

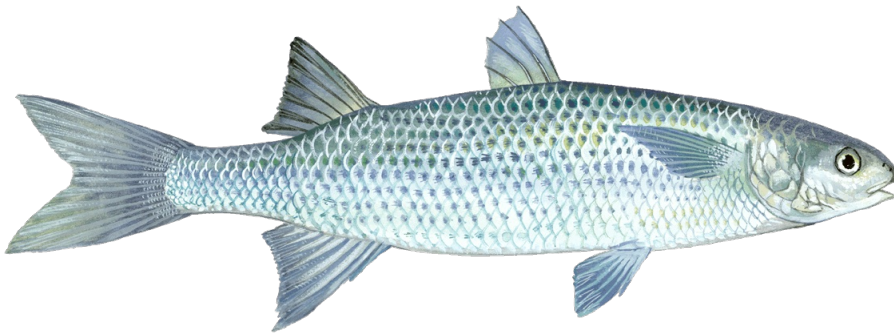
The Safina Center  
at Stony Brook University

AND

# Monterey Bay Aquarium Seafood Watch®

## Striped mullet (Florida)

*Mugil cephalus*



©Duane Raver

## Florida/Western Central Atlantic

### Beach seines, Cast nets

*Published June 01 2016, Reviewed November 20, 2019 – see Appendix A for more information*

*The Safina Center Seafood Analysts*

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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 .....	13
<i>Criterion 1: Impacts on the Species Under Assessment</i> .....	13
<i>Criterion 2: Impacts on Other Species</i> .....	15
<i>Criterion 3: Management Effectiveness</i> .....	18
<i>Criterion 4: Impacts on the Habitat and Ecosystem</i> .....	22
Acknowledgements .....	25
References .....	26
Appendix A: Updates to Striped Mullet Report .....	28

## **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 Watch Assessment. Each assessment 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." This ethic is operationalized in the Seafood Watch standards, available on our website here. In producing the assessments, 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 assessments 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 Watch assessments in any way they find useful.

## **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**

Striped mullet (*Mugil cephalus*) is a catadromous, schooling fish inhabiting the coastal areas around the southern Atlantic Ocean (east coast) and the Gulf of Mexico (west coast). This species is targeted from October to February for its valuable eggs (sold as roe in seafood markets), but the meat is also used as bait in commercial and recreational fisheries and is consumed in some regions of the southern U.S. The largest commercial fisheries for striped mullet operate out of southwest Florida (managed by the Florida Fish and Wildlife Conservation) and east of the Mississippi River, off the coast of Louisiana (not covered in this report). A majority of the roe is exported, primarily to Asia. Florida stock assessments on striped mullet are performed every 3–5 years and have suggested the stock is in healthy condition, with low fishing mortality rates. Cast and seine nets (Florida) are used almost exclusively to catch schools of mullet; bycatch and habitat effects with this type of gear are thought to be minimal. This small, bottom-feeding species is considered important in the overall Gulf marine ecosystem because it is preyed upon by a range of other fauna. Striped mullet is highly fecund, relatively short-lived, with a low age at maturity, making it resilient to heavy fishing pressure. But due to its importance in the ecosystem as well as the state economies, managers have taken steps to prevent fishing mortality from becoming deleterious to stocks. This combination of factors results in an overall rating of “Best Choice.”

## 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
<b>Striped mullet</b> Florida/Western Central Atlantic   Beach seines   United States of America	Green (5.000)	Yellow (2.644)	Green (4.000)	Green (3.464)	<b>Best Choice (3.678)</b>
<b>Striped mullet</b> Florida/Western Central Atlantic   Cast nets   United States of America	Green (5.000)	Yellow (2.644)	Green (4.000)	Green (3.873)	<b>Best Choice (3.782)</b>

### Summary

Striped mullet in Florida Western Central Atlantic fisheries, caught by beach seine or cast nets, are rated as a **Best Choice** due to low impacts on the stock, moderate impacts on other species, highly effective management and minimal impacts on the environment.

### 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 either Criterion 1 or Criterion 3 (or both) is Green, 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 includes recommendations for striped mullet (*Mugil cephalus*) caught by beach seine and cast net. The fishery occurs in the waters of the U.S. South Atlantic and the Gulf of Mexico, including Florida's east and west coast. In North Carolina, Alabama, and Louisiana, where there's little demand for mullet for human consumption due to its oiliness, most commercial exploitation targets roe-carrying females (for the exporting of roe) and mullet for mullet bait fisheries.

## **Species Overview**

Striped mullet is the most abundant species in the family Mugilidae, inhabiting the coastal areas around the Gulf of Mexico (GOM) and southern Atlantic Ocean (Leard et al. 1995). It is catadromous, meaning it spends its adult life in fresh/brackish estuarine habitats, and returns to the coastal ocean to spawn (FMNH 2015). Striped mullet is a bottom-feeding species (detritivores feeding on the top layer of sediment) and considered important in the overall Gulf marine ecosystem because it is preyed upon by a range of other fauna (Chagaris et al. 2014).

This species is highly fecund, relatively short-lived, with a young age at maturity, making it resilient to heavy fishing pressure (GulfFINFO 2015). Striped mullet are fished recreationally in many states (Alabama, Mississippi, Florida, etc.), primarily with cast nets (pers. comm., David Chagaris, March 30, 2016), but also with gigs and bow arrows (pers. comm., Steve Brown, March 17, 2016) because they are not easily caught by hook and line. The largest commercial fisheries for this species operate out of southwest Florida (for human consumption, sold domestically), Alabama, and North Carolina, and the most valuable product—roe (eggs)—is exported. Mullet meat is not the best quality during the spawning season, and roe fishery handling procedures don't produce a high quality fish for eating, which is why mullet carcasses are used for bait in other fisheries, including those for spiny lobster, stone crab, blue crab, crawfish, and assorted finfish (GulfFINFO 2015).

In Alabama, the commercial fishery runs year-round, and fishers target mullet (with cast nets and gillnets) for flesh and sell it to local dealers, but from October 24th through December 31st, mullet is targeted for roe (GulfFINFO 2015), (NMFS 2015)). In North Carolina, most commercial exploitation uses gillnets to target roe-carrying females (NCDMF 2014). In Mississippi, striped mullet is primarily harvested (with cast nets, and sometimes gillnets) for its roe, and has all but disappeared from local restaurants. In Louisiana, where there's little demand for mullet for human consumption due to its oiliness (LSU 2015), mullet is fished year-round (with gillnets) for the live mullet bait fishery, and from the third Monday in October until the third Monday of the following January, Louisiana's striped mullet fishery targets the fish for roe (GulfFINFO 2015).

Traditionally, gillnets and purse seines were used to catch striped mullet. But due to concerns about bycatch and sportfish stocks, beginning in 1995, Florida and Louisiana prohibited the use of all "entangling nets" ((Mahmoudi 2000), pers. comm., David Chagaris, March 30, 2016). The fishing methods currently and most commonly in use include haul or beach seines and cast or strike nets (GulfFINFO 2015). In 2014, striped mullet was the largest fishery along the west coast of Florida by volume (11.64 million lbs; 5,280 MT, (NMFS 2015)).

Although striped mullet may inhabit federal waters (3 to 200 mi from shore), they are most abundant in state waters, so management of the fisheries is the responsibility of each state. In the GOM, the Gulf States Marine Fisheries Commission (GSFMC) oversees management by individual states and coordinates an overall Fishery Management Plan (FMP) for striped mullet (GulfFINFO 2015). The Florida Fish and Wildlife Conservation Commission is responsible for managing the striped mullet fishery in state waters, inshore out to 3 nm on the South Atlantic side, and 9 nm in the Gulf of Mexico. Other Gulf states are responsible for managing mullet fisheries in their state waters; the Gulf States Marine Fisheries Commission helps coordinate management of interjurisdictional fisheries such as mullet, gathering scientific data and organizing management strategies across the Gulf states (GulfFINFO 2015).



## Production Statistics

The Gulf has supplied the majority of striped mullet in the United States since at least the 1960s. In 2014, Gulf fishers brought in nearly 10.5 million pounds of mullet (Florida, east and west coast: 5,279 MT), about 89% of the total U.S. mullet harvest. Dockside revenue in 2014 totaled nearly \$8.1 million (GulfFINFO 2015). Alabama and North Carolina brought in the second-largest amounts of striped mullet in 2014, with a total of approximately 1.8 million lbs (790.4 MT and 767.6 MT, respectively), followed by Louisiana (approximately 1.1 million lbs; 490.5 MT), and Mississippi (39,000 lbs; 14.2 MT) (Fig. 1).

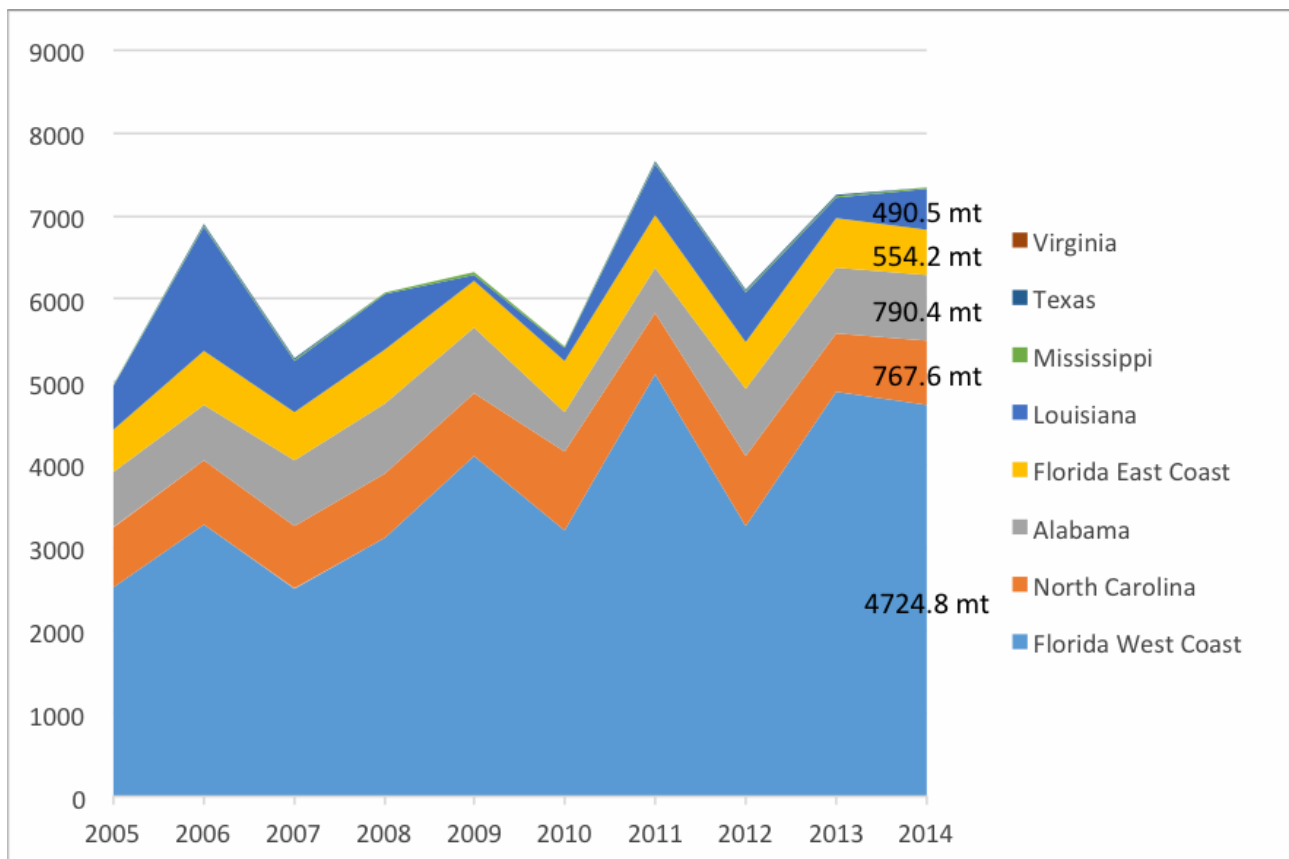


Figure 1 U.S. landings of striped mullet (MT) by state, 2005–2014 (data from NMFS 2015).

## Importance to the US/North American market.

According to U.S. trade data, roe exports and both meat and roe imports have remained fairly steady over the last decade, while meat exports have shown a generally increasing trend (Fig. 2). In 2015, the majority of imports were from Vietnam (45%), China-Taipei (41%), and India (12%) (Fig. 3a, b), and exports to Haiti (38%), Colombia (17%), China-Taipei (15%), and Dominican Republic (14%) (NMFS 2015). Though the weight of exported mullet meat far exceeds the weight of exported roe, the value of mullet meat is much lower. In 2014, striped mullet from the U.S. likely made up about 40%–45% of the mullet on the U.S. market (based on NMFS 2015 domestic production and trade data) and using edible weight conversion factors from NMFS (domestic landings product = 0.33 of edible product, imports = 0.75, exports = 0.55).

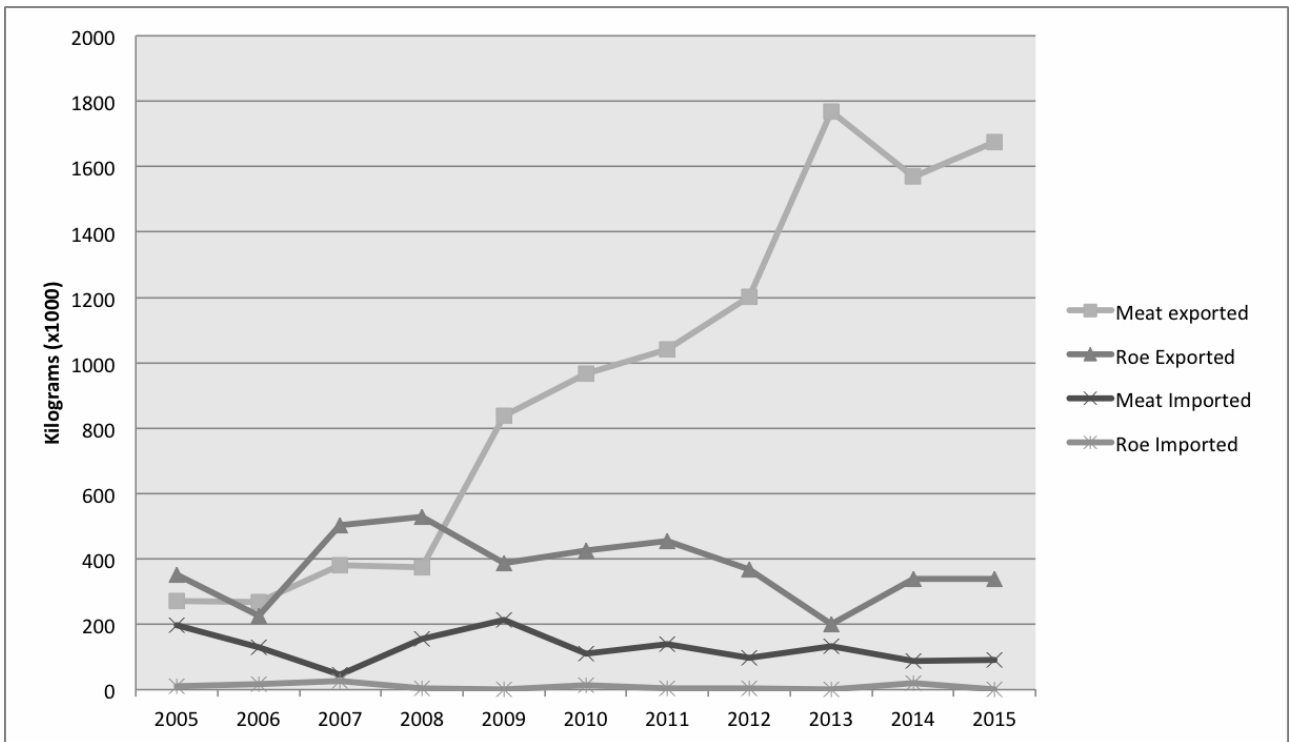


Figure 2 U.S. trade (imports and exports) of mullet meat and roe, 2005–2015 (data from NMFS 2015).

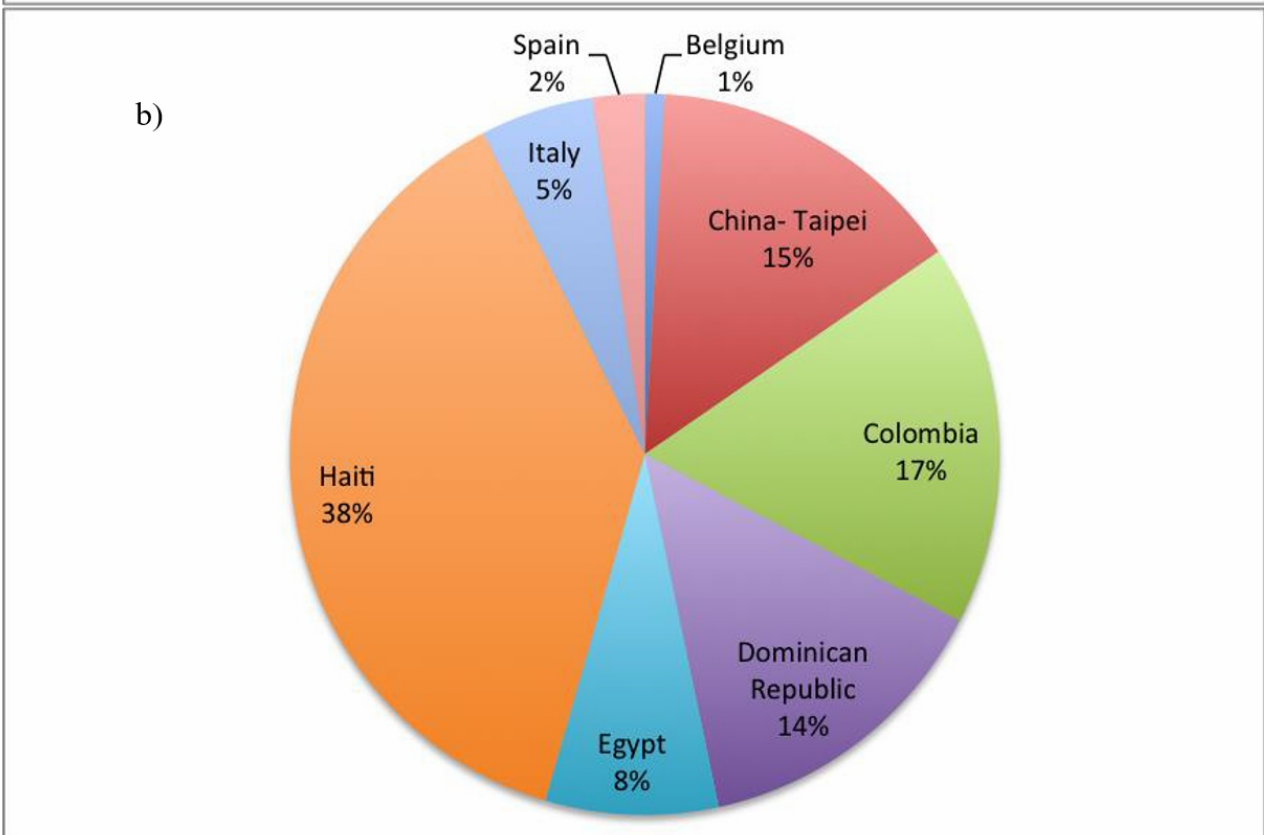
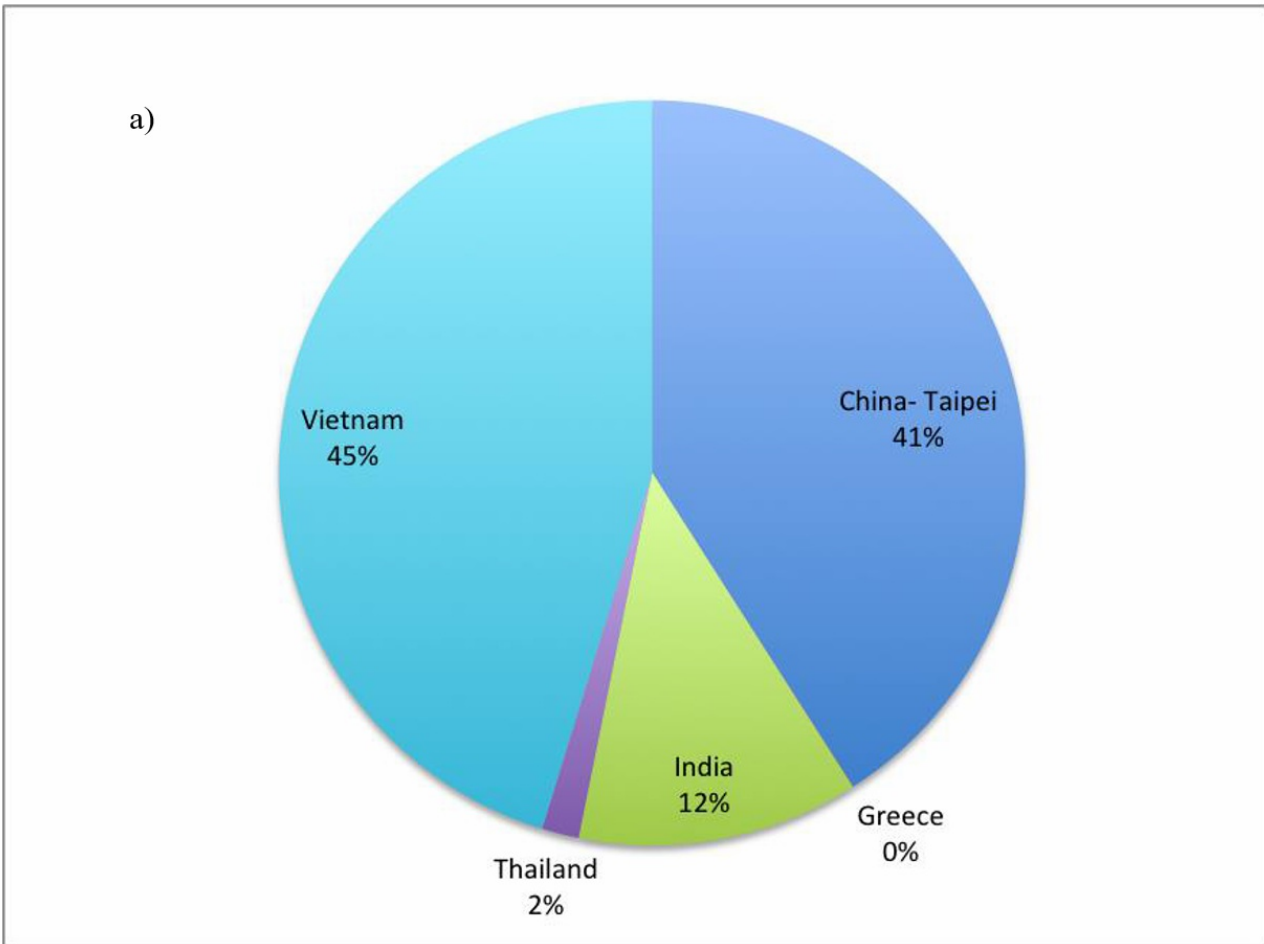


Figure 3 (a) 2015 U.S. trade imports and (b) exports of mullet meat and roe by country (data from NMFS 2015).

## **Common and market names.**

Striped mullet may be commonly referred to as mullet, jumping mullet, flathead mullet, popeye mullet, river/sea mullet, whirligig mullet, black/black back/grey mullet, jumping jack, lisa/liza, roundhead, springer, and molly/mullé (GulfFINFO 2015).

## **Primary product forms**

Mullet is sold whole, collared or gutted, and filleted, either fresh or frozen, smoked or salted (Leard et al. 1995). "Yellow-red roe" are female eggs, while "white roe" are testes. Roe is generally not seen in the U.S. market, except relatively recently in the Gulf (Lallo 2015), but is exported to European and Asian countries where it is considered a delicacy.

## Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at [www.seafoodwatch.org](http://www.seafoodwatch.org). The specific standard used is referenced on the title page of all Seafood Watch assessments.

### Criterion 1: Impacts on the Species Under Assessment

*This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. 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

STRIPED MULLET			
Region   Method	Abundance	Fishing Mortality	Score
Florida/Western Central Atlantic   Beach seines United States of America	5.00: Very Low Concern	5.00: Low Concern	Green (5.000)
Florida/Western Central Atlantic   Cast nets United States of America	5.00: Very Low Concern	5.00: Low Concern	Green (5.000)

#### Criterion 1 Assessment

##### SCORING GUIDELINES

##### Factor 1.1 - Abundance

Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- 5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.
- 3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.
- 2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.
- 1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.

## Factor 1.2 - Fishing Mortality

Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

### STRIPED MULLET

#### Factor 1.1 - Abundance

##### **FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

##### **FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

#### **Very Low Concern**

The SS3 (Stock synthesis, version 3) model from the 2014 Florida stock assessment estimates that  $B_{2013}:B_{SPR35\%} = 1.74$  for the east coast and that  $B_{2013}:B_{SPR35\%} = 1.74$  for the west coast (Chagaris et al. 2014). For this reason, abundance is deemed "very low" concern.

#### **Justification:**

Since 1993, mullet stocks in Florida (east and west coasts) have been managed relative to reference points based on spawning potential ratio (SPR) ((Leard et al. 1995), (Mahmoudi 2000)). Overfished and overfishing definitions have been established, but the Florida Fish and Wildlife Conservation Commission (FWCC) has not identified separate target and threshold (limit) reference points for the stocks. Stocks are considered overfished if SPR is below 35% of the stock's maximum spawning potential (Chagaris et al. 2014).

## Factor 1.2 - Fishing Mortality

##### **FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

##### **FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

#### **Low Concern**

The SS3 model from the 2014 Florida stock assessment estimates that  $F_{2013}:F_{SPR35\%} = 0.41$  for the east coast and that  $F_{2013}:F_{SPR35\%} = 0.48$  for the west coast (Chagaris et al. 2014). For this reason, fishing mortality is deemed "low" concern.

#### **Justification:**

Overfishing occurs when fishing mortality (F) rates exceed the rate necessary to maintain a 35% SPR (Chagaris et al. 2014).

## Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. 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. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait 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 is Critical if Factor 2.3 (Fishing Mortality) is Critical

### Guiding Principles

- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable level.
- Minimize bycatch.

### 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.

STRIPED MULLET					
Florida/Western Central Atlantic   Beach Seines   United States Of America					
Subscore:	2.644	Discard Rate:	1.00	C2 Rate:	2.644
Species   Stock	Abundance	Fishing Mortality	Subscore		
Finfish	2.33: Moderate Concern	3.00: Moderate Concern	Yellow (2.644)		

STRIPED MULLET					
Florida/Western Central Atlantic   Cast Nets   United States Of America					
Subscore:	2.644	Discard Rate:	1.00	C2 Rate:	2.644
Species   Stock	Abundance	Fishing Mortality	Subscore		
Finfish	2.33: Moderate Concern	3.00: Moderate Concern	Yellow (2.644)		

The incidental take of non-target species in the striped mullet fishery is somewhat dependent upon whether fishing occurs during spawning (roe) season. According to Leard et al. (Leard et al. 1995), because striped mullet form dense schools during spawning, incidental take is very low during these times. It is because of these dense schools, and because of the high value of roe, that in Florida waters more than 80% of annual landings are made during the spawning season (October–January). When bycatch does occur during the non-

spawning season (March– September), it is considered “relatively insignificant” due to the volume and species composition (Leard et al. 1995) (pers. comm., Steve Brown [FWCC], Jan. 19, 2016). The most commonly caught bycatch species (retained) in 2014 were mojarra (1.67% of cast net catches), sheepshead (2.67% of cast net and seine catches combined), crevalle jack (*Caranx hippos*) (3.01% of cast net and seine catches combined), and ladyfish (*Elops saurus*) (1.20% of seine catches) (pers. comm., Steve Brown [FWCC], Jan. 19, 2016). None of these is a species of concern, nor does any make up more than 5% of the total catch; therefore they were not included as Criterion 2 species. Trip tickets do not capture information about discards (pers. comm., Steve Brown and Behzad Mahmoudi [FWCC], Jan. 19, 2016), so an unknown finfish score has been added to Criterion 2 to account for any unknown/non-retained discards.

Still, commercial fishers have expressed concern over unused/discarded target species “bycatch” during the roe season (Lane 2015), although there is no indication of the total biomass of these discards.

## Criterion 2 Assessment

### SCORING GUIDELINES

#### Factor 2.1 - Abundance

(same as Factor 1.1 above)

#### Factor 2.2 - Fishing Mortality

(same as Factor 1.2 above)

### FINFISH

#### Factor 2.1 - Abundance

##### FLORIDA / WESTERN CENTRAL ATLANTIC

Beach Seines | United States Of America

##### FLORIDA / WESTERN CENTRAL ATLANTIC

Cast Nets | United States Of America

#### Moderate Concern

“Unknown Finfish” are scored here according to the Unknown Bycatch Matrices (pp. 55–61 in the Seafood Watch Standard for Fisheries), which allow for scoring the risk of bycatch impacts by taxon, gear, and region where no data are available on the composition of the catch (including discards). Bony fish are scored as “moderate” concern using the Unknown Bycatch Matrix, unless there is reason to think the species that are likely caught are highly vulnerable or depleted; in this case, there is no reason.

#### Factor 2.2 - Fishing Mortality

##### FLORIDA / WESTERN CENTRAL ATLANTIC

Beach Seines | United States Of America

##### FLORIDA / WESTERN CENTRAL ATLANTIC

Cast Nets | United States Of America

#### Moderate Concern

Unknown finfish caught as bycatch in a bottom seine (beach seine) receive a fishing mortality of “high” concern in the unknown bycatch matrices (pp. 55–61 in Seafood Watch Standard for Fisheries). Given that



the majority of the catch is made on schools of mullet, and bycatch is not likely to be a “high” concern for this fishery (see Criterion 2 synthesis above), a score of “moderate” concern score is appropriate. Cast net is not listed in the matrices, but is assumed to have similar impacts as beach seine for the purposes of this assessment.

### Factor 2.3 - Modifying Factor: Discards and Bait Use

Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

*Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.*

RATIO OF BAIT + DISCARDS/LANDINGS	FACTOR 2.3 SCORE
<100%	1
>=100	0.75

#### FLORIDA / WESTERN CENTRAL ATLANTIC

Beach Seines | United States Of America

#### FLORIDA / WESTERN CENTRAL ATLANTIC

Cast Nets | United States Of America

#### < 100%

Kelleher (Kelleher 2005) suggests an average discard rate of 32% for beach seines. There are no estimates given for cast nets, so it is assumed that discards are <20%, since cast netting is usually targeting a school of spawning mullet, and therefore bycatch of other species is minimal.

## **Criterion 3: Management Effectiveness**

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective,' 'moderately effective,' 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- 5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.
- 4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.
- 3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.
- 2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'
- 1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'
- 0 (Critical) — Management Strategy and Implementation is 'critical'.

The Criterion 3 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 Management Strategy and Implementation is Critical.

### **GUIDING PRINCIPLE**

- The fishery is managed to sustain the long-term productivity of all impacted species.

### **Criterion 3 Summary**

<b>Fishery</b>	<b>Management Strategy</b>	<b>Bycatch Strategy</b>	<b>Research and Monitoring</b>	<b>Enforcement</b>	<b>Stakeholder Inclusion</b>	<b>Score</b>
Fishery 1: Florida/Western Central Atlantic   Beach seines   United States of America	Highly Effective	Highly Effective	Moderately Effective	Highly Effective	Highly Effective	Green (4.000)
Fishery 2: Florida/Western Central Atlantic   Cast nets   United States of America	Highly Effective	Highly Effective	Moderately Effective	Highly Effective	Highly Effective	Green (4.000)

### **Criterion 3 Assessment**

#### **Factor 3.1 - 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? Do managers follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.*

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**Highly Effective**

Quantitative stock assessments are conducted every 3 to 5 years and include fishery-dependent and -independent monitoring data. Management measures include: size limits to protect juveniles, seasonal/area closures to protect spawning adults, and licensing requirements in order to catch commercial quantities of mullet (FWCC 2015). Bycatch is relatively insignificant, with a low mortality rate. Overfished and overfishing definitions have been established, but FWCC has not identified separate target and threshold (limit) reference points for the stock, nor explicit harvest control rules to guide management decisions. Florida striped mullet has been regulated by a combination of size limits, bag and trip limits, gear restrictions (e.g., gillnet ban), and weekend closures (FWCC 2015). But quantitative biological reference point targets that appear suitable and conservative relative to the population life history for this stock have been in place since 1993 ((Leard et al. 1995), (Mahmoudi 2005), (Mahmoudi 2008) and (Chagaris et al. 2014)). In the early 1990s, when the stock was deemed overfished with overfishing occurring, scientific advice was given to managers to decrease fishing mortality and increase spawner escapement in order to reach the reference points (Leard et al. 1995). A public referendum was passed in 1995 that prohibited the use of entangling nets (gillnets) in Florida waters (Florida Senate 2015) and, although not explicitly for striped mullet, it was an important management decision that allowed the striped mullet stock to rebuild. The three most recent stock assessments ((Mahmoudi 2005), (Mahmoudi 2008) and (Chagaris et al. 2014)) suggest that the Florida striped mullet population is healthy and harvest levels are generally stable, and so further management measures have not been required. Due to the above, we have deemed this factor "highly effective."

**Justification:**

FWCC also monitors the commercial striped mullet fishery through its Marine Fisheries Trip Ticket Program, which requires that all sales of seafood products from the waters of Florida must be reported on a trip ticket at the time of sale. Trip tickets include information about the harvester, the gear used, the dealer purchasing the product, the date of the transaction, the county and water body in which the species was landed, time fished, and pounds of each species landed for each trip. They collect data for the recreational fishery through the Marine Recreational Information Program survey (GulfINFO 2015).

**Factor 3.2 - Bycatch Strategy**

*Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.*

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**Highly Effective**

Because bycatch is relatively insignificant with low mortality of non-target species (See Criterion 2), there are no specific bycatch-related measures in place except for the ban on entangling nets in Florida waters (since 1995). A rating of "highly effective" is given in this scenario.

### Factor 3.3 - Scientific Research and Monitoring

*Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.*

#### FLORIDA / WESTERN CENTRAL ATLANTIC

Beach Seines | United States Of America

#### FLORIDA / WESTERN CENTRAL ATLANTIC

Cast Nets | United States Of America

#### Moderately Effective

Quantitative stock assessments are conducted every 3 to 5 years. The 2014 assessment was based on data through 2013, including commercial and recreational harvest from numerous sources (e.g., NMFS, U.S. Commissioner of Fisheries, and Florida State Board of Conservation, FWCC-FWRI), fishery-independent indices of abundance conducted by the Fish and Wildlife Research Institute's Fisheries Independent Monitoring (FIM) program in major estuaries along the east and west coasts of Florida, and available biological samples (e.g., age and length data from the Trip Information Program) (Chagaris et al. 2014) & (GulfFINFO 2015)).

Stock status was evaluated using five different population models, ranging from data-poor to data-rich, with the preferred model being Stock Synthesis 3 (SS3), a fully age-structured, forward-projecting, quantitative model (Chagaris et al. 2014). The results of the other four models were consistent with the results of the SS3 model, suggesting that the final preferred model was appropriate and the model results were robust.

There has been concern expressed over unused/discarded target species "bycatch" washing up on beaches during the roe season (Lane 2015) (pers. comm., David Chagaris, March 30, 2016). Once processing houses reach capacity during the spawning season, they stop buying from harvesters, so males (white roe) specifically are released, with high mortality rates.

Furthermore, female carcasses are discarded after being processed for their roe (yellow-red, which is more valuable than white). It is thought that this occurs infrequently during the roe season only; for example, when fishers encounter large runs and they discard carcasses to make room for more valuable roe, or if they believe processing houses will not buy them (pers. comm., David Chagaris, March 30, 2016). There is no indication of the total biomass of these discards, but FWCC officials have posted a bulletin to commercial fishers in order to address these concerns ((Lane 2015), (FWCC 2015b), & (FWCC Commercial Fisheries Bulletin 2015)).

Due to the presence of an up-to-date stock assessment that incorporates both fishery- dependent and - independent data, plus scientific research and monitoring in the striped mullet fishery, while also taking into account the lack of data on discards of mullet and other species, we have rated this factor "moderately effective."

### Factor 3.4 - 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.*

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**Highly Effective**

Florida regulations prohibit the use of any gear other than cast nets (no more than 14 ft. long, and no more than two per vessel) and beach or haul seines (no larger than 500 ft<sup>2</sup>, and no more than two may be fished per vessel). Harvest is prohibited seaward of the 3-mile line (Gulf and Atlantic) and seaward of the Everglades National Park line in Florida Bay. There are county- specific catch requirements between October 1 and January 31, as well as nightly closures between November 1 and the end of February. Weekend closures for half the year (July 1– January 31) occur statewide (FWCC 2015).

Florida regulations are the strictest of all Gulf States and are enforced by both the U.S. Coast Guard and the state wildlife agency. Violations of the entangling net ban are considered serious and carry the possibility for license suspension and civil/criminal penalties (FWCC 2014b). Due to this, we have deemed this factor “highly effective.”

**Factor 3.5 - 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, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.*

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**Highly Effective**

The management process appears to be transparent and includes stakeholder input (e.g., heeding scientific advice given to managers when the stock was overfished and undergoing overfishing to reduce fishing mortality and increase spawner escapement, holding meetings with commercial fishers regarding targeted discards); hence we have deemed this factor “highly effective.”

## **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 (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 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**

<b>Region   Method</b>	<b>Gear Type and Substrate</b>	<b>Mitigation of Gear Impacts</b>	<b>EBFM</b>	<b>Score</b>
<b>Florida/Western Central Atlantic   Beach seines</b> United States of America	3	+1	Moderate Concern	Green (3.464)
<b>Florida/Western Central Atlantic   Cast nets</b> United States of America	5	+1	Moderate Concern	Green (3.873)

### **Criterion 4 Assessment**

#### **SCORING GUIDELINES**

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

Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - 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. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - 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 - Modifying Factor: Mitigation of Gear Impacts

Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

## Factor 4.3 - Ecosystem-Based Fisheries Management

Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

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

### FLORIDA / WESTERN CENTRAL ATLANTIC

Beach Seines | United States Of America

**3**

The fishing gear used (beach seines and cast nets) is primarily deployed in the water column on schools of mullet, over sandy or muddy bottoms and dense vegetation (GulfFINFO 2015), so there is little impact on bottom habitat. Beach seines are scored as a 3 due to their contact with the bottom (sand/mud), and cast nets are scored as a 5 (no bottom contact).

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**5**

The fishing gear used (beach seines and cast nets) is primarily deployed in the water column on schools of mullet, over sandy or muddy bottoms and dense vegetation (GulfFINFO 2015), so there is little impact on bottom habitat. Beach seines are scored as a 3 due to their contact with the bottom (sand/mud), and cast nets are scored as a 5 (no bottom contact).

**Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts**

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**+1**

Beach and haul seines must be smaller than 500 ft<sup>2</sup>, and no more than two may be fished per vessel. Cast nets must be smaller than 14 ft long, and no more than two may be fished per vessel (FWCC 2015). Although not specific to seining or cast netting, there are year-round closures that include prohibition of harvest from federal waters (outside 3 nautical miles [nm] from shore on the South Atlantic side, and 9 nm in the Gulf of Mexico) or outside the Everglades National Park in the Collier-Monroe county region. Seasonal closures also occur in certain areas during the fall and winter (FWCC 2015). For these reasons, the fishery is deemed to have “strong mitigation” measures in place.

**Factor 4.3 - Ecosystem-Based Fisheries Management**

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Beach Seines | United States Of America

**FLORIDA / WESTERN CENTRAL ATLANTIC**

Cast Nets | United States Of America

**Moderate Concern**

Striped mullet is both an economically and ecologically important species. It is a bottom feeder, foraging for decaying plant material and microorganisms found on aquatic plants, and also serves as prey for apex predators such as birds, fish, sharks, and marine mammals (GulfFINFO 2015). Because of this, it is recommended that future modeling take into account predator-prey interactions and how their removal from the ecosystem influences the aquatic food chain (Chagaris et al. 2014). Because there are no studies on this at present, we have deemed this factor “moderate.”



## **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: Updates to Striped Mullet Report**

This report was reviewed for any significant stock status and management updates to the fishery on November 20, 2019. None were found that would indicate the final rating is no longer accurate.