BLUE OCEAN INSTITUTE

Inspiration, Information, Action

and

Monterey Bay Aquarium Seafood Watch®

Yellowfin tuna

Thunnus albacares

Trinidad and Tobago

Pelagic Longline

April 5, 2013

Blue Ocean Institute Seafood Analysts

Final Seafood Recommendation

Species / Fishery	Impacts on Species Under Assessment	Impacts on other Species	Management Effectiveness	Impacts on Habitat and Ecosystem	Overall Recommendation
Yellowfin tuna Trinidad and Tobago Caribbean Sea - Longline, Pelagic	Red (2.16)	Red (1.41)	Yellow (2.45)	Green (3.87)	**Avoid (2.320)**

Scoring note – 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** = Final Score between 3.2 and 5, **and** no Red Criteria, **and** no Critical scores

▬ **Good Alternative** = Final score between 2.2 and 3.199, **and** Management is not Red, **and** no more than one Red Criterion other than Management, **and** no Critical scores

▼ **Avoid** = Final Score between 0 and 2.199, **or** Management is Red, **or** two or more Red Criteria, **or** one or more Critical scores.

Executive Summary

Yellowfin tuna are found and caught in tropical and subtropical waters worldwide with a variety of fishing gears. This report evaluates yellowfin tuna caught in the Trinidad and Tobago surface longline fishery in the Caribbean region of the Atlantic Ocean.

Yellowfin tuna in the Atlantic Ocean are at a low abundance and it is uncertain whether current fishing levels on yellowfin tuna are sustainable or not. Several other tuna species, billfish (swordfish, marlins), and sharks are also caught in Trinidad and Tobago's longline fishery. Some of these species are at very low abundances, including blue and white marlins, and some endangered sea turtles are also caught in the fishery.

Several management regulations have been established to manage yellowfin tuna and their associated species both at the international level, through the International Commission for the Conservation of Atlantic Tunas (ICCAT), and by Trinidad and Tobago. Management overall has been moderately effective; however monitoring and management of bycatch, like sea turtles, needs improvement. The pelagic or surface longline gear used to catch yellowfin tuna causes no damage to bottom habitats, but because tuna fisheries catch numerous top predator species, there is some concern that these fisheries may affect ocean food webs and ecosystems.

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Introduction

Scope of the analysis and ensuing recommendation

This report evaluates the sustainability of yellowfin tuna caught in Trinidad and Tobago's longline fishery in the Caribbean region of the Atlantic Ocean.

Overview of the species and management bodies

Yellowfin tuna are found worldwide in tropical and subtropical waters. They can migrate long distances, and they often form schools with similarly sized individuals. Juvenile yellowfin tuna are typically found in surface waters with other small tunas, while larger fish may be found in either surface or subsurface waters {ICCAT 2011a}. They also tend to aggregate around natural debris or objects and around man-made floating objects, known as fish aggregating devices (FADs). In the eastern Pacific, they frequently associate with dolphins, but this is not common elsewhere {ISSF 2012}. Yellowfin tuna are short-lived, with a maximum age of less than 10 years, and reach sexual maturity at an early age (2-5 years). They can grow to a maximum size of 180-200 cm {ICCAT 2011a, ISSF 2012, IOTC 2012}.

There are four populations of yellowfin tuna: Atlantic, Eastern Pacific, Western and Central Pacific, and Indian Ocean. Globally, yellowfin tuna account for around 27% of the total tuna catches {ISSF 2012}. Catches of Yellowfin tuna steadily increased from the 1960's to the early 2000's, peaking at around 1.5 million metric tons (t), but have declined some in recent years to around 1.1 to 1.2 million metric tons. In recent years the highest catches have occurred in the Western and Central Pacific (500,000 t), followed by the Indian Ocean (300,000 t), the Eastern Pacific (200,000 t), and the Atlantic (100,000 t). Purse seines are the most common fishing gear used to catch yellowfin tuna, but pelagic longlines, pole and line, and various other gears are also used {ISSF 2012}. Each yellowfin tuna population is managed by an international regional fishery management organization.

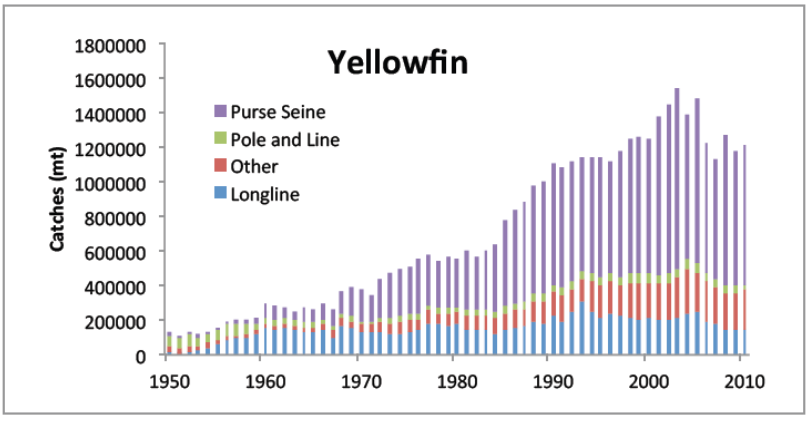

Figure 1: Global yellowfin tuna catches by gear type 1950-2010 {ISSF 2012}

This report focuses on Trinidad and Tobago's longline fishery in the Caribbean region of the Atlantic Ocean. In the Atlantic Ocean, the regional management organization responsible for the management of tuna and tuna-like species is the International Commission for the Conservation of Atlantic tunas (ICCAT). Trinidad and Tobago is a contracting party of the ICCAT. The government agency responsible for fisheries management in Trinidad and Tobago is the Fisheries Division of the Ministry of Food Production. Trinidad and Tobago is also part of the Caribbean Regional Fisheries Mechanism (CRFM), an inter-governmental organization that was established in 2003 and aims to facilitate the responsible management of fisheries resources in the Caribbean region {CRFM 2002}.

Production Statistics

Total catches of tuna and tuna-like species in Trinidad and Tobago fisheries in 2010 were estimated to be just over 4,000 metric tons (t) {ICCAT 2012b}. They have both artisanal and semi-industrial fishing fleets. Yellowfin tuna are caught in the semi-industrial longline fishery. This fishery has been growing in recent years. Currently, there are 36 vessels in the fishery, which range from 14-33 meters in length {ICCAT 2012b, MFP 2013}. Catches of yellowfin tuna are reported to be around 500-800 t in recent years {ICCAT 2012a}. However, these catches only include the Trinidad-based portion of the fishery and thus are an underestimate of the total catches. There is limited data collection for the Tobago-portion of the fishery and these catches are not reported {MFP 2013}. While yellowfin tuna is the principal species caught in Trinidad and Tobago's pelagic longline fishery, several other tuna and billfish (e.g. swordfish, marlins) species are also caught {MFP 2011a, 2013}.

Importance to the US/North American market

Most yellowfin tuna available in the US market is imported from a number of different countries. Commercial catches of yellowfin tuna in the US have been around 2,000-3,000 metric tons (t) in recent years (2007-2011). Imports of yellowfin tuna have ranged from 16,000-23,000 t. In 2012, Trinidad and Tobago contributed to 11% (1,700 t) of the US imports of yellowfin tuna. They were the second leading contributor {NMFS 2013}. However, reported imports for Trinidad and Tobago have been higher than total reported catches in recent years. This could mean that fish that are being trans-shipped through Trinidad and Tobago are being misidentified as the wrong country of origin {MFP 2013}.

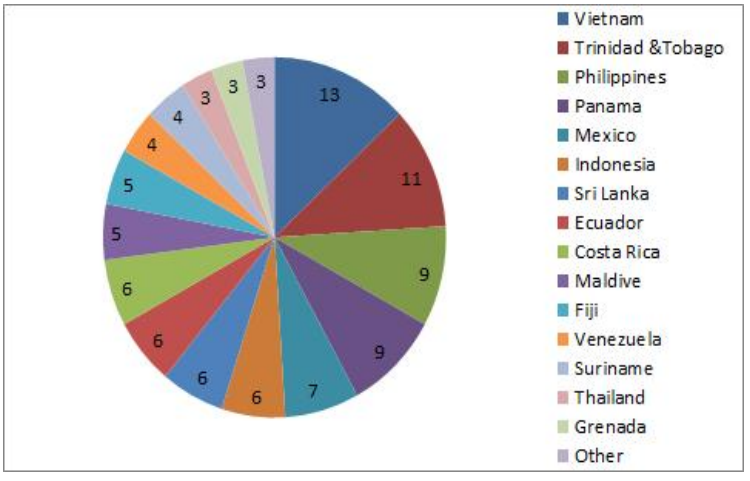

Figure 2: Contribution (%) by Country to U.S. Yellowfin Tuna Imports

Common and market names

The Hawaiian name for yellowfin is ahi, a term which has become common in the mainland US as well. When used for sushi or sashimi, yellowfin is commonly sold as maguro or toro.

Primary product forms

Yellowfin tuna is sold fresh, frozen, or smoked. Longline caught yellowfin may be used for sushi/sashimi.

Analysis

Scoring Guide

- All scores result in a zero to five final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of five indicates high performance.
- The full Seafood Watch Fisheries Criteria that the following scores relate to are available on our website at http://www.seafoodwatch.org.

Criterion 1: Fishery's impact on species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown. The final Criterion 1 Score is determined by taking the geometric mean of the abundance and fishing mortality scores.

YELLOWFIN TUNA				
Region / Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Criterion 1 Score**
Trinidad and Tobago Caribbean Sea Longline, Pelagic	Medium	2.00:High Concern	2.33:Moderate Concern	**Red (2.159)**

Justification of Ranking

Factor 1.1 - Inherent Vulnerability to Fishing

- Low = FishBase vulnerability score for species 0-35 OR species exhibits life history characteristics that make it resilient to fishing, e.g., early maturing (<5 years), short lived (< 10 years), small maximum size, and low on food chain.
- Medium = FishBase vulnerability score for species 36-55 OR life history characteristics that make it neither particularly vulnerable or resilient to fishing, e.g. moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain.
- High = FishBase vulnerability score for species 56-100 OR life history characteristics that make is particularly vulnerable to fishing, e.g. long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator.

  Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g. schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

Medium

Yellowfin tuna sexually mature between 2-5 years of age or around 100 cm. They can grow up to 200 cm in length and have a maximum age of 8-9 years. {ICCAT 2011a, ISSF 2012, IOTC 2012} The FishBase vulnerability score for yellowfin tuna is 46 out of 100 {Froese and Pauly 2011}. This is considered to be a 'medium' inherent vulnerability to fishing.

Factor 1.2 - Abundance

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

2.00: High Concern

Yellowfin tuna in the Atlantic Ocean are overfished, with abundance being about 15% below the target/limit abundance level or the biomass at maximum sustainable yield (BMSY) {ICCAT 2011a, b}. There is some uncertainty in the abundance estimate. One abundance estimate indicated a decline in abundance in recent years, while another estimate suggested abundance has increased in recent years {ICCAT 2011a, b}. The population status of yellowfin tuna in the Atlantic Ocean is considered a 'high concern.'

Factor 1.3 - Fishing Mortality

- 5 (Very Low Concern) = Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY) OR fishery does not target species and its contribution to the mortality of species is negligible (≤ 5% of a sustainable level of fishing mortality)
- 3.67 (Low Concern) = Probable (>50% chance) that fishing mortality is at or below a sustainable level, but some uncertainty OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught)
- 2.33 (Moderate Concern) = Fishing mortality is fluctuating around sustainable levels OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery, and if species is depleted, reasonable management is in place.

- 1 (High Concern) = Overfishing is occurring, but management is in place to curtail overfishing OR fishing mortality is unknown, species is depleted and no management is in place
- 0 = (Critical) = Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.

2.33: Moderate Concern

Fishing mortality on yellowfin tuna was estimated to be about 13% below the fishing mortality at the maximum sustainable yield (FMSY) as of 2010, suggesting fishing levels on yellowfin tuna are sustainable. However, there is a high degree of uncertainty around the fishing mortality estimate {ICCAT 2011a, b}. The two population models used in the assessment provide very different estimates of fishing mortality, with one model estimating fishing mortality to be above a sustainable level and the other estimating fishing mortality to below a sustainable level {ICCAT 2011a, b}. In addition, in the model in which fishing mortality is estimated to be below a sustainable level, the fishing mortality reference point that was chosen, Fmax (the fishing level that produces the greatest yield/catch from the fishery), as a proxy for the fishing mortality at the maximum sustainable yield (FMSY) may not be suitable {ICCAT 2011a, b}. Several studies have indicated that in many cases the Fmax reference point is likely to be greater than FMSY {Gabriel and Mace 1999}. If a more conservative fishing mortality reference point had been used as a proxy for FMSY, fishing levels may have been deemed unsustainable {ICCAT 2011b}. Due to the high uncertainty surrounding the fishing mortality estimate, we consider fishing mortality on yellowfin tuna unknown and a 'moderate concern'.

Criterion 2: Impacts on other retained and bycatch species

All retained and primary bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. Seafood Watch® defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch.

YELLOWFIN TUNA				
Region / Method	**Lowest Scoring of Other Species**	**Lowest Species Subscore**	**Discard Rate Modifying Score ((Discards+ Bait)/Retained Catch)**	**Criterion 2 Score**
Indonesia Western Central Pacific Longline, Pelagic	Blue Marlin	1.414	1.00 (<20%)	**Red (1.414)**

Synthesis

Yellowfin tuna is the most common species caught in Trinidad and Tobago's longline fishery, but bigeye tuna and swordfish are also targeted in the fishery {ICCAT 2012b, MFP 2013}. Other minor species caught incidentally in the fishery include albacore tuna, blue marlin, white marlin, Atlantic sailfish, dolphinfish, blackfin tuna, and sharks {FAO 2004, Soomai 2005, MFP 2011a, ICCAT 2012a, MFP 2013}. All of these species are reported to be retained and utilized. While some of these species are at sustainable abundance levels (e.g. swordfish), albacore tuna, blue marlin, and white marlin are all at low abundances and overfished {ICCAT 2012a}. The status of many shark species is also of high concern. In addition, endangered sea turtles are sometimes caught in this fishery. Seabirds may be incidentally captured as well, but none of the seabirds found in Trinidad and Tobago's waters are threatened or endangered {BirdLife International 2013}. Marine mammals are occasionally caught in pelagic longline fisheries {Gilman et al. 2006, NMFS 2012}, but this does not appear to be a major concern in the Caribbean region {NMFS 2012}. Overall, the lowest scoring of the 'other species' in the fishery was blue marlin, due to its low abundance and continued high fishing of this species. The fishery may also have a negative impact on white marlin and sea turtles.

Justification of Ranking
Only species that scored 'red' are included here. All other species evaluations are in Appendix 1. See criterion 1 for scoring definitions.

Atlantic White Marlin

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
White marlin reach sexual maturity early in life, around 2-4 years of age (145-160 cm), and are thought to live for 15 years {Collette et al. 2011b}. The FishBase vulnerability score for white marlin is 41 out of 100 {Froese and Pauly 2011}. This is considered a 'medium' inherent vulnerability to fishing.

Factor 2.2 – Abundance

2.00: High Concern
White marlin in the Atlantic Ocean are overfished. Abundance of white marlin has been low for the last decade and remains well below the target/limit level, i.e. the biomass at maximum sustainable yield (BMSY) {ICCAT 2012a, c}. Additionally, the International Union for the Conservation of Nature (IUCN) list white marlin as 'vulnerable' {Collette et al. 2011b}. Therefore the population status of white marlin is considered a 'high concern'.

Factor 2.3 - Fishing Mortality

2.33: Moderate Concern
Fishing mortality on white marlin is uncertain. If current reported white marlin catches are accurate, then fishing mortality is estimated to be below a sustainable level. However, there is some concern that total fishery removals of white marlin may be higher than reported, and if this is the case then fishing mortality would be above a sustainable level {ICCAT 2012c}. The reported white marlin catches by Trinidad and Tobago are very small (< 15 t), but catches by most nations are small and the cumulative catches could be impacting the population {ICCAT 2012a}. To ensure that catches of white marlin remain at their current levels or below, a catch limit of 400 t was recently established for white marlin and spearfish combined (these species are hard to separate in the catches) and divided among countries. Trinidad and Tobago is allowed to catch 15 t of white marlin/spearfish {ICCAT 2012f}. Since the fishing mortality of white marlin is uncertain, it is rated a 'moderate concern'.

Blue Marlin

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
Blue marlin can grow to large size and live for over 20 years, but reach sexual maturity at an early age {Froese and Pauly 2011, Collette et al. 2011a}. The FishBase vulnerability score for

blue marlin in 52 out of 100 {Froese and Pauly 2011}. This is considered a 'medium' inherent vulnerability to fishing.

Factor 2.2 – Abundance

2.00: High Concern
Blue marlin in the Atlantic Ocean are overfished. The latest population assessment for Atlantic blue marlin in 2011, estimated the abundance of spawning fish (i.e. sexually mature fish) to be around 67% of the target/limit level or the biomass at maximum sustainable yield (BMSY) {ICCAT 2012a}. Blue marlin are also listed a 'vulnerable' by the International Union for the Conservation of Nature (IUCN) {Collette et al. 2011a}. Therefore, the population status of blue marlin is considered to be a 'high concern'.

Factor 2.3 - Fishing Mortality

1.00: High Concern
Overfishing is occurring on blue marlin in the Atlantic Ocean. The latest population assessment for blue marlin estimated fishing mortality in 2009 to be 1.1 to 2.2 times that of the fishing mortality at maximum sustainable yield (FMSY). It was determined that unless catches of blue marlin are substantially reduced, the population will continue to decline {ICCAT 2012a}. Catches of blue marlin reported by Trinidad and Tobago from 2005 to 2010 were only 15-35 t annually, but catches by most nations are low, so the cumulative catches by all countries are likely contributing to overfishing {ICCAT 2012a}. Recently, management established a catch limit of 2,000 t for blue marlin to help reduce fishing mortality on this species. The amount of blue marlin that Trinidad and Tobago is permitted to catch is 20 t {ICCAT 2012f}. Fishing mortality of blue marlin is considered a 'high concern'.

Turtles

Factor 2.1 - Inherent Vulnerability to Fishing

High
Sea turtles are long-lived and do not reproduce until late in life. They are considered to have a 'high' inherent vulnerability to fishing.

Factor 2.2 – Abundance

1.00: Very High Concern
Sea turtles that may be found in Trinidad and Tobago's waters of the Caribbean Atlantic include the leatherback, loggerhead, green, olive ridley, and hawksbill turtles. The leatherback and hawksbill sea turtles are considered to be 'critically endangered' {Sarti Martinez 2000, Mortimer and Donnelly 2008}, and the loggerhead and green sea turtles are considered 'endangered' {Marine Turtle Specialist Group 1996, Seminoff 2004}. The olive ridley is considered 'vulnerable' {Abreu-Grobois and Plotkin 2008}. A recent study that assessed the risks and threats of regional sea turtle populations around the globe found the green sea turtle in the south Caribbean

region to be at high risk, while the other sea turtles in this region were found to be at lower risk {Wallace et al. 2011}. Since the majority of the sea turtles are considered endangered, the population status of sea turtles is rated a 'very high concern'.

Factor 2.3 - Fishing Mortality

3.67: Low Concern
Sea turtles are known to be caught in the non-artisanal portion of Trinidad and Tobago's longline tuna fishery, but the amount caught is not recorded. The Trinidad and Tobago fisheries division has identified this issue as one requiring further investigation {MFP 2013c}. Although data from the Trinidad and Tobago is not available, some data for other, similar fisheries is available. Sea turtle catches recorded by scientific observers on-board U.S. pelagic longline vessels that fish in the Caribbean for tuna and swordfish are low, particularly compared to sea turtle catches in other areas of the Atlantic {NMFS 2012}. As well, a recent report that assessed bycatch impacts on sea turtles by gear type and region found that longline gear has a low impact on all sea turtles species (leatherback, loggerhead, hawksbill, olive ridley, and green) in the Northwest Atlantic/Caribbean region where the Trinidad and Tobago fishery takes place {Wallace et al. 2013}. Trinidad and Tobago has adopted a national recovery plan for sea turtles. Efforts to reduce sea turtle bycatch in Trinidad and Tobago fisheries have primarily focused on gillnet fisheries, since this is considered to be a much greater threat to their populations {Forestry Division et al. 2010}. Since longline fisheries in the Caribbean/Northwest Atlantic appear to have a low impact on sea turtles in this region, but it may not be negligible, fishing mortality on sea turtles is considered a 'low concern'.

All Species

Factor 2.4 - Discard Rate Modifying Score

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	Discard score
<20%	1
20-40%	0.95
40-60%	0.9
60-80%	0.85
80-100%	0.8
>100%	0.75

1.00: < 20%
Nearly all fish species, including sharks, are retained and utilized. However, some sea turtles and seabirds may be incidentally caught in the fishery and discarded back to sea {MFP 2013}. There is no information on bait use in this fishery. Overall discards in the fishery are likely minimal and less than 20% of the retained catch.

Criterion 3: Management effectiveness

Management is separated into management of retained species and management of non-retained species/bycatch. The final score for this criterion is the geometric mean of the two scores.

Region / Method	Management of Retained Species	Management of Bycatch Species	Criterion 3 Score
Trinidad and Tobago Caribbean Sea Longline, Pelagic	3.00: Moderate Concern	2.00: High Concern	Yellow(2.449)

Synthesis

Several management measures have been established by the International Commission for the Conservation of Atlantic Tunas (ICCAT) to manage tunas and their associated species, including total allowable catch limits for many species. The Trinidad and Tobago government has also established measures to manage tuna species, and Trinidad and Tobago tuna vessels reportedly follow many of the ICCAT management recommendations. However, there is limited monitoring of bycatch of sea turtles and seabirds in this fishery. Trinidad and Tobago is working to improve management of their tuna fisheries.

Justification of Ranking

Factor 3.1: Management of Fishing Impacts on Retained Species

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

- 5 (Very Low Concern) = Rated as 'highly effective' for all seven subfactors considered
- 4 (Low Concern) = Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective'.
- 3 (Moderate Concern) = All subfactors rated at least 'moderately effective'.
- 2 (High Concern) = At minimum meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective'.
- 1 (Very High Concern) = Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective'
- (Critical) = No management exists when a clear need for management exists (i.e., fishery catches threatened, endangered, or high concern species) OR there is a high level of Illegal, Unregulated, and Unreported Fishing occurring.

Factor 3.1: Management of fishing impacts on retained species								
Region / Method	Strategy	Recovery of Species of Concern	Research	Following of Scientific Advice	Enforcement of Regulations	Track Record	Stakeholder Inclusion	3.1 Score
Trinidad and tobago Caribbean Sea Longline, Pelagic	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	3.00: Moderate Concern

Subfactor 3.1.1 - Management Strategy and Implementation

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

Moderately Effective

In the Trinidad and Tobago fishery, yellowfin tuna, bigeye tuna, and swordfish are all targeted, while albacore tuna, Atlantic sailfish, white marlin, blue marlin, blackfin tuna, dolphinfish, and sharks are caught incidentally, but are retained. In the Atlantic, these species are managed through various conservation and management measures by the International Commission for the Conversation of Atlantic Tunas (ICCAT). As a member of the ICCAT, Trinidad and Tobago is expected to implement and follow the regulations established by the ICCAT. The main management measure for yellowfin tuna is a total allowable catch of 110,000 metric tons (t). There are also some measures in place to regulate fisheries that utilize fish aggregating devices (FADs) {ICCAT 2011c, 2012a}. There is 85,000 t catch limit for bigeye tuna {ICCAT 2011c}. The catch limit for North Atlantic Swordfish is 13,700 t, of which Trinidad and Tobago is permitted to catch 125 t {ICCAT 2011d}. A catch limit is also in place for albacore tuna {ICCAT 2011f}. Blue marlin and white marlin are managed under a rebuilding plan, that aims to reduce catches, but so far these species have remained overfished {ICCAT 2006, 2012a}. Recently, new catch limits were established for these species. The catch limit for blue marlin is 2,000 t and the catch limit for white marlin plus spearfish is 400 t {ICCAT 2012f}. There are currently no international regulations in place for Atlantic sailfish. Measures for sharks include the mandatory release of some species (but Trinidad and Tobago is exempted from this measure) and catch reporting requirements {ICCAT 2007, 2010a, b, 2011e}.

A new fisheries management bill was drafted by Trinidad and Tobago in 2011 to help improve management of their fisheries and help the nation to comply with all of the ICCAT regulations, but the bill has not yet gone into effect {MFP 2011b, ICCAT 2012b}. However, it is reported that Trinidad and Tobago longline fishermen do follow the measures recommended by the ICCAT to avoid sanctioning by the ICCAT and a ban on exporting tuna to the US {MFP 2013}. Additionally, a new licensing system will go into effect July 2013 which will grant fishing rights to vessels

based on their compliance with management regulations, such as catch reporting, proper vessel identification, and possession of navigational equipment {MFP 2013}. Research toward the development of a shark management plan is expected to begin in 2013 {Mohammed 2013, personal communication}. Trinidad and Tobago is also party to the Caribbean Regional Fisheries Mechanism, which had resolved to combat illegal, unregulated, and unreported fishing and to develop a common fisheries policy for the Caribbean region {CRFM 2010a, 2011}. Overall, some effective management is in place in Trinidad and Tobago and they are working towards the development of a successful management strategy.

Subfactor 3.1.2 - Recovery of Species of Concern

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

Moderately Effective

Several species caught in the Trinidad and Tobago tuna longline fishery are overfished, including yellowfin tuna, albacore tuna, white marlin, and blue marlin. All of these species are under rebuilding plans. The current management measures in place for yellowfin tuna, which includes a total allowable catch limit of 110,000 t, are thought to be sufficient to allow the population to rebuild {ICCAT 2012a}. However, there is concern about whether current fishing levels on yellowfin tuna are actually sustainable or not. A total allowable catch limit of 28,000 t has been set for albacore tuna, and is expected to allow the population to rebuild in the long term {ICCAT 2011f}. Regulations to reduce catches of blue marlin and white marlin have been in place since 2000. However, these species have continued to remain overfished and fishing levels have remained too high {ICCAT 2012a}. A total allowable catch limit of 2,000 was recently instituted for blue marlin, following scientific advice that catches above this level would not allow the population to increase {ICCAT 2012f}. A catch limit of 400 t was established for white marlin and spearfish combined, in order to ensure catches remain at or below the current level {ICCAT 2012f}. Bigeye tuna and Atlantic sailfish may also be overfished, but this remains uncertain. There are also concerns about the status of several shark species in the Atlantic Ocean. Some measures are in place to protect sharks, such as requirements to release vulnerable species and report catches {ICCAT 2007, 2010a, b, 2011e}. Trinidad and Tobago will begin research toward the development of a shark management plan in 2013 {Mohammed 2013, personal communication}. Overall, management measures to rebuild depleted species are in place, but have so far only been 'moderately effective'.

Subfactor 3.1.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species. To receive a highly effective score, population assessments must be conducted regularly and they must be robust enough to reliably determine the population status.

Moderately Effective

Population assessments have been conducted for yellowfin tuna, bigeye tuna, albacore tuna, swordfish, blue marlin, white marlin, Atlantic sailfish, and some pelagic sharks, including blue shark and shortfin mako shark {ICCAT 2012a}. However, for some species the population status remains highly uncertain (e.g. bigeye tuna, sailfish, sharks) {ICCAT 2012a). For the Trinidad fishery, catch data is collected, but data collection for the Tobago fishery has been poor. However, there are national efforts to improve data collection and research. A new licensing system law will soon go into effect, which will require fishermen to report catch and fishing effort data if they want to be granted a fishing license {MFP 2013}. Trinidad and Tobago is also working on implementing a data collection program to collect size data for the major species. Recently, they conducted a research study on their recreational fishery {ICCAT 2012b}. In 2013, they will begin research toward the development of a shark management plan {Mohammed 2013, personal communication}. They have not yet established an on-board scientific observer program to verify catch reports by fishermen (because of resource limitations), but such a program has been proposed in the new fisheries legislation they have drafted {MFP 2011a}. Overall, monitoring/data collection is 'moderately effective'.

Subfactor 3.1.4 - Management Record of Following Scientific Advice

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

Moderately Effective

Managers of the tuna fisheries in the Atlantic Ocean followed scientific advice when setting catch limits for some species (e.g. yellowfin tuna, blue marlin). However, managers have yet to establish measures for Atlantic sailfish, despite scientific advice to do so, and have set country-specific catch limits for swordfish above the recommended level {ICCAT 2012a}. Thus management only sometimes follows scientific advice.

Subfactor 3.1.5 - Enforcement of Management Regulations

Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations. To achieve a highly effective rating, there must be regular enforcement of regulations and verification of compliance.

Moderately Effective

Enforcement of management regulations in Trinidad and Tobago is being undertaken by the Fisheries Monitoring, Surveillance, and Enforcement Unit of the Fisheries Division {MFP 2013}. The current level of enforcement in Trinidad and Tobago is uncertain, but appears moderate. Catches are reported to be inspected upon landing in the longline fishery and as of 2011, vessel monitoring systems were beginning to be put on vessels larger than 24 meters in length {ICCAT 2012b}. A new licensing system will also go into effect in July 2013, which will grant fishing rights to vessels based on their compliance with management regulations. In order to qualify for a license there must be no evidence that they have engaged in illegal, unregulated, or unreported fishing {MFP 2013}. Transshipment is monitored at two port locations and foreign fishing vessels are particularly monitored in relation to illegal, unregulated, and unreported fishing {ICCAT 2012b}. Additional staff members are also being added in August 2013 to focus on monitoring of activities at transshipment ports to ensure fishing vessels are complying with national and international regulations {Mohammed 2013, personal communication}. Overall enforcement is considered 'moderately effective'.

Subfactor 3.1.6 – Management Track Record

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

Moderately Effective

Managers have implemented several measures to maintain or rebuild tuna and billfish populations, but several species still remain overfished {ICCAT 2012a}. Therefore the management track record is considered 'moderately effective'.

Subfactor 3.1.7 - Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process. Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g. fishermen, conservation groups, etc.). A highly effective will be given if the management process is transparent and includes stakeholder input.

Highly Effective

The current involvement of stakeholders in the management process is uncertain. However, the draft fishery management plan that is expected to go into effect stipulates that a fishery advisory board will be formed, which will consist of government officials, representatives from the various fishery sub-sectors, a representative from the fish processing industry, and a member of the scientific community. Additionally, the new legislation stipulates that

management plans should include the roles and responsibilities of the various stakeholders in the management process {MFPLMA 2011b}. Because there appears to be substantial effort to include all stakeholders in the management process, this factor is rated as 'highly effective'.

Factor 3.2: Management of Fishing Impacts on Bycatch Species

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

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

Factor 3.2: Management of fishing impacts on bycatch species					
Region / Method	**Strategy**	**Research**	**Following of Scientific Advice**	**Enforcement of Regulations**	**3.2 Score**
Trinidad and tobago Caribbean Sea Longline, Pelagic	Moderately Effective	Ineffective	Moderately Effective	Moderately Effective	2.00: High Concern

Subfactor 3.2.1 - Management Strategy and Implementation

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

Moderately Effective

Nearly all fish caught in the Trinidad and Tobago longline tuna fishery, including sharks, are kept and utilized. However sea turtles are known to be incidentally caught in this fishery, and seabirds may be incidentally caught as well {MFP 2013}. The International Commission for the

Conservation of Atlantic Tunas has established some measures pertaining to the bycatch of sea turtles and seabirds. Countries are required to collect data on sea turtle catches in their fisheries, and longline fishing vessels must carry de-hooking equipment to release any captured sea turtles {ICCAT 2010d}. There are also bycatch mitigation measures in place for seabirds in areas where seabird interactions are of high concern {ICCAT 2011g}, but in the Caribbean region, the tuna fisheries do not overlap with threatened seabird species. In Trinidad and Tobago, they do not yet collect information on sea turtle and seabird bycatch in the fishery. This has been identified as an area for research by the Trinidad and Tobago Fisheries Division {MFP 2013}. There is a national sea turtle recovery plan in place in Trinidad and Tobago {Forestry Division et al. 2010}. The taking, removing, or selling of turtle eggs and the killing or selling of any turtle is prohibited. Effort to reduce fisheries bycatch of sea turtles has primarily focused on gillnet fisheries, because these fisheries are thought to be a much greater threat to their populations {Forestry Division et al. 2010}. Because fishing mortality on sea turtles and seabirds by the Trinidad and Tobago fishery appears to be low and it is unclear whether management needs to implement additional measures to reduce bycatch of these species, we will consider the bycatch management strategy 'moderately effective'.

Subfactor 3.2.2 - Scientific Research and Monitoring

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

Ineffective

Bycatch in the Trinidad and Tobago longline tuna fishery includes sea turtles and seabirds. However, there has been no regular data collection of these bycatch species in the fishery. The Trinidad and Tobago Fisheries Division has identified these bycatch issues for further research {MFP 2013}. Bycatch monitoring is currently considered 'ineffective'.

Subfactor 3.2.3 - Management Record of Following Scientific Advice

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

Moderately Effective

Managers of the tuna fisheries in the Atlantic Ocean only sometimes follow scientists' advice (see management of retained species), so this factor is rated as 'moderately effective'.

Subfactor 3.2.4 - Enforcement of Management Regulations

Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's' compliance with regulations. To achieve a highly effective rating, there must be regular enforcement of regulations and verification of compliance.

Moderately Effective

Enforcement of management regulations in Trinidad and Tobago is considered 'moderately effective' (see management of retained species).

Criterion 4: Impacts on the habitat and ecosystem

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

Region / Method	Impact of Gear Type on Substrate	Mitigation of Gear Impacts	EBFM	Criterion 4 Score
Trinidad and Tobago Caribbean Sea Longline, Pelagic	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	**Green (3.873)**

Justification of Ranking

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

- 5 (None) = Fishing gear does not contact the bottom
- 4 (Very Low) = Vertical Line Gear
- 3 (Low) = Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom *occasionally* (<25% of the time) or purse seine known to commonly contact bottom
- 2 (Moderate) = Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand;
- 1 (High) = Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g. cobble or boulder).
- 0 (Very High) = Dredge or trawl fished on biogenic habitat, e.g. deep-sea corals, eelgrass and maerl.

Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive plausible habitat type

5.00: None

Pelagic longlines are unlikely to contact the seafloor. Therefore the impact on habitats/substrates is 'none'.

Factor 4.2 - Mitigation of Gear Impacts

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

Not Applicable

Factor 4.3 – Ecosystem-Based Fisheries Management

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

3.00: Moderate Concern

The longline fishery for yellowfin tuna also catches bigeye tuna, billfish (e.g. swordfish, marlins), and several sharks. These species are generally considered to be top predators and thus may play an important role in pelagic ocean ecosystems {Essington et al. 2002, Kitchell et al. 2002, Hunsicker 2012}. Some studies have shown that the removal of these large predators by fisheries can lead to changes in the food web or have top down cascading effects {Essington et al. 2002, Fonteneau 2003, Pauly and Palomares 2005, Ward and Myers 2005}. For instance, a reduction in these large predators has been linked to increases in prey species, like smaller fishes and invertebrates {Ward and Myers 2005, Essington 2007, Kitchell et al. 2006, Ferretti et al. 2010}. However, in other studies, top-down food web impacts from fishing large predators were not found to be as strong {Cox et al. 2002, Griffiths et al. 2010}. The extent of food web impacts caused by the removal of large predators may depend on a variety of factors, such as the intensity of fishing exerted on the predators and the diversity of predators in the ecosystem {Baum and Worm 2009, Ferretti et al. 2010}. So far the regional management body responsible for the management of tuna and their associated species in the Atlantic Ocean has made limited progress in incorporating ecosystem-based principles into management strategies {Gilman et al. 2013}. However, plans are in the works to develop an Ecosystem Based Fishery Management Plan, which includes plans to develop a model of the food web and to develop indicators of ecosystem health to be used as management targets. Some aspects of ecosystem based management are already being used in the population assessments {ICCAT 2012e}. Since there is some concern that tuna fisheries may negatively impact the ecosystem, but studies are underway to examine these impacts, management of the ecosystem and food web is considered a 'moderate concern'.

Overall Recommendation

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

The overall recommendation for the fishery is calculated as follows:

▲ **Best Choice** = Final Score between 3.2 and 5, **and** no Red Criteria, **and** no Critical scores

▲ **Good Alternative** = Final score between 2.2 and 3.199, **and** Management is not Red, **and** no more than one Red Criterion other than Management, **and** no Critical scores

▲ **Avoid** = Final Score between 0 and 2.199, **or** Management is Red, **or** two or more Red Criteria, **or** one or more Critical scores.

Species / Fishery	Impacts on Species Under Assessment	Impacts on other Species	Management Effectivness	Impacts on Habitat and Ecosystem	Overall Recommendation
Yellowfin tuna Trinidad and tobago Caribbean Sea - Longline, Pelagic	Red (2.16)	Red (1.41)	Yellow (2.45)	Green (3.87)	**Avoid (2.320)**

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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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Appendix A: Review Schedule

Next assessment for Yellowfin tuna scheduled for 2015. http://www.iccat.int/en/assess.htm. New management measures in Trinidad and Tobago may also go into effect in the next year or two.

Appendix B: List of All Species Assessed in the Fishery

Trinidad and Tobago: Caribbean Sea, Longline, Pelagic

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Blue Marlin	Medium	2.00: High Concern	1.00: High Concern	**1.414**
Turtles	High	1.00: Very High Concern	3.67: Low Concern	**1.916**
Atlantic White Marlin	Medium	2.00: High Concern	2.33: Moderate Concern	**2.159**
Atlantic Sailfish	High	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
Bigeye Tuna	High	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
Blackfin Tuna	Medium	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
Dolphinfish	Medium	3.00: Moderate Concern	2.33: Moderate Concern	**2.644**
Albacore Tuna	High	2.00: High Concern	3.67 Low Concern	**2.709**
Seabirds	High	2.00: High Concern	3.67 Low Concern	**2.709**
Sharks	High	2.00: High Concern	3.67: Low Concern	**2.709**
Swordfish	High	5.00: Very Low Concern	5.00: Very Low Concern	**5.000**

Justification of Ranking
For species not included in body of report

Albacore Tuna

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
The FishBase vulnerability score for albacore tuna is 58 out of 100, which is considered a 'high' inherent vulnerability to fishing {Froese and Pauly 2011}. However, the life history characteristics suggest albacore tuna has a 'medium' inherent vulnerability. They mature early in life (around 5 years and 90 cm), are moderately long-lived (15 years), and grow to a size of 140 cm {ISSF 2012}. They are broadcast spawners, releasing their eggs into the water column. They are considered top predators {Froese and Pauly 2011}. We have rated the inherent

vulnerability of albacore tuna as 'medium' since the life history information suggests this score is more appropriate.

Factor 2.2 – Abundance

2.00: High Concern
Albacore tuna in the North Atlantic is overfished. The current abundance is at around 62% of the target/limit level or the biomass at maximum sustainable yield (BMSY), with a potential range of 45-79% of BMSY (ICCAT 2012a). Therefore, the population status of albacore tuna is considered a 'high concern'.

Factor 2.3 - Fishing Mortality

3.67: Low Concern
The fishing mortality on albacore tuna is somewhat uncertain, but appears to be around the fishing level at the maximum sustainable yield (FMSY). Fishing mortality was estimated to be between 85% and 123% of FMSY {ICCAT 2012a}. A total allowable catch of 28,000 metric tons (t) was instituted for albacore tuna to allow the population to rebuild, but several provisions in the rule could potentially allow for catches to exceed this level. However, in recent years catches have been below the recommended limit {ICCAT 2012a}. Albacore tuna is a minor bycatch species in the Trinidad and Tobago longline tuna fishery {MFP 2013} and catches of albacore in the fishery only account for a very low percentage of the total fishing mortality on the species {ICCAT 2012a}. Fishing mortality on albacore tuna by the Trinidad and Tobago fishery is thus considered a 'low concern'.

Atlantic Sailfish

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
The FishBase vulnerability score for Atlantic sailfish is 65 out of 100 {Froese and Pauly 2011}. This is considered a ‘high’ inherent vulnerability to fishing. However, the life history information suggests that Atlantic sailfish only have a ‘medium’ inherent vulnerability to fishing. Females grow to around 220 cm in length and reach sexual maturity at around 155 cm in length {ICCAT 2012a}. They can live for at least 17 years. They are broadcast spawners, releasing their eggs into the water column. They are top predators {Froese and Pauly 2011}. We have rated vulnerability as 'medium' since the life history information suggests this is more appropriate

Factor 2.2 – Abundance

3.00: Moderate Concern
The abundance of Atlantic sailfish in the western Atlantic Ocean is highly uncertain. Large declines in abundance of Atlantic sailfish occurred prior to 1990. Since 1990 there is conflicting abundance data, with some abundance estimates indicating a declining trend, some an increasing trend, and others no trend. Some abundance estimates indicate that the population

is below the target/limit level or the biomass at maximum sustainable yield (BMSY), while others estimate abundance to be above BMSY {ICCAT 2012a}. Since the abundance of Atlantic sailfish in the western Atlantic Ocean is uncertain and the species has a medium vulnerability to fishing, the population status of Atlantic sailfish is rated a 'moderate concern'.

Factor 2.3 - Fishing Mortality

2.33: Moderate Concern
The most recent population assessment for Atlantic sailfish in the western Atlantic could not determine whether current fishing levels are sustainable or not {ICCAT 2012a}. The reported Atlantic sailfish catches by Trinidad and Tobago are very small (10-30 t), but catches by most nations are small {ICCAT 2012a}. Since the fishing mortality on Atlantic sailfish is unknown, fishing mortality is considered a 'moderate concern'.

Bigeye Tuna

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
The FishBase vulnerability score for bigeye tuna is 72 out of 100, which is considered a 'high' inherent vulnerability to fishing {Froese and Pauly 2011}. However, the life history information for bigeye tuna suggests they only have a 'medium' inherent vulnerability. They grow quickly, sexually maturing at 3-4 years of age or around 100 cm in length, live for around 15 years, and grow to a medium size of 230 cm {ISSF 2012, ICCAT 2012a}. They are broadcast spawners, releasing their eggs into the water column. They are considered top predators {Froese and Pauly 2011}. We have rated vulnerability as 'medium' since the life history information suggests this is more appropriate.

Factor 2.2 – Abundance

3.00: Moderate Concern
The abundance of bigeye tuna in the Atlantic Ocean appears to have increased in recent years. However, it remains uncertain whether abundance is above or below the target/limit abundance level, and hence whether the population is overfished or not. Abundance is estimated to potentially range from 72% to 134% of the target/limit level or the biomass at maximum sustainable yield (BMSY) {ICCAT 2012a}. Since abundance is unknown and bigeye tuna have a medium vulnerability to fishing, the population status of bigeye tuna is rated a 'moderate concern'.

Factor 2.3 - Fishing Mortality

2.33: Moderate Concern
Bigeye tuna are one of the primary target species in the Trinidad and Tobago tuna longline fishery {MFP 2013}. The fishing mortality of bigeye tuna in the Atlantic Ocean is uncertain. Fishing mortality is estimated to range from 65% to 155% of the fishing mortality at maximum

sustainable yield (FMSY). Therefore is cannot be determined whether total fishing levels on bigeye tuna are sustainable or not {ICCAT 2012a}. Since the fishing mortality on bigeye tuna is unknown but management measures are in place for this species, fishing mortality is considered a 'moderate concern'.

Blackfin Tuna

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
Blackfin tuna are a small tuna species that can grow to just over 100 cm in length {Collette et al. 2011c}. The FishBase vulnerability score for blackfin tuna is 41 out of 100 {Froese and Pauly 2011}. This is considered a 'medium' inherent vulnerability to fishing.

Factor 2.2 – Abundance

3.00: Moderate Concern
The abundance of blackfin tuna in the western Atlantic/Caribbean region is unknown {ICCAT 2012a, CRFM 2012}. The International Union for the Conservation of Nature (IUCN) list blackfin tuna as a species of 'least concern' because there is no evidence of population declines {Collette et al. 2011c}. The population status of blackfin tuna is considered a 'moderate concern'.

Factor 2.3 - Fishing Mortality

2.33: Moderate Concern
It is unknown whether the current fishing levels on blackfin tuna are sustainable or not {CRFM 2012, Collette et al. 2011c}. Reported catches of blackfin tuna by Trinidad and Tobago are small {ICCAT 2012a}, but this species is primarily caught in the Tobago portion of the fishery, which has poor catch reporting {MFP 2013}. Fishing mortality of blackfin tuna is considered a 'moderate concern'.

Dolphinfish (Mahi Mahi)

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
Dolphinfish or mahimahi are short-lived, reach sexual maturity early in life, and grow to a size of around 200 cm in length. The FishBase vulnerability score for dolphinfish is 39 out of 100, which is considered a 'medium' inherent vulnerability to fishing {Froese and Pauly 2011}.

Factor 2.2 – Abundance

3.00: Moderate Concern
The abundance of dolphinfish in relation to target conservation abundance reference points/goals is unknown. Catch rates of dolphinfish in eastern Caribbean fisheries, which are used to provide an index of abundance, show no consistent decreasing or increasing trend from

1995 to 2010 {CRFM 2010b}. Since the abundance of dolphinfish is unknown and dolphinfish have a medium vulnerability to fishing, their population status is considered a 'moderate concern'.

Factor 2.3 - Fishing Mortality

2.33: Moderate Concern
The fishing mortality of dolphinfish is unknown. Catches of dolphinfish in the eastern Caribbean region have been increasing. Catches by the island nations in the eastern Caribbean have reached 1200 t in recent years. When catches by the U.S., Brazil, and Venezuela are also included, catches have reached over 3000 t {CRFM 2010b}. There is no indication of abundance declines over the last 15 years. This suggests that fishery removals are not having a significant effect on the dolphinfish population, but since a formal population assessment has not been conducted for dolphinfish, this remains uncertain {CRFM 2010b}. Fishing mortality on dolphinfish is considered a 'moderate concern'.

Seabirds

Factor 2.1 - Inherent Vulnerability to Fishing

High
Seabirds are considered to have a 'high' inherent vulnerability to fishing.

Factor 2.2 – Abundance

2.00: High Concern
Several seabird species are found throughout the Caribbean region, however, none are known to be threatened or endangered {Birdlife International 2013}. Because seabirds have a high inherent vulnerability to fishing and abundance is unknown, the status of seabirds is considered a 'high concern'.

Factor 2.3 - Fishing Mortality

3.67: Low Concern
There have been few reports of seabird catches in the Trinidad and Tobago longline tuna fishery, but it is uncertain whether seabirds are caught but not reported. This fisheries division in Trinidad and Tobago has identified this issue for further research {MFP 2013}. Seabird catches in the U.S. pelagic longline fishery for tuna and swordfish in the Atlantic, Gulf of Mexico, and Caribbean regions are low {NMFS 2012}. Additionally, the seabird species that could potentially be caught are not considered to be threatened or endangered {BirdLife International 2013}. Fishing mortality on seabirds is considered a 'low concern'.

Sharks

2.1 - Inherent Vulnerability

High
In general, sharks have a 'high' inherent vulnerability to fishing {Froese and Pauly 2011}. Most are long-lived, reach sexual maturity late in life, and have low reproductive rates.

Factor 2.2 – Abundance

2.00: High Concern
The two most common sharks species caught in the Trinidad and Tobago pelagic longline tuna fishery are the blue shark and thresher sharks. Other sharks that are also sometimes caught include the shortfin mako, longfin mako, hammerhead, blacktip, sandbar/brown, tiger and night sharks {MFP 2013}. Population assessments have only been conducted for blue shark and shortfin mako shark in the Atlantic Ocean. The abundances of both blue shark and shortfin mako shark are estimated to be above the target level, i.e. the biomass at maximum sustainable yield (BMSY); however, there is a high degree of uncertainty in these abundance estimates {ICCAT 2012a, d}. The International Union for the Conservation of Nature (IUCN) considers the blue shark 'near threatened' {Stevens 2009} and the shortfin mako shark 'vulnerable' on their red list of threatened species {Cailliet et al. 2009}. Thresher sharks are also considered 'vulnerable {Goldman et al. 2009} and several of the other shark species caught in the fishery are considered 'vulnerable' or 'endangered' as well. Therefore, the population status of shark species is a 'high concern'.

Factor 2.3 - Fishing Mortality

3.67: Low Concern
The recent stock assessments for blue shark and shortfin mako shark in the Atlantic Ocean estimate fishing levels to be below the fishing mortality at maximum sustainable yield (FMSY), which would mean fishing levels are currently sustainable {ICCAT 2012a, d}. However, there is a high degree of uncertainty in these estimates. Fishing mortality on other shark species is unknown. The Trinidad and Tobago fishery only catches low numbers of shark species. From 2002-2010 they caught a total of 246 t of shark. Blue shark is the most common shark species caught followed by thresher sharks {MFP 2013}. Catches of blue shark by Trinidad and Tobago only accounted for 9 t of the 65,000 t reportedly caught in the Atlantic Ocean {ICCAT 2012a}. Given that the contribution to total shark mortality by the Trinidad and Tobago fishery is likely low, we have rated fishing mortality on sharks a 'low concern'.

Swordfish

Factor 2.1 - Inherent Vulnerability to Fishing

Medium
The FishBase vulnerability score for swordfish is 72 out of 100 which is considered a 'high' inherent vulnerability to fishing {Froese and Pauly 2011}. However, life history information for

swordfish indicates they mature around 180 cm in length and age 5, or possibly earlier, can live for 15 years, and can grow to large sizes in excess of 300 cm {ICCAT 2012a, Froese and Pauly 2011}. They are broadcast spawners, releasing their eggs into the water column. They are top predators. The life history information suggests that a 'medium' inherent vulnerability rating is more appropriate.

Factor 2.2 – Abundance

5.00: Very Low Concern
The abundance of swordfish in the North Atlantic Ocean is estimated to be at or just above the target abundance level or the biomass at maximum sustainable yield (BMSY) {ICCAT 2012a}. Therefore the population status of swordfish is a 'very low concern'.

Factor 2.3 - Fishing Mortality

5.00 Very Low Concern
Swordfish are also targeted in Trinidad and Tobago's longline tuna fishery {MFPLMA 2013}. Since 2005, fishing mortality on swordfish has been below the fishing mortality at maximum sustainable yield (FMSY), indicating that current fishing levels are sustainable {ICCAT 2012a}. Therefore fishing mortality of swordfish is considered a 'very low concern'.

About Blue Ocean Institute

Blue Ocean Institute creates an original blend of science, art and literature that inspires a deeper connection with nature, especially the sea. Our books, films and educational programs instill hope, enlighten personal choices and build a larger constituency for conservation. From Alaskan fishing villages to Zanzibar's shores, we witness firsthand how nature is changing, then explain what these changes mean for wildlife and for people. Blue Ocean translates science into language people can understand. Our goal is to be a unique voice of hope, guidance and inspired change. Our work is disseminated through major, mainstream outlets such as the PBS television network, *The New York Times*, Huffington Post, NationalGeographic.com and CNN.com plus other established print, television and online media.

Founded in 2003 by conservation pioneer and MacArthur "genius" award winner Dr. Carl Safina, Blue Ocean Institute builds on three decades of his field research, policy work, acclaimed books and other writing.

Blue Ocean's *From Sea to Table* Program
Blue Ocean's founders created the first seafood guide in 1998. Blue Ocean's online seafood guide now encompasses over 160-wild-caught species. Our peer-reviewed seafood reports are transparent, authoritative, easy to understand and use. All rankings and full reports are available on our website in the *Seafood Choices* section. *From Sea to Table* helps consumers, retailers, chefs and health professionals discover the connection between human health, a healthy ocean, fishing and sustainable seafood.

- Our online guide to sustainable seafood is based on our scientific rankings for more than 160 wild-caught seafood species and provides simple guidelines.
- We partner with Whole Foods Market (WFM) to help educate their seafood suppliers and staff, and provide our scientific seafood rankings for WFM stores in the US and UK.
- Through our partnership with Chefs Collaborative, we created *Green Chefs/Blue Ocean,* a free, interactive, online sustainable seafood course for chefs and culinary professionals.
- Our website features tutorials, videos, blogs, links and discussions of the key issues such as mercury in seafood, bycatch, overfishing, etc.

Check out our Fellows Program, Scientific Collaborations and Carl Safina's current work at www.blueocean.org.

Blue Ocean Institute is a 501 (c) (3) nonprofit organization based in the School of Marine & Atmospheric Sciences at Stony Brook University, Long Island, NY. www.blueocean.org admin@blueocean.org |

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

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

Guiding Principles

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished[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 capture fisheries must possess to be considered sustainable by the Seafood Watch program:

- *Stocks are healthy and abundant.*
- *Fishing mortality does not threaten populations or impede the ecological role of any marine life.*
- *The fishery minimizes bycatch.*
- *The fishery is managed to sustain long-term productivity of all impacted species.*
- *The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.*
- *Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts, or reduction of genetic diversity.*

Based on these guiding principles, Seafood Watch has developed a set of four sustainability **criteria** to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Impacts on the species/stock for which you want a recommendation
2. Impacts on other species
3. Effectiveness of management
4. Habitat and ecosystem impacts

Each criterion includes:

- Factors to evaluate and rank
- Evaluation guidelines to synthesize these factors and to produce a numerical score
- A resulting numerical score and **rank** for that criterion

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

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

Best Choices/Green: Are well managed and caught or farmed in environmentally friendly ways.

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

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