

# Monterey Bay Aquarium Seafood Watch®

**Blue shark** (*Prionace glauca*)  
**Dolphinfish (Mahi mahi)** (*Coryphaena hippurus*)  
**Porbeagle shark** (*Lamna nasus*)  
**Shortfin mako shark** (*Isurus oxyrinchus*)  
**Wahoo** (*Acanthocybium solandri*)



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**U.S. Atlantic and Gulf of Mexico, Canada North Atlantic**

**Drifting longlines, Handlines and hand-operated pole-and-lines, Trolling lines**

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## **Disclaimer**

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

Seafood Watch Standard used in this assessment: Standard for Fisheries vF2

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## **About Seafood Watch**

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

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

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

## **Guiding Principles**

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

Based on this principle, Seafood Watch had developed four sustainability **criteria** for evaluating wildcatch fisheries for consumers and businesses. These criteria are:

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

Each criterion includes:

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

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

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

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

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

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

## **Summary**

This report provides seafood recommendations for mahi mahi, shortfin mako shark, blue shark, and porbeagle shark caught in the U.S. and Canadian longline fisheries that target tuna and swordfish. Tuna and swordfish have been assessed a separate report. This report also provides recommendation for mahi mahi and wahoo caught in U.S. Atlantic handline and troll fisheries.

### **Longline Fisheries**

The U.S. fishery (Atlantic and Gulf of Mexico) targets tuna and swordfish but also captures several shark species including blue shark (*Prionace glauca*) and shortfin mako shark (*Isurus oxyrinchus*), along with mahi mahi (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*). The Canadian fishery targets swordfish but blue, shortfin mako, and porbeagle sharks (*Lamna nasus*) are also caught. This report focuses on blue and shortfin mako sharks along with mahi mahi and wahoo. Tuna and swordfish caught in these fisheries have been assessed in a separate Seafood Watch report.

Porbeagle, blue, and shortfin mako sharks all grow slowly, reach sexual maturity at a late age, and produce few young. In contrast, mahi mahi reaches sexual maturity at a young age and produces a large number of young. The status of mahi mahi in the Atlantic Ocean is considered to be stable although no full assessment has been conducted. Wahoo status is unknown, but not believed to be of concern. Blue shark populations have been assessed as healthy. Shortfin mako shark populations are assessed as likely healthy but there is considerable uncertainty surrounding assessment results. Porbeagle populations are endangered in Canada.

In U.S. and Canadian domestic waters, the National Marine Fisheries Service and Fisheries and Oceans Canada, respectively, manage tuna and swordfish. Mahi mahi and wahoo are also managed by the South Atlantic Fishery Management Council but are not included in management plans under the Gulf of Mexico Fishery Management Council.

These longline fisheries also capture a number of secondary target and bycatch species, including other fish, sharks, and sea turtles. We have included species that typically are reported as 5% or more of the total catch or whose status, e.g., endangered or threatened, justifies their inclusion in this report based on the Seafood Watch criteria. In the U.S. fishery, incidentally captured species include mammals and sea turtles. The U.S. has implemented management measures to address these incidental captures. In the Canadian fishery, sea turtles are also incidentally captured and some management action has been taken to address this. Tuna and swordfish are included in this section because they are primary targeted species, which as noted have been assessed in a separate Seafood Watch report. Management of bycatch species in the U.S. fishery is moderately effective because several measures have been adopted to protect species such as sea turtles. Canada has not adopted as many measures and therefore management is considered insufficient for bycatch species.

Longlines do not typically come in contact with bottom habitats but do capture “exceptional species” and management does not currently take this into account.

### **U.S. Handline and Troll Fisheries for Mahi Mahi and Wahoo**

Both mahi mahi and wahoo mature quickly, are short-lived, and highly fecund, and hence are moderately resistant to fishing pressure. But the stock status and fishing mortality rates for these species are almost entirely unknown.

A single study of the Western Atlantic and Gulf of Mexico mahi mahi stock found biomass to exceed  $B_{MSY}$ , although the data in this analysis are outdated. In the Atlantic, mahi mahi and wahoo are jointly managed under a Fishery Management Plan established by the South Atlantic Fisheries Management Council (SAFMC). There are some measures in place aimed at protecting the Western Atlantic stocks, including size limits for mahi mahi

in Florida, Georgia, and South Carolina (>20" fin length, FL), although there are currently no size restrictions on wahoo landed in U.S. waters. The FMP also sets  $B_{MSY}$  and optimal yields for both species and identifies potential future research topics to inform management agencies on stock status, fishery impacts, life history characteristics, and essential habitat. It is unclear whether any of the efforts to ascertain this information are underway.

Domestic landings account for less than 5% of the mahi mahi available in the U.S. marketplace. There are no data available regarding U.S. wahoo imports and exports. Imported mahi mahi is assessed in separate Seafood Watch reports.

Other pelagic species are captured opportunistically in the Atlantic mahi mahi and wahoo handline and troll fisheries, including yellowfin tuna and swordfish. Recent stock assessments suggest that Atlantic yellowfin is overfished, but the mahi mahi and wahoo handline and troll fisheries do not contribute substantially to total yellowfin mortality. Troll fishing has very low discard rates when compared to other commercial fishing methods and, although there are no estimates of fisheries discards for the Atlantic handline/troll fleets, numerous studies have found that discards with these gear types are negligible.

There is relatively little monitoring of handline and troll operators in this fishery and no research program in place on the effects of the current management plan on Atlantic mahi mahi and wahoo stocks. Compliance with FMP guidelines is enforced by state wildlife and fisheries agencies, the U.S. Coast Guard, and NOAA. Various stakeholder groups have an interest in the management of mahi mahi and wahoo, chiefly commercial fishers and recreational/charter operators. A key objective of the FMP is to ameliorate competition between these constituencies, and to this end, the management plan prohibits the sale of recreationally landed mahi mahi and wahoo and sets an annual cap on the quantity of mahi mahi landed by commercial fishers.

Handline and troll fisheries do not adversely impact the sea floor substrate, so no mitigation measures are necessary. Mahi mahi and wahoo are considered mid-trophic level predators; however, keystone species including sharks are very occasionally captured in the U.S. Atlantic handline/troll fisheries, but do not compose a significant proportion of the catch. Furthermore, sharks are not generally retained; handline and troll gear is highly selective, with fishers able to release undesirable species quickly, thus minimizing capture mortality. But there are no efforts underway to assess the impacts of these gears on the Atlantic pelagic ecosystems.

## 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
Wahoo United States of America Gulf of Mexico, Drifting longlines, United States of America	Green (3.320)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.680)</b>
Blue shark Canada Northwest Atlantic, Drifting longlines, Canada	Green (3.320)	Red (1.410)	Red (1.730)	Green (3.870)	<b>Avoid (2.366)</b>
Porbeagle Canada Northwest Atlantic, Drifting longlines, Canada	Red (1.530)	Red (1.410)	Red (1.730)	Green (3.870)	<b>Avoid (1.949)</b>
Shortfin mako shark Canada Northwest Atlantic, Drifting longlines, Canada	Yellow (2.640)	Red (1.410)	Red (1.730)	Green (3.870)	<b>Avoid (2.234)</b>
Blue shark United States of America Atlantic, Drifting longlines, United States of America	Green (3.320)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.680)</b>
Dolphinfish United States of America Atlantic, Handlines and hand-operated pole-and-lines, United States of America	Green (3.831)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.443)</b>
Dolphinfish United States of America Atlantic, Drifting longlines, United States of America	Green (3.830)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.778)</b>
Shortfin mako shark United States of America Atlantic, Drifting longlines, United States of America	Yellow (2.640)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.531)</b>
Wahoo United States of America Atlantic, Handlines and hand-operated pole-and-lines, United States of America	Green (3.318)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.322)</b>

Wahoo United States of America Atlantic, Drifting longlines, United States of America	Green (3.320)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.680)</b>
Dolphinfish United States of America Gulf of Mexico, Drifting longlines, United States of America	Green (3.830)	Red (1.339)	Yellow (3.000)	Green (3.870)	<b>Good Alternative (2.778)</b>
Wahoo United States of America Atlantic, Hand-operated pole and lines, United States of America	Green (3.318)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.322)</b>
Dolphinfish United States of America Atlantic, Hand-operated pole and lines, United States of America	Green (3.831)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.443)</b>
Wahoo United States of America Atlantic, Trolling lines, United States of America	Green (3.318)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.322)</b>
Dolphinfish United States of America Atlantic, Trolling lines, United States of America	Green (3.831)	Yellow (3.162)	Yellow (3.000)	Green (3.873)	<b>Best Choice (3.443)</b>

## Summary

Mahi mahi, wahoo, blue and shortfin mako sharks caught in the US Atlantic and Gulf of Mexico longline fisheries have an overall recommendation of "Good Alternative". Porbeagle, shortfin mako and blue sharks caught in the Canadian longline fishery have an overall recommendation of "Avoid". Mahi mahi and wahoo caught in the troll and pole-and-line and handline fisheries are a "Best Choice."

## Scoring Guide

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

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

- **Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch



Management Strategy (Factor 3.2) are Very High Concern<sup>2</sup>, and no more than one Red Criterion, and no Critical scores

- **Avoid/Red** = Final Score  $\leq 2.2$ , 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.
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<sup>2</sup> Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

# **Introduction**

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

This report focuses on the U.S. and Canadian longline fisheries and U.S. Atlantic mahi mahi and wahoo handline and troll fisheries.

The U.S. pelagic longline fishery (Atlantic and Gulf of Mexico) targets tuna and swordfish but also captures several shark species including blue shark (*Prionace glauca*) and shortfin mako shark (*Isurus oxyrinchus*), along with mahi mahi (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*). The Canadian fishery targets swordfish, but blue, shortfin mako, and porbeagle sharks (*Lamna nasus*) are also caught. The pelagic longline portion of this report focuses on blue and shortfin mako sharks, along with mahi mahi and wahoo. Tuna and swordfish caught in these fisheries have been assessed in separate Seafood Watch reports, but are discussed herein and assessed in the handline and troll fisheries.

Other pelagic species are captured opportunistically in the Atlantic mahi mahi and wahoo handline and troll fisheries, including yellowfin tuna and swordfish. Domestic landings account for less than 5% of the mahi mahi available in the U.S. marketplace. There are no data available regarding U.S. wahoo imports and exports.

## **Species Overview**

### Mahi mahi

Mahi mahi is a highly migratory species found worldwide in tropical and subtropical waters. Mahi mahi reaches sexual maturity at a young age, grows quickly, and produces a large number of young. Mahi mahi is typically found in pelagic habitats, where it forms schools and is commonly found associated with floating objects. Mahi mahi is a top predator, feeding on small fish and squid (Froese and Pauly 2015).

### Wahoo

Wahoo (*Acanthocybium solandri*) is the only extant member of the genus *Acanthocybium* and is a member of the family Scombridae, along with tunas and mackerels. Wahoo also is a mid-trophic level predator, feeding primarily on other fishes and occasionally cephalopods (Froese and Pauly 2016) (Polovina et al. 2009). It is found worldwide in tropical and subtropical waters between 20° and 30°C. (Zischke et al. 2013). Wahoo is not sexually dimorphic. Both males and females reach sexual maturity in the first year of life (Jenkins and McBride 2009) (Brown-Peterson et al. 2000). Wahoo grows to at least 200 cm FL (Hogarth 1976, as cited in (Collette et al. 2011)) and females are also highly fecund, producing as many as 1.7 million eggs per spawning event (Jenkins and McBride 2009). Estimates of wahoo lifespan range from 5 to 10 years (for review see (Zischke et al. 2013)). Wahoo often is associated with floating debris and targeted near fish aggregation devices (Collette et al. 2011).

In the Western Atlantic, wahoo ranges from New York to Colombia, including in the Gulf of Mexico and the Caribbean Sea (SAFMC 2003). Like those for mahi mahi, wahoo landings vary seasonally in the Western Atlantic. Peak catches typically occur off North and South Carolina from April to September, and in the eastern Caribbean between December and June. Wahoo is available year-round in Florida, Puerto Rico, and the U.S. Virgin Islands (SAFMC 2003). Wahoo is highly migratory; in one case, traveling a distance of 1,707 mi (2,747 km) in just over 6 months (NMFS 1999).

### Sharks

Blue shark is a highly migratory species of shark found throughout the world's oceans in epipelagic and mesopelagic waters. Blue shark reaches sexual maturity at a late age, grows slowly, and produces a small number of young. It is the most widely distributed shark species and the most abundant, with abundance

increasing with latitude. Blue shark is an apex predator, consuming a variety of fish and squid species (ISCSWG 2014).

Porbeagle shark is a highly migratory species of shark found in pelagic and epipelagic waters. It is found within the North Atlantic and temperate waters in the Southern hemisphere. It is most commonly found on continental and offshore regions but can be found inshore. Porbeagle shark feeds on schooling species of fish, squid, and other sharks. Porbeagle is slow growing, reaching sexual maturity at a late age and producing a small number of young (Froese and Pauly 2015).

Shortfin mako shark is a highly migratory species of shark found in coastal and oceanic epipelagic waters worldwide (from 20° S to 40° N). It is an apex predator, feeding on fish and cephalopods, among other prey. Like other shark species, sexual maturity is reached at a late age, growth is slow, and shortfin mako shark produces only a small number of young (Froese and Pauly 2015).

## **Production Statistics**

### Mahi Mahi and Sharks

Porbeagle catches from Canada have dropped over time. Catches peaked at 1,575 t in 1994. By 2003, catches were under 200 t and only 19 t were reported during 2013 (ICCAT 2014). Catches of shortfin mako shark by Canada have remained fairly low over time, with only 35 t reported in 2013 (ICCAT 2014). Canadian catches of blue shark have not been reported since 2008. Prior to this, catches were variable, ranging from a high of 1,702 t in 1993 to a low of 346 t in 2003 (ICCAT 2014).

In the U.S., catches of shortfin mako shark have hovered between 300 and 400 t since 1990. In 2013, the U.S. reported catches of 402 t of shortfin mako shark (ICCAT 2014). Catches of blue shark have decreased from 200–300 t during the 1990s to only 32 t in 2013 (ICCAT 2014). Catches of mahi mahi have been variable over time. The U.S. reported that 68,124 mahi mahi were retained in 2007 but only 34,250 mahi mahi were retained in 2013 (NMFS 2014c).

### Wahoo

Wahoo is incidentally captured throughout its range in fisheries targeting tuna, swordfish, and mahi mahi (Zischke et al. 2013). Global landings have increased significantly in the past 50 years (Figure 1). Anomalous peaks in landings, due to sporadic reporting by major fishing nations, may indicate a historic underreporting of the worldwide wahoo catch, although recent data are likely more reliable (Zischke et al. 2013).

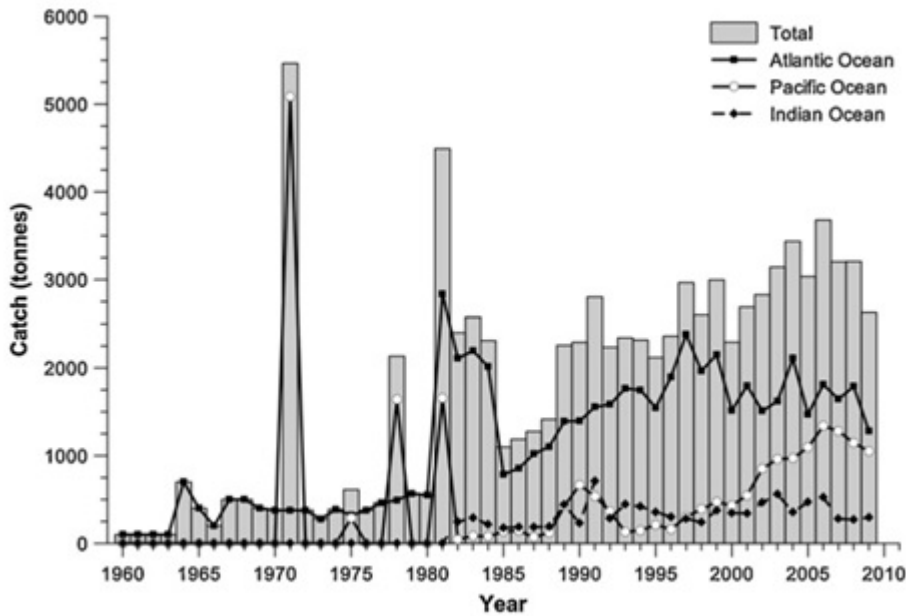


Figure 1 Worldwide wahoo landings by year and ocean basin (from Zischke 2012, data from FAO 2011).

In 2010, commercial fishers in the U.S. caught 300 MT of wahoo. The vast majority of domestically landed wahoo originate from the Hawaiian Islands (91.1%). The remainder are landed primarily in Florida (cumulative east and west coasts, 4.8%) and North Carolina (1.9%). Other states reporting nominal wahoo catch (<1% of U.S. landings) include South Carolina, Texas, Virginia, New York, New Jersey, Connecticut, Massachusetts, and Louisiana (NMFS 2011c).

Wahoo in the Atlantic are landed primarily with longline, troll and handline gears (Figure 2, R. Kokubun pers com.; (NMFS 2011c)).

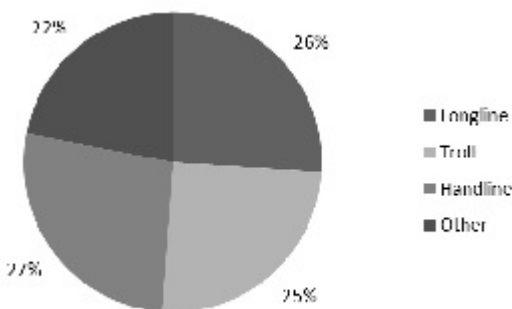


Figure 2 Wahoo catch by gear type in the U.S. Atlantic. "Other" gears include gill nets, diving outfits and combination gear (NMFS 2011c).

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

#### Mahi mahi and sharks

During 2014, the United States imported 26,467 t of mahi mahi. The majority of this (26%) came from Ecuador, followed by Chinese Taipei (21%) and Peru (21%). Another 6% (1,595 t) was imported from Panama (NMFS 2015). Species-specific information on import and exports of blue, shortfin mako, and porbeagle sharks is not available through the National Marine Fisheries Service. During 2014, imports of fresh shark primarily came from Mexico, with smaller amounts imported from Canada, China, Costa Rica, and Spain. Shark fins were

imported from New Zealand and China (NMFS 2015).

### Wahoo

The United States Census Bureau's foreign trade database, based on import and export declarations made to U.S. Customs and Border Protection, does not include a separate category for wahoo and therefore no foreign trade data (imports, exports, re-exports) are available for this species (pers. comm., M. Liddel 2015).

### **Common and market names.**

Porbeagle, shortfin mako and blue sharks are also known as 'shark'. Mahi mahi is also known as dolphinfish. Wahoo (*A. solandri*) is sold both as wahoo and ono.

### **Primary product forms**

Mahi mahi and shark species are sold in fresh and frozen form. Wahoo is available as fresh or frozen whole, fillets, steaks, and headed and gutted.

## Assessment

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

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

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

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

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

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

#### Criterion 1 Summary

BLUE SHARK				
Region   Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
Canada/Northwest Atlantic Drifting longlines   Canada	1.00: High	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)
United States of America/Atlantic Drifting longlines   United States of America	1.00: High	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)

DOLPHINFISH				
Region   Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
United States of America/Atlantic Handlines and hand-operated pole-and-lines   United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)
United States of America/Atlantic Drifting longlines   United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)

United States of America/Gulf of Mexico Drifting longlines   United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)
United States of America/Atlantic Hand-operated pole and lines   United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)
United States of America/Atlantic Trolling lines   United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)

PORBEAGLE				
Region   Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
Canada/Northwest Atlantic Drifting longlines   Canada	1.00: High	1.00: Very High Concern	2.33: Moderate Concern	Red (1.53)

SHORTFIN MAKO SHARK				
Region   Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
Canada/Northwest Atlantic Drifting longlines   Canada	1.00: High	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)
United States of America/Atlantic Drifting longlines   United States of America	1.00: High	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)

WAHOO				
Region   Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
United States of America/Gulf of Mexico Drifting longlines   United States of America	2.00: Medium	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)

United States of America/Atlantic Handlines and hand-operated pole-and-lines   United States of America	2.00: Medium	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)
United States of America/Atlantic Drifting longlines   United States of America	2.00: Medium	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)
United States of America/Atlantic Hand-operated pole and lines   United States of America	2.00: Medium	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)
United States of America/Atlantic Trolling lines   United States of America	2.00: Medium	3.00: Moderate Concern	3.67: Low Concern	Green (3.32)

Blue shark was last assessed in 2015 and its status is considered healthy. Although a full stock assessment of mahi mahi has not been conducted, there are indications that its population is stable. Porbeagle populations, although assessed a number of years ago, appear to be below sustainable levels. In addition, porbeagle shark is listed as Endangered by the Committee on the Status of Endangered Wildlife In Canada. The most recent assessment of shortfin mako shark in the Atlantic suggested that the population was healthy. There was a large degree of uncertainty surrounding these results and its actual status. The status of wahoo is uncertain.

## Criterion 1 Assessment

### SCORING GUIDELINES

#### Factor 1.1 - Inherent Vulnerability

- *Low*—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).
- *Medium*—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing, (e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain).
- *High*—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make it particularly vulnerable to fishing, (e.g., long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator). Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g., schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.



## Factor 1.2 - Abundance

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

## Factor 1.3 - Fishing Mortality

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

## BLUE SHARK

### Factor 1.1 - Inherent Vulnerability

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### High

FishBase assigned a high to very high vulnerability score of 77 out of 100 (Froese and Pauly 2013). Blue shark reaches sexual maturity around 4–7 years of age and reaches a maximum size and age of 380 cm and 16 years, respectively. Blue shark gives birth to live pups every 1–2 years (ISCSWG 2014). These life history characteristics also suggest a high inherent vulnerability to fishing.

### Factor 1.2 - Abundance

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### Moderate Concern

Blue shark in the North Atlantic was last assessed in 2015. Two different models were used to determine the status of blue shark in the North Atlantic. Both models indicated that the population is most likely not overfished. The Bayesian surplus production model indicated that the biomass in 2013 was between 196% and 205% of levels needed to produce the maximum sustainable yield (MSY). The Stock Synthesis III model

indicated that the spawning stock in 2013 was 135% to 345% of levels needed to produce MSY (ICCAT 2015). But the assessment noted that, due to considerable uncertainty in data inputs and model structure assumptions, the possibility that overfishing was occurring and the stock was overfished could not be ruled out (ICCAT 2015). Blue shark is considered Near Threatened (globally) by the International Union for the Conservation of Nature (IUCN) and a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Stevens 2009) (COSEWIC 2006). We have awarded a “moderate” concern score because there is still a large amount of uncertainty surrounding these estimates.

### **Factor 1.3 - Fishing Mortality**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **Low Concern**

Blue shark has one of the highest susceptibilities to longline fishing gear among elasmobranchs in the Atlantic (ICCAT 2012a), and longlines are the primary gear that captures blue shark in the North Atlantic. But according to the 2015 assessment, overfishing is not occurring. Two models were used to assess fishing mortality rates of blue shark in the North Atlantic. Both indicated that fishing mortality rates are currently below levels needed to produce the maximum sustainable yield ( $F_{2013}/F_{MSY} = 0.04-0.50$  and  $0.15-0.75$ ) (ICCAT 2015). We have awarded a “low” concern score because it appears that overfishing is not occurring but not a very low concern score to account for large amounts of uncertainty.

### **DOLPHINFISH**

#### **Factor 1.1 - Inherent Vulnerability**

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Medium**

FishBase assigned a moderate vulnerability score of 39 out of 100 (Froese and Pauly 2013). Dolphinfinch reaches sexual maturity between 35 and 55 cm in length and within the first year of life. The maximum size and age reached is 210 cm and 4 years of age. It is a broadcast spawner and high-level predator (Froese and Pauly 2014).

#### **Factor 1.2 - Abundance**

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Low Concern**

Dolphinfinch is assessed along with 13 other “small tunas” in the Atlantic. Currently, there is not enough

information to conduct a full assessment of this group (ICCAT 2012a). A separate preliminary attempt at a stock assessment for dolphinfish in the Caribbean and for the U.S. fishery was conducted in 2006. The results suggested that catch rates had been fairly stable over the 10-year study period and that the population was likely near virgin levels in both areas (Parker et al. 2006). In addition, the International Union for Conservation of Nature (IUCN) considers dolphinfish a species of Least Concern with a stable population trend. We have awarded a "low" concern score due to the IUCN status and the results of the preliminary assessment indicating that the population was likely near virgin levels.

### **Factor 1.3 - Fishing Mortality**

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Low Concern**

Dolphinfish makes up a small proportion of "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data (ICCAT 2012a). Dolphinfish is caught by a variety of gears (Collette et al. 2011d). United States catches of dolphinfish increased dramatically during the late 1980s and early 1990s but subsequently decreased again. Since 2000, catches have fluctuated with no real trend (FAO 2013). Fisheries are not considered to be a major threat to dolphinfish (Collette et al. 2013). We have awarded a "low" concern score because fishing mortality overall is a low concern because dolphinfish is not heavily exploited and not believed to be threatened by fishing.

### **PORBEAGLE**

#### **Factor 1.1 - Inherent Vulnerability**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **High**

FishBase has assigned a very high vulnerability score of 86 out of 100 (Froese and Pauly 2013). Porbeagle shark reaches sexual maturity between 162 and 230 cm in length and from 8 to 13 years in age. A maximum length of 317 cm and age >26 years can be attained (ICCAT 2009). Porbeagle shark is a top predator and gives birth to live young (Froese and Pauly 2016). These life history characteristics also suggest a high inherent vulnerability to fishing.

#### **Factor 1.2 - Abundance**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Very High Concern**

An assessment of porbeagle shark in the Northwest Atlantic Ocean was conducted in 2008. According to this assessment, the abundance was very low- well below BMSY levels, although the abundance does appear to be increasing in recent years (ICCAT 2008). The International Union for the Conservation of Nature (IUCN) has listed porbeagle shark as Vulnerable and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) considers porbeagle sharks to be Endangered (Stevens et al. 2006)(COSEWIC 2004). We have awarded a "very high" concern score based on abundance being below BMSY, combined with the various listings by IUCN and Canada.

## Factor 1.3 - Fishing Mortality

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### Moderate Concern

Fishing mortality rates of porbeagle shark in the Northwest Atlantic Ocean are below levels needed to produce the maximum sustainable yield (FMSY) ( $F_{\text{current}}/F_{\text{MSY}}$  ranged from 0.03 to 0.36) and therefore overfishing is not occurring (ICCAT 2008). But this assessment is several years old and the Committee for the Status of Endangered Wildlife in Canada has recently re-assessed this species and maintained the Endangered status due to the large amounts of unknown mortality, including bycatch in Canadian fisheries (COSEWIC 2014). We have therefore awarded a "moderate" concern instead of low concern score.

## SHORTFIN MAKO SHARK

### Factor 1.1 - Inherent Vulnerability

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### High

FishBase assigned a very high vulnerability of 86 out of 100 (Froese and Pauly 2013). Shortfin mako shark reaches sexual maturity between 180 and 200 cm in size. The maximum size attained by shortfin mako shark is around 325–375 cm and it can live 25–40 years. Shortfin mako shark is a top predator and gives birth to live young (Froese and Pauly 2015).

### Factor 1.2 - Abundance

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Moderate Concern

The last assessment for shortfin mako sharks in the North Atlantic was conducted in 2012. The results of this assessment indicated that the biomass was above BMSY and that the population is not overfished. Catch rate trends showed increasing trends or flat trends in recent years. However, there were inconsistencies between estimated biomass trajectories and CPUE trends, which resulted in a fair amount of uncertainty within the estimated biomass. The current biomass to BMSY ratio was estimated to range between 1.15-2.04 and the current biomass to virgin biomass ratio ranged from 0.55-1.63 (ICCAT 2012b). Based on these estimates the population is not overfished. However, the assessment was surrounded by a large amount of uncertainty (ICCAT 2014).

The International Union for the Conservation of Nature (IUCN) considers shortfin mako sharks to be Vulnerable (globally) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) considers this species to be threatened (Cailliet et al. 2009)(COSEWIC 2006b). These classifications pre-date the most recent assessment. We have awarded a moderate concern score based on this classification combined with the high level of uncertainty surrounding the most recent assessment for shortfin mako sharks in the Atlantic Ocean.

### Factor 1.3 - Fishing Mortality

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### Moderate Concern

Ecological Risk Assessments of Atlantic sharks indicate that shortfin mako shark is one of the shark species most susceptible to longline capture in the Atlantic (ICCAT 2012a). In terms of individual countries' catches of shortfin mako sharks, Canada reports few catches in the North Atlantic ocean. The last population assessment indicated that fishing mortality was currently below levels needed to produce the maximum sustainable yield (FMSY). The estimated ratio of current fishing mortality rates to FMSY ranged from 0.16 to 0.92. According to these results, overfishing is not occurring. There was considerable uncertainty surrounding the results of this assessment and it was noted that fishing mortality should remain constant until more reliable results are available (ICCAT 2012b). In addition, there are concerns with underreporting of catches. We have therefore awarded a "moderate" concern score.

### WAHOO

#### Factor 1.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### Medium

FishBase assigned a moderate to high vulnerability score of 46 out of 100. Wahoo reaches sexual maturity around 99 cm in length and 1 year of age. The maximum length attained is 250 cm and it can live to around 9 years of age. Wahoo is a broadcast spawner and considered a top predator (Froese and Pauly 2014). These life history characteristics also suggest a moderate level of vulnerability.

#### Factor 1.2 - Abundance

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### Moderate Concern

In the Atlantic, wahoo is assessed along with 13 other "small tuna" species. Currently, there is not enough information to conduct a full assessment of this group (ICCAT 2012a). In the Gulf of Mexico, wahoo is not assessed. The International Union for Conservation of Nature (IUCN) considers the Atlantic population a population of Least Concern, indicating that there is no evidence to suggest populations are declining overall, although local decreases in abundance might have occurred (Collette et al. 2011f). An assessment conducted in the Caribbean suggested stable populations between 1996 and 2006 (Collette et al. 2011f). We have awarded a "moderate" concern score because a stock assessment has not been completed, although it is listed as Least Concern by the IUCN and it has a moderate vulnerability level.

### **Factor 1.3 - Fishing Mortality**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Low Concern**

Wahoo makes up a small proportion of “small tuna” catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data (ICCAT 2012a). Catches of wahoo in the Atlantic have been variable over time. Fishing is not thought to have negatively affected wahoo populations in the Atlantic Ocean, although increased fishing on fish aggregation devices (FADs) has led to increased fishing and bycatch mortality rates (Collette et al. 2011f). In the Gulf of Mexico, there is a small amount of wahoo caught in the tuna fisheries. We have awarded a “low” concern score because fishing mortality does not appear to adversely affect the population.

## **Criterion 2: Impacts on other species**

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

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

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

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

### **Criterion 2 Summary**

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

BLUE SHARK - CANADA/NORTHWEST ATLANTIC - DRIFTING LONGLINES - CANADA					
Subscore:	1.410	Discard Rate:	1.00	C2 Rate:	1.410
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Porbeagle	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Shortfin mako shark	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)	

**BLUE SHARK - UNITED STATES OF AMERICA/ATLANTIC - DRIFTING LONGLINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.339</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Short-finned pilot whale	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Shortfin mako shark	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)	
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)	
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.830)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)	

**DOLPHINFISH - UNITED STATES OF AMERICA/ATLANTIC - DRIFTING LONGLINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.339</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Short-finned pilot whale	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	



Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Shortfin mako shark	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)
Blue shark	1.00:High	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)

DOLPHINFISH - UNITED STATES OF AMERICA/ATLANTIC - HANDLINES AND HAND-OPERATED POLE-AND-LINES - UNITED STATES OF AMERICA					
<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)	
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.318)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	

DOLPHINFISH - UNITED STATES OF AMERICA/ATLANTIC - HAND-OPERATED POLE AND LINES - UNITED STATES OF AMERICA					
<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.318)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)

DOLPHINFISH - UNITED STATES OF AMERICA/ATLANTIC - TROLLING LINES - UNITED STATES OF AMERICA					
<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)	
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.318)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	

DOLPHINFISH - UNITED STATES OF AMERICA/GULF OF MEXICO - DRIFTING LONGLINES - UNITED STATES OF AMERICA					
<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.339</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Escolar	2.00:Medium	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Long snouted lancetfish	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)	

Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Blackfin tuna	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)

**PORBEAGLE - CANADA/NORTHWEST ATLANTIC - DRIFTING LONGLINES - CANADA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>1.410</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Shortfin mako shark	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)	
Blue shark	1.00:High	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)	

**SHORTFIN MAKO SHARK - CANADA/NORTHWEST ATLANTIC - DRIFTING LONGLINES - CANADA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>1.410</b>
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	

Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)
Porbeagle	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)
Blue shark	1.00:High	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)

**SHORTFIN MAKO SHARK - UNITED STATES OF AMERICA/ATLANTIC - DRIFTING LONGLINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.339</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Short-finned pilot whale	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)	

Blue shark	1.00:High	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Wahoo	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.830)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)

WAHOO - UNITED STATES OF AMERICA/ATLANTIC - DRIFTING LONGLINES - UNITED STATES OF AMERICA					
Subscore:	1.410	Discard Rate:	0.95	C2 Rate:	1.339
Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Bigeye tuna	2.00:Medium	2.00:High Concern	1.00:High Concern	Red (1.410)	
Short-finned pilot whale	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)	
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)	
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)	
Shortfin mako shark	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)	
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)	
Albacore	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.160)	
Blue shark	1.00:High	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)	
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.830)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)	

**WAHOO - UNITED STATES OF AMERICA/ATLANTIC - HANDLINES AND HAND-OPERATED POLE-AND-LINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)	
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	

**WAHOO - UNITED STATES OF AMERICA/ATLANTIC - HAND-OPERATED POLE AND LINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)	
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	

**WAHOO - UNITED STATES OF AMERICA/ATLANTIC - TROLLING LINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>3.162</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>3.162</b>
<b>Species</b>	<b>Inherent Vulnerability</b>	<b>Abundance</b>	<b>Fishing Mortality</b>	<b>Subscore</b>	
Yellowfin tuna	2.00:Medium	2.00:High Concern	5.00:Very Low Concern	Yellow (3.162)	
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)	
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.472)	

**WAHOO - UNITED STATES OF AMERICA/GULF OF MEXICO - DRIFTING LONGLINES - UNITED STATES OF AMERICA**

<b>Subscore:</b>	<b>1.410</b>	<b>Discard Rate:</b>	<b>0.95</b>	<b>C2 Rate:</b>	<b>1.339</b>
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Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Silky shark	1.00:High	2.00:High Concern	1.00:High Concern	Red (1.410)
Bluefin tuna	1.00:High	1.00:Very High Concern	2.33:Moderate Concern	Red (1.530)
Leatherback turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Loggerhead turtle	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.920)
Escolar	2.00:Medium	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.640)
Yellowfin tuna	2.00:Medium	2.00:High Concern	3.67:Low Concern	Yellow (2.710)
Long snouted lancetfish	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Blackfin tuna	2.00:Medium	3.00:Moderate Concern	3.67:Low Concern	Green (3.320)
Dolphinfish	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.830)
Swordfish	2.00:Medium	4.00:Low Concern	5.00:Very Low Concern	Green (4.470)

The scoring for Criterion 2 applies to the fishery as a whole based on its impact on bycatch species. Scoring for Criterion 2 is based on the worst scoring species caught within each fishery. The U.S. Atlantic and Gulf of Mexico (GOM) longline fishery catch a variety of species in addition to the targeted species. Marine mammals and seabirds are typically caught in very low numbers in the U.S. Atlantic swordfish and tuna longline fisheries. Interactions have been reported (<0.01% of observed catch) with dolphins, pilot whales, minke whales, sperm whales, and false killer whales. Seabird interactions are also very infrequent but can include gannets, gulls, and shearwaters (Parkes et al. 2013) (NOAA 2012). For example, seabird interactions range from 27 to 284 per year or an average of 62 per year, with a catch rate of 0.005 to 0.036 birds/1,000 hooks (NOAA 2012). Sea turtle interactions have decreased over the past 10 years, mostly due to the implementation of bycatch mitigation measures. In 2004, 1,362 and 734 interactions with leatherback and loggerhead turtles (respectively) occurred but by 2011, only 239 and 438 interactions (respectively) occurred (NOAA 2012). Loggerhead interactions typically occur in northern areas of the fishery, while leatherback interactions occur more frequently in the Mid-Atlantic Bight and GOM. In addition to these species, sharks, billfish, and other fish are also incidentally captured. We have included several additional "main species" in this report because they represent at least 5% of the catch or due to their vulnerability and status (Seafood Watch criteria). U.S. pelagic longline observer program data and HMS SAFE reports were used to identify these species. The worst scoring species in the GOM and Atlantic longline fisheries is the silky shark, based on its stock status and fishing mortality rates. Short-finned pilot whale is also a worst scoring species in the Atlantic fishery.

In the Canadian longline fishery, a variety of species are also caught. Seabird bycatch does not appear to be a major issue in this fishery. Several species of sea turtles have been observed in this fishery. A variety of sharks

have been observed caught in this fishery but the primary species is the blue shark. In addition, billfish and other fish species can be incidentally captured. We have included several additional “main species” in this report because they represented at least 5% of the total catch or due to their vulnerability to fishing. Observer data was used to determine these species. The worst scoring species in this fishery are leatherback and loggerhead sea turtles, along with Atlantic bluefin tuna, based on their stock status and fishing mortality rates.

The troll/pole and handline fisheries are highly selective, with the only main species being dolphinfish, wahoo, swordfish, and yellowfin tuna.

#### US Gulf of Mexico

Species	Justification	Score
Silky shark	High concern	
Yellowfin tuna	Target species	
Blackfin tuna	Target species	
Longsnout lancetfish	High bycatch	
Swordfish	Target species	
Bluefin tuna	2% observed catch (2007-2009), status	SEFSC POP data; HMS 2014b
Escolar	6% observed catch (2007-2009)	SEFSC POP data
Lancetfish	12% observed catch (2007-2009)	SEFSC POP data
Leatherback	IUCN listing	SEFSC POP data; NMFS 2014b
Loggerhead		

#### US Atlantic

Species	Justification	Source
Bigeye tuna	Target species	



Silky shark	High concern	
Atlantic bluefin tuna	High concern	
Yellowfin tuna	Target species	
Albacore tuna	Target species	
Swordfish	Target species	
Leatherback	0.12 % observed catch (2005-2011), IUCN listing	MMI 2011
Loggerhead	0.25 % observed catch (2005-2011), IUCN listing	MMI 2011
Short-finned pilot whale	majority of PBR	Waring et al. 2013

## Canada

Species	Justification	Source
Bigeye tuna	Target species	
Yellowfin tuna	Target species	
Albacore	Target species	
Swordfish	Target species	
Atlantic bluefin tuna	Target species	
	Target species	
leatherback	IUNC listing	MMI 2011
loggerhead	IUCN listing	MMI 2011

## Criterion 2 Assessment

### SCORING GUIDELINES

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

*(same as Factor 1.1 above)*

## Factor 2.2 - Abundance

(same as Factor 1.2 above)

## Factor 2.3 - Fishing Mortality

(same as Factor 1.3 above)

### SILKY SHARK

#### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### High

FishBase assigned a very high vulnerability of 79 out of 100 (Froese and Pauly 2015). Silky shark reaches sexual maturity between 200 and 260 cm in size and 7 to 12 years of age. Silky shark gives birth to live young. It reaches a maximum size of 350 cm and lives at least 25 years (Froese and Pauly 2015). These life history characteristics also suggest a high vulnerability to fishing.

#### Factor 2.2 - Abundance

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### High Concern

A stock-wide population assessment of silky shark in the Atlantic Ocean has not been conducted. The International Union for Conservation of Nature (IUCN) has listed silky shark as Vulnerable in the Northwest Atlantic and Western Central Atlantic Ocean and Near Threatened in the Southwest Atlantic Ocean. Some analysis of catch rate series in the Northwest and Central Atlantic Ocean have indicated large declines in population size (Baum et al. 2003) (Cortes et al. 2007). There are significant issues with species identification and an overall lack of reporting for this species (Bonfil et al. 2009). We have awarded a "high" concern score based on the IUCN status.

#### Factor 2.3 - Fishing Mortality

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### High Concern

Fishing mortality rates of silky shark in the Atlantic are not known but it is known to be caught in pelagic longline fisheries. An Ecological Risk Assessment found silky shark scored 8th out of 20 species for susceptibility to pelagic longline gear in the North Atlantic, indicating that it is highly susceptible (Cortes et al. 2012). A lack of reporting and species identification issues have made assessing fishing mortality rates difficult (Bonfil et al. 2008). In the entire U.S. pelagic longline fishery, silky shark represents around 30% of all elasmobranchs (Beerkircher et al. 2002). Incidental and targeted mortality from fisheries, including longlines, is thought to be a contributing factor to silky shark population declines (Bonfil et al. 2009). We have awarded a "high" concern and not critical concern score because, even though fishing mortality rates are unknown and fishing appears to be a contributing factor to population declines, the U.S. has prohibited this species from being retained by pelagic longline vessels.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%-19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## YELLOWFIN TUNA

### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### Medium

FishBase assigned a "moderate" vulnerability score of 46 out of 100 (Froese and Pauly 2013). Yellowfin tuna reaches sexual maturity around 100 cm in size and 2-5 years in age. A maximum length of 140-150 cm can be attained and it can live 8-9 years. It is a broadcast spawner and high-level predator in the ecosystem (Froese and Pauly 2014) (ICCAT 2014). These life history characteristics also support a moderate level of vulnerability.

## Factor 2.2 - Abundance

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### High Concern

Yellowfin tuna in the Atlantic Ocean was last assessed in 2016. The population is currently estimated to be about 5% below Convention objectives ( $B_{2014}/B_{MSY} = 0.95$  (0.71–1.36)), with a 45.5% chance that the population is not overfished or undergoing overfishing. Their status has improved since the 2011 assessment, when it was estimated at 85% of  $B_{msy}$  with a 26% chance the population is not overfished or undergoing overfishing. However, the stock is still considered to be overfished (ICCAT 2016b). This rates as “high” concern because the population is classified as overfished.

## Factor 2.3 - Fishing Mortality

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Low Concern

The current fishing mortality rate is estimated to be 23% below  $F_{MSY}$  ( $F_{current}/F_{MSY} = 0.77$  (0.53–1.05)) and the maximum sustainable yield (MSY) is estimated at 126,304 t (ICCAT 2016b). This suggests that fishing mortality rates are sustainable and overfishing is not occurring. The assessment suggested only a 13.3% chance the stock is both overfished and undergoing overfishing and suggested that the continuation of current catch levels into the future will be sustainable through 2014. We have therefore awarded a low concern score.

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### Very Low Concern

The current fishing mortality rate is estimated to be 23% below  $F_{MSY}$  ( $F_{current}/F_{MSY} = 0.77$  (0.53–1.05)) and the maximum sustainable yield (MSY) is estimated at 126,304 t (ICCAT 2016b). This suggests that fishing mortality rates are sustainable and overfishing is not occurring. The assessment suggested only a 13.3% chance the stock is both overfished and undergoing overfishing and suggested that the continuation of current catch levels into the future will be sustainable through 2014.

In 2013, only 5.5% (90.9 MT) of all commercial yellowfin landings in the U.S. Atlantic were caught by troll and handline fishing combined (NMFS 2014c). The proportion of these landings from the mahi-wahoo handline and troll fisheries is unknown, but it is likely to be less than 5% of all commercial yellowfin landings. Thus, the

mahi-wahoo handline and troll fisheries probably are not substantial contributors to yellowfin tuna mortality and have a negligible impact on the stock. Therefore we have rated this as “very low” concern.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### < 20%

Handline and troll fishing have very low discard rates compared to other commercial fishing methods (Baily et al. 1996) (Harrington et al. 2005) (Kelleher 2005) (NMFS 2011). A recent nationwide assessment of discards in U.S. fisheries also suggests that the discard rates in the coastal migratory species troll fisheries in the South Atlantic are low: 8,774.48 individuals discarded and 985,790 individuals landed (NMFS 2011), though the authors did not calculate actual discard rates due to multiple confounding factors.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009,

observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## BIGEYE TUNA

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

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
 UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **Medium**

FishBase assigned a high to very high vulnerability of 72 out of 100 (Froese and Pauly 2013). Bigeye tuna's life history characteristics suggest a medium vulnerability to fishing. For example, bigeye tuna reaches sexual maturity around 100–125 cm, reaches a maximum size of 200 cm, and lives around 11 years (Davies et al. 2011) (Froese et al. 2013). It is a broadcast spawner and top predator (Froese and Pauly 2013). Based on these life history characteristics, we have awarded a medium score.

#### **Justification:**

Life history characteristic	Parameter	Score
Average size at maturity	>200 cm	1
Average maximum size	<300 cm	2
Average maximum age	10-25 years	2
Reproductive strategy	Broadcast spawner	3
Trophic level	>3.25	1
Average score		1.8

### **Factor 2.2 - Abundance**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
 UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **High Concern**

Bigeye tuna in the Atlantic was last assessed in 2015. Several models were used in this assessment. The Stock Synthesis model indicates that the biomass has decreased over time and fell below the levels necessary to produce the maximum sustainable yield (BMSY) in 2010. The Age Structured Production Model indicated that the ratio of the biomass in 2014 to that needed to produce the maximum sustainable yield (B2014/BMSY) ranged between 0.554 and 1.225. The Virtual Population Analysis also indicated that the population is overfished (ICCAT 2015a). The current status is assessed to be overfished based on the most plausible model runs (0.48–1.20). We have awarded a "high" concern score because there is evidence the population of bigeye tuna in the Atlantic is overfished.

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

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
 UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **High Concern**

According to the Age Structured Production model used in the 2015 assessment, the ratio of fishing mortality

in 2014 to that needed to produce the maximum sustainable yield (F2014/FMSY) ranged from 0.576 to 1.436. According to the stock synthesis model, the F2014/FMSY ratio appears to have decreased in recent years to below 1. The Virtual Population Analysis (VPA) base model indicated that overfishing is not occurring, although some model runs indicated that overfishing is occurring. The VPA results were sensitive to the values used for recruitment (ICCAT 2015a). Based on the most plausible model runs (0.62–1.85), there is an indication that overfishing is occurring (ICCAT 2015a). Because overfishing is occurring, we rated this a “high” concern.

## Factor 2.4 - Discard Rate

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## SHORT-FINNED PILOT WHALE

### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### High

Marine mammals have a high vulnerability score (Seafood Watch 2013).

### Factor 2.2 - Abundance

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### High Concern

Short-finned pilot whale is considered Data Deficient with an unknown population trend by the International Union for Conservation of Nature (IUCN). There are no global estimates of abundance or stock-wide estimates in the Atlantic (Taylor et al. 2012b). Within U.S. waters, the total number of animals is unknown but there are population estimates from specific regions and time periods, and these estimates have been used to estimate a total population size of 24,674 whales (Waring et al. 2013). Trends in abundance cannot be determined in this region (Waring et al. 2013). We have awarded a “high” concern score due to the unknown status and high inherent vulnerability.

## Factor 2.3 - Fishing Mortality

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### High Concern

Short-finned pilot whale is caught in the U.S. pelagic longline fishery (NMFS 2012b). The Potential Biological Removal is 159 individuals, and total fishery-related mortality estimates for short-finned and long-finned pilot whales combined between 2005 and 2009 were 162 whales, the majority of which was due to the pelagic longline fishery, midwater trawl fishery, and groundfish fishery (Waring et al. 2013). The pelagic longline fishery was responsible for an average combined 119 whale deaths between 2005 and 2009 (Waring et al. 2013). It is unknown how many of the total fishery mortalities were short-finned pilot whales (although mortalities were assumed to be at least 119 because the pelagic longline fishery is assumed to be affecting only short-finned pilot whales). Therefore, it is unknown whether the PBR is being exceeded, but the stock is not currently listed as strategic. The U.S. pelagic longline fishery is a Category 1 fishery for interactions with pilot whales, which means that frequent interactions occur and serious injury of marine mammals occurs (FR 2014). Based on the high percentage of the PBR removed by this fishery, plus its Category 1 listing, we have awarded a "high" concern score.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).



## **Criterion 3: Management Effectiveness**

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

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

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

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

### **Criterion 3 Summary**

<b>Region / Method</b>	<b>Harvest Strategy</b>	<b>Bycatch Strategy</b>	<b>Score</b>
Canada / Northwest Atlantic / Drifting longlines / Canada	3.000	1.000	Red (1.730)
United States of America / Atlantic / Handlines and hand-operated pole-and-lines / United States of America	3.000	0.000	Yellow (3.000)
United States of America / Atlantic / Drifting longlines / United States of America	3.000	3.000	Yellow (3.000)
United States of America / Atlantic / Trolling lines / United States of America	3.000	0.000	Yellow (3.000)
United States of America / Atlantic / Hand-operated pole and lines / United States of America	3.000	0.000	Yellow (3.000)
United States of America / Gulf of Mexico / Drifting longlines / United States of America	3.000	3.000	Yellow (3.000)

### **Criterion 3 Assessment**

#### **SCORING GUIDELINES**

#### **Factor 3.1 - Harvest Strategy**

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

- *5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered*
- *4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*
- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and*

*Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'*

- 1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'
- 0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.

### Factor 3.1 Summary

FACTOR 3.1 - MANAGEMENT OF FISHING IMPACTS ON RETAINED SPECIES							
Region / Method	Strategy	Recovery	Research	Advice	Enforce	Track	Inclusion
Canada / Northwest Atlantic / Drifting longlines / Canada	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately Effective
United States of America / Atlantic / Handlines and hand-operated pole-and-lines / United States of America	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective
United States of America / Atlantic / Drifting longlines / United States of America	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective
United States of America / Atlantic / Trolling lines / United States of America	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective
United States of America / Atlantic / Hand-operated pole and lines / United States of America	Moderately Effective	N/A	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective
United States of America / Gulf of Mexico / Drifting longlines / United States of America	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective

This report focuses on the U.S. and Canadian domestic longline fisheries. In U.S. waters, tuna and swordfish are managed by the National Marine Fisheries Service. The Department of Fisheries and Oceans Canada manages swordfish and tuna in Canadian waters. Canada and the U.S. are also Contracting Parties of the International Commission for the Conservation of Atlantic Tunas (ICCAT), a Regional Fisheries Management Organization also in charge of management of these species, and must abide by all ICCAT recommendations. This section of the report is scored based on the respective domestic management measures currently in place.

### **Subfactor 3.1.1 – Management Strategy and Implementation**

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Moderately Effective**

The species included in this report are caught in targeted tuna and swordfish fisheries. Management measures for swordfish in Canadian waters include a minimum size limit and individual transferable quotas (quotas that can be transferred between individuals based on Canada's allocated quota from ICCAT). The quota is split between the longline and harpoon fishery. There are time/area closures in place as well. Fishers with swordfish licenses can also target other tunas. There is an offshore tuna license that has a 5 t swordfish bycatch limit and a 20 t bluefin tuna limit. There are specific catch composition requirements under this offshore license to ensure that bluefin tuna is not the only targeted species. There is also a quota for bluefin tuna allocated to Canada by ICCAT and this is divided by sectors. There is a total allowable catch (TAC) in place for bigeye and albacore tuna based on ICCAT allocated quotas. No other quotas are in place for tunas but effort is limited through licenses (Hanke et al. 2012).

Canada does have a non-binding National Plan of Action for sharks but it is not a management or regulatory plan. There are no catch limits in place for blue shark or shortfin mako shark caught as bycatch (because porbeagle shark cannot be targeted, its management is discussed under Factor 3.2), although there is a non-restrictive limit in targeted fisheries (DFO 2007). There are no management measures in place for mahi mahi.

Concerns with management of sharks caught as bycatch is further addressed in Factor 3.2.

We have awarded a moderate concern score because there are some management measures in place for the targeted species in this fishery, although further precaution is needed, particularly for shark species.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

#### **Moderately Effective**

The South Atlantic Fishery Management Council (SAFMC) manages mahi mahi and wahoo in U.S. waters through a joint Fishery Management Plan. It includes a minimum size limit for mahi mahi of 20 cm FL (fork length) off of Florida, Georgia, and South Carolina, requires vessel permits, and an annual catch limit (ACL) of 1,157,001 lbs (SAFMC 2003) (NOAA 2015). There are no size restrictions on wahoo landed in U.S. federal waters.

The FMP sets BMSY and optimal yields each for mahi mahi and wahoo, and identifies potential future research topics to inform management agencies on stock status, fishery impacts, life history characteristics, and essential habitat. It is unclear whether any of the efforts to ascertain this information are underway (pers. comm., B. Chevront 2015).

There is relatively little monitoring of handline/troll operators in this fishery and no program in place for continued research on the effects of the current management plan on Atlantic mahi mahi and wahoo stocks.

Compliance with FMP guidelines is enforced by state wildlife and fisheries agencies, the U.S. Coast Guard, and NOAA. Affected stakeholders include commercial fishers and recreational/charter operators. A key objective of the FMP is to ameliorate competition between these constituencies and, to this end, the management plan prohibits the sale of recreationally landed mahi mahi and wahoo. It also caps the quantity of mahi mahi landed by commercial fishers each year.

Swordfish must be landed whole (NMFS 2013). There are no catch limits in place for the U.S. fishery for other tuna species, but there is a size limit of greater than 27 in for bigeye and yellowfin tuna.

We have awarded management strategy and implementation of the mahi mahi/wahoo fishery a moderate concern because some management measures are in place.

**Justification:**

Likely due to a dearth of data on the status of mahi mahi stocks in the Atlantic, the FMP identifies a very broad range for MSY of mahi mahi, between 18.8 and 46.5 million pounds (8,527.5 – 21,092.0 mt). The MSY range of wahoo is much narrower, with MSY falling between 1.41 and 1.63 million pounds (639.6 -739.4 mt). Optimal yields are designated as 75% of MSY and 100% of MSY for mahi mahi and wahoo, respectively.

The state of Florida requires commercially landed mahi mahi to be of 20" (50.8 cm) minimum FL in both Gulf of Mexico and Atlantic state waters. Within state waters mahi mahi can be harvested using spear and hook and line gear. Outside states waters longlines can be used. Georgia and South Carolina also require commercial mahi mahi catch to be of individuals >20" (50.8 cm) FL. There are no size restrictions in any other Atlantic states (SAFMC 2012). There are no state or federal restrictions on the size of wahoo landed in US waters (SAFMC 2003).

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Moderately Effective**

The U.S. pelagic longline fishery management measures include requiring fishers to have permits to fish for Atlantic tuna and swordfish. There are time/area closures for pelagic longline gears, and the use of live bait is banned (NOAA 2012). In addition, there is a 20-m length limit for longline vessels fishing in the Mid-Atlantic Bight (NMFS 2013). In the South Atlantic, longline is the only gear authorized to fish for swordfish. There are catch limits for swordfish and there is a minimum size limit in both the North and South Atlantic. In addition, swordfish must be landed whole (NMFS 2013). Only large medium and giant Atlantic bluefin tuna can be kept in the longline fishery, and there are strict restrictions on the amount that can be retained. There are two bluefin tuna areas (north/south) with subquotas that close at different times than the rest of the fishery (NMFS 2013). In the Northeast Distant Restricted Area, 25 MT of the bluefin quota for the U.S. is allocated when fishing for other species. The United States has been allotted a small quota for albacore tuna. There are no catch limits in place for the U.S. fishery for other tuna species, but there is a size limit of greater than 27 inches for bigeye and yellowfin tuna. Historically, quota overages for incidentally caught bluefin tuna have been a significant concern in this fishery. Longline fishers could not retain bluefin once the quota had been met, but the fishery could remain open and bluefin were still killed and discarded, leading to substantial bluefin quota overages in the longline category over the past several years. NMFS has recently issued a final rule (Final Amendment 7 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan) (NOAA 2014) to address this issue by expanding closed areas to protect spawning bluefin, requiring the fishery to close once the bluefin quota has been exceeded, and requiring retention of all legal-sized bluefin tuna to reduce dead discarding.

In the U.S. Atlantic, the South Atlantic Fishery Management Council manages mahi mahi. There is a fishery management plan in place (Dolphin Wahoo Fishery of the Atlantic Fishery Management Plan), which includes a

size limit of 20 cm FL (fork length) off of Florida, Georgia, and South Carolina, vessel permit requirements, and an annual catch limit (ACL) of 1,157,001 lbs (SAFMC 2003) (NOAA 2015).

Blue and shortfin mako sharks are managed under the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2006). They are included in the "pelagic sharks" management unit. Fishers must have a permit to fish for sharks (limited access permit). Although retention limits exist for other species of sharks, there is currently no limit on the number of "pelagic sharks" that can be taken under the directed permit. Under the incidental permit, 16 "pelagic sharks" can be taken per vessel per trip. There are time/area closures in place for pelagic longline fisheries operating in the Atlantic and Gulf of Mexico (NOAA 2014). Both shark species have stock assessments that have high uncertainty but suggest that the stocks are not overfished and overfishing is not occurring. These species are managed in the U.S. under an FMP that provides a mechanism to take action if the stock becomes overfished, as is required in the U.S. by the Magnuson-Stevens Act. There are not specific quotas for blue and shortfin mako sharks or other measures specific to conserving these species that are in place at this time.

The score for management strategy and implementation reflects a holistic view of the management of the fishery, which primarily targets tuna and swordfish but also catches and retains the various other pelagics species included in this report, including blue and shortfin mako sharks. The U.S. fishery has strong regulations in place for some species, but international action will be needed to fully protect all species in the fishery, particularly shark species and overfished tunas. We have awarded a moderate concern score to account for management measures being in place, while acknowledging the need for stronger international management for blue and shortfin mako sharks.

#### UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderately Effective**

The U.S. pelagic longline fishery management measures include requiring fishers to have permits to fish for Atlantic tuna and swordfish. There are time/area closures for pelagic longline gears, and in the Gulf of Mexico (GOM) the use of live bait is banned and weak hooks are required (NOAA 2012). There are catch limits for swordfish and a minimum size limit. In addition, swordfish must be landed whole (NMFS 2013). Direct targeting of bluefin tuna in the GOM is prohibited; however, this fishery still incidentally catches bluefin tuna. There are no catch limits for other tuna species but there is a size limit of greater than 27 in for yellowfin tuna (NMFS 2013). Historically, quota overages for incidentally caught bluefin tuna have been a significant concern in this fishery. Longline fishers could not retain bluefin once the quota had been met, but the fishery could remain open and bluefin were still killed and discarded, leading to substantial bluefin quota overages in the longline category over the past several years. NMFS has recently issued a final rule (Final Amendment 7 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan) (NOAA 2014) to address this issue by expanding closed areas to protect spawning bluefin, requiring the fishery to close once the bluefin quota has been exceeded, and requiring retention of all legal-sized bluefin tuna to reduce dead discarding.

The Gulf of Mexico Fishery Management Council is in charge of mahi mahi. Although it was originally included in the Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic, it has since been removed, due to a lack of need for management, and there are currently no management measures in place (GMFMC 2015).

Blue and shortfin mako sharks are managed under the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2006). They are included in the "pelagic sharks" management unit. Fishers must have a permit to fish for sharks (limited access permit). Although retention limits exist for other species of sharks, there is currently no limit on the number of "pelagic sharks" that can be taken under the directed permit. Under the incidental permit, 16 "pelagic sharks" can be taken per vessel per trip. There are time/area

closures in place for pelagic longline fisheries operating in the Atlantic and Gulf of Mexico (NOAA 2014). Both shark species have stock assessments that have high uncertainty but suggest that the stocks are not overfished and overfishing is not occurring. These species are managed in the U.S. under an FMP that provides a mechanism to take action if the stock becomes overfished, as is required in the U.S. by the Magnuson-Stevens Act. There are not specific quotas for blue and shortfin mako sharks or other measures specific to conserving these species that are in place at this time.

The score for management strategy and implementation reflects a holistic view of the management of the fishery, which primarily targets tuna and swordfish but also catches and retains the various other pelagics species included in this report, including blue and shortfin mako sharks. The U.S. fishery has strong regulations in place for some species, but international action will be needed to fully protect all species in the fishery, particularly shark species and overfished tunas. We have awarded a “moderately effective” score to account for management measures being in place, while acknowledging the need for stronger international management for blue and shortfin mako sharks.

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Moderately Effective**

Canada had a rebuilding plan in place for swordfish from 2004 to 2006 (DFO 2009) and the International Commission for the Conservation of Atlantic Tunas (ICCAT) also had a rebuilding plan in place (ICCAT 2014). Swordfish in the North Atlantic is no longer overfished or undergoing overfishing (ICCAT 2013b). Atlantic bluefin tuna is under a 20-year rebuilding plan through ICCAT, and Canada has initiated additional management measures for Atlantic bluefin tuna to aid in its recovery, but the population is still being rebuilt (DFO 2008). There is some indication that these measures are working, according to the most recent assessment of Atlantic bluefin tuna (ICCAT 2014). Porbeagle shark is listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada, and directed fishing for it is prohibited (it is discussed in Factor 3.2 because it is considered a bycatch species) (COSEWIC 2004). There is no Canadian specific recovery plan in place for albacore tuna, which is likely overfished but no longer undergoing overfishing (ICCAT 2014). Bigeye tuna has recently been assessed as overfished and undergoing overfishing (ICCAT 2015b). ICCAT adopted new regulations during the 2015 Commission meeting to address the status of bigeye tuna but these will not be put into place until 2016 (ICCAT 2015c). We have awarded a “moderately effective” score because Canada has implemented additional management measures to aid in the recovery of depleted populations.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

#### **N/A**

Yellowfin tuna is retained and assessed under Factor 3.1 rather than 3.2. The current management measures

in place for yellowfin tuna include a total allowable catch limit of 110,000 t. The 2016 yellowfin assessment indicated that maintaining catch's at current levels has a 68% probability of maintaining a healthy stock through 2024 (ICCAT 2016b). Mahi mahi and wahoo are not species of concern. Although some catch of yellowfin occurs in this fishery, the fishery has a negligible impact, so we have awarded an N/A score

#### UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderately Effective**

North Atlantic albacore tuna is currently under a rebuilding program that was initiated in 2009 and last updated in 2013 (ICCAT 2011c) (ICCAT 2013c). According to the most recent assessment, there is a 53% probability the population will be rebuilt by 2019 (meeting Convention objectives) if the total allowable catch (TAC) is attained, and a 75% probability if catches are lower. A recovery plan for Atlantic bluefin tuna in the Northwest Atlantic was initiated in 1998 and is a 20-year plan. New recommendations were put into place in 2009 (adopted in 2008), in 2010, and supplemented in 2013 (ICCAT 2013c). According to the most recent assessment, there is some indication that Atlantic bluefin tuna is rebuilding (ICCAT 2014). The United States does not currently require a rebuilding plan for yellowfin tuna, which is overfished (NMFS 2014b)(ICCAT 2016b).

ICCAT, which the US is a party to, has implemented measures to address both bigeye tuna and yellowfin tuna stock concerns. Bigeye tuna are under a multi-year conservation and management program initiated in 2009, which includes capacity limitations, vessel authorization to fish, and catch limits. However, bigeye tuna have recently been assessed as overfished and undergoing overfishing (ICCAT 2015a). ICCAT adopted new regulations during the 2015 Commission meeting to address the status of bigeye tuna but these will not be put into place until 2016 (ICCAT 2015b).

The multi-year conservation and management program for bigeye tuna was amended in 2011 to include yellowfin tuna. In addition to capacity limits and vessel authorization, it also includes a total allowable catch (TAC) for yellowfin (ICCAT 2011b). Measures to recover yellowfin tuna populations appear to be succeeding, as the 2016 yellowfin assessment showed that yellowfin is recovering, overfishing has halted, and biomass is nearly at Bmsy. The 2016 yellowfin assessment also indicated that maintaining catches at current levels will result in a 68% probability of maintaining a healthy stock through 2024 (ICCAT 2016b). At the 2016 ICCAT Commission meeting, a Recommendation that included catch limits for bigeye and yellowfin tuna, fishing capacity limitations, FAD fishing regulations, area/time closures and additional control and surveillance measures was adopted (ICCAT 2016d).

We have awarded a "moderately effective" score because some populations have begun to recover.

#### UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderately Effective**

A recovery plan for Atlantic bluefin tuna in the Northwest Atlantic was initiated in 1998 and is a 20-year plan. New recommendations (adopted in 2008) were put into place in 2009 and 2010, and supplemented in 2013 (ICCAT 2013c). According to the most recent assessment, there is some indication that Atlantic bluefin tuna is rebuilding (ICCAT 2014). The United States does not currently require a rebuilding plan for yellowfin tuna, which is overfished (NMFS 2014b)(ICCAT 2016b). Swordfish is considered rebuilt and no longer in need of a recovery plan (ICCAT 2013).

ICCAT, which the US is a party to, has implemented measures to address yellowfin tuna stock concerns. The multi-year conservation and management program for bigeye tuna was amended in 2011 to include yellowfin

tuna. In addition to capacity limits and vessel authorization, it also includes a total allowable catch (TAC) for yellowfin (ICCAT 2011b). Measures to recover yellowfin tuna populations appear to be succeeding, as the 2016 yellowfin assessment showed that yellowfin is recovering, overfishing has halted, and biomass is nearly at Bmsy. The 2016 yellowfin assessment also indicated that maintaining catches at current levels will result in a 68% probability of maintaining a healthy stock through 2024 (ICCAT 2016b). At the 2016 ICCAT Commission meeting, a Recommendation that included catch limits for yellowfin tuna, fishing capacity limitations, FAD fishing regulations, area/time closures and additional control and surveillance measures was adopted (ICCAT 2016d).

Because management has allowed some species to begin recovering, this is scored as “moderately effective.”

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Moderately Effective**

Assessments of sharks are conducted every 4–6 years; every 4 years for albacore, bigeye, and yellowfin tuna and swordfish; and every 2 years for Atlantic bluefin tuna. These assessments include data on catch and effort, both fishery-dependent and -independent, from various fisheries targeting these species, along with biological information and other data (ICCAT 2012a). There is a large amount of uncertainty surrounding some of these results and no assessments have been conducted for mahi mahi. We have therefore awarded a “moderately effective” score.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

#### **Moderately Effective**

The FMP identifies several knowledge deficits regarding the biology and stock status of mahi mahi and wahoo in the Atlantic EEZ and makes the following recommendations for future research: 1) Collect data to improve estimates of life history characteristics like growth and fecundity; 2) identify essential habitat; 3) implement observer programs and studies of post-release mortality to examine the efficacy of minimum size requirements. As yet it is unclear whether there are any research programs underway to address these deficits.

As a result of the magnitude of the longline catch, more attention has been paid to ensuring observer coverage on longline vessels than on handline or trolling vessels, particularly in terms of documenting catch composition and mitigating bycatch of sensitive species. As with all federal fisheries, commercial handline and troll operators still must comply with NMFS requests for logbook accounts of catch composition and effort. Additionally, landing weigh-out reports are collected from seafood dealers, while biological samples and onboard or dockside interviews are conducted by both state and federal agencies, to ascertain catch data pertaining to mahi mahi and wahoo landings with handlines, trolls, and other hook and line gears. Therefore, we rate scientific research and monitoring of the mahi mahi and wahoo handline and troll fisheries as “moderately effective.”



UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderately Effective**

We have awarded a moderately effective score because population assessments are conducted for the majority of “main species” on a regular basis, but there is a large amount of uncertainty surrounding some of the results. Assessments for bigeye and yellowfin tuna are conducted every 4–6 years, for swordfish every 4 years, and for Atlantic bluefin tuna every 2 years. Assessments are conducted by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and include catch and effort data from a number of fleets targeting the species throughout the Atlantic Ocean, along with biological information and other data. Like all tuna assessments, there is a high degree of uncertainty surrounding some of the assessment results. Blue and shortfin mako sharks are also assessed every 4–6 years in the Atlantic. The only “main species” not assessed individually in this fishery is dolphinfish.

UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderately Effective**

We have awarded a “moderately effective” score because population assessments are conducted for some but not all “main species” in this fishery. Assessments for yellowfin tuna and swordfish are conducted every 4 years and for Atlantic bluefin tuna every 2 years. Assessments are conducted by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and include catch and effort data from a number of fleets targeting the species throughout the Atlantic Ocean, along with biological information and other data. Like all tuna assessments, there is a high degree of uncertainty surrounding some of the assessment results. Blue and shortfin mako sharks are also assessed every 4–6 years in the Atlantic (ICCAT 2012a), but escolar, dolphinfish (not individually assessed), and lancetfish populations are not assessed.

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderately Effective**

For Atlantic bluefin tuna in the Northwest Atlantic, total allowable catches (TACs) have been set at 1,900 t in 2009, 1,800 t in 2010, and 1,750 t from 2011 to 2014. The Standing Committee on Research and Statistics (SCRS) suggested that, under either recruitment scenario, keeping catches at 1,750 t should allow the biomass to increase (ICCAT 2012a), so the TAC for 2013 and 2014 was set at 1,750 t (ICCAT 2012c). It has been suggested that maintaining yellowfin tuna catches at current levels (110,000 t) should lead to the biomass remaining healthy through 2024 (ICCAT 2016). The TAC was set at this level starting in 2012 (ICCAT 2012a). It was also advised that measures to reduce FAD-related and other fishing mortality on small yellowfin tuna should be implemented if the Commission intends to increase the long term yield of yellowfin tuna, which was addressed at the 2016 Commission meeting (ICCAT 2016b)(ICCAT 2016d). Bigeye tuna TAC should be reduced from the current level of 85,000 t, in order to allow the population to rebuild (ICCAT 2015d). The Commission lowered the bigeye tuna TAC to 65,000 t from 2016 to 2018, which will allow a 49% probability of rebuilding by 2028 (ICCAT 2015c). The swordfish working group advised setting the TAC no higher than 13,000 t to maintain the population within Convention objectives, but the TAC in 2011 was set at 13,700 t

(ICCAT 2012a). The Commission has followed advice and set the TAC for albacore tuna in the North Atlantic at 28,000 t for 2012 and 2013. The current assessment indicates that if catches remain at the current TAC level, the population will rebuild (53% probability) by 2019, which abides by the 2011 recovery plan. If catches were lowered, recovery would occur more quickly. The current management measure for North Atlantic albacore tuna allows for potential overages by allowing excess catch (not included in the total TAC) to be caught by countries with no allocated TAC (ICCAT 2013a). Canada closed its directed fishery for porbeagle shark in 2013 and has a catch limit in place for incidental captures (ICCAT 2014). It has been advised that catches of shortfin mako shark not be increased (ICCAT 2014) but no catch limits have been set for this species. We have awarded a “moderately effective” score because scientific advice is not always followed.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

### **Moderately Effective**

Although we don't know the status of the research related to the handline and trolling fisheries for mahi mahi and wahoo, their management falls under the SAFMP, which does have scientific reference points for fishing mortality. The FMP identifies a broad range for MSY of mahi mahi: between 18.8 and 46.5 million pounds (8,527.5 and 21,092.0 MT). The MSY range of wahoo is much narrower, falling between 1.41 and 1.63 million pounds (639.6 and 739.4 MT). Optimal yields are designated as 75% of MSY and 100% of MSY for mahi mahi and wahoo, respectively. Therefore, Seafood Watch rates this as “moderately effective.”

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### **Highly Effective**

In the Canadian swordfish fishery, the use of logbooks is required by all commercial fishers, and monitoring at sea and through aerial patrols is conducted by the Canadian Coast Guard and the Department of National Defense. In addition, illegal and unreported fishing is penalized through seizure of catches, fines, and suspension of licenses (DFO 2010). Quotas are monitored by the Department of Fisheries and Oceans (DFO) and by industry, along with fisheries associations (MMI 2011). Vessel monitoring systems (VMS) are also used to monitor this fishery, along with dockside monitoring (DFO 2010). Since 1996, there has been 100% dockside monitoring for the longline fleet (MMI 2011). Canada's allotted quota for swordfish in 2012 was 1,548 t, and total landings were under this, at 1,488 t in 2012 and 1,505 t in 2013 (ICCAT 2013b).

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

### **Highly Effective**

The SAFMC 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 including state wildlife agencies, the US

Coast Guard, and NOAA. Additionally, SAFMC has convened a Law Enforcement Advisory Panel to make recommendations on enforcement strategies (SAFMC 2012). SAFMC also publishes quarterly reports on law enforcement activities conducted in the Atlantic EEZ. We have therefore awarded a highly effective score.

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Highly Effective**

In terms of Atlantic bluefin tuna, the United States catches were under the allotted quota from 2004 to 2008, the quota was reached in 2009, but catches in 2011 were far below quota levels due to reduced discards in the Gulf of Mexico (ICCAT 2012a). The longline fishery has consistently gone over its allotted subquota (NMFS 2014b). The United States has been under the allotted quota for swordfish and albacore tuna as well, even though the total TAC (all countries combined) for swordfish was exceeded during 2012 (ICCAT 2012a) (ICCAT 2013b). Information on catches is collected through a logbook program. Pelagic longline vessels targeting tuna and swordfish are required to use vessel monitoring systems (VMS). To enforce compliance with time/area closures for pelagic longline gear, species composition data (which is collected through both logbook and observer records) are used to differentiate between bottom and pelagic longline gear (NMFS 2013). The U.S. Coast Guard also helps enforce fisheries regulations. New measures, including 100% video monitoring coverage on longline vessels, are currently being implemented (NOAA 2014). We have therefore awarded a “highly effective” score.

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### **Moderately Effective**

According to the 2009 assessment of swordfish in the North Atlantic, the population was above the level needed to produce the maximum sustainable yield (BMSY) and therefore the Commission’s rebuilding objective had been met (ICCAT 2012a). But the international total allowable catch for swordfish was exceeded in 2012 (ICCAT 2014). Atlantic bluefin tuna populations appear to be recovering based on the most recent assessment. Historically, management measures in place for albacore tuna in the North Atlantic have failed to allow the population to recover (ICCAT 2009a). New management measures have been put into place, overfishing is no longer occurring, and biomass is recovering and expected to be recovered in 5 years. Yellowfin tuna are still slightly overfished, but the most recent assessment indicates that they are recovering under current management (ICCAT 2016). Bigeye tuna has become overfished under current management measures, although updated measures have been adopted and will be put into place during 2016 (ICCAT 2015c) (ICCAT 2015d). We have awarded a “moderately effective” score because some species remain depleted, some are healthy, and others have an uncertain status.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

### **Moderately Effective**

The United States has complied with international regulations for tuna and swordfish species and instituted some domestic regulations. Yellowfin tuna are still slightly overfished, but the most recent assessment indicates that they are recovering under current management (ICCAT 2016). According to the 2009 assessment of swordfish in the North Atlantic, the population was above the levels needed to produce the maximum sustainable yield ( $B_{MSY}$ ) and therefore the Commission's rebuilding objective had been met (ICCAT 2009c) (ICCAT 2012a). We have awarded a "moderately effective" score because some species remain depleted, some are healthy, and others have an uncertain status.

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderately Effective**

The United States has complied with international regulations for tuna and swordfish species and instituted some of their own domestic regulations. Historically management measures in place for albacore tuna in the North Atlantic have failed to allow the population to recovery (ICCAT 2009a). However, new management measures have been put into place and overfishing is no longer occurring and biomass is recovering and expected to be recovered in 5 years time. Based on the most recent assessment, there is some indication that management measures are allowing populations of Atlantic bluefin tuna to increase in the northwest Atlantic (ICCAT 2014). Yellowfin tuna are still slightly overfished, but the most recent assessment indicates that they are recovering under current management (ICCAT 2016). According to the 2009 assessment of swordfish in the North Atlantic, the population was above levels needed to produce the maximum sustainable yield ( $B_{MSY}$ ) and therefore the Commission's rebuilding objective had been meet (ICCAT 2009c)(ICCAT 2012a). We have awarded a moderate concern score because some species remain depleted, some are healthy and others have an uncertain status.

UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderately Effective**

The United States has complied with international regulations for tuna and swordfish species and instituted some of their own domestic regulations. Based on the most recent assessment, there is some indication that management measures are allowing populations of Atlantic bluefin tuna to increase in the northwest Atlantic (ICCAT 2014). Yellowfin tuna are still slightly overfished, but the most recent assessment indicates that they are recovering under current management (ICCAT 2016). According to the 2009 assessment of swordfish in the North Atlantic, the population was above levels needed to produce the maximum sustainable yield ( $B_{MSY}$ ) and therefore the Commission's rebuilding objective had been meet (ICCAT 2012a). We have awarded a moderate concern score because some species remain depleted, some are healthy and others have an uncertain status.

## **Subfactor 3.1.7 – Stakeholder Inclusion**

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

*process is transparent and includes stakeholder input.*

#### CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

##### **Moderately Effective**

The Canadian management process is transparent and includes stakeholder input. There are two advisory bodies, The Atlantic Large Pelagic Advisory Committee (ALPAC) and the Scotia Fundy Large Pelagics Advisory Committee (SFLPAC). ALPAC is the link between DFO and regional committees, providing information on management of swordfish (and tunas) in Atlantic Canada. Federal and provincial governments, fishers, and processors compose this committee. The SFLPAC is a consultative forum on management, conservation, protection, and utilization of swordfish. The Canadian management plan for swordfish also has objectives in place for co-management of the fishery between managers and industry (MMI 2011). But Canada does not allow conservation groups to be part of the Canadian delegation to the International Commission for the Conservation of Atlantic Tunas. We have therefore awarded a “moderately effective” score

#### UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Highly Effective**

The stated goals of the FMP include balancing the competing interests of commercial and recreational fishers. The FMP proposes several actions to accomplish this, including a prohibition on the sale of mahi mahi and wahoo caught by recreational fisheries in the Atlantic EEZ and an annual cap of 1.5 million pounds (680.4 MT) of mahi mahi or 13% of total catch (whichever is greater) landed by commercial fishers. Individuals from state and federal marine resource and conservation agencies, non-governmental organizations, as well as commercial and recreational fisheries associations were consulted in the process of writing the management plan (SAFMC 2003).

### **Factor 3.2 - Bycatch Strategy**

#### **SCORING GUIDELINES**

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

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

### FACTOR 3.2 - BYCATCH STRATEGY

Region / Method	All Kept	Critical	Strategy	Research	Advice	Enforce
Canada / Northwest Atlantic / Drifting longlines / Canada	No	No	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
United States of America / Atlantic / Handlines and hand-operated pole-and-lines / United States of America	Yes	All Species Retained				
United States of America / Atlantic / Drifting longlines / United States of America	No	No	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective
United States of America / Atlantic / Trolling lines / United States of America	Yes	All Species Retained				
United States of America / Atlantic / Hand-operated pole and lines / United States of America	Yes	All Species Retained				
United States of America / Gulf of Mexico / Drifting longlines / United States of America	No	No	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective

#### Subfactor 3.2.2 – Management Strategy and Implementation

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

#### CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

##### Ineffective

The Canadian longline fishery requires the use of circle hooks (size 16), requires live release of “sensitive” species, landing and reporting of non-target catches, and collaboration with Department of Fisheries and Oceans (DFO) scientists to examine bycatch in the fishery and find ways to reduce it. Fishers are also required to use safe handling and release guidelines for sea turtles, including the use of de-hooking kits and dipnets (DFO 2013). There are no bycatch limits on the number of sea turtles that can be incidentally captured, and loggerhead turtle is not legally protected (i.e., under the Species at Risk Act, SARA), though it is assessed as Endangered according to COSEWIC (DFO 2010b). There are no bycatch limits for sea turtles, and sea turtle mitigation measures (e.g., circle hooks) have only been in use since 2012. In contrast, the United States has had bycatch mitigation measures (including bait and gear restrictions) to reduce sea turtle interactions in place for a number of years, and loggerhead is offered protection under the U.S. Endangered Species Act.

Canada does have a National Plan of Action for sharks but this is non-binding and is not a management or regulatory document. In terms of species included in this report, there is a catch limit for porbeagle shark (DFO 2007). Other shark species, such as white, oceanic whitetip, hammerhead, and silky, are prohibited from being retained (DFO 2013). Best practices for reducing the incidental capture of sharks are not required in this fishery (e.g., bait restrictions, prohibiting wire leader, avoiding “hot spots”) (Gilman 2011), and Canada follows the 5% fins-to-carcass ratio and does not require shark fins to be naturally attached. In addition, catch and retention of porbeagle shark continues despite the species’ Endangered finding under COSEWIC, as well as

Endangered listing under IUCN and listing on Appendix II of CITES, though the directed fishery for porbeagle shark has been closed. There is no recovery plan in place for porbeagle shark. The population is projected to recover very slowly if fishing mortality remains below 4% of vulnerable biomass; however, true bycatch mortality rates are very poorly known in part due to low observer coverage, and under-reported catch could jeopardize the population's recovery (COSEWIC 2014b).

Because of ongoing concerns with insufficient management and mitigation of bycatch of endangered and vulnerable species, including loggerhead turtles and porbeagle shark, we have awarded an "ineffective" score.

#### UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderately Effective**

The United States has implemented a number of measures to address bycatch in the pelagic longline fishery. For example, there is a Cape Hatteras Special Research Area in place to protect pilot whales and Risso's dolphins. Marine mammals are protected under the Marine Mammal Protection Act and are prohibited from being captured. Fishers are required to report any entanglements. High occurrences of loggerhead and leatherback sea turtles, which also are protected species, in the U.S. pelagic longline fishery resulted in management initiating measures to protect them in 2000. These included partly closing the Northeast Distant statistical reporting area during 2000 and completely closing it from 2001 through 2003. Additional research into bycatch mitigation techniques resulted in the required use of circle hooks in the fishery (Foster et al. 2012). In the Northeast Distant Gear Restricted Area (NED), specific gear and bait restrictions are in place to reduce sea turtle interactions. Outside of this region, only corrodible 18/0 or larger circle hooks with offset less than 10° or 16/0 or larger circle hooks with no offset are allowed to be used, with specific bait restrictions (whole finfish and/or squid). Longline vessels must also have onboard sea turtle handling and release gears. There are not bycatch limits for sea turtles. A number of shark species are prohibited from being captured, including silky shark, which is included in this report. Other than the circle hook requirements, there are no other shark-specific bycatch mitigation measures in place. Sharks are required to be landed with their fins naturally attached. Smalltooth sawfish is also protected under the Endangered Species Act and is prohibited from being caught, although it is not often reported in this fishery (NMFS 2013). We have awarded a "moderately effective" score to account for these measures, including bait and gear restrictions to reduce sea turtle bycatch, rules for shark fins being naturally attached, area closures to protect mammals, and protection offered under the Endangered Species Act, while acknowledging that this fishery is still considered a Category 1 fishery (FR 2014).

#### UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderately Effective**

The United States has implemented a number of measures to address bycatch in the pelagic longline fishery. For example, there is a Cape Hatteras Special Research Area in place to protect pilot whales and Risso's dolphins. Marine mammals are protected under the Marine Mammal Protection Act and are prohibited from being captured. Fishers are required to report any entanglement. High occurrences of loggerhead and leatherback sea turtles, which also are protected species, in the U.S. pelagic longline fishery resulted in management initiating measures to protect them in 2000. Longline vessels in the Gulf of Mexico are restricted to using weak hooks, and live bait may not be used to reduce sea turtle interactions (NMFS 2013). Longline vessels must also have onboard sea turtle handling and release gears. In addition, a number of shark species are prohibited from being captured, including silky shark, and the U.S. requires sharks to be landed with their fins naturally attached. Smalltooth sawfish is also protected under the Endangered Species Act and is prohibited from being caught, although it is infrequently caught in this fishery (NMFS 2013).

Historically, quota overages for incidentally caught bluefin tuna have been a significant concern in this fishery. Longline fishers could not retain bluefin once the quota had been met, but the fishery could remain open and bluefin were still killed and discarded, leading to substantial bluefin quota overages in the longline category over the past several years. NMFS has recently issued a final rule (Final Amendment 7 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan) (NOAA 2014) to address this issue by expanding closed areas to protect spawning bluefin, requiring the fishery to close once the bluefin quota has been exceeded, and requiring retention of all legal-sized bluefin tuna to reduce dead discarding.

This subfactor is rated “moderately effective” because there are some effective measures in place, but these have not been fully effective in preventing bycatch of species of concern, and significant bycatch issues remain in this fishery.

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Moderately Effective**

The Canadian longline fishery uses fisheries observers to monitor and record catch and effort, both for target and bycatch species (DFO 2012a). Observer coverage has ranged from a high of almost 30% in 2002 to a low of just over 5% in 2008. Observer coverage was less than 10% between 2004 and 2008 but increased to around 11% during 2009 and 2010 (Hanke et al. 2012). Hanke et al. (2012) indicated concerns with the amount of observer coverage and the design of the observer coverage for this fleet. We have awarded a “moderately effective” score to account for these issues.

UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **Moderately Effective**

The U.S. pelagic longline fleet has around 10% observer coverage (NMFS 2012). Observers collect catch and effort information on both target and bycatch species. The information is used in stock assessments and also to verify logbook data. Sea turtle and marine mammal interactions data are monitored on a quarterly time schedule and data are reviewed to determine if additional management action is warranted (NOAA 2012). We consider this observer coverage rate only “moderately effective.”

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

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



CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Moderately Effective**

See harvest strategy section 3.1.4 for detailed explanation.

**Subfactor 3.2.5 – Enforcement of Management Regulations**

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Highly Effective**

See section 3.1.5 for detailed response.

## **Criterion 4: Impacts on the habitat and ecosystem**

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

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

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

*Rating cannot be Critical for Criterion 4.*

### **Criterion 4 Summary**

<b>Region / Method</b>	<b>Gear Type and Substrate</b>	<b>Mitigation of Gear Impacts</b>	<b>EBFM</b>	<b>Score</b>
Canada / Northwest Atlantic / Drifting longlines / Canada	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.870)
United States of America / Atlantic / Handlines and hand-operated pole-and-lines / United States of America	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.873)
United States of America / Atlantic / Drifting longlines / United States of America	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.870)
United States of America / Atlantic / Trolling lines / United States of America	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.873)
United States of America / Atlantic / Hand-operated pole and lines / United States of America	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.873)
United States of America / Gulf of Mexico / Drifting longlines / United States of America	5.00: None	0.00: Not Applicable	3.00: Moderate Concern	Green (3.870)

Although pelagic longline, handline, and trolling gears do not typically come in contact with bottom habitats, they do impact a number of ecologically important species and the consequence of this varies by region. Mitigation measures to reduce the impact of pelagic longlines on bottom habitats are not generally needed.

## Criterion 4 Assessment

### SCORING GUIDELINES

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

- 5 (None) - Fishing gear does not contact the bottom
- 4 (Very Low) - Vertical line gear
- 3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (
- 2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand
- 1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)
- 0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)  
*Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

#### Factor 4.2 - Mitigation of Gear Impacts

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

#### Factor 4.3 - Ecosystem-Based Fisheries Management

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

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

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### None

Although pelagic longlines are surface fisheries, contact with the seabed can occur in shallow-set fisheries (Passfield and Gilman 2010). These effects are still considered to be a low risk to bottom habitats (Gilman et al. 2013) (Seafood Watch 2013), so we have awarded a no impact score.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

##### None

Troll and handline fishing gear do not impact the sea floor substrate.

#### Factor 4.2 - Mitigation of Gear Impacts

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### Not Applicable

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

##### Not Applicable

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

##### Not Applicable

#### Factor 4.3 - Ecosystem-Based Fisheries Management

CANADA / NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA / ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA / GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### Moderate Concern

Pelagic longline fisheries operating in the Atlantic Ocean, including within U.S. and Canadian waters, catch ecologically important species including other tunas, billfish, and sharks. In particular, sharks are considered top predators in many ecosystems and play a critical role in how these ecosystems are structured and function (Piraino et al. 2002) (Stevens et al. 2000). The loss of these predators can cause many changes, such as to

prey abundances, that can lead to a cascade of other effects (Myers et al. 2007) (Duffy 2003) (Ferretti et al. 2010) (Schindler et al. 2002) and behavioral changes (Heithaus et al. 2007). Longline fisheries could cause other indirect effects that are not well understood, such as reducing prey available to seabirds due to the removal of tunas, reducing optimal school sizes, or reducing the fitness of individuals in a school (Gilman et al., in press). Currently, neither the U.S. nor Canada have policies in place addressing the ecosystem impacts of these fisheries. However, both nations are cooperating members of ICCAT, which has adopted management measures to protect bycatch species and conducts ecological risk assessments. In addition, there is a Sub-Committee on Ecosystems within ICCAT that is investigating the role of Ecosystem Based Management within ICCAT fisheries (ICCAT 2013b). We have awarded a moderate concern score because of while there are interactions with ecologically important species and a lack of domestic ecosystem based management ICCAT has begun investigating ecosystem based measures.

UNITED STATES OF AMERICA / ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA / ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

### **Moderate Concern**

Mahi mahi and wahoo are both considered mid-trophic-level species (Polovina et al. 2009) (SAFMC 2003). Removal of any component of a biological community can have cascading effects on a host of other species (Crowder et al. 2008). Meso-predators like mahi mahi and wahoo undoubtedly play an important ecological role (Crooks and Soulé 1999) (Estes et al. 1998). But this report focuses on the effects of commercial fisheries on organisms considered to be of exceptional importance to ecosystem function and food web structure: for example, those species whose effects on ecological processes are greater than would be predicted by their biomass alone, including top predators, ecosystem engineers, and important primary producers (Sergio et al. 2008) (Mumby et al. 2008). The South Atlantic Fishery Management Council has a Fishery Ecosystem Plan (SAFMC 2009).

Several shark species are occasionally captured in both the U.S. Atlantic handline/troll and Hawaiian troll fisheries, but do not make up a significant proportion of the catch. Furthermore, sharks are not generally retained (NMFS 2015) (pers. comm., P. Dalzell 2015); troll and handline gears are highly selective, with fishers able to release undesirable species quickly, thus minimizing capture mortality. There are no efforts underway to assess the impacts of troll gears on the Hawaiian or South Atlantic pelagic ecosystems.

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

### **ESCOLAR**

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Medium**

FishBase has assigned a very high vulnerability score of 85 out of 100 (Froese and Pauly 2014). Escolar reaches a maximum length of 200 cm. Little information is available on the size at which sexual maturity is reached, but some research indicates that maturity may be reached by 84 cm (Maskimov 1970). It is a high-level predator (Froese and Pauly 2014). This species is listed as Least Concern by the International Union for Conservation of Nature (IUCN) (Collette et al. 2015). These life history characteristics suggest a moderate inherent vulnerability (PSA score = 2) according to the Seafood Watch productivity table.

##### **Justification:**

Life history trait	Parameter	Score
Average maximum size	100-300 cm	2
Reproductive strategy	Broadcast spawner	3
Trophic level	>3.25	1
Average soze at maturity	40-200 cm	2
Average Score		2

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

##### **Moderate Concern**

No stock-wide assessment has been conducted for escolar but it has been assessed by the International Union for the Conservation of Nature (IUCN) to be a species of Least Concern (Collette et al. 2015). An assessment was conducted in 2002 in the Western South Atlantic and indicated that the population was declining (Milessi and Defeo 2002). But this is outside the region of this report. Also, an analysis of escolar in the U.S. pelagic longline fishery has been conducted. Variations in catch rates between months, years, and locations were evident. This study focused on data from the 1990s but found that the population appeared stable (Levesque 2010). We have awarded a "moderate" concern score because assessments are old and the current status is unknown.

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Moderate Concern**

Information on fishing mortality rates for escolar is scant. An analysis of the U.S. pelagic longline fishery from the 1990s indicated that escolar were not undergoing overfishing, but this assessment has not been updated. Escolar represents around 6% of the total catch in the Gulf of Mexico (GOM) pelagic longline fishery, with just over 3,000 animals observed caught between 2007 and 2009 (SEFSC 2013). We have awarded a "moderate" concern score because fishing mortality rates are unknown.

## **Factor 2.4 - Discard Rate**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **20-40%**

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

## LEATHERBACK TURTLE

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **High**

Sea turtles have a high level of vulnerability (Seafood Watch 2013). Sea turtle life history characteristics support this high inherent vulnerability score. Sea turtles grow slowly, reach sexual maturity at a late age and produce a small number of young.

### **Factor 2.2 - Abundance**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **Very High Concern**

Leatherback sea turtle has been listed as Endangered by the U.S. Endangered Species Act (ESA) since 1970 (NMFS 2014b). Leatherback is listed as Endangered by Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2012). The International Union for Conservation of Nature (IUCN) classified leatherback turtle in the Northwest Atlantic as Least Concern (Tiwari et al. 2013). In addition, leatherback turtle has been listed on the Convention on International Trade of Endangered Species (CITES) since 1975 and is currently listed on CITES Appendix I, meaning that it is threatened with extinction if international trade is not prohibited. In the Atlantic, the population size is estimated between 34,000 and

94,000 (TEWG 2007). We have awarded a “very high” concern score based on the various CITES and national listings.

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **Low Concern**

Fishing mortality is thought to be a major global threat to leatherback turtle, especially for juveniles and adults that can be incidentally captured in fisheries along their migration routes (Martinez 2000) (Zug and Parham 1996). But in the Northwest Atlantic Ocean, leatherback sea turtle has a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013). Within the U.S. Gulf of Mexico (GOM), interactions rates have ranged from a low of 26 in 2010 to a high of 838 in 2003 (NMFS 2014b). Interactions were historically the highest in the GOM compared to other areas, but interaction rates have decreased significantly over time (NMFS 2014b). A 2004 Biological Opinion determined that the pelagic longline fishery posed a threat to leatherback turtles. After this decision, new management measures requiring the use of circle hooks size 16/0 or larger became required in this fishery. This gear modification was expected to reduce the incidental capture of sea turtles (DFO 2012a). In addition, several time/area closures were put into place. Bycatch estimates of leatherback sea turtle have shown a continuing downward trend since these regulations were put into place (Garrison and Stokes 2009). We have therefore awarded a “low” concern score.

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### **Low Concern**

Fishing mortality is thought to be a major global threat to leatherback turtles, especially for juveniles and adults that can be incidentally captured in fisheries along their migration routes (Martinez 2000)(Zug and Parham 1996). However, in the Northwest Atlantic Ocean, leatherback sea turtles have a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013). In Canadian waters, leatherback turtles have an estimated mortality rate of 21-49% from pelagic longline fisheries and 102 and 36 interactions were observed (5-30% observer coverage) by fisheries observers during the time periods of 2001 to 2005 and 2006 to 2010 respectively (DFO 2012). Based on these observed interactions, estimated interactions for the whole fishery appear to have declined from 120-190 prior to 2006 to 60-90 per year since 2006 (DFO 2012). Although it should be noted that observer coverage rates were not the same during these two time periods. The impact of this fishery on their population is unknown. Canada does require the use of circle hooks in this fishery to reduce sea turtle interactions (DFO 2012a), and bycatch in this fishery does not appear to be threatening the population, but impacts are not fully known. We have therefore awarded a low concern score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### **Low Concern**

Fishing mortality is thought to be a major global threat to leatherback turtle, especially for juveniles and adults that can be incidentally captured in fisheries along their migration routes (Martinez 2000) (Zug and Parham 1996). But in the Northwest Atlantic Ocean, leatherback sea turtle has a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013). Within the U.S. Atlantic (excluding the Gulf of Mexico), interaction rates have ranged from 207 during 2011 to 582 during 2004 (NMFS 2014b). A 2004 Biological Opinion determined that the pelagic longline fishery posed a threat to leatherback turtles. After this decision, new management measures requiring the use of circle hooks size 16/0 or larger became required in this fishery. This gear modification was expected to reduce the incidental capture of sea turtles. In addition,



several time/area closures were put into place. Bycatch estimates of leatherback sea turtle have shown a continuing downward trend since these regulations were put into place (Garrison and Stokes 2009). We have therefore awarded a “low” concern score.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%-19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%-19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## LOGGERHEAD TURTLE

### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### High

Sea turtles have a high level of vulnerability (Seafood Watch 2013). Sea turtle life history characteristics support this high inherent vulnerability score. Sea turtles grow slowly, reach sexual maturity at a late age and produce a small number of young.

## Factor 2.2 - Abundance

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Very High Concern

The International Union for Conservation of Nature (IUCN) classified loggerhead turtle as Endangered in 1996, although it has been suggested that this needs to be updated (MTSG 2006). Loggerhead is also listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010) and listed as Threatened (NW Atlantic population) on the U.S. Endangered Species List (NMFS 2013c). In the Western North Atlantic, populations have been declining since the late 1990s (NMFS 2009). We have awarded a “very high” concern score based on the IUCN and national listings.

## Factor 2.3 - Fishing Mortality

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Low Concern

The incidental capture of loggerhead turtle is considered a primary threat globally to its populations (MTSG 2006). In the Atlantic Ocean, it has been estimated that between 150,000 and 200,000 loggerheads were incidentally caught during 2000 (Lewison et al. 2004). The majority of information available is from the U.S. pelagic longline fishery, and the Canadian fishery to an extent. It is estimated that interactions between loggerhead turtle and the U.S. Atlantic longline fishery have ranged from 243 to 820 between 2003 and 2012 (NMFS 2014b). An assessment conducted during 2009 determined that there was not enough information to assess the effect of loggerhead mortality in individual fisheries (NMFS 2009b) (Paul 2010). Other research suggests that this population is at a low population risk from bycatch and that bycatch impacts were low (Wallace et al. 2013). A 2004 Biological Opinion determined that the pelagic longline fishery posed a threat to leatherback turtles. After this decision, new management measures requiring the use of circle hooks size 16/0 or larger became required in this fishery. This gear modification was expected to reduce the incidental capture of sea turtles. In addition, several time area closures were put into place. Bycatch estimates of loggerhead sea turtle have been below the record highs of the 1990s since 2000. Bycatch rates dropped in 2005 after the implementation of the previously mentioned management measures, increased slightly in 2006 and 2007, but have since declined (Garrison and Stokes 2009). We have therefore awarded a “low” concern score.

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### Low Concern

The incidental capture of loggerhead turtle is considered a primary threat globally to its populations (MTSG 2006). In the Atlantic Ocean, it has been estimated that between 150,000 and 200,000 loggerheads were incidentally caught during 2000 (Lewison et al. 2004). The majority of information available is from the U.S. pelagic longline fishery and the Canadian fishery to an extent. The Canadian fishery caught 1,200 loggerhead turtles between 2002 and 2008, with an estimated mortality of 200–500 individuals (Paul 2010). An

assessment conducted during 2009 determined that there was not enough information to assess the effect of loggerhead mortality in individual fisheries (NMFS 2009b) (Paul 2010). The Department of Fisheries and Oceans Canada is currently trying to determine fishing mortality rates for loggerhead. Research suggests that this population is at a low population risk from bycatch and that bycatch impacts were low (Wallace et al. 2013). Canada does require the use of circle hooks in this fishery to reduce sea turtle interactions (DFO 2012a), and bycatch in this fishery does not appear to be threatening the population, but impacts are not fully known. We have therefore awarded a "low" concern score.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%-19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%-19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## LONG SNOUTED LANCETFISH

### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Medium

FishBase assigned a very high vulnerability score of 83 out of 100 (Froese and Pauly 2013). Long snouted lancetfish reaches a maximum size of 215 cm. It is a top predator and broadcast spawner (Froese and Pauly). These life history characteristics suggest a moderate inherent vulnerability according to the Seafood Watch productivity and susceptibility table (PSA score = 2). This species is considered a species of Least Concern by the International Union for the Conservation of Nature (IUCN) (Paxton 2010). Based on this species widespread distribution and because it is not targeted in fisheries (Chuguey Pers. Comm. 2016), we have awarded a moderate concern scored based on our PSA score.

**Justification:**

Life history trait	Parameter	Score
Average maximum size	100-300 cm	2
Trophic level	>3.25	1
Reproductive strategy	Broadcast spawner	3
Average Score		2

**Factor 2.2 - Abundance**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Moderate Concern**

Long snouted lancetfish is considered a species of Least Concern by the International Union for Conservation of Nature (IUCN). It has a wide range and is found at depths not targeted by most fisheries. There is no information on the population size or whether it is increasing or decreasing in size (Paxton 2010). We have awarded a “moderate” concern score because abundance is unknown but the population is rated by IUCN as “Least Concern” and is not a highly vulnerable species.

**Factor 2.3 - Fishing Mortality**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Low Concern**

Long snouted lancetfish is not targeted but is caught as bycatch in some fisheries, such as pelagic longlines. For example, it represents around 12% of the total catch in the U.S. Gulf of Mexico pelagic longline fishery (unpublished POP data). This incidental capture is not thought to be a threat to this species (Paxton 2010), so we have awarded a “low” concern score.

**Factor 2.4 - Discard Rate**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**20-40%**

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within

the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

## SWORDFISH

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED  
STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Medium**

FishBase assigned a high to very high vulnerability of 72 out of 100 (Froese and Pauly 2013). But the life history characteristics of swordfish indicate a lower vulnerability to fishing. For example, swordfish reaches sexual maturity at around 180 cm in size and around 5 years of age, and it reaches a maximum length of 455 cm and lives more than 10 years. Swordfish is a broadcast spawner and top predator (Froese and Pauly 2013). This is more indicative of a moderate vulnerability to fishing.

### **Factor 2.2 - Abundance**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED  
STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA

UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

#### **Low Concern**

The last assessment for swordfish in the North Atlantic was conducted in 2013. The population of swordfish in the North Atlantic is estimated to be at or above the levels needed to produce the maximum sustainable yield (BMSY) and the population is not overfished ( $B_{2011}/BMSY = 1.14$  (1.05-1.24)). The results from this assessment were very similar to those from the previous 2009 assessment (ICCAT 2013b). There is some concern surrounding the size structure of the population (ICCAT 2013b), so we have awarded a "low" concern and not very low concern score.

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

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### **Very Low Concern**

Fishing mortality of swordfish in the North Atlantic has been below levels needed to produce the maximum sustainable yield (FMSY) since 2000 and overfishing is not currently occurring ( $F_{2011}/FMSY = 0.82$  (0.73-0.91)). Fishing mortality peaked in 1995 and has shown a downward trend since, with a slight increase from 2002–2005 (ICCAT 2013b). We have awarded a “very low” concern score because fishing levels on swordfish are sustainable.

## **Factor 2.4 - Discard Rate**

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### **20-40%**

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### **< 20%**

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, HANDLINES AND HAND-OPERATED POLE-AND-LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, HAND-OPERATED POLE AND LINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/ATLANTIC, TROLLING LINES, UNITED STATES OF AMERICA

### **< 20%**

Handline and troll fishing have very low discard rates compared to other commercial fishing methods (Baily et al. 1996) (Harrington et al. 2005) (Kelleher 2005) (NMFS 2011). A recent nationwide assessment of discards

in U.S. fisheries also suggests that the discard rates in the coastal migratory species troll fisheries in the South Atlantic are low: 8,774.48 individuals discarded and 985,790 individuals landed (NMFS 2011), though the authors did not calculate actual discard rates due to multiple confounding factors.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**20-40%**

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

**ALBACORE**

**Factor 2.1 - Inherent Vulnerability**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**Medium**

FishBase assigned a high vulnerability score of 58 out of 100 (Froese and Pauly 2013). But the life history characteristics of albacore suggest only a medium vulnerability to fishing. For example, albacore reaches sexual maturity between 5 and 6 years of age and reaches a maximum age of 15 years (ISCAWG 2011). it is a broadcast spawners and top predator (Froese and Pauly 2013). Based on these life history characteristics, we have awarded a medium score.

**Justification:**

Life history characteristic	Paramater	Score
Age at maturity	<5 years	3
Average maximum age	10-25 years	2
Reproductive strategy	Broadcast spawner	3
Trophic level	>3.25	1
Average score		2.25

**Factor 2.2 - Abundance**

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

**High Concern**

The population of albacore tuna in the North Atlantic has been below the level needed to produce the maximum sustainable yield (BMSY) since the mid-1980s but has improved since the lowest levels in the late 1990s. There is considerable uncertainty surrounding the status of albacore tuna in the North Atlantic, as evidenced by the wide array of model results. Currently, the ratio of the current spawning stock biomass to that at the maximum sustainable yield (SSBcurrent/SSBMSY) is estimated to be 0.94 (0.74–1.14). There is a

0.2% probability that the population is overfished and undergoing overfishing, a 27.4% probability that the population is neither overfished nor undergoing overfishing, and a 72.4% probability that the population is either overfished or overfishing is occurring but not both (ICCAT 20013). The International Commission for the Conservation of Atlantic Tunas considers this population overfished and we have awarded a "high" concern score.

### Factor 2.3 - Fishing Mortality

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### Very Low Concern

The maximum sustainable yield (MSY) of albacore tuna in the North Atlantic is estimated to be 31,680 t. Historically, fishing mortality rates were above levels needed to produce the maximum sustainable yield (FMSY) from the 1960s to mid-2000s. However, currently  $F_{2012}/F_{MSY} = 0.72$  (0.55-0.89) and the population is no longer undergoing overfishing (ICCAT 2013a), so we have awarded a "very low" concern score.

### Factor 2.4 - Discard Rate

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

#### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

## BLUEFIN TUNA

### Factor 2.1 - Inherent Vulnerability

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

#### High

FishBase assigned a very high vulnerability score of 82 out of 100 (Froese and Pauly 2013). In the western



Atlantic, bluefin tuna reaches sexual maturity around 9 years of age and under 200 cm in length. It is long lived, reaching ages of 40 years and lengths over 300 cm (ICCAT 2012b). Atlantic bluefin tuna is a broadcast spawner and has a high trophic level, according to FishBase (Froese and Pauly 2013). These life history characteristics also suggest a high vulnerability.

## Factor 2.2 - Abundance

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Very High Concern

Based on a low recruitment scenario for Atlantic bluefin tuna in the Northwest Atlantic, the current biomass ( $B_{2013}$ ) is around 225% (192%–268%) above the level needed to produce the maximum sustainable yield ( $B_{MSY}$ ); but under the high recruitment scenario, the biomass is only 48% (35%–72%) of  $B_{MSY}$ . Therefore, under the low recruitment scenario, Atlantic bluefin tuna is not overfished, but under the high recruitment scenario it is (ICCAT 2012b). Atlantic bluefin tuna is listed as Endangered under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is under assessment for designation on Canada's Species at Risk Act (SARA) (GOC 2013). The International Union for the Conservation of Nature (IUCN) considers Atlantic bluefin tuna to be Endangered (Collette et al. 2011a). We have awarded a "very high" concern score due to the IUCN status and because the stock assessment has been hindered with data concerns and uncertainty.

### Justification:

Two alternative hypotheses are currently considered by the scientific committee conducting the assessment. The first one (high potential recruitment) assumes that high recruitment levels seen in the 1970s can be attained again if the stock is allowed to recover. The second hypothesis (low potential recruitment) assumes that these high levels of recruitment can no longer be achieved due to circumstances such as environmental changes. The results of the models and therefore the status of the population is highly dependent on which one of these hypotheses is true, and there is currently no indication which hypothesis is more plausible.

## Factor 2.3 - Fishing Mortality

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA  
UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA  
UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Moderate Concern

For bluefin tuna in the Northwest Atlantic Ocean, the fishing mortality rate needed to produce the maximum sustainable yield (FMSY) under the low recruitment scenario is 0.12 (0.17–0.24) and 0.08 (0.07–0.10) under the high recruitment scenario. The current  $F_{2010-2012}/F_{MSY}$  is 0.36 (0.28–0.43) and 0.88 (0.64–1.08) under the low and high scenarios, respectively. Therefore, under both recruitment scenarios, overfishing is not occurring (ICCAT 2014). The United States management measures have been put into place to reduce longline mortality (NMFS 2014b). We have awarded a "moderate" concern and not low concern score due to the uncertainty of these results and because overfishing has been occurring under the high recruitment scenario for many years.

### Justification:

The National Marine Fisheries Service has recently issued a final rule (Final Amendment 7 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan) (NOAA 2014) to address this issue by expanding closed areas to protect spawning bluefin, requiring the fishery to close once the bluefin quota

has been exceeded, and requiring retention of all legal-sized bluefin tuna to reduce dead discarding.

## Factor 2.4 - Discard Rate

CANADA/NORTHWEST ATLANTIC, DRIFTING LONGLINES, CANADA

### < 20%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Discard rates in the Canadian swordfish fishery vary depending on the species. In 2009, around 7% of swordfish were discarded, 10% of bigeye tuna, 5% of yellowfin, 50% of shortfin mako shark, 95% of porbeagle shark, but only 3% of dolphinfish (Hanke et al. 2012). It is likely that overall discard rates are less than 20%, so we have awarded a low score.

UNITED STATES OF AMERICA/ATLANTIC, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0%–40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10%–19% (Kelleher 2005). Within the U.S. pelagic longline fishery, discard rates vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. The overall bycatch to total catch rate for this fishery in 2010 was 23% (NMFS 2013b).

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## BLACKFIN TUNA

### Factor 2.1 - Inherent Vulnerability

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Medium

FishBase assigned a moderate vulnerability score of 41 out of 100 (Froese and Pauly 2013). Blackfin tuna is a small tuna species that reaches sexual maturity by 50 cm and 3 years of age. The maximum length attained is around 108 cm and it lives to around 5 years of age. Blackfin tuna is a broadcast spawner and high-level predator in the ecosystem (Froese and Pauly 2014). These life history characteristics also suggest a moderate

vulnerability level.

## Factor 2.2 - Abundance

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Moderate Concern

In Atlantic waters, blackfin tuna is assessed along with 13 other "small tuna" species. Currently, there is not enough information to conduct a full assessment of this group (ICCAT 2012a). According to the International Union for Conservation of Nature (IUCN), blackfin tuna is a species of Least Concern with a stable population trend and is considered one of the most common tuna species in the Western Atlantic (Collette et al. 2011b). We have awarded a "moderate" concern score because information on its status is unknown and it has a moderate vulnerability to fishing pressure.

## Factor 2.3 - Fishing Mortality

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### Low Concern

Blackfin tuna makes up a small proportion of "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data. Landings have been variable over the years, peaking in the early 1990's but showing no consistent trend over time (ICCAT 2012a). It is caught by a variety of gears but there is no indication that overfishing is occurring (Collette et al. 2011b). We have awarded a "low" concern score because there is no indication overfishing is occurring and this species is not heavily targeted in this fishery.

## Factor 2.4 - Discard Rate

UNITED STATES OF AMERICA/GULF OF MEXICO, DRIFTING LONGLINES, UNITED STATES OF AMERICA

### 20-40%

Pelagic longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0-40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10-19% (Kelleher 2005). Discard rates in the U.S. pelagic longline fishery vary depending on the species. For example, in 2011, 18% of swordfish were discarded while over 90% of sharks were discarded (NMFS 2014b). Between 2007 and 2009, observer records indicated that 96% of billfish, 46% of other fish, and 95% of sharks were discarded. Within the other fish category, only 6% of dolphinfish were discarded, 15% of escolar, and 94% of lancetfish (pers. comm., SEFSC 2015). But Atlantic bluefin tuna discard rates in this fishery can be very high. For example, in 2011, 68% of Atlantic bluefin were discarded but discard rates have been as high as 78% (NMFS 2014b). The overall bycatch to total catch rate in 2010 was 23% (NMFS 2013b).