Monterey Bay Aquarium Seafood Watch®

Spanish and King Mackerel

©Duane Raver

United States of America: Southeast Atlantic, Gulf of Mexico

Cast nets, Handlines and hand-operated pole-and-lines, Trolling lines, Encircling gillnets, Gillnets and entangling nets (unspecified)

November 2, 2020

Seafood Watch Consulting Researcher

Seafood Watch Standard used in this assessment: Standard for Fisheries vF3

Table of Contents

About Seafood Watch

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

Each sustainability recommendation on the regional pocket guides is supported by a Seafood 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

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard. 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 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.

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

Summary

This report focuses on the king mackerel (*Scomberomorus cavalla*) and Spanish mackerel (*S. maculatus*) fisheries in the U.S. Southeastern Atlantic region and the U.S. Gulf of Mexico (GoM). Both species are targeted by recreational and commercial operators fishing in coastal pelagic areas. Along the Atlantic coast, Spanish mackerel range from the Florida Keys to New York, and occasionally as far north as New England, and king mackerel from Massachusetts to Brazil. In the Atlantic, king mackerel are landed primarily with hook and line gears (handline and troll), cast nets, and sink gillnets (north of Cape Hatteras, North Carolina), whereas Spanish mackerel are landed with handlines and runaround gillnet gears (and, occasionally, unspecified gillnets/entangling/sink nets). Specifically, in the North Carolina Spanish mackerel ocean fishery, sink- and runaround gillnets are used, whereas in the estuarine fishery, drift gillnets are used. In the Gulf of Mexico, king mackerel are captured with handlines, cast nets, and runaround gillnets, and Spanish mackerel with handlines and gillnets/entangling gillnets. States with the majority of mackerel landings that are included in area 31 (Western Central Atlantic) are North Carolina, Florida (East and West coast), Alabama, and Louisiana.

King and Spanish mackerel are confined to warm tropical and subtropical waters and are distributed along the east of the United States, through the Gulf of Mexico, with the range of king mackerel extending south in the coastal zone of Central and South America, to Brazil. During their first few years these species grow quickly. King mackerel reach sexual maturity at approximately 4 years of age; they breed prolifically, spawning repeatedly during the breeding season. Spanish mackerel typically reach sexual maturity in their first (male) or second (female) year and also exhibit high levels of fecundity.

A full assessment of each of U.S. king and Spanish mackerel stocks were conducted by the Southeast Data Assessment and Review (SEDAR) process. Atlantic and Gulf of Mexico king mackerel were assessed in 2014 and the stocks were deemed to be not currently overfished or experiencing overfishing. Spanish mackerel were assessed in 2012 (S. Atlantic) and 2013 (Gulf of Mexico). The Atlantic Spanish mackerel were determined to be neither in an overfished state, nor experiencing overfishing. Some concerns about the population model parameters were raised in the review stage of the Gulf of Mexico Spanish mackerel assessment process. As a result, no population or fishing mortality estimates were endorsed in the SEDAR report. Although, the Gulf of Mexico Fishery Management Council (GMFMC) revisited these critiques via their Statistical and Science Committee and affirmed the SEDAR findings, Gulf Spanish mackerel stocks are neither in an overfished state, nor experiencing overfishing. Overall, king and Spanish mackerel stocks are robust and are being exploited at appropriate levels.

King and Spanish mackerel are targeted by both recreational and commercial fisherman in the coastal pelagic zone. In the Gulf of Mexico, mackerel are captured with handlines, cast nets, gillnets/entangling nets, and encircling/runaround gillnet gears, while in the Atlantic, mackerel are caught with these gears, in addition to troll gear and drift gillnets. Handline and troll gears have relatively low rates of bycatch and low discard rates. However, the handline fisheries are responsible for a significant portion of greater amberjack landings, a species that is considered imperiled. Despite recent efforts to rebuild the stock, greater amberjacks continue to be overfished (but not experiencing overfishing). The runaround/encircling net fishery tends to incidentally catch various shark species, some of which have high inherent vulnerability and/or are overfished/undergoing overfishing, and bottlenose dolphins, while gillnets/entangling nets interact with various shark species, bottlenose dolphins, and bluefish, which are currently overfished. Cast nets and drift gillnets also catch and retain bluefish.

In the U.S., king and Spanish mackerel are managed under the Fishery Management Plan (FMP) for Coastal and Migratory Pelagic Resources (Mackerels) (1983), managed jointly by the Atlantic States Marine Fishery Commission (ASMFC; Spanish mackerel only), South Atlantic Fishery Management Council (SAFMC) and the GMFMC. The strategy and goals set forth by the original FMP and subsequent amendments are appropriate to the fisheries, and the most recent stock assessments suggest that the current restrictions in place are

adequate to maintain the integrity of both Atlantic and Gulf king and Spanish mackerel stocks. All U.S. stocks of both species have been assessed via SEDAR, which provides rigorous and independent assessment that takes in to consideration both scientific advice and stakeholder concerns. However, certain retained species are either overfished, or of unknown stock status, which results in a yellow rating. The cast net, troll, and drift gillnet fisheries had a yellow rating, due to impacts on other species.

Enforcement of fishery regulations is carried out jointly by a number of state and federal agencies, including state departments of wildlife and/or fisheries resources, the U.S. Coast Guard and NOAA. SAFMC and GMFMC each also have law enforcement panels to make recommendations on enforcement strategies. Bycatch management for the cast net, troll, and handline fisheries is appropriate; all species are generally retained; hence, bycatch is of little concern, and these fisheries earned green scores for this criterion. In the encircling/runaround gillnet, gillnet/entangling net fishery, and drift gillnet fisheries, bycatch management is yellow.

The gear types assessed in this report generally have no impacts on the sea floor, aside from gillnets/entangling nets, which contact the bottom, and are known to have more of a detrimental impact on habitats. EBFM is underway for these fisheries and will take a minimum of five years to implement. All fisheries aside from entangling gillnet fisheries (yellow), earned green scores for this criterion.

Overall, cast net and troll fisheries for both king mackerel and Spanish mackerel in the U.S Atlantic and Gulf of Mexico are considered a Best Choice. Entangling net, encircling/runaround gillnet, drift gillnet, and handline fisheries, have a rating of 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
Atlantic Spanish mackerel United States of America/Western Central Atlantic | Cast nets	Green (4.284)	Yellow (2.236)	Yellow (3.000)	Green (3.873)	**Best Choice (3.248)**
Atlantic Spanish mackerel United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**
Atlantic Spanish mackerel United States of America/Gulf of Mexico | Gillnets and entangling nets (unspecified)	Green (4.284)	Red (1.732)	Yellow (3.000)	Yellow (2.449)	**Good Alternative (2.717)**
Atlantic Spanish mackerel United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**
Atlantic Spanish mackerel United States of America/Western Central Atlantic | Drift gillnets	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**

Atlantic Spanish mackerel United States of America/Western Central Atlantic | Encircling gillnets	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**
Atlantic Spanish mackerel United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	Green (4.284)	Red (1.732)	Yellow (3.000)	Yellow (2.449)	**Good Alternative (2.717)**
Atlantic Spanish mackerel United States of America/Gulf of Mexico | Encircling gillnets | Spanish Mackerel	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**
King mackerel United States of America/Western Central Atlantic | Trolling lines	Green (4.284)	Yellow (2.644)	Green (5.000)	Green (3.873)	**Best Choice (3.848)**
King mackerel United States of America/Gulf of Mexico | Cast nets	Green (4.284)	Yellow (2.644)	Yellow (3.000)	Green (3.873)	**Best Choice (3.387)**
King mackerel United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**

King mackerel United States of America/Gulf of Mexico | Encircling gillnets	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**
King mackerel United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	Green (4.284)	Red (1.732)	Yellow (3.000)	Yellow (2.449)	**Good Alternative (2.717)**
King mackerel United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	Green (4.284)	Red (1.732)	Yellow (3.000)	Green (3.873)	**Good Alternative (3.047)**

Summary

King mackerel and Spanish mackerel caught using cast nets or troll gear are rated a Best Choice as stocks are healthy and there is minimal bycatch. King mackerel and Spanish mackerel caught using gillnets, encircling nets, handlines and hand-operated pole and lines are rated a Good Alternative, as there are some concerns with the impact of the fishery on other species including sharks, turtles and marine mammals.

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 Concern2, 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.

---

[2] 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 focuses on the king mackerel (*Scomberomorus cavalla*) and Spanish mackerel (*S.maculatus*) fisheries in the U.S. Southeastern Atlantic region and the U.S. Gulf of Mexico. Both species are targeted by recreational and commercial operators fishing in coastal pelagic areas. Along the Atlantic coast, Spanish mackerel range from the Florida Keys to New York, and occasionally as far north as New England, and king mackerel from Massachusetts to Brazil (NOAA 2019b)(NOAA 2019c). In the Atlantic, king mackerel are landed primarily with hook and line gears (handline and troll), cast nets, and sink gillnets (north of Cape Hatteras, North Carolina), whereas Spanish mackerel are landed with handlines and runaround gillnets (and, occasionally, unspecified gillnets/entangling/sink nets). Specifically, in the North Carolina Spanish mackerel ocean fishery, sink- and runaround gillnets are used, whereas in the estuarine fishery, drift gillnets are used. In the Gulf of Mexico, king mackerel are captured with handlines, cast nets, and runaround gillnets, and Spanish mackerel with handlines and gillnets/entangling gillnets. States with the majority of mackerel landings that are included in area 31 (Western Central Atlantic) are North Carolina, Florida (East and West coast), Alabama, and Louisiana.

Gear Descriptions

Handline gear is a single fishing line, baited with lures or bait fish, which is held in the hands. Handlining can be done from boats or from the shore (FAO 2019a).

Trolling involves towing 1-8 lines at various depths with artificial spoons, feathered jigs, or hooks commonly baited with mullet or menhaden through the water behind a slow (e.g., 3-6 knots) moving vessel (NOAA 2015).

Cast nets, also called a throw nets, are circular nets with small weights distributed around its edge. The basic structure of a cast net includes a handline, swivel, horn, brail lines, netting, and leadline. The handline is held as the net is thrown. Cast nets are thrown by hand in such a manner that it spreads out while it is in the air, before it sinks into the water (see figure) (FAO 2019a). The leadline causes the net to sink quickly, trapping fish underneath the net. When the handline is pulled, the brail lines draw up, closing the net to form a pocket, catching the trapped fish. The whole net is then pulled out of the water. They range from 200-2400 ft in length, 5-25 ft in depth, and have a mesh size of 3.25 to 4.5inches stretched (NOAA 2015}(Mathers et al. 2016).

Runaround gillnets, also called strike nets, are often used in conjunction with spotter aircraft to actively encircle a school of fish.The nets are set to enclose the area of water the fish occupy (FAO 2019a). Mean soak time of roundabout/strike nets is 0.90 hours (Mathers et al. 2016b) (Randy Gregory, pers. comm., October 15, 2019). Following placement of the net, movement of fish into the net to become gilled is stimulated by the use of noise (e.g., revving the engine, striking the water) or light. The net is then retrieved using a mechanical drum elevated above the rear deck of the vessel, starting with the last part set, and laying the net on the deck for storage (NOAA 2015). Fishers set runaround gillnets in a variety of shapes to catch fish, including circles, semi circles, figure eight like patterns with the net open on both ends, and straight lines perpendicular and close to shore, to catch fish schooling along the shoreline (Mathers et al. 2016).

Drift gillnets consist of a string of gillnets kept vertical by floats on the upper line (headrope) and weights on the lower line (groundrope) (sometimes the groundrope is without weights), drifting with the current, in general near the surface or in mid-water; commonly used to catch schooling pelagic species (FAO 2019a). Drift gillnets are normally set in a straight line off the vessel's stern, and have an average set time of 2.25 hours (NOAA 2015).

Gillnets/entangling nets are strings of single, double or triple netting walls, vertical, near by the surface, in midwater on on the bottom, in which fish will gill, entangle or enmesh. Gillnets and entangling nets have floats on the upper line (headrope) and, in general, weights on the ground-line (footrope) (see figures) (FAO

2019a). Fishers usually fish 5 or 6 nets (each 400 yards in length) simultaneously, moving from 1 net to another throughout the day. These nets have a mesh size of 3-3.8 inches stretched (NOAA 2015) (Mathers et al. 2016). Mean soak time of sink nets is 2.06 hours (Mathers et al. 2016b) (Randy Gregory, pers. comm., October 15, 2019).

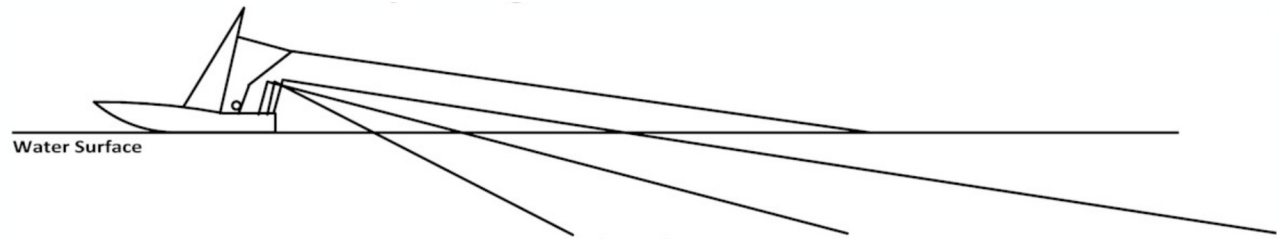

Figure 1 Trolling Lines (Tormenter Ocean 2019).

.}

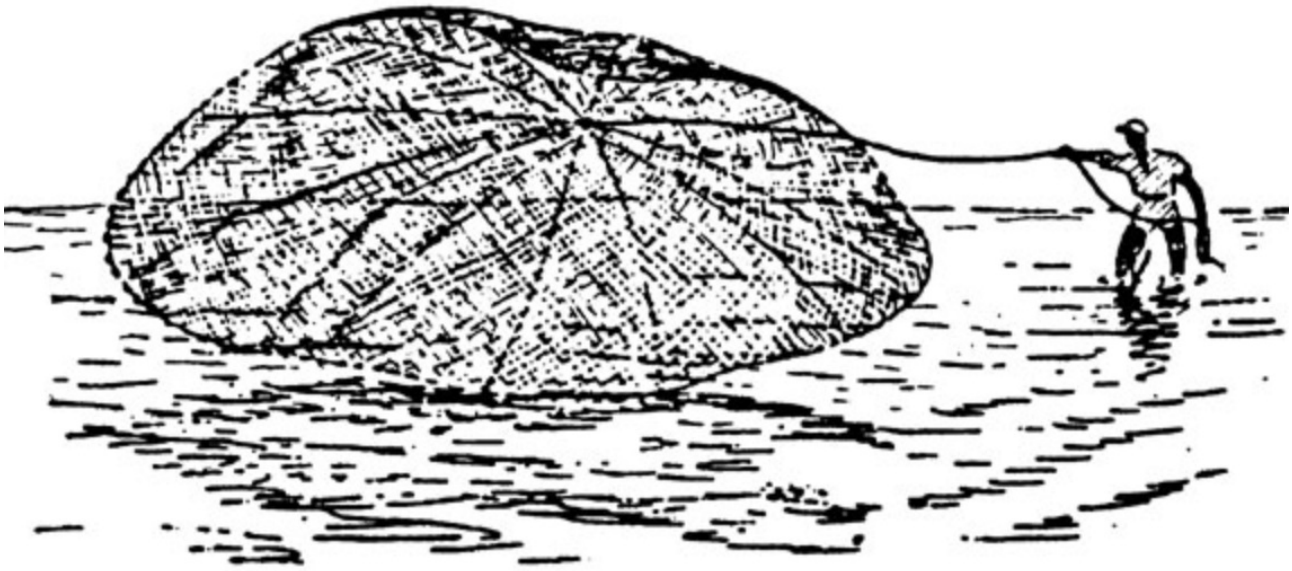

Figure 2 Cast net (FAO 2019c)

}

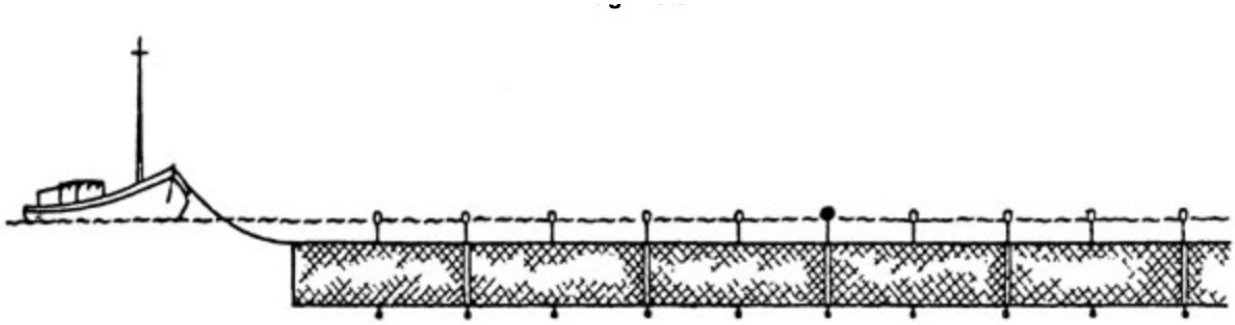

Figure 3 Drift gillnet (FAO 2019a).

.}

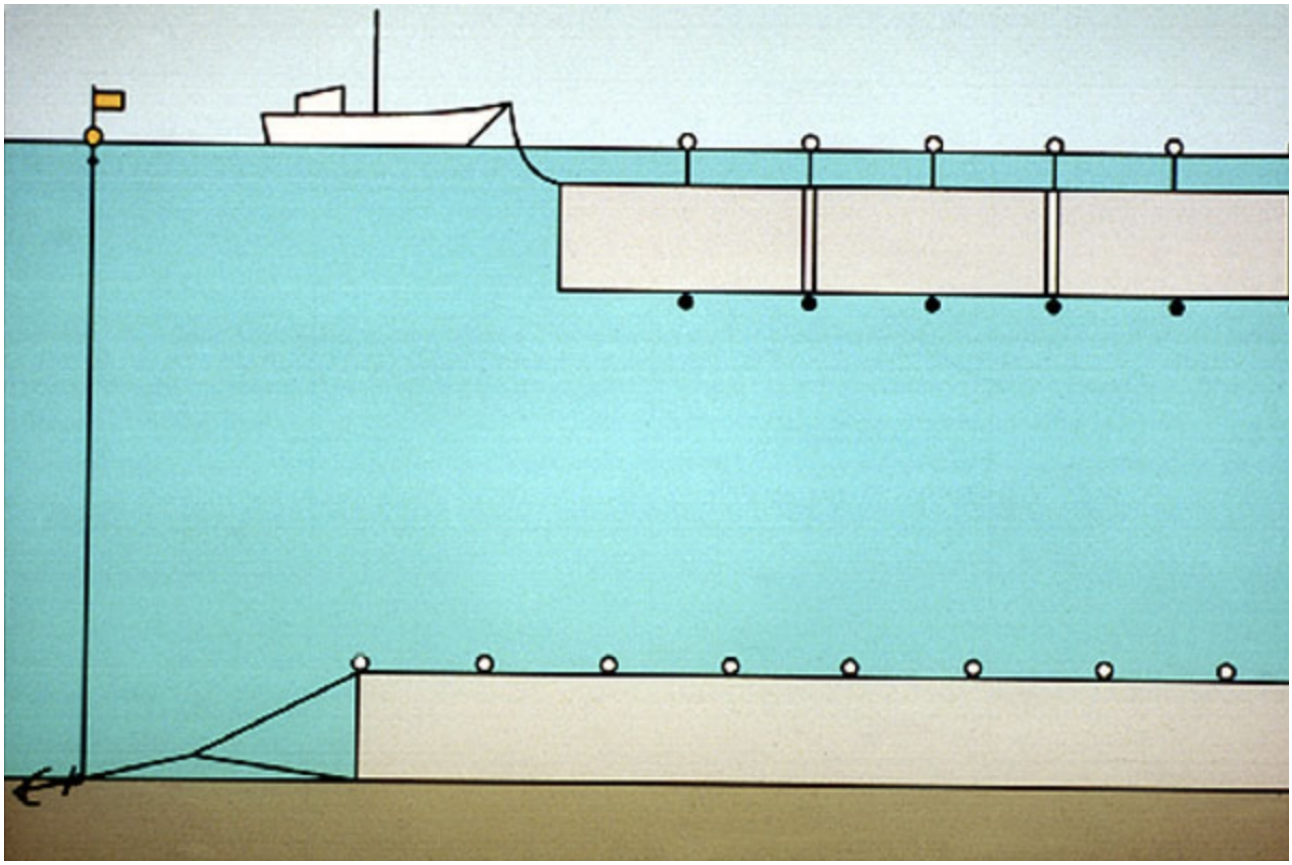

Figure 4 Gillnets and Entangling Nets (FAO 2019).

.}

Species Overview

King (*S. cavalla*) and Spanish mackerel (*S. maculatus*) are coastal migratory pelagic species, found in the western Atlantic and Gulf of Mexico. Both species are members of the family Scombridae, which includes tunas, bonitos, true mackerels (Scombrini; Genera: Scomber and Rastrelliger) and Spanish (Scomberomorini; Genera: Acanthocybium, Scomberomorus and Grammatorcynus) mackerels.

King mackerel is found in the Western Atlantic and Gulf of Mexico, from Massachusetts south to Brazil, including the Gulf of Mexico and the Caribbean Sea (see figure). This is an important commercial and recreational fish along the east coast of the United States (DeVries et al. 2002). King mackerel prefer warm waters and are rarely found in areas with sea surface temperatures less than 68°F (20°C) (SAFMC 2013). They form large schools and feed aggressively on smaller fishes, squid and shrimp. King mackerel are sexually dimorphic, with females exhibiting faster growth rates, and attaining larger sizes than males (DeVries and Grimes 1997). Growth rates also vary by region, with Atlantic fish growing at a faster rate than Gulf of Mexico fish (DeVries and Grimes 1997). Females reach maturity during the first year of life, upon reaching approximately 14 cm FL and males mature by 4 years, or 72 cm FL. King mackerels are highly fecund, with females releasing multiple batches of eggs throughout the spawning season. Finucane *et al. (*Finucane et al. 1986) sampled king mackerel, from both the Atlantic and Gulf of Mexico and found mature females contained 69,000-12,207,000 eggs.

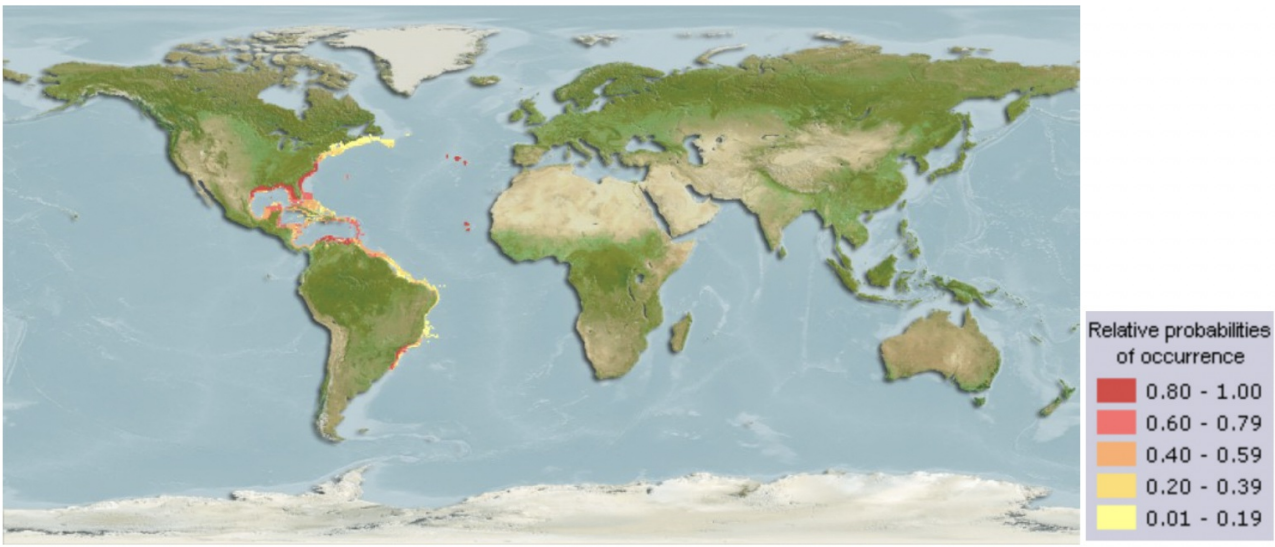

Figure 5 Geographic distribution of king mackerel (Scomberomorus cavalla) (Aquamaps 2019a).

.}

Spanish mackerel are distributed along the eastern coast of the U.S. and through the Gulf of Mexico, and they are targeted by commercial and recreational fishers throughout their range (NMFS 2009) (see figure). Commercial operators are allocated 55% of Spanish mackerel catch in the Atlantic, and 57% in the Gulf of Mexico (NOAA 2019). This species is confined to seas with water temperatures between 21°C and 27°C, and migrates northward during the spring and southward in the fall (Godcharles and Murphy 1986). In spring, summer, and fall months, they are abundant in the northern Gulf of Mexico and along the U.S. Atlantic coast (*ibid*). Female Spanish mackerel reach sexual maturity later, and at larger sizes than males. Males become reproductively viable in their first year, with 50% of males mature at 23.9 cm (9.4") FL (Schmidt et al. 1993). Females become mature in their second year, with 50% of females mature at 35.8 cm (14.1") FL (*ibid*). Spawning occurs from approximately May to August in the Atlantic (Schmidt et al. 1993) and May to September in the Gulf of Mexico (Finucane and Collins 1986). Maximum ages of 6 years and 11 years have been recorded for males and females, respectively (Schmidt et al. 1993). Spanish mackerel are highly fecund, with females containing 100,000-2,000,000 eggs (Finucane and Collins 1986).

Figure 6 Geographic distribution of Spanish mackerel (Scomberomorus maculates) (Aquamaps 2019b).

.}

In the U.S. Exclusive Economic Zone (EEZ) Spanish and king mackerel fisheries are managed under the Fishery Management Plan (FMP) for Coastal and Migratory Pelagic Resources (Mackerels) (1983). This FMP includes provisions for both Atlantic and Gulf of Mexico fish stocks and is jointly managed by the Atlantic States Marine Fisheries Commission (ASMFC), South Atlantic Fishery Management Council (SAFMC) and the Gulf of Mexico Fishery Management Council (GMFMC). In federal waters, authorized gear for Atlantic king mackerel includes: all gear except drift gillnet and long gillnet (North of Cape Lookout) and automatic reel, bandit gear, handline, and rod and reel (South of Cape Lookout). Authorized gear for Atlantic Spanish mackerel in federal waters includes: automatic reel, bandit gear, handline, rod and reel, cast net, run-around gillnet, and stab net.

The FMP divides the commercial fishery into a quota system between the Atlantic and Gulf migratory groups. Within the Atlantic migratory group, there are two zones- the Northern (consisting of New York, Connecticut, and Rhode Island) and the Southern (South Carolina, Georgia and Florida which is broken up into the North Carolina/South Carolina line to the Flagler/Volusia County line (29º25'N)) and the Flagler/Volusia County line to the Miami-Dade Monroe County line; see figure) (ASMFC 2018)(SAFMC 2018). Spanish mackerel in the Atlantic are cooperatively managed by the states through the ASMFC in state waters (0-3 miles from shore), and by the SAFMC and NOAA Fisheries in federal waters (3-200 miles from shore). The management unit for Spanish mackerel consists of all estuarine waters to the inshore boundary of the exclusive economic zone (EEZ) from New York through the east coast (Monroe/Dade county line) of Florida (ASMFC 2013). King mackerel are managed by the SAFMC and NOAA Fisheries within the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia and east Florida to Key West (SAFMC 2019e). Each Council manages based on migratory group, not Council jurisdiction.

The FMP establishes catch limits, identifies allowable gear and seasonal fishery closures for commercial and recreational fishers, and establishes a framework for modifying the FMP, as dictated by changes in stock parameters and fishery exploitation. The FMP has been amended 21 times between 1985 and 2019.

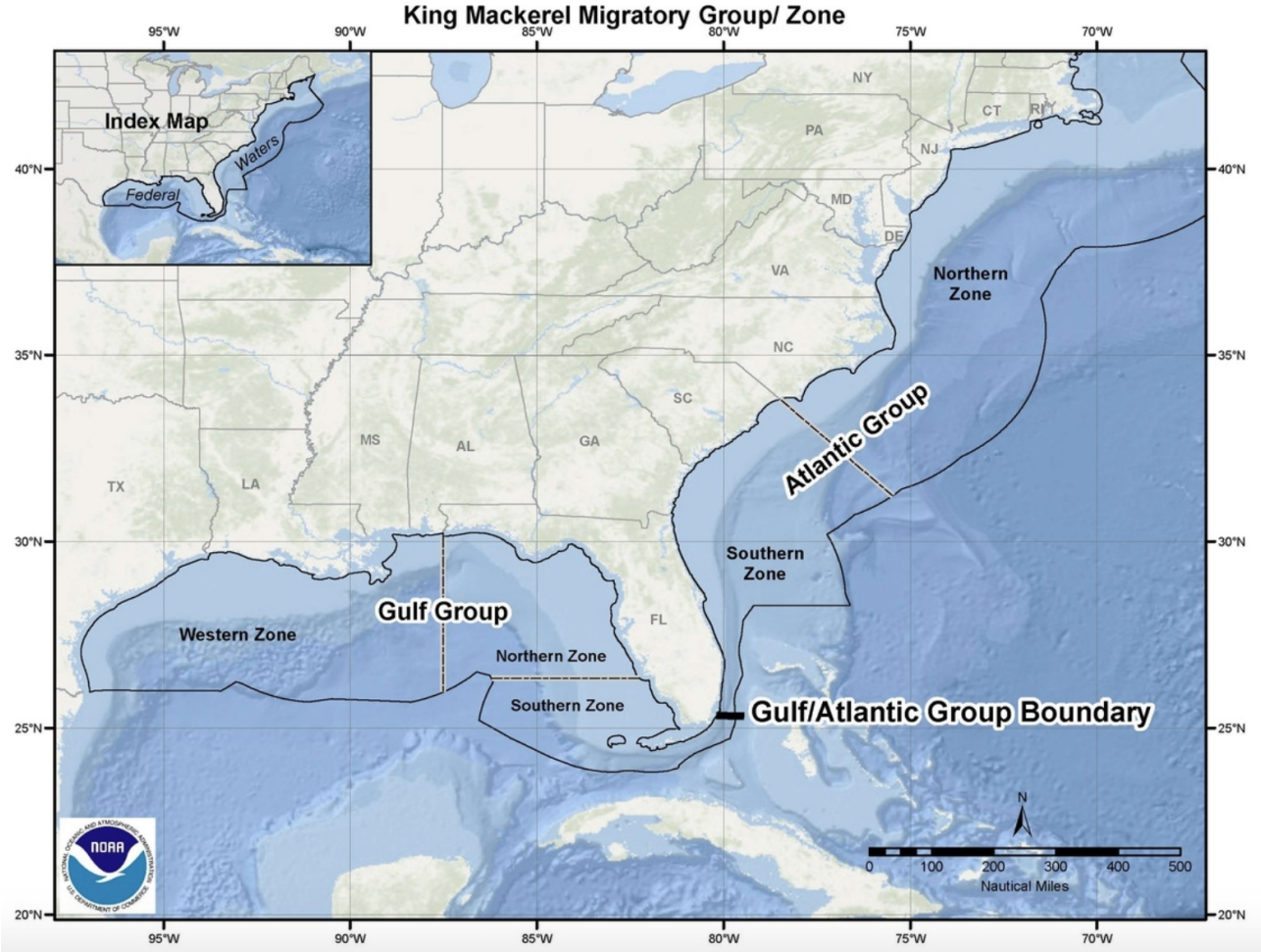

Figure 7 King Mackerel Migratory Group/Zone (from NOAA 2019c).

Production Statistics

King and Spanish mackerel are landed by commercial fishers throughout their respective ranges. In 2018, U.S. commercial fishers landed approximately 2568 mt total; 1310.1 mt in the Atlantic and 1257.9 mt of king mackerel in the Gulf of Mexico, and in 2016, 2444.5 mt total of king mackerel; 1194.9 mt in the Atlantic and 1249.6 mt in the Gulf of Mexico (NOAA 2019c)(NMFS 2019). For 2016 (the most recent data by state and gear), the bulk of these captures occurred in Florida (980.7 mt from the East coast (40.1%), 732.4 mt from the West coast (30%)), Louisiana (451.6 mt; 18.5%); North Carolina (198.1 mt; 8.1%), Alabama (51 mt; 2.1%), South Carolina (15.9% mt; <1%), Texas (14.7 mt; <1%), New Jersey (0.1 mt; <1%) and Virginia (0.1 mt; <1%) also reported nominal landings (NMFS 2019). The primary means of king mackerel capture in the Atlantic are by troll and handline gear combined (763.8 mt; 64%), unspecified gear (214.1 mt; 18%), and "line troll" gear (190.1 mt; 16%), whereas handline gear (575.9 mt; 54.1%), troll and handlines (197.2 mt; 19%), and runaround (strike) gillnets (101.2 mt; 9.5%) account for the majority of king mackerel landings in the Gulf of Mexico (*ibid;* see figure).

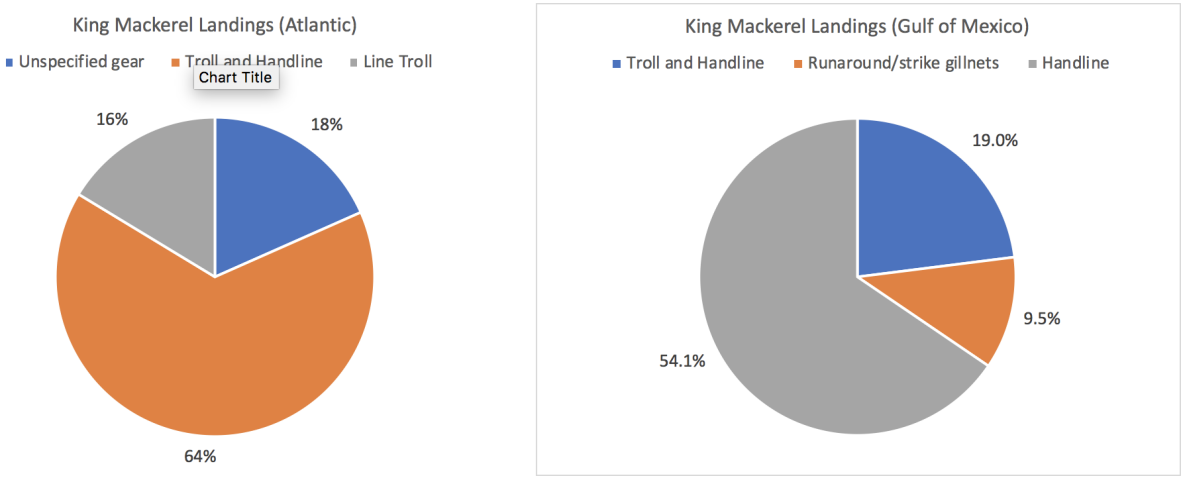

Figure 8 King mackerel landings by gear type in the U.S. Atlantic and Gulf of Mexico EEZs (extrapolated from NMFS 2019).

In 2018, U.S. fishers landed a total of 2268.3 mt of Spanish mackerel; 1803.9 mt in the Atlantic and 464.4 mt in the Gulf of Mexico, and in 2017, a total of 1883.96 mt (NOAA 2019). In 2016, a total of 2007.7 mt; 1384.3 mt in the Atlantic and 623.4 mt in the Gulf of Mexico (see figure) (ASMFC 2019a) (NMFA 2019). Florida was responsible for 67.4% (1116.4 mt from the East coast, 237.1 mt from the West coast) of total U.S. Spanish mackerel landings, while North Carolina and Alabama landed 13.6% (272.9 mt) and 19.8% (398.5 mt), respectively. Connecticut, Louisiana, Maryland, New Jersey, New York, Rhode Island and Virginia also reported some capture (< 1%). Spanish mackerel in the U.S. Atlantic are landed primarily via troll and handline gear (622.5 mt; 45%), cast net (312.5 mt; 22.6%), unspecified gears (296.6; 21.4%), and entangling nets/gillnet gears (153.2 mt; 11.1%). In the U.S. Gulf of Mexico, the majority of Spanish mackerel landings are attributable to entangling/gillnet (366.3 mt; 58.8%), run-around gillnet (177 mt; 28.4%) and troll and handline gears (60.7 mt; 9.7%) (NMFS 2019) (see figure). Gillnet operators oftentimes do not disclose the particular type of gillnet array being fished, but it is generally accepted that the majority of these gillnet gears are runaround (strike) nets (SEDAR 2012a)(SEDAR 2013).

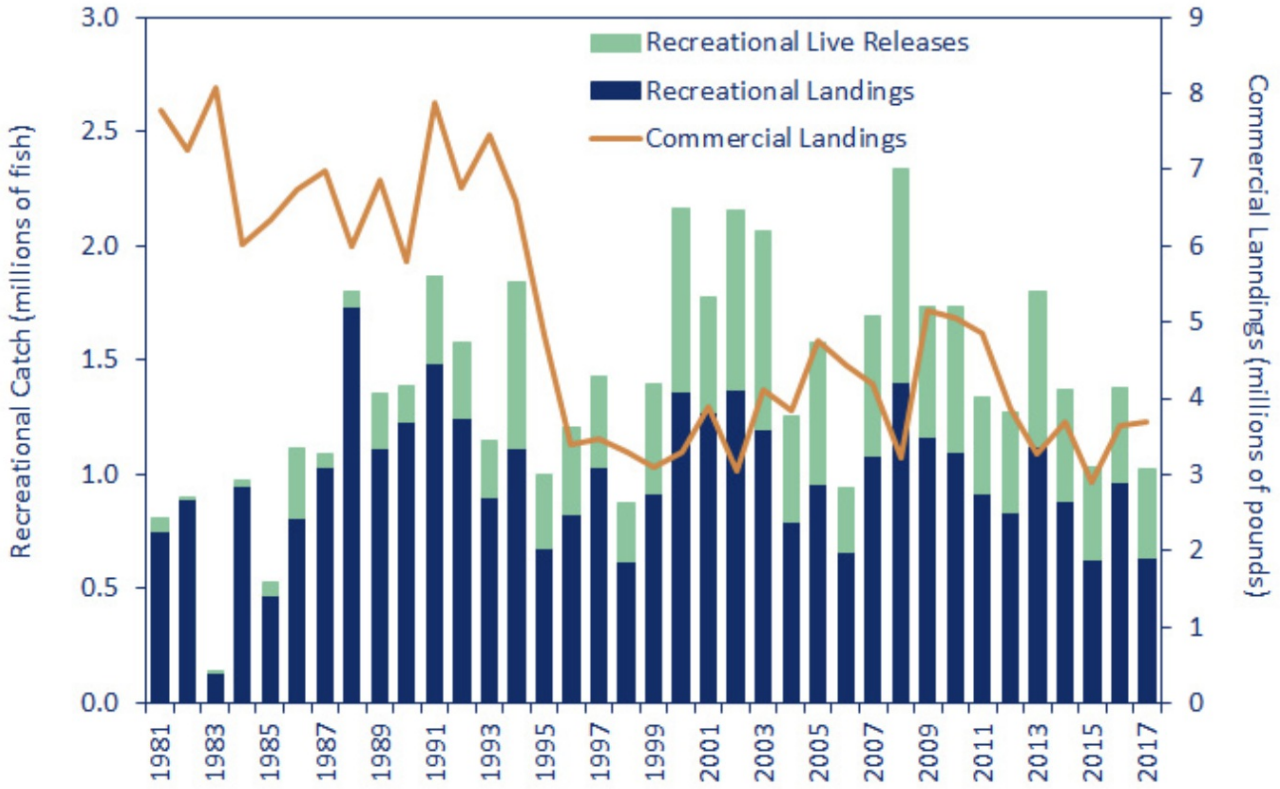

Figure 9 Spanish Mackerel Commercial Landings and Recreational Catch (from ASMFC 2019).

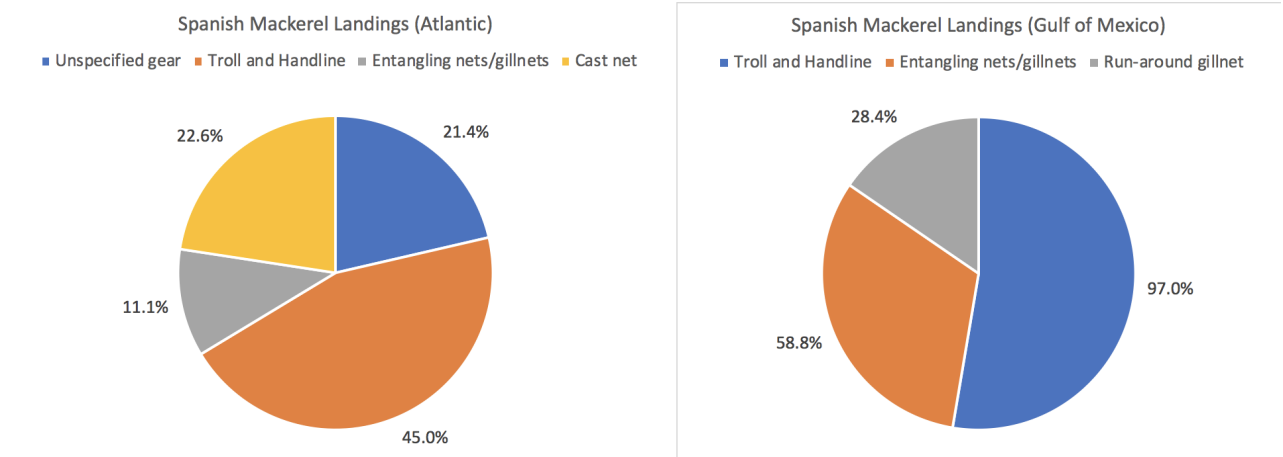

Figure 10 Spanish mackerel landings by gear type in the U.S. Atlantic and Gulf of Mexico EEZs (extrapolated from NMFS 2019).

Historically, both Spanish and king mackerel have been incidentally captured, in high numbers, and discarded dead (SEDAR 2013)(SEDAR 2014) in the Gulf of Mexico and South Atlantic shrimp trawl fisheries. The Gulf and South Atlantic Fisheries Development Foundation and several states (North Carolina, South Carolina, Georgia, and Florida) have been evaluating finfish bycatch in the southeastern shrimp trawl fishery, including bycatch of Spanish and king mackerel (ASMFC 2018). BRDs are required for use in shrimp trawls fished shoreward of the 100-fathom (183-meter) depth contour in the Gulf of Mexico, and within the EEZ of the South Atlantic region (NOAA 2019h).

There is some evidence to suggest that mitigation measures have been successful (SEDAR 2013), however

there is still much uncertainty regarding the magnitude of finfish bycatch by shrimp trawlers. King mackerel discards, particularly from the Gulf shrimp fishery, have varied over time, and appear to have decreased sharply since 2005 (SEDAR 2014a)(SEDAR 2014b). Similarly, the most recent Spanish Mackerel stock assessments (SEDAR 2012a)(SEDAR 2013) concluded that Spanish mackerel bycatch in both in the Atlantic and Gulf of Mexico the shrimp trawl fisheries has decreased significantly in during these years. During shrimp trawl bycatch reduction studies in the 1990s, Spanish mackerel occurred in less than than 10 percent of the trawl samples, unless sampling was in very shallow water, where occurrence increased to approximately 50% of the trawl samples (Branstetter 1997). Even when Spanish mackerel occurred in the nets, the abundance was low, with usually less than five fish per hour being documented (Nance 1998).

Importance to the US/North American market.

In recent years the U.S. has imported and exported fresh, frozen and preserved mackerel. Categories for imported and exported fishery products are set forth in the Harmonized Tariff Schedule, as maintained by the U.S. International Trade Commission. While this body does recognize trade in mackerels, specifically, jack and horse mackerel (*Trachurus* spp.), Atka mackerel (*Pleurogrammus monopterygius*), as well as blue, chub and Atlantic mackerels (*Scomber scombrus*, *S. australasicus* and *S. japonicas*; collectively grouped as 'mackerel'), there is no specific designation for either king or Spanish mackerel. Accordingly, these species are included in an 'other marine' fish category; thus, it is difficult to state with any certainty whether these species are imported to or exported from the U.S. (M. Liddel, pers comm.).

Common and market names.

King mackerel is also known as king, kingfish, cavalla, smoker, sierra and cero (FAO 2019b)(NOAA 2019a). Spanish mackerel is also known Spaniard, spotted mackerel, bay mackerel and spotted cybium (NOAA 2019b).

Primary product forms

Both species are commonly available in fresh, frozen and smoked forms.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at 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

Guiding Principles

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

Criterion 1 Summary

ATLANTIC SPANISH MACKEREL			
Region | Method	**Abundance**	**Fishing Mortality**	**Score**
United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Gulf of Mexico | Gillnets and entangling nets (unspecified)	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	3.67: Low Concern	5.00: Low Concern	Green (4.284)

United States of America/Western Central Atlantic | Cast nets	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Drift gillnets	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Encircling gillnets	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Gulf of Mexico | Encircling gillnets Spanish Mackerel	3.67: Low Concern	5.00: Low Concern	Green (4.284)

KING MACKEREL			
Region | Method	**Abundance**	**Fishing Mortality**	**Score**
United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Gulf of Mexico | Encircling gillnets	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Trolling lines	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	3.67: Low Concern	5.00: Low Concern	Green (4.284)

United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	3.67: Low Concern	5.00: Low Concern	Green (4.284)
United States of America/Gulf of Mexico | Cast nets	3.67: Low Concern	5.00: Low Concern	Green (4.284)

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.*

ATLANTIC SPANISH MACKEREL

Factor 1.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Low Concern

The 2013 Gulf of Mexico Spanish mackerel stock assessment concluded that SSB_{2011}/SSB_{MSY} = 1.83 (SEDAR 2013a); therefore, the stock is not overfished (see figure). However, there was some disagreement amongst the independent reviewers as to the appropriateness of the assessment model; accordingly there were no population or fishing mortality estimates endorsed in the final SEDAR assessment report. The Gulf of Mexico Fishery Management Council assembled a Scientific and Statistical Committee (SSC) Review Panel to address the independent reviewer critiques in August 2013. The panel concluded that the data used in the assessment were sound and robust, and affirmed that biomass exceeds management targets. The Gulf Spanish mackerel stock is above management targets and hence, not in an overfished state, but since the stock assessment is more than five years old, abundance is considered to be "low concern, instead of "very low concern".

Justification:

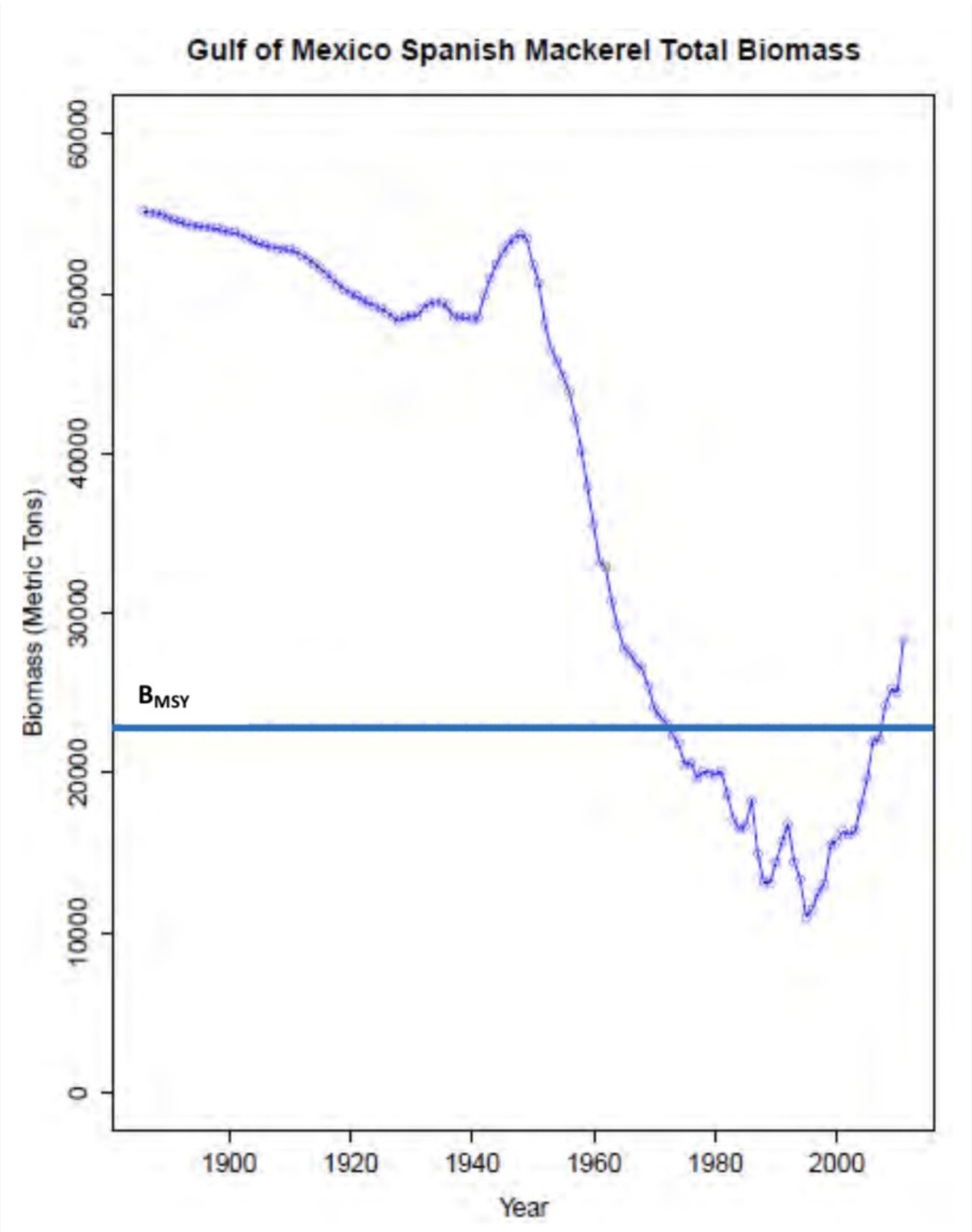

Figure 11 Estimated total Gulf of Mexico Spanish mackerel biomass (SEDAR 2013a).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

The most recent South Atlantic Spanish mackerel stock assessment was conducted in 2012, and estimated spawning stock biomass (SSB) to be SSB_{2011}/SSB_{MSY} = 1.49 and SSB_{2011}/MSST = 2.29, indicating that the stock is not overfished (see figure) (SEDAR 2012a). Biomass exceeds both B_{MSY} and MSST, but because the stock assessment is more than five years old, abundance is considered "low concern" instead of "very low concern".

Justification:

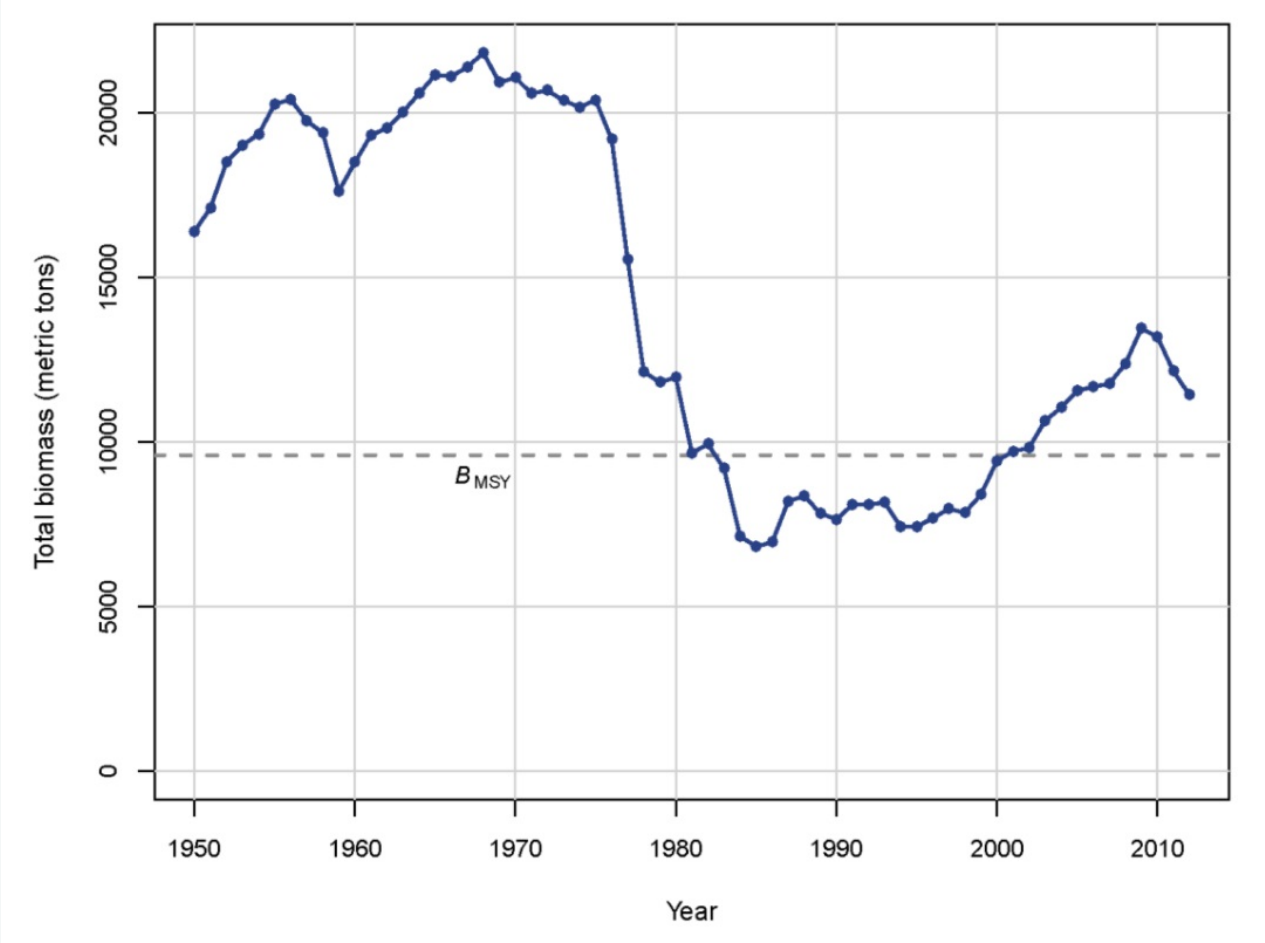

Figure 12 Estimated total biomass of southern Atlantic Spanish mackerel; the dashed line indicates BMSY (SEDAR 2012).

The next stock assessment is currently scheduled to be conducted through the SEDAR process in 2021.

Factor 1.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Low Concern

The 2013 Gulf of Mexico Spanish mackerel stock assessment concluded that $F_{2009\text{-}2011}$/MFMT = 0.40; thus, this stock is not undergoing overfishing (see figure) (SEDAR 2013a). However, there was some disagreement amongst the independent reviewers as to the appropriateness of the assessment model, accordingly there were no population or fishing mortality estimates endorsed in the final SEDAR assessment report. The GMFMC assembled a SSC Review Panel to address the independent reviewer critiques in August 2013. The panel concluded that the data used in the assessment were sound and robust and affirmed that fishery mortality for this stock is below MFMT. The SSC panel produced a fishing mortality estimate that was slightly lower ($F_{current}$/MFMT = 0.38) than that in the SEDAR report, although it remains in line with the overall conclusions (GMFMC 2013). Since this stock is not undergoing overfishing, fishing mortality is considered "low concern".

Justification:

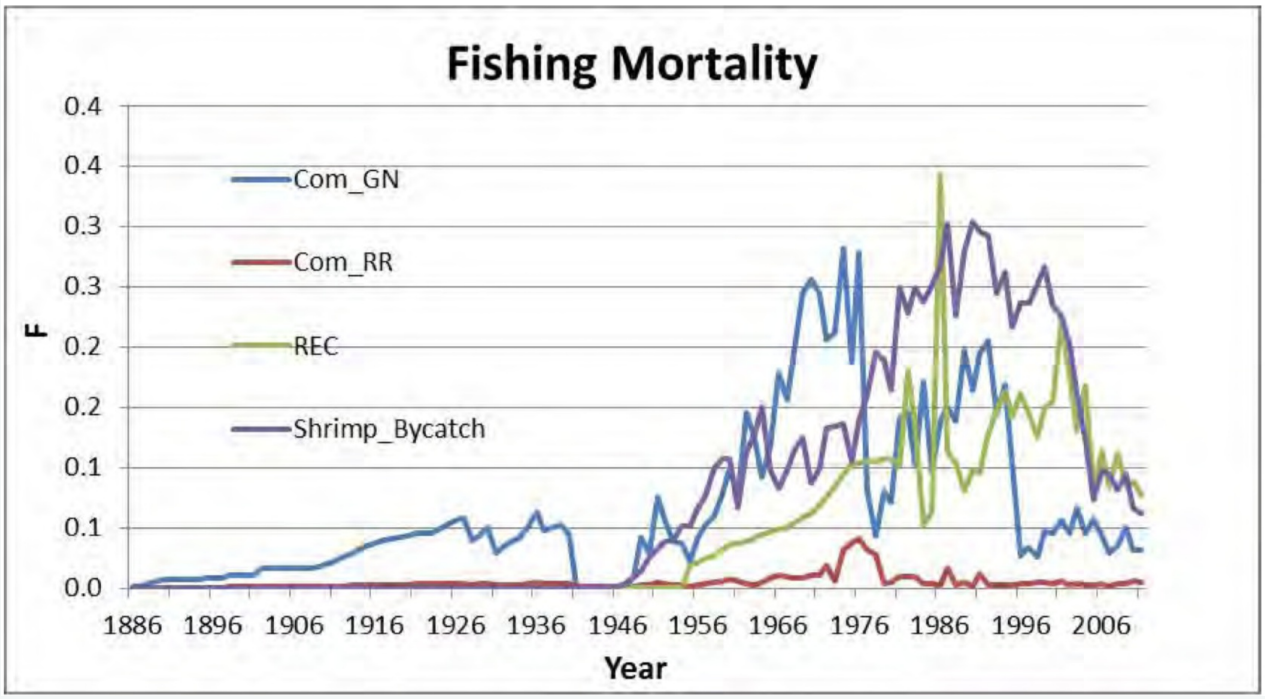

Figure 13 Fleet specific fishing mortality estimates for Gulf of Mexico Spanish mackerel (SEDAR 2013a). Fishing fleets include commerical gillnet (Com_GN), commerical rod and reel (Com_RR), recreational (REC) fishers, as well as bycatch in the Gulf of Mexico shrimp trawl (Shrimp_Bycatch). These bycatch estimates are highly uncertain and should be interpreted with caution (Branstetter pers comm.).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

In the 2012 Atlantic Spanish mackerel stock assessment report, fishing mortality (exploitation rate) was $F_{2009-2011}/F_{MSY}$ = 0.526, with F_{2011}/F_{MSY} = 0.521 (SEDAR 2012a). Therefore, overfishing is not occurring and fishing mortality is considered to be "low concern".

ATLANTIC SPANISH MACKEREL

Factor 1.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Low Concern

The 2013 Gulf of Mexico Spanish mackerel stock assessment concluded that SSB_{2011}/SSB_{MSY} = 1.83 (SEDAR 2013a); therefore, the stock is not overfished (see figure). However, there was some disagreement amongst the independent reviewers as to the appropriateness of the assessment model; accordingly there were no population or fishing mortality estimates endorsed in the final SEDAR assessment report. The Gulf of Mexico Fishery Management Council assembled a Scientific and Statistical Committee (SSC) Review Panel to address the independent reviewer critiques in August 2013. The panel concluded that the data used in the assessment were sound and robust, and affirmed that biomass exceeds management targets. The Gulf Spanish mackerel stock is above management targets and hence, not in an overfished state, but since the stock assessment is more than five years old, abundance is considered to be "low concern, instead of "very low concern".

Justification:

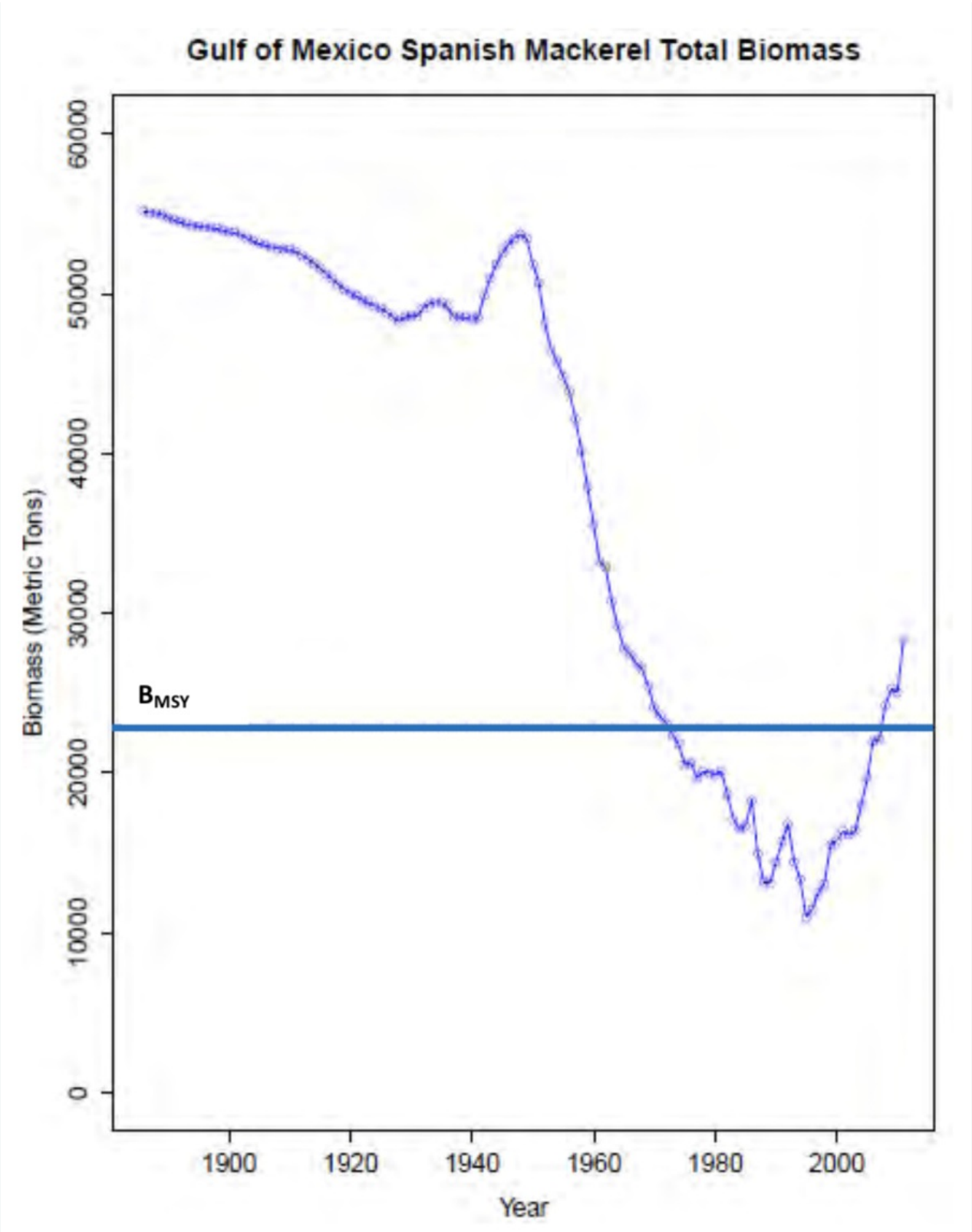

Figure 14 Estimated total Gulf of Mexico Spanish mackerel biomass (SEDAR 2013a).

Factor 1.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Low Concern

The 2013 Gulf of Mexico Spanish mackerel stock assessment concluded that $F_{2009-2011}$/MFMT = 0.40; thus, this stock is not undergoing overfishing (see figure) (SEDAR 2013a). However, there was some disagreement amongst the independent reviewers as to the appropriateness of the assessment model, accordingly there were no population or fishing mortality estimates endorsed in the final SEDAR assessment report. The GMFMC assembled a SSC Review Panel to address the independent reviewer critiques in August 2013. The panel concluded that the data used in the assessment were sound and robust and affirmed that fishery mortality for this stock is below MFMT. The SSC panel produced a fishing mortality estimate that was slightly lower ($F_{current}$/MFMT = 0.38) than that in the SEDAR report, although it remains in line with the overall conclusions (GMFMC 2013). Since this stock is not undergoing overfishing, fishing mortality is considered "low concern".

Justification:

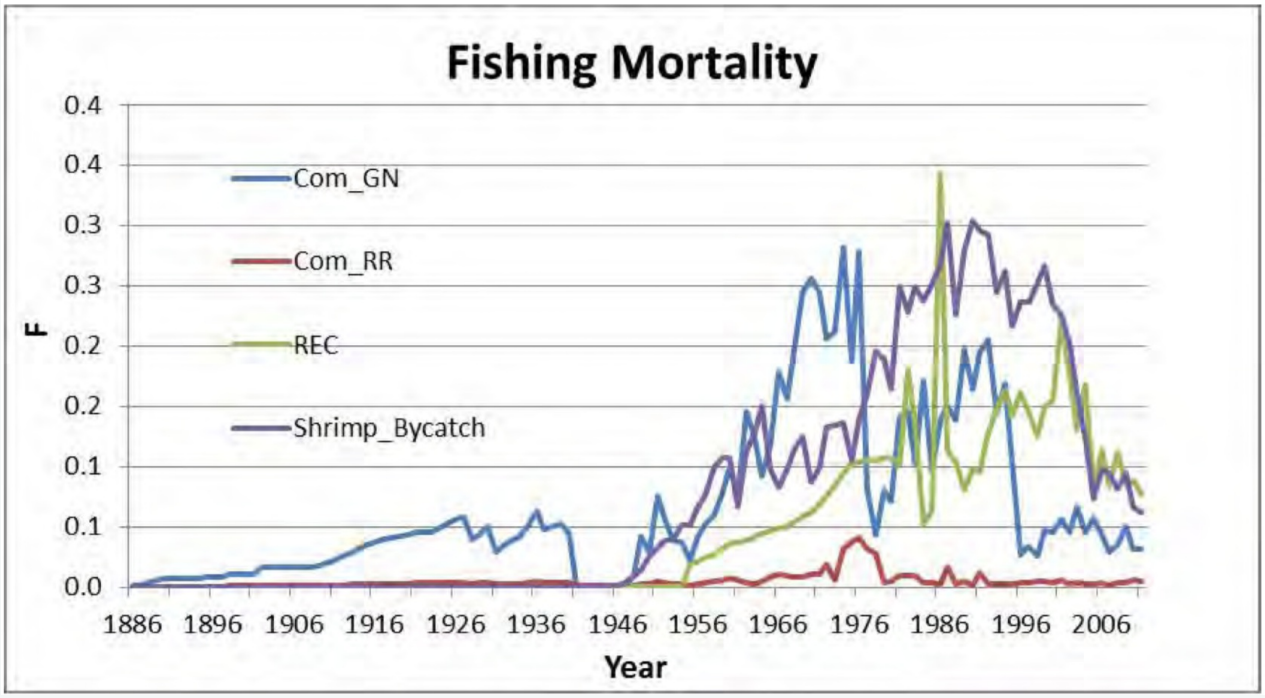

Figure 15 Fleet specific fishing mortality estimates for Gulf of Mexico Spanish mackerel (SEDAR 2013a). Fishing fleets include commerical gillnet (Com_GN), commerical rod and reel (Com_RR), recreational (REC) fishers, as well as bycatch in the Gulf of Mexico shrimp trawl (Shrimp_Bycatch). These bycatch estimates are highly uncertain and should be interpreted with caution (Branstetter pers comm.).

KING MACKEREL

Factor 1.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

Low Concern

The 2014 Gulf of Mexcio king mackerel stock assessment estimated that SSB_{2012}/SSB_{MSY} = 2.1, indicating that

the stock is not overfished (SEDAR 2014b). Because the stock assessment is more than five years old, biomass is considered "low concern" instead of "very low concern".

Justification:

An updated king mackerel stock assessment update via SEDAR has already been conducted. The stock assessment report was reviewed by the South Atlantic SSC in April 2020, and will be reviewed by the SAFMC in June 2020 (Christian Wiegand, pers. comm., March 30, 2020).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Low Concern

The 2014 Atlantic king mackerel stock assessment estimated that SSB_{2012}/SSB_{MSY} = 1.24, indicating that the stock is not overfished (SEDAR 2014a). Because the stock assessment is more than five years old, biomass is considered "low concern" instead of "very low concern".

Factor 1.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

Low Concern

The 2014 Gulf of Mexico king mackerel stock assessment estimated that F_{2012}/F_{MSY} = 0.507 (SEDAR 2014a). This indicates that the stock is not undergoing overfishing, and fishing mortality is therefore deemed to be "low concern".

Justification:

This is assessment does not include fishing mortality attributable to Mexican fishing fleets targeting this population of king mackerel, and accordingly there was some uncertainty as to the actual level of fishery exploitation experienced in the Gulf (*ibid*). However, the SSC met and concluded that the base assessment model used in the stock assessment is the best scientific information available and is acceptable for management purposes (GoM FMC 2015).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Low Concern

The 2014 Atlantic king mackerel stock assessment estimated that F_{2012}/F_{MSY} = 0.37 (SEDAR 2014a). This indicates that the stock is not undergoing overfishing, and fishing mortality is therefore deemed to be "low concern".

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 Crtitical

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.

ATLANTIC SPANISH MACKEREL United States Of America/Gulf Of Mexico | Encircling Gillnets | Spanish Mackerel					
Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**
Species | Stock	**Abundance**		**Fishing Mortality**	**Subscore**	
Bottlenose dolphin	1.00:High Concern		3.00:Moderate Concern	Red (1.732)	
Sharks	1.00:High Concern		3.00:Moderate Concern	Red (1.732)	

ATLANTIC SPANISH MACKEREL United States Of America/Gulf Of Mexico | Gillnets And Entangling Nets (Unspecified)					
Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**
Species | Stock	**Abundance**		**Fishing Mortality**	**Subscore**	
Bottlenose dolphin	1.00:High Concern		3.00:Moderate Concern	Red (1.732)	
Sharks	1.00:High Concern		3.00:Moderate Concern	Red (1.732)	
Sea turtles	1.00:High Concern		3.00:Moderate Concern	Red (1.732)	
Bluefish	1.00:High Concern		5.00:Low Concern	Yellow (2.236)	

Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Blue runner	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic bumper	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic menhaden	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)

ATLANTIC SPANISH MACKEREL
United States Of America/Gulf Of Mexico | Handlines And Hand-Operated Pole-And-Lines

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Greater amberjack	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Red snapper	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
King mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Vermilion snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)
Yellowtail snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

ATLANTIC SPANISH MACKEREL
United States Of America/Western Central Atlantic | Cast Nets

Subscore:	**2.236**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.236**

Species | Stock	Abundance	Fishing Mortality	Subscore
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Crevalle jack	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Striped mullet	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

ATLANTIC SPANISH MACKEREL
United States Of America/Western Central Atlantic | Drift Gillnets

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Sea turtles	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Bottlenose dolphin	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)

ATLANTIC SPANISH MACKEREL
United States Of America/Western Central Atlantic | Encircling Gillnets

Subscore:	1.732	Discard Rate:	1.00	C2 Rate:	1.732

Species | Stock	Abundance	Fishing Mortality	Subscore
Bottlenose dolphin	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sharks	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
grey seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor porpoise	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Short-beaked common dolphin	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)

ATLANTIC SPANISH MACKEREL
United States Of America/Western Central Atlantic | Gillnets And Entangling Nets (Unspecified)

Subscore:	1.732	Discard Rate:	1.00	C2 Rate:	1.732

Species | Stock	Abundance	Fishing Mortality	Subscore
Bottlenose dolphin	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sharks	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sea turtles	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Humpback whale	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Blue runner	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic bumper	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic menhaden	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
grey seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor porpoise	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Short-beaked common dolphin	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Minke whale: Canadian east coast	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)

King mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Cobia	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

ATLANTIC SPANISH MACKEREL
United States Of America/Western Central Atlantic | Handlines And Hand-Operated Pole-And-Lines

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Greater amberjack	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Crevalle jack	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Blue runner	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Gray triggerfish	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
King mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Vermilion snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

KING MACKEREL
United States Of America/Gulf Of Mexico | Cast Nets

Subscore:	**2.644**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.644**

Species | Stock	Abundance	Fishing Mortality	Subscore
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Striped mullet	3.67:Low Concern	5.00:Low Concern	Green (4.284)

KING MACKEREL
United States Of America/Gulf Of Mexico | Encircling Gillnets

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Bottlenose dolphin	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sharks	1.00:High Concern	3.00:Moderate Concern	Red (1.732)

KING MACKEREL
United States Of America/Gulf Of Mexico | Handlines And Hand-Operated Pole-And-Lines

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Greater amberjack	1.00:High Concern	3.00:Moderate Concern	Red (1.732)

Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Red snapper	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic Spanish mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Vermilion snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)
Yellowtail snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

KING MACKEREL
United States Of America/Western Central Atlantic | Gillnets And Entangling Nets (Unspecified)

Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Bottlenose dolphin	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sharks	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Sea turtles	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Humpback whale	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Blue runner	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic bumper	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Ladyfish	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic menhaden	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
grey seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor porpoise	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Harbor seal	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Short-beaked common dolphin	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Minke whale: Canadian east coast	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Atlantic Spanish mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Cobia	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

KING MACKEREL United States Of America/Western Central Atlantic | Handlines And Hand-Operated Pole-And-Lines					
Subscore:	**1.732**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.732**

Species | Stock	Abundance	Fishing Mortality	Subscore
Greater amberjack	1.00:High Concern	3.00:Moderate Concern	Red (1.732)
Bluefish	1.00:High Concern	5.00:Low Concern	Yellow (2.236)
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Crevalle jack	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Blue runner	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Gray triggerfish	2.33:Moderate Concern	5.00:Low Concern	Green (3.413)
Atlantic Spanish mackerel	3.67:Low Concern	5.00:Low Concern	Green (4.284)
Vermilion snapper	5.00:Very Low Concern	5.00:Low Concern	Green (5.000)

KING MACKEREL United States Of America/Western Central Atlantic | Trolling Lines					
Subscore:	**2.644**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.644**

Species | Stock	Abundance	Fishing Mortality	Subscore
Spotted tunny	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Barracuda spp.	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.644)
Atlantic sharpnose shark	3.67:Low Concern	5.00:Low Concern	Green (4.284)

Criterion 2 species for the various gillnet fisheries and the handline/troll fisheries were determined from a number of bycatch studies, between 2012 and 2017, carried out using data from the Southeast Gillnet Observer Program, which covers anchored (sink and stab), strike, or drift gillnet fishing, regardless of target, by vessels that fish year-round from Florida to North Carolina and the Gulf of Mexico (Enzenauer et al. 2015)(Mathers et al. 2016a)(Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018). Criterion 2 species for the North Carolina fisheries specifically were determined from two sources at North Carolina Department of Natural Resources (Randy Gregory, pers. comm., October 15, 2019 and Alan Bianchi, pers. comm., December 30, 2019). Marine mammals included in the assessment for gillnet fisheries were determined using the 2019 List of Fisheries for the Mid-Atlantic gillnet fishery, the Southeast Atlantic gillnet fishery, the North Carolina inshore gillnet fishery, and the Gulf of Mexico gillnet fisheries.

US GoM Encircling Gillnets (King mackerel)

Species composition was determined based on data from the encircling/runaround/strike net fishery targeting king mackerel, which were available for 2016 and 2017 in the GoM and Atlantic combined. According to these data, catch composition by number of all king mackerel targeted sets in 2017 (2016) was 99.98% (99.96%) teleosts and 0.02% (0.04%) elasmobranchs (Mathers et al. 2017)(Mathers et al. 2018). Catch was almost completely composed of king mackerel (99.28%; 99.51%); other catch by number included spotted tunny, *Euthynnus alletteratus* (in 2017: 0.05%). Spotted tunny was not included in the assessment as this species comprised less than 5% of the total catch, and are not overfished or endangered.

Shark catch by number was blacktip shark, *Carcharhinus limbatus* (50%; 75%; Near Threatened), scalloped hammerheads, *Sphyrna lewini* (in 2017: 50%; Critically Endangered*)* and nurse shark, *Ginglymostoma cirratum* (in 2016: 25%; Data Deficient).

Bottlenose dolphins, were included in this fishery, as per the 2019 List of Fisheries, which documents the level of interactions a fishery has with marine mammals.

US GoM Encircling Gillnets (Spanish mackerel)

Catch composition was determined from a study by Mathers et al (2016) (Mathers et al. 2016b) which characterized the catch composition of state gillnet fisheries in the Gulf of Mexico using data from observed trips from 2012-2015. According to these data, encircling gillnets (referred to as strike nets in the study) targeting Spanish mackerel caught mostly teleost fishes (97.26%) alongside small numbers of invertebrates (1.85%), elasmobranchs (0.87%), and batoids (0.10%).

Shark bycatch included several species, most notably Atlantic sharpnose shark (58% of sharks caught), spinner shark (12%), and finetooth shark (12%). Other shark species observed in the catch included blacktip shark, requiem sharks, blacknose shark, smooth dogfish, and a single bonnethead shark (Mathers et al. 2016b).

Bottlenose dolphins, were included in this fishery, as per the 2019 List of Fisheries, which documents the level of interactions a fishery has with marine mammals.

US GoM Gillnets/Entangling Nets (Spanish mackerel)

Species composition was determined based on data from the gillnet/entangling net fishery targeting Spanish mackerel, which were available for 2015 (a,b), 2016 and 2017 in the GoM and Atlantic combined. According to these data, catch composition by number of all Spanish mackerel targeted sets in 2017 (2016; 2015a; 2015b) was 97.30% (98.44%; 97.45%; 99.05%) teleosts, 2.70% (1.11%; 1.62%; 0.83%) elasmobranchs, in 2016 (2015a; 2015b): 0.36% (0.89%; 0.12%) invertebrates, and 0.09% (0.04%) batoids, and in 2015: 0.01% marine mammals (Mathers et. al. 2016a)(Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

By number, shark catch (2016; 2015a; 2015 b) was made up of Atlantic sharpnose shark, *Rhizoprionodon terraenovae* (82.56%; 57.95%; 57.95%*;* Least Concern), bonnethead shark, *Sphyrna tiburo* (15.12%; 24.43%; 24.43%*;* Least Concern), and blacktip shark, *Carcharhinus limbatus* (2.33%; 6.25%; 6.25%; Near Threatened). By weight, the shark catch was made up of sandbar shark, *Carcharhinus plumbeus* (in 2016: 33.66%; 33.66%), followed by Atlantic sharpnose shark (71.92%; 26.98%; 26.98%), and blacktip shark (14.84%; 15.42%; 15.42%; *ibid*).

In 2017, bluefish, *Pomatomus saltatrix*, made up 70.67% of the teleost catch by number, followed by Spanish mackerel (23.33%) and bluerunner jack (2.74%) (Mathers et al. 2018). In 2016 (2015a), Spanish mackerel made up 63.55% (63.55%) of the teleost catch by number, followed by Atlantic menhaden, *Brevoortia tyrannus* (11.91%; 11.91%), bluefish (10.92%; 10.92%), and Atlantic bumper, *Chloroscombrus chrysurus* (3.07%; 3.07%) (Mathers et al. 2016a)(Mathers et al. 2017). In 2015(b), Spanish mackerel made up the majority of teleosts (3.8% of total catch), followed by bluefish (18.8%), ladyfish (11.3%), Atlantic bumper (8.2%), Atlantic menhaden (8.2%), and bluerunner jack (6.8%). Atlantic sharpnose was the predominant species of shark caught (Mathers et al. 2015b).

Bottlenose dolphins, were included in this fishery, as per the 2019 List of Fisheries. Sea turtles were included (as a group) as well, as per the CMP Biological Opinion (NOAA 2015).

US GoM Handlines (King and Spanish mackerel)

Species composition was determined based on data from the Florida Fish and Wildlife Commission for trips using handline gear targeting Spanish or king mackerel from in 2018 (Steve Brown, pers. comm., December 13, 2019). According to these data, catch composition of all Spanish mackerel targeted sets in the US GoM (FL West coast) was comprised of 45% yellowtail snapper, 17% red snapper, 10% vermilion snapper, and 7.1% Spanish mackerel (Steve Brown, pers. comm., December 13, 2019). Catch composition of all king mackerel targeted sets in the US GoM (FL West coast) was comprised of 53% king mackerel, 24% ladyfish, and 8.9% yellowtail snapper (*ibid*).

Sea turtles were included (as a group), as per the CMP Biological Opinion (NOAA 2015).

US Atlantic Cast Nets (King mackerel)

Species composition was determined based on data from the Florida Fish and Wildlife Commission for trips using cast net gear targeting king mackerel in 2018 (Steve Brown, pers. comm., December 13, 2019).

In 2018, catch composition of all king mackerel targeted sets in the US Atlantic (FL East coast) was comprised of 13.7% bluefish, 9.1% crevalle jack, and 7.8% black/striped mullet (Steve Brown, pers. comm., December 13, 2019).

No marine mammals were included in this fishery, as per the 2019 List of Fisheries.

US GoM Cast Nets (King mackerel)

Species composition was determined based on data from the Florida Fish and Wildlife Commission for trips using cast net gear targeting king mackerel in 2018 (Steve Brown, pers. comm., December 13, 2019).

In 2018, catch composition of all king mackerel targeted sets in the US GoM (FL West coast) was comprised of 57.6% ladyfish, and 31.1% black/striped mullet (*ibid*).

No marine mammals were included in this fishery, as per the 2019 List of Fisheries.

US Atlantic Drift Gillnets (Spanish mackerel)

Only the Spanish mackerel estuarine fishery in North Carolina uses drift gillnets. This gear has short soak times (80+º water in the summer when this fishery occurs), with bycatch of mainly bluefish (Randy Gregory, pers. comm., October 15, 2019).

Bottlenose dolphins, were included in this fishery, as per the 2019 List of Fisheries. Sea turtles were included (as a group) as well, as per the CMP Biological Opinion (NOAA 2015).

US Atlantic Encircling Gillnets (Spanish mackerel)

Species composition was determined based on data from the encircling/runaround/strike net fishery targeting Spanish mackerel, which were available for 2015 in the GoM and Atlantic combined. According to these data, catch composition by number was 97.26% teleosts, 1.85% invertebrates, 0.87% elasmobranchs, and 0.10% batoids (Mathers et al. 2016b). Spanish mackerel made up 49.4% of the total catch, followed by ladyfish (19.7%), bluefish (7.3%), bluerunner jack (6.8%), and Atlantic bumper (6.8%). Atlantic sharpnose was the predominant species of shark caught (*ibid*).

The Spanish mackerel fishery in North Carolina is an over 95% gillnet fishery with about 65% of those fish harvested in the ocean (< 3 miles from shore). The ocean fishery typically uses encircling/runaround/strike nets

and gillnet/entangling/sink nets (with very short soak times of .5 to 2 hours) with bycatch of bluefish, spotted tunny and small coastal sharks.

Bottlenose dolphins, were included in this fishery, as per the 2019 List of Fisheries.

US Atlantic Gillnets/Entangling Nets (King and Spanish mackerel)

Species composition was determined based on data from the gillnet/entangling net fishery targeting king and Spanish mackerel, which were available for 2015 (a,b), 2016 and 2017 in the GoM and Atlantic combined. See above "US GoM Gillnets/entangling nets (Spanish mackerel)" for Spanish mackerel targeted sets.

In 2016, catch composition by number of all king mackerel targeted sets was 56.52% teleosts, 29.57% elasmobranchs, and 13.91% batoids (Mathers et al. 2017). By number, shark catch was comprised of spinner shark, *Carcharhinus brevipinna* (35.29%; Near Threatened), smooth dogfish, *Mustelus canis* (35.29%*;* Near Threatened), and sandbar shark (17.65%; Vulnerable). By weight, the shark catch was spinner shark, *Carcharhinus brevipinna* (29.02%; Near Threatened), tiger shark, *Galeocerdo cuvier* (24.95%; Near Threatened), and sandbar shark, *Carcharhinus plumbeus* (21.29%; Vulnerable; *ibid*). King mackerel made up 84.62% of the teleost catch by number (47.8% of total catch), followed by spotted tunny (10.77%; 6.1% of total catch; *ibid).*

For the king mackerel gillnet/entangling/sink net fishery in North Carolina (which has very short soak times and only occurs north of Cape Hatteras, by regulation), occasional bycatch is bluefish, spotted tunny and cobia (Randy Gregory, pers. comm., October 15, 2019). The Spanish mackerel ocean fishery typically uses gillnet/entangling/sink nets and encircling/runaround/strike nets (with very short soak times of .5 to 2 hours) with bycatch of bluefish, spotted tunny and small coastal sharks (sharpnose and spinner).

Bottlenose dolphins, humpback whales, minke whales, harbor porpoises, short-beaked common dolphins, harbor seals, and grey seals were included in these fisheries, as per the 2019 List of Fisheries.

US Atlantic Handlines (King and Spanish mackerel)

Species composition was determined based on data from the Florida Fish and Wildlife Commission for trips using handline gear targeting Spanish or king mackerel in 2018 (Steve Brown, pers. comm., December 13, 2019), and on data from the handline fishery targeting mixed species, which were available for February 2014 to January 2015 in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), combined (Enzenauer et al. 2015).

In 2018, catch composition of all Spanish mackerel targeted sets in the US Atlantic (FL East coast) was comprised of 21.6% vermilion snapper, 18% spotted tunny, 9.9% Spanish mackerel, 9.51% greater amberjack, and 5.3% gray triggerfish (Steve Brown, pers. comm., December 13, 2019). Catch composition of all king mackerel targeted sets in the US GoM (FL East coast) was comprised of 33% king mackerel, 24.2% crevalle jack, and 16.6% bluefish (*ibid*).

According to 2014-2015 data, catch composition was comprised of 85.8% teleosts and 14.2% sharks. Spotted tunny comprised 24.7% of the total catch, followed by Greater amberjack, *Seriola dumerili* (24.2%), and king mackerel (17.4%). Atlantic sharpnose shark (Cortés 2009) was the most common species of shark caught (81.5%; *ibid*).

Sea turtles were included (as a group), as per the CMP Biological Opinion (NOAA 2015). No marine mammals were included in this fishery, as per the 2019 List of Fisheries.

US Atlantic Trolling Lines (King mackerel)

According to the 2014-2015 data, catch composition included 96.0% teleosts and 4.0% sharks (Enzenauer et al. 2015). King mackerel comprised 76.9% of the teleost catch, followed by 15.7% spotted tunny. Atlantic sharpnose was the only species of shark caught (4.0%).

In the North Carolina king mackerel hook and line fishery, the most frequent bycatch is spotted tunny (Randy Gregory, pers. comm., October 15, 2019).

Sea turtles were included (as a group) as well, as per the CMP Biological Opinion (NOAA 2015). No marine mammals were included in this fishery, as per the 2019 List of Fisheries.

Summary

The species assessed here are mostly retained in the fisheries with minimal levels of discarding. Incidental take of protected species, such as marine mammals, remained a rare occurrence, with none observed in 2016 (in the gillnet portion of the CMP fishery) (GMFMC 2016). All sharks were lumped into a general "sharks" category and scored in line with the most vulnerable species (according to their stock status' or their IUCN listing) using the SFW Unknown Bycatch Matrix (UBM). Interactions of the CMP fishery with smalltooth sawfish, *Pristis pectinata*, and Atlantic sturgeon, *Acipenser oxyrhynchus oxyrhynchus*, are thought to be very rare, and known occurrences resulted in live release (NOAA 2015).

Sharks, sea turtles and bottlenose dolphins limit the Criterion 2 score for the gillnet fisheries due to their stock statuses and the likelihood of interaction with this fishery. Greater amberjack limit the score for the handline fisheries because they are overfished and spotted tunny limit the troll fishery.

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)

BOTTLENOSE DOLPHIN

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

High Concern

The Gulf of Mexico Gillnet Fishery has interactions with bottlenose dolphins. Specifically those stocks that are affected by the GoM Gillnet Fishery are the Eastern, Western and Northern GoM coastal stocks, as well as the GoM Bay, Sound, and Estuarine (BSE) stocks (NOAA 2019l).

GoM BSE

Population size estimates for most of the GoM BSE stocks are more than eight years old, and therefore, the current population sizes for all but two are considered unknown (NOAA 2019m). The data are insufficient to determine population trends for most of the GoM BSE common bottlenose dolphin stocks, and the status of these stocks relative to OSP is unknown (*ibid*).

Eastern GoM coastal

The best abundance estimate available for the northern Gulf of Mexico Eastern Coastal Stock of common bottlenose dolphins is 12,388, with a minimum population size of 11,110 individuals (NOAA 2016a). Stock status relative to OSP in the GoM EEZ is unknown and there is insufficient data to determine the population trends (*ibid*).

Northern GoM coastal

The best abundance estimate available for the northern Gulf of Mexico Northern Coastal Stock of common bottlenose dolphins is 7,185, with a minimum population size of 6,044 individuals (NOAA 2016c). Stock status relative to OSP in the GoM EEZ is unknown and there is insufficient data to determine the population trends (*ibid*).

Western GoM coastal

The best abundance estimate available for the northern Gulf of Mexico Western Coastal Stock of common bottlenose dolphins is 20,161, with a minimum population size of 17,491 individuals (NOAA 2016a). Stock status relative to OSP in the GoM EEZ is unknown and there is insufficient data to determine the population trends (*ibid*).

Summary

Common bottlenose dolphins in these regions are not listed as threatened or endangered under the Endangered Species Act, but the GoM BSE stocks are strategic stocks because most of the stock sizes are currently unknown. Because some of the bottlenose dolphin stocks that interact with this fishery are of unknown abundance, but are considered to have high inherent vulnerability based on Seafood Watch criteria for marine mammals, abundance is scored as "high concern".

Justification:

NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico.

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

High Concern

The Mid-Atlantic Gillnet Fishery and the Southeast Atlantic Gillnet Fishery have interactions with bottlenose dolphins. Specifically those stocks that are affected by the Mid-Atlantic Gillnet Fishery are the Northern and Southern Migratory coastal stocks, the WNA offshore stock, and the Northern (NNCES) and Southern (SNCES) NC estuarine stocks. Those affected by the Southeast Atlantic Gillnet Fishery are the Southern

Migratory coastal, SC/GA coastal, Central FL coastal, and Northern FL coastal stocks of bottlenose dolphins (NOAA 2019k).

WNA Offshore stock

The best available estimate for the offshore stock of common bottlenose dolphins in the western North Atlantic is 77,532, with a minimum population size of 56,053 (NOAA 2017). This estimate is from summer 2011 surveys covering waters from central Florida to the lower Bay of Fundy.

Northern (NNCES)

The best available abundance estimate for the NNCES Stock is 823 individuals (CV=0.06), with a minimum population size of 782 (Gorgone et al. 2014). This estimate was based on photo-ID mark-recapture surveys in summer 2013, but may be an underestimation as the survey did not cover all of the stock's range (i.e., coastal waters) (NOAA 2018a).

Southern (SNCES) NC estuarine stocks

The current population size of the SNCES Stock is unknown because the survey data are more than eight years old (Wade and Angliss 1997), but the stock size is likely less than 200 individuals due to the restricted range of the stock and the best available abundance estimate (Urian et al. 2013) (NOAA 2018b).

Northern Migratory coastal stock

The best available abundance estimate for the Northern Migratory Coastal Stock of common bottlenose dolphins in the western North Atlantic is 6,639, with a minimum population size of 4,759 individuals (NOAA 2018g).

Southern Migratory coastal stock

The best available abundance estimate for the Southern Migratory Coastal Stock of common bottlenose dolphins in the western North Atlantic is 3,751, with a minimum population size of 2,353 individuals (NOAA 2018f).

SC/GA coastal stock

The best available abundance estimate for the South Carolina/Georgia Coastal Stock of common bottlenose dolphins in the western North Atlantic is 6,027, with a minimum population size of 4,569 individuals (NOAA 2018e).

Central FL coastal stock

The best available abundance estimate for the Central Florida Coastal Stock of common bottlenose dolphins in the western North Atlantic is 1,218, with a minimum population size of 913 individuals (NOAA 2018d).

Northern FL coastal stock

The best available abundance estimate for the Northern Florida Coastal Stock of common bottlenose dolphins in the western North Atlantic is 877, with a minimum population size of 595 individuals (NOAA 2018c).

Summary

Common bottlenose dolphins in these regions are not listed as threatened or endangered under the Endangered Species Act, but they are strategic stocks due to their designations as depleted under the MMPA. Analysis of trends in abundance suggest a possible decline in all stock abundances between 2002–2004 and 2016; however, there is limited power to evaluate trends given uncertainty in stock distribution, lack of precision in abundance estimates, and a limited number of surveys (NOAA 2018c-g). The IUCN considers this species as "Least Concern" (Wells et al. 2019), but since these stocks are presumed to be below OSP due to their designations as depleted, and these populations are likely in decline, abundance is considered "high concern".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

Moderate Concern

The Spanish mackerel drift gillnet fishery occurs in North Carolina (NC) estuaries, where both the Northern (NNCES) and Southern (SNCES) NC estuarine stocks of bottlenose dolphins occur (NOAA 2019l).

The best available abundance estimate for the NNCES Stock is 823 individuals (CV=0.06), with a minimum population size of 782 (Gorgone et al. 2014). This estimate was based on photo-ID mark-recapture surveys in summer 2013, but may be an underestimation as the survey did not cover all of the stock's range (i.e., coastal waters) (NOAA 2018a).

The current population size of the SNCES Stock is unknown because the survey data are more than eight years old (Wade and Angliss 1997), but the stock size is likely less than 200 individuals due to the restricted range of the stock and the best available abundance estimate (Urian et al. 2013) (NOAA 2018b).

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. The IUCN considers this species as "Least Concern" (Wells et al. 2019), and since the status of these stocks relative to OSP, as well as population trends, are unknown, abundance is considered "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Moderate Concern

The Gulf of Mexico mackerel gillnet fishery is listed as a Category II fishery for bottlenose dolphins stocks in the GoM Bay, Sound, and Estuary (BSE), and Eastern, Northern and Western GoM coastal, which means that there are occasional interactions (NOAA 2019d).

GoM BSE

The total annual human-caused mortality and serious injury for the Northern Gulf of Mexico BSE stocks of common bottlenose dolphins during 2012–2016 is unknown. PBR is undetermined for all but two stocks (Mississippi River Delta, 1.4; Sarasota Bay/Little Sarasota Bay, 1) because the population size estimates are

more than eight years old (NOAA 2019m).

In recent years, there have not been any reported or observed marine mammal mortalities associated with gillnet fisheries in the BSE, but stranding data suggest that gillnet and marine mammal interactions do occur, causing mortality and serious injury. From 2012–2016, there were 11 entanglements in research-related gillnets in BSE stocks: seven dolphins in Texas, two in Louisiana, and two in Florida. Two of the 11 entanglements resulted in mortalities, and three in serious injuries (*ibid*). Taking into account the evidence from stranding data and the low PBRs for stocks with recent abundance estimates, the total fishery-related mortality and serious injury likely exceeds 10% of the total known PBR or previous PBR (unknown), and therefore, it is probably not insignificant and not approaching the zero mortality and serious injury rate (*ibid*).

Eastern GMX coastal

The total annual human-caused mortality and serious injury for the Eastern Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown (PBR of 111), because this stock is known to interact with unobserved fisheries (NOAA 2016a). However, this is not a strategic stock, because it is assumed that the mean annual human-caused mortality and serious injury does not exceed PBR (*ibid*).

Northern GMX coastal

The total annual human-caused mortality and serious injury for the Northern Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown (PBR of 60), because this stock is known to interact with an unobserved fishery (NOAA 2016c). No marine mammal mortalities associated with U.S. gillnet fisheries have been reported or observed for the Northern Coastal Stock, but stranding data suggest that gillnet and marine mammal interactions do occur (*ibid*). There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi and Louisiana (state waters only), and no takes have been observed to date (*ibid*). The GoM Northern Coastal Stock is not considered strategic under the MMPA.

Western GMX coastal

The total annual human-caused mortality and serious injury for the Western Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown (PBR of 175), because this stock is known to interact with unobserved fisheries (NOAA 2016b). No marine mammal mortalities associated with U.S. gillnet fisheries have been reported or observed for the Western Coastal Stock, but stranding data suggest that gillnet and marine mammal interactions do occur (*ibid*). There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi and Louisiana (state waters only), and no takes have been observed to date (*ibid*). The GoM Western Coastal Stock is not considered strategic under the MMPA; however, the occurrence of an unusual mortality event of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the Western Coastal Stock area and is cause for concern (*ibid*).

Summary

For the Gulf of Mexico region, NOAA considers the Bay, Sound, and Estuary (BSE) stock as a strategic stock, while the Eastern Coastal, Northern Coastal, and Western Coastal stocks are not strategic (NOAA 2016a-c) (NOAA 2019m). However, since it is unclear whether the fishing mortality from GoM mackerel gillnet fisheries exceeds 50% of the PBR in each of these bottlenose dolphin stocks, fishing mortality is scored as "moderate concern".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Moderate Concern

The Mid-Atlantic Gillnet Fishery is a Category I fishery and the Southeast Atlantic Gillnet Fishery and North Carolina Inshore Gillnet fishery are Category II fisheries, meaning that there are frequent interactions with, and occasional interactions with bottlenose dolphins, respectively. Specifically those stocks that are affected by the Mid-Atlantic Gillnet Fishery and the North Carolina Inshore Gillnet fishery are the Northern and Southern Migratory coastal bottlenose dolphin stocks. And those affected by the Southeast Atlantic Gillnet Fishery are the Southern Migratory coastal, SC/GA coastal, Central FL coastal, and Northern FL coastal stocks of bottlenose dolphins (NOAA 2019k).

WNA Offshore stock

The estimated mean annual fishery-related mortality and serious injury of offshore common bottlenose dolphins during 2010–2014 was 39.4, with a PBR of 561 (NOAA 2017). The Mid-Atlantic Gillnet fishery is known to interact with this stock, however, mean annual mortality for this fishery is not available.

Northern (NNCES) NC estuarine stock

The total annual human-caused mortality and serious injury for the NNCES Stock during 2011–2015 is unknown, with a PBE of 7.8 individuals (NOAA 2018a). The mean annual fishery-related mortality and serious injury for observed fisheries, for strandings, and for at-sea observations identified as fishery-related ranged between 0.2 and 17.6, and additional mean annual mortality and serious injury due to other human-caused sources (fishery research, at-sea entanglements in unidentified gear) was 0.6. This range reflects several many sources of uncertainty and is a minimum estimate (*ibid*). During 2011–2015, one dead dolphin stranding, ascribed to the NNCES Stock, was recovered inshore with attached gillnet gear attributed to the North Carolina inshore gillnet fishery. Current information on interactions between common bottlenose dolphins and the North Carolina inshore gillnet fishery is based solely on stranding data as no bycatch has been observed by state and federal observer programs, but is likely insufficient to detect all bycatch events of common bottlenose dolphins if they were to occur in the inshore commercial gillnet fishery (*ibid*).

Southern (SNCES) NC estuarine stock

The total annual human-caused mortality and serious injury for the SNCES Stock during 2011–2015 is unknown, with an undetermined PBR (NOAA 2018b). During 2011–2015, there were no documented mortalities or serious injuries in inshore gillnet gear of common bottlenose dolphins that could be ascribed to the SNCES Stock. However, there were two cases documented in which a carcass stranded with markings indicative of interaction with gillnet gear, but no gear was attached to the carcass and it is unknown whether the interactions with the gear contributed to the deaths of these animals. These cases occurred in 2012 and 2015, and both were ascribed to the SNCES and NNCES stocks. Neither of these mortalities are included in the annual human-caused mortality and serious injury total for this stock (*ibid*).

Northern Migratory coastal stock

The total annual human-caused mortality and serious injury for the Northern Migratory Coastal Stock during 2011–2015 is unknown, with a PBR of 48 individuals (NOAA 2018g). The total mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-related ranged between

6.1 (CV=0.32) and 13.2 (CV=0.22; *ibid*). This range reflects several many sources of uncertainty and is a minimum estimate. North Carolina is the largest component of the Mid-Atlantic gillnet fishery in terms of fishing effort and observed marine mammal takes (Palka and Rossman 2001)(Lyssikatos and Garrison 2018). The resultant five-year mean minimum and maximum mortality estimates (2011–2015) were 6.1 (CV=0.32) and 12.2 (CV=0.22) animals per year, respectively (*ibid*). In addition, from 2011 to 2015, six dead, stranded dolphins were recovered with markings indicative of interaction with gillnet gear, but no gear was attached to the carcasses and it is unknown whether the interactions with the gear contributed to the death of these animals. Four of the six cases were ascribed to the Northern Migratory Coastal Stock alone, and two were ascribed to the Northern and Southern Migratory Coastal and NNCES stocks (*ibid*). Therefore, PBR is not exceeded, but the Mid-Atlantic gillnet fishery likely accounts for more than 50% of PBR.

Southern Migratory coastal stock

The total annual human-caused mortality and serious injury for the Southern Migratory Coastal Stock during 2011–2015 is unknown, with a PBR of 23 individuals individuals (NOAA 2018f). The total minimum mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-related ranged between 0 and 14.3 (CV=0.31; *ibid*). This range reflects several many sources of uncertainty and is a minimum estimate. North Carolina is the largest component of the mid-Atlantic gillnet fishery in terms of fishing effort and observed marine mammal takes (Palka and Rossman 2001)(Lyssikatos and Garrison 2018). The resultant 5-year mean minimum and maximum mortality estimates (2011–2015) for the Southern Migratory Coastal Stock were therefore 0 and 12.5 (CV=0.31) animals per year, respectively (*ibid*). In addition, during the current 5-year period there were also four common bottlenose dolphin strandings, all in North Carolina, with markings indicative of interaction with gillnet gear, but no gear was attached to the carcasses and it is unknown whether the interactions with the gear contributed to the death of these animals. All four cases were ascribed to multiple stocks including the Southern Migratory Coastal Stock (*ibid*). Therefore, PBR is not exceeded, but the mid-Atlantic gillnet fishery likely accounts for more than 50% of PBR.

SC/GA coastal stock

Total mean annual human-caused mortality and serious injury for the South Carolina/Georgia Coastal Stock during 2011–2015 is unknown. The mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-related ranged between 1.0 and 1.2, with a PBR of 46 individuals individuals (NOAA 2018e). Additional mean annual mortality and serious injury due to other human-caused sources (fishery research, recreational fishing gear) was 0.4 (*ibid*). This range reflects several many sources of uncertainty and is a minimum estimate. There have been no documented mortalities or serious injuries of common bottlenose dolphins associated with the Southeast Atlantic gillnet fishery during 2011–2015 that could be ascribed to the South Carolina/Georgia Coastal Stock (*ibid*).
This fishery targets mackerel in waters between North Carolina and southern Florida, were the majority of fishing effort occurs in federal waters because Florida, Georgia, and South Carolina, with limited exception, prohibit the use of gillnets in state waters. Therefore, PBR is not exceeded, and the Southeast Atlantic gillnet fishery does not account for more than 50% of PBR.

Central FL coastal stock

The total annual human-caused mortality and serious injury for the Central Florida Coastal Stock during 2011–2015 is unknown. The mean annual fishery-related mortality and serious injury for strandings identified as fishery-related was 0.4, with a PBR of 9.1 (NOAA 2018d). This range reflects several many sources of uncertainty and is a minimum estimate. There have been no documented mortalities or serious injuries of common bottlenose dolphins associated with the Southeastern U.S. Atlantic Shark Gillnet or Southeast Atlantic Gillnet fisheries during 2011–2015 that could be ascribed to the Central Florida Coastal Stock. Therefore, PBR is not exceeded, and the Southeast Atlantic gillnet fishery does not account for more than 50% of PBR.

Northern FL coastal stock

The total annual human-caused mortality and serious injury for the Northern Florida Coastal Stock during 2011–2015 is unknown, with a PBR of 6. The mean annual fishery-related mortality and serious injury for strandings identified as fishery-related was 0. Mean annual mortality and serious injury due to other human-caused sources (fishery research and entanglements in unidentified gear and wire) was 0.6 (NOAA 2018c). This range reflects several many sources of uncertainty and is a minimum estimate. There have been no documented mortalities or serious injuries of common bottlenose dolphins associated with the Southeast Atlantic gillnet fishery during 2011–2015 that could be ascribed to the Northern Florida Coastal Stock. Therefore, PBR is not exceeded, and the Southeast Atlantic gillnet fishery does not account for more than 50% of PBR.

Summary

Common bottlenose dolphins in these regions are not listed as threatened or endangered under the Endangered Species Act, but they are strategic stocks due to their designations as depleted under the MMPA. Assessing bottlenose dolphin stocks on a regional basis, mackerel gillnet fisheries are scored as "moderate concern", based on the lowest performing stock in each body of water.

However, because the Mid-Atlantic gillnet fishery accounts for more than 50% of PBR for at least 2 stocks (Northern- and Southern migratory coastal stocks), all of the above stocks are scored as "moderate concern" for fishing mortality, based on the lowest-rated stock affected by these fisheries.

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

Moderate Concern

The North Carolina Inshore Gillnet Fishery is a Category II fishery, meaning that there are occasional interactions with marine mammals, specifically the Northern and Southern NC estuarine stocks of bottlenose dolphins (NOAA 2019l).

The total annual human-caused mortality and serious injury for the NNCES Stock during 2011–2015 is unknown, with a PBE of 7.8 individuals (NOAA 2018a). The mean annual fishery-related mortality and serious injury for observed fisheries, for strandings, and for at-sea observations identified as fishery-related ranged between 0.2 and 17.6, and additional mean annual mortality and serious injury due to other human-caused sources (fishery research, at-sea entanglements in unidentified gear) was 0.6. This range reflects several many sources of uncertainty and is a minimum estimate (*ibid*).

During 2011–2015, one dead dolphin stranding, ascribed to the NNCES Stock, was recovered inshore with attached gillnet gear attributed to the North Carolina inshore gillnet fishery. Current information on interactions between common bottlenose dolphins and the North Carolina inshore gillnet fishery is based solely on stranding data as no bycatch has been observed by state and federal observer programs, but is likely insufficient to detect all bycatch events of common bottlenose dolphins if they were to occur in the inshore commercial gillnet fishery (*ibid*).

Given the uncertainties, and the fact that the maximum mean annual human-caused mortality and serious injury from all fisheries exceeds PBR, NMFS considers this stock strategic under the MMPA. The NC inshore drift gillnet fishery-related mortality and serious injury for this stock appears to be less than 50% of PBR, but this value does not take into account many unknowns (i.e., lack of observed bycatch, lack of recovery of all

dead animals) and is likely an underestimate.

The total annual human-caused mortality and serious injury for the SNCES Stock during 2011–2015 is unknown, with an undetermined PBR (NOAA 2018b). During 2011–2015, there were no documented mortalities or serious injuries in inshore gillnet gear of common bottlenose dolphins that could be ascribed to the SNCES Stock. However, there were two cases documented in which a carcass stranded with markings indicative of interaction with gillnet gear, but no gear was attached to the carcass and it is unknown whether the interactions with the gear contributed to the deaths of these animals. These cases occurred in 2012 and 2015, and both were ascribed to the SNCES and NNCES stocks. Neither of these mortalities are included in the annual human-caused mortality and serious injury total for this stock (*ibid*).

Due to this, fishing mortality for both stocks is considered unknown, or "moderate concern".

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

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

The majority of bycatch in the North Carolina drift gillnet fishery is retained (Randy Gregory, pers. comm., October 15, 2019).

SHARKS

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

High Concern

The gillnet/entangling net fishery is known to catch ETP shark species, such as blacktip (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), sandbar sharks (*Carcharhinus plumbeus*; Vulnerable) (Musick et al. 2009), spinner sharks (*Carcharhinus brevipinna*; Near Threatened) (Burgess 2009), dusky smooth hounds/smooth dogfish (*Mustelus canis;* Near Threatened) (Conrath 2009), scalloped hammerheads (*Sphyrna lewini*; Near Threatened) (Baum et al. 2009), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae;* Least concern) (Cortés 2009), bonnethead sharks (*Sphyrna tiburo;* Least concern) and tiger sharks (*Galeocerdo cuvier*; Near Threatened) (Ferreira and Simpfendorfer 2019)(Mathers et. al. 2016a)(Mathers et al. 2016b) (Mathers et al. 2017)(Mathers et al. 2018).

The status of these shark species vary, but the scoring for abundance is based on the most vulnerable species, and some of these species are Threatened. Therefore, abundance is considered "high concern".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets

High Concern

The strike/runaround/encircling net fishery is known to catch ETP shark species, such as blacktip (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), scalloped hammerheads (*Sphyrna*

lewini; Near Threatened) (Baum et al. 2009) nurse sharks (*Ginglymostoma cirratum*; Data Deficient) (Rosa et al. 2006) and Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*; Least concern) (Cortés 2009) (Mathers et al. 2016)(Mathers et al. 2017)(Mathers et al. 2018).

The status of these shark species vary, but the scoring for abundance is based on the most vulnerable species, and some of these species are Threatened. Therefore, abundance is considered "high concern".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

High Concern

The gillnet/entangling net fishery is known to catch ETP shark species, such as blacktip (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), sandbar sharks (*Carcharhinus plumbeus*; Vulnerable) (Musick et al. 2009), spinner sharks (*Carcharhinus brevipinna*; Near Threatened) (Burgess 2009), dusky smooth hounds/smooth dogfish (*Mustelus canis;* Near Threatened) (Conrath 2009), scalloped hammerheads (*Sphyrna lewini*; Near Threatened) (Baum et al. 2009), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae;* Least concern) (Cortés 2009), bonnethead sharks (*Sphyrna tiburo;* Least concern) and tiger sharks (*Galeocerdo cuvier*; Near Threatened) (Ferreira and Simpfendorfer 2019)(Mathers et. al. 2016a)(Mathers et al. 2016b) (Mathers et al. 2017)(Mathers et al. 2018).

Small coastal sharks (spp. unknown) tend to be caught as bycatch in the North Carolina Spanish mackerel ocean fishery, which typically uses sink nets and run around/strike nets (with very short soak times 0.5 to 2 hours) (Randy Gregory, pers. comm., October 15, 2019).

The status of these shark species vary, but the scoring for abundance is based on the most vulnerable species, and some of these species are Threatened. Therefore, abundance is considered "high concern".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

High Concern

The strike/runaround/encircling net fishery is known to catch ETP shark species, such as blacktip (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), scalloped hammerheads (*Sphyrna lewini*; Near Threatened) (Baum et al. 2009), nurse sharks (*Ginglymostoma cirratum*; Data Deficient) (Rosa et al. 2006) and Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*; Least concern) (Cortés 2009) (Mathers et al. 2016)(Mathers et al. 2017)(Mathers et al. 2018).

Small coastal sharks (spp. unknown) tend to be caught as bycatch in the North Carolina Spanish mackerel ocean fishery, which typically uses sink nets and run around/strike nets (with very short soak times 0.5 to 2 hours) (Randy Gregory, pers. comm., October 15, 2019).

The status of these shark species vary, but the scoring for abundance is based on the most vulnerable species, and some of these species are Threatened. Therefore, abundance is considered "high concern".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

High Concern

The encircling net fishery targeting Spanish mackerel is known to catch ETP shark species, such as blacktip (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), pinner sharks (*Carcharhinus brevipinna*; Near Threatened) (Burgess 2009), smooth dogfish (*Mustelus canis;* Near Threatened) (Conrath 2009), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae;* Least concern) (Cortés 2009), bonnethead sharks (*Sphyrna tiburo;* Least concern) and blacknose shark (*Carcharhinus acronotus*; Near Threatened) (Morgan et al. 2009)(Mathers et. al. 2016a)(Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

The status of these shark species vary, but the scoring for abundance is based on the most vulnerable species, and some of these species are Threatened. Therefore, abundance is considered "high concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

For entangling gillnets, shark bycatch ranged from 1.62 to 29.57% of total catch, or from 85 to 163 sharks total, by number (Mathers et al. 2016a)(Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018). The effect of this level of fishing mortality on the populations is unknown; hence, fishing mortality is considered "moderate concern".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets

Moderate Concern

For encircling nets, shark bycatch ranged from 0.02% to 0.87% of total catch, or from 2 to 186 sharks total, by number (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018). The effect of this level of fishing mortality on the populations is unknown; hence, fishing mortality is considered "moderate concern".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Moderate Concern

For encircling nets, shark bycatch ranged from 0.02% to 0.87% of total catch, or from 2 to 186 sharks total, by number (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018). The effect of this level of fishing mortality on the populations is unknown; hence, fishing mortality is considered "moderate concern".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Moderate Concern

For encircling nets targeting Spanish mackerel, shark bycatch ranged from <0.01% to 0.5% of total catch, or from 1 to 116 sharks total, by number (Mathers et al. 2016b). The effect of this level of fishing mortality on the populations is unknown; hence, fishing mortality is considered "moderate concern".

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

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

BLUEFISH

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

High Concern

According to the 2018 bluefish (*Pomatomus saltatrix*) benchmark stock assessment, SSB_{2018} was estimated to be 201 million pounds, which is only 92% of the $SSB_{threshold}$ (219 million pounds) (ASFMC 2019c)(NMFS 2019c). However, based on the 2019 operational stock assessment and peer-review conducted by the Northeast Regional Stock Assessment Workshop (assessment not yet available) (ASMFC 2020), bluefish are overfished relative to the updated reference points, in all prior years dating back to 1985 (*ibid*). Therefore, bluefish biomass is considered "high concern".

Justification:

The updated stock assessment incorporated data through 2018 and included revised estimates of recreational catch and effort from the Marine Recreational Information Program (ASMFC 2020).

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

Low Concern

According to the 2018 bluefish benchmark stock assessment, fishing mortality was estimated to be 0.146, which is below the $F_{Threshold}$ ($F_{MSY\ PROXY}$= $F_{35\%}$ =0.183) (ASMFC 2019c)(NOAA 2019c). Therefore, bluefish are not undergoing overfishing and fishing mortality is considered "low concern".

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

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

The majority of bycatch in the North Carolina drift gillnet fishery is retained (Randy Gregory, pers. comm., October 15, 2019).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

< 100%

There are no fishery specific discard data available for cast net fisheries targeting Spanish and king mackerel. However, this gear is likely to have moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

SPOTTED TUNNY

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Moderate Concern

There is no formal stock assessment for spotted tunny, *Euthynnus alletteratus.* Therefore, a Productivity Susceptibility Analysis (PSA) was done. According to the PSA, spotted tunny have medium inherent vulnerability (PSA = 2.73; see detailed scoring below); and since the IUCN considers this species as "Least Concern" (Collette et al. 2011), abundance is scored as "moderate concern".

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ** = [(**1 ∗ **2 ∗ **3 ∗ **4) – 1/ 40] + 1 .*

*3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ** = √(P² + S)²*

Productivity Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**
Average age at maturity	1 year	1	(Orvis News 2014)
Average maximum age	10 years	2	(Froese and Pauly 2018)
Fecundity	71,000-2,200,000 eggs	1	(Froese and Pauly 2018)
Average maximum size	122 cm	2	(Froese and Pauly 2018)
Average size at maturity	10-15 cm	1	(Florida Museum 2017)
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2018)
Trophic level	-	-	-
Quality of habitat	SFW default	2	
Total productivity (average)	**1.428**		

Susceptibility Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**

Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default
Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default
Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Mathers et al. 2017)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.428^2 + 2.325)^2}$

V = $\sqrt{(1.428 + 2.325)^2}$

V = 2.73 (medium vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Moderate Concern

There is no formal stock assessment for spotted tunny; therefore, fishing mortality is unknown. As such, this factor is scored as "moderate concern".

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

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

< 100%

There are no fishery specific discard data available for troll fisheries targeting king mackerel. However, troll gear has exceedingly low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, troll fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

LADYFISH

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

Moderate Concern

There is no formal stock assessment for ladyfish, *Elops saurus*, and stock status is unknown. According to the Productivity Susceptibility Analysis, ladyfish have medium inherent vulnerability (PSA = 2.68; see detailed scoring below); and the IUCN considers this species to be a "Data Deficient" (Adams et al. 2012), In combination with an unknown stock status, abundance is scored as "moderate concern".

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ** = [(**1 ∗ **2 ∗ **3 ∗ **4) – 1/ 40] + 1 .*

*3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ** = √(P² + S)²*

Productivity Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**
Average age at maturity	2 years old	1	(Froese and Pauly 2018)
Average maximum age	6	1	(FWC 2010)
Fecundity	-	-	-
Average maximum size	100 cm	2	(Froese and Pauly 2018)
Average size at maturity	-		-
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2018)
Trophic level	2.12	1	(Akin and Winemiller 2008)
Quality of habitat	SFW default	2	
Total productivity (average)	**1.33**		

Susceptibility Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**
Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default

Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default
Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Enzenauer et a. 2015)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.33^2 + 2.325)^2}$

V = $\sqrt{(1.33 + 2.325)^2}$

V = 2.68 (medium vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

Moderate Concern

There is no formal stock assessment for ladyfish; therefore, fishing mortality is unknown. As such, this factor is scored as "moderate concern".

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

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

< 100%

There are no fishery specific discard data available for cast net fisheries targeting Spanish and king mackerel. However, this gear is likely to have moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

GREATER AMBERJACK

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

High Concern

According to the 2016 greater amberjack (*Seriola dumerili*) stock assessment, $SSB_{current}$ (2012)/$SSB_{SPR30\%}$ < 1.0, indicating that the stock is overfished (SEDAR 2016b), and therefore, a "high concern".

Justification:

According to the NMFS 2019 2nd quarter update, greater amberjack is overfished and in year 3 of a 3-year rebuilding plan (NMFS 2019b).

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Moderate Concern

The 2016 stock assessment determined that fishing mortality, $F_{current}$ (geometric mean of F_s over 2010-2012)/$F_{SPR30\%}$ = >1.0, indicating that the stock is undergoing overfishing (SEDAR 2016b). However, according to the NMFS 2019 2nd quarter update, greater amberjack is not undergoing overfishing (NMFS 2019b). Because the data supporting the 2nd quarter update is unclear, fishing mortality is considered "moderate concern".

Justification:

The NMFS FSSI status changed as a function of changing the beginning of the recreational fishing year to August 1 in 2018 (Lisa Hollensead (Gulf Council), pers. comm., January 10, 2020). This means that the 2018 quota was applied only in the Fall of 2018. The 2019 quota, applied to the entire 2018/19 fishing year, did not exceed ACL. Commercial landings in 2019 were 92.7% of ACL. Both sectors exceeded ACT, but not ACL. ACL = ABC = 75% OFL.

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

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

BARRACUDA SPP.

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Moderate Concern

There is no formal stock assessment for barracudas in Florida; therefore, stock status is unknown. According to the Productivity Susceptibility Analysis, barracuda have medium inherent vulnerability (PSA = 2.81; see detailed scoring below); and the IUCN considers most species to be a "Least Concern" (IUCN 2019). In combination with an unknown stock status, abundance is scored "moderate concern".

Justification:

In 2018, barracuda (species unknown) comprised 11.9% of the total catch in trolls (Steve Brown, pers. comm., December 19, 2019).

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ** = [(**1 * **2 * **3 * **4) – 1/ 40] + 1 .*

*3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ** = √(P² + S)²*

Productivity Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)
Average age at maturity	3-4 years old	1	(KWA 2020)
Average maximum age	14 years old	2	(KWA 2020)
Fecundity	15,000-900,000 eggs	1	(KWA 2020)
Average maximum size	200 cm	2	(KWA 2020)
Average size at maturity	66 cm	2	(Froese and Pauly 2018)
Reproductive strategy	Broadcast spawner	1	(KWA 2020)
Trophic level	-	-	-
Quality of habitat	Moderately altered by non-fishing impacts	2	SFW default
Total productivity (average)	**1.57**		

Susceptibility Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)
Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default
Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default

Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Steve Brown, pers. comm., December 19, 2019)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.57^2 + 2.325)^2}$

V = $\sqrt{(1.57 + 2.325)^2}$

V = 2.81 (medium vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Moderate Concern

Since fishing mortality is unknown, a score of "moderate concern" is given.

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

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

< 100%

There are no fishery specific discard data available for troll fisheries targeting king mackerel. However, troll gear has exceedingly low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, troll fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

SEA TURTLES

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

High Concern

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all likely to be adversely affected by the CMP fisheries, as they are highly migratory throughout the GOM and South Atlantic (NOAA 2015). Because these species are considered highly vulnerable (either Threatened or Endangered) according to the Endangered Species Act (USFWS 2020), abundance is scored as "high concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

Moderate Concern

Interactions between gillnet fisheries for king and Spanish mackerel are believed to be rare, and observed interactions have resulted in the live release of turtles caught in these fisheries (NOAA 2015). However, observer coverage in these fisheries is very low and typically occurs while observing other fisheries, which creates some uncertainty. The most recent Biological Opinion (BiOp) (NOAA 2015) for the Coastal Migratory Pelagic fisheries in the Atlantic found that the fisheries would not cause jeopardy to turtle species, but determined that adverse impacts were not discountable, therefore fishing mortality is scored a moderate concern.

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

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

The majority of bycatch in the North Carolina drift gillnet fishery is retained (Randy Gregory, pers. comm., October 15, 2019).

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

Fishery	Management Strategy	Bycatch Strategy	Research and Monitoring	Enforcement	Stakeholder Inclusion	Score
Fishery 1: United States of America/Gulf of Mexico | Cast nets	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 2: United States of America/Gulf of Mexico | Encircling gillnets	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 3: United States of America/Gulf of Mexico | Encircling gillnets | Spanish Mackerel	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 4: United States of America/Gulf of Mexico | Gillnets and entangling nets (unspecified)	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)

Fishery 5: United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 6: United States of America/Western Central Atlantic | Cast nets	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 7: United States of America/Western Central Atlantic | Drift gillnets	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 8: United States of America/Western Central Atlantic | Encircling gillnets	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 9: United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 10: United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Yellow (3.000)
Fishery 11: United States of America/Western Central Atlantic | Trolling lines	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Green (5.000)

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 manages 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.

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

Moderately Effective

King and Spanish mackerel in the Atlantic are managed by the South Atlantic Fishery Management Council (SAFMC; ASMFC manages Atlantic Spanish mackerel in state waters), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC). The SAFMC/GMFMC

management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a). The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 (nm) offshore from the seaward boundary of the states of North Carolina, South Carolina, Georgia, and east Florida to Key West (GMFMC 2016). In state waters, Atlantic Spanish mackerel are managed also by the Atlantic States Marine Fisheries Commission (ASMFC) (0-3 miles). The Mid-Atlantic Council is responsible for fishery resources in federal waters off New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina, but has delegated management of CMP species to the South Atlantic Council (*ibid*).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC). Each Council manages based on migratory group, not Council jurisdiction.

Spanish mackerel caught in federal waters must be a least 12” (30.5 cm) FL and must be caught with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

The most recent amendment related to king mackerel was CMP Framework Amendment 6 in 2018, which pertained to modifying the commercial trip limits in the Atlantic Southern Zone for Atlantic migratory group king mackerel. This framework amendment applies to the harvest of Atlantic king mackerel in the exclusive economic zone (EEZ) from the North Carolina/South Carolina line to the Miami- Dade/Monroe county line (Atlantic Southern Zone) (SAFMC 2018). Additionally, CMP Framework 8 (approved by the Council in December 2019 and currently undergoing NMFS review) proposes additional changes (Christina Wiegand, pers. comm., March 30, 2020). The most recent amendment related to Spanish mackerel was CMP Framework 5, which aims to eliminate permit restrictions unique to commercial king and Spanish mackerel permitted vessels. The need for this action is to standardize vessel permit restrictions applicable after a commercial quota closure, remove restrictions on recreational fishing, and reduce the potential for regulatory discards in the king mackerel and Spanish mackerel components of the CMP fisheries (GMFCM 2016).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two

separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized. When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if Total allowable catch limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019). King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals.

Retained species in this fishery other than king and Spanish mackerel are: bluefish, crevalle jack, ladyfish (in the GoM only), and striped mullet (Steve Brown, pers. comm., December 19, 2019). Of these retained species, there are no formal stock assessments for crevalle jack, or ladyfish. Bluefish (Wood 2016)(ASFMC 2020) and striped mullet (Chagaris et al. 2014) have been recently assessed; bluefish are currently overfished (NMFS 2019c)(ASFMC 2020), while striped mullet are not overfished or experiencing overfishing. Amendment 18 in 2011, removed certain bycatch species (bluefish (in the GoM)) from the CMP FMP because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*).

The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a), However, because bluefish are overfished, and other species are unassessed/have an unknown stock status, management of the cast net fisheries is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Moderately Effective

King and Spanish mackerel in the Atlantic are managed by the Atlantic States Marine Fisheries Commission (ASFMC; Spanish mackerel only) and South Atlantic Fishery Management Council (SAFMC), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC) under the Fishery Management Plan for the Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic Region. The FMP extends management area for Spanish mackerel through the Mid-Atlantic Fishery Management Council's jurisdiction (North Carolina to New York). The SAFMC/GMFMC management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a). The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 (nm) offshore from the seaward boundary of the states of North Carolina, South Carolina, Georgia, and east Florida to Key West (GMFMC 2016). The Mid-Atlantic Council is responsible for fishery resources in federal waters off New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina, but has delegated management of CMP species to the South Atlantic Council (*ibid*).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC).

Spanish mackerel landed in federal waters must be a least 12” (30.5 cm) FL and must be landed with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

The most recent amendment related to king mackerel was CMP Framework Amendment 6 in 2018, which

pertained to modifying the commercial trip limits in the Atlantic Southern Zone for Atlantic migratory group king mackerel. This framework amendment applies to the harvest of Atlantic king mackerel in the exclusive economic zone (EEZ) from the North Carolina/South Carolina line to the Miami- Dade/Monroe county line (Atlantic Southern Zone) (SAFMC 2018). The most recent amendment related to Spanish mackerel was CMP Framework 5, which aims to eliminate permit restrictions unique to commercial king and Spanish mackerel permitted vessels. The need for this action is to standardize vessel permit restrictions applicable after a commercial quota closure, remove restrictions on recreational fishing, and reduce the potential for regulatory discards in the king mackerel and Spanish mackerel components of the CMP fisheries (GMFCM 2016).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized. When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if total Allowable Catch Limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

Retained species in this fishery other than king and Spanish mackerel are: spotted tunny, ladyfish, bluefish, bluerunner jack, Atlantic bumper, and Atlantic sharpnose sharks (Mathers et al. 2016b)(Mathers et al. 2017) (Mathers et al. 2018). Of these retained species, there are no formal stock assessments for spotted tunny, ladyfish, bluerunner jack, or Atlantic bumper. Bluefish (Wood 2016) and Atlantic sharpnose sharks (SEDAR 2013c) have been recently assessed; bluefish are currently overfished (NMFS 2019c), while Atlantic sharpnose sharks are not overfished or experiencing overfishing. Amendment 18 in 2011, removed certain bycatch species (spotted tunny and bluefish (in the Gulf)) from the CMP FMP because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*).

The encircling gillnet fisheries have also been documented as occasionally catching and retaining: blacktip, *Carcharhinus limbatus;* Atlantic sharpnose, *Rhizoprionodon terraenovae*; spinner, *Carcharhinus brevipinna;* finetooth, *Carcharhinus isodon*; and bonnethead sharks, *Sphyrna tiburo* (Mathers et al. 2016a) (Mathers et al. 2016b).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the

Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed/managed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically. Some of these shark species have an unknown stock status (blacktip, bonnethead, and spinner sharks) (ASMFC 2018)(ASMFC 2019). Species that are managed, but are not of conservation concern are Atlantic sharpnose and finetooth sharks.

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019). King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals.

The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a). However, because bluefish are overfished, and most of the retained shark bycatch species are managed, but some have an unknown stock status, management of the entangling gillnet fisheries is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderately Effective

King and Spanish mackerel in the Atlantic are managed by the South Atlantic Fishery Management Council (SAFMC; Spanish mackerel only), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC). The SAFMC/GMFMC management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a). The Gulf Council is responsible for fishery resources in federal waters of the Gulf of Mexico. These waters extend to 200 nautical miles (370 km) offshore from the Gulf seaward boundary of Alabama, Florida, Louisiana, Mississippi, and Texas (GMFMC 2016). The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 (nm) offshore from the seaward boundary of the states of North Carolina, South Carolina, Georgia, and east Florida to Key West (GMFMC 2016). In state waters, Atlantic Spanish mackerel are managed also by the Atlantic States Marine Fisheries Commission (ASMFC; 0-3 miles). The Mid-Atlantic Council is responsible for fishery resources in federal waters off New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina, but has delegated management of CMP species to the South Atlantic Council (*ibid*).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory

group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC). Each Council manages based on migratory group, not Council jurisdiction.

Spanish mackerel caught in federal waters must be a least 12" (30.5 cm) FL and must be caught with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

The most recent amendment related to king mackerel was CMP Framework Amendment 6 in 2018, which pertained to modifying the commercial trip limits in the Atlantic Southern Zone for Atlantic migratory group king mackerel. This framework amendment applies to the harvest of Atlantic king mackerel in the exclusive economic zone (EEZ) from the North Carolina/South Carolina line to the Miami- Dade/Monroe county line (Atlantic Southern Zone) (SAFMC 2018). Additionally, CMP Framework 8 (approved by the Council in December 2019 and currently undergoing NMFS review) proposes additional changes (Christina Wiegand, pers. comm., March 30, 2020). The most recent amendment related to Spanish mackerel was CMP Framework 5, which aims to eliminate permit restrictions unique to commercial king and Spanish mackerel permitted vessels. The need for this action is to standardize vessel permit restrictions applicable after a commercial quota closure, remove restrictions on recreational fishing, and reduce the potential for regulatory discards in the king mackerel and Spanish mackerel components of the CMP fisheries (GMFCM 2016).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized. When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for

the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if Total allowable catch limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

The gillnet/entangling net fishery is known to catch and retain various finfish species. Amendment 18 in 2011, removed certain bycatch species (spotted tunny and bluefish) from the CMP FMP because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*). However, bluefish are currently overfished (NMFS 2019c).

The entangling gillnet fisheries have also been documented as occasionally catching and retaining: blacktip sharks, *Carcharhinus limbatus;* scalloped hammerheads, *Sphyrna lewini;* Atlantic sharpnose sharks, *Rhizoprionodon terraenovae*; blacknose sharks, *Carcharhinus acronotus*; finetooth sharks, *Carcharhinus isodon*; bonnethead sharks, *Sphyrna tiburo*; and spinner sharks, *Carcharhinus brevipinna* (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed/managed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically. Some of these shark species are of high conservation concern, such as scalloped hammerheads and blacknose sharks (both overfished and experiencing overfishing), or have an unknown stock status (blacktip, bonnethead, and spinner sharks) (*ibid*). Species that are managed, but are not of conservation concern are Atlantic sharpnose and finetooth sharks.

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019).

King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals. The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a). However, because bluefish are currently overfished, and most of the retained shark bycatch species are managed, but many are either of high conservation concern or have an unknown stock status, management of the entangling gillnet fisheries is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO

Handlines And Hand-Operated Pole-And-Lines

Moderately Effective

King and Spanish mackerel in the Atlantic are managed by the South Atlantic Fishery Management Council (SAFMC; ASMFC manages Atlantic Spanish mackerel in state waters), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC). The SAFMC/GMFMC

management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC). Each Council manages based on migratory group, not Council jurisdiction.

Spanish mackerel caught in federal waters must be a least 12" (30.5 cm) FL and must be caught with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized. When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached

in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if Total allowable catch limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

The Western Central Atlantic and Gulf of Mexico handline fisheries targeting king and Spanish mackerel incidentally capture greater amberjack (Enzenauer 2015). The majority of greater amberjack capture occurs with handlines or other small hook and line gear (NMFS 2019c); thus, the impacts of this fishery are potentially significant. The greater amberjack rebuilding plan is in year 3 of 3, but thus far has failed to appreciably increase stock biomass; this stock is currently overfished (but not experiencing overfishing) (SEDAR 2016). Other targeted species such as spotted tunny and bluefish were removed from the CMP FMP by Amendment 18 (in 2011) because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*). However, bluefish are currently overfished (NMFS 2019c).

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019). King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals.

The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a). However, because greater amberjack and bluefish are retained and currently overfished, management of the fishery is considered to be "moderately effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Moderately Effective

King and Spanish mackerel in the Atlantic are managed by the South Atlantic Fishery Management Council (SAFMC; ASMFC manages Atlantic Spanish mackerel in state waters), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC). The SAFMC/GMFMC management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a). The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 (nm) offshore from the seaward boundary of the states of North Carolina, South Carolina, Georgia, and east Florida to Key West (GMFMC 2016). The Mid-Atlantic Council is responsible for fishery resources in federal waters off New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina, but has delegated management of CMP species to the South Atlantic Council (*ibid*).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as

to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC). Each Council manages based on migratory group, not Council jurisdiction.

Spanish mackerel caught in federal waters must be a least 12" (30.5 cm) FL and must be caught with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

The most recent amendment related to king mackerel was CMP Framework Amendment 6 in 2018, which pertained to modifying the commercial trip limits in the Atlantic Southern Zone for Atlantic migratory group king mackerel. This framework amendment applies to the harvest of Atlantic king mackerel in the exclusive economic zone (EEZ) from the North Carolina/South Carolina line to the Miami- Dade/Monroe county line (Atlantic Southern Zone) (SAFMC 2018). Additionally, CMP Framework 8 (approved by the Council in December 2019 and currently undergoing NMFS review) proposes additional changes (Christina Wiegand, pers. comm., March 30, 2020).The most recent amendment related to Spanish mackerel was CMP Framework 5, which aims to eliminate permit restrictions unique to commercial king and Spanish mackerel permitted vessels. The need for this action is to standardize vessel permit restrictions applicable after a commercial quota closure, remove restrictions on recreational fishing, and reduce the potential for regulatory discards in the king mackerel and Spanish mackerel components of the CMP fisheries (GMFCM 2016).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized. When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends

from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if Total allowable catch limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

The Western Central Atlantic and Gulf of Mexico handline fisheries targeting king and Spanish mackerel capture and retain greater amberjack and spotted tunny. The majority of greater amberjack capture occurs with handlines or other small hook and line gear (NMFS 2019c); thus, the impacts of this fishery are potentially significant. The greater amberjack rebuilding plan is in year 3 of 3, but thus far has failed to appreciably increase stock biomass; this stock is currently overfished (but not experiencing overfishing) (SEDAR 2016). Some targeted species such as spotted tunny and bluefish were removed from the CMP FMP by Amendment 18 (in 2011) because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*). However, bluefish are currently overfished (NMFS 2019c). Other targeted finfish such as cobia are of low conservation concern, while blue runner and crevalle jack are unassessed.

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019). King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals.

The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a). However, because greater amberjack and bluefish are retained and currently overfished, management of the fishery is considered to be "moderately effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Highly Effective

King and Spanish mackerel in the Atlantic are managed by the South Atlantic Fishery Management Council (SAFMC), whereas in the Gulf of Mexico both species are managed by the Gulf of Mexico Fishery Management Council (GMFMC). The SAFMC/GMFMC management boundary is Highway 1 through the Florida Keys, with SAFMC managing king and Spanish mackerel off the east coast of the U.S., south to Highway 1 and GMFMC managing these species north of Highway 1 to the US-Mexico border (SEDAR 2012a). The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 (nm) offshore from the seaward boundary of the states of North Carolina, South Carolina, Georgia, and east Florida to Key West (GMFMC 2016). In state waters, Atlantic Spanish mackerel are managed also by the Atlantic States Marine Fisheries Commission (ASMFC; 0-3

miles). The Mid-Atlantic Council is responsible for fishery resources in federal waters off New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina, but has delegated management of CMP species to the South Atlantic Council (*ibid*).

Spanish mackerel in the southeast Atlantic/Gulf of Mexico region is managed as two separate fish stocks according to management council boundaries (SEDAR 2012a). However, there is some disagreement as to whether there are multiple distinct stocks (SEDAR 2012a). There appear to be no genetic differences between Atlantic and Gulf of Mexico stocks, although morphometric differences do exist (SEDAR 2008). It is unclear whether Atlantic and Gulf Spanish mackerel mix directly, or if the homogeneity between these populations is instead a result of genetic exchange during spawning (*ibid*). The Atlantic stock, or migratory group, (SAFMC) includes all fish caught south of U.S. Highway 1, through the Florida Keys, and northward along the east coast of Florida to Maine. Spanish mackerel caught north of U.S. Highway 1, along the west coast of Florida to Texas are considered to belong to the Gulf of Mexico stock/migratory group (GMFMC). Each Council manages based on migratory group, not Council jurisdiction.

Spanish mackerel caught in federal waters must be a least 12" (30.5 cm) FL and must be caught with heads and fins intact (SAFMC 2019a). It should be noted that Schmidt et al. (1993) found L_{50} = 36 cm for females, thus a significant portion of females caught in adherence with the federal size guideline may not yet have reached reproductive age. In the Atlantic, Spanish mackerel can be caught from March 1st until the end of February. In the Northern Zone, which extends from New York to the North Carolina/South Carolina state line, the trip limit is 3,500 pounds year-round. In the Southern Zone, which extends from the North Carolina/South Carolina state line to the Miami-Dade/Monroe Florida county line, the trip limit begins at 3,500 pounds. After 75% of the Southern Zone adjusted quota (total quota minus 250,000 lbs) is met or projected to be met, the trip limit is reduced to 1,500 pounds. When 100% of the Southern Zone adjusted quota is met or projected to be met, the trip limit is reduced to 500 pounds until the end of the fishing year, or until the Southern Zone total commercial quota is met or projected to be met, at which time the commercial sector in the Southern Zone would be closed to harvest of Spanish mackerel (NOAA 2019e). Purse seine and drift gillnet gear are prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana, Mississippi, and Alabama with highly variable fishing effort. In the Gulf of Mexico, only run-around gillnetting for these species is allowed (NOAA 2019d).

The most recent amendment related to king mackerel was CMP Framework Amendment 6 in 2018, which pertained to modifying the commercial trip limits in the Atlantic Southern Zone for Atlantic migratory group king mackerel. This framework amendment applies to the harvest of Atlantic king mackerel in the exclusive economic zone (EEZ) from the North Carolina/South Carolina line to the Miami- Dade/Monroe county line (Atlantic Southern Zone) (SAFMC 2018). Additionally, CMP Framework 8 (approved by the Council in December 2019 and currently undergoing NMFS review) proposes additional changes (Christina Wiegand, pers. comm., March 30, 2020). The most recent amendment related to Spanish mackerel was CMP Framework 5, which aims to eliminate permit restrictions unique to commercial king and Spanish mackerel permitted vessels. The need for this action is to standardize vessel permit restrictions applicable after a commercial quota closure, remove restrictions on recreational fishing, and reduce the potential for regulatory discards in the king mackerel and Spanish mackerel components of the CMP fisheries (GMFCM 2016).

King mackerel in the Atlantic and Gulf are currently considered to be a single stock, also comprised of two separate migratory units (Atlantic Migratory Group and Gulf Migratory Group; (SAFMC 2018). The king mackerel Atlantic Migratory Group ranges from New York, south to Florida and the Gulf Migratory Group ranges from Florida to Texas (*ibid*).

For king mackerel total allowable catch (TAC) limits have been designated for each migratory group, for each commercial and recreational operators, regardless of management jurisdiction. For both migratory groups the minimum king mackerel size is 24" (61cm) FL, with no more than 5% total catch, by weight, undersized.

When landed, fins and heads must be attached (SAFMC 2019a). The Atlantic Migratory Group fishery is open from March 1st until the end of February, or until the quota is reached, and is divided into Northern and Southern Zones (with a trip limit of 3,500 pounds year-round) (NOAA 2019e). The Gulf Migratory Group king mackerel season and quotas vary for each of the three Gulf of Mexico management zones (Western, Northern, and Southern). The Western Zone extends from the southern border of Texas to the Alabama/Florida state line. The fishing year is July 1 through June 30 with a trip limit of 3,000 pounds. The Northern Zone extends from the Alabama/Florida border to the Collier/Lee Florida county line. The fishing year is October 1 through September 30 with a trip limit of 1,250 pounds. The Southern Zone extends from the Collier/Lee county line to the Monroe/Dade county line. The Southern Zone is split into hook-and-line and gillnet components. The fishing year for the hook-and-line component is July 1 through June 30 with a trip limit of 1,250 pounds; for the gillnet component, its is the Tuesday after the Martin Luther King, Jr. holiday through June 30 with a trip limit of 45,000 pounds. While the fishing year ends June 30 for the gillnet fishery, the quota is usually reached in less than two weeks (ibid). Notably, drift gillnets are forbidden in the Atlantic, although are permitted to capture king mackerel during an abbreviated season in south Florida west coast subzone (SAFMC 2019). Commercial quotas are decreased the following year if Total allowable catch limit (ACL) is exceeded and stock is overfished (ASMFC 2018).

The Western Central Atlantic troll fishery targeting mixed species and coastal pelagics capture spotted tunny and Atlantic sharpnose shark (Enzenauer 2015). Retained species, such as spotted tunny, were removed from the CMP FMP by Amendment 18 (in 2011) because they were not in need of Federal management (Federal Register 2011). The species were originally included in the FMP "for data collection purposes", but data collection on any species is required of fishermen and dealers that hold Federal permits, regardless of the presence of that species in an FMP (*ibid*). Atlantic sharpnose sharks are occasionally kept; this species is managed under the Consolidated Highly Migratory Species Fishery Management Plan and is not considered overfished or undergoing overfishing (SEDAR 2013c).

The U.S. king and Spanish mackerel stocks are each assessed regularly by the Southeast Data, Assessment and Review (SEDAR) process. SEDAR is a joint effort by the Caribbean, SAFMC, GMFMC, NOAA and the Atlantic and Gulf States Marine Fishery Commissions. Additionally, the Mackerel Cobia Advisory Panel reviews fishery information for Atlantic migratory group Spanish and king mackerel and develops fishery performance reports. The purpose of these reports is to compliment the stock assessments by assembling information from members' experience and observations on the water, and in the marketplace (SAFMC 2019). King and Spanish mackerel are included in the Coastal Migratory Pelagic Fishery Management Plan (1983), which is amended regularly to adjust for changes in stock parameters, fishing effort and management goals.

The goals for king and Spanish mackerel management set forth in the FMP are appropriate to the species and ongoing monitoring suggests that these management guidelines are being implemented successfully (SEDAR 2012a). Therefore, the management this fishery is considered to be "highly effective".

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.

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

Highly Effective

The GoM and Southeast Atlantic cast net fishery is classified in the List of Fisheries as a Category III fishery, meaning that there is a remote likelihood of, or no known interactions with, marine mammals (NOAA 2019l).

Cast net gear is usually deployed directly on schools of mackerel, and traditionally has relatively low rates of bycatch and discards. The majority of finfish caught are retained (bluefish, crevalle jack, ladyfish, and striped mullet).

Because there is little to no bycatch, bycatch strategy is considered "highly effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets

Moderately Effective

The run-around/encircling gillnet fishery has been documented as occasionally catching blacktip sharks, *Carcharhinus limbatus;* scalloped hammerheads, *Sphyrna lewini;* nurse sharks, *Ginglymostoma cirratum;* and Atlantic sharpnose sharks, finetooth sharks, *Carcharhinus isodon;* and bonnethead sharks, *Sphyrna tiburo* (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically, including some of which are caught in this fishery: blacktip, scalloped hammerhead, Atlantic sharpnose, finetooth and bonnethead sharks.

Some of these shark species that are always discarded are of high conservation concern, such as scalloped hammerhead and blacknose sharks (both overfished and experiencing overfishing), sandbar sharks (overfished), or have an unknown stock status (nurse sharks) (*ibid*). Species such as blacktip and bonnethead sharks that are sometimes kept, sometimes discarded. are addressed in Criterion 3.1.

Many of these shark bycatch species are managed, but are either of high or unknown stock status. It is unclear whether there are management measures to protect sharks in the gillnet fisheries. As such, scoring is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Moderately Effective

The run-around/encircling gillnet fishery has been documented as occasionally catching blacktip sharks, *Carcharhinus limbatus;* Atlantic sharpnose sharks, finetooth sharks, *Carcharhinus isodon;* and bonnethead sharks, *Sphyrna tiburo* (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically, including some of which are caught in this fishery: blacktip, Atlantic sharpnose, finetooth and bonnethead sharks.

Some of these shark species that are always discarded are of high conservation concern, such as blacknose sharks (both overfished and experiencing overfishing). Species such as blacktip and bonnethead sharks that are sometimes kept, sometimes discarded. are addressed in Criterion 3.1.

Many of these shark bycatch species are managed, but are either of high or unknown stock status. It is unclear whether there are management measures to protect sharks in the gillnet fisheries. As such, scoring is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderately Effective

The entangling gillnet fishery has been documented as occasionally catching blacktip sharks, *Carcharhinus limbatus;* scalloped hammerheads, *Sphyrna lewini;* Atlantic sharpnose sharks, *Rhizoprionodon terraenovae*; finetooth sharks, *Carcharhinus isodon;* bonnethead sharks, Sphyrna tiburo, spinner sharks, *Carcharhinus brevipinna;* dusky sharks, *Carcharhinus obscurus*; sandbar sharks, *Carcharhinus plumbeus*; tiger sharks, *Galeocerdo cuvier*; and sand tiger sharks, *Carcharias taurus* (Mathers et al. 2016b) (Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically, including some of which are caught in this fishery: blacktip, tiger, spinner, nurse, scalloped hammerhead, Atlantic sharpnose, finetooth, bonnethead, sandbar, dusky, common thresher sharks (Teo et al. 2016)(Frazier et al. 2018}(ASMFC 2019).

Some of these shark species that are always discarded are of high conservation concern, such as dusky sharks (overfished and experiencing overfishing), sandbar sharks (overfished), or are part of the Aggregated Large Coastal shark group and have an unknown stock status (nurse, tiger, spinner, and blacktip sharks). Species such as spinner sharks that are sometimes kept, sometimes discarded. are addressed in Criterion 3.1.

Many of these shark bycatch species are managed, but are either of high or unknown stock status. It is unclear whether there are management measures to protect sharks in the gillnet fisheries. As such, scoring is considered to be "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Highly Effective

The Gulf and South Atlantic CMP handline fishery is classified in the List of Fisheries as a Category III fishery, meaning that there is a remote likelihood of, or no known interactions with, marine mammals (NOAA 2019l).

Handline gear has relatively low rates of bycatch and discards. The majority of finfish caught are retained (spotted tunny and greater amberjack), and some shark species that are bycaught and comprise more than 5% of the total catch (such as Atlantic sharpnose sharks; managed and not overfished or undergoing

overfishing) (ASMFC 2018) are discarded alive.

Because there is little to no bycatch, bycatch strategy is considered "highly effective".

Justification:

Handline gear (unpowered) hauls targeting coastal pelagic species in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West) were comprised of 85.8% teleosts and 14.2% sharks (Enzenauer 2015). Little tunny comprised 24.7% of the total catch, followed by 24.2% Greater amberjack, *Seriola dumerili.,* and king mackerel (17.4%). Atlantic sharpnose was the most common species of shark caught (81.5%; *ibid*).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

Moderately Effective

The Mid-Atlantic Gillnet Fishery is considered a Category I fishery, because it is known to have frequent interactions with marine mammals, while the Southeast Atlantic gillnet fishery and the North Carolina inshore gillnet fisheries are considered Category II fisheries, because they are known to occasionally interact with marine mammals (NOAA 2019d).

The gillnet/entangling net fisheries are known to interact with some marine mammals and ETP shark species, such as bottlenose dolphins (*Tursiops truncatus*; Least Concern) (Wells et al. 2019), blacktip sharks (*Carcharhinus limbatus*; Near Threatened) (Burgess and Branstetter 2009), sandbar sharks (*Carcharhinus plumbeus*; Vulnerable) (Musick et al. 2009), spinner sharks (*Carcharhinus brevipinna*; Near Threatened) (Burgess 2009), dusky smooth hounds/smooth dogfish (*Mustelus canis;* Near Threatened) (Conrath 2009), tiger sharks (Galeocerdo cuvier; Near Threatened) (Ferreira and Simpfendorfer 2019), common thresher sharks (*Alopias vulpinus*; Vulnerable) (Goldman et al. 2009), sand tiger sharks (*Carcharias taurus*; Vulnerable) (Pollard and Smith 2009), blacknose sharks (*Carcharhinus acronotus;* Near Threatened) (Morgan et al. 2009), and dusky sharks (*Carcharhinus obscurus*; Vulnerable) (Musick et al. 2009b) (Mathers et al. 2016a) (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

All three of these these fisheries are subject to Bottlenose Dolphin Take Reduction Plan (BDTRP) implementing regulations because of the potential for interactions with bottlenose dolphins, and the Mid-Atlantic and Southeast Atlantic gillnet fisheries also abide by the Atlantic Large Whale Take Reduction Plan (ALWTRP), which reduces the risk of serious injury and death of large whales caused by accidental entanglement in U.S. commercial trap/pot and gillnet fishing gear by restricting where and how gear can be set, including closures and gear modifications such as use of sinking groundline and weak links, trap minimums, and gear markings (NOAA 2019g). In addition, the Mid-Atlantic gillnet fishery is subject to the Harbor Porpoise Take Reduction Plan (HPTRP), which includes required pinger use, as well as time and area closures in which gillnet fishing is prohibited (NOAA 2019n).

Research and monitoring is ongoing to understand the effectiveness of proposed management measures and their effect on bycatch (GMFMC 2016). Due to the above, bycatch strategy in the gillnet/entangling net fishery is "moderately effective".

Justification:

King and Spanish mackerel fisheries in the Northwest Atlantic do not have a great deal of bycatch due to commercial fishing practices and quality degrading in warm water (80+º water in the summer when this

fishery occurs; Randy Gregory, pers. comm., October 15, 2019). In addition, drift gillnets have very short soak times.

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Moderately Effective

The Southeast Regional Office (SERO) and the SEFSC participate in a wide range of training and outreach activities to communicate bycatch related issues to various organizations, government entities, commercial interests and recreational groups, such as public announcements, Southeast Fishery Bulletins, or News Releases on different topics, including use of turtle exclusion devices, bycatch reduction devices, use of methods and devices to minimize harm to turtles and sawfish, information intended to reduce harm and interactions with marine mammals, and other methods to reduce bycatch for the convenience of constituents in the southern United States. This information is also included in newsletters and publications that are produced by NMFS and the various regional fishery management councils. Announcements and news releases are also available on the internet and broadcasted over NOAA weather radio (GMFMC 2016).

The Mid-Atlantic Gillnet Fishery is considered a Category I fishery, because it is known to have frequent interactions with marine mammals, while the Southeast Atlantic gillnet fishery and the North Carolina inshore gillnet fisheries are considered Category II fisheries, because they are known to occasionally interact with marine mammals (NOAA 2019d).

All three of these these fisheries are subject to Bottlenose Dolphin Take Reduction Plan (BDTRP) implementing regulations because of the potential for interactions with bottlenose dolphins, and the Mid-Atlantic and Southeast Atlantic gillnet fisheries also abide by the Atlantic Large Whale Take Reduction Plan (ALWTRP), which reduces the risk of serious injury and death of large whales caused by accidental entanglement in US commercial trap/pot and gillnet fishing gear by restricting where and how gear can be set, including closures and gear modifications such as use of sinking groundline and weak links, trap minimums, and gear markings (NOAA 2019g). In addition, the Mid-Atlantic gillnet fishery is subject to the Harbor Porpoise Take Reduction Plan (HPTRP), which includes required pinger use, as well as time and area closures in which gillnet fishing is prohibited (NOAA 2019n).

The run-around/encircling gillnet fishery has been documented as occasionally catching blacktip sharks, *Carcharhinus limbatus;* scalloped hammerheads, *Sphyrna lewini;* nurse sharks, *Ginglymostoma cirratum;* and Atlantic sharpnose sharks, finetooth sharks, *Carcharhinus isodon;* and bonnethead sharks, *Sphyrna tiburo* (Mathers et al. 2016b)(Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically, including some of which are caught in this fishery: blacktip, scalloped hammerhead, Atlantic sharpnose, finetooth and bonnethead sharks.

Some of these shark species that are always discarded are of high conservation concern, such as scalloped hammerhead and blacknose sharks (both overfished and experiencing overfishing), sandbar sharks (overfished), or have an unknown stock status (nurse sharks) (*ibid*). Species such as blacktip and bonnethead sharks that are sometimes kept, sometimes discarded are addressed in Criterion 3.1.

Research and monitoring is ongoing to understand the effectiveness of proposed management measures and their effect on bycatch (GMFMC 2016). Many of these shark bycatch species are managed, but are either of

high concern or unknown stock status. It is unclear whether there are management measures to protect sharks in the gillnet fisheries. As such, scoring is considered to be "moderately effective".

Justification:

The ALWTRP contains formal regulations with which Spanish mackerel gillnet fishmen must comply. There are five gillnet management zones within the management area of the CMP FMP (Mid-/Southeast Atlantic Gillnet Waters, Southeast Restricted Area North, Southeast Restricted Area South, Southeast US Monitoring Area, and the Other Southeast Gillnet Waters; see figure).

Mid-Atlantic

Mid/South Atlantic Gillnet Waters consists of all U.S. waters bounded on the north from 72°30' W. long. south to 36°33.03' N. lat., and east to the eastern edge of the EEZ, and bounded on the south by 32°00' N. lat, and east to the eastern edge of the EEZ. From September 1st to May 31st, fisherman with gillnets are subject to ALWTRP gear requirements, depending on whether the gear is anchored or drifting (NOAA 2018k).

Southeast Atlantic

From November 15th through April 15th, fishing with gillnets is prohibited in the Southeast U.S. Restricted Area North (includes waters north of 29°00' N. (near Ponce de Leon Inlet, FL) to 32°00' N. (near the GA/SC border) from the shoreline eastward to 80°00' W, and of South Carolina, within 35 nautical miles of the shoreline) (NOAA 2018j).

From December 1 through December 31 and from March 1 through March 31, the Southeast U.S. Restricted Area South (includes waters north of 27°51' N. (near Sebastian Inlet, FL) to 29°00' N. (near Ponce de Leon Inlet, FL) from the shoreline eastward to 80°00' W.)) is closed to fishing with or possessing gillnets. However, fishing with gillnet for Spanish mackerel is exempt from these closures if: 1) Gillnet mesh size is between 3-1/2 inches and 4-7/8 inches stretched mesh; 2) A valid commercial vessel permit for Spanish mackerel is issued to the vessel and is onboard; 3) No person may fish with, set, place in the water, or have on board a vessel a gillnet with a float line longer than 800 yards; 4) the gillnet is removed from the water before night or immediately if visibility decreases below 500 yards; 5) No net is set within 3 nm of a right, humpback, or fin whale; and 6) the gillnet is removed immediately from the water if a right, humpback, or fin whale moves within 3 nm of the set gear; 6) no net is set at night or when visibility is less than 500 yards (*ibid*).

Other Southeast Gillnet Waters (consisting of the area from 32º00' N. lat. (near Savannah, GA) south to 26º46.5' N. lat and extending from 80o00' W. long. east to the eastern edge of the EEZ) are subject to ALWTRP gear requirements (*ibid*).

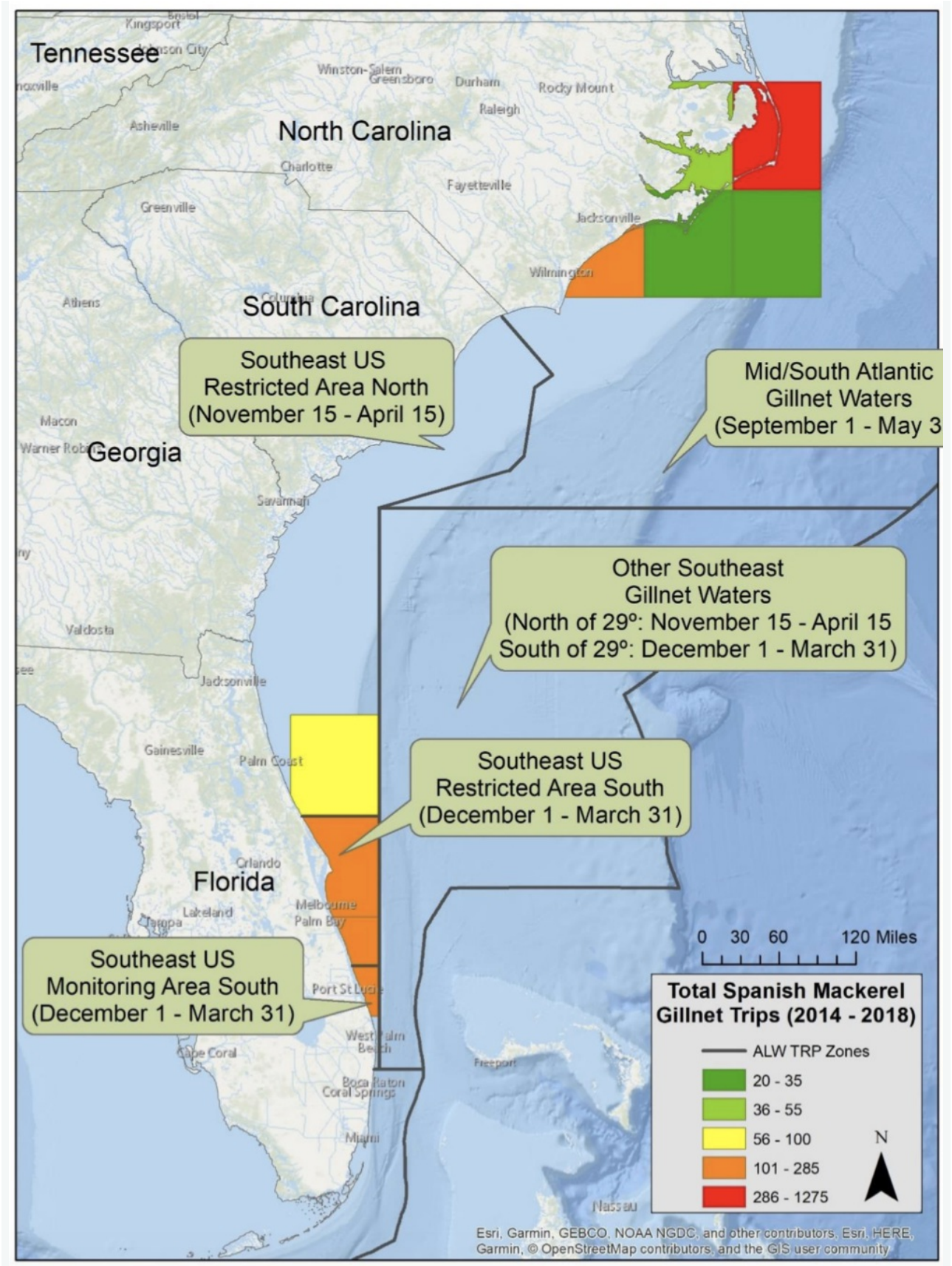

Figure 16 Map of the total number of commercial gillnet trips landing Spanish mackerel from 2014 to 2018 by Southeast Coastal Fisheries Trip Report Logbook top area grid and Atlantic Large Whale Take Reduction Plan gillnet management areas (Wiegand 2019). This figure only includes trips made by vessels holding a federal Spanish mackerel permit and does not account for vessels that only fish in state waters, and thus do not carry a federal Spanish mackerel permit on their vessel.

In a 2016 bycatch composition study, ETP sharks were found to make up approximately 1-30% of total catch composition in both Spanish and king mackerel sink gillnet fisheries (Mathers et al. 2017).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderately Effective

The Southeast Regional Office (SERO) and the SEFSC participate in a wide range of training and outreach activities to communicate bycatch related issues to various organizations, government entities, commercial interests and recreational groups, such as public announcements, Southeast Fishery Bulletins, or News Releases on different topics, including use of turtle exclusion devices, bycatch reduction devices, use of methods and devices to minimize harm to turtles and sawfish, information intended to reduce harm and interactions with marine mammals, and other methods to reduce bycatch for the convenience of constituents in the southern United States. This information is also included in newsletters and publications that are produced by NMFS and the various regional fishery management councils. Announcements and news releases are also available on the internet and broadcasted over NOAA weather radio (GMFMC 2016).

The Mid-Atlantic Gillnet Fishery is considered a Category I fishery, because it is known to have frequent interactions with marine mammals, while the Southeast Atlantic gillnet fishery and the North Carolina inshore gillnet fisheries are considered Category II fisheries, because they are known to occasionally interact with marine mammals (NOAA 2019d).

All three of these these fisheries are subject to Bottlenose Dolphin Take Reduction Plan (BDTRP) implementing regulations because of the potential for interactions with bottlenose dolphins, and the Mid-Atlantic and Southeast Atlantic gillnet fisheries also abide by the Atlantic Large Whale Take Reduction Plan (ALWTRP), which reduces the risk of serious injury and death of large whales caused by accidental entanglement in US commercial trap/pot and gillnet fishing gear by restricting where and how gear can be set, including closures and gear modifications such as use of sinking groundline and weak links, trap minimums, and gear markings (NOAA 2019g). In addition, the Mid-Atlantic gillnet fishery is subject to the Harbor Porpoise Take Reduction Plan (HPTRP), which includes required pinger use, as well as time and area closures in which gillnet fishing is prohibited (NOAA 2019n).

The entangling gillnet fishery has been documented as occasionally catching blacktip sharks, *Carcharhinus limbatus;* scalloped hammerheads, *Sphyrna lewini;* Atlantic sharpnose sharks, *Rhizoprionodon terraenovae*; finetooth sharks, *Carcharhinus isodon;* bonnethead sharks, Sphyrna tiburo, spinner sharks, *Carcharhinus brevipinna;* dusky sharks, *Carcharhinus obscurus*; sandbar sharks, *Carcharhinus plumbeus*; tiger sharks, *Galeocerdo cuvier*; and sand tiger sharks, *Carcharias taurus* (Mathers et al. 2016b) (Mathers et al. 2017)(Mathers et al. 2018).

The commercial shark fishery, both large coastal- and small coastal sharks, is generally concentrated in the Southeastern U.S. and Gulf of Mexico, and primarily caught with bottom longline, followed by gillnets (ASMFC 2019). Stock status is assessed by species complex or by species group for species without enough data for an individual assessment; 14 species have been assessed domestically, including some of which are caught in this fishery: blacktip, tiger, spinner, nurse, scalloped hammerhead, Atlantic sharpnose, finetooth, bonnethead, sandbar, dusky, common thresher sharks (Teo 2016)(ASMFC 2018}(ASMFC 2019).

Some of these shark species that are always discarded are of high conservation concern, such as dusky sharks (overfished and experiencing overfishing), sandbar sharks (overfished), or are part of the Aggregated Large Coastal shark group and have an unknown stock status (nurse, tiger, spinner, and

blacktip sharks). Species such as spinner sharks that are sometimes kept, sometimes discarded. are addressed in Criterion 3.1.

Many of these shark bycatch species are managed, but are either of high or unknown stock status. It is unclear whether there are management measures to protect sharks in the gillnet fisheries. As such, scoring is considered to be "moderately effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Highly Effective

Troll gear have relatively low rates of bycatch and low discard rates. Because there is little to no bycatch, bycatch strategy is considered "highly effective".

Justification:

Trolling hauls targeting mixed species in the Carolinas, Georgia/Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West) were comprised of 4% elasmobranchs, with Atlantic sharpnose sharks being the only species caught (66.7%), and all were released alive (Enzenauer et al. 2015).

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.

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Highly Effective

Gulf of Mexico king and Spanish mackerel are managed by GMFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a) (SEDAR 2013)) reflect contemporary stock information and scientific analysis of the Gulf of Mexico king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current Gulf of Mexico king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program (SEAMAP) Groundfish Trawl Survey-Gulf of Mexico, and the SEAMAP Fall Plankton Survey (king mackerel). SEAMAP surveys provides long-term data on abundance and biomass of those marine organisms collected by trawl sampling in the Gulf of Mexico (*ibid*).

For king mackerel, fishery-dependent data were ascertained from Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey and logbook records. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex . Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type (SEDAR 2014a)(SEDAR 2014b). For Gulf Spanish mackerel, fishery-dependent data were collected from the Texas Parks and Wildlife Department Sports-boat Angling Survey. These data include CPUE for coastal sport fishers in coastal Texas waters (SEDAR 2013).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

Due to the above, scientific research and monitoring are scored as "highly effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel

Moderately Effective

Gulf of Mexico king and Spanish mackerel are managed by GMFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a) (SEDAR 2013)) reflect contemporary stock information and scientific analysis of the Gulf of Mexico king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current Gulf of Mexico king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program (SEAMAP) Groundfish Trawl Survey-Gulf of Mexico, and the SEAMAP Fall Plankton Survey (king mackerel). SEAMAP surveys provides long-term data on abundance and biomass of those marine organisms collected by trawl sampling in the Gulf of Mexico (*ibid*).

For king mackerel, fishery-dependent data were ascertained from Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey and logbook records. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex . Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type (SEDAR 2014a)(SEDAR 2014b). For Gulf Spanish mackerel, fishery-dependent data were collected from the Texas Parks and Wildlife Department Sports-boat Angling Survey. These data include CPUE for coastal sport fishers in coastal Texas waters (SEDAR 2013).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic

basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

The Southeast Gillnet Observer Program covers all anchored (sink, stab, set), run-around/strike, or drift gillnet fisheries from North Carolina to Florida and in the Gulf of Mexico, year-round (NOAA 2019f). This program complies with the Marine Mammal Protection Act, the Endangered Species Act, and the 1999 revised Fishery Management Plan for Highly Migratory Species. In a 2016 study, a total of three run-around/strike gillnet vessels were observed on three trips, targeting king and Spanish mackerel in the Southeast U.S. region. Of those trips targeting just king mackerel, catch was almost entirely composed of king mackerel (99.51%) (Mathers et al. 2017).

However, because there are certain shark species caught that are of unknown stock status/unassessed, scientific research and monitoring are scored as "moderately effective".

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderately Effective

Gulf of Mexico king and Spanish mackerel are managed by GMFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a) (SEDAR 2013)) reflect contemporary stock information and scientific analysis of the Gulf of Mexico king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current Gulf of Mexico king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program (SEAMAP) Groundfish Trawl Survey-Gulf of Mexico, and the SEAMAP Fall Plankton Survey (king mackerel). SEAMAP surveys provides long-term data on abundance and biomass of those marine organisms collected by trawl sampling in the Gulf of Mexico (*ibid*).

For king mackerel, fishery-dependent data were ascertained from Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey and logbook records. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex . Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type (SEDAR 2014a)(SEDAR 2014b). For Gulf Spanish mackerel, fishery-dependent data were collected from the Texas Parks and Wildlife Department Sports-boat Angling Survey. These data include CPUE for coastal sport fishers in coastal Texas waters (SEDAR 2013).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

The Southeast Gillnet Observer Program covers all anchored (sink, stab, set), run-around/strike, or drift gillnet

fisheries from North Carolina to Florida and in the Gulf of Mexico, year-round (NOAA 2019f). In 2016, a total of 11 sink gillnet vessels were observed on 32 trips, targeting Spanish mackerel in the Southeast U.S. region. Of those trips targeting just Spanish mackerel, catch was comprised mostly of teleosts (98.441%), of which Spanish mackerel made up 63.55% (Mathers et al. 2017).

However, because there are certain shark species caught that are of unknown stock status/unassessed, scientific research and monitoring are scored as "moderately effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Highly Effective

South Atlantic king and Spanish mackerel are managed by ASFMC (Spanish only) and SAFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a)(SEDAR 2013)) reflect contemporary stock information and scientific analysis of the South Atlantic king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current South Atlantic king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program: South Atlantic (SEAMAP-SA) trawl. SEAMAP-SA provides long-term data on abundance and biomass of those marine organisms collected by high-rise trawl sampling in the South Atlantic Bight, between Cape Hatteras, NC and Cape Canaveral, FL (SEDAR 2012a)(SEDAR 2014a).

For king mackerel, fishery-dependent data were ascertained from the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey, logbook records, and the North Carolina Trip Index. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex. Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type. The North Carolina Trip Index contains data on inshore and offshore commercial fisheries including total catch composition, weight, fishing area and gear (SEDAR 2014a). For Spanish mackerel, fishery-dependent data were also collected from the MRFSS, as well as the Florida Trip Ticket program (for troll/handline fisheries). The Florida Trip Ticket Program includes catch data for South Atlantic gillnet, cast net, and hook and line fisheries (SEDAR 2012a).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

The Southeast Gillnet Observer Program covers all anchored (sink, stab, set), run-around/strike, or drift gillnet fisheries from North Carolina to Florida and in the Gulf of Mexico, year-round (NOAA 2019f). This program

complies with the Marine Mammal Protection Act, the Endangered Species Act, and the 1999 revised Fishery Management Plan for Highly Migratory Species. Spanish mackerel are among the species targeted with gillnet in North Carolina state waters. Observer coverage for gillnet is up to 10% and provided by the North Carolina Division of Marine Fisheries, primarily during the fall flounder fishery in Pamlico Sound (GMFMC 2016).

Due to the above, scientific research and monitoring are considered "highly effective".

Justification:

NMFS Southeast Fisheries Science Center (SEFSC) 1. monitors length and weight at age and size frequencies, fishing mortality, and migration; 2. collects age data and catch per unit effort by area, season, fishery, and gear; monitor shrimp trawl bycatch; 3. investigates methods to predict year class strength; and 4. calculates estimates of recruitment, and develop conservation gear to reduce bycatch. NMFS also collects discard data through a bycatch logbook in the mackerel and snapper-grouper fisheries. The Gulf and South Atlantic Fisheries Development Foundation and several states (North Carolina, South Carolina, Georgia, and Florida) have evaluated finfish bycatch in the southeastern shrimp trawl fishery, including bycatch of Spanish mackerel. SEAMAP collects Spanish mackerel data in its coastal trawl survey from Cape Hatteras to Cape Canaveral.

Abundance trends are monitored primarily through fishery-dependent sources. The states and the SEFSC monitor catch data through the cooperative commercial statistics collection program and the recreational fisheries survey. North Carolina also conducts fishery-independent monitoring. Three fishery independent gillnet surveys were carried out by the North Carolina Division of Marine Fisheries in May of 2001, 2003 and 2008, respectively; however, overall Spanish mackerel CPUE from these surveys was too low to give the precision and confidence needed for the data to be used for management purposes (ASMFC 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

Moderately Effective

South Atlantic king and Spanish mackerel are managed by ASFMC (Spanish only) and SAFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a)(SEDAR 2013)) reflect contemporary stock information and scientific analysis of the South Atlantic king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current South Atlantic king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program: South Atlantic (SEAMAP-SA) trawl. SEAMAP-SA provides long-term data on abundance and biomass of those marine organisms collected by high-rise trawl sampling in the South Atlantic Bight, between Cape Hatteras, NC and Cape Canaveral, FL (SEDAR 2012a)(SEDAR 2014a).

For king mackerel, fishery-dependent data were ascertained from the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey, logbook records, and the North Carolina Trip Index. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific

data on catch composition, size, weight, age and sex. Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type. The North Carolina Trip Index contains data on inshore and offshore commercial fisheries including total catch composition, weight, fishing area and gear (SEDAR 2014a). For Spanish mackerel, fishery-dependent data were also collected from the MRFSS, as well as the Florida Trip Ticket program (for troll/handline fisheries). The Florida Trip Ticket Program includes catch data for South Atlantic gillnet, cast net, and hook and line fisheries (SEDAR 2012a).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

The Southeast Gillnet Observer Program covers all anchored (sink, stab, set), run-around/strike, or drift gillnet fisheries from North Carolina to Florida and in the Gulf of Mexico, year-round (NOAA 2019f). This program complies with the Marine Mammal Protection Act, the Endangered Species Act, and the 1999 revised Fishery Management Plan for Highly Migratory Species. Spanish mackerel are among the species targeted with gillnet in North Carolina state waters. Observer coverage for gillnet is up to 10% and provided by the North Carolina Division of Marine Fisheries, primarily during the fall flounder fishery in Pamlico Sound (GMFMC 2016).

However, because there are certain shark species caught that are of unknown stock status/unassessed, scientific research and monitoring are scored as "moderately effective".

Justification:

NMFS Southeast Fisheries Science Center (SEFSC) 1. monitors length and weight at age and size frequencies, fishing mortality, and migration; 2. collects age data and catch per unit effort by area, season, fishery, and gear; monitor shrimp trawl bycatch; 3. investigates methods to predict year class strength; and 4. calculates estimates of recruitment, and develop conservation gear to reduce bycatch. NMFS also collects discard data through a bycatch logbook in the mackerel and snapper-grouper fisheries. The Gulf and South Atlantic Fisheries Development Foundation and several states (North Carolina, South Carolina, Georgia, and Florida) have evaluated finfish bycatch in the southeastern shrimp trawl fishery, including bycatch of Spanish mackerel. SEAMAP collects Spanish mackerel data in its coastal trawl survey from Cape Hatteras to Cape Canaveral.

Abundance trends are monitored primarily through fishery-dependent sources. The states and the SEFSC monitor catch data through the cooperative commercial statistics collection program and the recreational fisheries survey. North Carolina also conducts fishery-independent monitoring. Three fishery independent gillnet surveys were carried out by the North Carolina Division of Marine Fisheries in May of 2001, 2003 and 2008, respectively; however, overall Spanish mackerel CPUE from these surveys was too low to give the precision and confidence needed for the data to be used for management purposes (ASMFC 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderately Effective

South Atlantic king and Spanish mackerel are managed by ASFMC (Spanish only) and SAFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a)(SEDAR 2013)) reflect contemporary stock information and scientific analysis of the South Atlantic king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life

history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current South Atlantic king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program: South Atlantic (SEAMAP-SA) trawl. SEAMAP-SA provides long-term data on abundance and biomass of those marine organisms collected by high-rise trawl sampling in the South Atlantic Bight, between Cape Hatteras, NC and Cape Canaveral, FL (SEDAR 2012a)(SEDAR 2014a).

For king mackerel, fishery-dependent data were ascertained from the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey, logbook records, and the North Carolina Trip Index. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex. Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type. The North Carolina Trip Index contains data on inshore and offshore commercial fisheries including total catch composition, weight, fishing area and gear (SEDAR 2014a). For Spanish mackerel, fishery-dependent data were also collected from the MRFSS, as well as the Florida Trip Ticket program (for troll/handline fisheries). The Florida Trip Ticket Program includes catch data for South Atlantic gillnet, cast net, and hook and line fisheries (SEDAR 2012a).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

The Southeast Gillnet Observer Program covers all anchored (sink, stab, set), run-around/strike, or drift gillnet fisheries from North Carolina to Florida and in the Gulf of Mexico, year-round (NOAA 2019f). This program complies with the Marine Mammal Protection Act, the Endangered Species Act, and the 1999 revised Fishery Management Plan for Highly Migratory Species. Spanish mackerel are among the species targeted with gillnet in North Carolina state waters. Observer coverage for gillnet is up to 10% and provided by the North Carolina Division of Marine Fisheries, primarily during the fall flounder fishery in Pamlico Sound (GMFMC 2016).

However, because there are certain shark species caught that are of unknown stock status/unassessed, scientific research and monitoring are scored as "moderately effective".

Justification:

NMFS Southeast Fisheries Science Center (SEFSC) 1. monitors length and weight at age and size frequencies, fishing mortality, and migration; 2. collects age data and catch per unit effort by area, season, fishery, and gear; monitor shrimp trawl bycatch; 3. investigates methods to predict year class strength; and 4. calculates estimates of recruitment, and develop conservation gear to reduce bycatch. NMFS also collects discard data through a bycatch logbook in the mackerel and snapper-grouper fisheries. The Gulf and South Atlantic Fisheries Development Foundation and several states (North Carolina, South Carolina, Georgia, and Florida) have evaluated finfish bycatch in the southeastern shrimp trawl fishery, including bycatch of Spanish mackerel. SEAMAP collects Spanish mackerel data in its coastal trawl survey from Cape Hatteras to Cape Canaveral.

Abundance trends are monitored primarily through fishery-dependent sources. The states and the SEFSC monitor catch data through the cooperative commercial statistics collection program and the recreational

fisheries survey. North Carolina also conducts fishery-independent monitoring. Three fishery independent gillnet surveys were carried out by the North Carolina Division of Marine Fisheries in May of 2001, 2003 and 2008, respectively; however, overall Spanish mackerel CPUE from these surveys was too low to give the precision and confidence needed for the data to be used for management purposes (ASMFC 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Highly Effective

South Atlantic king and Spanish mackerel are managed by ASFMC (Spanish only) and SAFMC and are assessed by SEDAR. The most recent stock assessments (king mackerel: (SEDAR 2014a)(SEDAR 2014b), Spanish mackerel: (SEDAR 2012a)(SEDAR 2013)) reflect contemporary stock information and scientific analysis of the South Atlantic king and Spanish mackerel populations. The data collection phase of the SEDAR process includes: 1. Characterizing, defining and mapping stocks, 2. A review and discussion of life history information, 3. Providing measures of population abundance, including fishery-dependent and -independent information, 4. Assessing commercial and recreational catch data, 5. Determining most efficacious methods of assessing stock status and management benchmarks and 6. Making recommendations for future research directions. These data provide the underpinning for the stock assessment reports. Additionally, the final reports are subjected to review by three independent experts who assess whether the management recommendations are appropriate to the available data and current stock parameters.

The current South Atlantic king and Spanish mackerel assessment models are based on fishery-independent data from the Southeast Area Monitoring and Assessment Program: South Atlantic (SEAMAP-SA) trawl. SEAMAP-SA provides long-term data on abundance and biomass of those marine organisms collected by high-rise trawl sampling in the South Atlantic Bight, between Cape Hatteras, NC and Cape Canaveral, FL (SEDAR 2012a)(SEDAR 2014a).

For king mackerel, fishery-dependent data were ascertained from the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), the NMFS recreational headboat survey, logbook records, and the North Carolina Trip Index. The MRFSS collects catch data from public fishing access points, and collects species identification, morphometric data, and angler fishing behavior. The recreational headboat survey includes region-specific data on catch composition, size, weight, age and sex. Federal logbook data are collected from commercial fishers and include data on total catch (by weight), fishing area and gear type. The North Carolina Trip Index contains data on inshore and offshore commercial fisheries including total catch composition, weight, fishing area and gear (SEDAR 2014a). For Spanish mackerel, fishery-dependent data were also collected from the MRFSS, as well as the Florida Trip Ticket program (for troll/handline fisheries). The Florida Trip Ticket Program includes catch data for South Atlantic gillnet, cast net, and hook and line fisheries (SEDAR 2012a).

In addition to the SEDAR assessment process, each of the eight U.S. Fishery Management Councils have separate Scientific and Statistical Committees (SSC) which act to review the biological, social and economic basis for council management plans. This committee makes recommendations for management actions in accordance with plan objectives and national fishery management guidelines.

Due to the above, scientific research and monitoring are considered "highly effective".

Justification:

NMFS Southeast Fisheries Science Center (SEFSC) 1. monitors length and weight at age and size frequencies, fishing mortality, and migration; 2. collects age data and catch per unit effort by area, season, fishery, and

gear; monitor shrimp trawl bycatch; 3. investigates methods to predict year class strength; and 4. calculates estimates of recruitment, and develop conservation gear to reduce bycatch. NMFS also collects discard data through a bycatch logbook in the mackerel and snapper-grouper fisheries. The Gulf and South Atlantic Fisheries Development Foundation and several states (North Carolina, South Carolina, Georgia, and Florida) have evaluated finfish bycatch in the southeastern shrimp trawl fishery, including bycatch of Spanish mackerel. SEAMAP collects Spanish mackerel data in its coastal trawl survey from Cape Hatteras to Cape Canaveral.

Abundance trends are monitored primarily through fishery-dependent sources. The states and the SEFSC monitor catch data through the cooperative commercial statistics collection program and the recreational fisheries survey. North Carolina also conducts fishery-independent monitoring. Three fishery independent gillnet surveys were carried out by the North Carolina Division of Marine Fisheries in May of 2001, 2003 and 2008, respectively; however, overall Spanish mackerel CPUE from these surveys was too low to give the precision and confidence needed for the data to be used for management purposes (ASMFC 2018).

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.

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Highly Effective

The GMFMC has no law enforcement authority, and thus works closely with a number of state and federal agencies to ensure that fishers comply with fisheries regulations.The GMFMC's Law Enforcement Technical Committee that works in conjunction with the Gulf States Marine Fisheries Commission’s Law Enforcement Committee periodically convenes to make recommendations on enforcement strategies. This panel includes members of the law enforcement community from each of the five Gulf states, as well as representatives from the U.S. Fish and Wildlife Service, U.S. Coast Guard and NOAA (GMFMC 2019).

Commercial fishers in the Gulf are subject to both at-sea and dockside inspections, and must submit logbook reports, when requested. Due to the above, enforcement is considered to be "highly effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Highly Effective

The ASMFC and the SAFMC have no law enforcement authority and thus work closely with a number of state and federal law enforcement agencies to ensure that fishers comply with fisheries regulations, including state departments of wildlife and/or fisheries resources, the U.S. Coast Guard and NOAA (SAFMC 2019)(ASMFC 2019b). Joint Enforcement Agreements allow state marine resource law enforcement personnel to share jurisdictional authority with federal agencies, and has helped with funding for these partnerships. Additionally, SAFMC has a Law Enforcement Advisory Panel which convenes to makes recommendations on enforcement strategies (*ibid*).

In addition to at-sea inspections, commerical fishers in the Atlantic are subject to dockside inspections, and must submit logbook reports, when requested. Overall, enforcement is determined to be "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.

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Highly Effective

The SEDAR assessment process includes participants from state and federal agencies, non-governmental organizations, management council members, and fishery industry representatives at all workshop

activities. Scoping workshops, public hearings, virtual meetings, and online comment forms are held to collect input; public comments, in person or in writing, are considered by the Council before it takes final action on proposed rule changes. Public testimony is heard during each Council meeting. After the Council takes final acton, proposed rule changes are submitted to NMFS for further review and approval before implementation by the Secretary of Commerce (SEDAR 2019d)(GMFMC 2019).

According to SEDAR (SEDAR 2014b): "SEDAR emphasizes constituent and stateholder participation in assessment development, transparency in the assessment process and a rigorous and independent scientific review of completed stock assessments."

Due to the above, stakeholder inclusion is considered "highly effective".

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Highly Effective

Under ASMFC, Spanish mackerel are managed within the South Atlantic State/Federal Fisheries Management Board, with formal stakeholder input provided by the South Atlantic Advisory Panel. ASMFC also requires opportunity for public input on all management documents and opportunity for comment at all Board meetings.

The SEDAR assessment process includes participants from state and federal agencies, non-governmental organizations, management council members, and fishery industry representatives at all workshop activities. Scoping workshops, public hearings, virtual meetings, and online comment forms are held to collect input; public comments, in person or in writing, are considered by the Council before it takes final action on proposed rule changes. Public testimony is heard during each Council meeting. After the Council takes final acton, proposed rule changes are submitted to NMFS for further review and approval before implementation by the Secretary of Commerce (SEDAR 2019d)(GMFMC 2019).

According to SEDAR (SEDAR 2014b): "SEDAR emphasizes constituent and stateholder participation in assessment development, transparency in the assessment process and a rigorous and independent scientific review of completed stock assessments."

Due to the above, stakeholder inclusion is considered "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*

GUIDING PRINCIPLES

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

Region | Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Score
United States of America/Gulf of Mexico | Cast nets	5	0	Moderate Concern	Green (3.873)
United States of America/Gulf of Mexico | Encircling gillnets	5	0	Moderate Concern	Green (3.873)
United States of America/Gulf of Mexico | Encircling gillnets Spanish Mackerel	5	0	Moderate Concern	Green (3.873)
United States of America/Gulf of Mexico | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	Green (3.873)
United States of America/Gulf of Mexico | Gillnets and entangling nets (unspecified)	2	0	Moderate Concern	Yellow (2.449)
United States of America/Western Central Atlantic | Drift gillnets	5	0	Moderate Concern	Green (3.873)
United States of America/Western Central Atlantic | Encircling gillnets	5	0	Moderate Concern	Green (3.873)

United States of America/Western Central Atlantic | Cast nets	5	0	Moderate Concern	Green (3.873)
United States of America/Western Central Atlantic | Trolling lines	5	0	Moderate Concern	Green (3.873)
United States of America/Western Central Atlantic | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	Green (3.873)
United States of America/Western Central Atlantic | Gillnets and entangling nets (unspecified)	2	0	Moderate Concern	Yellow (2.449)

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

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

5

Cast net gears do not contact the sea floor; hence, SFW scores this factor as 5/5.

UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

5

Encircling gillnet gear (unanchored) used to fish for Spanish and King mackerel do not contact the seafloor (GMFMC 2016). Though there is the potential for these gear types to snag and entangle bottom structures and cause tear-offs or abrasions, this is uncommon in the mackerel fisheries because they tend to occur near the

surface. As such, SFW scores this factor 5/5.

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

2

Gillnet/entangling net fishing for mackerel occurs over both sandy and reef habitats (SAFMC 2018). These sink gillnets may or may not be anchored depending on the state using them. Based on the SFW criteria, this factor receives a score of 2/5.

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

5

Handline gillnet gear used to fish for Spanish and King mackerel do not contact the seafloor (GMFMC 2016). Though there is the potential for these gear types to negatively impact rocky bottom and reef habitats, this is uncommon in the mackerel fisheries because they tend to occur near the surface. As such, SFW scores this factor 5/5.

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets

5

Drift gillnets do not contact the sea floor; hence, SFW scores this factor 5/5.

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

2

Gillnet/entangling net fishing for mackerel occurs over both sandy and reef habitats (SAFMC 2018). These sink gillnets may or may not be anchored depending on the state using them. Based on the SFW criteria, this factor receives a score of 2/5.

Justification:

Sink gillnets used in the North Carolina fisheries are not anchored and therefore do not usually contact the sea floor (Randy Gregory, pers. comm., October 28, 2019).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

5

Trolling is defined as fishing with lines trailing behind a vessel which is in constant motion at speeds in excess of four knots with a visible wake. Such trolling may not involve the use of down riggers, wire lines, planers, or similar devices (GMFMC 2019). Hence, trolling gears do not contact the sea floor. As a resut, SFW scores this

factor as 5/5.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

0

Since this gear does not contact the sea floor, no mitigation is necessary.

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

0

In the U.S. South Atlantic region Marine Protected Areas (MPAs) are closed to still fishing (fishing with the line and bait resting still or stationary in the water; can be done from a boat, a dock, a jetty or from shore) (SAFMC 2019b). Gillnets are only permitted in the Gulf southern zone (see figure), which includes federal waters off Collier and Monroe Counties, Florida. The gillnet fishery for Gulf group king mackerel in or from the Gulf EEZ is closed each year from July 1 until 6:00 a.m. on the day after the Martin Luther King Jr. federal holiday, as well as during all subsequent weekends and observed federal holidays (except for the first weekend following the Martin Luther King Jr. holiday) (GMFMC 2019). Within the Gulf Southern zone, there are two marine sanctuaries which are closed to all fishing activity; Pulley Ridge HAPC and the Florida Keys National Marine Sanctuary (GMFMC 2019).

Because only a small proportion of these habitats are closed to gillnet fishing (less than 20%) no mitigation credit is awarded.

Justification:

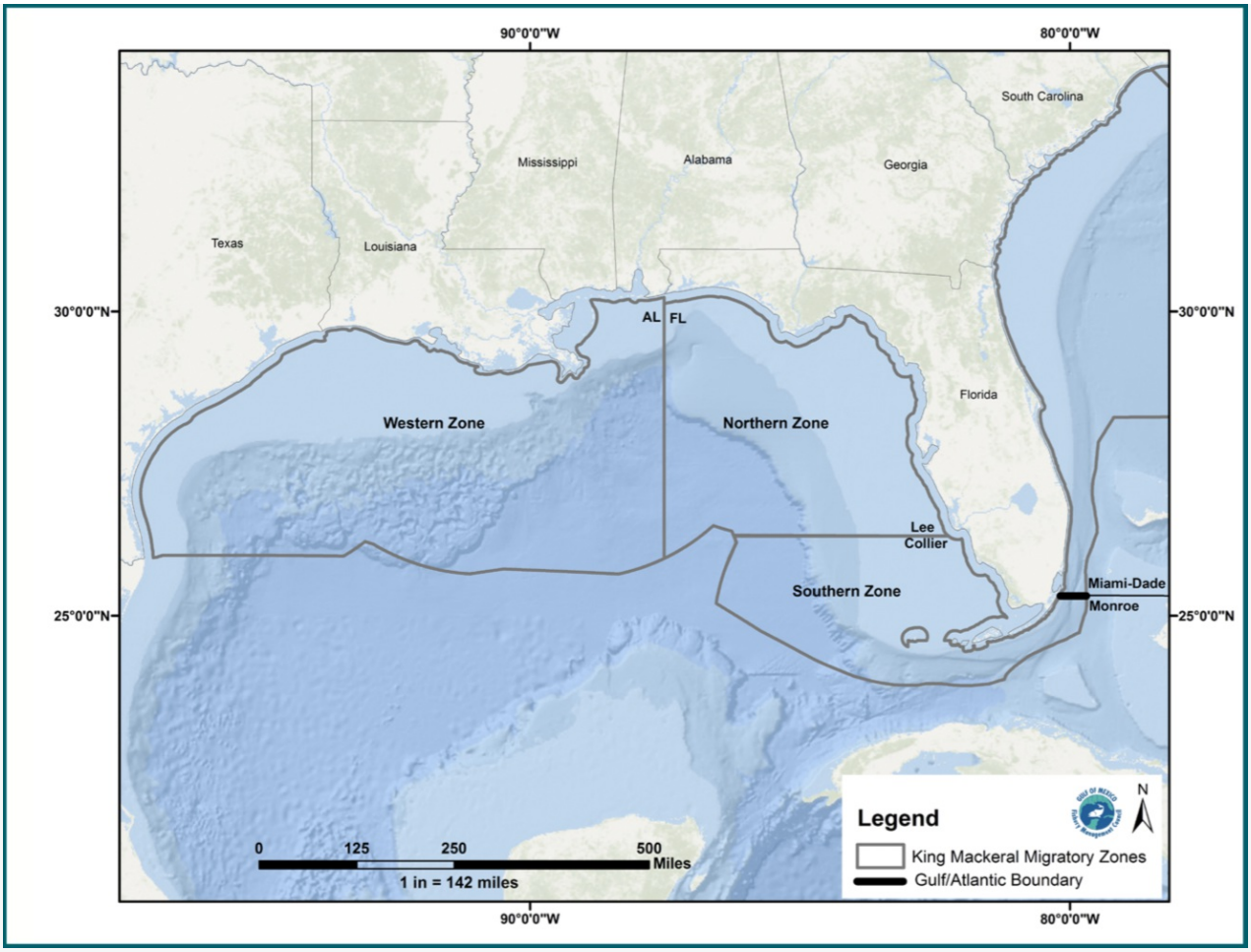

Figure 17 King mackerel migratory zones (GMFMC 2019).

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

0

Because handlines do not generally touch the sea floor, no gear mitigation required.

Justification:

Damage to marine environments caused by handline gear is minimal. Accordingly, there are few areas closed to handline gears.

In the U.S. South Atlantic region, Marine Protected Areas (MPAs) are closed to still fishing, but handline gear targeting pelagic species, such as mackerel, tuna, dolphin, and billfish, can be trolled within the MPAs (SAFMC 2019b).

While most marine sanctuaries in the Gulf of Mexico are closed to all fishing activity, there are some protected areas that do allow conventional hook and line gears (i.e., Garden Flower Banks National Marine Sanctuary), or trolled lines targeting non-reef fish species (i.e., Madison-Swanson Reserve, Steamboat Lumps Reserve, May 1-Oct 31) (FGB NMS 2018)(GMFMC 2019).

Factor 4.3 - Ecosystem-Based Fisheries Management

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets
UNITED STATES OF AMERICA / GULF OF MEXICO
Encircling Gillnets | Spanish Mackerel
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Moderate Concern

NOAA has started the process of developing and implementing Ecosystem-Based Fisheries Management (EBFM). It is anticipated that the process of moving from the current management system to EBFM will take a minimum of 5 years. Separate EBFM Road Map Implementation Plans exist for the U.S. South Atlantic Region, but these plans will be coordinated moving forward. NOAA's 2019 Gulf of Mexico EBFM Implementation Plan identifies and outlines the following principles: 1. Implement ecosystem-level planning; 2. Advance our understanding of ecosystem processes; 3. Prioritize vulnerabilities and risks of ecosystems; 4. Explore and address trade-offs within an ecosystem; 5. Incorporate ecosystem considerations into management advice; 6. Maintain resilient ecosystems (NOAA 2019i).

The GOM EBFM plan specifically documents the efforts that the SEFSC, Southeast Regional Office (SERO), and other regional partners have completed to date, guides the organization of ecosystem science within the Southeast region; clarifies regional priorities in order to facilitate collaboration, and assists the GoM Fishery Management Council with ecosystem-level planning.

The Gulf Council has not yet developed a Fishery Ecosystem Plan (FEP) or other formal policy document stating EBFM objectives; however, many activities within the portfolio of Gulf research and policy already contain elements of EBFM, such as advancing stock assessments, tracking ecosystem trends, climate change, multi-species interactions, connectivity, habitat conservation, and human dimensions (*ibid*).

Because EBFM is underway, but has not been fully implemented, this factor is scored as "moderately effective."

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Drift Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Moderate Concern

NOAA has started the process of developing and implementing Ecosystem-Based Fisheries Management (EBFM). It is anticipated that the process of moving from the current management system to EBFM will take a minimum of 5 years. Separate EBFM Road Map Implementation Plans exist for the U.S. South Atlantic and Northeast Regions (which include North Carolina above and below Cape Hatteras), but these plans will be coordinated moving forward. NOAA's 2019 South Atlantic and Northeast EBFM Implementation Plans identify and outline the following principles: 1. Implement ecosystem-level planning; 2. Advance our understanding of ecosystem processes; 3. Prioritize vulnerabilities and risks of ecosystems; 4. Explore and address trade-offs within an ecosystem; 5. Incorporate ecosystem considerations into management advice; 6. Maintain resilient ecosystems (NOAA 2019j). The Southeast Regional Office (SERO) and the SEFSC are working, internally and with partners, to move EBFM forward in the southeastern US Atlantic region. The Greater Atlantic Regional Fisheries Office (GARFO) and the Northeast Fisheries Science Center (NEFSC) and partners are doing the same in the Northeast region.

The South Atlantic Fishery Management Council developed a Fishery Ecosystem Plan (FEP), established from the Council's Habitat Protection and Ecosystem-Based Management Advisory Panel (which meets a few times/year), in cooperation with NOAA Fisheries and experts from state, Federal, NGOs, academia and other regional organizations and associations (SAFMC 2019d). The FEP is a mechanism to incorporate ecosystem principles, goals, and policies into the fishery management process and is developed to provide the Council with a clear description and understanding of the fundamental physical, biological, and human/institutional context of ecosystems within which fisheries are managed. The FEP also highlights needed information and how that information should be used in the context of FMPs (*ibid*). Council policies developed through the process support data collection, model and supporting tool development and implementation of the FEP, which will provide a metric for determining the incorporation of ecosystem considerations into the management process (*ibid*).

The FEP also addresses key new issue areas including: 1. highlighting an understanding of the complexity and connectivity of South Atlantic food webs and the implications of climate variability and fisheries as the basis for further policy development; 2. consideration in habitat and fish stock assessment and future management of fisheries and habitat supporting a more comprehensive view of conservation and management in the South Atlantic, and the ability to identify long-term information needs available models; and 3. tools and capabilities that will advance the move to EBFM in the region (*ibid*).

In the Northeast, the Mid-Atlantic Council has adopted an incremental approach via its Ecosystem Approach to Fisheries Management (EAFM) guidance document, which sets policy with how the Mid-Atlantic Council approaches forage fish, climate, habitat, and species interactions (MAFMC 2019). The New England Council, on the other hand, is exploring the possibility of a wholesale change in its management structure, and if pursued, will require more time to develop and adopt its EBFM policies (NOAA 2019j).

Because EBFM is underway, but has not been fully implemented, this factor is scored as "moderately effective."

Acknowledgements

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

Seafood Watch would like to thank the consulting researcher and author of this report, Rachel Simon, as well as several anonymous reviewers for graciously reviewing this report for scientific accuracy.

References

Adams, A., Guindon, K., Horodysky, A., MacDonald, T., McBride, R., Shenker, J. & Ward, R. 2012. Elops affinis . The IUCN Red List of Threatened Species 2012: e.T184047A1745464. Available at: http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T184047A1745464.en. Downloaded on 12 December 2019.

Akin, S., K.O. Winemiller. 2008. Body size and trophic position in a temperate estuarine food web. Acta oecologica 33, 144–153. Available at: https://aquaticecology.tamu.edu/files/2012/07/AkinWActaOecol2008.pdf.

Aquamaps. 2019a. Computer Generated Native Distribution Map for Scomberomorus cavalla (King mackerel), with modelled year 2100 native range map based on IPCC A2 emissions scenario. Available at: https://www.aquamaps.org/receive.php?type_of_map=regular.

Aquamaps. 2019b. Computer Generated Native Distribution Map for Scomberomorus maculatus (Atlantic Spanish mackerel), with modelled year 2100 native range map based on IPCC A2 emissions scenario. Available at: https://www.aquamaps.org/receive.php?type_of_map=regular.

ASFMC. 2019c. Coastal Sharks. Available at: http://www.asmfc.org/species/coastal-sharks.

ASMFC. 2013. Addendum I To The Omnibus Amendment To The Interstate Fishery Management Plans For Spanish Mackerel, Spot, And Spotted Seatrout: Spanish Mackerel Commercial Management Measures for 2013 and 2014. August 2013. Available at: http://www.asmfc.org/uploads/file/SpMackerelAddendumI_Aug2013.pdf.

ASMFC. 2017. 2017 Atlantic Menhaden Stock Assessment Update. Available at: http://www.asmfc.org/uploads/file/59832ee0MenhadenStockAssessmentUpdate_Aug2017.pdf.

ASFMC. 2018. 2018 Review of the Atlantic States Marine Fisheries Commission Fishery Management Plan for Spanish Mackerel (Scomberomorus maculatus): 2017 Fishing Year. Available at: http://www.asmfc.org/uploads/file/5c01a4f9spanishmackerelFMPreview2018.pdf.

ASMFC. 2019a. Spanish Mackerel. Available at: http://www.asmfc.org/species/spanish-mackerel.

ASMFC. 2019b. The Law Enforcement Committee. Available at: http://www.asmfc.org/law-enforcement/the-law-enforcement-committee.

ASMFC. 2019c. Bluefish. Available at: http://www.asmfc.org/species/bluefish.

ASMFC. 2020. Bluefish. Available at: http://www.asmfc.org/species/bluefish.

Baum, J., S. Clarke, A. Domingo, M. Ducrocq, A.F. Lamónaca, N. Gaibor, R. Graham, S. Jorgensen, J.E. Kotas, E. Medina, J. Martinez-Ortiz, J. Monzini Taccone di Sitizano, M.R. Morales, S.S. Navarro, J.C. Pérez-Jiménez, C. Ruiz, W. Smith, S.V. Valenti, C.M. Vooren. 2009. Sphyrna lewini. The IUCN Red List of Threatened Species 2009: e.T39385A10190088. http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T39385A10190088.en. Downloaded on 14 October 2019.

Bowen, D. 2016. Halichoerus grypus. The IUCN Red List of Threatened Species 2016: e.T9660A45226042. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T9660A45226042.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/details/9660/0.

Burgess, G.H. 2009. Carcharhinus brevipinna. The IUCN Red List of Threatened Species 2009: e.T39368A10182758. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39368A10182758.en. Downloaded on

19 September 2019.

Burgess, H. G., S. Branstetter. 2009. Carcharhinus limbatus. The IUCN Red List of Threatened Species 2009: e.T3851A10124862. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T3851A10124862.en. Downloaded on 19 September 2019.

Cass-Calay, S.L., Porch, C.E., Goethel, D.R., Smith, M.W., Matter, V., McCarthy, K.J. 2015. Stock assessment of red snapper in the Gulf of Mexico 1872 - 2013 with provisional 2014 landings, SEDAR. Available at: http://sedarweb.org/docs/suar/SEDARUpdateRedSnapper2014_FINAL_9.15.2015.pdf.

Chagaris, D., D. Addis, B. Mahmoudi. 2014. The 2014 stock assessment update for striped mullet, Mugil cephalus, in Florida. Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL. 76 pp.

Collette, B., Amorim, A.F., Boustany, A., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Fox, W., Fredou, F.L., Graves, J., Viera Hazin, F.H., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Nelson, R., Oxenford, H., Teixeira Lessa, R.P. & Pires Ferreira Travassos, P.E. 2011. Euthynnus alletteratus. The IUCN Red List of Threatened Species 2011: e.T170345A6759394. Available at: http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T170345A6759394.en. Downloaded on 31 July 2019.

Conrath, C. 2009. Mustelus canis. The IUCN Red List of Threatened Species 2009: e.T39359A10215463. http://dx.doi.org/10.2305/IUCN.UK.2005.RLTS.T39359A10215463.en. Downloaded on 19 September 2019.

Cortés, E. 2009. Rhizoprionodon terraenovae. The IUCN Red List of Threatened Species 2009: e.T39382A10225086. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39382A10225086.en. Downloaded on 15 October 2019.

Cortés, E., Lowry, D., Bethea, D. & Lowe, C.G 2016. Sphyrna tiburo. The IUCN Red List of Threatened Species 2016: e.T39387A2921446. http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T39387A2921446.en. Downloaded on 15 October 2019.

De Queiroz, J.D.G.R., N. L.A. Salvador, M.F. Sousa, V.E.L. Da Silva, N.N. Fabré V.S. Batista. 2018. Life-history traits of Chloroscombrus chrysurus (Actinopterygii: Perciformes: Carangidae) in tropical waters of the Atlantic Ocean. Acta Ichthyologica Et Piscatoria 48:1, 1-8. Available at: https://www.researchgate.net/publication/324240026_Life-history_traits_of_Chloroscombrus_chrysurus_Actinopterygii_Perciformes_Carangidae_in_tropical_waters_of_the_

DeVries, D. A., and C. B. Grimes. 1997. Spatial and temporal variation in age and growth of king mackerel, Scomberomorus cavalla, 1977-1992. Fishery Bulletin 95, 694-708.

DeVries, D. A., C. B. Grimes, and M. H. Prager. 2002. Using otolith shape analysis to distinguish eastern Gulf of Mexico and Atlantic Ocean stocks of king mackerel. Fisheries Research 57, 51-62.

Enzenauer, M.P., S.J.B., Gulak, B.M. Deacy, J.K. Carlson. 2015. Characterization of the Southeastern U.S. Atlantic Mid-Shelf and Deepwater Reef Fish Fisheries.

FAO. 2019b. Scomberomorus cavalla (Cuvier, 1829). Available at: http://www.fao.org/fishery/species/2483/en.

FAO. 2019a. Fishing Gear Type. Available at: http://www.fao.org/fishery/geartype/search/en.

Federal Register. 2011. Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region; Amendment 18. Vol. 76, No. 250, 50 CFR Part 622.

December 29, 2011. Available at: https://safmc.net/wp-content/uploads/2016/06/CMP_18_Final_Rule-2.pdf.

Ferreira, L.C. & Simpfendorfer, C. 2019. Galeocerdo cuvier. The IUCN Red List of Threatened Species 2019: e.T39378A2913541. http://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39378A2913541.en. Downloaded on 19 September 2019.

FGB NMS. 2018. Flower Garden Banks National Marine Sanctuary. Available at: https://flowergarden.noaa.gov/about/faq.html.

Finucane, J. H., L. A. Collins, H. A. Brusher, and C. H. Saloman. 1986. Reproductive biology of king mackerel, Scombermorus cavalla, from the southeastern United States. Fishery Bulletin 84, 841-850.

FishWatch. 2016. Vermilion Snapper. Available at: http://www.fishwatch.gov/profiles/vermilion-96 snapper.

Florida Museum. 2017. Discover Fishes: Euthynnus alletteratus. Available at: https://www.floridamuseum.ufl.edu/discover-fish/species-profiles/euthynnus-alletteratus/.

Frazier B., T. Moore, K. Rootes-Murdy. 2017. Review of the Atlantic States Marine Fishery Commission Fishery Management Plan for Coastal Sharks: 2015 and 2016 FISHING YEAR. Available at: http://www.asmfc.org/uploads/file/5af33f78CoastalSharksFMPReview__2017.pdf.

Froese, R., D. Pauly. Editors. 2017. FishBase. World Wide Web electronic publication. Available at: http://fishbase.tw/Summary/SpeciesSummary.php?ID=71&AT=crevalle+jack.

Florida Fish and Wildlife Conservation Commission. (FWC). 2010. Ladyfish, Elops saurus Linnaeus, 1766. Available at: https://gcrl.usm.edu/public/fish/docs/ladyfish.profile.florida.fish.wildlife.cons.comm.pdf.

FWC. 2018. Crevalle Jack, Caranx hippos (Linnaeus, 1766). Available at: https://myfwc.com/media/19228/crevalle-jack-18.pdf.

GMFCM. 2013. Standing and Special Mackerel SSC Meeting Summary. GMFMC. 6pp.

GMFMC. 2011. Regulatory amendment to the Reef fish Management plan to set 2011 total allowable catch for red snapper, Tampa, Florida 33607. Available at: http://www.gulfcouncil.org/docs/amendments/Red Snapper 2011 Regulatory Amendment - 1-%0A11.pdf.

GMFMC. 2016. Modifications to Commercial Permit Restrictions for King and Spanish Mackerel: Final Framework Amendment 5 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region. 89 Pp. December 2.

GMFMC. 2019. Commercial Fishing Regulations for Gulf of Mexico Federal Waters. For Species Managed by the Gulf of Mexico Fishery Management Council. January 2019. Available at: http://gulfcouncil.org/wp-content/uploads/commercial-regulations.pdf.

Godcharles, M.F. and M.D. Murphy. 1986. Species Profiles: Life histories and environmental requirements of coastal fishes and invertebrates (South Florida) King mackerel and Spanish mackerel. U.S. Fish and Wildlife Service Biological Reports. 82(11.58). U.S Army Corps of Engineers, TR EL-82-4. 18 pp.

Goldman, K.J., Baum, J., Cailliet, G.M., Cortés, E., Kohin, S., Macías, D., Megalofonou, P., Perez, M., Soldo, A. & Trejo, T. 2009. Alopias vulpinus. The IUCN Red List of Threatened Species 2009: e.T39339A10205317. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39339A10205317.en. Downloaded on 28 October 2019.

GoM FMC. 2015. Gulf of Mexico Fishery Management Council: Standing and Special Mackerel SSC Review of SEDAR 38 Stock Assessment. Tampa, Florida. January 6-8, 2015. Available at: http://archive.gulfcouncil.org/council_meetings/BriefingMaterials/BB-01-2015/B%20-4%20SSC%20Summary.pdf.

Gorgone, A.M., T. Eguchi, B.L. Byrd, K.M. Altman, A.A. Hohn. 2014. Estimating the abundance of the Northern North Carolina Estuarine System Stock of common bottlenose dolphins (Tursiops truncatus). NOAA Tech. Memo. NMFS-SEFSC-664. 22 pp.

Hammond, P.S., G. Bearzi, A. Bjørge, K. Forney, L. Karczmarski, T. Kasuya, W.F. Perrin, M.D. Scott, J.Y. Wang, R.S. Wells, B. Wilson. 2008a. Phocoena phocoena. The IUCN Red List of Threatened Species 2008: e.T17027A6734992. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T17027A6734992.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/search.

Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y., Wells, R.S. & Wilson, B. 2008b. Delphinus delphis. The IUCN Red List of Threatened Species 2008: e.T6336A12649851. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T6336A12649851.en. Downloaded on 27 March 2018. Available at: http://www.iucnredlist.org/details/6336/0.

Herdson, D. 2010. Caranx crysos. The IUCN Red List of Threatened Species 2010: e.T154807A4637970. Available at: http://dx.doi.org/10.2305/IUCN.UK.2010-4.RLTS.T154807A4637970.en. Downloaded on 31 July 2019.

IUCN. 2019. Barracuda; Gulf of Mexico Region. Available at: https://www.iucnredlist.org/search?query=barracuda&searchType=species.

Johnson, A., G. Salvador, J. Kenney, J. Robbins, S. Kraus, S. Landry and P. Clapham. 2005. Fishing gear involved in entanglements of right and humpback whales. Mar. Mamm. Sci. 21, 635–645.

Kelleher, K. 2005. Discards in the world's marine fisheries. An update. FAO Fisheries Technical Paper. No. 470. Rome, FAO. 2005. 131p.

KWA (Key West Aquarium). 2020. Tiger of the Sea. Available at: https://www.keywestaquarium.com/barracudas.

Leard, R., B. Mahmoudi, H. Blanchet, H. Lazauski, K. Spiller, M. Buchanan, C. Dyer, W. Keithly. 1995. The striped mullet fishery of the Gulf of Mexico, United States: A Regional Management Plan. Number 33. Gulf States Marine Fisheries Commission: 196 pp. PO Box 726 Ocean Springs, MS 39566-0726. Available at: http://www.gsmfc.org/.

Lowry, L. 2016. Phoca vitulina. The IUCN Red List of Threatened Species 2016: e.T17013A45229114. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T17013A45229114.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/17013/0.

Mid-Atlantic Fishery Management Council. 2019. Mid-Atlantic Fishery Management Council Ecosystem Approach to Fisheries Management Guidance Document. Adopted August 8, 2016. Revised February 2, 2019. Available at: http://www.mafmc.org/eafm.

Mahmoudi, B. 2000. Status and trends in the Florida mullet fishery. A report submitted to the Florida Fish and Wildlife Conservation Commission, 22p.

Mathers, A.N., B.M. Deacy, J.K. Carlson. 2016b. Characterization of Catch and Bycatch in the State Gillnet Fisheries of Alabama, Mississippi, and Louisiana, 2012-2015. NOAA Technical Memorandum NMFS-SEFSC-691. 35 Pp.

Mathers, A.N., B.M. Deacy, J.K. Carlson. 2016a. Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2015. NOAA Technical Memorandum NMFS-SEFSC-690. 30 p.

Mathers, A.N., B.M. Deacy, J.K. Carlson. 2017. Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2016. NOAA Technical Memorandum NMFS-SEFSC-713. 29 Pp. Available at: https://repository.library.noaa.gov/view/noaa/15769.

Mathers, A.N., B.M. Deacy, H.E. Moncrief-Cox, J.K. Carlson. 2018. Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2017. NOAA Technical Memorandum NMFS-SEFSC-728. 13 Pp.

Morgan, M., P.M. Carlson, J., Kyne, R. Lessa. 2009. Carcharhinus acronotus. The IUCN Red List of Threatened Species 2009: e.T161378A5410167. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T161378A5410167.en. Downloaded on 28 October 2019.

Munro, J. L. 1983. "The Biology, Ecology and Bionomics of the Jacks, Carangidae". Caribbean Coral Reef Fishery Resources (A second edition of The biology, ecology, exploitation, and management of Caribbean reef fishes : scientific report of the ODA/UWI Fisheries Ecology Research Project, 1969–1973, University of the West Indies, Jamaica.). Manila: International Center for Living Aquatic Resources Management. pp. 82–94. ISBN 971-10-2201-X.

Musick, J.A., Stevens, J.D., Baum, J.K., Bradai, M., Clò, S., Fergusson, I., Grubbs, R.D., Soldo, A., Vacchi, M. & Vooren, C.M. 2009. Carcharhinus plumbeus. The IUCN Red List of Threatened Species 2009: e.T3853A10130397. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T3853A10130397.en. Downloaded on 19 September 2019.

Musick, J.A., R.D. Grubbs, J. Baum, E. Cortés. 2009b. Carcharhinus obscurus. The IUCN Red List of Threatened Species 2009: e.T3852A10127245. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T3852A10127245.en. Downloaded on 28 October 2019.

NMFS. 2009. Our living oceans. Report on the status of U.S. living marine resources, 6th edition. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/SPO-80, 369 Pp.

NMFS, 2016. 2016 Gulf of Mexico Red Snapper Recreational Season Length Estimates NOAA Fisheries, Southeast Regional Office, Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/lapp_dm/documents/pdfs/2016/rs_2016_rec_quota_projection.

NMFS. 2019a. Annual Commercial Landing Statistics. Available at: https://www.st.nmfs.noaa.gov/pls/webpls/FT_HELP.SPECIES.

NMFS. 2019b. Fishery Stock Status Updates. Available at: https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates.

NMFS 2019c. NMFS 3rd Quarter 2019 Update. Table A. Summary of Stock Status for FSSI Stocks. Available at: https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates.

NOAA.2015. Endangered Species Act - Section 7 Consultation Biological Opinion. 226 Pp. Available at: https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast.

NOAA. 2016a. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Gulf of Mexico Eastern Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2016b. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Gulf of Mexico Western Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2016c. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Gulf of Mexico Northern Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2017. 2017 and 2018 Gulf of Mexico Recreational Landings and Annual Catch Limits (ACLs) and Annual Catch Targets (ACTs). Available at: http://sero.nmfs.noaa.gov/sustainable_fisheries/acl_monitoring/recreational_gulf/index.html.

NOAA. 2018a. Common Bottlenose Dolphin (Tursiops truncatus truncatus) Northern North Carolina Estuarine System Stock. April 2018. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2018b. Common Bottlenose Dolphin (Tursiops truncatus truncatus) Southern North Carolina Estuarine System Stock. April 2018. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2018c. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Western North Atlantic Northern Florida Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2018d. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Western North Atlantic Central Florida Coastal Stock. September 2018. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2018e. Common Bottlnose Dolphin (Tursiops truncatus truncatus): Western North Atlantic South Carolina/Georgia Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2018g. Common Bottlenose Dolphin (Tursiops truncatus truncatus) Western North Atlantic Northern Migratory Coastal Stock. April 2018. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2018f. Common Bottlenose Dolphin (Tursiops truncatus truncatus) Western North Atlantic Southern Migratory Coastal Stock. April 2018. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2018h. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Northern Gulf of Mexico Bay, Sound, and Estuary Stocks. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2018i. Common Dolphin (Delphinus delphis delphis): Western North Atlantic Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2018j. Atlantic Large Whale Take Reduction Plan: Southeast Gillnet Fisheries Requirements and Management Areas. Available at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan#outreach

NOAA. 2018k. Atlantic Large Whale Take Reduction Plan: Mid-Atlantic Gillnet Fisheries Requirements and Management Areas. Available at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan#outreach.

NOAA. 2019a. King Mackerel. Available at: https://www.fisheries.noaa.gov/species/king-mackerel.

NOAA. 2019b. Spanish Mackerel. Available at: https://www.fisheries.noaa.gov/species/spanish-mackerel.

NOAA. 2019c. 2019 and 2018 Preliminary Gulf of Mexico Commercial Landings. Available at: https://www.fisheries.noaa.gov/southeast/2019-and-2018-preliminary-gulf-mexico-commercial-landings#2018-2019-preliminary-commercial-king-mackerel-landings.

NOAA. 2019c. King Mackerel. Available at: https://www.fisheries.noaa.gov/species/king-mackerel.

NOAA. 2019d. Gulf of Mexico Gillnet Fishery - MMPA List of Fisheries. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/gulf-mexico-gillnet-fishery-mmpa-list-fisheries.

NOAA. 2019e. Making Sense of Mackerel. Available at: https://www.fisheries.noaa.gov/southeast/rules-and-regulations/making-sense-mackerel.

NOAA. 2019f. Southeast Gillnet Observer Program. Available at: https://www.fisheries.noaa.gov/southeast/fisheries-observers/southeast-gillnet-observer-program.

NOAA. 2019g. Bottlenose Dolphin Take Reduction Plan. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/bottlenose-dolphin-take-reduction-plan.

NOAA. 2019h. Bycatch Reduction Devices - Gulf of Mexico and South Atlantic. Available at: https://www.fisheries.noaa.gov/southeast/bycatch/bycatch-reduction-devices-gulf-mexico-and-south-atlantic.

NOAA. 2019i. 2019 Gulf of Mexico EBFM Implementation Plan. Available at: https://www.fisheries.noaa.gov/national/ecosystems/ecosystem-based-fishery-management-implementation-plans.

NOAA. 2019j. Ecosystem Based Fisheries Management Implementation Plan for the South Atlantic. Available at: https://www.fisheries.noaa.gov/national/ecosystems/ecosystem-based-fishery-management-implementation-plans.

NOAA. 2019k. North Carolina Inshore Gillnet Fishery - MMPA List of Fisheries. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/north-carolina-inshore-gillnet-fishery-mmpa-list-fisheries.

NOAA. 2019l. List of Fisheries Summary Tables. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/list-fisheries-summary-tables#table-2-category-i

NOAA. 2019m. Common Bottlenose Dolphin (Tursiops truncatus truncatus): Gulf of Mexico Northern Coastal Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-

stock-assessment-reports-species-stock#cetaceans---dolphins.

NOAA. 2019o. GRAY SEAL (Halichoerus grypus atlantica): Western North Atlantic Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock#pinnipeds---otariids-(eared-seals-or-fur-seals-and-sea-lions).

NOAA. 2019p. Harbor Porpoise (Phocoena phocoena phocoena): Gulf of Maine/Bay of Fundy Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2019q. Harbor Seal (Phoca vitulina vitulina): Western North Atlantic Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2019r. Minke Whale (Balaenoptera acutorostrata acutorostrata): Canadian East Coast Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2019s. Humpback Whale (Megaptera novaeangliae): Gulf of Maine Stock. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

Orvis News. 2014. Fish Facts: False Albacore (Euthynnus alletteratus). Available at: https://news.orvis.com/fly-fishing/fish-facts-false-albacore-euthynnus-alletteratus/.

Pollard, D., A. Smith. 2009. Carcharias taurus. The IUCN Red List of Threatened Species 2009: e.T3854A10132481. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T3854A10132481.en. Downloaded on 28 October 2019.

Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr., R.L., Butterworth, D.S., Clapham, P.J., Cooke, J., Donovan, G.P., Urbán, J. & Zerbini, A.N. 2008a. Megaptera novaeangliae. The IUCN Red List of Threatened Species 2008: e.T13006A3405371. Available at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T13006A3405371.en. Downloaded on 24 July 2018.

Reilly, S.B., J.L Bannister, P.B. Best, M., Brown, R.L. Brownell Jr., D.S. Butterworth, P.J. Clapham, J. Cooke, G.P. Donovan, J. Urbán, A.N. Zerbini. 2008b. Balaenoptera acutorostrata. The IUCN Red List of Threatened Species 2008: e.T2474A9444043. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T2474A9444043.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/2474/0.

Rosa, R.S., Castro, A.L.F., Furtado, M., Monzini, J. & Grubbs, R.D. 2006. Ginglymostoma cirratum. The IUCN Red List of Threatened Species 2006: e.T60223A12325895. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T60223A12325895.en. Downloaded on 15 October 2019.

SAFMC. 2018b. Mackerel Cobia Advisory Panel Spanish Mackerel Fishery Performance Report. Available at: https://safmc.net/download/SpanishMackFPR_April2018.pdf.

SAFMC. 2018. Framework Amendment 6 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region: Atlantic King Mackerel Commercial Trip Limits. November 2018. Available at: https://safmc.net/download/CMP_FW6_FINAL_2.pdf.

SAFMC. 2019a. King Mackerel. Available at: https://safmc.net/regulations/regulations-by-species/king-

mackerel/.

SAFMC. 2019b. Marine Protected Areas. Available at: https://safmc.net/safmc-managed-areas/marine-protected-areas/.

SAFMC. 2019c. Fisheries Management and Law Enforcement. Available at: https://safmc.net/fisheries-management-and-law-enforcement/.

SAFMC. 2019d. Habitat Conservation & Ecosystem Management. Available at: https://safmc.net/fishery-ecosystem-plan-ii-introduction/.

SAFMC. 2019e. Role of the Fishery Management Councils. Available at: https://safmc.net/about-safmc/.

Sánchez-García, O. Escobar-Sánchez, M.C. Valdez-Pineda, J.S. Ramírez-Pérez, R.E. Morán-Angulo, X.G. Moreno-Sánchez. 2017. Selective predation by crevalle jack Caranx caninus on engraulid fishes in the SE Gulf of California, Mexico. Environmental Biology of Fishes 100,8: 899–912. Available at: https://link.springer.com/article/10.1007%2Fs10641-017-0615-0.

Schmidt, D.J., M.R. Collins and D.M. Wyanski. 1993. Age, growth, maturity and spawning of Spanish mackerel, Scomberomorous maculatus (Mitchill), from the Atlantic Coast of the southeast United States. Fishery Bulletin 91, 526-533.

Schmidt, D.J., M.R. Collins, D.M. Wyanski. 1993. Age, growth, maturity and spawning of Spanish mackerel, Scomberomorous maculatus (Mitchill), from the Atlantic Coast of the southeast United States. Fishery Bulletin 91: 526-533.

SEDAR. 2005. SEDAR 07- Gulf of Mexico Red Snapper Assessment Report, Available at: http://sedarweb.org/docs/sar/S7SAR_FINAL-redsnapper.pdf.

SEDAR. 2008. SEDAR 17 Stock assessment report: South Atlantic Spanish mackerel. Available at: http://sedarweb.org/sedar-17-stock-assessment-report-south-atlantic-spanish-mackerel.

SEDAR. 2009. Stock Assessment of Red Snapper in the Gulf of Mexico - SEDAR Update Assessment -, Miami, FL. Available at: http://sedarweb.org/docs/suar/Gulf Red Snapper Update 2009 5.0.pdf.

SEDAR. 2012a. SEDAR 28 – South Atlantic Spanish mackerel Stock Assessment Report. SEDAR, North Charleston SC. 444 pp. Available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=28.

SEDAR. 2012b. SEDAR 27A Stock Assessment Report: Southeastern Yellowtail Snapper, St.Petersburg. Available at: sedarweb.org/docs/sar/yts_fwc_sar.pdf.

SEDAR. 2013a. SEDAR 28 – Gulf of Mexico Spanish Mackerel Stock Assessment Report. SEDAR, North Charleston SC. 712 pp. Available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=28.

SEDAR. 2013b. SEDAR 28 – South Atlantic Cobia Stock Assessment Report. SEDAR, North Charleston SC. 420 pp. Available at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=28.

SEDAR. 2013c. SEDAR 34 Stock Assessment Report: HMS Atlantic Sharpnose Shark. September 2013. Available at: http://sedarweb.org/docs/sar/S34_ATSH_SAR.pdf.

SEDAR. 2014b. SEDAR 38 Stock Assessment Report--Gulf of Mexico King Mackerel. SEDAR, North Charleston, SC. 465pp. Available at: http://sedarweb.org/docs/sar/SEDAR_38_Gulf_SAR.pdf.

SEDAR. 2014a. SEDAR 38 Stock Assessment Report--South Atlantic King Mackerel. SEDAR, North Charleston, SC. 502pp.

SEDAR. 2016b. SEDAR 33 Stock Assessment Update Report Gulf of Mexico Greater Amberjack (Seriola dumerili). Available at: http://sedarweb.org/2016-update-sedar-33-gulf-mexico-greater-amberjack-report.

SEDAR 2016a. SEDAR 49 Stock Assessment Report Gulf of Mexico Data-limited Species: Red Drum, Lane Snapper, Wenchman, Yellowmouth Grouper, Speckled Hind Snowy Grouper, Almaco Jack, Lesser Amberjack. North Charleston, SC. Available at: http://sedarweb.org/docs/sar/SEDAR_49_SAR_report.pdf.

SEDAR. 2018b. SEDAR 52: Stock Assessment Report, Gulf of Mexico Red Snapper. Available at: http://sedarweb.org/docs/sar/S52_Final_SAR_v2.pdf.

SEDAR. 2019d. Southeast Data, Assessment, and Review: Welcome page. Available at: http://sedarweb.org.

SEDAR. 2020a. SEDAR 69 – Atlantic Menhaden Benchmark Stock Assessment Report. SEDAR, North Charleston SC. 691 pp. Available at: http://sedarweb.org/sedar-69.

SEDAR. 2020b. SEDAR 58 – Atlantic Cobia Stock Assessment Report. SEDAR, North Charleston SC. 500 pp. Available at: http://sedarweb.org/sedar-58

SEDAR 2006. SEDAR 11: Stock Assessment Report, Large Coastal Shark Complex, Blacktip and Sandbar Shark. Available at: http://sedarweb.org/docs/sar/Final_LCS_SAR.pdf.

SEDAR. 2011. SEDAR 9 Update Stock Assessment Report: Gulf of Mexico Vermilion Snapper. Available at: http://sedarweb.org/docs/suar/Final%20Vermilion%20Snapper%20Update%20with%20addendum.pdf.

SEDAR. 2016c. SEDAR 45 Stock Assessment Report Gulf of Mexico Vermilion Snapper, Florida. Available at: http://sedarweb.org/docs/sar/S45_Final_SAR.pdf.

SEDAR. 2016d. SEDAR 41 – South Atlantic Gray Triggerfish Assessment Report. SEDAR, North Charleston SC. 428 pp. Available at: http://sedarweb.org/sedar-41.

SEDAR. 2018a. SEDAR 55: Stock Assessment Report: South Atlantic Vermilion Snapper. North Charleston, SC. Available at: http://sedarweb.org/sedar-projects.

A. Sley, O. Jarboui, M. Ghorbel, A. Bouain. 2012. Annual reproductive cycle, spawning periodicity and sexual maturity of blue runner Caranx crysos (Pisces, Carangidae) from the Gulf of Gabes (Tunisia, Eastern Mediterranean). Journal of Applied Ichthyology, 28, 5: 785-790.

Smith-Vaniz, W.F., Abad-Uribarren, A., Fraser, T., Chiappa Carrara, X. & Robins, R.H. 2015b. Caranx hippos. The IUCN Red List of Threatened Species 2015: e.T190458A78679372. Available at: https://www.iucnredlist.org/species/190458/78679372. Downloaded on 31 July 2019.

Smith-Vaniz, W.F., Curtis, M., Williams, J.T., Brown, J. & Pina Amargos, F. 2015a. Seriola rivoliana. The IUCN Red List of Threatened Species 2015: e.T16507347A16510402. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T16507347A16510402.en. Downloaded on 21 October 2019.

Smith-Vaniz, W.F., J. Brown, F. Pina Amargos, J.T. Williams, M. Curtis. 2015c. Chloroscombrus chrysurus (errata version published in 2017). The IUCN Red List of Threatened Species 2015: e.T16437187A115358128. Available at: http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T16437187A16510252.en. Downloaded on 12 December 2019.

Stony Brook University. 2019. Atlantic Menhaden: Scientist Sign-on Letter. Available at: https://www.somas.stonybrook.edu/menhaden/.

Teo, S.L.H., E.G. Rodriguez, O. Sosa-Nishizaki. 2016. Status of Common Thresher Sharks, Alopias vulpinus Along the West Coast of North America. Available at: https://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-557.pdf.

Urian, K.W., D.M. Waples, R.B. Tyson, L.E. Willams Hodge, A.J. Read. 2013. Abundance of bottlenose dolphins (Tursiops truncatus) in estuarine and near-shore waters of North Carolina, USA. J. N. C. Acad. Sci. 129(4):165–171.

USFWS. 2020. ECOS Environmental Conservation Online System. Available at: https://www.fws.gov/endangered/.

Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

West, J., J.E. Powers. 2016. Update Assessment of Striped Mullet Mugil cephalus in Louisiana Waters: 2016 Report. Available at: http://www.wlf.louisiana.gov/sites/default/files/pdf/document/40572-stock/mullet_la_2016.pdf.

Wiegand, C. 2019. Commercial Effort in the Atlantic Spanish Mackerel Fishery. White Paper. September 2019. Available at: https://safmc.net/download/Briefing%20Book%20MC%20AP%20October%202019/MCAP_A2a_SpanishMackWhit

Wood, A. 2016. Bluefish Benchmark Stock Assessment for 2015. 60th SAW Assessment Report. Available at: http://www.asmfc.org/uploads/file/55d2392c2015BluefishBenchmarkStockAssessment.pdf.

Appendix A: Extra By Catch Species

ATLANTIC MENHADEN

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

The 2020 benchmarks are calculated through spawner-per-recruit calculations (fecundity-based) using the mean values of any time- varying components (i.e., growth, maturity) over the time series 1955-2017 (SEDAR 2020a). Based on the current adopted benchmarks, the Atlantic menhaden stock status is not overfished. Total fecundity was estimated at $2.60x10^{15}$ eggs in 2017, which is above the $FEC_{THRESHOLD}$ of $1.46x10^{15}$ eggs, and above the current FEC_{TARGET} ($1.95x10^{15}$ eggs; *ibid*). Because Atlantic menhaden is a forage fish species, according to the Lenfest Forage Fish Task Force guidance, it is classified as an "intermediate information tier" fishery, and requires that there must be at least 40% of virgin or unfished biomass (B_0) left in the water (Stony Brook University 2019). As it is unclear what biomass is with respect to virgin biomass, abundance is scored as "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

The 2020 benchmarks are calculated using the full fishing mortality rate (F-based) over the time series 1955-2017. Based on the currently adopted benchmarks, the Atlantic menhaden stock is not undergoing overfishing (SEDAR 2020a). The geometric mean F on ages 2-4 was 0.11 in 2017, which was below the $F_{THRESHOLD}$ of 0.60. The current stock is below the current fishing mortality target of F = 0.22 (*ibid*).

Because Atlantic menhaden is a forage fish species, according to the Lenfest Forage Fish Task Force (LFFTF) recommendations, it is classified as an "intermediate information tier" fishery and requires that fishing mortality is no higher than 50% of $F_{MSY.}$ The current estimate of full F from the ERP (Ecological Reference Point stock assessment) model is 0.157, below both the example multispecies/ERP target (0.188) and threshold (0.573) (SEDAR 2020a), indicating Atlantic menhaden are not experiencing overfishing even when their role as forage is taken into consideration. While the target ERP may not be consistent with the LFFTF recommendations as it is greater than 50% of the single species MSY fishing mortality, current fishing mortality is at a level commensurate to the LFFTF recommendations, therefore fishing mortality is scored as a low concern.

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

CREVALLE JACK

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

Moderate Concern

There is no formal stock assessment for crevalle jack, Caranx hippos, and stock status is unknown. According to the Productivity Susceptibility Analysis, crevalle jack have medium inherent vulnerability (PSA = 2.99; see detailed scoring below); and the IUCN considers this species as "Least Concern" (Smith-Vaniz et al. 2015b). In combination with an unknown stock status, abundance is scored as "moderate concern".

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ?? = [(??1 * ??2 * ??3 * ??4) – 1/ 40] + 1 .*

3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ?? = √(P² + S)²

Productivity Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)

Average age at maturity	5	2	(FWC 2018)
Average maximum age	17-19	2	(FWC 2018)
Fecundity	1,000,000	1	(Munro 1983)
Average maximum size	124 cm	2	(Froese and Paul 2017)
Average size at maturity	60 cm	2	(Froese and Paul 2017)
Reproductive strategy	Broadcast spawner	1	(FWC 2018)
Trophic level	4.3	3	(Sánchez-García et al. 2017)
Quality of habitat	SFW default	2	
Total productivity (average)	**1.875**		

Susceptibility Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**
Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default
Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default
Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Mathers et al. 2017)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.8752 + 2.325)^2}$

$V = \sqrt{(1.875 + 2.325)^2}$

V = 2.99 (medium vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

Moderate Concern

There is no formal stock assessment for crevalle jack; therefore, fishing mortality is unknown. As such, this factor is scored as "moderate concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

< 100%

There are no fishery specific discard data available for cast net fisheries targeting Spanish and king mackerel. However, this gear is likely to have moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

BLUE RUNNER

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

There is no formal stock assessment for blue runner, Caranx crysos; therefore, stock status is unknown. According to the Productivity Susceptibility Analysis, blue runner have medium inherent vulnerability (PSA = 2.66; see detailed scoring below); and the IUCN considers this species to be a "Least Concern" (Herdson 2010). In combination with an unknown stock status, abundance is scored "moderate concern".

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ** = [(**1 * **2 * **3 * **4) – 1/ 40] + 1 .*

*3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ** = √(P² + S)²*

Productivity Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)
Average age at maturity	2-3 years old	1	(Sley et al. 2012)
Average maximum age	11	2	(Froese and Pauly 2018)
Fecundity	41,000-1,546,000 eggs	1	(Froese and Pauly 2018)
Average maximum size	55-70 cm	1	(Froese and Pauly 2018)
Average size at maturity	27 cm	1	(Froese and Pauly 2018)
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2018)
Trophic level	-	-	-
Quality of habitat	SFW default	2	

Total productivity (average)	**1.286**

Susceptibility Attribute	**Relevant Information**	**Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)**	**Reference(s)**
Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default
Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default
Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Mathers et al. 2017)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.2386^2 + 2.325)^2}$

V = $\sqrt{(1.286 + 2.325)^2}$

V = 2.66 (medium vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

There is no formal stock assessment for blue runner; therefore, fishing mortality is unknown. As such, this factor is scored as "moderate concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

COBIA

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Very Low Concern

The 2020 cobia stock assessment found spawning stock biomass (SSB) in the South Atlantic region of the U.S. to be above the level at maximum sustainable yield, SSB_{2017}/SSB_{MSY} = 1.88 and $SSB_{2017}/SSBF_{40\%}$ = 1.41 (SEDAR 2020b). Therefore, this stock is not considered overfished, and is award a score of "very low concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

In the 2020 stock assessment, SEDAR found the current level of fishery exploitation in the U.S. South Atlantic to be below the reference point, $F_{2015\text{-}2017}/F_{40\%}$ = 0.29; therefore, overfishing is not occurring (SEDAR 2020b) and fishing mortality is considered "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

GREY SEAL

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

Current estimates of the total western Atlantic gray seal population are not available; although estimates of portions of the stock are available for select time periods (NOAA 2019o). The number of pups born at US breeding colonies can be used to approximate the total size (pups and adults) of the gray seal population in U.S. waters, based on the ratio of the best estimate of population size to pups in Canadian waters (4.3:1; *ibid*). Using this approach, the population estimate in US waters is 27,131 (CV=0.19, 95% CI: 18,768–39,221) animals; however, there is uncertainty in this abundance level in the U.S. because life history parameters that influence the ratio of pups to total individuals in this portion of the population are unknown (*ibid*). Gray seal abundance is likely increasing in the US Atlantic Exclusive Economic Zone (EEZ), but the rate of increase is unknown. The IUCN considers this species as "Least Concern" (Bowen 2016), with an increasing population trend; therefore abundance is considered "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

For the period 2012–2016, the average annual estimated human-caused mortality and serious injury to gray seals in the U.S. and Canada was 5,688 (878 U.S./4,809 Canada) per year, with a PBR of 1,389 (NOAA 2019o). The U.S. observed fishery accounted for 18.3% (878/4,809) of the average annual estimated human caused mortality and serious injury; the Mid-Atlantic gillnet fishery accounted for 1.4% (12/878) of those deaths (*ibid*). Because the Mid-Atlantic gillnet fishery contributes to less than 50% of the PBR, and total U.S. fisheries mortality does not exceed PBR, this factor is considered a "low concern".

Justification:

The average was derived from six components: 1) 873 (CV=0.10) from the 2012–2016 U.S. observed fisheries; 2) 4.8 from average 2012– 2016 non-fishery related, human interaction stranding and shooting mortalities in the U.S.; 3) 0.8 from U.S. research mortalities; 4) 659 from the average 2012–2016 Canadian commercial harvest; 5) 74 from the average 2012–2016 DFO scientific collections; and 6) 4,076 removals of nuisance animals in Canada (*ibid*).

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

HARBOR SEAL

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

The best current abundance estimate of the harbor seal stock is 75,834 (CV=0.15), with a minimum population size of 66,884, which is from a 2012 survey} (NOAA 2019q). The status of this population, relative to the optimum sustainable population (OSP), in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (*ibid*). The IUCN considers this species as "Least Concern" (Lowry 2016), and since status and trend analysis are unknown, abundance is considered "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

Total human-caused mortality or serious injury to the harbor seal stock during 2012 to 2016 was 345 (333 harbor seals per year from U.S. fisheries), with a PBR of 2,006 (NOAA 2019q). The Mid-Atlantic gillnet fishery accounts for 5.1% (17/333 individuals) of the total bycatch across all fisheries (*ibid*). Because PBR is not exceeded, and the Mid-Atlantic gillnet fishery is not a major contributor, fishing mortality is considered a "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

HARBOR PORPOISE

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 79,883 (CV=0.32), with a minimum population size of 61,415, which is from a 2011 survey (NOAA 2019p). However, the surveyed area may not have covered the entire area of the stock's habitat at the appropriate time of the year, and the current abundance estimate did not account for availability bias due to submergence of animals. Without a correction for availability bias, the abundance estimate is expected to be biased low (*ibid*). The status of this population, relative to the optimum sustainable population (OSP), in the US Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (*ibid*). The IUCN considers this species as "Least Concern" (Hammond et al. 2008a), and since status and trend analyses are unknown, abundance is considered "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

Total annual estimated average fishery-related mortality or serious injury to the harbor porpoise stock during 2011 to 2015 was 256 harbor porpoises per year (CV=0.18) from U.S. fisheries, with a PBR of 706 (NOAA 2019p). The Mid-Atlantic gillnet fishery accounted for 12.5% (32/256 individuals) of the total bycatch across all fisheries (*ibid*). Because PBR is not exceeded, and the Mid-Atlantic gillnet fishery accounts for less than 50% of the PBR, fishing mortality is considered a "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

SHORT-BEAKED COMMON DOLPHIN

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Moderate Concern

The current best abundance estimate for short-beaked common dolphins off the U.S. Atlantic coast is 70,184 (CV=0.28), with a minimum population size of 55,690 (NOAA 2018). This estimate is derived from 2011 shipboard and aerial surveys, and is the only current estimate available (*ibid*). Although this estimate is considerably lower than the 2015 estimate, it is not an indication of population decline because it does not include data from the 2007 TNASS survey from Canadian waters upon the recommendation in GAMMS II Workshop (Wade and Angliss 1997); as such, it is not comparable to the previous assessment's estimate (NOAA 2018a). The status of common dolphins, relative to OSP, in the US Atlantic EEZ is unknown, and population trends have not been investigated (*ibid*). The IUCN considers this species as "Least Concern" (Hammond et al. 2008b), and since status and trend analysis are unknown, abundance is considered "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

Low Concern

Total annual estimated average fishery-related mortality or serious injury to the short-beaked common dolphin stock during 2011 to 2015 was 437 (CV=0.10), with a PBR of 557 (NOAA 2018i). The Mid-Atlantic gillnet fishery accounted for only 8.9% of the total US fishery-related serious injury and mortality (31/437 individuals; *ibid*). Because PBR is not exceeded, and the Mid-Atlantic gillnet fishery accounts for less than 50% of the PBR, fishing mortality is considered a "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Encircling Gillnets

< 100%

There are no fishery specific discard data available for encircling net/strike gillnet fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish and king mackerel targeted fisheries, 100% of spotted tunny, 100% of bluefish, 99% of ladyfish, 100% bluerunner jack, 96% Atlantic bumper, 88% crevalle jack, 62.5% blacktip shark caught in encircling gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

HUMPBACK WHALE

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

A recent count of the minimum number alive (MNA) for 2015 was produced by counting the number of unique individuals (by coloration) seen in 2015 in the Gulf of Maine stock area, as well as seen both before and after 2015 (NOAA 2019s). The humpback MNA for 2015 was 896, and includes not only cataloged whales but some calves born in 2015 but not yet identifiable. Minimum population size is also 896, because the count is both more recent and larger than the 2011 line transect estimate, and has zero probability of overestimating abundance; and hence, population size is increasing (*ibid*).

NMFS conducted a global status review of humpback whales (Bettridge et al. 2015) and recently revised the ESA listing of the species (Federal Register 2016). The final rule indicated that until the stock delineations are reviewed in light of the Distinct Population Segment (DPS) designations, NMFS would consider stocks that do not fully or partially coincide with a listed DPS, as not depleted for management purposes. Hence, the Gulf of Maine stock (part of the West Indies DPS) is considered not depleted because it does not coincide with any ESA-listed DPS (*ibid*). According to the IUCN, this species is listed as "Least Concern," with an increasing population trend (Reilly et al. 2018a). However, because humpback whale status is essentially unknown (both the abundance determination and the accounting of human caused mortality are biased low), abundance is scored as "moderate concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

For 2012-2016, the minimum annual rate of human-caused mortality and serious injury to the Gulf of Maine humpback whale stock averaged 9.7 animals per year. This value includes incidental fishery interaction records, 7.1; and records of vessel collisions, 2.6, with a PBR of 14.6 (NOAA 2019s)

Gillnet serious injury or mortality was only associated with three humpback whale incidences between 2012 and 2016; many interactions were with unidentifiable gears (*ibid*). However, gillnets were the primary cause of entanglements and entanglement mortalities (20%) of humpbacks in the Gulf of Maine between 1975 and 1990 (*ibid*). In U.S. waters, (Johnson et al. 2005) found that 40% of humpback entanglements were in trap/pot gear and 50% were in gillnets, but sample sizes were small and much uncertainty still exists about the frequency of certain gear types involved in entanglement (*ibid*).

Because PBR is not exceeded, but gillnets in general are a main contributor to humpback whale fishing mortality, fishing mortality is considered a "moderate concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76%

sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

MINKE WHALE: CANADIAN EAST COAST

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

The abundance estimate for the minke whale stock is 2,591 (CV=0.81), with a minimum population estimate of 1,425 whales (NOAA 2019r). This estimate, derived from 2011 shipboard and aerial surveys, is the only current estimate available (*ibid*). The status of this population, relative to the optimum sustainable population (OSP), in the US Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (*ibid*). The IUCN considers this species as "Least Concern" (Reilly et al. 2008b), and since status and trend analysis are unknown, abundance is considered "moderate concern".

Justification:

Common minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock, which inhabits the area from the western half of the Davis Strait (45ºW) to the Gulf of Mexico. There are uncertainties about stock structure due to the limited understanding of the distribution, movements, and genetic structure of this stock. At this point, no analyses of stock structure within this stock have been performed (NOAA 2019r).

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

Low Concern

During 2012 to 2016, the average annual minimum detected human-caused mortality and serious injury was 7.7 minke whales per year, which is the sum of 6.5 (1.5 U.S./2.35 Canada/2.3 unassigned, but first reported in the U.S./0.35 unassigned, but first reported in Canada) minke whales per year from U.S. and Canadian fisheries using strandings and entanglement data, 1.0 (0.6 U.S./0.4 Canada) per year from vessel strikes, and 0.2 takes in observed U.S. fishing gear.with a PBR of 14 (NOAA 2019r). The Mid-Atlantic gillnet fishery account for approximately 0.2% of these mortalities. Because the PBR is not exceeded, and the Mid-Atlantic gillnet fishery accounts for less than 50% of the PBR, fishing mortality is considered a "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

ATLANTIC SHARPNOSE SHARK

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Low Concern

According to the 2013 Atlantic sharpnose shark stock assessment, spawning stock fecundity (SSF; sum of number at age times pup production at age) SSF_{2011}/SSF_{MSY} = 1.66 (SEDAR 2013c). Therefore, the stock is not overfished and is scored "low concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

Low Concern

According to the most recent stock assessment, Atlantic sharpnose shark fishing mortality is F_{2011}/F_{MSY} = 0.33 (SEDAR 2013c). Therefore, the stock is not undergoing overfishing and fishing mortality is scored "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Trolling Lines

< 100%

There are no fishery specific discard data available for troll fisheries targeting king mackerel. However, troll gear has exceedingly low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, troll fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

ATLANTIC BUMPER

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

There is no formal stock assessment for Atlantic bumper, *Chloroscombrus chrysurus;* therefore, stock status is unknown. According to the Productivity Susceptibility Analysis, Atlantic bumper have low inherent vulnerability (PSA = 2.64; see detailed scoring below); and the IUCN considers this species to be a "Least Concern" (Smith-Vaniz et al. 2015c), In combination with an unknown stock status, abundance is scored "moderate concern".

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

*2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: ** = [(**1 * **2 * **3 * **4) – 1/ 40] + 1 .*

*3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: ** = √(P² + S)²*

Productivity Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)
Average age at maturity	2.9 years old	1	(De Queiroz et al. 2018)
Average maximum age	-	-	-
Fecundity	-	-	-
Average maximum size	65 cm	1	(Froese and Pauly 2018)
Average size at maturity	12.4 cm	1	(Froese and Pauly 2018)
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2018)
Trophic level	-	-	-
Quality of habitat	SFW default	2	

Total productivity (average)	**1.25**

Susceptibility Attribute	Relevant Information	Score (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)	Reference(s)
Areal overlap (Considers all fisheries)	>30% of the species concentration is fished, considering all fisheries.	3	SFW default
Vertical overlap (Considers all fisheries)	High degree of overlap between fishing depths and depth range of species	3	SFW default
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted, or is incidentally encountered AND is not likely to escape the gear, BUT conditions under'high risk' do not apply	2	SFW default
Post-capture mortality (Specific to fishery under assessment)	Retained species	3	(Enzenauer et a. 2015)
Total susceptibility (multiplicative)	**2.325**		

Vulnerability (V) = $\sqrt{(1.25^2 + 2.325)^2}$

V = $\sqrt{(1.25 + 2.325)^2}$

V = 2.64 (low vulnerability)

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

Moderate Concern

There is no formal stock assessment for Atlantic bumper; therefore, fishing mortality is unknown. As such, this factor is scored as "moderate concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Gillnets And Entangling Nets (Unspecified)
UNITED STATES OF AMERICA / GULF OF MEXICO
Gillnets And Entangling Nets (Unspecified)

< 100%

There are no fishery specific discard data available for gillnet/entangling net fisheries targeting Spanish and king mackerel. However, this gear has moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.

Justification:

In the Spanish mackerel targeted fishery, 93-99% of bluefish, 99% of ladyfish, 100% bluerunner jack, 76% sharpnose shark, 100% sea trout, 96% Atlantic menhaden (0% in 2016), 53.9% bonnethead shark, 100% blacktip shark, 100% crevalle jack, and 100% Atlantic croaker caught in sink gillnets were retained (Mathers et al. 2016b)(Mathers et al. 2018).

VERMILION SNAPPER

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Very Low Concern

According to the 2018 stock assessment for vermilion snapper, $SSB_{2016}/MSST = 1.51$ and $SS_{B2016}/SSB_{MSY} = 1.13$ (SEDAR 2018a). Therefore, biomass is above both the LRP and the TRP, but is quite close to MSY. The age structure in the 2016 model run showed there is an increasing proportion of old fish compared to previous years, with strong recruitment in the 2000s and slightly fewer young fish. There was average- to below-average recruitment in recent years (*ibid*). Because biomass is above the target reference point, abundance is considered "very low concern".

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Very Low Concern

According to the 2016 stock assessment for vermilion snapper, $SSB_{current}/MSST_{FSPR30\%} = 1.40$ and $SSB_{current}/SSB_{FSPR30\%} = 1.05$ (SEDAR 2016c). The vermilion snapper stock is healthy and is above the target reference point (TRP) and LRP in 2014. The stock is not overfished, though may have been overfished during years 1986 to 2006. The species' ability to quickly recover from overfishing (relative to other snapper species), is attributable to its fast growth rates, moderate level of natural mortality and young maturity (*ibid*). Because the stock is above or fluctuating around the TRP, abundance is considered "very low concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Low Concern

The most recent update stock assessment in the SA vermilion fishery found that the current F (with the geometric mean from the period 2014 to 2016), was estimated by the base run to be $F_{2014-2016}/F_{MSY}$ = 0.609, and the median value was $F_{2014-2016}/F_{MSY}$ = 0.564 (SEDAR 2018a). There is much uncertainty in the assessment (see Justification) but there is less than a 50% chance that fishing mortality is less than the sustainable level. Since fishing mortality is much lower than $F_{MSY,}$ the stock is considered to be a "low concern".

Justification:

Around 83.2% of MCB runs agreed with the base run that the stock is currently not experiencing overfishing, but there is "much uncertainty in the terminal years" (SEDAR 2018a).

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Low Concern

The most recent stock assessment estimated that $F_{current}/MFMT_{FSPR30\%}$ = 0.73 (SEDAR 2016c); therefore, the population is currently not experiencing overfishing. Since the last assessment, there has been a reduction in mortality and fishing mortality is deemed as "low concern".

Justification:

The most recent stock assessment indicated that fishing mortality (F) relative to F_{MSY} and $F_{SPR30\%}$ is 0.73, indicating that the population is currently not experiencing overfishing (*ibid*). An acceptable biological catch (ABC) has been recommended by the Scientific and Statistical Committee (SSC) for GOM vermilion snapper such that when commercial landings reach an acceptable target set by the GMFMC, the fishery is closed (FishWatch 2016)(SEDAR 2011).

In the 2011 stock assessment update, the SSC recommended that the ABC could be increased (SEDAR 2011). At this time, the GMFMC has opted not to increase the annual catch limit (ACL) of GOM vermilion snapper: Southeast Data, Assessment, and Review (SEDAR) report 45 advised that the yield could be moderately increased; however, considering the uncertainty (attributable to model inputs such as natural mortality, length-weight relationship) in the assessments, the current yields are suitable with projected ABCs.

The decrease in fishing mortality is due to decreases in bycatch from the shrimp trawl fishery and recent decreases in commercial exploitation in the eastern GOM. There is a rise in recreational mortality, which is larger than commercial mortality.

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines
UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel.

However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

GRAY TRIGGERFISH

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Moderate Concern

According to the 2016 stock assessment for South Atlantic gray triggerfish, current stock status was estimated to be $SSB_{2014}/MSST = 4.5$ and $SSB_{2014}/SSB_{F30\%} = 2.65$; therefore, the stock is not overfished (SEDAR 2016d). The uncertainty analysis indicated that the terminal estimate of stock status is robust. Of the MCB runs, 100% indicated that the stock was above MSST in 2014. However, according to the NMFS 3rd Quarter 2019 update, abundance/overfished status is unknown (NMFS 2019c). As such, abundance is scored as "moderate concern".

Justification:

Estimated time series of stock status ($SSB/MSST$ and $SSB/SSB_{F30\%}$) showed an increase through the 1990s followed by a general decline through 2010, and an increase in the most recent years. Base-run estimates of spawning biomass have remained above the threshold (MSST) throughout the assessment period (*ibid*).

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

Low Concern

According to the 2016 stock assessment, current fishery status (with current F represented by the geometric mean from 2012–2014), was estimated to be $F_{2012-2014}/F_{30\%} = 0.14$, and the median value was $F_{2012-2014}/F_{30\%} = 0.14$ (SEDAR 2016d); therefore, overfishing is not occurring. This determination is in agreement with the NMFS 3rd quarter 2019 update (NMFS 2019c); hence, fishing mortality is considered "low concern".

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general,

handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

YELLOWTAIL SNAPPER

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Very Low Concern

According to the most recent stock assessment (2012, SEDAR 27), the stock is not overfished with high recruitment, but has experienced some decline in abundance (especially for the yellowtail snapper in the age-12 group) (SEDAR 2012b). The NMFS 3rd quarter 2019 report updated the B/B_{MSY} proxy to 3.36; therefore, biomass is above the TRP (NMFS 2019c). Since the stock is above LRP and TRP, abundance is considered "very low concern".

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Low Concern

Since the last stock assessment, yellowtail snapper landings have slightly decreased in the GoM commercial fishery. In the recreational fishery, there have been vast fluctuations in landings: recorded landings show 294,538 fish were caught in 2012, whereas, 563,273 fish were caught in 2015 (Gulf Info 2016b). $F_{2010}/F_{30\%SPR}$ = 0.154 for the GoM (SEDAR 2012b) indicating that the population is currently not experiencing overfishing. Therefore, fishing mortality is deemed a "low" concern.

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of

greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

RED SNAPPER

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Moderate Concern

Maximum Sustainable Yield (MSY) is undetermined for the GOM red snapper fishery since the stock-recruitment variable is incalculable. The 2018 stock assessment used proxy reference points to determine the biomass for GoM red snapper, where the limit reference point (LRP) is spawning stock biomass $SSB_{current}$/minimum stock size threshold (MSST) ratio is $SSB_{current}$/MSST, which is estimated at 1.41 (SEDAR 2018b). The target reference point (TRP) is $SSB_{current}/SSB_{FSPR26\%} = 0.7$, where SPR is the spawning potential ratio (*ibid*). However, $SSB_{current}/SSB_0$ is 0.18 (*ibid*) and Seafood Watch standards require that appropriate reference points do not allow biomass to fall below 30% of B_0. The stock is in a rebuild program with a target date of 2032.

The red snapper's biological status has changed from overfished in the 2015 assessment to not overfished in the recent 2018 assessment. These changes are the result of stock recovery, but also important changes to the reference point MSST (discussed below) (SEDAR 2018b).

Since the 2018 stock assessment deems that GOM red snapper is no longer overfished, the SSB is well above the LRP, but below the TRP and well below virgin levels, abundance is considered "moderate concern".

Justification:

According to reference points, GoM red snapper have been overfished since 1988, but managers believe that the tide is shifting (SEDAR 2005)(GMFMC 2011). Stock abundance and commercial landings have exhibited declines in the long-term. In the short-term, trends are increasing due to high recruitment and the presence of strong year classes between 2004 and 2006, particularly in the western component of the fishery (SEDAR 2009).

There have been significant differences between the results of the last two stock assessments: the most recent GOM red snapper stock assessment (published in 2018) declared that the stock is no longer overfished. The previous report (published in 2015) estimated $SSB_{2013}/SSB_{FSPR26\%} = 0.54$; deeming the stock as overfished (Cass-Calay et al. 2015); biomass was showing signs of increasing, but was well below the LRP (Cass-Calay et al. 2015).

These changes have largely been a result of the reduction in MSST. MSST has reduced due to changes in how it is calculated, following requirements in Amendment 44 of the Gulf of Mexico Reef Fish Fishery Management Plan. In the previous stock assessment, MSST was calculated as "(1-M) * SSBFSPR26%, where M = 0.09 (i.e., the average value of M from the Lorenzen M curve for fully selected ages)" (Cass-Calay et al. 2015). This has been changed to 0.5 * SSBFSPR26% (SEDAR 2018b). If the previous MSST calculation had still been used with the most up-to-date stock information, the 2018 stock assessment states "the red snapper resource would still be considered overfished (SSB2016/MSSTOLD = 0.77)" (SEDAR 2018b).

The biggest uncertainty in the 2018 stock assessment is still the poor understanding of the stock-recruit relationship (SEDAR 2018b). This has meant that MSY is incalculable. The stock-recruit function relationship is poorly defined because of the unpredictable recruitment and a lack of data. Proxies have been created to

replace MSY. The SPR of SPR26% has been selected as the optimal proxy. However, SPR26% does not include recruitment into the calculation and, therefore, does not aim to determine the maximum yield for economic gain. An SPR at 26% has been considered as too low a percentage for such a long-lived species (SEDAR 2013b). Other proxies of varying SPR including FSPR22%, FSPR24%, FSPR30% and FSPRmax or FSPR20% have been suggested. When FSPR30% was considered, it was suggested that FSPR26% would be the optimum proxy for MSY. If a different proxy to the current one is adopted, the projected rebuild timeframe would also likely change; the Magnuson-Stevens Act would require the rebuild timeframe to be 10 years or less, which could require stricter management measures to be implemented (SEDAR 2015h).

Another important issue with the red snapper stock assessment is the difference in recovery in the eastern and western regions of the GOM. In general red snapper have been steadily rebuilding across both regions since the mid-2000s, but rebuilding in the eastern region appears to have leveled off or declined over the last 3 to 5 years. The population sizes in the eastern region are expected to decline rapidly, while the western region's sizes are continuing to steadily rebuild (SEDAR 2018b).

Factor 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

Moderate Concern

According to the 2018 stock assessment, $F_{current}$/MFMT = 0.823 (SEDAR 2018b), where MFMT is the maximum fishing mortality threshold (defined as $F_{SPR26\%}$); therefore, overfishing is not occurring. Fishing mortality is fluctuating around sustainable proxy levels, and has decreased since previous stock assessments. There is concern that the 2017 landings (which have not been included in the 2018 stock assessment) may change the outcome of the overfishing status due to quota overages (of 50%) in the private sector (NOAA 2017).

Since fishing mortality is trending downwards and fluctuating around the F_{MSY} proxy, fishing mortality is scored as a "moderate concern".

Justification:

While overfishing is not occurring, some concerns about the long-term prognosis of the stock remain.
The most recent stock assessment does not contain the provisional landings data for 2017; yet, in 2017, the length of the recreational seasons was extended by 39 days (NOAA 2017) and the state water management area in Louisiana were increased from 0 to 3 miles to 0 to 9 miles in 2016 (*ibid*), which has caused the private (the recreational fishery accounts for just over half of the GoM red snapper quota (GMFMC 2017c) (50 CFR §622.2017) red snapper sector to exceed its ACL by over 50% (*ibid*). The Department of Commerce stated that the overages will likely delay the rebuilding timeline by six years, but will still allow the continued growth of the stock (albeit at a reduced rate) (50 CFR §622.2017).

Other sources of mortality originate mainly from recreational fishery, discards (in both the commercial and recreational fisheries) and when snapper are caught as bycatch in the shrimp trawl fishery. In three out of the past five years, the recreational fishery has exceeded its quota (NMFS 2016).

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / GULF OF MEXICO
Handlines And Hand-Operated Pole-And-Lines

< 100%

There are no fishery specific discard data available for handline fisheries targeting Spanish and king mackerel. However, handline gear has low rates of bycatch. Kelleher (Kelleher 2005) found that, in general, handline fisheries have a discard rate ranging from 0-7%.

Justification:

According to the Enzenauer report (Enzenauer et al. 2015), which took place in the Carolinas, Georgia/ Florida (Cape Canaveral) and southern Florida (Cape Canaveral to Key West), four of the eight sharks caught in this study were discarded alive and the fate of the other four sharks was "unknown". Seventy eight percent of greater amberjack were retained, while 26% were discarded alive, and almost 95-100% of spotted tunny and almaco jack were retained (*ibid*).

STRIPED MULLET

Factor 2.1 - Abundance

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

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).

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

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).

A 2016 stock assessment in Louisiana found that $SS/SS_{30\%}$ is > 1.0, suggesting that the stock is currently not in an overfished state (West and Powers 2016).

However, because the model in the Louisiana stock assessment indicates that the striped mullet stock was overfished in earlier years of the time-series, abundance is deemed "low concern", instead of "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 2.2 - Fishing Mortality

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets

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 (*ibid*).

UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

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).

According to a 2016 stock assessment of striped mullet in Louisiana, the current estimate of $F/F_{30\%}$ is < 1.0, suggesting the stock is currently not undergoing overfishing (West and Powers 2016). However, the assessment model indicates that the stock did experience overfishing in earlier years of the time-series (*ibid*).

Due to the above, fishing mortality is deemed "low concern".

Justification:

Overfishing occurs when fishing mortality (F) rates exceed the rate necessary to maintain a 35% SPR (*ibid*).

Factor 2.3 - Discard Rate

UNITED STATES OF AMERICA / WESTERN CENTRAL ATLANTIC
Cast Nets
UNITED STATES OF AMERICA / GULF OF MEXICO
Cast Nets

< 100%

There are no fishery specific discard data available for cast net fisheries targeting Spanish and king mackerel. However, this gear is likely to have moderate rates of bycatch. Kelleher (Kelleher 2005) found that, in general, gillnet/entangling net fisheries have a discard rate ranging from 0-66%.