment found that South Atlantic gag grouper spawning stock biomass is above the minimum stock size threshold ( $SSB/MSST = 1.13$ ) as of 2012, indicating that the population is not overfished (SEDAR 2014c). There is high confidence in this estimate, with 97.5% of model runs indicating the population is not overfished (SEDAR 2014c). Spawning stock biomass was found to be near but just below the target level of biomass at maximum sustainable yield ( $SSB/SSB_{MSY} = 0.97$ ) (SEDAR 2014c). But the assessment indicated that abundance was projected to decline after 2012 because of poor recruitment from 2010 to 2011. Because the South Atlantic gag grouper population is not overfished but abundance is below the target level and potentially declining, we have awarded a "low" concern score.

## Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Very Low Concern

Gag grouper is commonly targeted by commercial fishers using vertical lines and longlines, and by headboat and private recreational fishers using vertical lines. In the Gulf of Mexico, 687,655 lbs of gag grouper were caught in the commercial fishery and 926,510 lbs were caught in the recreational fishery in 2014 (NMFS 2016a) (NMFS 2016b). The most recent assessment for Gulf of Mexico gag grouper indicates that fishing mortality is below the fishing mortality at maximum sustainable yield ( $F/F_{MSY} = 0.765$ ); therefore, gag grouper is not experiencing overfishing (SEDAR 2014b) (NOAA 2016). The assessment also indicated that fishing mortality has declined substantially from peak levels in 2008 (SEDAR 2014b). Because it is highly likely that overfishing is not occurring, this factor is scored "very low" concern.

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

The 2014 stock assessment for South Atlantic gag grouper indicated that the average fishing mortality for the years 2010–2012 exceeded the target level of fishing at maximum sustainable yield ( $F/F_{MSY} = 1.23$ ), indicating that overfishing was occurring (SEDAR 2014c). But the South Atlantic Council's Scientific and Statistical Committee (SSC) noted that the fishing mortality rate for 2012, and the projected fishing mortality rate in 2013, suggested that overfishing did not occur in 2012 and 2013. Additionally, after the 2014 assessment, managers took action to revise the annual catch limit for gag grouper for the 2015–2019 fishing years to ensure that overfishing does not occur in the future (Federal Register 2015). NOAA Fisheries currently considers gag grouper in the South Atlantic to no longer be experiencing overfishing (NOAA 2016), but a new assessment has yet to be completed. Gag grouper is commonly targeted by commercial fishers using vertical lines, as well as by divers, and by headboat and private recreational fishers using vertical lines. In 2014, 380,252 lbs of gag grouper were caught in the commercial fishery and 177,606 lbs were caught in the recreational fishery in the South Atlantic (NMFS 2016a)(NMFS 2016b). Because of the recent suggestion that overfishing on South Atlantic gag grouper is no longer occurring, we have rated this factor a "low" concern.

## Factor 2.4 - Discard Rate

### UNITED STATES/GULF OF MEXICO, DIVING

#### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2012).

### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).

### UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

#### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2008).

### UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## GRAY TRIGGERFISH

## Factor 2.1 - Inherent Vulnerability

### UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Medium

FishBase has assigned a low vulnerability rating (49 out of 100) to gray triggerfish (Froese and Pauly 2016). Gray triggerfish (*Balistes caprisus*) is found in the Eastern Atlantic from Europe to Angola and in the Western Atlantic from Canada to Argentina (Froese and Pauly 2016). Gray triggerfish reaches maturity at 16 cm, with a maximum reported size of 60 cm and maximum weight of 6 kg (Lombardi et al. 2015) (Froese and Pauly 2016). Adult gray triggerfish are found associated with reefs, rocky bottoms, and wrecks to a depth of 100 m, while juveniles are found associated with floating algae (SAFMC 2015b) (Froese and Pauly 2016). During spawning, gray triggerfish males build and defend demersal nest territories on sandy bottoms, while females guard and ventilate eggs in the nest after fertilization (Simmons and Szedlmayer 2012). After

hatching, the larvae are pelagic and the juveniles drift with floating *Sargassum* (Antoni et al. 2011). Gray triggerfish feeds primarily on benthic invertebrates, including mussels, barnacles, and sea urchins (SAFMC 2015b).

## Factor 2.2 - Abundance

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Moderate Concern

The abundance of gray triggerfish in the U.S. Southeast Atlantic is uncertain. The International Union for the Conservation of Nature assessed gray triggerfish to be a "Vulnerable" species because of declines in many parts of its range; however, no evidence of decline was reported for the U.S. Atlantic (Jing et al. 2015).

Gray triggerfish in the Southeast Atlantic region is managed by the South Atlantic Fishery Management Council (SAFMC) under the Snapper-Grouper Fishery Management Plan. A recent assessment of Southeast Atlantic gray triggerfish could not estimate abundance relative to target and overfished abundance reference points because of high uncertainty in the assessment model (SEDAR 2016) (NOAA 2016). The review panel for the assessment stated that "there was no evidence of a decline in abundance or biomass at this time" (SEDAR 2016). A previous assessment in 2011 also concluded that abundance status was "highly uncertain" because of a small data set (Broome et al. 2011). There have been a few other limited studies on gray triggerfish abundance in this region. Potts and Brennan (2001) found that mean weights of gray triggerfish had declined in both the commercial and recreational fishery from 1983 to 1999, possibly indicating a drop in abundance, but they also indicated that the spawning potential ratio (SPR) at the time was 62%, indicating a healthy biomass (Potts and Brennan 2001). Rudershausen et al. (2008) found that gray triggerfish in the vertical line fishery off the coast of North Carolina had declined both in catch per unit of fishing effort (CPUE) and as a percentage of total species caught from the 1970s to 2005–2006, indicating possible declines in biomass in this area (Rudershausen et al. 2008).

Because there is uncertain abundance information for gray triggerfish in the Southeast Atlantic, we have awarded a score of "moderate" concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Moderate Concern

The first stock assessment for Southeast Atlantic gray triggerfish was completed in April 2016, and determined that exploitation status is unknown due to uncertainty in the assessment model (SEDAR 2016). Gray triggerfish is targeted by commercial, recreational, and headboat fishers using vertical lines, and made up the sixth-highest landings by weight in the Snapper-Grouper management complex for the South Atlantic region (Burton et al. 2015). Landings are roughly evenly split between the commercial (54.6%) and recreational (45.4%) sectors for this species (Burton et al. 2015). Landings increased sharply in the 1990s due to increased consumer demand for this species, declined from 1999 to 2003, and have increased again from 2004 to 2010 (Burton et al. 2015). But the review panel report from the assessment states that, based on the information available to the panel, "there was no evidence that current levels of removals have resulted in overfishing" (SEDAR 2016). Landings of this species are difficult to quantify, because gray triggerfish is often listed in dealer reports as generic "triggerfishes," which include queen, ocean, and gray triggerfish in the South Atlantic (pers. comm., Joseph Myers 2016). Because of the unknown fishing mortality for this species,



we have awarded "moderate" concern.

## Factor 2.4 - Discard Rate

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## MUTTON SNAPPER

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

### High

Mutton snapper (*Lutjanus analis*) has a high vulnerability to fishing (55 out of 100 FishBase rating) (Froese and Pauly 2016) and is considered to be "Near Threatened" by the International Union for the Conservation of Nature (IUCN) (Lindeman et al. 2016d). It reaches sexual maturity at approximately 52 cm, and grows to a maximum size of 94 cm; the oldest reported age is 29 years (Burton 2002). Mutton snapper is found in the Western Atlantic from Massachusetts to the coast of Brazil, including throughout the Gulf of Mexico and Caribbean, but is most abundant in the Antilles, Bahamas, and southern Florida (Carpenter 2002). It is typically found in inshore habitats to a depth of 70 m, associated with coral reefs, rocky bottoms, seagrass beds, and mangroves (Allen 1985) (GMFMC 2015a). Mutton snapper feeds on fish, crustaceans, squid, and gastropods (Burton 2002). This species is known to form offshore spawning aggregations from February to June, at depths of 20–40 m near shelf breaks over rocky or coral rubble bottoms (SEDAR 2007), potentially increasing its vulnerability to exploitation (Graham et al. 2008).

### Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

### Very Low Concern

The International Union for the Conservation of Nature (IUCN) considers mutton snapper to be a near threatened species (Lindeman et al. 2016b). In the U.S. Gulf of Mexico, mutton snapper is managed by the Gulf of Mexico Fisheries Management Council under the Reef Fish Management Plan. Mutton snapper in the southeast Atlantic, eastern Gulf of Mexico, and U.S. Caribbean are considered to be a single population, centered in South Florida (Carson et al. 2011) (Shulzitski et al. 2009). But there may be various subpopulations of mutton snapper that have different demographics (Carson et al. 2011). The most recent stock assessment of the South Atlantic and Gulf of Mexico mutton snapper population indicates that, as of 2013, the species is not overfished and abundance is above the target level or the biomass at maximum sustainable yield proxy ( $B/B_{MSY}$  proxy of 1.13) (SEDAR 2015d) (NOAA 2016). Abundance of mutton snapper has increased since the mid-1990s (SEDAR 2015d). Because the current mutton snapper population is healthy, this results in a score of "very low" concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, DIVING

### Very Low Concern

Mutton snapper in the South Atlantic and Gulf of Mexico are not subject to overfishing (NOAA 2016). The most recent stock assessment estimates the mean total fishing mortality for 2011 to 2013 (0.12) to be well below the fishing mortality at maximum sustainable yield proxy (0.18) (SEDAR 2015d). Mutton snapper is commonly targeted by commercial fishers using longlines and vertical lines, and by headboats and private recreational fishers using vertical lines. In 2014, commercial fisheries landed 200,965 lbs of mutton snapper (NMFS 2016a) and recreational fisheries landed 432,897 lbs of mutton snapper (NMFS 2016b) in the South Atlantic and Gulf of Mexico combined. Between 2004 and 2013, approximately 87% of all commercial landings came from the Gulf of Mexico (NMFS 2016a). Because of recent estimates of low fishing mortality, we have awarded a score of "very low" concern.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, DIVING

### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2012).

## RED GROUPE

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### High

FishBase has assigned a high vulnerability rating (63 out of 100) to red grouper (Froese and Pauly 2016). Red grouper (*Epinephelus morio*) is a medium-sized grouper with variable coloration ranging from red to mottled reddish-brown, reaching a maximum size of 125 cm. It is a protogynous hermaphrodite, with 50% of females reaching sexual maturity at approximately 54 cm (Moe 1969) and metamorphosing into males around age 9 (Allsop and West 2003). Adult red grouper and young-of-the-year juveniles are associated with offshore rocky and muddy bottoms to a depth of 330 m (Heemstra and Randall 1993), while juvenile fish ages 1–6 are common on nearshore coral reefs (GMFMC 2015a). Spawning takes place from January to March (Brule et al. 2003). Red grouper are found from North Carolina to the coast of Brazil, and throughout the Gulf of Mexico and Caribbean, feeding on smaller fish, squid, and crustaceans (Moe 1969) (GMFMC 2015a).

## Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

The International Union for the Conservation of Nature considers red grouper to be a "Near Threatened" species (Garcia-Moliner and Eklund 2004). Red grouper in the Gulf of Mexico is managed by the Gulf of Mexico Fisheries Management Council under the Reef Fish Management Plan. After a previous overfished status, the

Gulf of Mexico red grouper stock was declared rebuilt in 2007 (FishWatch 2015). Formal stock assessments (SEDAR 2009) (SEDAR 2015b) list this stock as not overfished, with abundance well above the target level of biomass at maximum sustainable yield and increasing from 2009 to 2013 ( $B/B_{MSY}$  proxy = 1.28 in 2009;  $B/B_{MSY}$  proxy = 1.83 in 2013). But the assessment review panel notes that there is some uncertainty around the abundance estimate, and there is debate regarding the appropriate reference points (SEDAR 2015b). Also, this species is vulnerable to toxic red tide events, which could reduce biomass (SEDAR 2009) (FishWatch 2015). Based on the recovery from previous overfished status combined with uncertainty in the recent stock assessment, abundance is rated as a "low" concern.

### Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, DIVING

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Very Low Concern

Red grouper in the Gulf of Mexico is not experiencing overfishing (NOAA 2016). Red grouper is commonly targeted by commercial fishers using vertical lines and longlines, and by headboat and private recreational fishers using vertical lines. Landings for the Gulf of Mexico in 2014 were 6,545,646 lbs by the commercial fishery and 426,494 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). Fishing mortality was estimated to be below the fishing mortality at maximum sustainable yield in both recent stock assessments ( $F/F_{MSY}$  = 0.778 in 2008;  $F/F_{MSY}$  = 0.76 in 2013) (SEDAR 2009) (SEDAR 2015b). Therefore, red grouper fishing mortality is a "very low" concern.

### Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, DIVING

#### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2012).

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).

### RED PORGY

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### High

FishBase has assigned a high vulnerability rating (66 out of 100) to red porgy (Froese and Pauly 2016). Red

porgy (*Pagrus pagrus*) is a medium-sized porgy with red-silver coloration. It can grow up to 91 cm in length (Froese and Pauly 2016). Red porgy is a protogynous hermaphrodite, reaching sexual maturity at approximately 22 cm (3 years of age) as a female and then metamorphosing into a male at 35–40 cm (Hood and Johnson 2000). Adult red porgy are found associated with rocky, coral rubble, or sandy bottoms to a depth of 250 m, and juveniles are found in shallower waters and seagrass beds (Froese and Pauly 2016) (SAFMC 2015b). Red porgy is found in the Western Atlantic from New York to Argentina, including the Gulf of Mexico and the Caribbean, and in the Eastern Atlantic from the British Isles to Angola and throughout the Mediterranean. Red porgy feeds on smaller fish, crustaceans, and other invertebrates (Froese and Pauly 2016).

## Factor 2.2 - Abundance

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### High Concern

The International Union for the Conservation of Nature (IUCN) considers red porgy to be a species of "Least Concern" (Russell et al. 2014). But red porgy in the U.S. South Atlantic Coast is considered overfished. The most recent assessment for this species, in 2012, estimated abundance to be at 61% of the threshold/limit abundance level, and at 47% of the target abundance level or the biomass at maximum sustainable yield ( $B_{MSY}$ ) (SEDAR 2012c). Red porgy is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper Fishery, and is in year 17 of an 18-year rebuilding program (NOAA 2016). Due to this depleted status, red porgy abundance is a "high" concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Red porgy in the South Atlantic stock is not experiencing overfishing. Fishing mortality over the years 2009–2011 was estimated to be 64% of the fishing mortality at maximum sustainable yield ( $F_{MSY}$ ) (SEDAR 2012c). But red porgy is currently recovering from a depleted state, and rebuilding has slowed in recent years. There is a low probability (2%–18%) that the population will rebuild by the 2018 timeline in the rebuilding plan (SEDAR 2012c). Red porgy is commonly targeted by commercial fishers, headboats, and private recreational boats using vertical lines. Landings for the South Atlantic Coast in 2014 were 149,599 lbs by the commercial fishery and 36,429 lbs by the recreational fishery (NMFS 2015a) (NMFS 2015b). Because of the current lack of overfishing but the slow rebuilding of South Atlantic red porgy, we awarded a "low" concern for fishing mortality.

## Factor 2.4 - Discard Rate

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## SCAMP

### Factor 2.1 - Inherent Vulnerability

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Medium

FishBase has assigned a high vulnerability rating (68 out of 100) to scamp (Froese and Pauly 2016), but its life history attributes, including late maturity and high fecundity, suggests a medium vulnerability to fishing (see Detailed Rationale). Scamp (*Mycteroperca microdon*) is a medium-sized grouper with variable coloration ranging from pale grayish-brown to dark brown, with dark spots. It grows to a maximum size up to 107 cm (Heemstra and Randall 1993) (Froese and Pauly 2016). Scamp is a protogynous hermaphrodite, maturing first as a female and then metamorphosing into a male. It has been recorded to live 21 years (Matheson et al. 2002) as many as 30 years. Juvenile scamp are found inshore associated with mangroves, jetties, and piers, while adults are found on rocky or coral bottoms at depths of 30–100 m (Heemstra and Randall 1993). Spawning typically takes place from May to November (Harris et al. 2002) (GMFMC 2015a). Scamp is found from North Carolina to the coast of Venezuela, and throughout the Caribbean, feeding on smaller fish, squid, and crustaceans (Heemstra and Randall 1993) (GMFMC 2015a).

#### Justification:

Table 1: Results from Seafood Watch fish vulnerability rubric (SFW Criteria document, p. 4). Attribute scores range from 1 to 3, with higher scores signifying more resilient life-history attributes.

Vulnerability attribute	Category	Score
Average age at maturity	5–15 years	2
Average maximum age	> 25 years	1
Fecundity	> 100 eggs	N/A
Average max size	100–300 cm	2
Average size at maturity	40–200 cm	2
Reproductive strategy	Broadcast spawner	3
Trophic level	> 3.25	1
Average Score	Medium Vulnerability	1.83

Species with average attribute scores between 1.80 and 2.43 are deemed to have a “medium” vulnerability.

### Factor 2.2 - Abundance

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Moderate Concern

The International Union for the Conservation of Nature (IUCN) considers scamp to be a species of “Least Concern” (Rocha et al. 2008c). Scamp along the South Atlantic Coast is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper Fishery Management Plan, and the last stock assessment was conducted in 2013.

assessment for this species was published in 1998 (Manooch et al. 1998). Spawning potential ratio (SPR) of scamp was thought to be between 35% and 52% of an unfished level, based on commercial and recreational landings and a range of likely natural mortality values, thus indicating a recovering stock (Manooch et al. 1998) (Potts and Brennan 2001). Recent stock status updates from NOAA Fisheries lists South Atlantic scamp abundance as "unknown" (NOAA 2016). Because of the lack of a recent stock assessment and medium vulnerability, we have rated abundance as "moderate" concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### Low Concern

Scamp in the South Atlantic region is not considered subject to overfishing (NOAA 2016), although the most recent formal stock assessment and fishing mortality estimate was published in 1998 (Manooch et al. 1998). Scamp is commonly targeted by commercial fishers, headboats, and private recreational fishers using vertical lines. Scamp landings in 2014 for the South Atlantic were 170,998 and 58,794 lbs for the commercial and recreational fisheries, respectively (NMFS 2016a) (NMFS 2016b). Between 2012 and 2015, scamp landings have not exceeded 62% of the established annual catch limit (NOAA SERO 2016a). We have awarded a score of "low" concern because it is unlikely that overfishing is occurring.

## Factor 2.4 - Discard Rate

UNITED STATES/WESTERN CENTRAL ATLANTIC, DIVING

### < 20%

Discard mortality is low when diver-based methods are used (< 5%), with discards resulting from the unintended catch of undersized individual fish (Frisch et al. 2008).

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermilion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## SNOWY GROUPE

## Factor 2.1 - Inherent Vulnerability

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### High

FishBase has assigned a high vulnerability rating (64 out of 100) to snowy grouper (Froese and Pauly 2016). Snowy grouper (*Hyporthodus niveatus*) is a medium-sized grouper with variable coloration ranging from dark brown to coppery brown. Snowy grouper has white spots on its sides and a dark saddle-shaped

mark on the caudal peduncle, but these markings may disappear in adults (Froese and Pauly 2016). It can grow to a size of 122 cm in length and 30 kg in weight. It is a protogynous hermaphrodite, reaching sexual maturity at approximately 45–50 cm as a female and later metamorphosing into a male, and can live up to 27 years (SEDAR 2014x). Adult snowy grouper are found offshore, associated with rocky bottoms over a depth range from 30 m to 525 m, although juveniles may be found inshore (Thierry et al. 2008). Its distribution extends from Massachusetts to the southern coast of Brazil, and throughout the Gulf of Mexico and Caribbean. It feeds on crabs, fish, cephalopods, and gastropods (Froese and Pauly 2016).

## Factor 2.2 - Abundance

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Moderate Concern

The International Union for the Conservation of Nature (IUCN) considers snowy grouper to be a "Vulnerable" species globally (Thierry et al. 2008), but lists the Gulf of Mexico population as "Least Concern" (Claro et al. 2015). Snowy grouper is managed by the Gulf of Mexico Fishery Management Council within the Deep Water Grouper Complex (which includes speckled hind and Warsaw grouper), but no formal stock assessment has been completed for snowy grouper; the population is currently under assessment in combination with other data-limited species (SEDAR 2016b). Abundance and associated reference points are unknown for the Gulf of Mexico (NOAA 2016), but an initial reef fish survey found that snowy grouper is low in frequency and abundance in the Gulf of Mexico, except for the mobile pinnacles region in the northern Gulf of Mexico (Campbell et al. 2016). Because of uncertain and conflicting abundance information for this population, we have rated abundance as "moderate" concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Moderate Concern

Snowy grouper in the Gulf of Mexico is not considered to be undergoing overfishing (NOAA 2016), but no formal population assessment has been completed. Landings have been stable in the Gulf of Mexico for the last three decades, and there is little indication of a decline (Claro et al. 2015). Snowy grouper is targeted by commercial and recreational fishers using vertical lines. Commercial landings for the Gulf of Mexico were 216,849 lbs in 2014, and landings were 20,915 lbs for the recreational fishery (NMFS 2016a) (NMFS 2016b). Because of unknown fishing mortality and stable landings, we have awarded a score of "moderate" concern.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).

## VERMILION SNAPPER

### **Factor 2.1 - Inherent Vulnerability**

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Medium**

FishBase has assigned a medium vulnerability rating (50 out of 100) to vermilion snapper (Froese and Pauly 2016). Vermilion snapper (*Rhomboplites aurorubens*) is a medium-sized snapper with red to reddish-silver coloration, and sometimes small yellow or blue markings. It can grow to 60 cm in length (Froese and Pauly 2016). Vermilion snapper reaches sexual maturity around 23 cm at 3–4 years of age, and adults may live up to a decade (Manooch 1987) (GMFMC 2015a). Adult vermilion snapper are found over rock, gravel, or sand bottoms down to 300 m, while juveniles inhabit shallower waters but still deeper than 25 m (Allen 1985). Vermilion snapper is found in the Western North Atlantic from North Carolina to the coast of Brazil, and throughout the Gulf of Mexico and Caribbean (Floeter et al. 2003). Vermilion snapper feeds on smaller fish, crustaceans, squid, benthic invertebrates, and some planktonic prey (Froese and Pauly 2016) (GMFMC 2015a).

### **Factor 2.2 - Abundance**

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Very Low Concern**

Vermilion snapper in the Gulf of Mexico is managed by the Gulf of Mexico Fisheries Management Council under the Reef Fish Management Plan, and was last assessed in 2011 (SEDAR 2011b). This assessment concluded that vermilion snapper in the Gulf of Mexico was not overfished, with spawning stock biomass in 2010 well above the target level or spawning stock biomass at maximum sustainable yield ( $SSB/SSB_{MSY} = 1.60$ ) (SEDAR 2011b). Because vermilion snapper was not overfished, with abundance well above the target level, we have awarded a "very low" concern score.

UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Low Concern**

Vermilion snapper in the South Atlantic is managed by the South Atlantic Fisheries Management Council under the Snapper-Grouper Fishery Management Plan, and was last assessed in 2012. The assessment indicates that the abundance of vermilion snapper has been declining since 1946 and was at its lowest level in 2011. The biomass of spawning fish was estimated to be slightly below the target level or the biomass at maximum sustainable yield ( $B/B_{MSY}$  of 0.98). But abundance was above the limit abundance reference point or the minimum stock size threshold ( $B/MSST = 1.26$ ), indicating that the population is not overfished (SEDAR 2012a). Because vermilion snapper is not overfished, but abundance is below the target level, we have awarded a "low" concern score.

### **Factor 2.3 - Fishing Mortality**

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### **Very Low Concern**

NOAA Fisheries lists vermilion snapper in the Gulf of Mexico as not subject to overfishing (NOAA 2016), and the most recent stock assessment (2010) estimates fishing mortality to be 32% of the target level or fishing



mortality at maximum sustainable yield ( $F/F_{MSY} = 0.32$ ) (SEDAR 2011b). Vermilion snapper is commonly targeted by commercial fishers using vertical lines, and by headboat and private recreational fishers using vertical lines. Landings for the Gulf of Mexico in 2014 were 1,761,456 lbs by the commercial fishery and 825,328 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). Juvenile vermillion snapper are also caught as bycatch in the shrimp trawl fishery. It was noted that recent declines in overall shrimp trawl effort across the Gulf have resulted in decreased fishing mortality for vermillion snapper (SEDAR 2011b). Given that fishing mortality is well below the target level, we have awarded a "very low" concern score.

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **Low Concern**

NOAA Fisheries lists vermillion snapper along the South Atlantic coast as not experiencing overfishing (NOAA 2016), and the most recent stock assessment estimates fishing mortality to be 67% of the target level or fishing mortality at maximum sustainable yield ( $F/F_{MSY} = 0.67$ ) (SEDAR 2012a) for the years 2009–2011. But the stock assessment also notes a large amount of uncertainty in this overall estimate, with some individual estimates indicating overfishing over the same period (SEDAR 2012a). In addition, it was noted that decreasing abundance and increasing fishing mortality rates are cause for concern (SEDAR 2012a). Vermilion snapper is commonly targeted by commercial fishers using vertical lines, and by headboat and private recreational fishers using vertical lines. Landings for the South Atlantic in 2014 were 907,528 lbs by the commercial fishery and 259,146 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). Given the low fishing mortality but acknowledged uncertainty around this measure, we have awarded a "low" concern score.

## **Factor 2.4 - Discard Rate**

#### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **20-40%**

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermillion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).

#### UNITED STATES/WESTERN CENTRAL ATLANTIC, HANDLINES AND HAND-OPERATED POLE AND LINES

##### **20-40%**

Commercial discards in the snapper-grouper fishery in the Southeast Atlantic are moderate. The total discards/landings ratio for the fishery was 23.2% between 2007 and 2011 (GSAFFI 2013). A large proportion of the discards in the fishery are undersized discards (36% to 98%, depending on the species) (GSAFFI 2008). Discards/landings ratios for some of the most commonly discarded species are: vermillion snapper, 17%; red snapper, 45%; and red grouper, 250% (GSAFFI 2010).

## **YELLOWTAIL SNAPPER**

### **Factor 2.1 - Inherent Vulnerability**

#### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

## Medium

FishBase has assigned a high vulnerability rating (65 out of 100) to yellowtail snapper, but its life history suggests fishing (see Detailed Rationale). Additionally, a Productivity Susceptibility Analysis for yellowtail snapper found it (MRAG 2009). Taking into account these different assessments, we have ranked its vulnerability as medium. Yellowtail snapper (*Lutjanus chrysurus*) is a medium-sized snapper with bluish coloration and it is recognized by a prominent yellow stripe along its side. It ranges in size up to 86 cm (Allen 1985). It reaches sexual maturity around 24 cm in length and 3 years of age, and forms spawning aggregations (Burton et al. 2005). The maximum observed age is 23 years (O'Hop et al. 2012). Adults are found well above coral reef bottoms, commonly over a depth range of 10–70 m, while juveniles inhabit sea grass beds (Burton 2016). Yellowtail snapper is found in the Western North Atlantic from North Carolina to the coast of Brazil, and throughout the Mexico and Caribbean (FLMNH 2005). Yellowtail snapper feeds on both benthic and planktonic prey, including fish, gastropods, cephalopods, and worms (Froese and Pauly 2016) (SAFMC 2015b).

### Justification:

Table 2: Results from Seafood Watch fish vulnerability rubric (SFW Criteria document, p. 4). Attribute scores can range from 1 to 3, with higher scores signifying more resilient life history attributes.

Vulnerability attribute	Category	Score
Average age at maturity	< 5 years	3
Average maximum age	10–25 years	2
Fecundity	> 100 eggs	N/A
Average max size	< 100 cm	3
Average size at maturity	< 40 cm	3
Reproductive strategy	Broadcast spawner	3
Trophic level	> 3.25	1
Average Score	Low Vulnerability	2.5

Species with average attribute scores between 2.44 and 3.0 are deemed to have a “low” vulnerability.

## Factor 2.2 - Abundance

### UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

#### Very Low Concern

Yellowtail snapper in the Gulf of Mexico is managed by the Gulf of Mexico Fisheries Management Council. The most recent stock assessment (SEDAR 2012b) treats this species as a single stock that ranges into both South Atlantic and Gulf of Mexico management zones. This assessment determined that this species is not overfished, with spawning stock biomass more than three times the target level of biomass at maximum sustainable yield ( $B/B_{MSY} = 3.36$ ) (SEDAR 2012b). Because of this high biomass, we have rated abundance as “very low” concern.

## Factor 2.3 - Fishing Mortality

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### Very Low Concern

Yellowtail snapper in the Gulf of Mexico and South Atlantic regions are not subject to overfishing (NOAA 2016). The most recent stock assessment estimated fishing mortality to be well below the fishing mortality at maximum sustainable yield ( $F/F_{MSY}$  of 0.154) (SEDAR 2012b). This ratio was based on an  $F_{MSY}$  that would yield a spawning potential ratio (SPR) of 30%. Yellowtail snapper is commonly targeted by commercial fishers, and by headboat and private recreational fishers using vertical lines. Landings for the Gulf of Mexico in 2014 were 1,880,973 lbs by the commercial fishery and 506,987 lbs by the recreational fishery (NMFS 2016a) (NMFS 2016b). Because of the very low overall fishing mortality, we have awarded a rating of "very low" concern for this species.

## Factor 2.4 - Discard Rate

UNITED STATES/GULF OF MEXICO, HANDLINES AND HAND-OPERATED POLE AND LINES

### 20-40%

Total discards/landings ratio for the reef fish fishery was 33.8% between 2006 and 2009 (Scott-Denton et al. 2011) and nearly identical from data collected in 2010–2011 (33.3%) (Scott-Denton and Williams 2013). Discards/landings ratios for four of the most commonly discarded species that are frequently caught with amberjack are: red snapper, 24%; vermilion snapper, 5%; red grouper, 41%; and gag grouper, 40% (Scott-Denton et al. 2011).