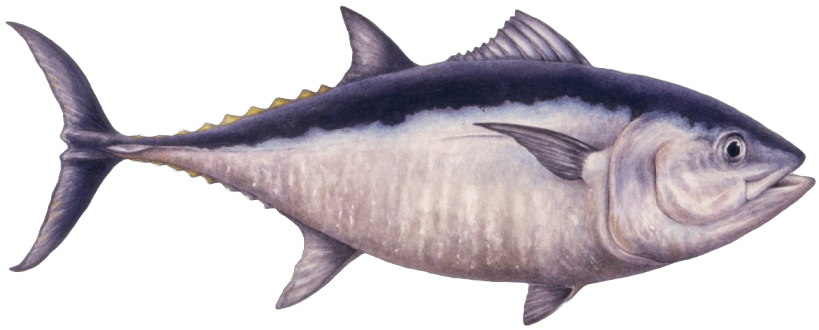
Large pelagics

Prionace glauca, Lamna nasus, Isurus oxyrinchus, Coryphaena hippurus, Acanthocybium solandri



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Atlantic Ocean

Drifting longlines, Floating object purse seine (FAD), Handlines and hand-operated pole-and-lines

Seafood Watch Consulting Researcher

March 1, 2021

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: Fisheries Standard v3

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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. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

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

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Watch assessments in any way they find useful.

Guiding Principles

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

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

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

These guiding principles are operationalized in the four criteria in this standard. Each criterion includes:

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

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

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

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

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

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

Summary

The Seafood Watch recommendations in this report are for the following species caught in the Atlantic Ocean: blue shark (*Prionace glauca*), porbeagle shark (*Lamna nasus*, Canada only), shortfin mako shark (*Isurus oxyrinchus*), dolphinfish (*Coryphaena hippurus*), and wahoo (*Acanthocybium solandri*). Fishing gears discussed herein include drifting longlines, floating object-associated purse seines, handlines, and hand-operated poles and lines.

Blue sharks in the north Atlantic are considered healthy but in the south Atlantic, their stock status is undermined. Likewise, the stock statuses in the Atlantic of dolphinfish and wahoo also are unknown. Shortfin mako sharks are listed as endangered under the IUCN, considered overfished in the north Atlantic and likely overfished in the south Atlantic, and porbeagle sharks are overfished and listed as endangered in Canada.

We have included species that typically comprise 5% or more of the total catch or whose status (i.e., endangered or threatened), justifies their inclusion in this report based on the Seafood Watch Standard for Fisheries. Longline fisheries capture a number of secondary target and bycatch species, and capture ecologically important species such as tunas and sharks, which could impact ecosystems. Highly selective gears such as handline and pole and line gears, tend to have very little bycatch associated with them. However, handline fisheries rely on live baitfish. The effect of the removal of these species on the ecosystem is unknown, and few baitfish fisheries are managed.

All fishing gears in this report fish on the surface and therefore do not negatively impact bottom habitats.

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Blue shark | Southwest Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Blue shark | Southeast Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Blue shark | Northwest Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Blue shark | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Blue shark | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Blue shark | Northeast Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Dolphinfish | Southeast Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Dolphinfish | Southwest Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Dolphinfish | Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Dolphinfish | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Dolphinfish | West Atlantic | Floating object purse seine (FAD)	2.644	1.000	1.000	3.873	**Avoid (1.789)**
Dolphinfish | Northwest Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Dolphinfish | East Atlantic | Floating object purse seine (FAD)	2.644	1.000	1.000	3.873	**Avoid (1.789)**
Dolphinfish | Northeast Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Dolphinfish | North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	2.644	5.000	3.873	**Best Choice (3.411)**

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Porbeagle | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.732	1.000	1.000	3.873	**Avoid (1.609)**
Shortfin mako shark | Southwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Shortfin mako shark | Southeast Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Shortfin mako shark | Northwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Shortfin mako shark | Northeast Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Shortfin mako shark | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000	1.000	1.000	3.873	**Avoid (1.403)**
Shortfin mako shark | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000	3.000	3.873	**Avoid (1.846)**
Wahoo | North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	2.644	5.000	3.873	**Best Choice (3.411)**
Wahoo | Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Wahoo | Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Wahoo | West Atlantic | Floating object purse seine (FAD)	2.644	1.000	1.000	3.873	**Avoid (1.789)**
Wahoo | East Atlantic | Floating object purse seine (FAD)	2.644	1.000	1.000	3.873	**Avoid (1.789)**

Summary

Dolphinfish and wahoo caught in US handline and hand-operated pole and line fisheries in the Atlantic Ocean are a best choice. Blue sharks, dolphinfish, and wahoo caught in US longline fisheries are a Good Alternative. All other ratings, which are caught in drifting longlines and object-associated purse seines are an Avoid recommendation.

Eco-Certification Information

There are no eco-certified fisheries that target the species in this report.

Scoring Guide

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

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

Best Choice/Green = Final Score >3.2, and no Red Criteria, and no Critical scores

Good Alternative/Yellow = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

Avoid/Red = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

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

Introduction

Scope of the analysis and ensuing recommendation

The Seafood Watch recommendations in this report are for the following species caught in the Atlantic Ocean: blue shark (*Prionace glauca*), porbeagle shark (*Lamna nasus*, Canada only), shortfin mako shark (*Isurus oxyrinchus*), dolphinfish (*Coryphaena hippurus*), and wahoo (*Acanthocybium solandri*). Fishing gears discussed herein include drifting longlines, floating object-associated purse seines, handlines, and hand-operated poles and lines.

Species Overview

Dolphinfish (Mahi mahi)

Dolphinfish is one of two species in the family Coryphaenidae, along with the pompano dolphinfish (*C. equiselis*) {Olson and Galván-Magaña 2002}, (Uchiyama and Boggs 2006), (Polovina et al. 2009), (Whoriskey et al. 2011). Both species have a global distribution and, though pompano dolphinfish are typically smaller than mahi mahi, they share a similar morphology and coloration. Accordingly, pompano dolphinfish are often mistaken for juvenile mahi mahi (Froese and Pauly 2019) and are sometimes sold as mahi mahi.

Mahi mahi are mid-trophic level predators, feeding primarily on other fishes and occasionally, crustaceans and squid (Froese and Pauly 2019). They are found worldwide in tropical and subtropical waters warmer than 20°C (FAO 2004). This species is extremely fast growing and reaches sexual maturity in the first year of life. Size at maturity varies throughout its range (for a summary, see (Collette et al. 2011h)). For example, in the western central Atlantic, female mahi mahi mature at approximately 41.9 cm (50%, 16.5 in; (McBride et al. 2012)) and males mature at approximately 47.6 cm (50%, 18.7 in; (Schwenke and Buckel 2008)), whereas in the eastern Caribbean, 50% of males and females mature at 91 cm and 83 cm, respectively (Oxenford 1999). Females are highly fecund, producing as many as 1.5 million eggs per spawning event, and short-lived, with a typical lifespan of less than 5 years (Collette et al. 2011h), (Froese and Pauly 2019). Mahi mahi are sexually dimorphic, with males significantly larger than females. Mahi mahi school in feeding aggregations and these schools are commonly associated with floating objects; hence, they are often captured near fish aggregation devices (FADs) .

Wahoo

Wahoo 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 2019), (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. 2011f)) 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. 2011f). In the Western Atlantic, wahoo ranges from New York to Colombia, including in the Gulf of Mexico and the Caribbean Sea . 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 . 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 sharks are highly migratory, found throughout the world's oceans in epipelagic and mesopelagic waters. Blue sharks reach sexual maturity at a late age, grow and reproduce slowly. Compared with other shark species, however, blue sharks are highly productive (Aires-da-Silva and Gallucci 2007). Their productivity depends on survival rates of juveniles (Aires-da-Silva and Gallucci 2007). It is the most widely distributed shark species and the most abundant, with abundance increasing with latitude. Blue sharks are apex predators, consuming a variety of fish and squid species (ISCSWG 2014).

Porbeagle sharks also are highly migratory, found in pelagic and epipelagic waters. They live in the North Atlantic and temperate waters in the Southern hemisphere. Porbeagle sharks are most commonly found on continental and offshore

regions but can occur inshore. They feed on schooling species of fish, squid, and other sharks. Porbeagle is long-lived (25-40 years) and slow growing, reaching sexual maturity at a late age (8-13 years) and producing a small number of young after an 8-9 month gestation (DFO 2015). (Froese and Pauly 2019).

Shortfin mako sharks are highly migratory 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 2019).

In U.S. and Canadian domestic waters, the National Marine Fisheries Service and Department of Fisheries and Oceans Canada, respectively, manage mahi mahi, wahoo and sharks. 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. The International Commission for the Conservation of Atlantic Tunas (ICCAT) manages these species in international waters.

Production Statistics

The following information is from the ICCAT catch statistics database (https://iccat.int/en/accesingdb.html#collapse1).

In the Atlantic, dolphinfish are primarily caught in the US recreational rod and reel fishery. This fishery comprises 96% of the US Atlantic mahi mahi landings and 49% of Atlantic mahi mahi landings of all countries combined (Figure 1). The majority of wahoo in the Atlantic (76%) is caught in purse seines. Longline landings are a distant second (8%). In the US, 90% of wahoo landings in the Atlantic are from the recreational rod and reel fishery (Figure 2).

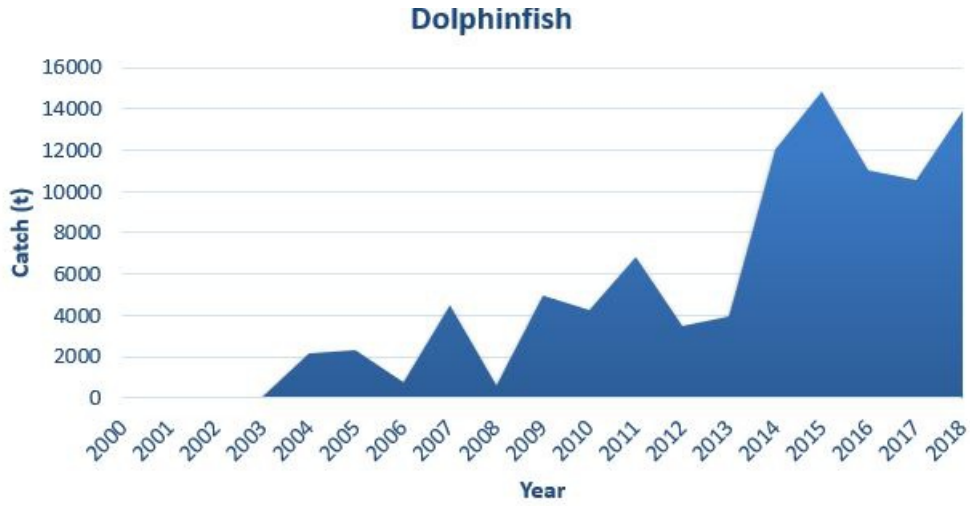

Figure 1: Catches of Atlantic dolphinfish 2000-2018 (ICCAT database).

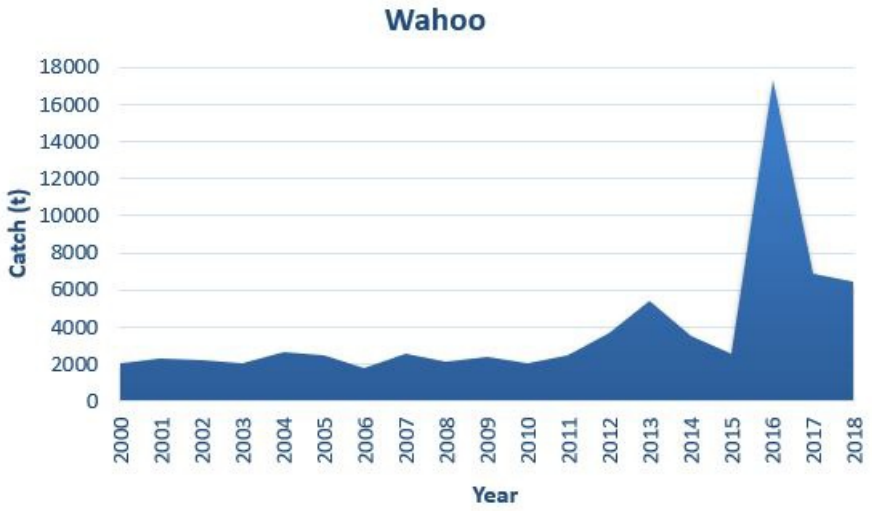

Figure 2: Catches of Atlantic wahoo 2000-2018 (ICCAT database).

Between 2003 and 2018, Atlantic dolphinfish landings increased to a high of nearly 15,000 tons (in 2015) and have fluctuated between roughly 10,500 tons and 14,000 tons since then. In 2016, Atlantic wahoo landings spiked at over 17,000 tons, but quickly declined. In 2017 and 2018, landings were between 6,400-6,900 tons.

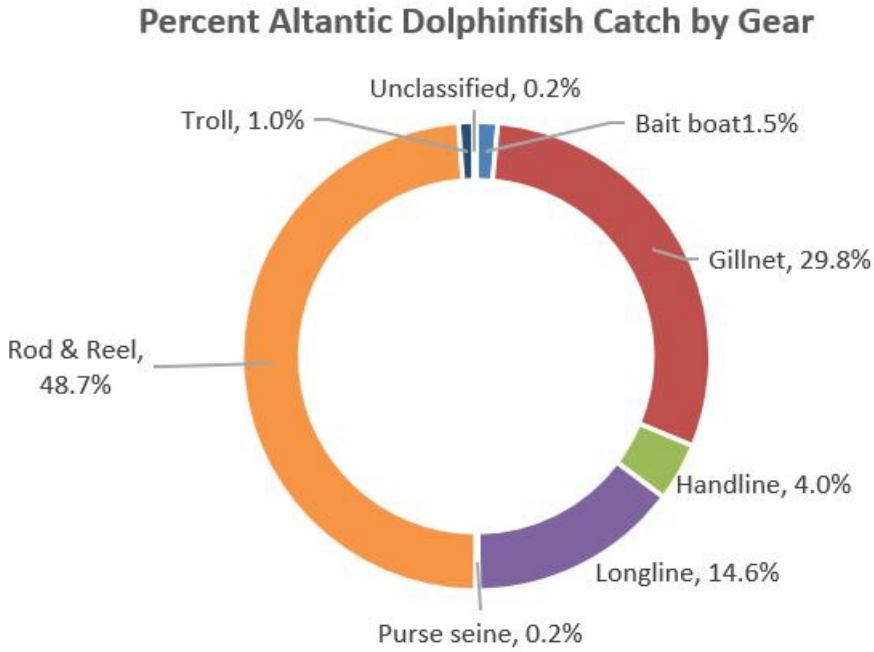

Figure 3: Percent of Atlantic dolphinfish catches by gear in 2018 (from IATTC catch database).

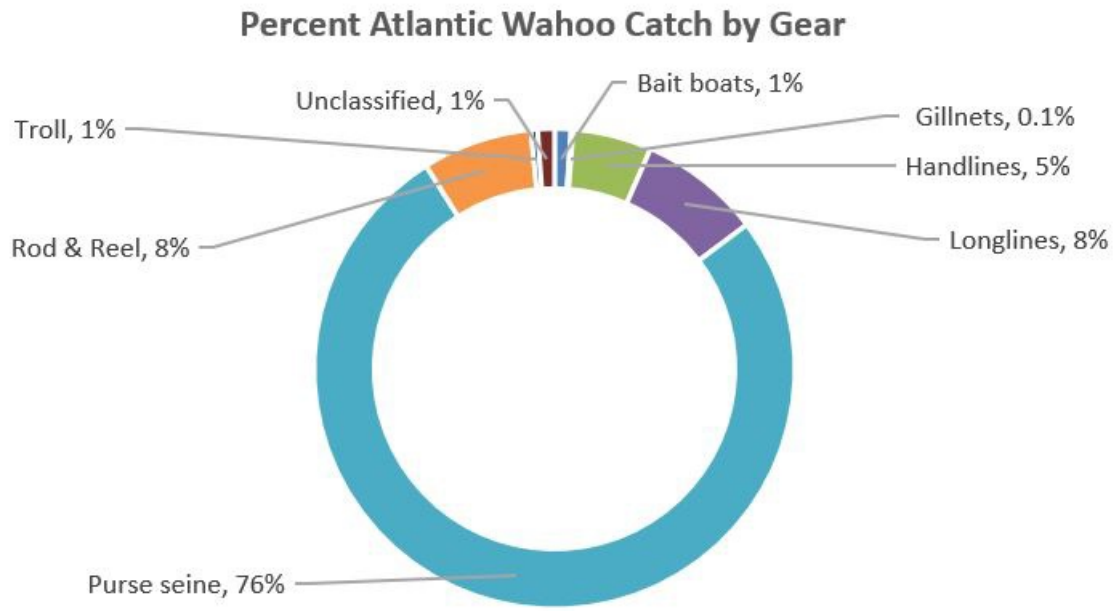

Figure 4: Percent of Atlantic wahoo catches by gear in 2018 (from IATTC catch database).

In 2018, nearly all blue, porbeagle and shortfin mako sharks combined (98%) were caught in longlines. Blue sharks comprised 92% of the shark catches in all gears in the Atlantic (> 68,000 tons) as well as 92% of sharks caught with longlines (~ 66,000 tons). Blue shark landings increased steadily between 2000-2011, peaking in 2011. They declined for a couple of years and have been increasing since 2013.

In 2018, porbeagle sharks comprised only 0.02% (16 tons) of all shark landings in the Atlantic, while fishermen landed just over 5,500 tons (8% total shark landings) of shortfin mako sharks in the Atlantic. Atlantic landings of porbeagle sharks have decreased steadily from 1,768 tons in 2000 to 16 tons in 2018. Shortfin mako shark landings in the Atlantic have fluctuated between approximately 4,800 tons in 2001 and roughly 7,300 tons in 2012. Since 2012, landings have declined to around 5,500 tons in 2018.

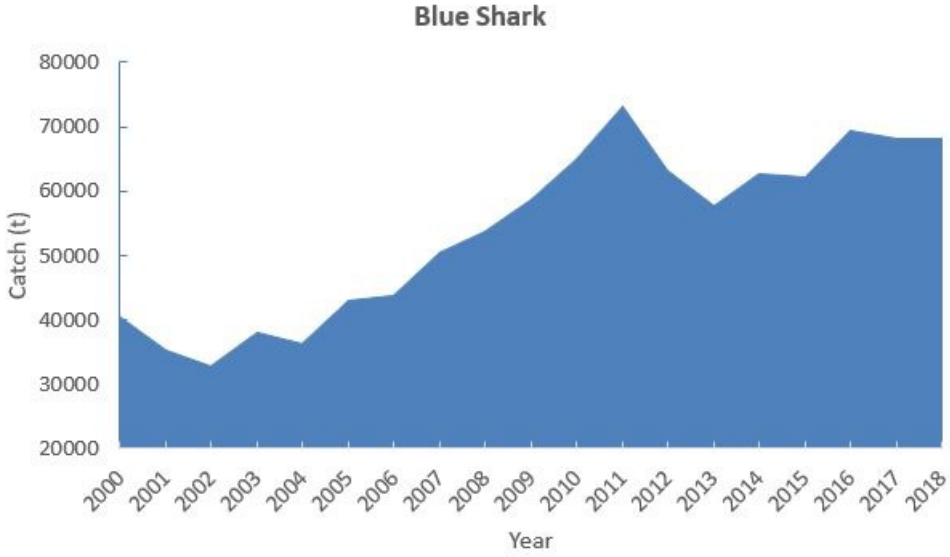

Figure 5: Catches of Atlantic blue sharks 2000-2018 (from IATTC cathc database).

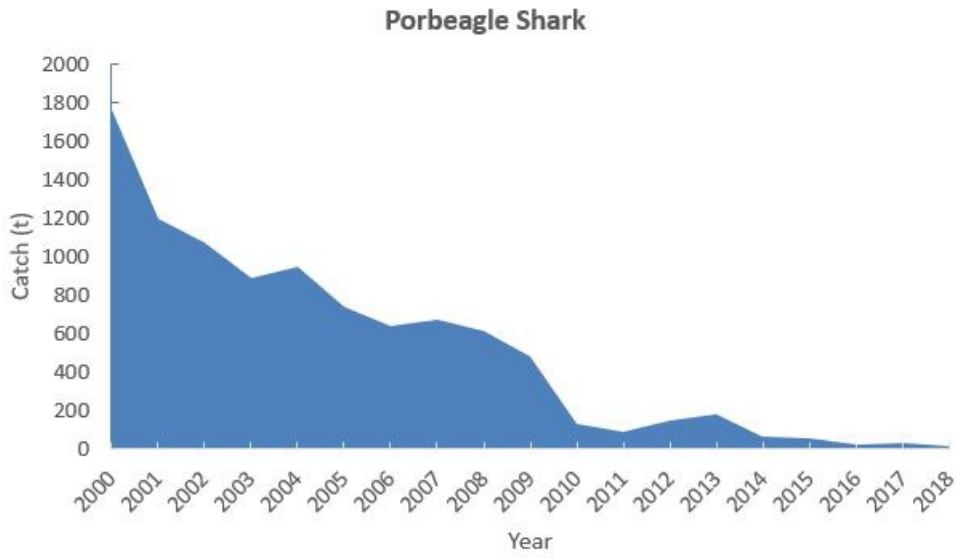

Figure 6: Catches of Atlantic porbeagle sharks 2000-2018 (from IATTC catch database).

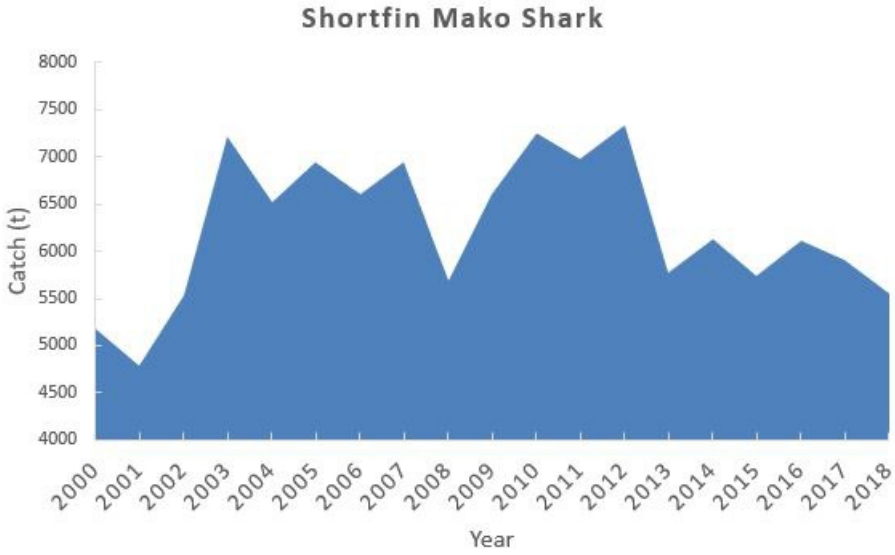

Figure 7: Catches of Atlantic shortfin mako sharks 2000-2018 (from IATTC catch database).

Importance to the US/North American market.

In 2019, the US imported just over 20,000 tons of dolphinfish, but majority of these imports came from the Pacific Ocean (i.e., Peru, Ecuador, Taiwan, Costa Rica and Vietnam) (NMFS 2020). NOAA Fisheries does not report wahoo imports nor shark imports at the species level (NMFS 2020). In 2019, the US imported nearly 116 tons of sharks and rays combined (NMFS 2020). Approximately two-thirds of shark and ray imports are from Canada and Mexico (NMFS 2020).

Common and market names.

Porbeagle, shortfin mako and blue sharks are also known as 'shark'. Mahi mahi is also known as dolphinfish and dorado. 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 Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

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

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

Guiding Principles

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

Criterion 1 Summary

BLUE SHARK			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Southwest Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Southeast Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Northwest Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Best Choice (4.284)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	3.670: Low Concern	5.000: Low Concern	Best Choice (4.284)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	3.670: Low Concern	5.000: Low Concern	Best Choice (4.284)
Northeast Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Best Choice (4.284)

DOLPHINFISH			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Southeast Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Southwest Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
West Atlantic | Floating object purse seine (FAD)	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Northwest Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
East Atlantic | Floating object purse seine (FAD)	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Northeast Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)

PORBEAGLE			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000: High Concern	3.000: Moderate Concern	Avoid (1.732)

SHORTFIN MAKO SHARK			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Southwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Avoid (1.000)
Southeast Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Avoid (1.000)

SHORTFIN MAKO SHARK			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Avoid (1.000)
Northeast Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Avoid (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000: High Concern	1.000: High Concern	Avoid (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000: High Concern	1.000: High Concern	Avoid (1.000)

WAHOO			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
West Atlantic | Floating object purse seine (FAD)	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)
East Atlantic | Floating object purse seine (FAD)	2.330: Moderate Concern	3.000: Moderate Concern	Good Alternative (2.644)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance

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

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

Factor 1.2 - Fishing Mortality

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

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

Blue shark

Factor 1.1 - Abundance

Northwest Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northeast Atlantic | Drifting longlines

Low Concern
Blue sharks in the North Atlantic were last assessed in 2015 (ICCAT 2015b). Catch rates indicated some variability over time, with peaks in abundance occurring in the late 1960s. There has been a general decline in abundance since the mid to late 1990s. According to the assessment, the current biomass (2013) was likely above B_{MSY} {ICCAT2015b}. The ratio of biomass in 2013 to MSY levels was estimated to be between 1.35 to 3.45 but only 0.75 to 0.98 of virgin levels (ICCAT 2015b). The population is likely not overfished and we have awarded a score of "low" concern. We have not awarded a score of "very low" concern due to the uncertainty of the results and because model estimates include the potential for the population to be overfished.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

Moderate Concern
The status of blue sharks in the South Atlantic was last assessed in 2015 (ICCAT 2015b). The ratio of the current biomass to that needed to produce the maximum sustainable yield ranged between 0.98–2.03 (ICCAT 2015b). The ratio of the current (2013) biomass to virgin levels was estimated to range between 0.39–1.00 (ICCAT 2015b). The current status of blue sharks in this region is considered undetermined due to the uncertainty of the results (ICCAT 2018b). We have therefore awarded a score of "moderate" concern.

Factor 1.2 - Fishing Mortality

Northwest Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northeast Atlantic | Drifting longlines

Low Concern
According to the 2015 stock assessment, fishing mortality rates on north Atlantic blue sharks are currently sustainable (ICCAT 2015b). The fishing mortality rate in 2013 was 4 to 75% of maximum sustainable yield levels, indicating that overfishing is not likely occurring (ICCAT 2015b). These results are similar to the previous 2008 assessment results (overfishing not likely occurring). We have therefore awarded a score of "low" concern.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of blue sharks in the South Atlantic were last estimated in 2015 (ICCAT 2015b). The ratio of fishing mortality rates to those needed to produce the maximum sustainable yield was estimated to range between 0.01–1.19 (ICCAT 2015b). Due to the large uncertainty with these results, overfishing status is considered to be undetermined (ICCAT 2018b). We have therefore awarded a score of "moderate" concern.

Dolphinfish

Factor 1.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
West Atlantic | Floating object purse seine (FAD)
Northwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Dolphinfish 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 2018b). An updated Ecological Risk Assessment (ERA) was conducted for small tuna during 2017 (ICCAT 2018b). The IUCN considers dolphinfish a species of "Least Concern" with a stable population trend. We have awarded a score of "moderate" concern due to the IUCN status.

Factor 1.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
West Atlantic | Floating object purse seine (FAD)
Northwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Dolphinfish make up a small proportion of "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data . Dolphinfish are caught by a variety of gears (Collette et al. 2011h). Landings of dolphinfish have increased in recent years (ICCAT 2018b). We have awarded a score of "moderate" concern because information on their status is unknown.

Porbeagle

Factor 1.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northwest Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the northwest Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.43 to 0.65 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). Porbeagle sharks were listed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2004 (DFO 2012a). A recent update of a tagging study used in the 2009 assessment showed a continued decline in abundance (Bowlby 2018). We have awarded a score of "high" concern based on abundance being below B_{MSY} and due to its "Endangered" Status under COSEWIC.

Northeast Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the northeast Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.09 to 1.93 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). We have awarded a score of "high" concern because the population is assessed to be overfished.

Southeast Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the southeast Atlantic Ocean was conducted in 2009; however, data was too limited in this region to assess their status (ICCAT 2009). The International Union for Conservation of Nature (IUCN) has listed porbeagles globally as "Vulnerable" with a decreasing population trend {Stevens et al. 2006}. We have awarded a score of "high" concern based on the IUCN Listing.

Southwest Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the southwest Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.38 to 0.78 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). We have awarded a score of "high" concern because the population is considered overfished.

Factor 1.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northwest Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the Northwest Atlantic Ocean are below F_{MSY} levels and therefore overfishing is not occurring. The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.03 to 0.36 (ICCAT 2009). Although this assessment is several years old, the assessment did indicate that maintaining the current exploitation rate would be sustainable (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old; therefore, their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Northeast Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the northeast Atlantic Ocean are below F_{MSY} levels (ICCAT 2009). The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.034 to 3.45 (ICCAT 2009). Although this assessment is several years old, the assessment did indicate that overfishing is not occurring (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old; therefore, their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Southeast Atlantic | Drifting longlines

Moderate Concern
Porbeagle sharks were assessed in 2009; however, due to a lack of data, fishing mortality rates in the southeast Atlantic could not be determined (ICCAT 2009). Porbeagle sharks are caught in longline fisheries throughout the Atlantic Ocean (Stevens et al. 2000) (ICCAT 2009). This mortality is considered a major threat to this species (Stevens et al. 2000). We have awarded a score of "moderate" concern due to a lack of information from this region.

Southwest Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the southwest Atlantic Ocean are below F_{MSY} levels (ICCAT 2009). The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.31-0.10.78 (ICCAT 2009). Due to the considerable uncertainty with these results, it is undetermined whether overfishing is occurring (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old and therefore their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Shortfin mako shark

Factor 1.1 - Abundance

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

High Concern
The last assessment for shortfin mako sharks in the North Atlantic was conducted in 2017 (ICCAT 2019a). The results indicated the population in 2015 was below maximum sustainable yield (B_{MSY}) levels . Results from the production models were more pessimistic (B/B_{MSY} = 0.57-0.85) compared to the age structured model (SS_F/SSF_{MSY} = 0.95) (ICCAT 2019a). Shortin mako sharks are listed as "Endangered" (globally) by the International Union for Conservation of Nature (Rigby et al. 2019) and have recently been listed in Appendix II of CITES (HSI 2019). The population is currently considered to be overfished (ICCAT 2018b). We have therefore awarded a score of "high" concern.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The last assessment for shortfin mako sharks in the South Atlantic was conducted in 2017 . The results of the assessment were highly uncertain. The biomass in 2016 was estimated to be between 65 and 175% of maximum sustainable yield (MSY) levels . The ICCAT Scientific Committee considers this stock to be "possibly" overfished, with a combined probability (4 assessment model runs) of 32.5% (ICCAT 2018b). Shortin mako sharks are listed as "Endangered" (globally) by the International Union for Conservation of Nature (Rigby et al. 2019) and have recently been listed in Appendix II of CITES (HSI 2019). We have awarded a score of "high" concern because it is possible this species is overfished in the south Atlantic Ocean.

Factor 1.2 - Fishing Mortality

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

High Concern
The 2017 stock assessment of shortfin mako sharks in the North Atlantic indicated that fishing mortality levels are well above maximum sustainable yield (MSY) levels (ICCAT 2019a). Fishing mortality levels in 2015, were estimated to be 93 to 438% above MSY levels (ICCAT 2019a). There is a 90% combined probability that the stock is overfished and undergoing overfishing (ICCAT 2019a) (ICCAT 2018b). Projections included in the stock assessment indicate that even with a total allowable catch (TAC) of 0, the population will continue to decline until 2035 and with a TAC of 500 t there is a 52% probability of rebuilding the stock to sustainable levels by 2070 (ICCAT 2019a). Catch levels in 2018 are significantly higher than these TAC levels (ICCAT 2019a). We have awarded a score of "high" concern because shortfin mako sharks in the North Atlantic are undergoing overfishing.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The results of the most recent stock assessment of short fin mako sharks in the South Atlantic Ocean is uncertain {ICCAT 217c}.Fishing mortality rates in 2016 were estimated to be between 86 and 367% of maximum sustainable yield levels (ICCAT 2017c). Based on the 2017 stock assessment there is a 41.9% probability that overfishing is occurring (ICCAT 2017c). The ICCAT Scientific Committee indicates overfishing of this stock is "possibly" occurring (ICCAT 2018b). We have awarded a score of "high" concern due to the uncertainty and potential the stock is undergoing overfishing.

Wahoo

Factor 1.1 - Abundance

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

Moderate Concern
In the Atlantic, wahoo are assessed along with 13 other "small tuna" species. Currently, there is not enough information to conduct a full assessment of this group (ICCAT 2018b). An updated Ecological Risk Assessment (ERA) was conducted for small tuna during 2017 (ICCAT 2018b). According to this ERA assessment, wahoo are ranked 1 out of 10 in terms of productivity, susceptibility, and vulnerability to capture in longline fisheries (ICCAT 2018b). The International Union for Conservation of Nature (IUCN) considers the Atlantic population a population of "Least Concern," indicating there is no evidence to suggest populations are declining overall, although local decreases in abundance might have occurred. An assessment conducted in the Caribbean suggested stable populations between 1996 and 2006 (Collette et al. 2011f). We have awarded a score of "moderate" concern because the stock status is unknown.

Factor 1.2 - Fishing Mortality

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

Moderate Concern
Wahoo make up a small proportion of "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data (ICCAT 2018b). Catches of wahoo in the Atlantic have been variable over time. Wahoo are a reported bycatch species in purse seine fisheries (Menard et al. 2000), making up around 6% (by number) of the "other fish" catch in the French and Spanish purse seine fisheries between 2003 and 2007 (Amande et al. 2010). In the European purse seine fishery, they had a per set occurrence rate of 53% between 2006 and 2007 (Chassot et al. 2008). Fishing is not thought to have negatively impacted wahoo populations in the Atlantic Ocean, although increased fishing on FADs has led to increased fishing and bycatch mortality rates (Collette et al. 2011f). We have awarded a moderate concern score due to a lack of information.

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

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

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

Guiding Principles

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

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

BLUE SHARK			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)

DOLPHINFISH			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)

DOLPHINFISH			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
East Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000: < 100%	Yellow (2.644)

PORBEAGLE			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000	1.000: < 100%	Red (1.000)

SHORTFIN MAKO SHARK			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)

WAHOO			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	2.644	1.000: < 100%	Yellow (2.644)

WAHOO			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	1.000	1.000: < 100%	Red (1.000)
West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
East Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

ATLANTIC AND ADJACENT AREAS | ATLANTIC, NORTHWEST | DRIFTING LONGLINES | CANADA | CANADIAN-FLAGGED VESSELS FISHING IN CANADIAN WATERS AND THE HIGH SEAS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Porbeagle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Blue shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

ATLANTIC AND ADJACENT AREAS | ATLANTIC, NORTHWEST | DRIFTING LONGLINES | UNITED STATES | UNITED STATES-FLAGGED VESSELS FISHING IN US WATERS AND THE HIGH SEAS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

ATLANTIC AND ADJACENT AREAS | ATLANTIC, NORTHWEST | DRIFTING LONGLINES | UNITED STATES | UNITED STATES-FLAGGED VESSELS FISHING IN US WATERS AND THE HIGH SEAS

SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Loggerhead turtle	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Pelagic stingray	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Short-finned pilot whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Wahoo	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Risso's dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Blue shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

EAST ATLANTIC | FLOATING OBJECT PURSE SEINE (FAD)

SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Blue marlin	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Rainbow runner	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Triggerfish (unspecified)	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Wahoo	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Skipjack tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)

GULF OF MEXICO | ATLANTIC, NORTHWEST | DRIFTING LONGLINES | UNITED STATES | UNITED STATES-FLAGGED VESSELS FISHING IN US WATERS AND THE HIGH SEAS

SUB SCORE: 1.000 | DISCARD RATE: 1.000 | **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Loggerhead turtle	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Escolar	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Long snouted lancetfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Pelagic stingray	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Wahoo	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTH ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES | UNITED STATES-FLAGGED VESSELS FISHING IN US WATERS AND THE HIGH SEAS

SUB SCORE: 2.644 | DISCARD RATE: 1.000 | **SCORE: 2.644**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Wahoo	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHEAST ATLANTIC | DRIFTING LONGLINES

SUB SCORE: 1.000 | DISCARD RATE: 1.000 | **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic sailfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)

NORTHEAST ATLANTIC | DRIFTING LONGLINES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Olive Ridley turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Porbeagle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hawksbill turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic bluefin tuna	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Bottlenose dolphin	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Frigate tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Short-finned pilot whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Risso's dolphin	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Blue shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

NORTHWEST ATLANTIC | DRIFTING LONGLINES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic sailfish	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Olive Ridley turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Porbeagle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hawksbill turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Bottlenose dolphin	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | DRIFTING LONGLINES

SUB SCORE: 1.000 | DISCARD RATE: 1.000 | **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Frigate tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Short-finned pilot whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Risso's dolphin	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Blue shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

SOUTHEAST ATLANTIC | DRIFTING LONGLINES

SUB SCORE: 1.000 | DISCARD RATE: 1.000 | **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Northern royal albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
White-chinned petrel	1.000: High Concern	1.000: High Concern	Red (1.000)
Wandering albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Tristan albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Swordfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Southern royal albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Sooty shearwater	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Yellow-nosed albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Grey-headed albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Loggerhead turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Black-browed albatross	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Porbeagle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic bluefin tuna	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Frigate tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

SOUTHEAST ATLANTIC | DRIFTING LONGLINES

SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Blue shark	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	3.670: Low Concern	5.000: Low Concern	Green (4.284)

SOUTHWEST ATLANTIC | DRIFTING LONGLINES

SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Northern royal albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
White-chinned petrel	1.000: High Concern	1.000: High Concern	Red (1.000)
Wandering albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Tristan albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Swordfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Southern royal albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Sooty shearwater	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Shortfin mako shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Yellow-nosed albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Grey-headed albatross	1.000: High Concern	1.000: High Concern	Red (1.000)
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Loggerhead turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Black-browed albatross	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Porbeagle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Frigate tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Blue shark	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	3.670: Low Concern	5.000: Low Concern	Green (4.284)

WEST ATLANTIC | FLOATING OBJECT PURSE SEINE (FAD)			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Blue marlin	1.000: High Concern	1.000: High Concern	Red (1.000)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Blackfin tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Dolphinfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Triggerfish (unspecified)	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Wahoo	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Skipjack tuna	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Yellowfin tuna	3.670: Low Concern	5.000: Low Concern	Green (4.284)

US longlines

The US Atlantic and Gulf of Mexico (GoMX) longline fisheries catch a variety of species in addition to the targeted species. The incidental observed take of marine mammals, turtles, and seabirds between 2007 and 2011 was less than 1% (Keene 2016). During the same time period, sharks and rays made up 25% of the observed take, finfish 23% of the observed take, and other tuna 6% (Keene 2016). A number of other species of fish are also captured, but only around eight of these — comprising about 50% of the observed catch by number — are considered marketable (swordfish, yellowfin tuna, bigeye tuna, dolphinfish, wahoo, escolar, albacore, and shortfin mako shark) (Keene 2016). Other bycatch species include the following: lancetfish, pelagic stingray, blackfin tuna, and skipjack tuna (Keene 2016) (SEFSC 2019). A total of 19,657 dolphinfish, 7,739 lancetfish, 6,825 escolar, 4,702 blackfin tuna, and 1,893 skipjack tuna were observed caught from 2007 to 2011 (SEFSC 2019).

Marine mammals and seabirds are typically caught in very low numbers in the US Atlantic longline fisheries. Interactions have been reported (<0.01% of observed catch) with dolphins, pilot whales, minke, sperm, and false killer whales (NOAA 2019a) (SEFSC 2019). Between 2012 and 2017, 150 pilot whales, 37 dolphins (mostly Risso's), and 1 sperm whale were observed incidentally captured in this fishery (SEFSC 2019). Seabird interactions also are very infrequent but can include gannets, gulls, and shearwaters (Parkes et al. 2013) (NOAA 2019a). 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 2019a). Sea turtle interactions have decreased over the past ten years, mostly due to the implementation of bycatch mitigation measures. In 2004, 1,362 and 734 interactions with leatherback and loggerhead turtles occurred but by 2011, only 239 and 438 interactions respectively occurred (NOAA 2019a). Between 2012 and 2017, 306 and 175 interactions were observed with leatherback and loggerhead sea turtles respectively (SEFSC 2019). Loggerhead interactions typically occur in northern areas of the fishery, while leatherback interactions occur more frequently in the mid-Atlantic Bight and Gulf of Mexico. In addition to these species, billfish and other fish are also incidentally captured. We have included several additional "main species" in this report based on the fact they represent at least 5% of the catch or due to their vulnerability and status. US pelagic, longline observer-program data were used to identify these species (Keene 2016) (SEFSC 2019).

Canadian longlines

The Canadian longline fishery also catches a variety of other species. Seabird bycatch does not appear to be a major

issue in this fishery. Several species of sea turtles have been observed in this fishery but interaction rates do not appear to be very high. In addition, billfish and other fish species can be incidentally captured (DFO 2012) (DFO 2012a) (DFO 2009) (DFO 2013). We have included several additional "main species" in this report because they represent at least 5% of the total catch or their vulnerability to fishing is high. Observer data were used to determine these species. The worst-scoring species in these fisheries are bigeye tuna, shortfin mako, and silky sharks, based on their stock status and fishing mortality rates.

Non-US/Non-Canadian longlines

Several species of tunas, billfish, sea turtles, and sea birds are also incidentally captured in longline fisheries in the Atlantic Ocean. Seabird bycatch in the Atlantic occurs in the highest amounts south of 30^{o}S, specifically for albatross, giant petrel, and petrel, and the southeastern and southwestern Atlantic Ocean have been identified as "hot spots" for longline bycatch of seabirds (Clay et al. 2019). Few if any interactions have been observed between pelagic longlines and seabirds north of 30^{o}S (Inoue et al. 2012). There are interactions with several species of sea turtles, some of which are considered endangered. We have included species that either make up at least 5% of the total catch and are considered "main species" according to the Seafood Watch Standard for Fisheries, or are a stock of concern, i.e., endangered, etc. Reported catches from the International Commission for the Conservation of Atlantic Tunas Task I database for 2011 were used to determine the main species. Other species were identified through the literature.

Purse seines

Bycatch levels are typically larger in associated vs. unassociated purse seine fisheries. For example, the bycatch rates in 2008 and 2009 were 13.4% and 19.4% respectively on FAD sets in the French and Spanish purse seine fisheries {Amande et al. 2011}. A variety of species, including tuna, billfish, sharks, and sea turtles have been reported in associated purse seine fisheries. For this report, we used observer data from European purse seine fisheries to identify species that are commonly caught in associated and unassociated fisheries in the Atlantic. Albacore are not included in this report because they are not a common component of purse seine fisheries (<5% of the catch) and the purse seine fishery is not a main source of fishing mortality of Atlantic albacore. Species that had high occurrence are included in this report as "main species" as well as some species whose vulnerability status qualifies them for inclusion based on the Seafood Watch Standard for Fisheries.

Other gears

Troll and pole fisheries typically have very low bycatch rates, although baitfish may be caught and used in these fisheries. Some species such as other tunas and other fish may be incidentally captured, but they make up a small proportion of the total catch (i.e., <5%) and therefore do not qualify as "main species" under the Seafood Watch Standard for Fisheries. All four tuna species (blackfin, skipjack, bigeye, and yellowfin tuna) can be caught together and they are considered secondary species in this report.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

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

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Albacore

Factor 2.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Very Low Concern
The status of albacore tuna in the north Atlantic was last assessed in 2016 (ICCAT 2016b). Biomass currently above MSY (B/B_{MSY} = 1.36) and the stock is considered healthy (ICCAT 2016b). There is a 96.8% probability the population is neither overfished nor undergoing overfishing (ICCAT 2018b). We have awarded a score of "very low" concern because the population of albacore tuna in the north Atlantic is healthy and above maximum sustainable yield.
Justification:
The biomass of albacore tuna in the North Atlantic declined between the 1930s and 1990s. The biomass remained slightly overfished, biomass was below maximum sustainable yield (MSY) levels, during the 1980s and 1990s.

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

Low Concern
A stock assessment of albacore in the South Atlantic was conducted in 2016 (ICCAT 2016b). The model included eight scenarios, with six scenarios indicating the stock is not overfished (ICCAT 2016b). The median estimate of the ratio of the current biomass (2015) to that needed to produce the maximum sustainable yield (MSY) was 1.10 (0.51–1.80) (ICCAT 2016b) (ICCAT 2018b). This is an improvement over the previous stock assessment. There is a 66% probability the biomass is above MSY (ICCAT 2016b) (ICCAT 2018b). We have awarded a score of "low" concern because there is a high probability the stock of albacore in the south Atlantic is not overfished.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Low Concern
The maximum sustainable yield (MSY) of albacore tuna in the North Atlantic is estimated to be 37,082 t (ICCAT 2016b). Fishing mortality rates peaked in the early 1980s and were above levels needed to produce the maximum sustainable yield (F_{MSY}) through the 1990s. However, currently F_{2014}/F_{MSY} = 0.54 (0.35-0.72) and the population is not undergoing overfishing (ICCAT 2016b). There is a 96.8% probability the population is neither overfished nor undergoing overfishing (ICCAT 2018b), so we have awarded a score of "low" concern.

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

Low Concern
The 2016 stock assessment of albacore in the South Atlantic indicated the stock is not undergoing overfishing (ICCAT 2016b) (ICCAT 2018b). The estimated ratio of current (2014) fishing mortality (F) to that needed to produce the maximum sustainable yield (F_{MSY}) was 0.54 (0.31–0.87) (ICCAT 2016b) (ICCAT 2018b). There is some uncertainty surrounding these estimates but there is a 66% probability the fishing mortality rates are below MSY (ICCAT 2016b) (ICCAT 2018b). We have awarded a score of "low" concern because overfishing is not likely occurring.

Atlantic bluefin tuna

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

High Concern
The most recent stock assessment of bluefin tuna in the eastern Atlantic and Mediterranean was conducted in 2020 (ICCAT 2020). Despite improvements in data quality over the years, there are data gaps in size and catch/effort for some fisheries (prior to 2014) (ICCAT 2017i) (ICCAT 2017c). Instability in recent recruitment indices have led to greater uncertainty in the virtual population analysis (VPA) model (ICCAT 2020). Based on this model, the biomass has increased steadily between the late 2000s and 2018, but the magnitude of this is difficult to quantify (ICCAT 2020)(ICCAT 2017i) (ICCAT 2017c).

The 2017 and 2020 assessments did not use any biomass-based reference points to determine the status of bluefin tuna because ICCAT has moved to using an F based management system. Under the F-based management system, there is no biomass rebuilding target. There are continuing issues with the information on recruitment levels being highly uncertain (ICCAT 2020) (ICCAT 2017i)(ICCAT 2017c). Recruitment is a key factor driving assumptions about the abundance of bluefin tuna in the future (ICCAT 2017i) (ICCAT 2017c). We have awarded a score of "high" concern due to very high uncertainty and a lack of evidence demonstrating that the stock is no longer overfished.
Justification:

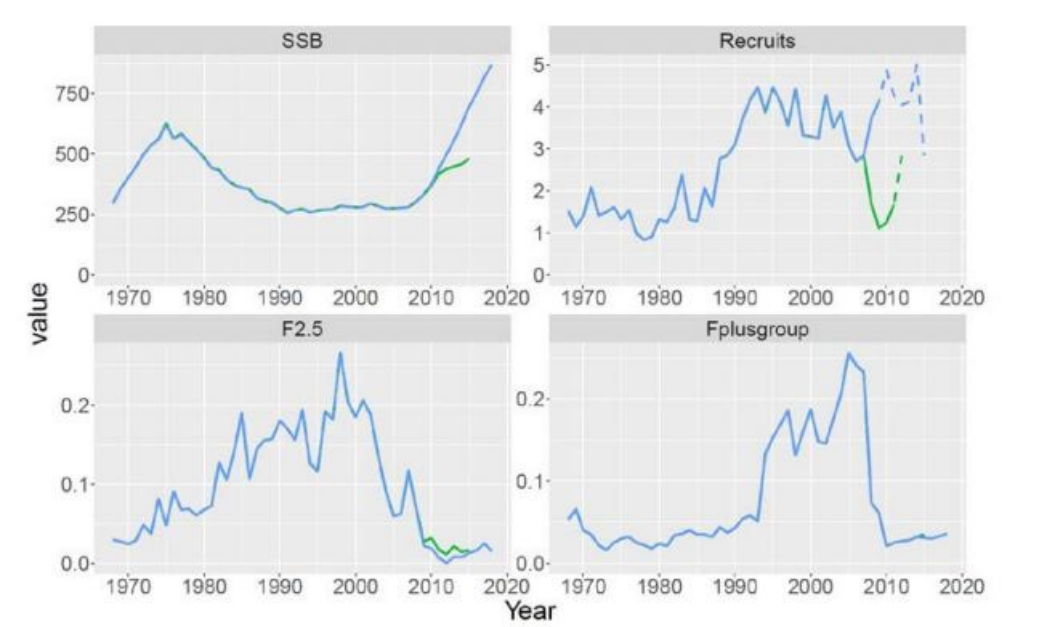

Figure 8: "Spawning stock biomass (in thousand metric ton), recruitment (in million), and fishing mortality (average over ages 2 to 5, and 10+) estimates from VPA base run in the 2020 stock assessment (blue) compared to the 2017 stock assessment (green) for the period between 1968 and 2015. The last years recruitments (dashed line: 2012-2013 for the 2017 stock assessment, and 2010-2015 for the 2020 stock assessment) were poorly estimated" (from(ICCAT 2020), p. 37).

Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

High Concern
The most recent stock assessment of bluefin tuna in the western Atlantic was conducted in 2020 (ICCAT 2020). Between 2017-2020, abundance decreased by 11.7%. Information on recruitment levels continues to be highly uncertain (ICCAT 2020) (ICCAT 2020a).

We have awarded a score of "high" concern because the stock has been historically overfished and recent decreases in abundance, which are larger than were predicted in 2017, coupled with a high degree of uncertainty surrounding recruitment.
Justification:
In 2017, the rebuilding plan was not yet completed, but the 2017 assessment did not provide management advice based on maximum sustainable yield (MSY) reference points. It focused on providing advice based on fishing mortality levels (ICCAT 2018b). The advice was for the near-term only and recruitment predictions were only for the near-term based on the recent past.

Recruitment is a key factor driving assumptions about the abundance of bluefin tuna in the future (ICCAT 2020), (ICCAT 2018b). According to the virtual population analysis - VPA, the biomass (B) of bluefin tuna in the western Atlantic gradually increased between 2004-2017. In 2015, B was at 69% of the 1974 biomass level (start of the assessment time series) (ICCAT 2018b). However, recruitment has been declining According to the Stock Synthesis model, which ran the assessment further back in time, the biomass in 2015 was 45% of the 1974 biomass level. The SCRS advised that catches restricted to 1,000 MT or less would not lead to a biomass decline in the future (ICCAT 2018b).

ICCAT assumes the population of bluefin tuna in the western Atlantic was near virgin levels in 1950. The model run of the younger spawning class =18% of virgin biomass (B_0) and 18% SSB_0 compared to near virgin levels (1950) (ICCAT 2018b).

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

Low Concern
The 2020 assessment of bluefin tuna in the eastern Atlantic and Mediterranean used a proxy reference point ($F_{0.1}$) for the maximum sustainable yield (F_{MSY}) (ICCAT 2020). Fishing mortality rates have been decreasing rapidly since 2008. Fishing mortality rates between 2015-2017 were below the reference point ($F2015\text{-}2017/F_{0.1} = 0.426$) (ICCAT 2020). Between 2015-2019, annual fishing mortality increased from 16,201 t to 28,760 t (ICCAT 2020). Models indicate that there is a 60% probability that F<F0.1 if annual fishing mortality remains at 36,000 t (ICCAT 2020).

Based on these results, overfishing of bluefin tuna in the Mediterranean likely is not occurring (ICCAT 2020). However, it should be noted that if quota and catches increase, this could have an impact on the stock, which we will not know until the next assessment is conducted (ICCAT 2020). We have awarded a score of "low" concern based on the current status of fishing mortality rates.
Justification:

Catch (t)	2018	2019	2020	2021	2022
18,000	100	100	100	100	100
20,000	99	99	99	99	99
22,000	99	99	98	98	98
23,655	98	98	98	98	98
24,000	98	98	97	98	97
26,000	97	96	96	96	96
28,000	95	94	94	94	94
30,000	93	92	92	90	89
31,000	90	90	89	89	88
32,000	89	88	87	86	83
33,000	86	85	83	81	80
34,000	82	81	79	78	75
35,000	79	77	76	72	70
36,000	75	73	70	68	64
37,000	70	68	65	62	59
38,000	65	63	60	57	54
39,000	59	57	54	52	49
40,000	56	52	49	46	44
45,000	36	35	34	30	28
50,000	24	22	20	18	18

Figure 9: The probabilities of F>F0.1 for quotas from 0 to 50,000 t for 2018 through 2022 under the recent 6 years (2006-2011) recruitment scenario, as estimated in the 2017 stock assessment. Shading corresponds to the probabilities of being in the ranges of 50-59%, 60-69%, 70-79%, 80-89%, and greater or equal to 90%. Catches for 2016 and 2017 are assumed to equal to the 2016 and 2017 TAC in all scenarios (ICCAT 2020).

Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

High Concern
The 2020 stock assessment of bluefin tuna in the western Atlantic used a proxy reference point ($F_{0.1}$) for the maximum sustainable yield (F_{MSY}). Updated models indicate that the current TAC has led to overfishing beginning in 2018 (ICCAT 2020). The 2017 models had projected a decrease in biomass of approximately 8% based on the TACs set in 2017 (ICCAT 2018b)(ICCAT 2017c). Those models underestimated the decrease in biomass by nearly

4% (ICCAT 2020). There was an 11.7% decrease in biomass between 2017-2020 (ICCAT 2020). Because the TAC has led to overfishing, we have rated this factor as high concern.

Atlantic sailfish

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines

High Concern
Two populations of sailfish are assessed in the Atlantic, eastern and western. The last assessment was conducted for both populations in 2016 (ICCAT 2018b). The assessment for the eastern population indicated that under all scenarios the population is overfished (ICCAT 2018b). The ratio of the current biomass (2014) to maximum sustainable yield (B_{MSY}) levels ranged from 0.37 to 0.71 (ICCAT 2018b). We have awarded a score of "high" concern due to the overfished status in the eastern Atlantic.

Northwest Atlantic | Drifting longlines

Moderate Concern
Two populations of sailfish are assessed in the Atlantic, eastern and western. The last assessment was conducted for both populations in 2016 (ICCAT 2018b). For the western population, the models could not provide the stock status due to large amounts of uncertainty (ICCAT 2018b). The Stock Synthesis model indicated the population was not overfished but the Stock Reduction Analysis indicated the stock was overfished (0.23–0.61) (ICCAT 2018b). We have awarded a score of "moderate" concern due to the unknown status in the western Atlantic.

Factor 2.2 - Fishing Mortality

Northeast Atlantic | Drifting longlines

High Concern
Atlantic sailfish are caught as bycatch in purse seine fisheries in the Atlantic and have been reported to be one of the more commonly caught bycatch species in unassociated sets (Chassot et al. 2008). The majority of sailfish are caught in the eastern compared to the western Atlantic. The last assessment conducted in 2016 was highly uncertain (ICCAT 2018b). The model estimated fishing mortality rates that ranged from 33% to 285% of maximum sustainable levels (ICCAT 2018b). It is therefore unclear if overfishing is occurring (ICCAT 2016h). We have awarded a score of "high" concern because it is possible overfishing is occurring.

Northwest Atlantic | Drifting longlines

High Concern
The 2016 stock assessment for Atlantic sailfish in the western Atlantic had a large amount of uncertainty surrounding the results (ICCAT 2018b). The current fishing mortality rates were estimated to be between 69 and 245% of maximum sustainable yield levels (ICCAT 2018b). We have awarded a score of "high" concern because it is possible overfishing is occurring in this population.

Bigeye tuna

Factor 2.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
East Atlantic | Floating object purse seine (FAD)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
West Atlantic | Floating object purse seine (FAD)

High Concern
Bigeye tuna in the Atlantic was assessed in 2018. The status of bigeye tuna in the Atlantic is based on several modeling approaches (ICCAT 2018). A long term decline in spawning stock biomass (SSB) has occurred and the current biomass is the lowest in the time series (ICCAT 2018). The population has been overfished since around 1996–97, with the current SSB being 59% of the maximum sustainable yield (ICCAT 2018). This stock assessment was able to decrease the uncertainty of other assessments based on the use of improved catch indices and information on total catches (ICCAT 2018). We have awarded a score of "high" concern because the population is overfished.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
East Atlantic | Floating object purse seine (FAD)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
West Atlantic | Floating object purse seine (FAD)

High Concern
The 2018 stock assessment indicates that fishing mortality rates have shown an increasing trend since the 1990s. Overfishing has been occurring since around 1994 (ICCAT 2018). The current fishing mortality rates are 60% above maximum sustainable yield levels (F/F_{MSY} = 1.6) (ICCAT 2018). We have awarded a score of "high" concern because overfishing is currently occurring.

Black-browed albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

Moderate Concern
The International Union for Conservation for Nature (IUCN) Red List of Threatened Species classifies black-browed albatross as "Least Concern" with an increasing population trend (BirdLife International 2018). The total population size worldwide is estimated to be 1.4 million individual birds (BirdLife International 2018). We have awarded a score of "moderate" concern based on the IUCN status and high vulnerability.

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The incidental capture of black-browed albatross in longline fisheries is likely a cause of population declines (BirdLife International 2018). Within the Atlantic longline fisheries it was estimated that between 2003 and 2006, 48,500 seabirds were incidentally caught, and of this 57% were albatross species and 32% were black-browed albatross. The highest catch rates occurred in the South Atlantic (south of 25°S) (Klaer 2012). Black-browed albatross were also reported to be one of the most commonly observed incidentally captured seabird species in the South Atlantic Taiwanese pelagic longline fishery (Yeh et al. 2012) and Japanese fishery (Inoue et al. 2012). These bycatch estimates are considered to be at a level to cause concern for vulnerable albatross populations (Klaer 2012). Bycatch which occurs in key areas such as South Georgia negatively impacts several species of albatross including black-browed (Clay et al. 2019). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best-practice bycatch mitigation measures (ICCAT 2011h) although the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Blackfin tuna

Factor 2.1 - Abundance

West Atlantic | Floating object purse seine (FAD)

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 2018b). An updated Ecological Risk Assessment (ERA) was conducted for small tuna during 2017 (ICCAT 2018b). According to this ERA, blackfin tuna ranked 8 out of 10 in terms of productivity, susceptibility, and vulnerability to capture in longline fisheries (ICCAT 2018b). According to the 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. 2011}. We have awarded a score of "moderate" concern because information on the status of blackfin tuna is unknown, it is listed as "Least Concern" under the IUCN, and has a moderate vulnerability to fishing pressure.

Factor 2.2 - Fishing Mortality

West Atlantic | Floating object purse seine (FAD)

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 2018b). ICCAT has investigated the use of length distributions and reference points to determine potential growth and recruitment overfishing. Analysis indicated that blackfin tuna exceeds these reference points (ICCAT 2018b). Landings of blackfin tuna have decreased in recent years (ICCAT 2018b). We have awarded a score of "moderate" concern, however, because fishing mortality is unknown.

Blue marlin

Factor 2.1 - Abundance

West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

High Concern
Blue marlin in the Atlantic was last assessed in 2018 (ICCAT 2018b). According to the assessment, the current biomass is below B_{MSY}. The ratio of the spawning stock biomass in 2016 (SSB_{2016}) to levels at the maximum sustainable yield (SSB_{MSY}) were estimated to range from 0.52 to 0.91, indicating the population is overfished (ICCAT 2018b). These results are similar to the results from the previous 2011 assessment. Blue marlin is also listed as "Vulnerable" by the International Union for the Conservation of Nature (IUCN) (Collette et al. 2011g). We have awarded a score of "high" concern because of the low abundance size and IUCN status.

Factor 2.2 - Fishing Mortality

West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

High Concern
Catches of blue marlin in purse seine fisheries operating around moored FADs are known to be high but under-reported (Chassot et al. 2008) {Menard et al. 2000b} (Amande et al. 2010). The maximum sustainable yield (MSY) is estimated to be around 3,056 t (and current fishing mortality rates are higher than F_{MSY} (F_{2016}/F_{MSY} = 1.03 (0.74–1.50) (ICCAT 2018b). Based on this assessment, overfishing is currently occurring (ICCAT 2018b). We have therefore awarded a score of "high" concern.

Bottlenose dolphin

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
Bottlenose dolphin is considered a species of "Least Concern" by the International Union for the Conservation of Nature (IUCN) (Wells et al. 2019). They are considered to be widespread and abundant throughout most of their range. There is a minimum worldwide estimate of 750,000 dolphins (Wells et al. 2019). In European Atlantic waters a large scale survey estimated a total of 27,700 dolphins (Hammond et al. 2017). In US Atlantic offshore waters, the population is estimated to be around 51,192 individuals and 97,964 dolphins in the northern Gulf of Mexico oceanic waters (Hayes et al. 2019). Despite their IUCN listing, dolphins are highly vulnerable to fishing, so we have awarded a score of "moderate" concern.

Factor 2.2 - Fishing Mortality

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
Bottlenose dolphins are incidentally captured by a variety of fishing gears including pelagic longlines (Wells et al. 2019). For example, Taiwanese longline vessels targeting tunas are known to capture bottlenose dolphins (Wells et al. 2019), as does the US pelagic longline fishery (12 on average per year) (Hayes et al. 2019). Populations appear to be healthy in the Atlantic, and there is no indication that incidental bycatch mortality is negatively impacting bottlenose dolphins. However, since fishing mortality rates are unknown, we have awarded a score of "moderate" concern.

Escolar

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern

No stock wide assessment has been conducted for escolar in the Atlantic Ocean. Their status has been assessed by the International Union for the Conservation of Nature (IUCN) as "Least Concern," with an unknown population trend (Smith-Vaniz et al. 2015b). An assessment was conducted in 2002 in the western South Atlantic indicating the population was was declining (Milessi and Defeo 2002). In addition to this, an analysis of Escolar in the US 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 the population appeared stable (Levesque 2010). We have awarded a score of "moderate" concern based on the IUCN status.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern

Information on fishing mortality rates for escolar is scant. An analysis of the US pelagic longline fishery from the 1990s indicated escolar was not undergoing overfishing, but this assessment has not been updated. They represent around 6% of the total catch in the Gulf of Mexico (GOM) pelagic longline fishery, with just over 3000 animals observed caught between 2007 and 2009 (SEFSC 2013). We have awarded a score of "moderate" concern because fishing mortality rates are unknown.

Frigate tuna

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
In the Atlantic, frigate tuna 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 2018b). An updated Ecological Risk Assessment (ERA) was conducted for small tuna during 2017 (ICCAT 2018b). The International Union for the Conservation of Nature (IUCN) considers frigate tuna a species of "Least Concern" with a stable population trend (Collette et al. 2011d). Frigate tuna are considered to be abundant but it is possible that declines in individual species of small tunas may not be apparent because overall trends for small tunas mask these issues (Collette et al. 2011d). We have awarded a score of "moderate" concern because their stock status is unknown.

Factor 2.2 - Fishing Mortality

Northeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
Frigate tuna is one of five "small tuna" species that make up 13% of total "small tuna" catches in the Atlantic Ocean (ICCAT 2018b). No assessment has been conducted due to a lack of data. Landings of frigate tuna peaked in the mid to late 1980s and late 1990s/early 2000s, declined during the mid 2000s and has since increased (ICCAT 2018b). An updated ecological risk assessment found frigate tuna to rank 7th out of 10 small tuna species (ICCAT 2018b). Frigate tuna are caught by a variety of gears and there is considerable under-reporting and un-reporting of catches due to species identification issues and high discarding rates (Collette et al. 2011d). We have awarded a score of "moderate" concern because information of fishing mortality rates is not available.

Grey-headed albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
Grey-headed albatross is listed as "Endangered" by the International Union for the Conservation of Nature (IUCN) based on quickly declining population sizes {BirdlifeInternational 2018b}. The population in South Georgia, a key population of this species, was estimated to have declined by 25% between 1977 and 2004 and by 43% between 2004 and 2015 (Poncet et al. 2006) (Poncet et al. 2017). There are an estimated 98,601 breeding pairs or 250,000 mature birds (BirdLife International 2018b). We have awarded a score of "high" concern based on the IUCN classification.

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
Declines in the population size of this species have been attributed to incidental capture in longline fisheries, which are considered a major threat to this species (BirdLife International 2018b). Grey-headed albatross were the most commonly reported seabird bycatch species in the Japanese longline fishery between 1997 and 2009 (90) (Inoue et al. 2012). However, this species was not reported as observed in the Taiwanese fleet between 2004 and 2008 (Yeh et al. 2012). Within the Atlantic longline fisheries it was estimated that between 2003 and 2006, 48,500 seabirds were incidentally caught and of this 57% were albatross species (Klaer 2012). Bycatch, which occurs in key areas such as South Georgia, negatively impacts several species of albatross including grey-headed (Clay et al. 2019). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best practice bycatch mitigation measures (ICCAT 2011h), although the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests that using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Hawksbill turtle

Factor 2.1 - Abundance

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

High Concern
Hawksbill turtles have been listed in the Convention on International Trade of Endangered Species (CITES) since 1977 and are currently listed in CITES Appendix 1, meaning they are threatened with extinction and international trade is prohibited. Wallace et al. (2011) list hawksbill sea turtles in the eastern Atlantic Ocean as among the world's 11 most endangered Regional Management Units (RMUs) and that hawksbills in the western Atlantic have a low conservation risk but high conservation threat (Wallace et al. 2011). Older assessments by the International Union for Conservation of Nature (IUCN) show that in the Atlantic Ocean, there has been a population decrease of 80.5% over the past 3 generations (Mortimer and Donnelly 2008). Hawksbill sea turtles globally are listed as "Critically Endangered" under the IUCN, with a decreasing population trend, but this assessment is global in nature and over ten years old (Mortimer and Donnelly 2008). We have awarded a score of "high" concern based on their IUCN and CITES classifications and assessments in the more recent peer-reviewed literature.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

Moderate Concern
The incidental capture of hawksbill turtles has been identified as adversely affecting their recovery worldwide, although declines in the population of hawksbill turtles is mainly a factor of historical targeting of this species (Mortimer and Donnelly 2008). In the western Atlantic, hawksbill turtles have a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013b). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, although they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have therefore awarded a score of "moderate" and not "low" concern.

Leatherback turtle

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
Leatherback sea turtles have been listed as "Endangered" by the United States Endangered Species Act (ESA) since 1970 {FR 1970}. In Canada, leatherbacks are assessed as "Endangered" and listed for legal protection under SARA (DFO 2012) (DFO 2003). The International Union for Conservation of Nature (IUCN) classified leatherback turtles as "Vulnerable" with a decreasing global population trend in 2000 (Wallace et al. 2013). However, the northwest Atlantic population appears to be increasing {Wallace 2013}. They are listed as "Endangered" by the IUCN in the northwest Atlantic Ocean (LWG 2018), "Data Deficient" in the Southeast Atlantic and "Critically Endangered" in the Southwest Atlantic {Wallace 2013}. Leatherback turtles have been listed in the Convention on International Trade in Endangered Species (CITES) since 1975 and are currently listed in CITES Appendix 1, meaning they are threatened with extinction and international trade is prohibited. In the northwest Atlantic, the population size is estimated to be 50,824 (TEWG 2007). We have awarded a score of "high" concern based on the IUCN, ESA, COSEWIC, SARA and CITES listings.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Moderate Concern
Fishing mortality is thought to be a major 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). Leatherback interactions throughout the high seas of the Atlantic are known to occur but the impacts on their populations is not known (TEWG 2007). One study has suggested that, in the northwest Atlantic Ocean, leatherback sea turtles have a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013). However, in Canadian waters, leatherback turtles have an estimated mortality rate of 21 to 49% from pelagic longline fisheries (DFO 2012). There are sea turtle bycatch mitigation measures (required use of circle hooks) in place for pelagic longline fisheries in Canada; however, their effectiveness in this fishery is unknown. We have awarded a score of "moderate" concern because mortality rates in Canadian longline fisheries are reported to be high and the effectiveness of mitigation measures is unknown.

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Fishing mortality is thought to be a major 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). Overall leatherback interactions throughout the high seas of the Atlantic are known to occur, but the impacts on their populations are not known (TEWG 2007). In the northwest Atlantic Ocean, a study has suggested that leatherback sea turtles have a low population risk and low bycatch impact from longline fisheries (Wallace et al. 2013). Within the US Atlantic (excluding the Gulf of Mexico), interaction rates (number) have ranged from 207 during 2011 to 582 during 2004 (NMFS 2012). Other estimates suggest approximately 300 turtles per year have interacted with US longlines between 2002 and 2016, most of which occur in the Gulf of Mexico, which could be a significant impact (LWG 2018). There are sea turtle bycatch mitigation measures (i.e., required use of circle hooks) in place for pelagic longline fisheries in the US, which are effective, so we have awarded a score of "moderate" instead of "high" concern.

Northeast Atlantic | Drifting longlines

High Concern
Fishing mortality threatens leatherback turtle populations worldwide. Adults and juveniles are especially susceptible to interacting with fisheries along their migration routes (Wallace et al. 2013) (Zug and Parham 1996). Leatherback interactions throughout the high seas of the Atlantic are known to occur but the impacts on their populations are not known (TEWG 2007). Observed sets of Taiwanese longline vessels operating in the high seas of the Atlantic indicated a total of 767 turtles were caught between 2002 and 2013, with leatherback turtles as the most commonly caught species (59.8%) (Huang 2015). A comprehensive literature review and analysis of 2014 ICCAT fishing effort and sea turtle bycatch data showed that the Northeast Atlantic Ocean, especially off the coast of Portugal, was a leatherback bycatch hotspot (Gray and Diaz 2017). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). Because leatherback sea turtle interactions can be high the northeast Atlantic and sea turtle mitigation measures do not meet best practices, this is scored as “high” concern.

Northwest Atlantic | Drifting longlines

High Concern
Fishing mortality threatens leatherback turtle populations worldwide. Adults and juveniles are especially susceptible to interacting with fisheries along their migration routes (Wallace et al. 2013) (Zug and Parham 1996). Leatherback interactions throughout the high seas of the Atlantic are known to occur but the impacts on their populations are not known (TEWG 2007). Within the southwest Atlantic, there are high levels of leatherback bycatch because pelagic longline fishing is distributed widely throughout the region (TEWG 2007). In the this region, leatherback populations are at a high risk from pelagic longline fisheries and are highly impacted by incidental capture in these fisheries (Wallace et al. 2013b). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have awarded a score of "high" concern because the impact of bycatch on this species is unknown and best practice bycatch mitigation measures are not in place.

Southeast Atlantic | Drifting longlines

High Concern
Fishing mortality threatens leatherback turtle populations worldwide. Adults and juveniles are especially susceptible to interacting with fisheries along their migration routes (Wallace et al. 2013) (Zug and Parham 1996). Leatherback interactions throughout the high seas of the Atlantic are known to occur but the impacts on their populations are not known (TEWG 2007). In the southeast Atlantic, the risk to the population is low, but the bycatch risk is high

and leatherback bycatch hotspot areas have been identified off the coasts of Liberia, Sierra Leone, Mauritania and Cameroon, and in the high seas off Angola (Wallace et al. 2013b) (Gray and Diaz 2017). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have awarded a score of "high" concern because the impact of bycatch on this species is unknown, there is a risk of entanglement, and best practice bycatch mitigation measures are not in place.

Southwest Atlantic | Drifting longlines

High Concern

Fishing mortality threatens leatherback turtle populations worldwide. Adults and juveniles are especially susceptible to interacting with fisheries along their migration routes (Wallace et al. 2013) (Zug and Parham 1996). Leatherback interactions throughout the high seas of the Atlantic are known to occur but the impacts on their populations are not known (TEWG 2007). In the southwest Atlantic Ocean, leatherback sea turtles have a high population risk and high bycatch impact from longline fisheries (Wallace et al. 2013b). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, although they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have awarded a score of "high" concern due to the high risk to the population.

Loggerhead turtle

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) classified loggerhead turtles globally as "Vulnerable" with a decreasing population trend (Casale and Tucker 2017). The northwest and southwest Atlantic population is listed as "Least Concern" by the IUCN (Casale and Tucker 2017). The 2011 US Endangered Species Act (ESA) determination for loggerhead turtles indicated nesting levels in 2010 were the highest since 2000 (NMFS 2011). Loggerhead sea turtles are listed as "Endangered" in Canada and are protected by the Species at Risk Act (SARA) (DFO 2017a) (DFO 2017b). There was a slight negative population trend between 1989 and 2010, but the rate of decline was not statistically different from zero (NMFS 2011). Nest numbers in Florida have increased from 2007 to 2016 and decreased slightly during 2017 and 2018, but additional data are needed to determine trends {FFWCC 2016} {FFWCC 2019}. Loggerheads are listed in Appendix 1 of the Convention on International Trade of Endangered Species (CITES). The population size of loggerhead turtles in the northwest Atlantic is estimated to be 83,717, and 7,686 in the southwest Atlantic (Casale and Tucker 2017). We have awarded a score of "high" concern based on the IUCN, ESA, SARA, and CITES listings.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Moderate Concern
The incidental capture of loggerhead turtles is considered a primary threat to their populations {MTSG 2006} (NMFS 2011). In Atlantic Canada, the pelagic longline fishery is the only continued threat to this species {DFO 2010a}. Loggerhead turtles are incidentally caught by a variety of fishing gears (i.e., trawl and purse seine) in the Atlantic Ocean (NMFS 2011). Some research has estimated a very large number loggerhead-fisheries interactions (150,000 to 200,000) during 2000 (Lewison et al. 2004), but the IUCN has estimated a much smaller interaction rate based on a population size of less than 90,000 {MTSG 2006}. The majority of information available is, to an extent, from the US pelagic longline fishery and the Canadian fishery. Older information from the Canadian fishery recorded 1,200 loggerhead turtles caught between 2002 and 2008 (Paul et al. 2010). A meta-data analysis found this population to be at a low population risk from bycatch and that bycatch impacts were low (Wallace et al. 2013b). There are sea turtle bycatch mitigation measures (required use of circle hooks) in place for pelagic longline fisheries in Atlantic Canada, but their effectiveness is unknown in this fishery. We have therefore awarded a score of "moderate" and not "low" concern.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Low Concern

The incidental capture of loggerhead turtles is considered a primary threat to their populations (NMFS 2011). Loggerhead turtles are incidentally caught by a variety of fishing gears (i.e., trawl and purse seine) in the Atlantic Ocean (NMFS 2011). In the Atlantic Ocean it has been estimated that between 150,000 to 200,000 loggerheads were incidentally caught during 2000 (Lewison et al. 2004). The majority of information available is, to an extent, from the US pelagic longline fishery and the Canadian fishery. Between 1992 and 2015, 902 loggerhead turtles were reported caught in the US Atlantic longline fishery (Swimmer et al. 2017). NMFS estimates that 635 loggerhead turtles will be caught annually by the US fishery with 143 of these animals dying in the process (NMFS 2004). The majority of loggerhead interactions occur in the Northeast Distant Area and few occur in the Gulf of Mexico (Swimmer et al. 2017). An assessment conducted during 2009 determined there was not enough information to assess the effect of loggerhead mortality in individual fisheries (NMFS 2009b) (Paul et al. 2010). However, a meta-data analysis found this population to be at a low population risk from bycatch and that bycatch impacts were low (Wallace et al. 2013b). There are sea turtle bycatch mitigation measures (required use of circle hooks) in place for pelagic longline fisheries in the Atlantic and Gulf of Mexico, which are very effective, so we have awarded a score of "low," instead of "moderate" concern.

Northeast Atlantic | Drifting longlines

Moderate Concern

Bycatch of loggerhead turtles is considered a primary threat to their populations (NMFS 2011). Loggerheads are incidentally caught by a variety of fishing gears in the Atlantic Ocean (NMFS 2011). In 2000, an estimated 150,000 to 200,000 loggerheads were accidentally caught in fishing gear (Lewison et al. 2004). A 2009 assessment concluded there was insufficient information to assess the effect of individual fisheries on loggerhead mortality (NMFS 2009b) (Paul et al. 2010). However, a meta analysis found that loggerhead turtles in the Northwest Atlantic were at a low risk from bycatch and that bycatch impacts were low (Wallace et al. 2013b). Observed sets of Taiwanese longline vessels operating in the high seas of the Atlantic indicated a total of 767 turtles (all species) were caught between 2002 and 2013, with loggerhead turtles as the third most-commonly caught species (8.7%) (Huang 2015), and a hotpot analysis based on ICCAT fishing effort data and a literature review identified several loggerhead-longline interaction hotpots in the northwestern and north-central Atlantic (Gray and Diaz 2017). The overall bycatch rate for loggerhead turtles ranged from 0.0128 to 0.0239 per 10,000 hooks (Huang 2015). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). Because bycatch impacts of loggerhead turtles in this area are low, but mitigation measures do not meet best practices, we have awarded a score of "moderate" concern.

Northwest Atlantic | Drifting longlines

Moderate Concern

Bycatch of loggerhead turtles is considered a primary threat to their populations (NMFS 2011). Loggerheads are incidentally caught by a variety of fishing gears in the Atlantic Ocean (NMFS 2011). In 2000, an estimated 150,000 to 200,000 loggerheads were accidentally caught in fishing gear in the Atlantic (Lewison et al. 2004). A 2009 assessment concluded there was insufficient information to assess the effect of individual fisheries on loggerhead mortality (NMFS 2009b) (Paul et al. 2010). However, a meta analysis found that loggerhead turtles in the Northeast Atlantic had a high risk of fisheries interactions but that bycatch impacts to the population were low (Wallace et al. 2013). Sea turtle bycatch mitigation measures are in place for pelagic longline fisheries in the Atlantic, although they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). Because bycatch impacts of loggerhead turtles populations in this area are low, but mitigation measures do not meet best practices, we have awarded a score of "moderate" concern.

Southeast Atlantic | Drifting longlines

High Concern

Bycatch of loggerhead turtles is considered a primary threat to their populations (NMFS 2011). Loggerheads are incidentally caught by a variety of fishing gears in the Atlantic Ocean (NMFS 2011). In 2000, an estimated 150,000 to 200,000 loggerheads were accidentally caught in fishing gear in the Atlantic (Lewison et al. 2004). A 2009 assessment concluded there was insufficient information to assess the effect of individual fisheries on loggerhead mortality (NMFS 2009b) {Paul et al. 2010}. However, a meta analysis found loggerhead turtles in the southwest Atlantic to be at low risk of fisheries interactions, but that bycatch impacts to the population were high (Wallace et al. 2013). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have awarded a score of "high" concern due to the high population impacts from bycatch and because best practice bycatch mitigation measures are not in place.

Southwest Atlantic | Drifting longlines

High Concern

Bycatch of loggerhead turtles is considered a primary threat to their populations (NMFS 2011). Loggerheads are incidentally caught by a variety of fishing gears in the Atlantic Ocean (NMFS 2011). In 2000, an estimated 150,000 to 200,000 loggerheads were accidentally caught in fishing gear in the Atlantic (Lewison et al. 2004). A 2009 assessment concluded there was insufficient information to assess the effect of individual fisheries on loggerhead mortality {NMFS 2009} (Paul et al. 2010). High sea turtle bycatch rates have been reported in the Brazilian and Uruguayan fisheries (Giffoni et al. 2008).Sea turtle bycatch mitigation measures are in place for pelagic longline fisheries in the Atlantic, but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). Because population-level impacts to loggerhead sea turtles in the southeast Atlantic are unknown and bycatch mitigation measures do not meet best practices, we have therefore awarded a score of "high" concern.

Long snouted lancetfish

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Long snouted lancetfish are considered a species of "Least Concern" by the International Union for Conservation of Nature (IUCN) (Paxton 2010). They have a wide range and are found at depths not targeted by most fisheries. However, there is no information on their population size or whether it is increasing or decreasing in size (Paxton 2010), so we have awarded a score of "moderate" concern.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Long snouted lancetfish are not targeted but are caught as bycatch in some fisheries, such as pelagic longlines. For example, they represent around 12% of the total catch in the US Gulf of Mexico pelagic longline fishery (unpublished POP data). This incidental capture, however, is not thought to be a threat to this species (Paxton 2010). We have awarded a score of "moderate" concern because fishing mortality rates are unknown for this species.

Northern royal albatross

Factor 2.1 - Abundance

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The northern royal albatross is listed as "Endangered" by the International Union for the Conservation of Nature (BirdLife International 2018f). This species has a decreasing population trend with estimated population size (global) of 17,000 mature birds (BirdLife International 2018f). Ninety-nine percent of the population is found on Chatham Islands in New Zealand {BirdLIfe International 2018f}. This species is listed in Annex 1 of the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) (BirdLife International 2018f). We have awarded a score of "high" concern due to the IUCN, ACAP, and CMS statuses.

Factor 2.2 - Fishing Mortality

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
Northern royal albatross is reported to be caught as bycatch in Atlantic longline fisheries (Jimenez et al. 2012). Within the Atlantic longline fisheries it was estimated that between 2003 and 2006, 48,500 seabirds were incidentally caught and of this 57% were albatross species. The highest catch rates occurred in the South Atlantic (south of 25^{o}S) (Klaer 2012). These bycatch estimates are considered to be at a level to cause concern for vulnerable albatross populations (Klaer 2012). Within the southwest Atlantic, pelagic longline fisheries are considered a major concern for several species of albatross including the northern royal albatross (Jimenez et al. 2014). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best practice bycatch mitigation measures (ICCAT 2011h), though the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests that using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Olive Ridley turtle

Factor 2.1 - Abundance

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) considers Olive Ridley sea turtles to be "Vulnerable" with a decreasing population trend (Abreu-Grobois and Plotkin 2008). Olive Ridley turtles have been listed as "Threatened" by the US Endangered Species Act (ESA) since 1978, and are listed in the Convention on International Trade of Endangered Species (CITES) Appendix 1 {Abreu-Grobois and Plotkins 2008}. Specifically, within the North Atlantic, the Arribada rookeries have decreased by 97 to 99% while the non-arribada rookeries have increased 364% over time (Abreu-Grobois and Plotkin 2008). We have awarded a score of "high" concern based on the IUCN status.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

Moderate Concern
The incidental capture of olive ridley turtles occurs worldwide, although the impact from other fisheries such as trawls and gillnets appear to have a larger negative impact compared to longlines (Wallace et al. 2013b) (Abreu-Grobois and Plotkin 2008). Information on olive ridley bycatch rates are not readily available, but a meta analysis suggested that bycatch impacts in the western Atlantic were low (Wallace et al. 2013b). Observer data collected from Taiwanese longline vessels operating in the high seas of the Atlantic indicated a total of 767 turtles were caught between 2002 and 2013, which reported olive ridley turtles as the second-most commonly caught species (27.1%) (Huang 2015). The overall bycatch rate for olive ridleys ranged from 0 to 0.010 per 10,000 hooks, with most turtles (all species) being caught in tropical areas such as the Gulf of Guinea (Huang 2015). There are sea turtle bycatch mitigation measures in place for pelagic longline fisheries in the Atlantic but they do not meet best practices such as specific hook and bait requirements (Swimmer et al. 2017) (Morgan and Pickerell 2018). We have awarded a score of "moderate" concern because bycatch impacts appear to be low in this area, but mitigation requirements do not meet best practice standards.

Pelagic stingray

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
A stock assessment has not been conducted for pelagic stingray in the Atlantic Ocean. Analysis of catch per unit effort indices for the Atlantic from the 1990s indicated increases in abundance (Kyne et al. 2019). ICCAT conducted an Ecological Risk Assessment, which indicated pelagic stingrays had the lowest vulnerability to fishing (ICCAT 2018b). The International Union for the Conservation of Nature (IUCN) has listed pelagic stingray's as a species of "Least Concern" (Kyne et al. 2019). The current population trend is unknown globally, although there is no information to suggest declines in abundance have occurred (Kyne et al. 2019). We have awarded a score of "moderate" concern based on the IUCN listing.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Fishing mortality rates for pelagic stingray in the Atlantic Ocean are unknown. They are incidentally captured in longline fisheries throughout the world (Kyne et al. 2019). Post-release mortality is thought to be low (Kyne et al. 2019). The US pelagic longline fishery reported a total of 5,993 pelagic stingrays were observed caught between 2007 and 2011, the majority being alive at the time of capture (Keene 2016). We have awarded a score of "moderate" concern because information on fishing mortality rates is not available.

Porbeagle

Factor 2.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northwest Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the northwest Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.43 to 0.65 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). Porbeagle sharks were listed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2004 (DFO 2012a). A recent update of a tagging study used in the 2009 assessment showed a continued decline in abundance (Bowlby 2018). We have awarded a score of "high" concern based on abundance being below B_{MSY} and due to its "Endangered" Status under COSEWIC.

Northeast Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the northeast Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.09 to 1.93 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). We have awarded a score of "high" concern because the population is assessed to be overfished.

Southeast Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the southeast Atlantic Ocean was conducted in 2009; however, data was too limited in this region to assess their status (ICCAT 2009). The International Union for Conservation of Nature (IUCN) has listed porbeagles globally as "Vulnerable" with a decreasing population trend {Stevens et al. 2006}. We have awarded a score of "high" concern based on the IUCN Listing.

Southwest Atlantic | Drifting longlines

High Concern
An assessment of porbeagle sharks in the southwest Atlantic Ocean was conducted in 2009. According to this assessment, the abundance is very low, well below B_{MSY} levels (ICCAT 2009). The ratio of current (2008) biomass to that needed to produce the maximum sustainable yield (B_{MSY}) was 0.38 to 0.78 (ICCAT 2009). This population is considered overfished (ICCAT 2018b). We have awarded a score of "high" concern because the population is considered overfished.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Northwest Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the Northwest Atlantic Ocean are below F_{MSY} levels and therefore overfishing is not occurring. The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.03 to 0.36 (ICCAT 2009). Although this assessment is several years old, the assessment did indicate that maintaining the current exploitation rate would be sustainable (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old; therefore, their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Northeast Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the northeast Atlantic Ocean are below F_{MSY} levels (ICCAT 2009). The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.034 to 3.45 (ICCAT 2009). Although this assessment is several years old, the assessment did indicate that overfishing is not occurring (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old; therefore, their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Southeast Atlantic | Drifting longlines

Moderate Concern
Porbeagle sharks were assessed in 2009; however, due to a lack of data, fishing mortality rates in the southeast Atlantic could not be determined (ICCAT 2009). Porbeagle sharks are caught in longline fisheries throughout the Atlantic Ocean (Stevens et al. 2000) (ICCAT 2009). This mortality is considered a major threat to this species (Stevens et al. 2000). We have awarded a score of "moderate" concern due to a lack of information from this region.

Southwest Atlantic | Drifting longlines

Moderate Concern
Fishing mortality rates of porbeagle sharks in the southwest Atlantic Ocean are below F_{MSY} levels (ICCAT 2009). The ratio of current (2008) fishing mortality rates to those needed to produce the maximum sustainable yield (F_{MSY}) are 0.31-0.10.78 (ICCAT 2009). Due to the considerable uncertainty with these results, it is undetermined whether overfishing is occurring (ICCAT 2009). We have awarded a score of "moderate" and not "low" concern because the assessment is over 10 years old and therefore their current status is uncertain, combined with continued issues with accurate data reporting (ICCAT 2018b).

Rainbow runner

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)

Moderate Concern
No stock assessment of rainbow runner in the Atlantic Ocean has been conducted. The International Union for Conservation of Nature (IUCN) lists this species as "Least Concern" with a stable population trend (Smith-Vaniz et al. 2015). We have awarded a score of "moderate" concern due to the IUCN listing combined with an unknown overall status.

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)

Moderate Concern
Although information on fishing mortality rates is not available for this species in the Atlantic, they are reported to be one of the most common bycatch species in the European purse seine fishery, having a 53% occurrence rate per set (Chassot et al. 2008). Rainbow runner are also reported as common bycatch in other FAD purse seine fisheries in the northeast Atlantic (Menard et al. 2000a) (Menard et al. 2000) and made up 18% (by number) of the total "other bony fish" catch between 2003 and 2005 in the French and Spanish purse seine fisheries (Amande et al. 2010). We have awarded a score of "moderate" concern due to their unknown status and high incidental capture rates in this fishery.

Risso's dolphin

Factor 2.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
Risso's dolphins are considered a species of "Least Concern" by the International Union for Conservation of Nature (IUCN), although their population trend is unknown (Kiszka and Braulik 2018). Global estimates of abundance are not available (Kiszka and Braulik 2018). However, in the western North Atlantic, the best abundance estimate (2011 surveys) is 12,619 to 18,250 individuals (Hayes et al. 2019). This estimate is expected to be low, based on bias within the survey design (Hayes et al. 2019). We have awarded a score of "moderate" concern because their stock status is unknown but they are listed as "Least Concern" by the IUCN.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Low Concern
Risso's dolphins are reported as incidentally caught in the US pelagic longline fishery {NOAA 2017}. The Potential Biological Removal is 126 dolphins and the total annual estimated average mortality (from fishing) between 2012 and 2016 was 49.9 dolphins (NOAA 2019). Specifically, the longline fishery was estimated to be responsible for 9.8 (CI=0.41) dolphin deaths during this time period, with the majority of interactions occurring between South Carolina and Cape Cod (NOAA 2019). The US pelagic longline fishery is a Category 1 fishery, meaning frequent incidental mortality or serious injury to marine mammals occurs (NMFS 2018). However, we have awarded a score of "low" concern because the percent of PBR removed by this fishery is less than 10% and they are not a "strategic stock."

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Moderate Concern
Risso's dolphins have been reported as incidentally captured in longline fisheries in the Atlantic, although information on bycatch interactions is lacking. Bycatch of this species has been reported along the US Atlantic coast (Kiszka 2015). Risso's dolphins have a large range and high abundance and therefore this incidental bycatch does not appear to be a major threat (Kiszka and Braulik 2018). Due to a lack of information, we have used the Seafood Watch "Unknown Bycatch Matrix," which has assigned a score of "moderate" for fishing mortality based on the fishing gear and taxa.

Sea turtles

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

High Concern
Several species of sea turtles — green, hawksbill, leatherback, loggerhead, Kemp's ridley, and olive ridley — have been reported as incidentally captured in purse seine fisheries operating in the Atlantic Ocean. Many of these species are listed as "Endangered" by the International Union for Conservation of Nature (IUCN), have decreasing population sizes, and are listed under the US Endangered Species Act (ESA) or in the Convention on International Trade in Endangered Species (CITES) Appendix 1. We have therefore awarded a score of "high" concern.
Justification:
Green: The International Union for Conservation of Nature (IUCN) has classified green sea turtles as "Endangered" with a decreasing population trend (Seminoff 2004). Green sea turtles have been listed in CITES since 1975 and are currently listed in the Convention on International Trade of Endangered Species (CITES) Appendix 1, meaning they are threatened with extinction and international trade is prohibited. Green turtle nesting occurs in 16 countries (73 sites) and all major nesting sites have shown long term increases in abundance (Seminoff et al. 2015). Green sea turtles in the Atlantic are listed as "Threatened" under the Endangered Species Act (FR 2016).

Hawksbill: The IUCN has classified hawksbill turtles as "Critically Endangered" with a decreasing population trend (Mortimer and Donnelly 2008). Hawksbill turtles have been listed in CITES since 1977 and are currently listed in CITES Appendix 1, meaning they are threatened with extinction and international trade is prohibited. In the Atlantic Ocean, there has been a population decrease of 80.5% over the past 3 generations (Mortimer and Donnelly 2008) and the East Atlantic population is considered to be one of the most endangered regional management units of turtles (Wallace et al. 2011).

Leatherback: Leatherback sea turtles have been listed as "Endangered" by the United States Endangered Species Act (ESA) since 1970 {FR 1970}. The northwest Atlantic Distinct Population Segment is currently a candidate for ESA listing and is under a Status Review (FR 2017). The International Union for Conservation of Nature (IUCN) classified leatherback turtles as "Vulnerable" with a decreasing global population trend in 2000 (Wallace et al. 2013). However, the northwest Atlantic population appears to be increasing (Wallace et al. 2013). They are listed as "Endangered" by the IUCN in the northwest Atlantic Ocean (LWG 2018), Data Deficient in the southeast Atlantic, and "Critically Endangered" in the southwest Atlantic {Wallace 2013}. Leatherback turtles have been listed in the Convention on International Trade in Endangered Species (CITES) since 1975 and are currently listed on CITES Appendix 1, meaning they are threatened with extinction and international trade is prohibited. In the northwest Atlantic, the population size is estimated to be 50,824 (TEWG 2007).

Loggerhead: The International Union for Conservation of Nature (IUCN) classified loggerhead turtles globally as "Vulnerable" with a decreasing population trend (Casale and Tucker 2017). The northwest and southwest Atlantic population is listed as "Least Concern" by the IUCN (Casale and Tucker 2017). The 2011, US Endangered Species Act (ESA) determination for loggerhead turtles indicated nesting levels in 2010 were the highest since 2000 (NMFS 2011). In Canada, loggerhead sea turtles are listed as "Endangered" in the Species at Risk Act (DFO 2012) (DFO 2017a). There was a slight negative population trend between 1989 and 2010, but the rate of decline was not statistically different from zero (NMFS 2011). Nest numbers in Florida have increased from 2007 to 2016 and decreased slightly during 2017 and 2018, but additional data is needed to determine trends (FWC 2019), (FWC 2016). Loggerheads are listed in Appendix 1 of the Convention on International Trade of Endangered Species (CITES). The population size of loggerhead turtles in the northwest Atlantic is estimated to be 83,717, and 7,686 in the southwest Atlantic (Casale and Tucker 2017).

Kemp's ridley: The IUCN has listed Kemp's ridley sea turtles as "Critically Endangered" with an unknown population trend {MTSG 1996}. Kemp's ridley are listed in CITES Appendix 1 and are listed as "Endangered"

throughout their range by the US ESA {MTSG 1996} {NMFS 2015}.

Olive ridley: The IUCN considers Olive Ridley sea turtles to be "Vulnerable" with a decreasing population trend. Olive Ridley turtles have been listed as "Threatened" in the Endangered Species Act (ESA) since 1978 {FR 1998} and are listed in CITES Appendix 1. The Arribada rookeries have decreased by 97 to 99% while the non-Arribada rookeries have increased 364% over time (Abreu-Grobois and Plotkin 2008).

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

Low Concern
While the incidental capture of sea turtles in fisheries is considered a great threat to their population viability, threats from purse seine fisheries are generally low (Bourjea et al. 2014). For example, a study using observer data collected between 1995 and 2011 reported 597 interactions with sea turtles with 86% being released alive (Clermont et al. 2012) (Bourjea et al. 2014). Between 2003 and 2011, 354 turtles were observed associated with floating object sets, with 80% released alive (Clermont et al. 2012). Based on this observer data, it is estimated that the European Union purse seine fleet interacted with 3,500 turtles between 1995 and 2010, which corresponds to an annual bycatch rate of 218 individuals (Clermont et al. 2012) (Bourjea et al. 2014). The full impact of this removal from the population is not clear. In addition, management measures to protect incidentally captured sea turtles are in place in this region, so we have awarded a score of "low" concern.
Justification:
Green: Only 2 occurrences of green sea turtles were reported in the eastern Atlantic FAD fishery between 1991 and 1997 (Menard et al. 2000). Between 2003 and 2007, 9 turtles were observed caught in the French and Spanish FAD fisheries (Amande et al. 2010). The occurrence rate per set in the French fishery (2005 to 2008) was 1.52 (Chassot et al. 2008). Observer records from 1995 to 2011 indicated 40 green turtles were incidentally captured (Clermont et al. 2012).

Hawksbill: Due to their distribution and life history patterns in the Atlantic Ocean, very few interactions occur with this species (Clermont et al. 2012).

Leatherback: Five leatherback sea turtles were reported incidentally captured in the French and Spanish FAD fishery between 2003 and 2007 (Amande et al. 2010). Observer records from 1995 to 2011 indicated 67 leatherback turtles were incidentally captured (Clermont et al. 2012).

Loggerhead: Between 1991 and 1997, 3 loggerhead turtles were observed caught in the eastern Atlantic (Menard et al. 2000) and 5 were reported captured between 2003 and 2007 in the French and Spanish FAD fishery (Amande et al. 2010). Observer records from 1995 to 2011 indicated 73 loggerhead turtles were incidentally captured (Clermont et al. 2012).

Kemp's Ridley: A total of 3 Kemp's ridley were observed caught in the French and Spanish FAD fisheries between 2003 and 2007 (Amande et al. 2010). The occurrence rate per set in the French FAD fishery was 1.52 between 2005 and 2008 (Chassot et al. 2008). Observer records from 1995 to 2011 indicated 38 Kemp's ridley were incidentally captured (Clermont et al. 2012).

Olive Ridley: Only 3 olive ridley turtles were reported captured in the Spanish and French FAD fishery between 2003 and 2007 {Amande et al. 2000} and their occurrence rate per set in the French FAD fishery was 1.52 between 2006 and 2007 (Chassot et al. 2008). Observer records from 1995 to 2011 indicated 76 olive ridley turtles were incidentally captured (Clermont et al. 2012).

Short-finned pilot whale

Factor 2.1 - Abundance

Northwest Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines

Moderate Concern
Short-finned pilot whales are listed as "Least Concern" with an unknown population trend by the International Union for Conservation of Nature (IUCN) (Minton et al. 2018). Within US 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 28,924 whales (NOAA 2019). Trends in abundance cannot be determined in this region (Hayes et al. 2019). We have awarded a score of "moderate" concern due to their IUCN status.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Short-finned pilot whales are caught in the US pelagic longline fishery (Hayes et al. 2019). The Potential Biological Removal (PBR) is 236 individuals and total mortality estimates between 2012 and 2016 is unknown, but there were 168 mortalities from the pelagic longline fishery during that time period (NOAA 2019). The US pelagic longline fishery is a Category 1 fishery, meaning frequent interactions and serious injury of marine mammals occurs (NMFS 2018). We have awarded a score of "moderate" concern because the total fisheries mortality is less than the PBR, and bycatch in the longline fishery is greater than 50% of the PBR.

Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

Moderate Concern
Pilot whales are incidentally captured in a number of fisheries in the Atlantic, but information on Atlantic-wide fishing mortality rates are not available (Minton et al. 2018). Due to a lack of information, we have used the Seafood Watch "unknown bycatch matrix" to score this species. Based on the taxa and gear type, we have awarded a score of "moderate" concern.

Silky shark

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Northwest Atlantic | Drifting longlines

High Concern
A stock wide population assessment of silky sharks in the Atlantic Ocean has not been conducted. The International Union for Conservation of Nature (IUCN) has listed silky sharks as "Vulnerable" with a decreasing population trend (Rigby et al. 2017). Some analysis of catch rate series in the northwest and central Atlantic Ocean have indicated large declines in population size (Baum et al. 2004) (Cortes et al. 2007). However, there are significant issues with species identification and an overall lack of reporting for this species (Rigby et al. 2017). We have awarded a score of "high" concern based on the IUCN status.

West Atlantic | Floating object purse seine (FAD)

High Concern
A stock wide population assessment of silky sharks in the Atlantic Ocean has not been conducted. The International Union for Conservation of Nature (IUCN) has listed silky sharks 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. 2004) (Rigby et al. 2017). However, there are significant issues with species identification and an overall lack of reporting for this species (Rigby et al. 2017). We have awarded a score of "high" concern based on the IUCN status.

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

High Concern
Fishing mortality rates of silky sharks in the Atlantic are not known, but they are known to be caught in purse seine fisheries. A lack of reporting and species identification issues have made assessing fishing mortality rates difficult (Rigby et al. 2017). Incidental and targeted mortality from fisheries, including purse seines, is thought to be a contributing factor to silky shark population declines (Rigby et al. 2017). We have awarded a score of "high" concern because fishing mortality rates are unknown but fishing appears to be a contributing factor to population.

Northeast Atlantic | Drifting longlines
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

High Concern
Fishing mortality rates of silky sharks in the Atlantic are not known, but they are known to be caught in pelagic longline fisheries. An Ecological Risk Assessment found silky sharks scored 8 out of 20 species for susceptibility to pelagic longline gear in the North Atlantic, indicting they are highly susceptible (Cortes et al. 2015). A lack of reporting and species identification issues have made assessing fishing mortality rates difficult (Bonfil 2008). Silky sharks are one of the most commonly caught shark species in this fishery (Keene 2016). Incidental and targeted mortality from fisheries, including longlines, is thought to be a contributing factor to silky shark population declines (Rigby et al. 2017). We have awarded a score of "high" concern because fishing mortality rates are unknown but fishing appears to be a contributing factor to the population.

Skipjack tuna

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)

Low Concern
A stock assessment of skipjack tuna in the eastern Atlantic was conducted in 2014 (ICCAT 2014). The results of the assessment were unclear and advice on the state of the stock cannot be provided; however, it is likely the biomass is larger than maximum sustainable yield levels (ICCAT 2014). ICCAT indicated it is not likely the population is overfished (ICCAT 2014) (ICCAT 2018b); we have therefore awarded a score of "low" concern. We have not awarded a score of "very low" concern due to high uncertainty and the age of the assessment.

West Atlantic | Floating object purse seine (FAD)

Low Concern
A stock assessment for skipjack tuna in the eastern and western Atlantic Ocean was conducted in 2014 (ICCAT 2014). The maximum sustainable yield was estimated to be 30,000 to 32,000 t (ICCAT 2014). It is likely the biomass in 2013 was higher than maximum sustainable yield (B_{MSY}) levels (ICCAT 2014). This population is not considered to be overfished (ICCAT 2018b); we have therefore awarded a score of "low" concern. We have not awarded a score of "very low" concern due to high uncertainty and the age of the assessment.

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)

Low Concern
The 2014 stock assessment of skipjack tuna in the eastern Atlantic Ocean did not estimate fishing mortality levels in 2013 as a ratio to maximum sustainable yield levels (F_{2013}/F_{MSY}) (ICCAT 2014). However, it was suggested that fishing mortality levels were less than those needed to produce the maximum sustainable yield levels and overfishing is not likely to be occurring (ICCAT 2014). We have therefore awarded a score of "low" concern.

West Atlantic | Floating object purse seine (FAD)

Moderate Concern
The 2014 stock assessment of skipjack tuna in the western Atlantic Ocean did not estimate fishing mortality levels in 2013 as a ratio to maximum sustainable yield levels (F_{2013}/F_{MSY}) (ICCAT 2018b). However, it was suggested that fishing mortality levels were less than those needed to produce the maximum sustainable yield levels and overfishing is not likely to be occurring (ICCAT 2018b). We have awarded a score of "moderate" concern because their status is uncertain.

Sooty shearwater

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) has listed sooty sheawater as a "Near Threatened" species with a decreasing population trend (BirdLife International 2019). There are an estimated 8,800,000 mature birds (BirdLife International 2019). Decreasing population trends have been shown in North America and New Zealand, but this analysis is over ten years old (Butcher and Niven 2007). We have awarded a score of "high" concern due to the IUCN status and age of the information.

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The incidental capture of sooty shearwater in longline fisheries is likely a cause of population decline (BirdLife International 2019) (Jimenez et al. 2014). Sooty shearwater has one of the highest overlaps with ICCAT longline effort south of 20° (Taylor and Small 2009). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic, but ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best practice bycatch mitigation measures (ICCAT 2011h). The Agreement on the Conservation of Albatross and Petrels (ACAP), however, suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Southern royal albatross

Factor 2.1 - Abundance

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) has listed the southern royal albatross as "Vulnerable" with a stable population trend (BirdLife International 2018i). There are an estimated 27,200 mature individuals (BirdLife International 2018i). Southern royal albatross are listed in Appendix II of CMS and Annex 1 of ACAP (BirdLife International 2018i). We have awarded a score of "high" concern due to their IUCN, CMS, and ACAP listings.

Factor 2.2 - Fishing Mortality

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The incidental capture of southern royal albatross in longline fisheries is likely a cause of population decline (BirdLife International 2018i) (Jimenez et al. 2014). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic, but ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best-practice, bycatch mitigation measures (ICCAT 2011h). The Agreement on the Conservation of Albatross and Petrels (ACAP), however, suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Swordfish

Factor 2.1 - Abundance

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Low Concern
The last assessment for swordfish in the North Atlantic was conducted in 2017. The population of swordfish in the North Atlantic is estimated to be at or above levels needed to produce the maximum sustainable yield (B_{MSY}) (age structured model B_{2015}/B_{msy} = 1.13 (0.81–1.45), Bayesian Surplus Production B_{2015}=0.99 (0.77–1.24) and the population is not overfished (ICCAT 2017). However, the results are slightly more pessimistic than the 2009 and 2013 assessments (ICCAT 2017). The results from this assessment were very similar to those from the previous 2009 assessment and there is a 60% probability the population is not overfished (ICCAT 2017). We have awarded a score of "low" concern because they are not overfished, but not "very low" because there is some uncertainty associated with the results.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The status of swordfish in the South Atlantic was assessed in 2017 (ICCAT 2017). The assessment indicated the current biomass is lower than that needed to produce the maximum sustainable yield (MSY), with median ratios of B_{2015}/B_{MSY} 0.64 (95% CI = 0.43–1) and 0.72 (0.53–1.01) (ICCAT 2017). These results indicate the stock is overfished and we have therefore awarded a score of "high" concern.

Factor 2.2 - Fishing Mortality

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Low Concern
Fishing mortality of swordfish in the North Atlantic has been below levels needed to produce the maximum sustainable yield (F_{MSY}) since 2000 and overfishing is not currently occurring (F_{2015}/F_{MSY}=0.75 (0.57–0.92) (ICCAT 2017). Fishing mortality rates increased between 2010 and 2013 but have since decreased (ICCAT 2017). We have awarded a score of "low" concern because overfishing is not occurring.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The 2017 assessment of South Atlantic swordfish estimated a fishing mortality rate that was close to maximum sustainable yield (MSY) levels (ICCAT 2017). The median estimate of current fishing mortality rates to those needed to produce the maximum sustainable yield was estimated to be 0.98 (CI = 0.70–2.36) (ICCAT 2017). This indicates that overfishing may be occurring and at the least, fishing mortality rates are approaching MSY levels (ICCAT 2017). We have awarded a score of "high" concern due to this.

Triggerfish (unspecified)

Factor 2.1 - Abundance

West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

Moderate Concern
Several species of triggerfish have been assessed by the International Union for Conservation of Nature (IUCN) and have all been assigned a "Least Concern" status (IUCN 2019). We have assigned a score of "moderate" concern because their status is unknown and they have a medium level of vulnerability to fishing.

Factor 2.2 - Fishing Mortality

West Atlantic | Floating object purse seine (FAD)
East Atlantic | Floating object purse seine (FAD)

Moderate Concern
Several species of triggerfish, including grey and bluespotted, are reported as common bycatch species in purse seine fisheries. They can make up as much as 12% of the total catch (Menard et al. 2000a) and 59% of "other fish" total catch (Amande et al. 2010). Other information suggests occurrence rates per set of 16% (Chassot et al. 2008). However, fishing mortality rates are unknown for these species, so we have awarded a score of "moderate" concern.

Tristan albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) has listed the Tristan albatross as "Critically Endangered" with a decreasing population trend (BirdLife International 2018g). There are an estimated 3,400 to 4,800 mature individuals and breeding populations are mostly restricted to Gough Island (McClelland et al. 2016). Based on recent counts, the population on Gough has decreased by 28% over 46 years, with an annual decrease of 3 to 5% between 2000 and 2016 (Cuthbert et al. 2014). Modeling of the population since 1980 has shown a decline of 96% in population over three generations (BirdLife International 2018g). Tristan albatross are listed in Annex 1 of ACAP (BirdLife International 2018g). We have awarded a score of "high" concern due to the IUCN and ACAP listings

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The incidental capture of black-browed albatross in longline fisheries is likely a cause of population decline (BirdLife International 2018) (Jimenez et al. 2014). The incidental capture of Tristan albatross in Atlantic longline fisheries is considered a major conservation concern (Jimenez et al. 2014). Tristan albatross has one of the highest overlaps with ICCAT longline effort south of 20° (Taylor and Small 2009). Within the Atlantic longline fisheries it was estimated that between 2003 and 2006, 48,500 seabirds were incidentally caught and of this 57% were albatross species. The highest catch rates occurred in the South Atlantic (south of 25°S) (Klaer 2012). These bycatch estimates are considered to be at a level to cause concern for vulnerable albatross populations (Klaer 2012). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic, but ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best practice bycatch mitigation measures (ICCAT 2011h). The Agreement on the Conservation of Albatross and Petrels (ACAP), however, suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy, the overlap of the fishery with Tristan albatrosses, and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Wandering albatross

Factor 2.1 - Abundance

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN), considers the wandering albatross population to be "Vulnerable" with a decreasing population trend (BirdLife International 2018c). The global population is around 20,100 mature individuals, but the status of this species in the western and central Pacific Ocean is unknown (BirdLife International 2018c). We have awarded a score of "high" concern based on the IUCN classification.

Factor 2.2 - Fishing Mortality

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
Wandering albatross are threatened by longline fisheries, which have been identified as a leading cause of their population declines. This is primarily a factor of their large range, which makes them susceptible to capture by a variety of fleets (BirdLife International 2018c). The highest bycatch rates for this species occur in the South Atlantic (Klaer 2012) (Inoue et al. 2012). Between 1997 and 2009, observers recorded 24 incidental captures of this species in the South Atlantic (Inoue et al. 2012). In addition, wandering albatross were reported to be one of the most commonly caught birds in the Taiwanese pelagic longline fishery in the South Atlantic (Yeh et al. 2012). Albatross made up 57% of the total seabird bycatch in the Atlantic Ocean from 2003 to 2006, but wandering albatross only made up around 1% of the bycatch species (Klaer 2012). Bycatch which occurs in key areas such as South Georgia negatively impacts several species of albatross including the wandering albatross (Clay et al. 2019). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best-practice, bycatch mitigation measures (ICCAT 2011h), although the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

White-chinned petrel

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN), has listed white-chinned petrel as "Vulnerable" and their populations are decreasing (BirdLife International 2018d). The global population is estimated to have declined from 1,430,000 pairs in the 1980s to 1,200,000 breeding pairs currently (BirdLife International 2018d). There are around 3 million mature birds {Brooke 2004} (BirdLife International 2018d). We have awarded a score of "high" concern based on the IUCN listing.

Factor 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
The incidental capture of white-chinned petrels in longline fisheries is thought to be a factor in ongoing population declines (BirdLife International 2018d). Between 1997 and 2009, 47 white-chinned petrels were observed as incidentally captured in longline fisheries in the South Atlantic, the fourth most commonly observed species (Inoue et al. 2012). Within the Atlantic longline fisheries it was estimated that between 2003 and 2006, 48,500 seabirds were incidentally caught (Klaer 2012). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best-practice, bycatch mitigation measures (ICCAT 2011), although the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to this discrepancy because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Whitetip shark

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

High Concern
Stock assessments for oceanic whitetip sharks throughout the Atlantic ocean have not been conducted. They have been assessed via an Ecological Risk Assessment in 2008 and 2012, at which point they ranked 13th out of 20 in terms of productivity, indicating they are more productive than other species (Cortes et al. 2015). The International Union for the Conservation of Nature (IUCN) considers oceanic whitetip sharks to be "Vulnerable" globally (Baum et al. 2015). We have awarded a score of "high" concern based on their IUCN status.

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

High Concern
Information on fishing mortality rates for oceanic whitetip sharks in the Atlantic Ocean is not available. This is due to a general lack of data, making stock assessments very difficult. An Ecological Risk Assessment was conducted in 2012 and oceanic whitetip sharks ranked 6th out of 20 species in terms of susceptibility to longline capture, meaning they are highly susceptible (Cortes et al. 2015). We have awarded a score of "high" concern because they are highly susceptible to capture and because there is a general lack of information.

Yellowfin tuna

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Southwest Atlantic | Drifting longlines
West Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Southeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Low Concern
Yellowfin tuna in the Atlantic Ocean was last assessed in 2019 (ICCAT 2019). The models indicate a significant decrease in the ratio of spawning stock biomass (SSB) to that needed to produce the maximum sustainable yield (SSB_{MSY}) since the 1960s (ICCAT 2019). The current status was estimated based on the results from all uncertainty grid models run. The current ratio of SSB/SSB_{MSY} was estimated to be 1.32 (CI:1.02–1.69) and therefore the stock is not overfished (ICCAT 2019). There is a 3.4% probability the stock is both overfished and undergoing overfishing, 0.5% being overfished but not overfishing, 36.9% not overfished but overfishing, and 59.3% being neither overfished nor undergoing overfishing (ICCAT 2019). We have awarded a score of "low" concern because yellowfin tuna is not considered overfished in the Atlantic Ocean.

Factor 2.2 - Fishing Mortality

East Atlantic | Floating object purse seine (FAD)
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Southwest Atlantic | Drifting longlines
West Atlantic | Floating object purse seine (FAD)
Northeast Atlantic | Drifting longlines
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Southeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines

Low Concern
The last assessment for yellowfin tuna in the Atlantic Ocean was conducted in 2019 (ICCAT 2019). The current fishing mortality rate is estimated to be right around the overfishing threshold ($F_{CURRENT}/F_{MSY}$=0.93 (0.56–1.43) and the maximum sustainable yield (MSY) is estimated to range between 101,779 and 120,468 t. There is a 3.4% probability the stock is both overfished and undergoing overfishing, 0.5% being overfished but not overfishing, 36.9% not overfished but overfishing, and 59.3% being neither overfished nor undergoing overfishing (ICCAT 2019). We have awarded a score of "low" concern because although fishing mortality rates are near the overfishing threshold there is a close to 60% probability that overfishing is not occurring.

Yellow-nosed albatross

Factor 2.1 - Abundance

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
Yellow-nosed albatross are considered "Endangered" by the International Union for Conservation of Nature (IUCN) with a decreasing population trend. A large and rapid population decline has occurred over three generations (72 years) (BirdLife International 2018e). Currently, there are only an estimated 35,000 to 73,500 mature individuals (BirdLife International 2018e). We have awarded a score of "very high" concern based on the IUCN status.

Factor 2.2 - Fishing Mortality

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

High Concern
Yellow-nosed albatross is one of the most commonly incidentally caught seabird species in pelagic longlines, and this incidental capture is considered to be a cause of population declines {BirdLife International 20128e}. Within the Atlantic longline fisheries, it was estimated that from 2003 to 2006, 48,500 seabirds were incidentally caught and of these 57% were albatross species and 17% were yellow-nosed albatross. The highest catch rates occurred in the South Atlantic (Klaer 2012). Yellow-nosed albatross were also reported as one of the most commonly observed incidentally captured seabirds in the Taiwanese pelagic longline fishery (Yeh et al. 2012). These bycatch estimates are considered to be at a level to cause concern for vulnerable albatross populations (Klaer 2012). Bycatch mitigation measures are in place in pelagic longline fisheries operating in the Atlantic. However, ICCAT only requires the use of two of three (branch line weighting, night setting, bird scaring) best-practice, bycatch mitigation measures (ICCAT 2011h), although the Agreement on the Conservation of Albatross and Petrels (ACAP) suggests using the three mitigation measures simultaneously is best practice (ACAP 2017). We have awarded a score of "high" concern due to the negative impact of bycatch on this population combined with the discrepancy in bycatch mitigation, and because the effectiveness of mitigation measures is still under study (ICCAT 2018g).

Factor 2.3 - Discard Rate/Landings

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

< 100%
Tuna longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0 to 40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10 to 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 sharks, 95% of porbeagles but only 3% of dolphinfish. It is likely that overall discard rates are <100%.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

< 100%

Tuna longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0 to 40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10 to 19% (Kelleher 2005). Discard rates in the US 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 2012). 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 (SEFSC, personal communication 2018). However, 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 2012). Bait is used in this fishery but information on the percentage of bait to total landings is not available. Its unlikely combined discards and bait use are greater than 100% of the total landings. We have therefore awarded a score of <100%.

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

< 100%

Tuna longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0 to 40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10 to 19% (Kelleher 2005). Discard rates in the US 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 2012). 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 (SEFSC, personal communication 2018). However, 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 2012). Bluefin tuna discard mortality rates in the northern Gulf of Mexico have been estimated at 59% (Orbesen et al. 2019). The ratio of discards plus bait use-to-landings, however, is likely <100%.

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

< 100%

Handline and troll and pole fisheries typically have a negligible discard rate, even as low as zero in some areas (Kelleher 2005). Troll and pole and line fisheries depend heavily on the use of baitfish, which most often comes from other fisheries (Gillet 2012). The amount of tuna caught is much greater than the amount of baitfish used. The tuna-to-bait ratio is typically around 30:1, although this can vary by fishery due to differences in the baitfish used, and fishing technique {Gillett 2010}. Therefore, we have left the score as <100%.

Southwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines

< 100%

Tuna longline fisheries have an average discard rate of 28.5%, although discard rates can range from 0 to 40% (Kelleher 2005). Within the Atlantic, discard rates typically range from 10 to 19% (Kelleher 2005). Bait is used in this fishery, but information on the percentage of bait to total landings is not available. Its unlikely combined discards and bait use are greater than 100% of the total landings.

West Atlantic | Floating object purse seine (FAD)

East Atlantic | Floating object purse seine (FAD)

< 100%

Purse seine fisheries have an average discard rate of 5%, although in the Atlantic this rate is slightly less, 4.1% (Kelleher 2005). Discard rates in the combined purse seine fisheries (associated and unassociated) for France and Spain are predominately made up of tunas (79% and 83%), rays (89% and 90%), bony fish (47% and 26%), sharks (31% and 45%) and 1% and 15% for billfish. In these purse seine fisheries, juvenile skipjack made up the majority of discarded tuna bycatch (Amande et al. 2010). Discard rates are typically higher in purse seine sets made on FADs than unassociated sets. In the French purse seine fishery, 97% of discards were made on FAD sets, with spotted tuna and skipjack making up 50% and 46% of those discards (Chassot et al. 2008). In this fishery, tuna discard rates on FAD sets ranged from 0 to 4% during 2007, and we have therefore awarded a <100% score.

Criterion 3: Management Effectiveness

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

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

The Criterion 3 rating is determined as follows:

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

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

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

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

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	Ineffective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Red (1.000)**
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
East Atlantic | Floating object purse seine (FAD)	Moderately Effective	Ineffective				**Red (1.000)**
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	Highly effective	Highly effective	Highly effective	Highly effective	Highly effective	**Green (5.000)**
Northeast Atlantic | Drifting longlines	Moderately Effective	Ineffective				**Red (1.000)**
Northwest Atlantic | Drifting longlines	Ineffective	Ineffective				**Red (1.000)**
Southeast Atlantic | Drifting longlines	Moderately Effective	Ineffective				**Red (1.000)**
Southwest Atlantic | Drifting longlines	Ineffective	Ineffective				**Red (1.000)**
West Atlantic | Floating object purse seine (FAD)	Moderately Effective	Ineffective				**Red (1.000)**

The United Nations Law of the Sea agreement (1995) indicated that the management of straddling and highly migratory fish stocks should be carried out through Regional Fisheries Management Organizations (RFMOs). RFMOs are the only legally mandated fishery management body on the high seas and there are currently 18 RFMOs (www.fao.org) that cover nearly all of the world's high seas. Countries must abide by the management measures set forth by individual RFMOs in order to fish in their waters (Cullis-Suzuki and Pauly 2010). Some RFMOs manage all marine living resources within their authority (i.e., General Fisheries Commission for the Mediterranean [GFCM]), while others manage a group of species such as tunas (i.e., International Commission for the Conservation of Atlantic Tunas [ICCAT]). This report focuses on fisheries in international waters within the Atlantic Ocean, which are managed by ICCAT as well as domestic waters of the US and Canada.

In US 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 US are also Contracting Parties of ICCAT. Scoring for this section of the report is based on the respective domestic and ICCAT management measures currently in place.

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation
Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy
Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring
Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure

bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations
Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

Factor 3.5 - Stakeholder Inclusion
Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Ineffective
The species included in this report are caught in targeted tuna and swordfish fisheries. The Department of Fisheries and Oceans Canada has an Integrated Fisheries Management Plan (IFMP) in place for Atlantic swordfish and tuna (DFO 2012a). Canada relies on the International Commission for the Conservation of Atlantic Tuna (ICCAT) as the inter-governmental organization that allocates quotas and other management measures (DFO 2012a). Canada monitors quotas through both the government, DFO, and industry (DFO 2012a). In addition to the IFMP and ICCAT mandated measures, there are a number of domestic legislation and policy measures in place, including the Fisheries Act that regulates all activities occurring at sea (DFO 2012a).

The Department of Fisheries and Oceans Canada has an Integrated Fisheries Management Plan (IFMP) in place for Atlantic swordfish and tuna (DFO 2012a). Canada relies on the International Commission for the Conservation of Atlantic Tuna (ICCAT) as the inter-governmental organization that allocates quotas and other management measures (DFO 2012a). Canada monitors quotas through both the government, DFO, and industry (DFO 2012a). In addition to the IFMP and ICCAT mandated measures, there are a number of domestic legislation and policy measures in place, including the Fisheries Act that regulates all activities occurring at sea (DFO 2012a).

Atlantic Bluefin tuna: Swordfish/other tunas license holders can retain 33.76 t of Bluefin tuna bycatch (DFO 2017). This number has gradually been increasing and they've received additional quota allocation from France (anonymous, pers. comm. 2021). The offshore license holder has a 15 t bluefin tuna bycatch limit (ICCAT 2020b). Canada's remaining quota allocated by ICCAT is 389.48 t (ICCAT 2020b). Bluefin bycatch quotas can be transferred from other fisheries to this one. There are specific catch composition requirements under this offshore license to ensure bluefin tuna are not the only targeted species (DFO 2012a) (DFO 2013). There is no evidence that this fishery has limited bycatch of bluefin tuna - there are no hard caps and rather than closing the fishery when it hits its quota allocation, it receives additional quote from other fisheries. The total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020). The 2020 stock assessment indicates that overfishing is currently occurring, and the current TAC should be reduced. For 2021, ICCAT member countries agreed to maintain the 2020 TAC, which is expected to continue overfishing of the stock (ICCAT 2020).

Sharks: Shark finning is prohibited. Canada has an International Plan of Action (IPOA) in place for sharks but this is non-binding and is not a management or regulatory document, and the IPOA for sharks is very old (DFO 2012a). Best practices for reducing the incidental capture of sharks are not required in this fishery (e.g., bait restrictions, avoiding "hot spots") (Gilman 2011), but wire leaders are prohibited.

Porbeagles are managed through a "live release" mechanism (DFO 2012a) (DFO 2013). Despite this practice, this

fishery does incidentally kill a number of porbeagle sharks and with only 10% observer coverage, it is difficult to determine the full impacts of these interactions {Knapman et al. 2020}. Despite the porbeagle sharks' "Endangered" finding under COSEWIC (which provides no legal protection in Canada), "Endangered" listing under IUCN, and listing in Appendix II of CITES, and even 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 mortality rates are poorly known partly because of low observer coverage, and under-reported catch could jeopardize the population's recovery {COSEWIC 2014b}. In 2018, Canada began the process of determining whether the western North Atlantic population of porbeagle sharks should be listed to the List of Wildlife Species at Risk as "Endangered" under the Species at Risk Act (SARA) (DFO 2018c). Porbeagle mating grounds have been closed to commercial fishing to help improve their population size (DFO 2018).

Shortfin mako sharks are also managed through "live-release" and in 2020, Canada implemented a no retention policy. As with porbeagle sharks, there are likely to be dead discards.

The IFMP for swordfish and other tuna (i.e., the longline fleet) has not been updated since 2013 and there are discrepancies between the public and official versions. Although management for swordfish has been successful, limits on fishing mortality of the western stock of Atlantic bluefin tuna are set too high, which is causing overfishing of the stock and this

We have awarded a score of "ineffective" because the longline fishery lacks effective mechanisms to control bycatch of Atlantic bluefin tuna. Also, international managers did not adhere to scientific advice and set quotas for Atlantic bluefin tuna at a level that will result in overfishing of the stock.

Justification:

Swordfish: Management measures for swordfish in Canadian waters include a minimum size limit and individual transferable quotas (based on Canada's allocated quota from ICCAT). The quota is split between the longline (90%) and harpoon (10%) fisheries. There are time/area closures in place as well. Fishermen with swordfish licenses can also target other tunas. There is an offshore tuna license that has a 5 ton (t) swordfish bycatch limit.

Other tuna: There is a TAC in place for bigeye and albacore tuna based on ICCAT allocated quotas.

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

No other quotas are in place for tunas but the effort is limited through licenses (Hanke et al. 2012).

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderately Effective
The species included in this report are caught in targeted tuna and swordfish fisheries. Tuna, sharks and billfish are managed under the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan and additional Amendments (NOAA 2006). The US 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 2019a). In addition, there is a 20 nm length limit for longline vessels fishing in the mid-Atlantic bight (NMFS 2013).

Tuna, sharks and billfish are managed under the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan and additional Amendments (NOAA 2006). The US 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 nm length limit for longline vessels fishing in the mid-Atlantic bight (NMFS 2013).

Dolphinfish and Wahoo
The South Atlantic Fisheries Management Council manages dolphinfish and wahoo. The Dolphin Wahoo Fishery Management Plan requires a 20 in. minimum FL size limit for dolphinfish off the coasts of South Carolina, Georgia and Florida, vessel permit requirements, and an annual catch limit (ACL) of 1,534,485 lbs. , (NMFS 2012), (SAFMC 2013). There are trip limits after 75% of the ACL has been met. These trip limits for dolphinfish were established after a closure in 2015 resulted from meeting the annual catch limit mid-season (SAFMC 2016).The ACL for wahoo is 75,542 lbs, which also has vessel permit requirements and a 500-lb trip limit (head and tail in tact). There are recreational bag limits of 2 wahoo per person per day and 10 dolphinfish per person per day.

Sharks: Blue and shortfin mako sharks are managed under the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan. Fishers must have a permit to fish for sharks (limited access permit). In March of 2018, an emergency regulation to address overfishing of shortfin mako sharks was implemented (NOAA 2018). This emergency rule dictates that all live shortfin mako sharks caught in the longline fishery must be released (NOAA 2018). There are limits on the number of large coastal sharks (i.e., sandbar and blacktip) and pelagic sharks (i.e. blue and shortfin mako) that can be caught and a number of prohibited shark species, including silky sharks (NOAA 2018). Smalltooth sawfish are also protected under the Endangered Species Act and are prohibited from being caught, although they are not often reported in this fishery (NMFS 2013). There is a subsequent measure in place that any shark not being retained must be released and if a dusky shark is incidentally captured, this must be broadcast over the radio to vessels in the area (NOAA 2018). There are limits on the number of large coastal sharks (i.e., sandbar and blacktip) and pelagic sharks (i.e., blue and shortfin mako) that can be caught and a number of prohibited shark species (NOAA 2018).

Atlantic Bluefin tuna (Western stock): Atlantic bluefin tuna cannot be targeted by the U.S. longline fishery. Landings can only be "incidental," and there is a size limit of 73 in for curved fork length (NOAA 2018). As of January 2018, longline vessels must account for bluefin tuna incidental landings through the Individual Bluefin Tuna Quota (IBQ) program (NOAA 2018). There is a 25 MT allocated quota for bluefin tuna in the Northeast Distant Area (NED) (NOAA 2018). Direct targeting of bluefin tuna in the Gulf of Mexico also is prohibited. The US longline fishery closes once the bluefin tuna quota has been met and there are two (north/south) bluefin tuna areas with subquotas that close at different times than the rest of the fishery {CFR 2013}.

Since implementation of the IBQ system, discards of Atlantic bluefin tunas in this fishery have decreased by nearly an order of magnitude while landings have remained steady {NMFS 2019a}. The US is allocated 54% of the total Western Atlantic Bluefin tuna TAC designated by ICCAT, but only 8% of that goes to the US longline fleet and the US longline fishery does not catch 100% of its base allocation (ICCAT 2020b) (NMFS 2020). The 2020 Atlantic bluefin tuna US longline landings (January to September) comprised only 5.7% of total US landings of Atlantic bluefin tuna (NMFS 2020). The total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020b). However, the US IBQ system has effectively reduced longline discards and has not led to an increase in landings.

The longline fishery closes once the bluefin tuna quota has been meet and there are two (north/south) bluefin tuna

areas with subquotas that close at different times than the rest of the fishery (NMFS 2013). Targeting (commercial fishing) billfish (white marlin, blue marlin, sailfish, roundscale spearfish, and longbill spearfish) is prohibited (NOAA 2018).

We have awarded moderately effective because US management measures have effectively limited Atlantic bluefin tuna catch (landings and discards) in the US longline fishery and management measures are in place for many species, although increased international restrictions on Western Atlantic bluefin tuna catches are required.
Justification:
Swordfish: In the US 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 US North and South Atlantic. In addition, swordfish must be landed whole (NMFS 2013). Once the directed fishery for swordfish closes, longline vessels are allowed to retain 15 swordfish per trip (NOAA 2018).

Other tuna: There are no catch limits for other tuna species but there is a size limit of greater than 27 in for bigeye and yellowfin tuna.

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}. To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

Targeting (commercial fishing) billfish (white marlin, blue marlin, sailfish, roundscale spearfish, and longbill spearfish) is prohibited (NOAA 2018).

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

Moderately Effective
There are time/area closures in place for the FAD fishery, limitations on the number of FADs that can be used, the requirement for a FAD management plan, and the use of non-entangling FADs {ICCAT 2016bc}.

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020

and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Skipjack: There are no management measures specific to skipjack tuna.

Blue marlin: There are catch restrictions for blue marlin that may be retained, based on limiting catches to 50% of 1996 or 1999 landings (ICCAT 2012a).

ICCAT has an "implied" target reference point (i.e., Kobe plot) but no specific values and no limit reference points for tropical tunas (bigeye, skipjack, and yellowfin). We have awarded a score of moderately effective because ICCAT has measures in place to address compliance with management measures and has enacted measures for several tuna species included in this report.

Blue marlin: There are catch restrictions for blue marlin that may be retained, based on limiting catches to 50% of 1996 or 1999 landings (ICCAT 2011f).

Dolphinfish and wahoo: There are no management measures in place for mahi mahi or wahoo.

ICCAT has an "implied" target reference point (i.e., Kobe plot) but no specific values and no limit reference points for tropical tunas (bigeye, skipjack, and yellowfin). We have awarded a score of "moderately effective" because ICCAT has measures in place to address compliance with management measures and has enacted measures for several retained species included in this report.

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
Swordfish**:** In the North Atlantic, swordfish are managed through country-specific TACs and a minimum size limit (ICCAT 2020), (DFO 2013), (DFO 2012a), (DFO 2009), (NOAA 2018), (Parkes et al. 2013).

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there are no specific quota allocations to individual CPCs {ICCAT 2020c}. To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Mahi mahi and wahoo: The South Atlantic Fisheries Management Council manages dolphinfish and wahoo. The Dolphin Wahoo Fishery Management Plan requires a 20 in. minimum FL size limit for dolphinfish off the coasts of South Carolina, Georgia and Florida, vessel permit requirements, and an annual catch limit (ACL) of 1,534,485 lbs. (NMFS 2012), (SAFMC 2013). There are trip limits after 75% of the ACL has been met. These trip limits for dolphinfish were established after a closure in 2015 resulted from meeting the annual catch limit mid-season (SAFMC 2016).The ACL for wahoo is 75,542 lbs, which also has vessel permit requirements and a 500-lb trip limit (head and tail in tact). There are recreational bag limits of 2 wahoo per person per day and 10 dolphinfish per person per day.

We have awarded a score of "highly effective" because appropriate management and conservation targets have been identified and the fisheries' main primary targeted and retained species have precautionary policies that are based on scientific advice and incorporate uncertainty. Risk aversion is in place, including regulations to control fishing mortality and respond to the state of the stock. There is evidence that the management strategies for the targeted species (swordfish) are being implemented successfully.

Northeast Atlantic | Drifting longlines

Moderately Effective

Albacore: There is a multi-annual management and conservation plan in place for North Atlantic albacore, which has the objective to keep the biomass in the green zone of the Kobe plot with at least a 60% probability (ICCAT 2016). Albacore tuna in the North Atlantic are managed through a total allowable catch (TAC) allocated to the European Union, Chinese Taipei, the United States, and Venezuela (ICCAT 2017). Countries other than these four are to limit their catches to 2015 t in 2019 and 2020 (ICCAT 2016). There is also a limit on the number of vessels targeting north Atlantic albacore to the average level of 1993 to 1995 (ICCAT 2016). In 2017 ICCAT adopted interim reference points for North Atlantic albacore (target and limit) and a harvest control rule (ICCAT 2017).

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Swordfish: In the North Atlantic, swordfish are managed through country-specific TACs and a minimum size limit (ICCAT 2017b).

Shortfin mako sharks:

Beginning in 2013, countries that have not reported catch data on shortfin mako sharks have been prohibited from catching shortfin mako sharks {ICCAT 2010h}. Additional measures to address north Atlantic shortfin mako sharks, which do not follow the SCRS scientific advice (ICCAT 2017f), (ICCAT 2019f), require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks caught dead (ICCAT 2017f), {ICCAT 2019f. For example, vessels larger than 12 m in length must have an observer or electronic (functioning) monitoring system on board, the shark must be dead when brought alongside the vessel, and the observer must record specific information (ICCAT 2017f), (ICCAT 2019f). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2017f), (ICCAT 2019f). The effectiveness of this measure has not been assessed (ICCAT 2017f), (ICCAT 2019f).

Blue sharks: There is an annual TAC of 39,102 t for North Atlantic blue sharks and specific catch limits for the EU, Japan and Morocco (ICCAT 2019e). All other countries are to maintain catches at recent levels. The effectiveness of this measure has not yet been assessed (ICCAT 2019e).

Dolphinfish and wahoo: There are no management measures in place for dolphinfish or wahoo in the Atlantic high seas.

We have awarded a score of "moderately effective" because ICCAT has measures in place to address compliance with management measures and has enacted measures for several retained species included in this report.

Northwest Atlantic | Drifting longlines

Ineffective

Albacore: There is a multi-annual management and conservation plan in place for North Atlantic albacore, which

has the objective to keep the biomass in the green zone of the Kobe plot with at least a 60% probability (ICCAT 2016). Albacore tuna in the North Atlantic are managed through a total allowable catch (TAC) allocated to the European Union, Chinese Taipei, the United States, and Venezuela (ICCAT 2017). Countries other than these four are to limit their catches to 2015 t in 2019 and 2020 (ICCAT 2016). There is also a limit on the number of vessels targeting North Atlantic albacore to the average level of 1993 to 1995 (ICCAT 2016). In 2017, ICCAT adopted interim reference points for North Atlantic albacore (target and limit) and a harvest control rule (ICCAT 2017).

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Western Atlantic bluefin: Atlantic bluefin tuna in the western Atlantic have been under a rebuilding plan since 1998. In 2017, based on the updated assessment, an interim Conservation and Management plan (CMP) (2018 to 2020) for western Atlantic bluefin tuna was adopted (ICCAT 2017c), (ICCAT 2018g), (ICCAT 2018e) (ICCAT 2020). Under the interim CMP, countries must continue to take measures not to transfer fishing effort between the eastern and western Atlantic. The total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020a)(ICCAT 2020a). The 2020 stock assessment indicates that overfishing is currently occurring, and the current TAC should be reduced. For 2021, ICCAT member countries agreed to maintain the 2020 TAC, which is expected to continue overfishing of the stock (ICCAT 2020b).

Skipjack: There are no management measures specific to skipjack tuna.

Swordfish: In the North Atlantic, swordfish are managed through country-specific TACs and a minimum size limit (ICCAT 2017b).

Blackfin tuna: There are no management measures in place for blackfin tuna in the Atlantic.

Shortfin mako sharks:
Beginning in 2013, countries that have not reported catch data on shortfin mako sharks have been prohibited from catching shortfin mako sharks {ICCAT 2010h}. Additional measures to address north Atlantic shortfin mako sharks, which do not follow the SCRS scientific advice (ICCAT 2017f), require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks caught dead (ICCAT 2017f). For example, vessels larger than 12 m in length must have an observer or electronic (functioning) monitoring system on board, the shark must be dead when brought alongside the vessel, and the observer must record specific information (ICCAT 2017f). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2017f). The effectiveness of this measure has not been assessed (ICCAT 2017f), (ICCAT 2019f), (ICCAT 2020).

Blue sharks: There is an annual TAC of 39,102 t for North Atlantic blue sharks and specific catch limits for the EU, Japan and Morocco (ICCAT 2019e). All other countries are to maintain catches at recent levels. The effectiveness of this measure has not yet been assessed (ICCAT 2019e), (ICCAT 2019g).

Dolphinfish and wahoo: There are no management measures in place for dolphinfish or wahoo in the Atlantic high seas.

For some species, management measures are in place, but there is a need for stronger international management for overfished Atlantic bluefin tuna. We have awarded an ineffective score because international managers did not adhere to scientific advice and set quotas at a level that will perpetuate overfishing of the stock.

Southeast Atlantic | Drifting longlines

Moderately Effective
Albacore: In the South Atlantic albacore are managed under a country-specific TAC (ICCAT 2016b).

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Swordfish: In the South Atlantic, swordfish are managed under a TAC that is divided by countries and through a minimum size limit (ICCAT 2017d).

Skipjack: There are no management measures specific to skipjack tuna.

Shortfin mako sharks:
Beginning in 2013, countries that have not reported catch data on shortfin mako sharks have been prohibited from catching shortfin mako sharks {ICCAT 2010h}. Additional measures to address north Atlantic shortfin mako sharks, which do not follow the SCRS scientific advice (ICCAT 2019f), (ICCAT 2017f), require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks caught dead (ICCAT 2019f), (ICCAT 2017f). For example, vessels larger than 12 m in length must have an observer or electronic (functioning) monitoring system on board, the shark must be dead when brought alongside the vessel, and the observer must record specific information (ICCAT 2019f), (ICCAT 2017f). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2019f), (ICCAT 2017f). The effectiveness of this measure has not been assessed (ICCAT 2019f),(ICCAT 2017f). In the south Atlantic, ICCAT recommends catch of shortfin mako sharks be limited to 2014 levels that reporting requirements should be improved (ICCAT 2014a)

Blue sharks: There is an annual TAC of 28,923 t for south Atlantic blue sharks and countries are required to comply with reporting requirements and are encouraged to collect data on key biological paramaters (ICCAT 2019g).

Dolphinfish and wahoo: There are no management measures in place for dolphinfish or wahoo in the Atlantic high seas.

ICCAT does not have a formally adopted target reference point, but does have an "implied" target reference point (i.e., maximum sustainable yield). There are no limit reference points. We have awarded a score of "moderate" concern because ICCAT has measures in place for primary species including TACs and some size limits.

Southwest Atlantic | Drifting longlines

Ineffective

Albacore: In the South Atlantic albacore are managed under a country-specific TAC (ICCAT 2016b).

Yellowfin: ICCAT set quota for yellowfin tuna at 110,000 t, below Fmsy. However, the TAC has been exceeded over the past several years, and there is no quota allocation {ICCAT 2020c}.

Bigeye: Bigeye tuna are overfished and ICCAT reduced the bigeye TAC slightly in 2020 from 65,000 t to 62,500 t and lowered it to 61,500 t for 2021 (ICCAT 2019c). In support of the reduced TAC, ICCAT also has implemented recommendations to reduce catch limits for individual CPCs as follows: a) A 21% reduction for CPCs with catch limits >10,000 t; b) catch limit that is 17% less than the recent average catch for CPCs that catch > 3,500 t; c) 10% reduction in catch limit for CPCs whose average, recent catch is between 1,000 t and 3,500 t; and d) maintain catch and effort for those CPCs with recent, average catch <1,000 t {ICCAT 2020c}. These measures are projected to result in a 51% probability of F being less than MSY by 2028 and a 62% by 2033 and a probability of B being larger than MSY of 33% by 2028 and 51% by 2033 (ICCAT 2019b).

To mitigate bycatch of juvenile yellowfin and bigeye tunas, ICCAT has reduced the number of FADs to 350 in 2020 and 300 in 2021 and implemented 2- and 3- month closures for 2020 and 2021 respectively (ICCAT 2019b), {ICCAT 2020c}.

Swordfish: In the South Atlantic, swordfish are managed under a TAC that is divided by countries and through a minimum size limit (ICCAT 2017d).

Skipjack: There are no management measures specific to skipjack tuna.

Blackfin tuna: There are no management measures specific to blackfin tuna.

Western Atlantic bluefin: Atlantic bluefin tuna in the western Atlantic have been under a rebuilding plan since 1998. In 2017, based on the updated assessment, an interim Conservation and Management plan (CMP) (2018 to 2020) for western Atlantic bluefin tuna was adopted (ICCAT 2017c), (ICCAT 2018g), (ICCAT 2018e) (ICCAT 2020). Under the interim CMP, countries must continue to take measures not to transfer fishing effort between the eastern and western Atlantic. The total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020a)(ICCAT 2020a). The 2020 stock assessment indicates that overfishing is currently occurring, and the current TAC should be reduced. For 2021, ICCAT member countries agreed to maintain the 2020 TAC, which is expected to continue overfishing of the stock (ICCAT 2020b).

Shortfin mako sharks:

Beginning in 2013, countries that have not reported catch data on shortfin mako sharks have been prohibited from catching shortfin mako sharks {ICCAT 2010h}. Additional measures to address north Atlantic shortfin mako sharks, which do not follow the SCRS scientific advice (ICCAT 2019f), (ICCAT 2017f), require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks caught dead (ICCAT 2019f), (ICCAT 2017f). For example, vessels larger than 12 m in length must have an observer or electronic (functioning) monitoring system on board, the shark must be dead when brought alongside the vessel, and the observer must record specific information (ICCAT 2019f), (ICCAT 2017f). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2019f), (ICCAT 2017f). The effectiveness of this measure has not been assessed (ICCAT 2019f),(ICCAT 2017f). In the south Atlantic, ICCAT recommends catch of shortfin mako sharks be limited to 2014 levels that reporting requirements should be improved (ICCAT 2014a)

Blue sharks: There is an annual TAC of 28,923 t for south Atlantic blue sharks and countries are required to comply with reporting requirements and are encouraged to collect data on key biological paramaters (ICCAT 2019g).

Dolphinfish and wahoo: There are no management measures in place for dolphinfish or wahoo in the Atlantic high seas.

ICCAT does not have a formally adopted target reference point but does have an "implied" target reference point (i.e., maximum sustainable yield). There are no limit reference points. For some species, management measures are in place, but there is a need for stronger international management for overfished Atlantic bluefin tuna. We have awarded a ineffective score because international managers did not adhere to scientific advice and set quotas at a level that will result in overfishing of the stock.

Factor 3.2 - Bycatch Strategy

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Moderately Effective
Sea turtles: The Canadian longline fishery requires the use of circle hooks, live release of "sensitive" species, landing and reporting non-target catches, and collaboration with the Department of Fisheries and Oceans (DFO) scientists to examine bycatch in the fishery and find ways to reduce it (DFO 2012). Fishers are also required to use safe handling and release guidelines for sea turtles, including the use of de-hooking kits and dipnets (DFO 2012a). 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.

Seabirds: Canada has an International Plan of Action (IPOA) in place for sea birds (all separate IPOAs) but this is non-binding and is not a management or regulatory document (DFO 2012a).

Other sharks: Other shark species, such as white, oceanic whitetip, hammerhead, and silky, are prohibited from being retained (DFO 2013).

There is an observer program in place that requires 10% of the fishery to be monitored (DFO 2012a).

We have scored a moderately effective for bycatch management because some bycatch management measures are in place but effectiveness is under debate and more could be done.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderately Effective
The United States has implemented a number of measures to address bycatch in the pelagic longline fishery.

Marine mammals: Skippers in the pelagic longline fishery must abide by the Pelagic Longline Take Reduction Plan, which has regulations aimed at reducing interactions with pilot whales and Risso's dolphins. Measures in this plan include the following: gear length restrictions in certain regions, a Cape Hatteras Special Research Area, regulations to report entanglements of large whales and a 20 nm length limit for longline vessels fishing in the mid-

Atlantic bight (NMFS 2013), (NOAA 2018). Marine mammals are also protected under the Marine Mammal Protection Act.

Sea turtles: High occurrences of loggerhead and leatherback sea turtles (protected under the US Endangered Species Act) in the US pelagic longline fishery resulted in management initiating measures to protect them in 2000. This 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 (18/0 or larger circle hooks and Atlantic mackerel and/or squid bait) (NOAA 2018). Outside of this region, only corrodible large circle hooks are allowed to be used with specific bait restrictions (whole finfish and/or squid) (NOAA 2018). Longline vessels must also have on board sea turtle handling and release gears (NOAA 2018).

Sharks: A number of shark species, including silky sharks, are prohibited from being captured. Smalltooth sawfish are also protected under the Endangered Species Act and are prohibited from being caught, although they are not often reported in this fishery (NMFS 2013). There is a subsequent measure in place that any shark not being retained must be released and if a dusky shark is incidentally captured, this must be broadcast over the radio to vessels in the area (NOAA 2018).

Since this fishery is a Category 1 fishery under the Marine Mammal Protection Act, this cannot score highly effective and have therefore awarded a moderately effective score.

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

Ineffective
The International Commission for the Conservation of Atlantic Tunas (ICCAT) has implemented a few management measures specific to bycatch in the purse seine fishery. Member countries are required to collect information on bycatch and discards and report that information to the Secretariat. Countries are also encouraged to provide identification guides for sharks, sea birds, sea turtles and marine mammals to vessels fishing in the Convention area (ICCAT 2011g). Several species of sharks - silky, oceanic whitetip, and hammerheads - are prohibited from being captured (ICCAT 2010d) (ICCAT 2010f). There are new measures in place to address compliance of shark-specific management measures (ICCAT 2018d). In addition, purse seine vessels must avoid encircling sea turtles, release those incidentally caught, and report any interactions (ICCAT 2010g). Management measures for other bycatch species, such as rainbow runner and triggerfish are not in place.

Individual countries are required to report on the implementation and compliance with several of these measures including for sea turtles and sharks (ICCAT 2010g) (ICCAT 2012i). There are no bycatch cap or catch limits in place and it is unknown if these measures have been sufficient to maintain the health of bycatch species populations, so we have awarded a score of "ineffective."

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
Most species are retained. We have awarded a score of "highly effective" because bycatch of other species, such as sharks, sea turtles, and sea birds is minimal.

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines

Southwest Atlantic | Drifting longlines

Ineffective

Some management measures to mitigate bycatch in the pelagic longline fishery have been implemented by the International Commission for the Conservation of Atlantic Tunas (ICCAT). Member countries are required to collect and report information on bycatch and discards and are suggested to provide identification guides for sharks, seabirds, sea turtles, and marine mammals to vessels fishing on the high seas (ICCAT 2011g).

Seabirds:
Although the information on seabird interactions is to be recorded, there is no requirement in the North Atlantic to utilize sea-bird-specific mitigation measures due to lower encounter rates, compared to the South Atlantic (ICCAT 2011h). In the South Atlantic, fishers are required to use two of three (branch line weighting, night setting, bird scaring) bycatch mitigation measures (ICCAT 2011h).

Sharks:
Silky, oceanic whitetip, thresher, and hammerhead sharks are prohibited from being caught {ICCAT 2011i} (ICCAT 2010e) (ICCAT 2010f) (ICCAT 2009d). There are new measures in place to address compliance of shark-specific management measures (ICCAT 2018d).

Sea turtles:
Longline vessels must carry safe handling, disentanglement, and release equipment for sea turtles and vessel captains must be trained in safe handling and release techniques (ICCAT 2010g). Individual countries are required to report on the implementation and compliance with several of these measures including for sea turtles and sharks (ICCAT 2010g) (ICCAT 2012i).

Marine mammals: There are no specific management measures in place to address the incidental capture of marine mammals.

There are no bycatch cap or catch limits in place and it is unknown if these measures have been sufficient to maintain the health of bycatch species populations. Bycatch mitigation measures for seabirds and sea turtles do not meet best practices (ACAP 2017) (Morgan and Pickerell 2018) (Swimmer et al. 2017). We have awarded a score of "ineffective" because mitigation of bycatch in this fishery has not been fully addressed and populations of bycatch species continue to decline.

Factor 3.3 - Scientific Research And Monitoring

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Moderately Effective
Assessments of albacore, bigeye and yellowfin tuna and swordfish are conducted every 3-6 years and Atlantic bluefin tuna every 2 years. 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 2018b). Stock assessments have also been conducted for shortfin mako, porbeagle and blue sharks (ICCAT 2018b). There is some uncertainty associated with stock assessments, such as for Atlantic bluefin tuna. We have therefore awarded a moderate and not highly effective score.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderately Effective
Assessments for bigeye and yellowfin tuna are conducted every 3 to 6 years, swordfish every 4 years, and 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. There is, like all tuna assessments, a high degree of uncertainty surrounding some of the assessment results. Blue sharks and shortfin mako sharks are also assessed every 4 to 6 years in the Atlantic (ICCAT 2018b). The only "main species" not assessed individually in this fishery is dolphinfish. We have awarded a score of "moderately effective" because population assessments are conducted for the majority of "main species" on a regular basis.

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
Assessments of yellowfin tuna are conducted every 3 to 6 years. 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 2018b). Assessments for swordfish in the North Atlantic are conducted on a regular basis, and include catch and effort information collected and supplied by individual countries, tagging data, biological information, and other data sets (ICCAT 2017). In addition, a wide range of models with different complexities and data sources are applied during the assessment to contrast the base case. We have awarded a score of "highly effective" because the management process uses independent and up-to-date scientific stock analyses that are peer-reviewed by a scientific body.

Factor 3.4 - Enforcement Of Management Regulations

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Highly effective
In the Canadian swordfish fishery the use of logbooks is required by all commercial fisherman 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 licences (DFO 2010). Quotas are monitored by DFO and by industry along with fisheries associations (MMI 2011). Catch and bycatch is monitored through an on board observer program. Vessel monitoring systems 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). We have awarded a highly effective score because adequate enforcement is in place.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
Information on catches is collected through a logbook program. Pelagic longline vessels targeting tuna and swordfish are required to use a vessel monitoring system (VMS). All vessels with an Atlantic Tunas Longline permit must have an electronic monitoring system installed and operable, but this is only to audit bluefin tuna catches (NOAA 2018). To enforce compliance with time/area closures for pelagic longline gear, species composition data, collected through both logbook and observer records, is used to differentiate between bottom and pelagic longline gear (NMFS 2013). The US Coast Guard also helps enforce fisheries regulations. Bluefin tuna catch reports must be submitted through the VMS within 12 hours of each longline set (NOAA 2018). We have awarded a score of "highly effective" because adequate enforcement is in place and capacity to control, ensure, and report compliance is appropriate to the scale of the fishery.

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
Information on catches is collected through a logbook program (NOAA 2018). The US Coast Guard also helps enforce fisheries regulations. Bluefin tuna catch reports must be submitted through the VMS within 12 hours of each longline set (NOAA 2018). We have awarded a score of "highly effective" because adequate enforcement is in place.

Factor 3.5 - Stakeholder Inclusion

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Highly 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 the regional committee, providing information on the management of swordfish (and tunas) in Atlantic Canada. Federal, the provincial government, fishermen, and processors make up this committee. The SFLPAC is a consultative forum on management made up of stakeholders for the 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). Canada has recently allowed conservation groups to be part of the Canadian delegation to the International Commission for the Conservation of Atlantic Tunas, but there is no formal call for participation and there appear to be some restrictions associated with participating. We have awarded a score of "highly effective" because there is stakeholder inclusion and an effective and constructive relationship between managers, scientists, and fishermen.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Highly effective
The United States management process is transparent and includes stakeholder input. For example, stakeholders are allowed to comment on fishery management plans and participate on fishery management councils (NOAA 2006). Stakeholders can participate in the US delegation to the International Commission for the Conservation of Atlantic Tuna (ICCAT 2018b). We have awarded a score of "highly effective" because stakeholder inclusion occurs throughout the management system.

Criterion 4: Impacts on the Habitat and Ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:

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

GUIDING PRINCIPLES

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

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas	5	0	Moderate Concern	**Green (3.873)**
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	5	0	Moderate Concern	**Green (3.873)**
East Atlantic | Floating object purse seine (FAD)	5	0	Moderate Concern	**Green (3.873)**
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas	5	0	Moderate Concern	**Green (3.873)**
North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas	5	0	Moderate Concern	**Green (3.873)**
Northeast Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
Northwest Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
Southeast Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
Southwest Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
West Atlantic | Floating object purse seine (FAD)	5	0	Moderate Concern	**Green (3.873)**

Although pelagic longline, purse seine, harpoon, handline and trolling line 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 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

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

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a

non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

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

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

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

5
Although pelagic longlines are surface fisheries, contact with the seabed can occur in shallow-set fisheries {Passfield and Gilman 2010}. However, these effects are still considered to be a low risk to bottom habitats (Chuenpagdee et al. 2003) {Seafood Watch 2016}. We have therefore awarded a score of "no impact."

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

5
Although purse seine fishing typically does not result in the nets coming in contact with the bottom, anchored FADs could result in contact with the bottom (Seafood Watch 2017).

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

5
Fishing gears such as handline, harpoon, and troll and pole rarely impact bottom habitats (Seafood Watch 2017).

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas
Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

0
Not Applicable

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

0
Not applicable

Factor 4.3 - Ecosystem-based Fisheries Management

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | Canada | Canadian-flagged vessels fishing in Canadian waters and the High Seas

Moderate Concern
Tuna and swordfish longline fisheries operating in the Atlantic Ocean, including within US 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, which can lead to a cascade of other affects (Myers et al. 2007) (Duffy 2003) (Ferretti et al. 2010) (Schindler et al. 2002) and behavioral changes (Heithaus et al. 2007). Canada uses a coordinated approach to manage environmental factors in fisheries through the Department of Fisheries and Oceans Canada Ecosystem Management Branch (DFO 2018b). DFO has The Science Framework for the Future, which outlines their approach towards an ecosystem-based management approach (DFO 2008). However, there is no ecosystem-based management plan in place for the swordfish fishery.

Atlantic and adjacent areas | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas
Gulf of Mexico | Atlantic, Northwest | Drifting longlines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Tuna and swordfish longline fisheries operating in the Atlantic Ocean, including within US and Canadain 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, which can lead to a cascade of other affects (Myers et al. 2007)(Duffy 2003)(Ferretti et al. 2010) (Schindler et al. 2002) and behavioral changes (Heithaus et al. 2007). The National Marine Fisheries Service has an Ecosystem Based Fishery Management Policy with a road map that describes what the management is based on (NOAA 2018b). There are draft ecosystem based fisheries management implementation plans, including one for Atlantic Highly Migratory Species (NOAA 2018c). But these are not yet in place, so we have only awarded a moderate concern score.

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)

Moderate Concern
Purse seine fisheries in the Atlantic Ocean catch several ecologically important groups including other tunas 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, which can lead to a cascade of other effects (Myers et al. 2007) (Duffy 2003) {Ferretti et aal. 2010} (Schindler et al. 2002) and behavioral changes (Heithaus et al. 2007).

The use of FADs can also impact the surrounding ecosystems. Smaller tuna, specifically bigeye and yellowfin, are often associated with FADs and this could lead to growth and recruitment overfishing (Freon and Dagorn 2000). In addition, increases in the biomass of tunas under FADs, reduced free-school abundance, changes in school movement patterns and structure, and differences between the age and size of free and FAD associated schools had been associated with the introduction of FAD fisheries {Fonteneau 1991} (Fonteneau et al. 2000a) (Menard et al. 2000a) {Menard et al. 2000b} (Josse et al. 1999) (Josse et al. 2000).

ICCAT has assessed several species of sharks and conducted ecological risk assessments for other bycatch species. Although ecosystem impacts are not currently included in management plans, ICCAT has adopted management measures to protect bycatch species and conducts ecological risk assessments {Cortes et al. 2012} (ICCAT 2010d) (ICCAT 2010f). In addition, there is a Sub-Committee on Ecosystems within ICCAT (ICCAT 2018f).

Detrimental food web impacts are possible, and there is some ecosystem-based management in place; however stronger policies may be needed to fully protect the ecological role of harvested species. We have therefore scored the impacts of FAD purse seines as moderate concern.

North Atlantic | Handlines and hand-operated pole-and-lines | United States | United States-flagged vessels fishing in US waters and the High Seas

Moderate Concern
Troll and pole fisheries rely on live baitfish, which could include "exceptional species" such as anchovy or sardines; the effect of the removal of these species on the ecosystem is unknown and few baitfish fisheries are managed {Gillett et al. 2012} (FAO 2014). Although ecosystem impacts are not currently included in management plans, ICCAT 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 2018f).

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines

High Concern
Pelagic longline fisheries 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, which 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).

ICCAT has assessed several species of sharks and conducted ecological risk assessments for other bycatch species. Ecosystem impacts are not currently included in management plans, and ICCAT has adopted minimal management measures to protect bycatch species and conducts ecological risk assessments {Cortes et al. 2012} (ICCAT 2010d) (ICCAT 2010f). There is, however, a Sub-Committee on Ecosystems within ICCAT (ICCAT 2018f).

This fishery also catches sea turtles, seabirds, and other large pelagic finfish, and management of these species as well as sharks is ineffective.

We have awarded a score of "high" concern because efforts to address potential trophic cascades and manage for the ecosystem impacts of the removal of apex predators have not been adequately addressed.

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

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References

43 FR 32800.

Abreu-Grobois, A and P. Plotkin (IUCN SSC Marine Turtle Specialist Group). 2008. Lepidochelys olivacea. The IUCN Red List of Threatened Species 2008: e.T11534A3292503.

ACAP. 2017. ACAP summary advice for reducing the impact of pelagic longline fisheries on seabirds. ACAP Tenth Advisory Committee.

Aires-da-Silva, A. and V. Gallucci. 2007. Demographic and risk analyses applied to management and conservation of the blue shark (Prionace glauca) in the North Atlantic Ocean. Marine and Freshwater Research 58(6):570-580. 10.1071/MF06156.

Alessandro, L. and Antonello, S. 2010. An overview of loggerhead sea turtle (Caretta caretta) bycatch and technical mitigation measures in the Mediterranean Sea. Reviews of Fish Biology and Fisheries 20:141-161

Alvarez de Quevedo, I., Cardona, L., De Haro, A., Pubill, E. and Aguilar, A. 2010. Sources of bycatch of loggerhead sea turtles in the western Mediterranean other than drifting longlines. ICES Journal of Marine Science 67:677-685.

Alvarez de Quevedo, I., Feliz, M.S. and Cardona, L. 2013. Mortality rates in by-caught loggerhead turtle Caretta caretta in the Mediterranean Sea and implications for the Atlantic populations. Marine Ecology Progress Series 489:225-234

Amande, M.J., Ariz, J., Chassot, E., de Molina, A.D., Gaerner, D., Murua, H., Pianet, R., Ruiz, J. and Chavance, P. 2010. Bycatch of the European purse seine tuna fishery in the Atlantic Ocean from 2003-2007 period. Aquatic Living Resources 23:353-362.

Arroyo, G.M., Mateos-Rodríguez, M., Muñoz, A.R., de la Cruz, A., Cuenca, D. and Onrubia, A. 2014. New population estimates of a critically endangered species, the Balearic Shearwater Puf?nus mauretanicus, based on coastal migration counts. Bird Conservation International 26(1): 87-99.

Báez, J.C, García-Barcelona, S., Mendoza, M., Ortiz de Urbina, J.M., Real, R. and Macías, D. 2014. Cory's shearwater by-catch in the Mediterranean Spanish commercial longline fishery: implications for management. Biodiversity and Conservation 23: 661-681.

Baum, J., Medina, E., Musick, J.A. & Smale, M. 2015. Carcharhinus longimanus. The IUCN Red List of Threatened Species 2015: e.T39374A85699641. http://dx.doi.org/10.2305/IUCN.UK.2015.RLTS.T39374A85699641.en.

Baum, J., Medina, E., Musick, J.A. and Smale, M. 2006. Carcharhinus longimanus. In: IUCN 2013. IUCN Red List of Threatened Species. Version2013.1

Baum, J.K. and Myers, R.A. 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. Ecology Letters 7:135-145.

Belda, E. J.; Sanchez, A. 2001. Seabird mortality on longline fisheries in the western mediterranean: factors affecting bycatch and proposed mitigating measures. Biological Conservation 98: 357-363.

BirdLife International 2018. Diomedea epomophora. The IUCN Red List of Threatened Species 2018: e.T22698314A132641187. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698314A132641187.en.

BirdLife International 2018. Thalassarche melanophris. The IUCN Red List of Threatened Species 2018: e.T22698375A132643647. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698375A132643647.en

BirdLife International 2018b. Thalassarche chrysostoma. The IUCN Red List of Threatened Species 2018:

e.T22698398A132644834. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698398A132644834.en.

BirdLife International 2018c. Diomedea exulans. The IUCN Red List of Threatened Species 2018: e.T22698305A132640680. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698305A132640680.en.

BirdLife International 2018d. Procellaria aequinoctialis. The IUCN Red List of Threatened Species 2018: e.T22698140A132628887. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698140A132628887.en.

BirdLife International 2018e. Thalassarche chlororhynchos. The IUCN Red List of Threatened Species 2018: e.T22698425A132645225. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698425A132645225.en.

BirdLife International 2018f. Diomedea sanfordi. The IUCN Red List of Threatened Species 2018: e.T22728323A132656392. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22728323A132656392.en.

BirdLife International 2018g. Diomedea dabbenena. The IUCN Red List of Threatened Species 2018: e.T22728364A132657527.

BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

BirdLife International. 2016. Puffinus mauretanicus. The IUCN Red List of Threatened Species 2016: e.T22728432A94984883. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22728432A94984883.en.

BirdLife International. 2016c. Puffinus yelkouan. The IUCN Red List of Threatened Species 2016: e.T22698230A93672084. Available at: http://www.iucnredlist.org/details/22698230/0

BirdLife International. 2017. Calonectris borealis (amended version of 2016 assessment). The IUCN Red List of Threatened Species 2017: e.T22732244A111148655.

BirdLife International. 2019. Ardenna grisea. The IUCN Red List of Threatened Species 2019: e.T22698209A154440143.

Bonfil, R. 2008. The biology and ecology of the silky shark, Carcharhinus falciformis. In: M. Camhi, E.K. Pikitch & E.A. Babcock (ed.), Sharks of the open ocean: biology, fisheries and conservation, pp. 114–127. Blackwell Science.

Borg, J.J. and Sultana, J. 2002. Status and distribution of the breeding Procellariiformes in Malta. Il-Merill 30: 10-15.

Bourgeois, K. and Vidal, E. 2008. The endemic Mediterranean yelkouan shearwater Puffinus yelkouan: distribution, threats and a plea for more data. Oryx 42(2): 187-194.

Bourjea, J., Clermont, S., Delgado, A., Murua, H., Ruiz, J., Ciccione, S. and Chavance, P. 2014. Marine turtle interaction with purse seine fishery in the Atlantic and Indian Oceans: lessons for management. Biological Conservation 178:74-87.

Bowlby, H. 2018. Shark research and assessment in 2017. Fisheries and Oceans Canada ALPAC February 21, 2018.

Broderick, A.C., Glen, F., Godley, B.J., and Hays, G.C. 2002. Estimating the number of green and loggerhead turtles nesting annually in the Mediterranean. Oryx 36:227-235

Bromhead, D., Foster, J., Attard, R., Findlay, J. and Kalish, J. 2003. A review of the impacts of fish aggregating devices (FADs) on tuna fisheries. Final report to the Fisheries Resources Research Fund. Bureau of Rural Sciences, Canberra, Australia. 122 p.

Brown-Peterson, N., J.S. Franks, and A.M. Burke. 2000. Preliminary observations on the reproductive biology of wahoo, Acanthocybium solandri, from the northern Gulf of Mexico and Bimini. Proc. Bahamas Annu. Gulf Caribb. Fish. Inst.. 51. 414-427.

Burgess, G. H., L. R. Beerkircher, G. M. Cailliet, J. K. Carlson, E. Cortés, K. J. Goldman, R. D. Grubbs, J. A. Musick, M. K. Musyl, and C. A. Simpfendorfer. 2011. Is the collapse of shark populations in the Northwest Atlantic Ocean and Gulf of Mexico real? Fisheries 30(10):19-26

Butcher, G. S., and D. K. Niven. 2007. Combining data from the Christmas Bird Count and the Breeding Bird Survey to determine the continental status and trends of North American birds. National Audubon Society. Washington, D.C. 34 pp plus tables.

Cadiou B. et les coordinateurs régionaux, coordinateurs départementaux et coordinateurs-espèce. 2015. 5e recensement des oiseaux marins nicheurs de France métropolitaine (2009-2012). Ornithos 22(5): 233-257.

Casale, P. 2008. Incidental catch of marine turtles in the Mediterranean Sea:captures, mortality, priorities. WWF Italy, Rome.

Casale, P. & Marco, A. 2015. Caretta caretta (North East Atlantic subpopulation). The IUCN Red List of Threatened Species 2015: e.T83776383A83776554.

Casale, P. & Tucker, A.D. 2017. Caretta caretta (amended version of 2015 assessment). The IUCN Red List of Threatened Species 2017: e.T3897A119333622. Downloaded on 14 January 2019.

Casale, P. 20111. Sea turtle by-catch in the Mediterranean. Fish and Fisheries 12:299-216. Available at: http://www.seaturtle.org/PDF/CasaleP_2011_FishFish.pdf

Casale, P., Nicolosi, P., Freggi, D., Turchetto, M. and Argano, R. (2003) Leatherback turtles (Dermochelys coriacea) in Italy and in the Mediterranean basin. Herpetological Journal 13, 135–139

Chassot, E., Amande, M.J., Chavance, P. Pianet, R. and Dedo, R.G. 2008. A preliminary attempt to estimate tuna discards and bycatch in the French purse seine fishery of the eastern Atlantic Ocean. SCRS/2008/117.

Cheung, W.W.L., T.J. Pitcher and D. Pauly, 2005. A fuzzy logic expert system to estimate intrinsic extinction vulnerabilities of marine fishes to fishing. Biol. Conserv. 124:97-111.

Chuenpagdee, R., Morgan, L., Maxwell, S, Norse, E. and Pauly D. 2003. Shifting gears: addressing the collateral impacts of fishing methods in US waters. Frontiers in Ecology and the Environment 10:517-524

Clarke, S., M. Sato, C. Small, B, Sullivan, Y, Inoue, and D. Ochi. 2014. Bycatch in longline fisheries for tuna and tuna-like species: a global review of status and mitigation measures. FAO Fisheries and Aquaculture Technical Paper No. 588. Rome, FAO. 199 pp.

Clay, T.A., Small, C., Tuck, G.N., Pardo, D., Carneiro, A.P.B., Wood, A.G., Croxall, J.P., Crossing, G.T. and Phillips, R.A. 2019. A comprehensive large-scale assessment of fisheries risk to threatened seabird populations. Journal of Applied Ecology: DOi: 10.1111/1365-2664.13407

Clermont, S., Chavance, P., Delgado, A., murua, H., Ruiz, J., Ciccione, S. and Bourjea, J. 2012. EU purse seine fishery interaction with marine turtles in the Atlantic and Indian Oceans: a 15 year analyses. IOTC 2012 WPEC08 35 V2

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Die, D., Fox, W., Fredou, F.L., Graves, J., Guzman-Mora, A., Viera Hazin, F.H., Hinton, M., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Montano Cruz, R., Nelson, R., Oxenford, H., Restrepo, V., Salas, E., Schaefer, K., Schratwieser, J., Serra, R., Sun, C., Teixeira Lessa, R.P., Pires Ferreira Travassos, P.E., Uozumi, Y. Yanez, E. 2011f. Acanthocybium solandri. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., de Oliveira Leite

Jr., N., Di Natale, A., Die, D., Fox, W., Fredou, F.L., Graves, J., Guzman-Mora, A., Viera Hazin, F.H., Hinton, M., Juan Jorda, M., Minte Vera, C., Miyabe, N., Montano Cruz, R., Nelson, R., Oxenford, H., Restrepo, V., Salas, E., Schaefer, K., Schratwieser, J., Serra, R., Sun, C., Teixeira Lessa, R.P., Pires Ferreira Travassos, P.E., Uozumi, Y. & Yanez, E. 2011g. Makaira nigricans. The IUCN Red List of Threatened Species 2011: e.T170314A6743776.

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Fox, W., Fredou, F.L., Graves, J., Guzman-Mora, A., Viera Hazin, F.H., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Montano Cruz, R., Nelson, R., Oxenford, H., Salas, E., Schaefer, K., Serra, R., Sun, C., Teixeira Lessa, R.P., Pires Ferreira Travassos, P.E., Uozumi, Y. Yanez, E. 2011c. Auxis rochei. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1.

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Fox, W., Fredou, F.L., Graves, J., Guzman-Mora, A., Viera Hazin, F.H., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Montano Cruz, R., Nelson, R., Oxenford, H., Salas, E., Schaefer, K., Serra, R., Sun, C., Teixeira Lessa, R.P., Pires Ferreira Travassos, P.E., Uozumi, Y. Yanez, E. 2011d. Auxis thazard. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1.

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Fox, W., Fredou, F.L., Graves, J., Viera Hazin, F.H., Juan Jorda, M., Minte Vera, C., Miyabe, N., Montano Cruz, R., Nelson, R., Oxenford, H., Schaefer, K., Serra, R., Sun, C., Teixeira Lessa, R.P., Pires Ferreira Travassos, P.E., Uozumi, Y. & Yanez, E. 2011h. Coryphaena hippurus. The IUCN Red List of Threatened Species 2011: e.T154712A4614989. http://dx.doi.org/10.2305/IUCN.UK.2011- 2.RLTS.T154712A4614989.en.

Collette, B., Amorim, A., Boustany, A., Carpenter, K., Dooley, J., Fox, W., Fredou, F., Fritzsche, R., Graves, J., Hazin, F., Herdson, D., Juan Jorda, M.J., Leite, N., Lessa, R., Matsuura, K., Minte-Vera, C., Nelson, J., Nelson, R., Oxenford, H. Travassos, P. 2011b. Sarda sarda. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1.

Collette, B., Amorim, A.F., Boustany, A., Carpenter, K.E., de Oliveira Leite Jr., N., Di Natale, A., Fox, W., Fredou, F.L., Graves, J., Viera Hazin, F.H., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Nelson, R., Oxenford, H., Teixeira Lessa, R.P. Pires Ferreira Travassos, P.E. 2011e. Euthynnus alletteratus. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1

Collette, B., Amorim, A.F., Boustany, A., Carpenter, K.E., Dooley, J., de Oliveira Leite Jr., N., Fox, W., Fredou, F.L., Fritzsche, R., Graves, J., Viera Hazin, F.H., Juan Jorda, M., Kada, O., Minte Vera, C., Miyabe, N., Nelson, J., Nelson, R., Oxenford, H., Teixeira Lessa, R.P. Pires Ferreira Travassos, P.E. 2011a. Thunnus atlanticus. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1

Cortés V, García-Barcelona S, González-Solís J. Sex- and age-biased mortality of three shearwater species in longline fisheries of the Mediterranean. Mar Ecol Prog Ser. 2018;588: 229–241

Cortés, E., Brown, C. and Beerkircher, L.R. 2007. Relative abundance and average size trends of pelagic sharks in the northwest Atlantic ocean, including the Gulf of Mexico and Caribbean Sea. Gulf and Caribbean Research 19(2): 37-52.

Cortes, E., Domingo, A., Miller, P., Forselledo, R., Mas, F. et al. 2015. Expanded ecological risk assessment of pelagic sharks caught in Atlantic pelagic longline fisheries. Collective Volume of Science Papers ICCAT 71(6):2637-2688.

COSEWIC. 2014. COSEWIC assessment and status report on the Porbeagle Lamna nasus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 40 pp. (www.registrelepsararegistry.gc.ca/default_e.cfm).

Cullis-Suzuki, S. and Pauly, D. 2010. Failing the high seas: a global evaluation of regional fisheries management organizations. Marine Policy 34:1036-1042

Cuthbert, R.J., Cooper, J., Ryan, P.G. 2014. Population trends and breeding success of albatrosses and giant petrels at Gough Island in the face of at-sea and on-land threats. Antarctic Science 26(2): 163-171.

Dagorn, L., K.N. Holland, V. Restrepo and G. Moreno. 2012. Is it good or bad to fish with FADs? What are the real impacts of the use of drifting FADs on pelagic marine ecosystem? Fish and Fisheries DOI:10.1111/j.1467-2979.2012.00478.x.

Department of Fisheries and Oceans Canada (DFO). 2008a. Bluefin tuna (Atlantic Canada). Fisheries and Oceans Canada.

Department of Fisheries and Oceans Canada (DFO). 2009. Canadian Atlantic swordfish and other tunas 2004-2006. Fisheries and Oceans Canada.

Department of Fisheries and Oceans Canada (DFO). 2010. Monitoring and enforcement. Fisheries and Oceans Canada.

Department of Fisheries and Oceans Canada (DFO). 2012. Assessment of leatherback turtle (Dermochelys coriacea) fishery and non-fishery interactions in the Atlantic Canadian waters. Canadian Science Advisory Secretariat Science Advisory Report 2012/041.

Department of Fisheries and Oceans Canada (DFO). 2012a. Canadian Atlantic swordfish and other tunas. Fisheries and Oceans Canada.

Derhé, M. A. 2012. Population assessment for the Yelkouan Shearwater Puffinus yelkouan. In: BirdLife International (ed.), Methodology for Bird Species Recovery Planning in the European Union. Final Report to the European Commission. BirdLife International for the European Commission, Cambridge, UK.

DFO. 2003. Species profile: leatherback sea turtle Atlantic population. Species at risk public registry.

DFO. 2008. Science at Fisheries and Oceans Canada: A framework for the future. Department of Fisheries and Oceans Canada.

DFO. 2013. Appendix : 2013 Canadian Atlantic swordfish and other tunas. Department of Fisheries and Oceans Canada.

DFO. 2015. Recovery Potential Assessment for Porbeagle (Lamna nasus) in Atlantic Canada. Science Advisory Report 2015/048.

DFO. 2017. bluefin tuna management in Atlantic Canada. Department of Fisheries and Oceans Canada.

DFO. 2017. Threat Assessment for Loggerhead Sea Turtle (Caretta caretta), Northwest Atlantic Population. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/014.

DFO. 2017a. Species profile: loggerhead sea turtle. Species at risk public registry. Department of Fisheries and Oceans Canada.

DFO. 2018. Porbeagle: public consultation. Department of Fisheries and Oceans Canada.

DFO. 2018b. Ecosystem management. Department of Fisheries and Oceans Canada.

DFO. 2018c. Shark conservation. Department of Fisheries and Oceans Canada.

Ditty, J., R. Shaw, C. Grimes, J. Cope. 1994. Larval development, distribution, and abundance of common dolphin, Coryphaena hippurus, and pompano dolphin, C. equiselis (family: Coryphaenidae), in the northern Gulf of Mexico.. Fishery Bulletin, 92(2): 275-291.

Duffy, J.E. 2003. Biodiversity loss, trophic skew and ecosystem functioning. Ecology Letters 6:680-687.

FAO. 2004. Species Fact Sheet: Coryphaena hippurus. http://www.fao.org/fishery/species/3130/en.

FAO. 2014. Fishing techniques tuna pole and line fishing. FAO Fisheries and Aquaculture Department.

FAO. 2018. Report of the Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations, Rome, 20-23 March 2018. FAO Fisheries and Aquaculture Report No.1231. Rome, Italy.

Ferretti, F., B. Worm, G.L. Britten, M.R. Heithaus, H.K. and Lotze. 2010. Patterns and ecosystem consequences of shark declines in the ocean. Ecology Letters, 13: 1055– 1071.

Florida Fish and Wildlife Conservation Commission (FWC). 2016. Index nesting beach survey totals (1989-2016). FWC, Fish and Wildlife Research Institute.

Florida Fish and Wildlife Conservation Commission (FWC). 2019. Statewide nesting beach survey program loggerhead nesting data, 2014-2018. FWC, Fish and Wildlife Research Institute.

Fonteneau, A., Ariz, J., Gaertner, D., Nordstrom, V. and Pallares, P. 2000a. Observed changes in the species composition of tuna schools in the Gulf of Guinea between 1981 to 1999, in relation with the fish aggregating device fishery. Aquatic and Living Resources 13:253-257.

Foster, D.G., Epperly, S.P., Shah, A.K. and Watson, J.W. 2012. Evaluation of hook and bait type on the catch rates in the western north Atlantic Ocean pelagic longline fishery. Bulletin of Marine Science 88:529-545.

FR. 2016. Endangered and threatened wildlife and plants; final rule to list eleven Distinct Population Segments of the green sea turtle (Chelonia mydas) as Endangered or Threatened and revision of current listing under the Endangered Species Act. 81 FR 20057.

FR. 2017. Endangered and Threatened Wildlife; 90-day finding on a petition to identify the northwest Atlantic leatherback turtle as a Distinct Population Segment and list it as Threatened under the Endangered Species Act. 82 FR 57565

Fréon, P. and Dagorn, L. 2000. Review of fish associative behavior: Toward a generalization of the meeting point hypothesis. Reviews in Fish Biology and Fisheries 10:183-207.

Froese, R. and D. Pauly. Editors. 2019. FishBase. World Wide Web electronic publication. www.fishbase.org, version (02/2019)

Gagern, A., van den Bergh, J. and Sumaila, U.R. 2013. Trade based estimation of bluefin tuna catches in the eastern Atlantic and Mediterranean, 2005-2011. PLoS ONE 8:e69959. doi: 10.1371/journal.pone.0069959.

García-Barcelona S, Ortiz de Urbina JM, de la Serna JM, Alot E, Macías D. Seabird bycatch in a spanish Mediterranean large pelagic longline fisheries, 2000–2008. Aquat Living Resour. 2010;23: 363–371.

Garibaldi, F. 2015. Bycatch in the mesopelagic swordfish longline fishery in the Ligurian Sea (Western Mediterranean). Collective Volume of Scientific Papers ICCAT 71:1495-1498.

Garrison L. P. 2007. Interactions between marine mammals and pelagic longline gear in the U.S. Atlantic Ocean between 1992 and 2004. Fishery Bulletin , 105: 408–417.

Genovart M, Arcos JM, Álvarez D, McMinn M, Meier R, Wynn R, et al. 2016. Demography of the critically endangered Balearic shearwater: the impact of fisheries and time to extinction. J Appl Ecol. 2016;53: 1158–1168.

Genovart M, Doak D, Igual JM, Sponza S, Kralj J, Oro D. 2017. Varying demographic impacts of different fisheries on three Mediterranean seabird species. Glob Chang Biol. 2017;23: 3012–3029. pmid:28231421

Giffoni, B., A. Domingo, G. Sales, F. N. Fiedler, and P. Miller. 2008. Interaccion de tortugas marinas (Caretta caretta y

Dermochelys coriacea) con la pesca de palangre pelagico en el Atlantico Sudoccidental: Una perspectiva regional para la conservacion. Collective Volume of Scientific Papers—International Commission for the Conservation of Atlantic Tunas 6:1861-1870.

Gillett, R. 2012. Report of the 2012 ISSF Workshop: the management of tuna bait fisheries: The results of a global study. ISSF Technical Report 2012-08. International Seafood Sustainability Foundation, Washington, D.C.

Gillett, R. 2010. Replacing purse seining with pole and line fishing in the Western Pacific: some aspects of the baitfish requirements. Gillett, Preston and Associates Inc. for the ISSF.

Gilman E. Brothers N. McPherson G. Dalzell P. 2006. A review of cetacean interactions with longline gear. Journal of Cetacean Research and Management , 8: 215–223.

Gilman, E., Pasfield, K. and Nakamura, K. 2013. Performance of regional fisheries management organizations: ecosystem-based governance of bycatch and discards. Fish and Fisheries DOI:10.1111/faf.12021

Gilman, E., Suuronen, P. and Chaloupka, M. 2017. Discards in global tuna fisheries. Marine Ecology Progress Series 582:231-252.

Gilman, E.L. 2011. Bycatch governance and best practice mitigation technology in global tuna fisheries. Marine policy 35(5):590-609.

Government of Canada. 2013. Species at Risk public registry. Government of Canada

Gray, C.M. and G.A. Diaz. 2017. Preliminary estimate of the number of sea turtle interactions with pelagic longline gear in the ICCAT Convention Area. SCRS/2016/125. Collective Volumes of Scientific Papers ICCAT 73(9):3128-3151.

Hall, M. and M. Roman. 2013. Bycatch and non-tuna catch in the tropical tuna purse seine fisheries of the world. FAO Fisheries and Aquaculture Technical Paper No. 568. Rome, FAO. 249 pp.

Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y., Wells, R.S. Wilson, B. 2008. Delphinus delphis. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1.

Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K.A., Karkzmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y. , Wells, R.S. & Wilson, B. 2012. Tursiops truncatus. The IUCN Red List of Threatened Species 2012: e.T22563A17347397.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. and Øien, N. 2017. Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Wageningen Marine Research.

Hanke, A.R., Andrushchenko, I and Croft, G. 2012. Observer coverage of the Atlantic Canadian swordfish and other tuna tuna longline fishery: an assessment of current practices and alternative methods. DFO Canada Scientific Advisory Section Resource Document 2012/049.

Hawkes, L.A., Broderick, A.C., Coyne, M.S., Godfrey, M.H., Lopez-Jurado, L.F., Lopez-Suarez, P., Merino, S.E., Varo-Cruz, N. and Godley, B.J. 2006. Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. Current Biology 16: 990-995.

Hayes SA, E. Josephson, K. Maze-Foley , and PE Rosel, editors. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2018. NOAA Tech Memo NMFS-NE-258; 306 p.

Hayes SA, Josephson E, Maze-Foley K, Rosel PE, Byrd B, Chavez-Rosales S, Col TVN, Engleby L, Garrison LP, Hatch J, Henry A, Horstman SC, Litz J, Lyssikatos MC, Mullin KD, Orphanides C, Pace RM, Palka DL, Soldevilla M, Wenzel FW. 2018. TM 245 US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2017 (second edition). NOAA Tech

Memo NMFS NE-245; 371 p.

Heithaus, M.R., Frid, A., Wirsing, A.J., Dill, L.M., Fourqurean, J.W., Burkholder, D., Thomson, J. and Bejder, L 2007. State-dependent risk taking by green sea turtles mediates top-down effects of tiger shark intimidation in a marine ecosystem. Journal of Animal Ecology 76:837-844.

HSI. 2019. Mako sharks win CITES App. II listing trade controls to clamp down on shark fin trade. Human Society International, August 2019

Huang H-W. 2015. Conservation Hotspots for the Turtles on the High Seas of the Atlantic Ocean. PLoS ONE 10(8): e0133614. doi:10.1371/ journal.pone.0133614

Huang, H. 2009. Report of the Taiwanese observer program for large-scale tuna longline fisheries in the Atlantic Ocean in 2007. ICCAT Collective Volume of Scientific Papers 65:2399-2408.

ICCAT. 2003. Recommendation by ICCAT relating to Mediterranean swordfish. Recommendation 03-04.

ICCAT. 2009. Report of the 2009 porbeagle stock assessment meeting. Copenhagen, Denmark, June 22-27, 2009.

ICCAT. 2009a. Report of the 2009 ICCAT albacore stock assessment session. Collective Volume of Scientific Papers, ICCAT 65:1113-1253

ICCAT. 2009b. Report of the 2008 ICCAT yellowfin and skipjack stock assessments meeting. Collective Volume of Scientific Papers ICCAT 64:669-927.

ICCAT. 2009c. Report of the 2009 sailfish stock assessment. Reciefe, Brazil, 1-5 June 2009.

ICCAT. 2009d. Recommendation by ICCAT on the conservation of thresher sharks caught in association with fisheries in the ICCAT convention area. Recommendation 09-07.

ICCAT. 2010a. Report of the 2010 ICCAT bigeye tuna stock assessment session. Pasaia, Gipuzkoa, Spain 5-9 July 2010.

ICCAT. 2010b. Report of the 2010 ICCAT Mediterranean swordfish stock assessment meeting. Madrid, Spain, June 28-July 2, 2010.

ICCAT. 2010c. Recommendation by ICCAT on the southern albacore catch limits for 2012 and 2013. Recommendation 11-05.

ICCAT. 2010d. Recommendation by ICCAT on hammerhead sharks (family Sphyrnidae) caught in association with fisheries managed by ICCAT. Recommendation 10-08.

ICCAT. 2010f. Recommendation by ICCAT on the conservation of oceanic whitetip shark caught in association with fisheries in the ICCAT convention area. Recommendation 10-07.

ICCAT. 2010g. Recommendation by ICCAT on the by-catch of sea turtles in ICCAT fisheries. Recommendation 10-09

ICCAT. 2011a. Report of the 2011 ICCAT south Atlantic and Mediterranean albacore stock assessment sessions. Madrid, Spain, 25-29 July 2011.

ICCAT. 2011c. Recommendation by ICCAT to amend the recommendation by ICCAT on a multi-year conservation and management program for bigeye tuna and yellowfin tuna. Recommendation 11-01.

ICCAT. 2011f. Report of the 2011 blue marlin stock assessment and white marlin data preparatory meeting. Madrid, Spain, 25-29 April 2011.

ICCAT. 2011g. Recommendation by ICCAT on information collection and harmonization of data on bycatch and discards in ICCAT fisheries. Recommendation 11-10.

ICCAT. 2011h. Supplemental recommendation by ICCAT on reducing incidental bycatch of seabirds in ICCAT longline fisheries. Recommendation 11-02.

ICCAT. 2012a. Report of the standing committee on research and statistics (SCRS). PLE-104/2012, Madrid, Spain, 1-5 October 2012.

ICCAT. 2012b. Report of the 2012 Atlantic bluefin tuna stock assessment session.. Doc. No. SCI-033/2012

ICCAT. 2012c. Recommendation by ICCAT amending the recommendation by ICCAT to establish a multi-annual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean. Recommendation 12-03

ICCAT. 2012d. Supplemental recommendation by ICCAT concerning the western Atlantic bluefin tuna rebuilding program. Recommendation 12-02.

ICCAT. 2012e. Recommendation by ICCAT for the conservation of north Atlantic swordfish. Recommendation 11-02.

ICCAT. 2012e. Recommendation by ICCAT for the conservation of north Atlantic swordfish. Recommendation 11-02.tember 30-October 4, 2013.

ICCAT. 2012g. 2012 shortfin mako stock assessment and ecological risk assessment meeting. Olhado, Portugal, 11-18 June, 2012.

ICCAT. 2012h. Expanded ecological risk assessment of pelagic sharks caught in Atlantic pelagic longline fisheries. SCRS/2012/167.

ICCAT. 2012i. Recommendation by ICCAT on compliance with existing measures on shark conservation and management. Recommendation 12-05.

ICCAT. 2003a. Recommendation by ICCAT concerning minimum standards for the establishment of a vessel monitoring system in the ICCAT convention area. ICCAT Rec 03-14.

ICCAT. 2011j. Recommendation by ICCAT further amending recommendation 09-10 establishing a list of vessels presumed to have carried out illegal, unreported and unregulated fishing activities in the ICCAT convention area. Recommendation 11-18.

ICCAT. 2013. ICCAT. 2013b. Summary of the report of the inter-sessional meeting of the Sub-Committee on Ecosystems. ICCAT Report 2012-13(II).

ICCAT. 2013. Recommendation by ICCAT amending Recommendation 10-09 on the by-catch of sea turtles in ICCAT fisheries. International Commission for the Conservation of Atlantic Tunas 13-11.

ICCAT. 2013a. Report of the Standing Committee on Research and Statistics (SCRS). Madrid, Spain, September 30-October 4, 2013.

ICCAT. 2014. Report of the 2014 ICCAT east and west Atlantic skipjack stock assessment meeting. Dakar, Senegal June 23 - July 1, 2014.

ICCAT. 2014a. Recommendation by ICCAT on shortfin mako caught in association with ICCAT fisheries. ICCAT REC 14-06.

ICCAT. 2014a. Recommendation by ICCAT on shortfin mako caught in association with ICCAT fisheries. ICCAT REC 14-06.

ICCAT. 2015. Recommendation by ICCAT on porbeagle caught in association with ICCAT fisheries. International Commission for the Conservation of Atlantic Tunas Rec 15-06.

ICCAT. 2015b. Report of the 2015 ICCAT blue shark stock assessment session. Lisbon, Portugal, July 27-31, 2015.

ICCAT. 2016. Report of the 2016 ICCAT yellowfin tuna stock assessment meeting. San Sebastian, Spain 27 June to 1 July 2016.

ICCAT. 2016b. Recommendation by ICCAT on a multi-annual conservation and management programme for tropical tunas. ICCAT Rec 16-01.

ICCAT. 2016b. Report of the 2016 ICCAT north and south Atlantic albacore stock assessment meeting. Madeira, Portugal April 28-May 6, 2016.

ICCAT. 2016c. Report on the independent performance review of ICCAT. ICCAT Madrid 2016.

ICCAT. 2016d. Recommendation by ICCAT replacing the Recommendation [13-04] and establishing a multi-annual recovery plan for Mediterranean swordfish. International Commission for the Conservation of Atlantic Tunas 16-05.

ICCAT. 2016e. ICCAT geographical definitions. International Commission for the Conservation of Atlantic Tunas.

ICCAT. 2016f. Recommendation by ICCAT on management measures for the conservation of Atlantic blue shark caught in association with ICCAT fisheries. Recommendation 16-12.

ICCAT. 2016h. Report of the 2016 sailfish stock assessment. ICCAT Sailfish Stock Assessment Meeting. Miami, FL. 30 May-3 June 2016.

ICCAT. 2017. Report of the 2017 ICCAT Atlantic swordfish stock assessment session. Madrid, Spain 3-7 July, 2017.

ICCAT. 2017b. Report of the 2017 ICCAT shortfin mako assessment meeting. Madrid, Spain, 12-16 June 2017.

ICCAT. 2017c. Report of the 2017 ICCAT bluefin stock assessment meeting. Madrid, Spain, 20-28 July, 2017. International Commission for the Conservation of Tuna.

ICCAT. 2017d. Recommendation by ICCAT amending the recommendation for the conservation of south Atlantic swordfish, Rec 16-04.

ICCAT. 2017e. Recommendation by ICCAT on a harvest control rule for north Atlantic albacore supplementing the multiannual conservation and management program, Rec 16-06. ICCAT Rec 17-04.

ICCAT. 2017f. Recommendation by ICCAT on the conservation of north Atlantic stock of shortfin mako caught in association with ICCAT fisheries. ICCAT 17-08

ICCAT. 2017i. Report of the Standing Committee on Research and Statistics (SCRS). International Commission for the Conservation of Tunas.

ICCAT. 2017j. Report of the 2017 ICCAT Albacore Species Group intersessional meeting (including the assessment of Mediterranean albacore). Madrid, Spain, 5-9 June 2017.

ICCAT. 2017k. Recommendation by ICCAT for an interim conservation and management plan for western atlantic bluefin tuna. ICCAT 17-06

ICCAT. 2018. Report of the 2018 ICCAT bigeye tuna stock assessment meeting. Pasaia, Spain, 16-20 July, 2018.

ICCAT. 2018a. Recommendation by ICCAT establishing a multi-annual management plan for bluefin tuna in the eastern Atlantic and Mediterranean Sea.

ICCAT. 2018b. Report of the Standing Committee on Research and Statistics (SCRS). Madrid Spain, 1-5 October 2018.

ICCAT. 2018c. Recommendation by ICCAT supplementing and amending recommendation 16-01 on a multi-annual conservation and management programme for tropical tunas. ICCAT Rec 18-01.

ICCAT. 2018d. Recommendation by ICCAT to replace recommendation 16-13 on the improvement of compliance review of conservation and management measures regarding sharks caught in association with ICCAT fisheries. Rec 18-06.

ICCAT. 2018e. ICCAT agreed on a reviewed multi-annual management plan for bluefin tuna in the eastern Atlantic and Mediterranean. ICCAT Press Release, November 19, 2018.

ICCAT. 2018f. Report of the 2018 ICCAT Sub-Committee on ecosystems meeting. Madrid, Spain 4-8, 2018.

ICCAT. 2018g. Resolution by ICCAT on development of initial management objectives for eastern and western bluefin tuna. ICCAT-18-03.

ICCAT. 2019. Report of the 2019 ICCAT yellowfin tuna stock assessment meeting. Grand-Bassam, Cote d'Ivoire, 8-16 July 2019.

ICCAT. 2019a. Report of the 2019 shortfin mako shark stock assessment update meeting. ICCAT Intersessional Meeting, Madrid, Spain 20-24, 2019.

ICCAT. 2019b. Report of the Standing Committee on Research and Statistics. Madrid Spain 20 September to 4 October 2019. International Commission for the Conservation of Atlantic Tunas.

ICCAT. 2019c. ICCAT Press release. International Commission for the Conservation of Atlantic Tunas.

ICCAT. 2019d. Executive Summary Report of the Small Tunas Species Group (SCRS). 24 pp.

ICCAT. 2019e. Recommendation by ICCAT amending the Recommendation 16-12 on management measures for the conservation of the north Atlantic blue shark caught in association with ICCAT Fisheries. ICCAT 19-07.

ICCAT. 2019f. Recommendation by ICCAT on the conservation of north Atlantic stock of shortfin mako caught in association with ICCAT Fisheries. ICCAT Rec 19-06 BYC.

ICCAT. 2019g. Recommendation by ICCAT on management measures for the conservation of south Atlantic blue shark caught in association withICCAT fisheries. ICCAT REC 19-08.

ICCAT. 2020. Compendium: Management recommendations and resolutions adopted by ICCAT for the conservation of Atlantic tunas and tuna-like species. Corazón de María, 8 – 28002 Madrid– Spain. 458 pp.

ICCAT. 2020a. 2020 SCRS Advice to the Commission. International Commission for the Conservation of Atlantic Tunas. Madrid, Spain

ICCAT. 2020b. Draft Recommendation by ICCAT Amending Rec. 17-06 for an Interim Conservation and Management Plan for Western Atlantic Bluefin Tuna. Doc. No. PA2_608/2020. 06 October 2020 (12:34).

ICCCAT. 2003b. Recommendation by ICCAT concerning the recording of catch by fishing vessels in the ICCAT

Convention Area. International Commission for the Conservation of Tunas.

Inoue, Y., Yokawa, K., Minami, H., Ochi, D., Sato, N. and Katsumata, N. 2012. Distribution of seabird bycatch using data collected by Japanese observers in 1997-2009 in the ICCAT area. Collective Volume of Scientific Papers ICCAT 68:1738-1753.

International Commission for the Conservation of Atlantic Tuna (ICCAT). 2011. Recommendation by ICCAT on the conservation of silky sharks caught in association with ICCAT fisheries. Recommendation 11-08.

International Commission for the Conservation of Atlantic Tuna (ICCAT). 2011e. Supplemental recommendation by ICCAT concerning the north Atlantic albacore rebuilding program. Recommendation 11-04

International Commission for the Conservation of Atlantic Tuna (ICCAT). 2010. Recommendation by ICCAT to establish minimum standards for fishing vessel scientific observer programs. Recommendation 10-10.

International Commission for the Conservation of Atlantic Tuna (ICCAT). 2010e. Recommendation by ICCAT on Atlantic shortfin mako sharks caught in association with ICCAT fisheries. Recommendation 10-06.

International Commission for the Conservation of Atlantic Tunas (ICCAT). 2011d. Recommendation for management measures for Mediterranean swordfish in the framework of ICCAT. Recommendation 11-03.

International Commission for the Conservation of Tuna (ICCAT). 2011b. Recommendation by ICCAT on the southern albacore catch limits for 2012 and 2013. Recommendation 11-05.

ISCSWG. 2014. Stock assessment and future projections of blue shark in the North Pacific Ocean. Report of the Shark Working Group. International Scientific Committee for Tuna and Tuna-like species in the North Pacific Ocean. 16-21 July 2014 Taipei, Chinese-Taipei.

Jenkins, K. and R. McBride. 2009. Reproductive biology of wahoo, Acanthocybium solandri , from the Atlantic coast of Florida and the Bahamas. Marine and Freshwater Research 60(9):893-897. DOI: 10.1071/MF08211

Jimenez, S., Domingo, A., Abreu, M. and Braziero, A. 2012. Risk assessment and relative impact of Uruguayan pelagic longliners on seabirds. Aquatic Living Resources 25:281-295.

Jiménez, Sebastián; Phillips, Richard A.; Brazeiro, Alejandro; Defeo, Omar; Domingo, Andrés. 2014 Bycatch of great albatrosses in pelagic longline fisheries in the southwest Atlantic: Contributing factors and implications for management. Biological Conservation, 171. 9-20. https://doi.org/10.1016/j.biocon.2013.12.035

Josse, E., Bertrand, A. and Dagorn, L. 1999. An acoustic approach to study tuna aggregated around fish aggregating devices in French Polynesia: methods and validation. Aquatic and Living Resources 12:303-313.

Josse, E., Dagorn, L. and Bertrand, A. 2000. Typology and behavior of tuna aggregations around fish aggregating devices from acoustic surveys in French Polynesia. Aquatic and Living Resources 13:183-192.

Keene, K.F. 2016. SEFSC pelagic observer program data summary for 2007-2011. NOAA Technical Memorandum NMFS-SEFSC-687. 29 pg.

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

Kiszka, J. & Braulik, G. 2018. Grampus griseus. The IUCN Red List of Threatened Species 2018: e.T9461A50356660. . Downloaded on 13 March 2019.

Kiszka, J. 2015. Marine mammals: a review of status, distribution and interaction with fisheries in the Southwest Indian

Ocean. In: R.P. Van der Elst and B.I. Everett (eds), Offshore fisheries of the Southwest Indian Ocean: their status and the impact on vulnerable species. Oceanographic Research Institute, Special Publication 10, pp. 303-323.

Klaer, N.L. 2012. Estimates of total seabird bycatch by Atlantic pelagic longline fisheries from 2003-2006. Marine Fisheries Review 74:14-20

Koehler, H.R., 2013. Promoting compliance in tuna RFMO's: a comprehensive baseline survey of the current mechanics of reviewing, assessing and addressing compliance with RFMO obligations and measures. ISSF Technical Report 2013-02.

Kyne, P.M., Barreto, R., Carlson, J., Fernando, D., Francis, M.P., Fordham, S., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Pteroplatytrygon violacea. The IUCN Red List of Threatened Species 2019: e.T161731A896169.

Laneri, K., Louzao, M., Martínez-Abraín, A., Arcos, J., Belda, E., Guallart, J., … Oro, D. 2010. Trawling regime influences longline seabird bycatch in the Mediterranean: new insights from a small-scale fishery. Marine Ecology Progress Series, 420, 241–252. doi:10.3354/meps08847.

Length-weight Relationships of Dolphinfish, Coryphaena hippurus, and Wahoo, Acanthocybium solandri: Seasonal Effects of Spawning and Possible Migration in the Central North Pacific. Marine Fisheries Review 68(1):19-29.

Levesque, J. 2010. Evolving fisheries: today's bycatch is tomorrow's target catch - escolar (Lepidocybium flavobrunneum) catch in the US pelagic longline fishery. The Open Fish Science Journal 3:30-42.

Lewison, R.I., Freeman, S.A. and Crowder, L.B. 2004. Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecology Letters 7:221-231

Lookeborg, S., Silkavuopio, S., Humborstad, O., Utne-Palm, A. and Ferter, K. 2014. Towards more efficient longline fisheries: fish feeding behavior, bait characteristics and development of alternative baits. Reviews in Fish Biology and Fisheries 24: 985-1003.

Lopez, D.M., Barcelona, S.G., Baez, J.C., De La Serna, J.Gm. and Oritz De Urbina, J.M. 2012. Marine mammal bycatch in Spanish Mediterranean large pelagic longline fisheries, with a focus on Risso's dolphin (Grampus griseus). Aquatic and Living Resources 25:321-331.

Lucchetti, A., Sala, A., 2009. An overview of loggerhead sea turtle (Caretta caretta) bycatch and technical mitigation measures in the Mediterranean Sea. Rev. Fish Biol. Fish. 20, 141–161.

LWG. 2018. Northwest Atlantic leatherback turtle (Dermochelys coriacea) status assessment. IUCN Leatherback Working Group.

Maison, K.A., Kinan Kelly, I. and K.P. Frutchey. 2010. Green Turtle Nesting Sites and Sea Turtle Legislation throughout Oceania. U.S. Dep. Commerce, NOAA Technical Memorandum. NMFS-F/SPO-110, 52 pp.

Marcek, B. and Graves, J.E. 2014. An estimate of postrelease mortality of school-size bluefin tuna in the US recreational troll fishery. North American Journal of Fisheries Management 34(3). DOI.1080/02755947.2014.902411.

McBride R.S., D.J.G. Snodgrass, D.H. Adams, S.J. Rider, J.A. Colvocoresses. 2012. An indeterminant model to estimate egg production of the highly iteroparous and fecund fish, dolphinfish (Coryphaena hippurus). Bulletin of Marine Science 88: 283-303.

McClelland, G. T. W., A. L. Bond, A. Sardana, Glass, T. 2016. Rapid population estimate of a surface-nesting seabird on a remote island using a low-cost unmanned aerial vehicle. Marine Ornithology 44: 215-220.

McDonaldxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Megalofonou, P., Yannopoulos, C., Damalas, D., Metrio, G., Deflorio, M., de la Serna, J.M. and Macias, D. 2005. Incidental catch and estimated discards of pelagic sharks from the swordfish and tuna fisheries in the Mediterranean Sea. Fisheries Bulletin 103:620-634.

Mejuto, J., Garcia-Cortes, B., Ramos-Cartelle, A. and de la Sema, J.M. 2008. Scientific estimations of bycatch landed by the Spanish surface longline fleet targeting swordfish (Xiphas gladius) in the Atlantic Ocean with special reference to the years 2005 and 2006. International Commission for the Conservation of Tunas SCRS/2008/045

Melo, J. and Melo, T. 2013. Interviews with fishers suggest European longlining threatens sea turtle populations in Cape Verdean waters. Marine Turtle Newsletter 138: 18-19.

Menard, F., Fonteneau, A., Gaertner, D., Nordstrom, V. Stequert, B. and Marchal, E. 2000. Exploitation of small tunas by a purse-seine fishery with fish aggregating devices and their feeding ecology in an eastern tropical Atlantic ecosystem. ICES Journal of Marine Science 57:525-520.

Menard, F., Stequert, B., Rubin, A., Herrera, M. and Marchal, E. 2000a. Food consumption of tuna in the equatorial Atlantic Ocean: FAD associated versus unassociated schools. Aquatic and Living Resources 13:233-240.

Milessi, A.C. and Defeo, O. 2002. Long-term impact of incidental catches by tuna longlines: the black escolar (Lepidocybium flavobrunneum) of the southwestern Atlantic Ocean. Fisheries Research 58:203-213

Miller, K.I., Nadheeh, I., Jauharee, A.R., Anderson, R.C. and Adam, M.S. 2017. Bycatch in the Maldivian pole-and-line tuna fishery. PLoS One 12: e0177391.

Minder, R. 2015. Spanish tuna fishing melds to Japan's taste, reshaping a 3,000-year-old technique. The New York Times. June 6, 2015.

Minton, G., Braulik, G. & Reeves, R. 2018. Globicephala macrorhynchus. The IUCN Red List of Threatened Species 2018: e.T9249A50355227. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T9249A50355227.en. Downloaded on 22 March 2019.

Monzon-Arguello, C., Rico, C., Naro-Maciel, E., Varo-Cruz, N., Lopez, P., Marco, A. and Lopez-Jurado, L.F. 2010. Population structure and conservation implications for the loggerhead sea turtle of the Cape Verde Islands. Conservation Genetics 11: 1871-1884.

Moody Marine International (MMI). 2011. North Atlantic swordfish (Xiphias gladius) Canadian pelagic longline fishery: Vol. 1 final report and determination. Contract Number:09-01 Nova Scotia swordfish.

Morgan, A., and Pickerell, T. 2018. Best practices for reducing bycatch in tuna longline fisheries. Sustainable Fisheries Partnership

Mortimer, J.A & Donnelly, M. (IUCN SSC Marine Turtle Specialist Group) 2008. Eretmochelys imbricata. The IUCN Red List of Threatened Species 2008: e.T8005A12881238.

Myers, R.A., Baum, J.K., Shepherd, T.D., Powers, S.P. and Peterson, C.H. 2007. Cascading effects of the loss of apex predatory sharks from a coastal. Science 315:1846-1850

National Marine Fisheries Service (NMFS). 2009b. An assessment of loggerhead sea turtles to estimate impacts of mortality reductions on population dynamics. NMFS Southeast Fisheries Science Center Contribution PRD-08/09-14

National Marine Fisheries Service. 2004. Biological opinion on the reinitiation of consultation on the Atlantic pelagic longline fishery for highly migratory species. National Marine Fisheries Service, St. Petersburg, Florida, June 1, 2004.

NEFSC. 2018. 65th Northeast regional stock assessment workshop (65th SAW) assessment summary report. Northeast Fisheries Science Center Reference Document 18-08.

New Ref. 2020. Testing

NMFS. 1999. The Southwest Fisheries Science Center's 1999 Billfish Newsletter. 12 pp.

NMFS. 2011. Endangered and threatened species: determination of nine Distinct Population Segments of loggerhead sea turtles. Federal Register 76 FR 58867: 58867-58952.

NMFS. 2012. Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Comprehensive Annual Catch Limit Amendment for the South Atlantic. 77 FR 15915. 50 CFR 622, Docket No. 100812345-2142-03, Document Number: 2012-6450.

NMFS. 2013. Leatherback Sea Turtle (Dermochelys coriacea) 5-Year Review : Summary and Evaluation. National Marine Fisheries Service.

NMFS. 2014. Amendment 7 to the Highly Migratory Species (HMS) Fishery Management Plan. National Marine Fisheries Service.

NMFS. 2018. Annual trade data by product, country/association. National Marine Fisheries Service Commercial Fisheries Statistics.

NMFS. 2018. List of fisheries summary tables. National Marine Fisheries Service.

NMFS. 2019. Annual trade data by product, country/association. NOAA National Marine Fisheries Service.

NMFS. 2019b. Three-Year Review of the Individual Bluefin Quota Program. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 166pp.

NMFS. 2020. 2020 Atlantic Bluefin Tuna Landings Updates. Posted November 30, 2020

NMFS. 2020. 2020 Atlantic Bluefin Tuna Landings Updates. Posted November 30, 2020.

NMFS. 2020. Annual Trade by Product, Country Association 2019.

NMFS. 2020b. NOAA Fisheries Commercial Landings Statistics.

NOAA. 2019a. 2019 Stock Assessment and Fishery Evaluation Report for Atlantic highly migratory species. US Department of Commerce, National Oceanic and Atmospheric Administration. 220 pg.

NOAA. 2006. Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan. Highly Migratory Species Management Division.

NOAA. 2015. Status review of the green turtle (Chelonia mydas) under the Endangered Species Act. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-539.

NOAA. 2018. HMS compliance guide: commercial fishing guide for complying with the Atlantic tunas, swordfish, shark and billfish regulations. Office of Sustainable Fisheries Highly Migratory Species Management Division.

NOAA. 2018b. Ecosystem-based fisheries management policy. NOAA Fisheries Policy 01-120.

NOAA. 2018c. NOAA fisheries ecosysetm based Fisheries Management Road Map draft regional implementation plan Atlantic Highly Migratory Species 2018-2022. National Oceanographic and Atmospheric Administration.

NOAA. 2019. Draft marine mammal stock assessment reports. Office of Protected Resources.

Northwest Atlantic Leatherback Working Group. 2018. Northwest Atlantic Leatherback Turtle (Dermochelys coriacea) Status Assessment (Bryan Wallace and Karen Eckert, Compilers and Editors). Conservation Science Partners and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). WIDECAST Technical Report No. 16. Godfrey, Illinois. 36 pp.

Olson R.J. and F. Galván-Magaña. 2002. Food habits and consumption rates of common dolphinfish (Coryphaena hippurus) in the eastern Pacific Ocean. Fishery Bulletin 100(2):279-298.

Oppel S., Raine A.F., Borg J.J., Raine H., Bonnaud E., Bourgeois K. and Breton A.R. 2011. Is the Yelkouan shearwater Puffinus yelkouan threatened by low adult survival probabilities? Biological Conservation 144(9): 2255-2263.

Orbesen, E.S., C.A. Brown, D. Snodgrass, J.E. Serafy and J.F. Walter, III. 2019. At-vessel and postrelease mortality rates of bluefin tuna (Thunnus thynnus) associated with pelagic longline gear in the northern Gulf of Mexico. Fishery Bulletin 117:15–23.

Oxenford, H. A. 1999. Biology of the dolphinfish (Coryphaena hippurus) in the western central Atlantic: a review, Sciencia Marina 63(3-4): 277-301.

Parker, C., Kleisner, K.M. and Nowlis, J.S. 2006. Preliminary assessment of the western central Atlantic dolphinfish (Coryphaena hippurus) stock: a Caribbean regional fisheries mechanism project. Sustainable Fisheries Division Contribution NO. SFD-2--6-041

Parkes, G., Mitchell, R., Trumble, R.J. 2013. MSC final report for US north Atlantic swordfish pelagic longline and handgear buoy fishery. MRAG Americas, Inc.

Paul, S.D., Hanke, A., Smith, S.C., and Neilson, J.D. 2010. An examination of loggerhead sea turtle (Caretta caretta) encounters in the Canadian swordfish and tuna longline fishery, 2002-2008. Canadian Science Advisory Secretariat Research Document 2010/088

Paxton, J.R. 2010. Alepisaurus ferox. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1.

Piraino, S., Fanelli, G., Boero, F. 2002. Variability of species roles in marine communities: change of paradigms for conservation priorities. Marine Biology 140:1067-1074.

Polovina, J.J., M. Abecassis, E.A. Howell, P. Woodworth. 2009. Increases in the relative abundance of midtrophic level fishes concurrent with declines in apex predators in the subtropical North Pacific, 1996 – 2006. Fishery Bulletin: 523-531.

Poncet, S., Wolfaardt, A.C., Black, A., Browning, S., Lawton, K., Lee, J., Passfield, K., Strange, G., Phillips, R.A. 2017. Recent trends in numbers of wandering (Diomedea exulans), black-browed (Thalassarche melanophris) and grey-headed (T. chrysostoma) albatrosses breeding at South Georgia. Polar Biology: 1-12. doi 10.1007/s00300-016-2057-0.

Poncet, S.; Robertson, G.; Phillips, R. A.; Lawton, K.; Phalan, B.; Trathan, P. N.; Croxall, J. P. 2006. Status and distribution of Wandering, Black-browed and Grey-headed Albatrosses breeding at South Georgia. Polar Biology 29: 772-781.

Raine, A.; Sultana, J.; Gillings, S. 2009. Malta breeding bird atlas 2008. BirdLife Malta, Ta'Xbiex, Malta.

Ramos, R.; Granadeiro, J. P.; Nevoux, M.; Mougin, J.-L.; Dias, M. P.; Catry, P. 2012. Combined Spatio-Temporal Impacts of Climate and Longline Fisheries on the Survival of a Trans-Equatorial Marine Migrant. PLoS ONE 7(7): e40822

Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Jabado, R.W., Liu, K.M., Marshall, A.,

Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Isurus oxyrinchus. The IUCN Red List of Threatened Species 2019: e.T39341A2903170. http://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39341A2903170.en. Downloaded on 19 September 2019.

Rigby, C.L., Sherman, C.S., Chin, A. & Simpfendorfer, C. 2017. Carcharhinus falciformis. The IUCN Red List of Threatened Species 2017: e.T39370A117721799. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T39370A117721799.en.

SAFMC. 2003. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic. Submitted to the Secretary of Commerce on January 14, 2003, 5pp.

SAFMC. 2003. Fishery Management Plan for the dolphin and wahoo fishery of the Atlantic. South Atlantic Fishery Management Council In Cooperation with the New England Fishery Management Council, Mid-Atlantic Fishery Management Council. Charleston, SC. 386 pp.

SAFMC. 2013. Amendment 5 to the Fishery Management Plan for the Dolphin and Wahoo Fishery for the Atlantic. North Charleston, SC. 202 pp.

SAFMC. 2016. Regulatory Amendment 1to the Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic: Modify commercial trip limits for dolphin. NOAA Fisheries Award No. FNA15NMF4410010. 114 pp.

Schindler, D.E., Essington, T.E., Kitchell, J.F., Boggs, C. and Hilborn, R. 2002. Sharks and tunas: fisheries impacts on predators with contrasting life histories. Ecological Applications 12:735-748.

Schwenke K.L. and J.A. Buckel. 2008. Age, growth and reproduction of dolphinfish (Coryphaena hippurus) caught off the coast of North Carolina. Fisheries Bulletin 106: 82-92

Seafood Watch. 2013. Seafood Watch. 2013. Seafood Watch criteria for fisheries. Monterey Bay Aquarium Seafood Watch Version January 18, 2013. 82 p.

Seafood Watch. 2017. Seafood Watch. 2017. Seafood Watch criteria for fisheries. Monterey Bay Aquarium Seafood Watch

SEDAR. 2006. Stock assessment report of SEDAR 9 Gulf of Mexico gray triggerfish. SEDAR 9 Assessment Report 1, Charleston, SC

SEFSC. 2013. Pelagic observer program catch and disposition data 2007-2009. Southeast Fisheries Science Center

SEFSC. 2019. Personnel communication, Pelagic Observer Program. February 2019.

Seminoff, J.A. (Southwest Fisheries Science Center, U.S.) 2004. Chelonia mydas. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2.

Seminoff, J.A., C.D. Allen, G.H. Balazs, P.H. Dutton, T. Eguchi, H.L. Haas, S.A. Hargrove, M.P. Jensen, D.L. Klemm, A.M. Lauritsen, S.L. MacPherson, P. Opay, E.E. Possardt, S.L. Pultz, E.E. Seney, K.S. Van Houtan, R.S. Waples. 2015. Status Review of the Green Turtle (Chelonia mydas) Under the U.S. Endangered Species Act. NOAA Technical Memorandum, NOAANMFS- SWFSC-539. 571pp.

Smith-Vaniz, W.F., Williams, J., Pina Amargos, F., Curtis, M. & Grijalba Bendeck, L. 2015. Lepidocybium flavobrunneum. The IUCN Red List of Threatened Species 2015: e.T190287A16510672. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T190287A16510672.en.

Smith-Vaniz, W.F., Williams, J.T., Pina Amargos, F., Curtis, M. & Brown, J. 2015. Elagatis bipinnulata. The IUCN Red List of Threatened Species 2015: e.T16440027A16510157. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T16440027A16510157.en.

species.

Stevens, J.D., Bonfil, R., Dulvy, N.K. and Walker, P.A. 2000. The effects of fishing on sharks, rays, and chimaeras (chondrichthuyans), and the implications for marine ecosystems. ICES Journal of Marine Science 57:476-494.

Stockesbury, M.J.W., Neilson, J.D., Susko, E. and Cooke, S.J. 2011. Estimating mortality of Atlantic bluefin tuna (Thunnus thynnus) in an experimental recreational catch-and-release fishery. Biological Conservation 144:2684-2691.

Sultana, J., Borg, J.J., Gauci, C. and Falzon, V. 2011. The Breeding Birds of Malta. BirdLife Malta, Malta.

Swimmer, Y., Gutierez, A., Bigelow, K., Barcelo, C., Schroeder, B., Keene, K., Shattenkirk, K. and Foster, D. 2017. Sea turtle bycatch mitigation in US longline fisheries. Frontiers in Marine Science 25: https://doi.org/10.3389/fmars.2017.00260

Taylor and Small. 2009. Spatial and temporal overlap between seabird distribution in the Atlantic Ocean and ICCAT longline fishing effort. Collect. Vol. Sci. Pap. ICCAT, 64(7), 2383–2397;

TEWG. 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical memorandum NMFS-SEFSC-555.

Tiwari, M., Wallace, B.P. & Girondot, M. 2013. Dermochelys coriacea (Northwest Atlantic Ocean subpopulation). The IUCN Red List of Threatened Species 2013: e.T46967827A46967830. Available at: http://www.iucnredlist.org/details/46967827/0

Tudela, S. 2000. Ecosystem effects of fishing in the Mediterranean: an analysis of the major threats of fishing gear and practices to biodiversity and marine habitats. Report for FAO Fisheries Department (EP/INT/759/GEF). Rome, Italy.

Wallace, B.P., DiMateo, A., Bolten, A., Chaloupka, M., Hutchinson, B., Abreu-Grobois, A. et al. 2011. Global conservation priorities for marine turtles. PLos One 6: https://doi.org/10.1371/journal.pone.0024510

Wallace, B.P., Kot, C.Y., DiMatteo, A.D., Lee, T., Crowder, L.B. and Lewison, R.L. 2013b. Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. Ecosphere 4:40.

Wallace, B.P., Tiwari, M. & Girondot, M. 2013. Dermochelys coriacea. The IUCN Red List of Threatened Species 2013: e.T6494A43526147. http://dx.doi.org/10.2305/IUCN.UK.2013-2.RLTS.T6494A43526147.en. Downloaded on 14 January 2019.

Waring, G.T., Josephson, e., Maze-Foley, K. and Rosel, P.E . 2013. US Atlantic and Gulf of Mexico marine mammal stock assessments - 2012. National Marine Fisheries Service.

Wells, R. S. and Scott, M. D. 1999. Bottlenose dolphin Tursiops truncatus (Montagu, 1821). In: S. H. Ridgway and R. Harrison (eds), Handbook of marine mammals, Vol. 6: The second book of dolphins and the porpoises, pp. 137-182. Academic Press, San Diego, CA, USA.

Wells, R.S., Natoli, A. & Braulik, G. 2019. Tursiops truncatus. The IUCN Red List of Threatened Species 2019: e.T22563A50377908. Downloaded on 21 March 2019.

Werner, T.B., Northridge, S., Press, K.M. and Young, N. 2015. Mitigating bycatch and depredation of marine mammals in longline fisheries. ICES Journal of Marine Science. 72:1576-1586.

Whoriskey S., R. Arauz, J.K. Baum. 2011. Potential impacts of emerging mahi-mahi fisheries on sea turtle and elasmobranch bycatch species. Biological Conservation 144 (6): 1841-1849.

Yeh, Y.M., Huan, H.W., Dietrich, K.S. and Melvin, E. 2012. Estimates of seabird incidental catch by pelagic longline fisheries in the south Atlantic Ocean. Animal Conservation 16:141-152.

Zischke, M.T., J.H. Farley, S.P. Griffiths, and I.R. Tibbetts.2013. Reproductive biology of wahoo, Acanthocybium solandri, off eastern Australia. Rev Fish Biol Fisheries 23, 491–506.

Zug, G.R. and Parham, J.F. 1996. Age and growth in leatherback turtles, Dermochelys coriacea (Testudines: Dermochelyidae): A skeletochronological analysis. Chelonian Conservation and Biology 2(2): 244-249.