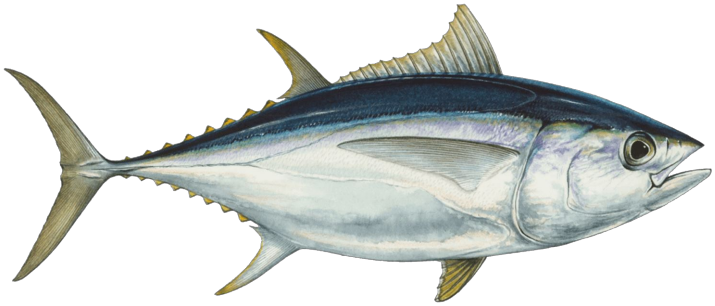
Tunas and Swordfish

Thunnus alalunga, Thunnus obesus, Thunnus atlanticus, Thunnus thynnus, Katsuwonus pelamis, Xiphias gladius, Thunnus albacares



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Atlantic Ocean

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

Seafood Watch Consulting Researcher

March 1, 2021

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: Buy first; they're well managed and caught or farmed responsibly.

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

Avoid/Red: Take a pass on these for now; they're overfished, lack strong management or are caught or farmed in ways that harm other marine life or the environment.

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

Summary

This report focuses on the following fisheries operating in the Atlantic Ocean: longline, purse seine, handline, harpoon, hand-operated pole and line, and trolling lines. These fisheries target the following species: albacore (*Thunnus alalunga*), Atlantic bluefin tuna (*Thunnus thynnus*), bigeye tuna (*Thunnus obesus),* blackfin tuna *(Thunnus atlanticus),* skipjack tuna *(Katsuwonus pelamis),* yellowfin tuna (*Thunnus albacares*), and swordfish (*Xiphias gladius*). This report does not include recommendations for handline caught bluefin tuna in the Mediterranean due to low catch volume nor purse seine caught bluefin in the Mediterranean because that fishery mostly supplies tuna farms.

Albacore tuna in the north and south Atlantic Ocean are considered healthy but their status in the Mediterranean is uncertain. Bigeye tuna are overfished and undergoing overfishing, while yellowfin and skipjack tuna populations are currently considered healthy. Swordfish in the north Atlantic are healthy but in the south Atlantic are overfished and undergoing overfishing. The status of blackfin tuna is unknown. Atlantic bluefin tuna populations have increased slightly in recent years but uncertainty remains concerning the status of their biomass. They were under a 20 year rebuilding plan since 1998 (which was replaced by an interim conservation and management plan in 2017 that changed to an $F_{0.1}$ approach) and fishing mortality rates for the eastern Atlantic/Mediterranean stock currently appear to be sustainable. However, a new stock assessment indicates declines in abundance of nearly 12% (4% greater than predicted by the 2017 assessment) for the western Atlantic bluefin tuna stock, and although the official status of the stock is viewed as 'not subject to overfishing' through the year 2017, model projections indicate that the current TAC likely led to overfishing relative to $F_{0.1}$ beginning in 2018, and the 2021 TAC of 2,350 mt was determined to have a 94% probability of causing overfishing.

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 criteria. Longline fisheries also capture a number of secondary target and bycatch species. Longline fisheries are known to capture ecologically important species such as tunas and sharks, which could have impacts to the overall ecosystem. Purse seine fisheries that operate around fish aggregating devices also result in bycatch of other finfish and shark species. Unassociated purse seine fisheries tend to have lower bycatch levels. Highly selective gears such as handline, harpoon, pole and line, and trolling lines 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.

These fishing gears 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
Albacore | Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	2.644	1.000	1.000	3.162	**Avoid (1.700)**
Albacore | North Atlantic Stock | Northeast Atlantic | Drifting longlines	5.000	1.000	1.000	3.162	**Avoid (1.994)**
Albacore | North Atlantic Stock | Northwest Atlantic | Drifting longlines	5.000	1.000	1.000	3.162	**Avoid (1.994)**
Albacore | South Atlantic Stock | Southeast Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Albacore | South Atlantic Stock | Southwest Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Albacore | North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	5.000	4.284	4.000	3.873	**Best Choice (4.268)**
Albacore | South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Albacore | North Atlantic Stock | North Atlantic | Trolling lines	5.000	5.000	4.000	3.873	**Best Choice (4.436)**
Albacore | South Atlantic Stock | South Atlantic | Trolling lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Albacore | North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	5.000	1.000	1.000	3.873	**Avoid (2.098)**
Albacore | North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	5.000	1.000	3.000	3.873	**Good Alternative (2.761)**
Atlantic bluefin tuna | Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	2.236	1.000	1.000	3.162	**Avoid (1.631)**
Atlantic bluefin tuna | Western Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Atlantic bluefin tuna | Western Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Atlantic bluefin tuna | Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000	1.000	3.873	**Avoid (1.403)**
Atlantic bluefin tuna | Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000	3.000	3.873	**Avoid (1.846)**

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Atlantic bluefin tuna | Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US	1.000	5.000	1.000	5.000	**Avoid (2.236)**
Bigeye tuna | Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Bigeye tuna | Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Bigeye tuna | Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Bigeye tuna | Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Bigeye tuna | Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	1.000	1.000	1.000	3.873	**Avoid (1.403)**
Bigeye tuna | Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	1.000	1.000	1.000	3.873	**Avoid (1.403)**
Bigeye tuna | Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	1.000	4.284	3.000	3.873	**Good Alternative (2.656)**
Bigeye tuna | Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	1.000	2.644	3.000	3.873	**Good Alternative (2.354)**
Bigeye tuna | Atlantic Stock | East Atlantic | Trolling lines	1.000	4.284	3.000	3.873	**Good Alternative (2.656)**
Bigeye tuna | Atlantic Stock | West Atlantic | Trolling lines	1.000	2.644	3.000	3.873	**Good Alternative (2.354)**
Bigeye tuna | Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000	1.000	3.873	**Avoid (1.403)**
Bigeye tuna | Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000	3.000	3.873	**Avoid (1.846)**
Blackfin tuna | West Atlantic | Floating object purse seine (FAD)	2.644	1.000	1.000	3.873	**Avoid (1.789)**
Blackfin tuna | West Atlantic | Handlines and hand-operated pole-and-lines	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Blackfin tuna | West Atlantic | Trolling lines	2.644	1.000	3.000	3.873	**Good Alternative (2.354)**
Skipjack tuna | Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Skipjack tuna | Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	3.318	1.000	1.000	3.873	**Avoid (1.893)**

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Skipjack tuna | Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Skipjack tuna | Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	3.318	1.000	3.000	3.873	**Good Alternative (2.492)**
Skipjack tuna | Eastern Atlantic Stock | East Atlantic | Trolling lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Skipjack tuna | Western Atlantic Stock | West Atlantic | Trolling lines	3.318	1.000	3.000	3.873	**Good Alternative (2.492)**
Skipjack tuna | Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Skipjack tuna | Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	3.318	1.526	3.000	3.873	**Good Alternative (2.769)**
Swordfish | Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Swordfish | North Atlantic Stock | Northeast Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Swordfish | North Atlantic Stock | Northwest Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Swordfish | South Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Swordfish | South Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000	1.000	3.162	**Avoid (1.333)**
Swordfish | North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	4.284	5.000	4.000	3.873	**Best Choice (4.268)**
Swordfish | South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	1.000	4.284	3.000	3.873	**Good Alternative (2.656)**
Swordfish | South Atlantic Stock | South Atlantic | Trolling lines	1.000	4.284	3.000	3.873	**Good Alternative (2.656)**
Swordfish | North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Swordfish | North Atlantic Stock | Northwest Atlantic | Harpoons | Canada	4.284	5.000	5.000	5.000	**Best Choice (4.810)**
Swordfish | North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Swordfish | North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Swordfish | North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	4.284	5.000	5.000	3.873	**Best Choice (4.513)**
Swordfish | North Atlantic Stock | Northwest Atlantic | Harpoons | United States	4.284	5.000	5.000	5.000	**Best Choice (4.810)**
Yellowfin tuna | Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Yellowfin tuna | Western Atlantic Stock | Northwest Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Yellowfin tuna | Eastern Atlantic Stock | Southeast Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Yellowfin tuna | Western Atlantic Stock | Southwest Atlantic | Drifting longlines	4.284	1.000	1.000	3.162	**Avoid (1.918)**
Yellowfin tuna | Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Yellowfin tuna | Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Yellowfin tuna | Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Yellowfin tuna | Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Yellowfin tuna | Eastern Atlantic Stock | East Atlantic | Trolling lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Yellowfin tuna | Western Atlantic Stock | West Atlantic | Trolling lines	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Yellowfin tuna | Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**
Yellowfin tuna | Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	4.284	1.526	3.000	3.873	**Good Alternative (2.952)**
Yellowfin tuna | Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	4.284	1.000	1.000	3.873	**Avoid (2.018)**
Yellowfin tuna | Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Yellowfin tuna | Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	4.284	1.000	3.000	3.873	**Good Alternative (2.656)**

Summary

North Atlantic albacore tuna and swordfish caught with harpoons, handlines, hand-operated pole and lines, and trolling lines are considered a Best Choice, while albacore tuna and swordfish from the South Atlantic caught in these same gears are a Good Alternative. With the exception of US fisheries, albacore tuna and swordfish caught with longlines have an Avoid recommendation. When caught by the US longline fleet, they are rated as a Good Alternative. Blackfin tuna caught by handlines and trolling gears are considered a Good Alternative but blackfin tuna caught by object-associated purse seine has an Avoid recommendation. Bluefin tuna caught in all gears in the Atlantic Ocean and Mediterranean Sea are rated as Avoid. Bigeye tuna caught in longlines and object-associated purse seines are an Avoid, while bigeye tuna caught with trolling lines, handlines, and hand-operated pole and line gears are a Good Alternative. Skipjack tuna are considered a Good Alternative when caught by gears other than FAD-purse seines and unassociated purse seines in the western Atlantic that also catch the western Atlantic bluefin tuna. Yellowfin tuna caught by the US longline fishery, unassociated purse seine fisheries (in the eastern Atlantic), handline, pole and line, and trolling fisheries have a Good Alternative recommendation. Yellowfin tuna caught by other longline fisheries, object-associated purse seine fisheries, and unassociated purse seines in the western Atlantic have an Avoid recommendation.

Scoring Guide

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

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

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

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

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

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

Introduction

Scope of the analysis and ensuing recommendation

This report focuses on the following fisheries operating in the Atlantic Ocean: longline, purse seine, handline, harpoon, and trolling lines. These fisheries target the following species: albacore (*Thunnus alalunga*), Atlantic bluefin tuna (*Thunnus thynnus*), bigeye tuna (*Thunnus obesus),* blackfin tuna *(Thunnus atlanticus),* skipjack tuna *(Katsuwonus pelamis),* yellowfin tuna (*Thunnus albacares*) along with swordfish (*Xiphias gladius*). This report does not include recommendations for handline caught bluefin tuna in the Mediterranean due to low catch volume nor purse seine caught bluefin tuna in the Mediterranean because that fishery mostly supplies tuna farms.

Species Overview

Albacore tuna are widely distributed in temperate and tropical waters in all oceans including the Atlantic and the Mediterranean Sea. There are two populations in the Atlantic, North and South, and a third in the Mediterranean. These populations have been identified for management purposes. Biological information supports these populations as well, but also suggests sub-populations within the North Atlantic and Mediterranean, and intermingling between populations of albacore in the Indian Ocean and South Atlantic may also occur. Longlines have historically captured the majority of albacore tuna worldwide (ICCAT 2018b).

Atlantic bluefin tuna are found in the waters of the Atlantic and adjacent to the Mediterranean. Although bluefin tuna make frequent dives to depths of 500 to 1,000 m they are primarily found in surface and sub-surface coastal and pelagic waters. Atlantic bluefin tuna are known to be in the Gulf of Mexico and the Mediterranean Sea. Recently, spawning has been identified in the Slope Sea region, but the relative contribution of this spawning region remains unresolved (ICCAT 2017d). Bluefin tuna return to these areas to spawn. Atlantic bluefin tuna are managed as two populations, western Atlantic and eastern Atlantic/Mediterranean Sea. Although the population structure (natal population and amount of overlap) is fairly well known, this is not currently taken into account in the management of the species mainly due to technical difficulties in creating assessment models that can account for the complexity (ICCAT 2017d).

Bigeye, skipjack, and yellowfin tuna are found in tropical and subtropical waters of the Atlantic and yellowfin also occurs in the Mediterranean (ICCAT 2018b). There are four populations of bigeye and yellowfin: western and central Pacific Ocean, eastern Pacific Ocean, Atlantic, and the Indian Ocean. There are five populations of skipjack: western and central Pacific Ocean, eastern Pacific Ocean, Atlantic (eastern and western) and the Indian Ocean. Juvenile yellowfin tuna and juvenile bigeye tuna tend to form schools with skipjack tuna that are mostly found in surface waters. Larger tunas are found in subsurface waters where they also form schools (ICCAT 2018b). Globally, longlines and purse seines capture the majority of bigeye, yellowfin, and skipjack tuna respectively (ICCAT 2018b).

Blackfin tuna are only found in the western Atlantic in pelagic waters from Massachusetts south to Trinidad and Brazil. Blackfin tuna are known to form mixed schools with skipjack tuna. Spawning appears to occur in offshore waters {Froesey and Pauly 2013}.

Swordfish are a widely distributed billfish species, found globally from 50°N to 50°S latitudes and throughout the Atlantic Ocean as well as the Mediterranean Sea. Spawning occurs in tropical and subtropical waters of the western Atlantic. There are three management units for swordfish: North and South Atlantic and Mediterranean. There is some genetic evidence to support these units as distinct populations, although mixing between the populations likely occurs. Longlines capture the majority of swordfish worldwide (ICCAT 2018b).

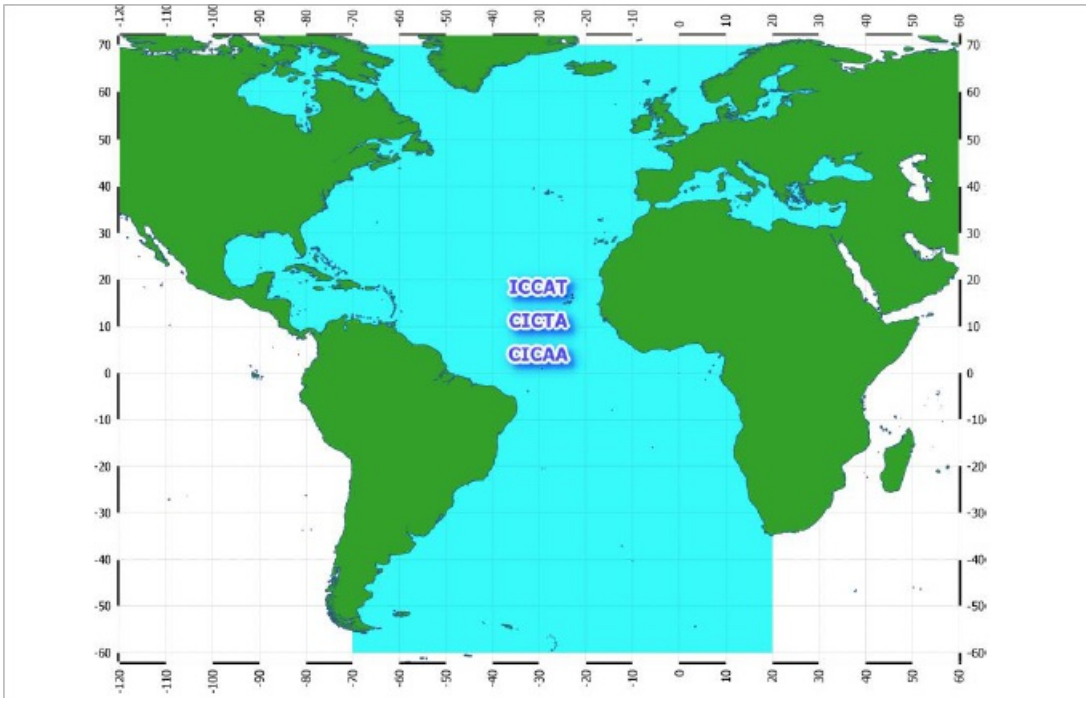

Figure 1: ICCAT Convention Area

Production Statistics

Albacore are caught by a number of fisheries, including (in descending order) bait boats, trawl, longline, troll and other surface gears (ICCAT 2018b). Albacore catches peaked in the 1960s at over 60,000 t and has declined since. In 2017 total catches in the North Atlantic were 23,310 t and 44,896 t throughout the Atlantic (ICCAT 2018b). Spain has historically reported the greatest catches of albacore tuna (ICCAT 2018b). Canada and the United States catch only a small amount of albacore tuna in the North Atlantic (ICCAT 2018b). In the Mediterranean, the majority of albacore tuna catches are made using longline and other surface gears. Total albacore catches in the region were 3,519 t in 2016, with 3,458 t coming from longlines (ICCAT 2017).

Commercial gears used to capture western Atlantic bluefin tuna include longlines, rod and reel (labeled in this report as hand-operated pole and line), purse seines, harpoons, and handlines. Catches of bluefin tuna peaked in the Atlantic in 1964 at 18,671 t, but declined shortly after, due mostly to the collapse of some longline fisheries. As the longline fishery moved into the northwest Atlantic and the Gulf of Mexico, catches began to increase again. Since 1982, when quotas were established, catches have been stable and generally below 2,000 t since 2007 (ICCAT 2018b). Catches in 2017, were 1,851 t (ICCAT 2018b). The United States (986 t, 2017) is the top fishery for Atlantic bluefin tuna in the northwest Atlantic Ocean, followed by Canada (472 t, 2017) (ICCAT 2018b).

In the eastern Atlantic/Mediterranean Sea, purse seines are the primary gear type used to capture (mostly juvenile) Atlantic bluefin tuna (approximately 60% of total catch). This catch supplies bluefin tuna aquaculture operations and are not rated in this report. Production from tuna ranching systems is, however, assessed in Seafood Watch farmed tuna reports. Longlines catch the largest volume sold for direct consumption (approximately 17% of total catch). Traps account for approximately 14% of total catch, but like purse seines, they increasingly are supplying tuna ranching operations (Minder 2015). Catches by the bait boat fishery have declined to the point where it is unlikely any are exported to the US market. Therefore, this report only assesses the eastern Atlantic/Mediterranean bluefin tuna longline fishery. Reported catches of bluefin tuna in the Mediterranean peaked in 1996 (50,000 t) and have since decreased, remaining around set total allowable catch (TAC) levels. However, major under-reporting of catches, due to implementation of TACs, occurred from the late 1990s through 2011, and actual catches were likely two to three times as high as reported catches during that time period (Gagern et al. 2013) (ICCAT 2014). In 2016, 13,162 t of bluefin tuna were caught in the Mediterranean, with longlines catching 1,523 t of this (ICCAT 2017).

In the eastern Atlantic, purse seines catch the vast majority of all skipjack tuna, while in the western Atlantic, bait boats catch the majority. Total catches of skipjack tuna in the Atlantic during 2017 were 265,565 t, which mostly occurred in

the eastern Atlantic. Catches were much larger than those seen in the past five years, but this may reflect the addition of Ghanaian catches not previously reported.

Bigeye tuna are principally caught by longlines but also purse seines and bait boat fisheries in the Atlantic Ocean. Peak catches of bigeye tuna occurred during the 1990s and catches have been declining since, to 78,482 t in 2017 (ICCAT 2018b). Canada and the United States are not major contributors to overall catches of bigeye tuna in the Atlantic. In 2017, the US landed 788 t of bigeye (ICCAT 2018b).

In the eastern Atlantic, purse seines catch the vast majority of all skipjack tuna, while in the western Atlantic, bait boats catch the majority. Total catches of skipjack tuna in the Atlantic during 2017 were 265,565 t, which mostly occurred in the eastern Atlantic. Catches were much larger than those seen in the past five years, but this may reflect the addition of Ghanian catches not previously reported.

The primary gear used to capture yellowfin tuna in the Atlantic are purse seines in the eastern Atlantic and longlines in the western Atlantic. Bait boat fisheries are also significant in the eastern Atlantic. By 2007, catches of yellowfin tuna throughout the Atlantic had declined by close to 50%, from 194,000 t in 1990 to 100,000 t. In recent years, catches have begun to increase again and were 139,316 t in 2017. In the eastern Atlantic, total catches are higher than in the western Atlantic, 106,228 t compared to 33,088 t in 2017 (ICCAT 2018b).

Longlines are the primary gear used to catch swordfish in the North Atlantic and worldwide but other surface gears, such as handlines and harpoon are also used. Peak catches of Swordfish in the Atlantic (20,236 t) occurred in 1987. The introduction of quotas, movement of some fleets into the South Atlantic and changes to the target species account for most of the decreases in catch (ICCAT 2018b). Total catches in the North Atlantic in 2017 were 1,046 t (ICCAT 2018b). The US catches the second-most swordfish in the western North Atlantic Ocean behind Spain (ICCAT 2018b). Canada catches the third most swordfish in the North Atlantic Ocean behind Spain and the US (ICCAT 2018b). Longlines are the primary gear used to catch swordfish in the Mediterranean Sea and worldwide. Peak catches (20,365 t) occurred in 1988 and since then have varied between 12,000 to 16,000 t. Catches declined to 8,954 t during 2016 (ICCAT 2017). In recent years some of the Italian and Spanish swordfish fleets have been transitioning to mesopelagic (mid-water) longline gear.

Blackfin tuna catches peaked during the mid-1990s at 4,488 t and since 2003, catches have been below 2,000 t. The US has reported between 200 to 600 t since 1993 (ICCAT 2018b).

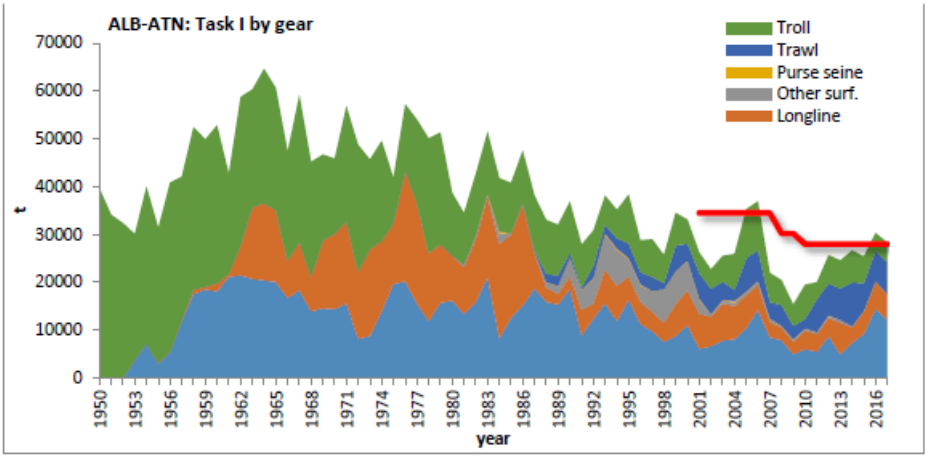

Figure 2: Albacore tuna (North Atlantic) catches by gear type between 1950 and 2017 (ICCAT 2018b).

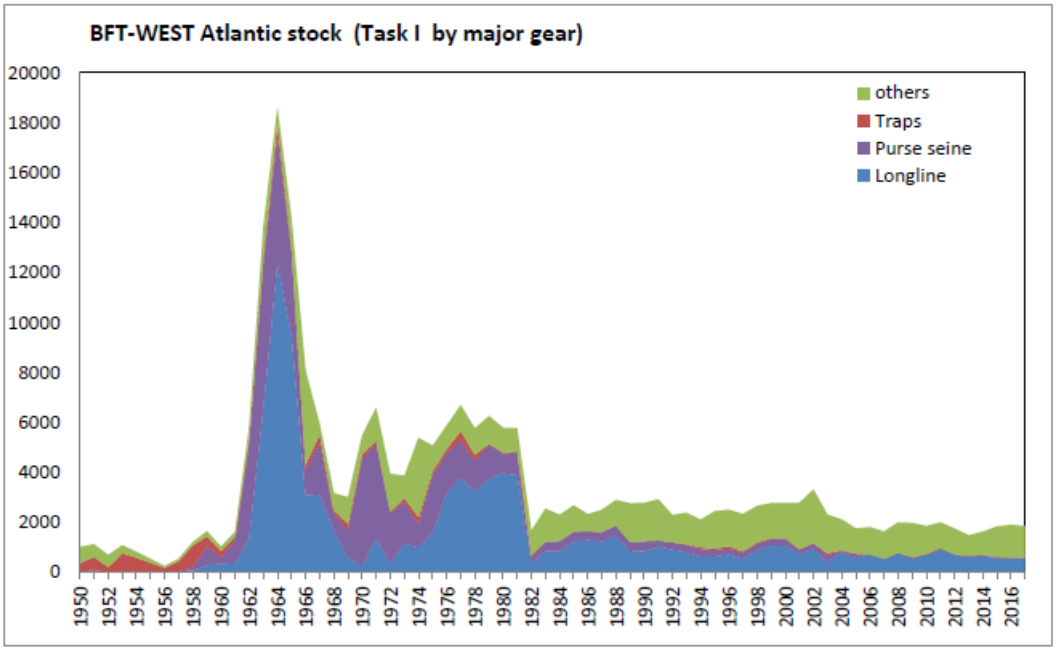

Figure 3: Bluefin tuna (northwest) catches by gear types between 1950 and 2017 (ICCAT 2018b).

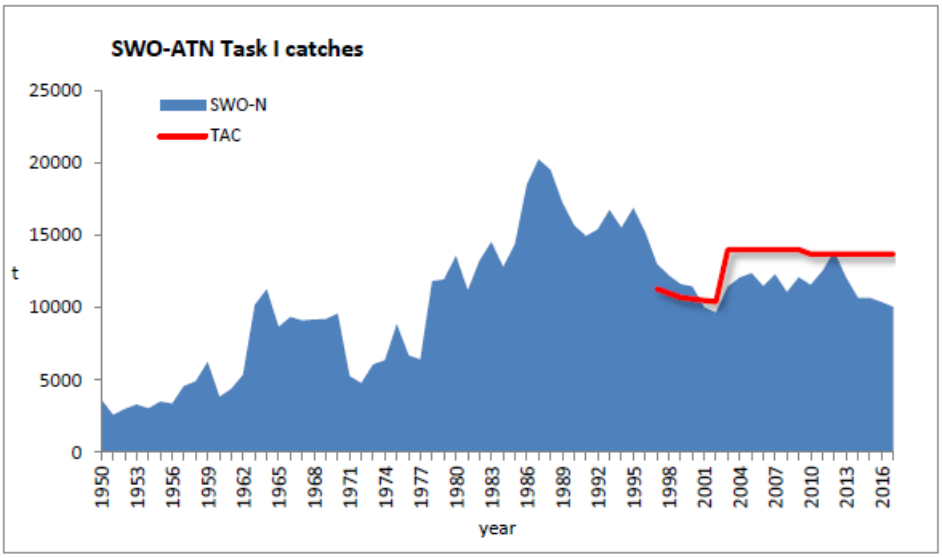

Figure 4: Swordfish (North Atlantic) catches and associated total allowable catch between 1950 and 2017 (ICCAT 2018b).

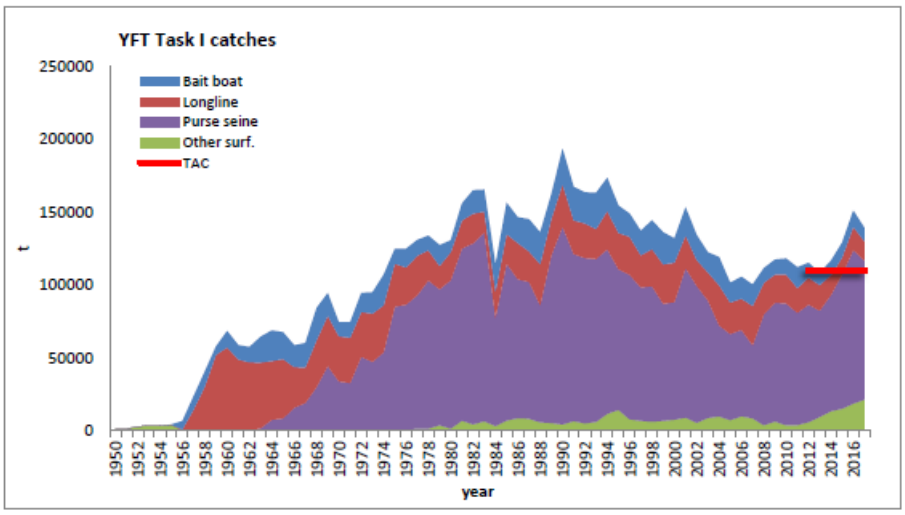

Figure 5: Yellowfin tuna catches by gear type between 1950 and 2017 (ICCAT 2018b).

Importance to the US/North American market.

The majority of bigeye tuna from the ICCAT region is imported from Brazil (53%). Yellowfin tuna is imported most frequently from Panama (22%), the Philippines (22%), Venezuela (20%) and Trinidad and Tobago (15%). The majority of skipjack tuna is imported from Mexico (NMFS 2019). The US imports the majority of Atlantic bluefin tuna from the ICCAT Convention area, from Spain (24%) (NMFS 2019). Information on blackfin tuna is not available.

Fifty percent of swordfish in the ICCAT Convention Area are imported from Brazil (NMFS 2019). The US imports the majority of albacore tuna caught in the North Atlantic from China (34%), and Mexico (34%) (NMFS 2019). Information on blackfin tuna is not available. The majority of US albacore, swordfish and bigeye exports go to Canada (52%, 74%, 77% respectively), while 85% of all (Pacific and Atlantic) bluefin tuna exports go to Japan and most of the exported yellowfin tuna goes to Spain (41%) (NMFS 2019).

Common and market names.

Atlantic bluefin tuna is also known as albacore, giant bluefin, northern bluefin tuna, tunny, and oriental tuna. Albacore tuna is also known as germon, longfinned tuna, albecore and T. germo. In Hawaii, bigeye and yellwofin tuna are known as Ahi, and skipjack as Aku. Swordfish is also known as broadbilled swordfish, broadbill, espada and emperado. Blackfin tuna does not have any other accepted names. Skipjack tuna is also known as ocean bonito and lesser tuna. In Hawaii, bigeye and yellowfin tuna are known as Ahi, and skipjack as Aku.

Primary product forms

Longline caught tuna and swordfish are sold in fresh and frozen form and for the sushi and sashimi markets.

Albacore tuna is commonly sold fresh, frozen and canned.

Purse seine and handline caught tuna is sold primarily in canned format.

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

ALBACORE			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
North Atlantic Stock | Northeast Atlantic | Drifting longlines	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
North Atlantic Stock | Northwest Atlantic | Drifting longlines	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
South Atlantic Stock | Southeast Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
South Atlantic Stock | Southwest Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | North Atlantic | Trolling lines	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
South Atlantic Stock | South Atlantic | Trolling lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

ALBACORE

ATLANTIC BLUEFIN TUNA

REGION / METHOD	ABUNDANCE	FISHING MORTALITY	SCORE
Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US	1.000: High Concern	1.000: High Concern	Red (1.000)

BIGEYE TUNA

REGION / METHOD	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | East Atlantic | Trolling lines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | West Atlantic | Trolling lines	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)

BLACKFIN TUNA			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
West Atlantic | Floating object purse seine (FAD)	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
West Atlantic | Handlines and hand-operated pole-and-lines	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
West Atlantic | Trolling lines	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

SKIPJACK TUNA			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Eastern Atlantic Stock | East Atlantic | Trolling lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Trolling lines	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

SWORDFISH			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic Stock | Northeast Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
South Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)
South Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000: High Concern	1.000: High Concern	Red (1.000)

SWORDFISH			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	1.000: High Concern	1.000: High Concern	Red (1.000)
South Atlantic Stock | South Atlantic | Trolling lines	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Harpoons | Canada	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Harpoons | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)

YELLOWFIN TUNA			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Eastern Atlantic Stock | Southeast Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | Southwest Atlantic | Drifting longlines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Eastern Atlantic Stock | East Atlantic | Trolling lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Trolling lines	3.670: Low Concern	5.000: Low Concern	Green (4.284)

YELLOWFIN TUNA			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	3.670: Low Concern	5.000: Low Concern	Green (4.284)

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.*

Albacore

Factor 1.1 - Abundance

Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

Albacore tuna in the Mediterranean was assessed in 2017 (ICCAT 2017j). The results indicate the status of albacore in the region is highly uncertain. There is however, some indication that the biomass is currently right around levels needed to produce the maximum sustainable yield (B_{2015}/B_{MSY}=1.002 (0.456–1.760) (ICCAT 2017j). We have awarded a score of "moderate" concern because the status is highly uncertain and appears to be fluctuating around maximum sustainable yield values.

Justification:

Figure 6: The stock status a) trajectories of B/BMSY and F/FMSY and the uncertainty of the estimates for the base case JABBA model and b) probability of being overfished and overfishing occurring (red, 36%), neither overfished or undergoing overfishing (green, 48%) and overfished or undergoing overfishing (orange, 16%) (ICCAT

2017).

North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic Stock | North Atlantic | Trolling lines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic Stock | South Atlantic | Trolling lines

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 1.2 - Fishing Mortality

Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern
Based on the 2017 stock assessment, it is unlikely albacore tuna in the Mediterranean are undergoing overfishing (ICCAT 2017j). The current fishing mortality rate (F_{2015}) ratio to that needed to produce the maximum sustainable yield (F_{MSY}) is 0.832 (0.223–2.194), indicating overfishing is not occurring (ICCAT 2017j). There was a great degree of uncertainty around these results. We have therefore awarded a score of "moderate" concern.
Justification:

Figure 7: The stock status a) trajectories of B/BMSY and F/FMSY and the uncertainty of the estimates for the base case JABBA model and b) probability of being overfished and overfishing occurring (red, 36%), neither overfished or undergoing overfishing (green, 48%) and overfished or undergoing overfishing (orange, 16%) (ICCAT 2017).

North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic Stock | North Atlantic | Trolling lines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic Stock | South Atlantic | Trolling lines

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 1.1 - Abundance

Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Northeast Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Southeast Atlantic | Drifting longlines

High Concern
The most recent stock assessment of bluefin tuna in the eastern Atlantic and Mediterranean was conducted in 2020 (ICCAT 2020a). 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)(ICCAT 2020a) (ICCAT 2019b). The Virtual Population Analysis (VPA) model was selected to determine the stock status. Based on this model, the biomass has increased steadily since the late 2000s (ICCAT 2020a). This assessment 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 and are even more uncertain than in the 2017 assessment (ICCAT 2020a). Recruitment is a key factor driving assumptions about the abundance of bluefin tuna in the future and it appears that model results are very sensitive to adding one additional year of data (ICCAT 2020a). 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:

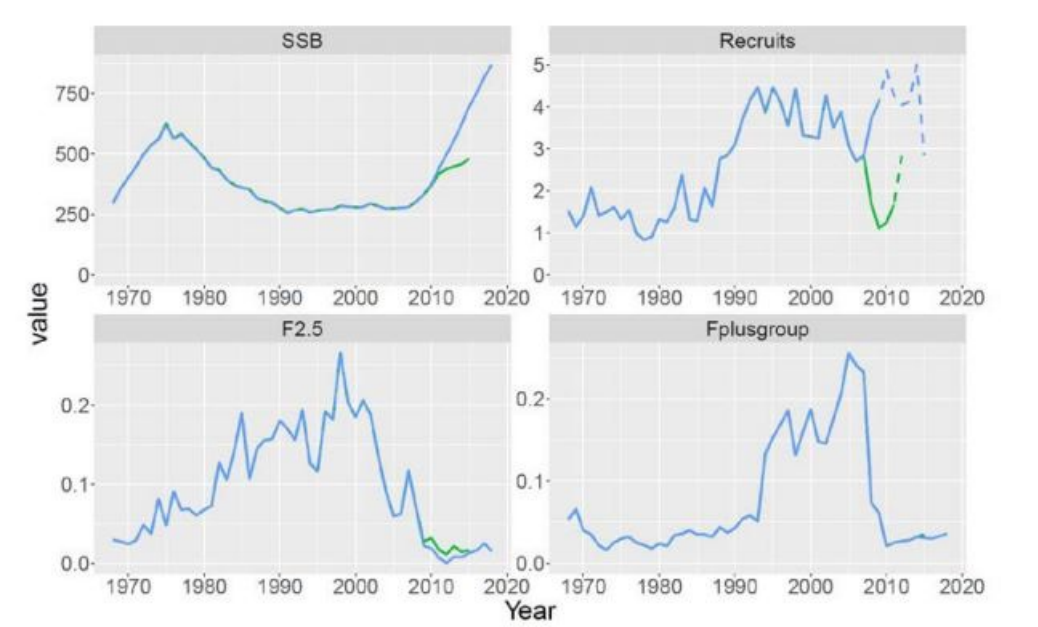

Figure 8: The spawning stock biomass (metric tons), recruitment (in thousand metric ton), recruitment (in million), and fishing mortality (average over ages 2 to 5 and 10+) estimates from VPA base run in the 2020 stock assessment (blue) compared to the 2017 stock assessment (green) from 1968-2015. The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

Western Atlantic Stock | Northwest Atlantic | Drifting longlines

Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

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). The most recent recruitment years are some of the lowest on record (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 2020 assessment estimates the stock was at14% of virgin biomass (B_0) in 2015 and has decreased in subsequent years (ICCAT 2020a).

Factor 1.2 - Fishing Mortality

Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Northeast Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Southeast 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. 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 be equal to the 2016 and 2017 TAC in all scenarios (ICCAT 2019b)

Western Atlantic Stock | Northwest Atlantic | Drifting longlines
Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

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}). Although the official status of the stock is viewed as 'not subject to overfishing,' model projections indicate that the current TAC likely has led to overfishing relative to F0.1 beginning in 2018, and the 2021 TAC of 2,350 mt was determined to have a 94% probability of causing overfishing (ICCAT 2020a)(ICCAT

2020)(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). Instead, there was an 11.7% decrease in biomass between 2017-2020 (ICCAT 2020). Because it is likely that the recent TACs have caused overfishing of the stock, we have rated this factor as high concern.

Bigeye tuna

Factor 1.1 - Abundance

Atlantic Stock | Northeast Atlantic | Drifting longlines
Atlantic Stock | Northwest Atlantic | Drifting longlines
Atlantic Stock | Southeast Atlantic | Drifting longlines
Atlantic Stock | Southwest Atlantic | Drifting longlines
Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | East Atlantic | Trolling lines
Atlantic Stock | West Atlantic | Trolling lines
Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 1.2 - Fishing Mortality

Atlantic Stock | Northeast Atlantic | Drifting longlines
Atlantic Stock | Northwest Atlantic | Drifting longlines
Atlantic Stock | Southeast Atlantic | Drifting longlines
Atlantic Stock | Southwest Atlantic | Drifting longlines
Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | East Atlantic | Trolling lines
Atlantic Stock | West Atlantic | Trolling lines
Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

Blackfin tuna

Factor 1.1 - Abundance

West Atlantic | Floating object purse seine (FAD)
West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

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 1.2 - Fishing Mortality

West Atlantic | Floating object purse seine (FAD)
West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

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.

Skipjack tuna

Factor 1.1 - Abundance

Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Eastern Atlantic Stock | East Atlantic | Trolling lines
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-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.

Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Western Atlantic Stock | West Atlantic | Trolling lines
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-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 1.2 - Fishing Mortality

Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Eastern Atlantic Stock | East Atlantic | Trolling lines
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-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.

Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Western Atlantic Stock | West Atlantic | Trolling lines
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-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.

Swordfish

Factor 1.1 - Abundance

Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
The most recent assessment for swordfish in the Mediterranean Sea was conducted in 2016 (ICCAT 2018b). The current biomass is much lower than levels from the 1980s (ICCAT 2018b). One model indicated the population is overfished, with the current biomass (B_{2015}) as less than 15% of the level needed for the maximum sustainable yield (B_{MSY}) (ICCAT 2018b). Recruitment has been declining for the past 10 years but there is a lot of uncertainty regarding stock productivity. We have awarded a score of "high" concern based on the decrease in biomass over time and potential that the population is overfished.

North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic | Harpoons | Canada
North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
North Atlantic Stock | Northwest Atlantic | Harpoons | United States

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 2013). 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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic Stock | South Atlantic | Trolling lines

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 1.2 - Fishing Mortality

Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines

High Concern

During the last assessment (2017) conducted for the Mediterranean population (ICCAT 2018b), several models were used to assess fishing mortality. The base case model indicated that fishing mortality rates are too high and overfishing is occurring (ICCAT 2018b). The estimated ratio of current fishing mortality rates to those needed to produce the maximum sustainable yield is 1.85 and the ratio to the F_{MSY} proxy of $F_{0.1}$ is 2.64 (ICCAT 2018b).

There are large catches of small fish, less than 3 years old, representing 50 to 70% of the catch. We have awarded a score of "high" concern because it appears overfishing is occurring.

North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic | Harpoons | Canada
North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
North Atlantic Stock | Northwest Atlantic | Harpoons | United States

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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic Stock | South Atlantic | Trolling lines

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.

Yellowfin tuna

Factor 1.1 - Abundance

Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines
Eastern Atlantic Stock | Southeast Atlantic | Drifting longlines
Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Eastern Atlantic Stock | East Atlantic | Trolling lines
Western Atlantic Stock | West Atlantic | Trolling lines
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 1.2 - Fishing Mortality

Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines
Eastern Atlantic Stock | Southeast Atlantic | Drifting longlines
Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Eastern Atlantic Stock | East Atlantic | Trolling lines
Western Atlantic Stock | West Atlantic | Trolling lines
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

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.

ALBACORE			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
South Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
South Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000: < 100%	Green (4.284)
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | North Atlantic | Trolling lines	5.000	1.000: < 100%	Green (5.000)
South Atlantic Stock | South Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)

ALBACORE			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)

ATLANTIC BLUEFIN TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US	5.000	1.000: < 100%	Green (5.000)

BIGEYE TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000: < 100%	Green (4.284)
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	2.644	1.000: < 100%	Yellow (2.644)
Atlantic Stock | East Atlantic | Trolling lines	4.284	1.000: < 100%	Green (4.284)

BIGEYE TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Atlantic Stock | West Atlantic | Trolling lines	2.644	1.000: < 100%	Yellow (2.644)
Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000: < 100%	Red (1.000)
Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)

BLACKFIN TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
West Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
West Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)

SKIPJACK TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	1.526	1.000: < 100%	Red (1.526)

SWORDFISH			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)

SWORDFISH			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
South Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
South Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	5.000	1.000: < 100%	Green (5.000)
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	4.284	1.000: < 100%	Green (4.284)
South Atlantic Stock | South Atlantic | Trolling lines	4.284	1.000: < 100%	Green (4.284)
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic | Harpoons | Canada	5.000	1.000: < 100%	Green (5.000)
North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	5.000	1.000: < 100%	Green (5.000)
North Atlantic Stock | Northwest Atlantic | Harpoons | United States	5.000	1.000: < 100%	Green (5.000)

YELLOWFIN TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | Southeast Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Southwest Atlantic | Drifting longlines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	1.000	1.000: < 100%	Red (1.000)
Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | West Atlantic | Trolling lines	1.000	1.000: < 100%	Red (1.000)
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	1.000	1.000: < 100%	Red (1.000)

YELLOWFIN TUNA			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-FAD)	1.526	1.000: < 100%	Red (1.526)
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	1.000	1.000: < 100%	Red (1.000)
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	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.

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)

EAST ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES			
SUB SCORE: 4.284	DISCARD RATE: 1.000	**SCORE: 4.284**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
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)

EAST ATLANTIC | TROLLING LINES

SUB SCORE: 4.284 | DISCARD RATE: 1.000 | **SCORE: 4.284**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
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)

EAST ATLANTIC | UNASSOCIATED PURSE SEINE (NON-FAD)

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic sailfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
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, WESTERN CENTRAL | DRIFTING LONGLINES | UNITED STATES

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	3.000: Moderate Concern	Red (1.732)
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)
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)

MEDITERRANEAN SEA, EAST ATLANTIC | DRIFTING LONGLINES

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Balearic shearwater	1.000: High Concern	1.000: High Concern	Red (1.000)
Green sea turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Levantine shearwater	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)

MEDITERRANEAN SEA, EAST ATLANTIC | DRIFTING LONGLINES

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Cory's shearwater	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Mammals	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)
Leatherback turtle	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Albacore	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Atlantic bonito	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Bullet tuna	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Blue shark	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTH ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES

SUB SCORE: 4.284 | DISCARD RATE: 1.000 | **SCORE: 4.284**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

NORTH ATLANTIC | TROLLING LINES

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Albacore	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

NORTHEAST ATLANTIC | DRIFTING LONGLINES

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)
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip 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)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hawksbill turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

NORTHEAST ATLANTIC | DRIFTING LONGLINES

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
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)
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)
Frigate tuna	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)
Short-finned pilot whale	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
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)
Leatherback turtle	1.000: High Concern	1.000: High Concern	Red (1.000)
Whitetip 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)
Silky shark	1.000: High Concern	1.000: High Concern	Red (1.000)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hawksbill 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)
Bottlenose dolphin	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Frigate tuna	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)
Short-finned pilot whale	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
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 | CANADA

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)

NORTHWEST ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | HARPOONS | CANADA

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | HARPOONS | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES | GENERAL QUOTA, ATLANTIC BLUEFIN TUNA, US

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic bluefin tuna	1.000: High Concern	1.000: High Concern	Red (1.000)

NORTHWEST ATLANTIC | HARPOONS | UNITED STATES

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC, WESTERN CENTRAL ATLANTIC | DRIFTING LONGLINES | UNITED STATES

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)
Loggerhead turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
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)
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)

SOUTH ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Albacore	3.670: Low Concern	5.000: Low Concern	Green (4.284)

SOUTH ATLANTIC | TROLLING LINES

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

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Swordfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Albacore	3.670: Low Concern	5.000: Low Concern	Green (4.284)

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)
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)

SOUTHWEST ATLANTIC | DRIFTING LONGLINES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
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)
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)

WEST ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES			
SUB SCORE: 2.644	DISCARD RATE: 1.000		**SCORE: 2.644**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Blackfin tuna	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)

WEST ATLANTIC | TROLLING LINES			
SUB SCORE: 2.644	DISCARD RATE: 1.000		**SCORE: 2.644**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bigeye tuna	1.000: High Concern	1.000: High Concern	Red (1.000)
Blackfin tuna	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)

WEST ATLANTIC | UNASSOCIATED PURSE SEINE (NON-FAD)			
SUB SCORE: 1.526	DISCARD RATE: 1.000		**SCORE: 1.526**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic sailfish	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Sea turtles	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
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). Sharks and rays made up 25% of the observed take, finfish 23% of the observed take, and other tuna 6% during the same time period {Keene 2106}. A number of other species of fish are also captured, but only around eight of these — making up about 50% of the observed catch by number — are considered marketable (swordfish, yellowfin tuna, bigeye tuna, dolphinfish (mahi-mahi), wahoo, escolar, albacore, and shortfin mako shark) (Keene 2016). Other bycatch species include the following: blue shark, lancetfish, pelagic stingray, silky shark, blackfin tuna, and skipjack tuna (Keene 2016) (SEFSC 2019). All of these species combined (common and incidental) accounted for 91% of observed gear interactions between 2007 and 2011 (Keene 2016). Between 2012 and 2017, 17,317 blue sharks, 2,019 silky sharks and 3,234 shortfin mako sharks were observed caught in this fishery (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 during the same time period (SEFSC 2019).

Marine mammals and seabirds are typically caught in very low numbers in the US Atlantic swordfish and tuna longline fisheries. Interactions have been reported (<0.01% of observed catch) with dolphins, pilot whales, minke, sperm, and

false killer whales (NOAA 2012) (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 2012). For example, seabird interactions range from 27 to 284 per year, or an average of 62 per year, with a catch rate of 0.005 to 0.036 birds/1,000 hooks (NOAA 2012). Sea turtle interactions have decreased over the past 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 2012). 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 GoMX. In addition to these species, sharks, 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 swordfish 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 (Knapman et al. 2020). A variety of sharks have been observed caught in this fishery including endangered porbeagle and shortfin mako sharks, but the primary shark bycatch species has been blue sharks. 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 sharks, sea turtles, and sea birds are also incidentally captured in tuna and swordfish 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 sea birds (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 as bycatch 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. Although some species such as other tunas, sharks and other fish may be incidentally captured, 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 target species (blackfin, skipjack, bigeye, and yellowfin tuna) can be caught together and they are considered secondary species of each other 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

Atlantic bluefin tuna

Factor 2.1 - Abundance

Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Northeast Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Southeast Atlantic | Drifting longlines

High Concern
The most recent stock assessment of bluefin tuna in the eastern Atlantic and Mediterranean was conducted in 2020 (ICCAT 2020a). 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)(ICCAT 2020a) (ICCAT 2019b). The Virtual Population Analysis (VPA) model was selected to determine the stock status. Based on this model, the biomass has increased steadily since the late 2000s (ICCAT 2020a). This assessment 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 and are even more uncertain than in the 2017 assessment (ICCAT 2020a). Recruitment is a key factor driving assumptions about the abundance of bluefin tuna in the future and it appears that model results are very sensitive to adding one additional year of data (ICCAT 2020a). 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:

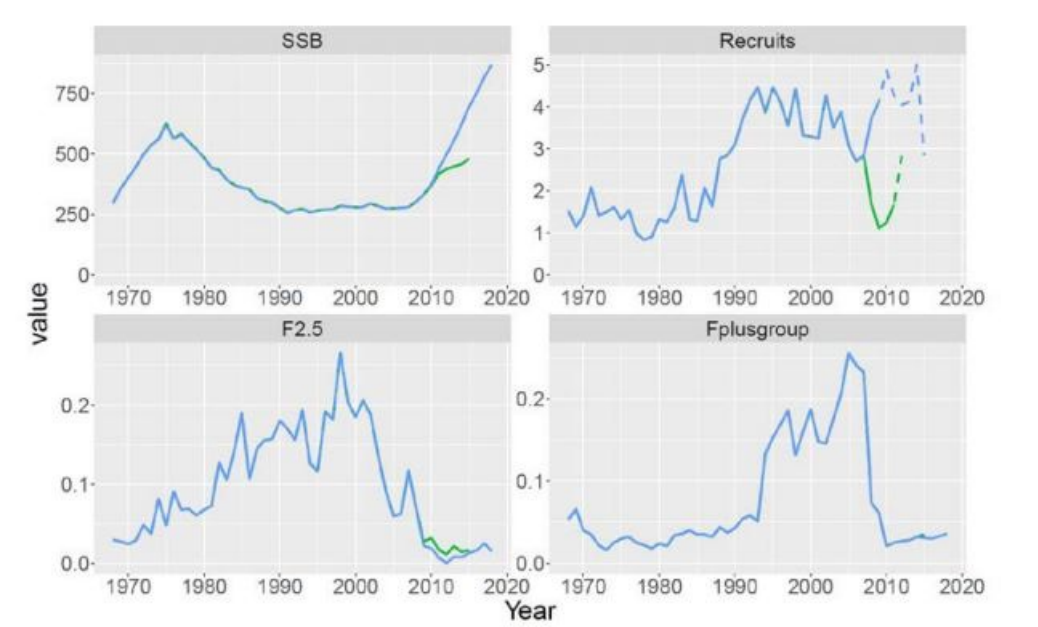

Figure 8: The spawning stock biomass (metric tons), recruitment (in thousand metric ton), recruitment (in million), and fishing mortality (average over ages 2 to 5 and 10+) estimates from VPA base run in the 2020 stock assessment (blue) compared to the 2017 stock assessment (green) from 1968-2015. The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

Western Atlantic Stock | Northwest Atlantic | Drifting longlines

Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

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). The most recent recruitment years are some of the lowest on record (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 2020 assessment estimates the stock was at14% of virgin biomass (B_0) in 2015 and has decreased in subsequent years (ICCAT 2020a).

Factor 2.2 - Fishing Mortality

Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Northeast Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Southeast 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. 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 be equal to the 2016 and 2017 TAC in all scenarios (ICCAT 2019b)

Western Atlantic Stock | Northwest Atlantic | Drifting longlines
Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

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}). Although the official status of the stock is viewed as 'not subject to overfishing,' model projections indicate that the current TAC likely has led to overfishing relative to F0.1 beginning in 2018, and the 2021 TAC of 2,350 mt was determined to have a 94% probability of causing overfishing (ICCAT 2020a)(ICCAT

2020)(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). Instead, there was an 11.7% decrease in biomass between 2017-2020 (ICCAT 2020). Because it is likely that the recent TACs have caused overfishing of the stock, we have rated this factor as high concern.

Atlantic bonito

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

In Atlantic waters, Atlantic bonito 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). The IUCN considers Atlantic bonito to be a species of "Least Concern" with a stable population trend (Collette et al. 2011b). We have awarded a score of "moderate" concern due to the unknown status.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

Atlantic bonito is one of five "small tuna" species that make up 88% of the total "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data. The majority of Atlantic bonito are caught in the Mediterranean and catches have fluctuated over the years, last peaking in 2006. There is some indication that Atlantic bonito caught in some parts of the Mediterranean are below the size at sexual maturity (Collette et al. 2011b). We have awarded a score of "moderate" concern because information on fishing mortality rates are unknown.

Atlantic sailfish

Factor 2.1 - Abundance

East Atlantic | Unassociated purse seine (non-FAD)

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.

West Atlantic | Unassociated purse seine (non-FAD)

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

East Atlantic | Unassociated purse seine (non-FAD)

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 2016). We have awarded a score of "high" concern because it is possible overfishing is occurring.

West Atlantic | Unassociated purse seine (non-FAD)

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.

Balearic shearwater

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
The International Union for Conservation of Nature (IUCN) has listed balearic shearwater (*Puffinus mauretanicus*) as "Critically Endangered," with a decreasing population trend (BirdLife International 2016). The current European population is estimated to be 19,000 (BirdLife International 2016). The BirdLife Datazone states a population decline of 14% per year, with an average extinction time of 61 years if the current trend is maintained {Arroyo et al. 2014}. Balearic shearwater are also listed on the OSPAR List of Threatened and/or Declining Species and Habitats, in the EU Birds Directive 2009/147/EC Annex I, in the ACAP-Agreement on the Conservation of Albatrosses and Petrels Annex, and the CMS-Convention on Migratory Species Appendix I (BirdLife International 2016). We have awarded a score of "high" concern because balearic shearwater are listed as "Critically Endangered" by the IUCN.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
In the Mediterranean Sea, bycatch, particularly from longline fisheries, is the main cause of population declines for three species of shearwater (Cory's, baleric, and Levantine) (Cortes et al. 2018) (Laneri et al. 2010). Bycatch in these fisheries is most commonly made up of Cory's shearwater, but is negatively impacting all three shearwater species {Cortes and Gonzales-Solis 2018} (Genovart et al. 2016) (Oppel et al. 2011) (Genovart et al. 2017). Estimates from the Spanish longline fishery operating in the region range from 200 individuals per year to 467–1,867 individuals per year (Belda and Sanchez 2001). We have awarded a score of "high" concern because bycatch in longline fisheries operating in the Mediterranean is negatively impacting this species.

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 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 and because the effectiveness of mitigation measures is still under study (ICCAT 2018f).

Blue marlin

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West 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

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

Blue shark

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines
North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest 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 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines
North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest 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.

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. 2017). 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. 2017). 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.

Bullet tuna

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

In Mediterranean waters, bullet 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). Bullet tuna are considered a species of "Least Concern" with a stable population trend by the International Union for the Conservation of Nature (IUCN). They are considered one of the most abundant juvenile tunas in the world. Abundance in the Mediterranean appears to fluctuate between locations every year (Collette et al. 2011c). We have awarded a score of "moderate" concern due to the unknown status.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

Bullet tuna is one of five "small tuna" species that make up 88% of total "small tuna" catches in the Atlantic Ocean. No assessment has been conducted due to a lack of data. Catches for the Atlantic and Mediterranean are combined, and after slight decreases during the late 1990s and early 2000s, catches have been increasing again (ICCAT 2018b). This species is caught by a variety of gears in the Mediterranean {Collete et al. 2011c}. We have awarded a score of "moderate" concern because information on fishing mortality rates are unknown.

Cory's shearwater

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

The International Union for the Conservation of Nature has assessed Cory's shearwater (*Calonectris borealis*) as "Least Concern" (BirdLife International 2017). This species has a large range, although the trend in population size is unknown (BirdLife International 2017). In Europe, the population is estimated to be 252,000 to 253,000 pairs (BirdLife International 2015). We have awarded a score of "moderate" concern because it is listed as "Least Concern" and while the population trend is unknown, it is not thought that any severe decrease will occur leading to a downgrading of status (BirdLife International 2017).

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern

This species is incidentally captured in longline fisheries operating in the Mediterranean. Bycatch in longline fisheries is negatively impacting the three shearwater species (Cory's, baleric, and Levantine) found in the Mediterranean {Cortes and Gonzales-Solis 2018} (Genovart et al. 2016) (Oppel et al. 2011) (Genovart et al. 2017). Cory's shearwater are the most common incidentally captured seabirds in the Mediterranean {Belda and Sanches 2001} (Garcia-Barcelona et al. 2010) (Laneri et al. 2010). For example, they are reported as the most commonly caught bird species in the Spanish longline fishery operating in the western Mediterranean (Baez et al. 2014). Adult survival declined throughout 1978 to 1999 and has recovered during the last decade (2005 to 2011). The incidental mortality from bycatch in longline fisheries (and high sea surface temperatures) increased mortality rates during the breeding season (March to October) (Ramos et al. 2012). We have awarded a score of "high" concern because this species has a high bycatch rate in the region and the impact to their population size is unknown.

Dolphinfish

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 2.2 - Fishing Mortality

Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 (ICCAT 2012a). Dolphinfish are caught by a variety of gears {Collete et al. 2011d}. 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.

Escolar

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

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, Western Central | Drifting longlines | United States

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
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest 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
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest 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.

Green sea turtle

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
Within the Mediterranean specifically, the population has decreased from historic levels but is not currently showing a decreasing trend in abundance (NOAA 2015). Based on a population viability analysis (PVA), there is a 33.3% probability the population will fall below the trend reference point (50% decline) after 100 years and 63.9% probability it will fall before the absolute abundance reference (100 females/yr) after 100 years (NOAA 2015).

A global assessment of sea turtle status that accounted for various population viability factors as well as threats assessed this population as high risk–high threat because of small and declining long-term population trend and high impacts of threats, specifically bycatch in trawls and gillnets (Wallace et al. 2011).

Green sea turtles are protected under the Endangered Species Act, with the Mediterranean distinct population segment listed as "Endangered" (foreign) (NOAA 2015). We have awarded a score of "high" concern due to the various Endangered listings.
Justification:
Green sea turtles have been listed in the Convention on International Trade in Endangered Species (CITES) since 1975 and are currently listed in Appendix 1, meaning they are threatened with extinction and international trade is prohibited. The mean annual number of nesting turtles worldwide has decreased between 48% to 67% over the past 100 to 150 years (Seminoff 2004). The International Union for Conservation of Nature (IUCN) has classified green sea turtles as "Endangered" with a decreasing population trend (globally) (Seminoff 2004). However, this assessment is well over 10 years old and is global in nature.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
Bycatch of green sea turtles in marine fisheries is considered a major threat to the species {Seminoff et al. 2004} and is a significant threat to their survival (NOAA 2015). Bycatch occurs throughout the Mediterranean and a reduction in bycatch mortality in the near future is unlikely due to a lack of bycatch reduction devices in the fisheries (NOAA 2015). Fishing in the region has been estimated to capture over 150,000 sea turtles a year (50,000 deaths) (Casale 2011)(Lucchetti and Sala 2009). The main longline fisheries affecting sea turtles in the Mediterranean are the Spanish and Italian fisheries (Casale 2008), but incidental captures in longline fisheries have been reported from Cyprus, Italy, and Egypt (NOAA 2015). Wallace et al. (Wallace et al. 2013) identified there was a high risk of bycatch in the Mediterranean for sea turtles. We have awarded a high concern score because the impact of incidental capture on green sea turtles in the Mediterranean is a concern to their small geographically restricted populations.

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

Northeast Atlantic | Drifting longlines
Northwest 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

Northeast Atlantic | Drifting longlines
Northwest 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

Mediterranean Sea, East Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines | Canada
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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, SARA and CITES listings.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 (Swimmer et al. 2017), so we have awarded a score of "moderate" instead of "high" concern.

Mediterranean Sea, East Atlantic | Drifting longlines

Low Concern
The incidental capture of leatherback sea turtles in longline fisheries is considered a threat to this species (Tiwari et al. 2013). There is concern that the continued incidental capture in small and large-scale operations near nesting beaches could jeopardize the future state of leatherbacks in the northwest Atlantic (Tiwari et al. 2013). However,

there are only a small number of individual leatherbacks incidentally captured in fisheries operating in the Mediterranean (Casale et al. 2003); currently, the threat from this capture is considered low (Wallace et al. 2013). We have therefore awarded a score of "low" 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.

Northwest Atlantic | Drifting longlines | Canada

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.

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.

Levantine shearwater

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern

The International Union for the Conservation of Nature (IUCN) has listed the Levantine shearwater (*Puffinus yelkouan*) as "Vulnerable" with a decreasing population trend (BirdLife International 2016c). Most estimates place the current population size between 46,000 and 92,000 individuals (Derhe 2012). A combination of low breeding success and low adult survival (across the western Mediterranean) in fisheries (in addition to predation) (BirdLife International 2016c). There is a potential that large breeding colonies in the eastern Mediterranean have not been identified as yet (BirdLife International 2016c). However, over the past 60 years eleven colonies have gone extinct (Bourgeois and Vidal 2008) (Cadiou 2015). Its estimated that the population in Italy is declining by 10 to 50% over 13 years, in France by 6% per year (Oppel et al. 2011) and in Malta by 0 to 15% over nine years {Borg and Sultana 2002} (Raine et al. 2009)(Sultana et al. 2011). These countries represent around three quarters of the entire population (BirdLife International 2016c). It is estimated that if population declines continue, the global breeding population will decrease by more than 30% over the next 54 years (BirdLife International 2016c). This species is also listed on the EU Birds Directive 2009/147/EC Annex 1 (BirdLife International 2016c). We have awarded a score of "high" concern based on the IUCN status and declining population trends.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern

In the Mediterranean Sea, bycatch is the main cause of population declines for three species of shearwater including the Levantine (Cortes et al. 2018). Longline fisheries have been identified as the main fishery in which this bycatch occurs (Cortes et al. 2018). Bycatch in longline fisheries is negatively impacting the three shearwater species (Cory's, baleric and Levantine) found in the Mediterranean {Cortes and Gonzales-Solis 2018} (Genovart et al. 2016) (Oppel et al. 2011) (Genovart et al. 2017). The most serious threat to the Levantine shearwater is the incidental capture in fisheries (BirdLife International 2016c). We are awarding a score of "high" concern because bycatch is negatively impacting this species.

Loggerhead turtle

Factor 2.1 - Abundance

Mediterranean Sea, East 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). In the Mediterranean, loggerheads are assessed as Least Concern with an increasing population by the IUCN (Casale and Tucker 2017). In Wallace et al. (2011) Med loggerheads were rated as low risk with a high threat from bycatch (Wallace et al. 2011). The sub population in the Northeast Atlantic has a large range that can extend into the western Mediterranean (Hawks et al. 2006) (Monzon-Arguello et al. 2010). This population is listed as Endangered by the IUCN (Casale and Marco 2015). Loggerheads are listed on Appendix 1 of the Convention on International Trade of Endangered Species (CITES). The current abundance of loggerhead turtles in the Mediterranean is estimated to be 7,200 individuals (Casale and Tucker 2017). We have awarded a high concern score based on the IUCN status in the northeast Atlantic region since this population extends into the Mediterranean.

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines | Canada
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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

Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

Moderate 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. 2013). 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 effective (Swimmer et al. 2017), so we have awarded a score of "moderate" concern.

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern

The incidental capture of loggerhead turtles is considered a primary threat to their populations {MTSG 2006}. Historically, bycatch of loggerheads in the Mediterranean has been considered high, as much as 35,000 to 80,000 individuals per year (Casale 2008) (Lewison et al. 2004). Within the Mediterranean, observer records indicate the number of loggerheads caught monthly by longlines is 1.2 individuals, the highest of all gears that incidentally capture loggerheads (Alvarez de Quevedo et al. 2010) (Alessandro and Antonello 2010). It was estimated that, overall, when these observed interactions were applied to the entire fishery between 2003 and 2004, 124 loggerheads were incidentally captured in this fishery (Alvarez et al. 2010). Based on post-release mortality rates, it was estimated that 8.5 to 10% of the loggerheads inhabiting areas in the Mediterranean fished by the Spanish fleet may be killed annually (Alvarez de Quevedo et al. 2013). However, a meta data analysis suggested loggerhead turtles had a low risk to their population size from longlines in the Mediterranean and a low bycatch impact, when bycatch is combined with other factors: fishing effort, mortality rates, and body size (Wallace et al. 2013).

Within the northeast Atlantic Ocean, bycatch is becoming an increasingly important issue to loggerhead turtles and an increasing threat (Melo and Melo 2013). According to Wallace et al., Bycatch in the northeast Atlantic is considered a high risk (Wallace et al. 2013). Some measures are in place to ensure that incidentally captured turtles are returned to the sea alive (safe handling guidelines and required use of de-hooking devices), but there are no universal measures (i.e., required by all fleets) to mitigate capture (i.e., required use of circle hooks) (ICCAT 2013). We have awarded a score of "moderate" concern because bycatch of loggerheads in the Mediterranean has a low impact on their population, but is considered a higher risk in the NE Atlantic.

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.

Northwest Atlantic | Drifting longlines | Canada

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. 2013). 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.

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, Western Central | Drifting longlines | United States

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, Western Central | Drifting longlines | United States

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.

Mammals

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines

High Concern
Marine mammals can come in contact with pelagic longline gears, usually through depredation events (Clarke et al. 2014). Toothed whale feeding patterns tend to overlap with tuna fisheries in temperate and tropical regions, leading to potential interactions (Clarke et al. 2014). Shallow-set longlines are commonly depredated by bottlenose and Risso's dolphins (Clarke et al. 2014). The International Commission for the Conservation of Atlantic Tunas (ICCAT) lists six species of marine mammals that interact with pelagic longlines: fin whale, long-finned pilot whale, Risso's dolphin, striped dolphin, bottlenose dolphin and goosebeaked whale. Observer data from the Spanish longline fleet indicate that Risso's dolphins are the most common marine mammal species incidentally captured (Lopez et al. 2012). A productivity and susceptibility analysis of these species found them to have a high intrinsic vulnerability to population decline (Clarke et al. 2014). We have awarded a score of "high" concern because marine mammals that may interact with pelagic longline tuna fisheries in this region are vulnerable to population declines.

Factor 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines

Moderate Concern
In general, longlines do not pose as great a threat to marine mammals as other fisheries (Gilman et al. 2006) (Garrison 2007) {Tudela 2004}. When interactions occur, they usually involve the marine mammal being incidentally hooked during depredation events or entangling and mortalities can be associated with this (Werner et al. 2015). Information on mortality related to these captures is limited (Wells and Scott 1999). Many other factors (capture for aquarium, direct hunting, environmental impacts) and incidental capture in other fisheries, such as gillnets, appear to be more disruptive to marine mammal population (Hammond et al. 2012). For example, the Spanish longline fleet recorded 56 interactions with four species of marine mammals, primarily Risso's dolphin, between 2000 and 2009 (Lopez et al. 2012). We have awarded a score of "moderate" concern because the incidental capture in pelagic longline fisheries can occur and there are associated mortalities, but many other factors have a larger impact on mammal population sizes.

Northern royal albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest 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

Southeast Atlantic | Drifting longlines
Southwest 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

Northeast Atlantic | Drifting longlines
Northwest 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

Northeast Atlantic | Drifting longlines
Northwest 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, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 {Baum 2009}. 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" (Baum et al. 2009). The current population trend is unknown globally, although there is no information to suggest declines in abundance have occurred (Baum et al. 2009). We have awarded a score of "moderate" concern based on the IUCN listing.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

Moderate Concern
Fishing mortality rates for pelagic stingray in the Atlantic Ocean are unknown. They are incidentally captured in longline fisheries throughout the world (Baum et al. 2009). Post-release mortality is thought to be low (Baum et al. 2009). 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

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.

Northwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines | Canada

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.

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

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).

Northwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines | Canada

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).

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

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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. 2018). This estimate is expected to be low, based on bias within the survey design (Hayes et al. 2018). 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

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.

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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."

Sea turtles

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)
East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-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 2017). 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 {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).

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)
East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-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).

Shortfin mako shark

Factor 2.1 - Abundance

Mediterranean Sea, East Atlantic | Drifting longlines
North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

High Concern
The last assessment for shortfin mako sharks in the North Atlantic was conducted in 2017 (ICCAT 2017b). The results indicated the population in 2015 was below maximum sustainable yield (B_{MSY}) levels (ICCAT 2017b). 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 2017b). 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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines

High Concern
The last assessment for shortfin mako sharks in the South Atlantic was conducted in 2017 (ICCAT 2017b). 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 (ICCAT 2017b). 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 2.2 - Fishing Mortality

Mediterranean Sea, East Atlantic | Drifting longlines
North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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 2017b). Fishing mortality levels in 2015, were estimated to be 93 to 438% above MSY levels (ICCAT 2017b). There is a 90% combined probability that the stock is overfished and undergoing overfishing (ICCAT 2017b) (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 2017b). 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.

South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest 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.

Short-finned pilot whale

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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. 2017). We have awarded a score of "moderate" concern due to their IUCN status.

Factor 2.2 - Fishing Mortality

Northeast Atlantic | Drifting longlines
Northwest 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.

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

Moderate Concern
Short-finned pilot whales are caught in the US pelagic longline fishery (Hayes et al. 2017). 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.

Silky shark

Factor 2.1 - Abundance

Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
East Atlantic | Floating object purse seine (FAD)
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

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 2018h). There are an estimated 8,800,000 mature birds (BirdLife International 2018h). 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 2018h) (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

Southeast Atlantic | Drifting longlines
Southwest 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

Southeast Atlantic | Drifting longlines
Southwest 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).

Triggerfish (unspecified)

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West 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

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

Wahoo

Factor 2.1 - Abundance

East Atlantic | Floating object purse seine (FAD)
West 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 2.2 - Fishing Mortality

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

Wandering albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest 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

Southeast Atlantic | Drifting longlines
Southwest 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 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 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

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

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

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

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.

Yellow-nosed albatross

Factor 2.1 - Abundance

Southeast Atlantic | Drifting longlines
Southwest 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

Southeast Atlantic | Drifting longlines
Southwest 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 Stock | East Atlantic | Floating object purse seine (FAD)
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)
Eastern Atlantic Stock | East Atlantic | Floating object purse seine (FAD)
Western Atlantic Stock | West Atlantic | Floating object purse seine (FAD)
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-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.

Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
North Atlantic Stock | Northeast Atlantic | Drifting longlines
North Atlantic Stock | Northwest Atlantic | Drifting longlines
South Atlantic Stock | Southeast Atlantic | Drifting longlines
South Atlantic Stock | Southwest Atlantic | Drifting longlines
Eastern Atlantic and Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines
Western Atlantic Stock | Northwest Atlantic | Drifting longlines
Western Atlantic Stock | Southwest Atlantic | Drifting longlines
Atlantic Stock | Northeast Atlantic | Drifting longlines
Atlantic Stock | Northwest Atlantic | Drifting longlines
Atlantic Stock | Southeast Atlantic | Drifting longlines
Atlantic Stock | Southwest Atlantic | Drifting longlines
Eastern Atlantic Stock | Northeast Atlantic | Drifting longlines
Eastern Atlantic Stock | Southeast 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.

North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Western Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

< 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). 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 ratio of discards plus bait use-to-landings, however, is likely <100%.

North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic Stock | North Atlantic | Trolling lines
South Atlantic Stock | South Atlantic | Trolling lines
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Atlantic Stock | East Atlantic | Trolling lines
Atlantic Stock | West Atlantic | Trolling lines
West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

Eastern Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines
Western Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines
Eastern Atlantic Stock | East Atlantic | Trolling lines
Western Atlantic Stock | West Atlantic | Trolling lines
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Atlantic stock | East Atlantic | Handlines and hand-operated pole-and-lines

< 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%.

North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Western Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada
Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada

< 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%.

North Atlantic Stock | Northwest Atlantic | Harpoons | Canada
North Atlantic Stock | Northwest Atlantic | Harpoons | United States

< 100%
Harpoon fisheries have very low discard rates, as low as zero in some areas (Kelleher 2005) (Gilman et al. 2017). This fishery does not use bait; therefore, discards plus bait are well below landings.

North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Western Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

< 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%.

Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

< 100%

This fishery specifically targets bluefin tuna (ICCAT 2017) (ICCAT 2017c). Handline and harpoon methods have very low discard rates typically ranging from 0 to 7%. Harpoon fisheries also have very low discard rates, as low as zero in some areas (Kelleher 2005) (Gilman et al. 2017), although there may be discarding of juvenile or undersized bluefin tuna in the handline fishery. Post release survival rates of tuna, including bluefin from handline type fisheries are typically very high {Marcek and Graves 2014} (Stokesbury et al. 2011).

Handline fisheries can depend heavily on the use of baitfish (some fisheries may use tuna and/or squid, which most often comes from other fisheries) {Gillett 2012}. The amount (tons) 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 in fishing technique {Gillett 2010}. There is concern with this fishery because mackerel and herring are used as bait. Herring is an important forage species in the region and their populations have recently decreased substantially (NEFSC 2018).

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
East Atlantic | Floating object purse seine (FAD)	Moderately Effective	Ineffective				**Red (1.000)**
East Atlantic | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**
East Atlantic | Trolling lines	Moderately Effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**
East Atlantic | Unassociated purse seine (non-FAD)	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
Mediterranean Sea, East Atlantic | Drifting longlines	Ineffective	Ineffective				**Red (1.000)**
North Atlantic | Handlines and hand-operated pole-and-lines	Highly effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
North Atlantic | Trolling lines	Highly effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northeast Atlantic | Drifting longlines	Moderately Effective	Ineffective				**Red (1.000)**
Northwest Atlantic | Drifting longlines	Ineffective	Ineffective				**Red (1.000)**
Northwest Atlantic | Drifting longlines | Canada	Ineffective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Red (1.000)**
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	Highly effective	Highly effective	Highly effective	Highly effective	Highly effective	**Green (5.000)**
Northwest Atlantic | Harpoons | Canada	Highly effective	Highly effective	Highly effective	Highly effective	Highly effective	**Green (5.000)**
Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Highly effective	**Red (1.000)**
Northwest Atlantic | Harpoons | United States	Highly effective	Highly effective	Highly effective	Highly effective	Highly effective	**Green (5.000)**
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
South Atlantic | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**
South Atlantic | Trolling lines	Moderately Effective	Highly effective	Highly effective	Moderately Effective	Highly effective	**Yellow (3.000)**
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)**
West Atlantic | Handlines and hand-operated pole-and-lines	Moderately Effective	Highly effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
West Atlantic | Trolling lines	Moderately Effective	Highly effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
West Atlantic | Unassociated purse seine (non-FAD)	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**

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

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.

East Atlantic | Unassociated purse seine (non-FAD)
East Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines

Moderately Effective
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.

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, has enacted measures for several tuna species included in this report.

Mediterranean Sea, East Atlantic | Drifting longlines

Ineffective

Bullet tuna, bonito: There are no management measures in effect for bullet tuna or Atlantic bonito in the Mediterranean (ICCAT 2017).

Albacore: There is one management measure in place (Rec 16-05) that limits the number of fishing vessels authorized to fish for albacore in the Mediterranean (originally designed to address bycatch of juvenile swordfish), and prohibits fishing for albacore between 1 October and 30 November (Rec 17-05) (ICCAT 2017c).

Eastern Atlantic Bluefin tuna: Eastern Atlantic bluefin tuna are currently managed under a recovery plan (2007 to 2022). There is a TAC within this recovery plan, divided among individual countries (overage of the TAC can occur), and longline fishing is only allowed from 1 January through 31 May. There is a size/weight restriction, prohibiting the capture of tuna less than 30 kg or with a fork length less than 115 cm. Atlantic bluefin tuna also are protected through bycatch limits (5% of total catch) in non-target fisheries. In addition, there are capacity management measures in place aimed at keeping countries catches within quota levels and measures to restrict fishing should the population decline drastically (ICCAT 2017b). The table in the "detailed information" section outlines the probabilities of F exceeding the reference point from 2018 to 2022 for various quotas. Given the large amount of uncertainty in the assessment, a precautionary approach to management of eastern Atlantic bluefin tuna is warranted. In addition, the SCRS has suggested moving to a management plan and moving forward with management strategy evaluation (MSE) to ensure the stock will continue to be managed sustainably (ICCAT 2017). In 2018, a new multi-annual management plan for bluefin tuna in the eastern Atlantic and Mediterranean was adopted (ICCAT 2018). This new plan allows for an increase in fishing capacity, removal of closed seasons for gears including longline and an increase in the bycatch tolerance for unauthorized vessels to land bluefin tuna (ICCAT 2018b).

Swordfish: Swordfish management measures include a bycatch limit (5%) for vessels not authorized to target swordfish, fishing permits specific to swordfish, time closures from 1 October through 30 November and from 15 February through 31 March, requirements that swordfish be landed whole, a minimum size limit, a limit on the number of hooks that can be set, and restrictions on the actual hook size and longline length. Countries also must take additional necessary measures to reduce mortality (ICCAT 2016b). However, these measures are not consistent with scientific advice and could lead to continued overfishing (see detailed section) (ICCAT 2017).

ICCAT does not have any formally accepted reference points but does have an "implied" target reference point (i.e., maximum sustainable yield) for most target species. For bluefin tuna, ICCAT does not have an implied target reference point, since they have moved away from an MSY based strategy. There is a framework for harvest control rules, but none are currently used (ICCAT 2017). We have awarded a score of "ineffective" because ICCAT has adopted measures for some species included in this report but not all of these measures (i.e., swordfish) meet the suggested scientific advice.

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 10: 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. 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 be equal to the 2016 and 2017 TAC in all scenarios { ICCAT 2019b}

F multiplier		F/Fsq	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0	F_{MSY}	0	0	0	0	0	100	100	100	100	100	100
0.25	F_{MSY}	0.14	0	0	0	0	7	100	100	100	100	100
0.5	F_{MSY}	0.29	0	0	0	0	0	10	69	96	98	100
0.75	F_{MSY}	0.43	0	0	0	0	0	1	3	20	53	72
1	F_{MSY}	0.57	0	0	0	0	0	0	0	2	4	8
1	F_{sq}	1	0	0	0	0	0	0	0	0	0	0
0.8	F_{sq}	0.8	0	0	0	0	0	0	0	0	0	0

Figure 11: Kobe II Strategy matrix for Mediterranean swordfish showing probabilities (%) of being in the green quadrant by year for each level of fishing mortality (ICCAT 2018b).

F multiplier		F/Fsq	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0	F_{MSY}	0	0	0	0	0	0	0	0	0	0	0
0.25	F_{MSY}	0.14	1684	2306	3011	3843	4723	5666	6550	7409	8217	8865
0.5	F_{MSY}	0.29	3278	4275	5374	6640	7937	9299	10597	11752	12860	13771
0.75	F_{MSY}	0.43	4786	5949	7203	8639	10028	11505	12962	14164	15353	16151
1	F_{MSY}	0.57	6214	7363	8594	10006	11300	12734	14198	15309	16406	17106
1	F_{sq}	1	10624	11198	12670	13577	14439	14924	15801	16242	16468	16352
0.8	F_{sq}	0.8	8826	9939	11786	13204	14464	15287	16465	17206	17746	17711

Figure 12: Catches of Mediterranean swordfish correspond to F levels in the table above (ICCAT 2018b).

North Atlantic | Handlines and hand-operated pole-and-lines

Highly 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).

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

We have awarded a score of "highly effective" because appropriate management and conservation targets have been identified (e.g., reference points), the fisheries' main primary targeted and retained species have precautionary policies based on scientific advice and incorporate uncertainty, and 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 these two species (albacore and swordfish) are being implemented successfully.

North Atlantic | Trolling lines

Highly effective

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, United States, and Venezuela (ICCAT 2017). Countries other than these four are to limit their catches to 2,015 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). We have

awarded a score of "highly effective" for the following reasons: 1) appropriate management targets; 2) precautionary policies based on scientific advice that incorporate uncertainty; 3) Effective rebuilding strategies, and 4) evidence that management measures are being successfully implemented.

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). 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).

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).

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.

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). 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).

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. Models indicate that 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 model 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.

For most species, management measures are in place, but there is a need for stronger international management for Western 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 result in overfishing the stock.

Northwest Atlantic | Drifting longlines | Canada

Ineffective

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).

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.

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. Models indicate that the total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020). The 2020 stock assessment model 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).

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, not by the major, industrial fisheries, but by a group of smaller fisheries with a shared, combined quota and some fisheries that are not covered by the TAC (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).

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.

Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

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

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.

Northwest Atlantic | Harpoons | Canada

Highly effective
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, a number of domestic legislation and policy measures are in place, including the Fisheries Act that regulates all activities occurring at sea (DFO 2012a).

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. Fishers with swordfish licenses can also target other tunas. There is an offshore tuna license that has a 5 t swordfish bycatch limit. We have awarded a score of "highly effective" because this stock is healthy and managed.

Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

Ineffective
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 2020 landings (January to September) of the US General (rod and reel, harpoon, and handline gears) and Harpoon fisheries targeting western Atlantic bluefin tuna comprised over 94% of total landings and 76% of the US quota (NMFS 2020). Models indicate that the total TAC set by ICCAT for the western stock of Atlantic bluefin tuna has led to overfishing (ICCAT 2020b). The 2020 stock assessment model indicates that overfishing is currently occurring, and the current TAC should be reduced to avoid continued overfishing. For 2021, ICCAT member countries agreed to maintain the 2020 TAC, which is expected to continue overfishing of the stock (ICCAT 2020b).

We have awarded ineffective because these fisheries are targeting a likely overfished stock of Western Atlantic bluefin tuna that is undergoing overfishing.

Justification:

There is a minimum size limit of 30 kg or 115 cm in length, although this can result in discarding of juvenile or undersized fish. There is a 10% tolerance for countries to allow fishers to go over these limits. Directed fishing for Atlantic bluefin tuna is not allowed in the Gulf of Mexico spawning grounds (ICCAT 2017b). ICCAT has no formally adopted reference points but an "implied" target reference point (i.e., maximum sustainable yield) is used to determine the stock status.

The United States adopts measures in line with those mandated by the ICCAT (NMFS 2014). The annual quota is split between fisheries and there are gear restricted areas, but they pertain to other fishing gears (not handline and/or harpoon) (NMFS 2014).

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

Moderately Effective

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).

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).

Sharks: In addition, 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). 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 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.

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).

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.

South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Trolling lines

Moderately Effective
Albacore tuna in the South Atlantic are managed under a country specific TAC (ICCAT 2016b). 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. There is a framework for harvest control rules, but none are currently used (ICCAT 2018).

Four the southern swordfish stock, the TAC is set below MSY and there is a 72% probability that the biomass will increase above BMSY by 2021 if current catches (10,404 t) are maintained (ICCAT 2019b).

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 albacore tuna and swordfish, but improvement is still needed.

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). 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).

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.

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 moderately effective 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. Models indicate that 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 model 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).

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 most 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 result in overfishing of the stock.

West Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

Moderately Effective
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.

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

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.

Factor 3.2 - Bycatch Strategy

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 hammerhead sharks are prohibited from being captured (ICCAT 2010d) (ICCAT 2010f). There are new measures in place to address compliance of shark-specific management measures (ICCAT 2018e). 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 dolphinfish, wahoo, 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."

East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)

Moderately Effective
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 hammerhead sharks are prohibited from being captured (ICCAT 2010d) (ICCAT 2010f). New measures are in place to address compliance of shark-specific management measures (ICCAT 2018e). 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 dolphinfish, wahoo, 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). No bycatch cap or catch limits are in place and it is unknown if these measures have been sufficient to maintain the health of bycatch species populations; however, unassociated purse seine fisheries have lower bycatch rates than associated, so we have awarded a score of "moderate" concern.

Mediterranean Sea, East Atlantic | Drifting longlines

Ineffective
Individual countries are required to report on the implementation of and compliance with safe handling, disentanglement, and release of sea turtles and prohibitions on catching some shark species (ICCAT 2013) (ICCAT 2011) (ICCAT 2010) (ICCAT 2010b). However, there are no bycatch caps or catch limits in place and it is unknown if these measures have been sufficient to maintain the health of bycatch species populations. Although some recent studies have indicated a reduction in the bycatch of sharks and sea turtles in the western Mediterranean (Garibaldi 2015), there are no universal measures in place that require the use of bycatch mitigation measures such as circle hooks or other gear restrictions. Given the potential impacts on highly vulnerable taxa (marine mammals, sea turtles, seabirds, and sharks), the bycatch management measures are insufficient. We have therefore awarded a score of "ineffective."
Justification:
The International Commission for the Conservation of Atlantic Tunas (ICCAT) and subsequently the General Fisheries Commission for the Mediterranean (GFCM) have required some measures to mitigate bycatch in the pelagic longline fishery. Member countries are required to collect and report information on bycatch and discards and it is suggested they provide identification guides for sharks, seabirds, sea turtles, and marine mammals to vessels fishing on the high seas (ICCAT 2011).

Although information on seabird interactions should be recorded, longline vessels fishing in the Mediterranean are

not required to mitigate interactions with seabirds and only implement seabird bycatch mitigation measures voluntarily (ICCAT 2011h).

Silky, oceanic whitetip, thresher, and hammerhead sharks are prohibited from being retained (ICCAT 2011) (ICCAT 2010) (ICCAT 2010b). There is a management measure related to blue sharks that looks to assess total catches and potential for catch limits after the next stock assessment (ICCAT 2016). Beginning in 2013, countries that have not reported catch data on shortfin mako sharks are prohibited from landing them (ICCAT 2010d). The current measures, which do not follow the SCRS scientific advice (ICCAT 2017e) require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks (ICCAT 2017e). 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 2017e). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2017e). The effectiveness of this measure will not be assessed until 2019 (ICCAT 2017e).

Finally, 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).

North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines
South Atlantic | Trolling lines
East Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines
West Atlantic | Trolling lines
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

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). A management measure related to blue sharks looks to assess total catches and potential for catch limits after the next stock assessment (ICCAT 2016c). There are new

measures in place to address compliance of shark-specific management measures (ICCAT 2018e).

Shortfin mako sharks: Beginning in 2013, countries that have not reported catch data on shortfin mako sharks are prohibited from catching them {ICCAT 2010h}. Additional measures to address north Atlantic shortfin mako sharks, which do not follow the SCRS scientific advice (ICCAT 2017e), require vessels to release shortfin mako sharks caught alive, and vessels must take specific measures to retain shortfin mako sharks caught dead (ICCAT 2017e). 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 2017e). There are additional provisions that allow countries to land shortfin mako sharks, such as domestic laws on minimum size at capture (ICCAT 2017e). The effectiveness of this measure will not be assessed until 2019 (ICCAT 2017e).

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.

Northwest Atlantic | Drifting longlines | Canada

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.

Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US
Northwest Atlantic | Harpoons | Canada

Highly effective
Bycatch is very low in these fisheries and measures are in place to release some potential bycatch species (i.e., shortfin mako and porbeagle sharks) alive, introduce bycatch mitigation measures, and take other measures to reduce fishing mortality (ICCAT 2017d) (ICCAT 2015). We have therefore awarded a score of "highly effective."

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

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).

Since this fishery is a Category 1, this cannot score highly effective and have therefore awarded a moderately effective score.

Factor 3.3 - Scientific Research And Monitoring

East Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines

Highly effective
Assessments of albacore, bigeye, and 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). We have therefore awarded a score of "highly effective."

East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)

Moderately Effective
Assessments of albacore, bigeye and yellowfin tuna, and swordfish are conducted every 3 to 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). However, there are gaps in assessing data from South Atlantic fisheries and still uncertainty with tropical tunas. We have therefore awarded a score "moderately effective."

North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines

Highly effective
Assessments for albacore tuna and 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 2016) (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.

Northwest Atlantic | Drifting longlines | Canada

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. Also, there is a lack of analysis of observer coverage for the longline fleet to understand the spatial and temporal coverage and the species being caught. This is part of the required action plans for the sea turtles under SARA and has been left unfunded by the government despite the efforts of government scientists. ICCAT reporting of discards, espcecially for sharks needs improvement. We have therefore awarded a moderate and not highly effective score.

Northwest Atlantic | Harpoons | Canada
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

Highly effective
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.

Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

Moderately Effective
Assessments of Atlantic bluefin tuna are conducted every two to three years and include catch and effort data from both fishery independent and dependent sources, along with biological information and other data sets (ICCAT 2017). However, there is a large amount of uncertainty surrounding the data and results. Uncertainty surrounded a variety of issues including potential mixing between the stocks (eastern/Mediterranean and western Atlantic), recruitment age/amount to the fisheries, age composition of the catch, age at sexual maturity, and indices of abundance. We have awarded a score of "moderately effective" rather than "highly effective."

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

Moderately Effective
We have awarded a score of "moderately effective" becasue population assessments are conducted for the majority of "main species" on a regular basis. 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.

South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Trolling lines

Highly effective
Assessments for albacore tuna 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 2016). 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.

West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

Moderately Effective
Stock assessments for bigeye, skipjack, and yellowfin tuna are conducted every 3 to 6 years and include catch and effort data from both fishery dependent and independent sources along with biological information and other data sets. Assessments for blackfin tuna are not conducted on a regular basis, and although they do include some catch, effort and size data, overall data needed for assessments is lacking (ICCAT 2018b). We have awarded a score of "moderately effective" because there is often uncertainty around the results of the assessments.

Factor 3.4 - Enforcement Of Management Regulations

East Atlantic | Unassociated purse seine (non-FAD)
East Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines

Moderately Effective
Countries are required to provide information on the catch, catch at size, location, and month of captures for tuna species (ICCAT 2016b) (ICCAT 2018c). Vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). Catch and effort data must be reported to the Secretariat. Vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). A TAC for yellowfin tuna was implemented in 2012 and there is the ability to subtract overages from subsequent years should catches of yellowfin tuna exceed TAC levels (ICCAT 2016b). Should bigeye tuna catches ever exceed the TAC, measures are in place to adjust the countries' quotas for the following years (ICCAT 2016b) (ICCAT 2018c). There is no TAC for skipjack tuna.

North Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines

Moderately Effective
ICCAT has many management, control, and surveillance (MSC) measures in place. For example, ICCAT keeps a record of vessels that fish in ICCAT waters and a list of vessels that have carried out illegal, unreported, and unregulated (IUU) fishing in the ICCAT Convention Area (ICCAT 2011a). There is a regional observer program for at-sea transshipments (ICCAT 2016b). Countries must provide to the ICCAT Secretariat catch and effort information, and vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). We have awarded a score of "moderate" concern because ICCAT has some enforcement actions in place.

Northwest Atlantic | Drifting longlines | Canada

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.

Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

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.

Northwest Atlantic | Harpoons | Canada

Highly effective
In the Canadian swordfish fishery the use of logbooks is required by all commercial fishers, and monitoring at sea and through aerial patrols is conducted by the Canadian Coast Guard and the Department of National Defense. In addition, illegal and unreported fishing is penalized through seizure of catches, fines, and suspension of licences (DFO 2010). Quotas are monitored by DFO and by industry along with fisheries associations (MMI 2011). Vessel monitoring systems are also used to monitor this fishery, along with dockside monitoring (DFO 2010). We have awarded a score of "highly effective" because adequate enforcement is in place.

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

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.

South Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Trolling lines
Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US

Moderately Effective
ICCAT has one of the best practices of reviewing and assessing compliance with management measures among member countries (Koehler 2013). Individual countries are required to report sources of fishing mortality and provide monthly catches of bluefin tuna (ICCAT 2017b) and vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). However, the compliance committee has been limited in its ability to actually enforce measures that countries fail to implement. Total catches of Atlantic bluefin tuna have not been over the set total allowable catch (TAC) in recent years (ICCAT 2017b). We have awarded a score of "moderately effective" because, although there is a compliance monitoring system in place, a performance review of ICCAT indicated there is little done to make sure countries comply with all measures (ICCAT 2016).

West Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Trolling lines

Moderately Effective
Countries are required to provide information on the catch, catch at size, location, and month of captures for tuna species (ICCAT 2016b) (ICCAT 2018c). Vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). Catch and effort data must be reported to the Secretariat. Vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). A TAC for yellowfin tuna was implemented in 2012 and there is the ability to subtract overages from subsequent years should catches of yellowfin tuna exceed TAC levels (ICCAT 2016b). If bigeye tuna catches ever exceed the TAC, there are measures in place to adjust countries' quotas for the following year (ICCAT 2016b) (ICCAT 2018c). There is no TAC for skipjack tuna. For yellowfin and bigeye, there have been overages for the past several years.

West Atlantic | Unassociated purse seine (non-FAD)

Moderately Effective
Individual countries are required to report sources of fishing mortality and provide monthly catches of bluefin tuna (ICCAT 2017c). Countries are required to provide information on the catch, catch at size, location, and month of captures for other tuna species (ICCAT 2016b). Vessel monitoring systems are required on all vessels larger than 20 m in length (ICCAT 2003). Catch and effort data are required to be reported to the Secretariat. A TAC for yellowfin tuna was implemented in 2012 and there is the ability to subtract overages from subsequent years should catches of yellowfin tuna exceed TAC levels (ICCAT 2016d). If bigeye tuna catches ever exceed the TAC, measures are in place to adjust countries' quotas for the following year (ICCAT 2016b) (ICCAT 2018c). There is no TAC for skipjack tuna.

Factor 3.5 - Stakeholder Inclusion

North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines
South Atlantic | Trolling lines
Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US
East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)
East Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines
West Atlantic | Trolling lines

Highly effective
The International Commission for the Conservation of Atlantic Tunas (ICCAT) has attempted to include stakeholder input in the management and conservation of some species (i.e., Atlantic bluefin) {ICCAT 2008b}. Observers are allowed at scientific and commission meetings but may not vote on individual management measures and are not included in all discussions related to management measures. Country delegates are active participants in the decision-making process with management measures needing the support of all participating countries. Country delegations are made up of individuals from the government, fisheries institutes, and industry. Countries participate in various working groups based on the interest to their respective fisheries. Meetings (intersessional and annual) are open to all participating countries and their respective delegates. We have have awarded a score of "highly effective" to account for the inclusion of stakeholder input and transparency of management process through meeting reports and the ability of non-delegates to attend and participate in meetings.

Northwest Atlantic | Drifting longlines | Canada
Northwest Atlantic | Harpoons | Canada

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..

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

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 Stock | East Atlantic | Floating object purse seine (FAD)	5	0	Moderate Concern	**Green (3.873)**
Atlantic Stock | East Atlantic | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	**Green (3.873)**
Atlantic Stock | East Atlantic | Trolling lines	5	0	Moderate Concern	**Green (3.873)**
Eastern Atlantic Stock | East Atlantic | Unassociated purse seine (non-FAD)	5	0	Moderate Concern	**Green (3.873)**
North Atlantic Stock | Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States	5	0	Moderate Concern	**Green (3.873)**
Mediterranean Stock | Mediterranean Sea, East Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
North Atlantic Stock | North Atlantic | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	**Green (3.873)**
North Atlantic Stock | North Atlantic | Trolling lines	5	0	Moderate Concern	**Green (3.873)**
North Atlantic Stock | Northeast Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
North Atlantic Stock | Northwest 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
North Atlantic Stock | Northwest Atlantic | Drifting longlines | Canada	5	0	Moderate Concern	**Green (3.873)**
North Atlantic Stock | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	5	0	Moderate Concern	**Green (3.873)**
North Atlantic Stock | Northwest Atlantic | Harpoons | Canada	5	0	Very Low Concern	**Green (5.000)**
Western Atlantic Stock | Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US	5	0	Very Low Concern	**Green (5.000)**
North Atlantic Stock | Northwest Atlantic | Harpoons | United States	5	0	Very Low Concern	**Green (5.000)**
North Atlantic Stock | Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States	5	0	Moderate Concern	**Green (3.873)**
South Atlantic Stock | South Atlantic | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	**Green (3.873)**
South Atlantic Stock | South Atlantic | Trolling lines	5	0	Moderate Concern	**Green (3.873)**
South Atlantic Stock | Southeast Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
South Atlantic Stock | Southwest Atlantic | Drifting longlines	5	0	High Concern	**Yellow (3.162)**
Atlantic Stock | West Atlantic | Floating object purse seine (FAD)	5	0	Moderate Concern	**Green (3.873)**
Atlantic Stock | West Atlantic | Handlines and hand-operated pole-and-lines	5	0	Moderate Concern	**Green (3.873)**
Atlantic Stock | West Atlantic | Trolling lines	5	0	Moderate Concern	**Green (3.873)**
Western Atlantic Stock | West Atlantic | Unassociated purse seine (non-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

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).

East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)

5
Unassociated purse seines do not come in contact with bottom habitats (Seafood Watch 2017).

Mediterranean Sea, East Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines | Canada
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States

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."

North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines
South Atlantic | Trolling lines
Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US
East Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines
West Atlantic | Trolling lines
Northwest Atlantic | Harpoons | Canada
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

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

Mediterranean Sea, East Atlantic | Drifting longlines
Northeast Atlantic | Drifting longlines
Northwest Atlantic | Drifting longlines
Southeast Atlantic | Drifting longlines
Southwest Atlantic | Drifting longlines
North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines
South Atlantic | Trolling lines
Northwest Atlantic | Drifting longlines | Canada
Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US
East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)
East Atlantic | Floating object purse seine (FAD)
West Atlantic | Floating object purse seine (FAD)
East Atlantic | Handlines and hand-operated pole-and-lines
West Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines
West Atlantic | Trolling lines
Northwest Atlantic | Harpoons | Canada
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Harpoons | United States

0
Not Applicable

Factor 4.3 - Ecosystem-based Fisheries Management

East Atlantic | Unassociated purse seine (non-FAD)
West Atlantic | Unassociated purse seine (non-FAD)
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).

Mediterranean Sea, East Atlantic | Drifting longlines
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).

This fishery also uses bait, either mackerel or squid. 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).

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 ecoystem impacts of the removal of apex predators have not been adequately addressed.

North Atlantic | Handlines and hand-operated pole-and-lines
South Atlantic | Handlines and hand-operated pole-and-lines
North Atlantic | Trolling lines
South Atlantic | Trolling lines
East Atlantic | Handlines and hand-operated pole-and-lines
East Atlantic | Trolling lines
West Atlantic | Trolling lines
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States

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).

Northwest Atlantic | Drifting longlines | Canada
Gulf of Mexico | Atlantic, Western Central | Drifting longlines | United States
West Atlantic | Handlines and hand-operated pole-and-lines

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 effects (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). The fisheries are regulated under the Sustainable Fisheries Framework, which is a suite of policies that are the legal regulations under the Fisheries Act and the Atlantic Fisheries Regulations (DFO 2020). However, there is no ecosystem-based management plan in place for the swordfish fishery.

Northwest Atlantic | Harpoons | Handlines and hand-operated pole-and-lines | United States | General Quota, Atlantic Bluefin Tuna, US
Northwest Atlantic | Harpoons | Canada
Northwest Atlantic | Harpoons | United States

Very Low Concern
Harpoon fisheries do not rely on bait like other pole fisheries and this type of fishing is very selective. 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).

Northwest Atlantic, Western Central Atlantic | Drifting longlines | United States

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.

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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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