



Monterey Bay Aquarium Seafood Watch®

Albacore Tuna

Thunnus alalunga



Image ©Monterey Bay Aquarium

Canada, Japan, US

Troll/Pole

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Alexia Morgan, Consulting Researcher

Disclaimer

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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 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 fished¹ or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

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

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

Each criterion includes:

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

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

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

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

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

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

Summary

Albacore tuna are caught in a variety of fisheries throughout the world. This report focuses on three, the United States, Canada (troll only), and Japan, troll and pole fisheries for albacore tuna in the North Pacific Ocean.

Abundance levels of albacore tuna in the North Pacific Ocean are high and fishing mortality rates are low. Troll and pole fisheries are highly selective and interactions with species of concern, such as marine mammals, sea turtles and sea birds have not been reported. Some shark species may be caught, but in very low amounts. This type of gear also has little to no impact to bottom habitats.

Albacore in the North Pacific Ocean are managed throughout their range by two regional fishery management organizations (RFMOs): the Western and Central Pacific Fisheries Management Council (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC). In domestic waters, the National Marine Fisheries Service is responsible for albacore tuna management in the United States, the Department of Fisheries and Oceans Canada is responsible in Canadian waters and in Japanese waters the Ministry of Agriculture, Forestry and Fisheries is responsible.

Although few management measures are in place for albacore tuna (both internationally and domestically) they have a healthy status, low bycatch and low impacts on bottom habitats in the North Pacific Ocean.

Table of Conservation Concerns and Overall Recommendations

Stock / Fishery	Impacts on the Stock	Impacts on Other Spp.	Management	Habitat and Ecosystem	Overall Recommendation
Albacore Tuna United States North Pacific – Troll/Pole	Green (3.83)	Green (5.00)	Yellow (3.00)	Green (3.87)	Best Choice (3.862)
Albacore Tuna Canada North Pacific – Troll/Pole	Green (3.83)	Green (5.00)	Yellow (3.00)	Green (3.87)	Best Choice (3.862)
Albacore Tuna Japan North Pacific – Troll/Pole	Green (3.83)	Green (5.00)	Yellow (3.00)	Green (3.87)	Best Choice (3.862)

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, **and** neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern,² **and** no more than one Red Criterion, **and** no Critical scores, **and** does not meet the criteria for Best Choice (above)
- **Avoid/Red** = Final Score ≤2.2, **or** either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern,² **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).

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Introduction

Scope of the analysis and ensuing recommendation

This report is for the Canadian, United States and Japanese North Pacific Ocean albacore tuna (*Thunnus alalunga*) troll and pole fisheries.

Overview of the species and management bodies

Albacore tuna are widely distributed in temperate and tropical waters in all oceans. There are six management units of albacore tuna: North and South Pacific Ocean, North and South Atlantic Ocean, Indian Ocean and Mediterranean Sea (ISSF 2014).

In international waters, albacore tuna is managed by the Western and Central Pacific Fisheries Commission and Inter-American Tropical Tuna Commission. The Department of Fisheries and Oceans manages Canada's waters, the National Marine Fisheries Service manages in the United States, and the Ministry of Fisheries and Agriculture manages in Japan.

Production Statistics

Globally, longline fisheries catch the majority of albacore tuna, but in the North Pacific Ocean troll and pole fisheries are also very important. Total albacore catches in the North Pacific in 2013 were 92,900 t (ISSF 2014). During 2013, troll and pole fisheries captured 34% of all albacore tuna, compared to 40% by longline fisheries (ISSF 2014).

Surface fisheries in the North Pacific Ocean, which include troll and pole, catch more than half of all albacore tuna. Troll and pole fisheries capture small juvenile albacore. Total catches in the North Pacific peaked at 126,000 t in 1976, reached the lowest level of 37,000 t in 1991, and subsequently reached the second highest peak of 125,000 t in 1999. Catches have varied between 65,000 lbs and 92,000 lbs between 2006 and 2012 (ISCAWG 2014). Pole and line and troll catches in the region have increased from lows in the 1990s of 10,000 t to around 50,000 t in the early 2000s. In recent years, pole and line catches have been less, fluctuating around 30,000 t (ISSF 2014) (ISSF 2014).

The Canadian troll, United States troll/pole and Japanese pole and line fisheries are the primary surface fleets in this region. In recent years, Canadian troll catches of albacore tuna have ranged from a low of 2,734 t in 1999 to a high of 7,856 t in 2004. The majority of this catch, primarily in recent years, has occurred along the US and Canadian coast line (FOC 2012). Since 1996, US troll and pole, and line catches, of albacore tuna have ranged from 8,400 t to 17,000 t (FOC 2012). Catches of albacore tuna by Japan peaked in the early 1970s and have remained below this peak since. In 2012, the Japanese fleet caught over 40,000 t of albacore tuna in the

North Pacific (ISCAWG 2014).

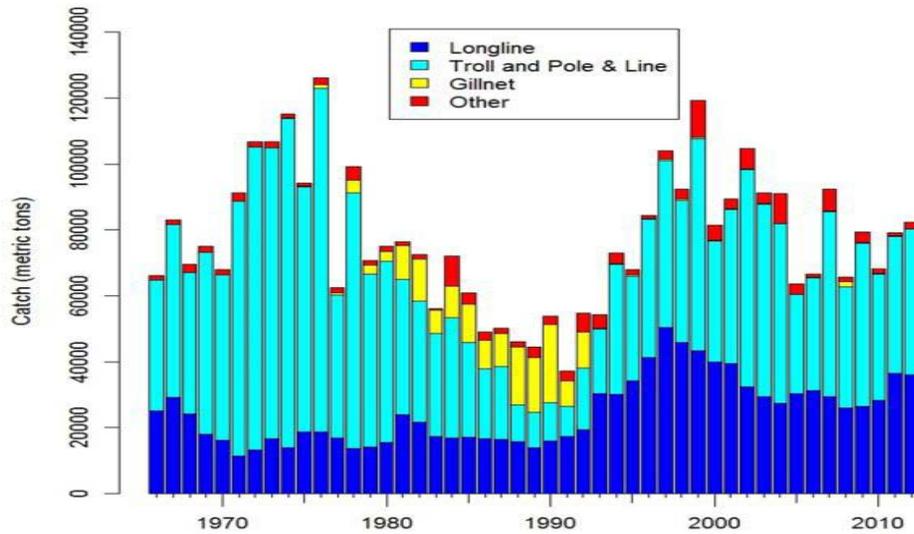


Figure 1: Catches of North Pacific albacore (*Thunnus alalunga*) by major gear types, 1966-2012. The Other gear category includes catches with purse seine, recreational gear, hand lines, and harpoons (SCAWG 2014).

Importance to the US/North American market

During 2013, the United States imported the most (39%) albacore tuna from Thailand. Included under 'Other' countries, the United States also imports large amounts of albacore from include Vietnam (20%) and Indonesia (16%) (NMFS 2014).

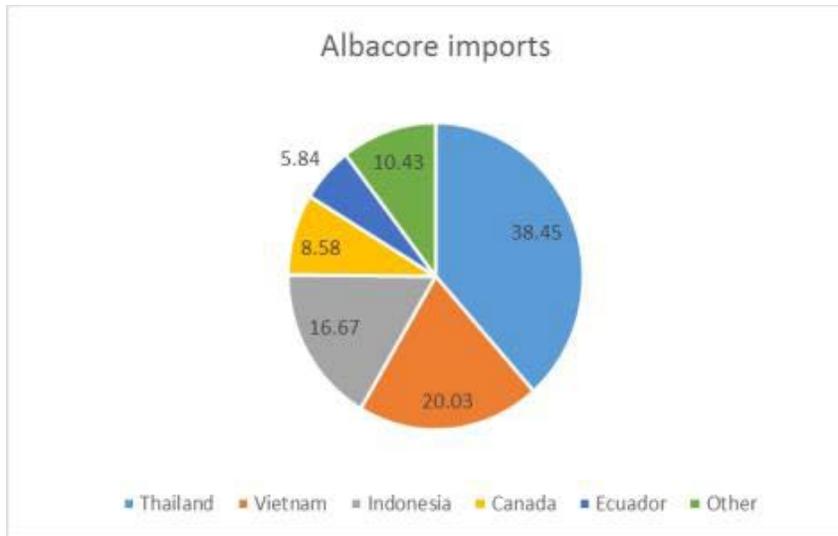


Figure 2: Major contributors to US albacore tuna imports in 2013, all countries and regions (%) (country of origin) (NMFS 2014).

Common and market names

Albacore tuna is also known as germon, longfinned tuna, albacore, white tuna and T. germo.

Primary product forms

Albacore tuna is commonly sold fresh, frozen and canned.

Assessment

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

Criterion 1: Stock for which you want a recommendation

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

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and <=3.2=Yellow or Moderate Concern*
- *Score <=2.2=Red or High Concern*
Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

Criterion 1 Summary

ALBACORE TUNA				
Region / Method	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Canada North Pacific Troll/Pole	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)
Japan North Pacific Troll/Pole	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)
United States North Pacific Troll/Pole	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.831)

Albacore tuna populations in the North Pacific Ocean are healthy and fishing pressure appears to be at sustainable levels.

Criterion 1 Assessment

ALBACORE TUNA

Factor 1.1 - Inherent Vulnerability

Scoring Guidelines

- *Low—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).*
- *Medium—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing,*

(e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain).

- *High—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make it particularly vulnerable to fishing, (e.g., long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator).*

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

Medium

FishBase assigned a high vulnerability score of 58 out of 100 (Froese and Pauly 2013). However, the life history characteristics of albacore suggest only a medium vulnerability to fishing. For example, albacore reach sexual maturity between 5 and 6 years of age and reach a maximum age of 15 years (ISCAWG 2014). They are broadcast spawners, and top predators (Froese and Pauly 2013). Based on these life history characteristics we have awarded a 'medium' score.

Factor 1.2 - Abundance

Scoring Guidelines

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

Low Concern

The most recent stock assessment for albacore tuna in the North Pacific Ocean was conducted in 2014. According to this assessment, the spawning stock biomass (SSB) in 2012 (last year of data included in the model) was 110,101 t with stock depletion estimated to be 35.8% of the unfished SSB. No biomass based reference points are in place, but the assessment concluded that there was little indication that the SSB was below any candidate biomass based reference points. We have, therefore, awarded a 'low' concern score because it is likely that albacore tuna in the North Pacific are not overfished, but are not a 'very low' concern score because no reference points are currently accepted (ISCAWG 2014).

Factor 1.3 - Fishing Mortality

Scoring Guidelines

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole**United States North Pacific, Troll/Pole****Low Concern**

The current fishing mortality rate (F2010-2012) for albacore tuna in the North Pacific Ocean is around 72% of the interim reference point (FSSB-ATHL50%, which is the fishing mortality rate that would lead to future minimum SSB falling below the SSB-ATHL threshold level at least once during a 25 year projection period). In addition, the current fishing mortality rates (F2010-2012) are below other F-based reference points (FMSY F0.1 and F10-40% (fishing mortality that gives 10%–50% reduction in the spawning potential ratio)) except FMED and F50%. Albacore tuna in the North Pacific Ocean are therefore not currently undergoing overfishing. However, any increases in fishing mortality rates will significantly reduce the spawning biomass (ISCAWG 2014). We have awarded a 'low' and not 'very low' concern score because there is no accepted target reference point (only interim) and because increases in fishing mortality could reduce the spawning biomass.

Criterion 2: Impacts on Other Species

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

- Score >3.2=Green or Low Concern
 - Score >2.2 and <=3.2=Yellow or Moderate Concern
 - Score <=2.2=Red or High Concern
- Rating is Critical if Factor 2.3 (Fishing Mortality) is Critical.

Criterion 2 Summary

Albacore Tuna: Canada North Pacific, Troll/Pole

Subscore: 5.000 Discard Rate: 1.00 C2 Rate: 5.000

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
ALBACORE TUNA	Medium	4.00: Low Concern	3.67: Low Concern	3.831

Albacore Tuna: Japan North Pacific, Troll/Pole

Subscore: 5.000 Discard Rate: 1.00 C2 Rate: 5.000

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
ALBACORE TUNA	Medium	4.00: Low Concern	3.67: Low Concern	3.831

Albacore Tuna: United States North Pacific, Troll/Pole

Subscore: 5.000 Discard Rate: 1.00 C2 Rate: 5.000

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
ALBACORE TUNA	Medium	4.00: Low Concern	3.67: Low Concern	3.831

Bycatch in the North Pacific albacore troll and pole fishery is minimal, representing typically less than 1% of the total catch (Kelleher 2005). Bycatch does not typically include any species of concern, such as sea birds, sea turtles, or marine mammals, although sharks may be incidentally caught. For example, bycatch in the Canadian North Pacific albacore troll fishery during 2011, consisted of 10 albacore tuna considered too small, 8 blue sharks, 2 shortfin mako sharks, 6 Pacific Bluefin tuna, 1 bigeye tuna, 2 dolphin fish and 42 yellowtail, all of which were released alive. This represented 0.02% of the total catch by weight (Holmes 2012). During 2011, less than 4 mt of other species (other tuna, dorado, groundfish and salmon) were landed by the US west coast albacore hook and line fishery (PFMC 2012). Although baitfish are used in this fishery, their ratio of tuna to baitfish is around 30:1. In addition, baitfishing typically makes up only a small proportion of the total fishing effort on bait species (Gillett 2012). Due to these reasons, no baitfish species are included in this report and we have, therefore, included only albacore tuna (the target species), in this report.

Criterion 2 Assessment

Factor 2.4 - Discard Rate

Canada/North Pacific, Troll/Pole

Japan/North Pacific, Troll/Pole

United States/North Pacific, Troll/pole

< 20%

The average discard rate in tuna pole and line fisheries is 0.1%, although this rate can be slightly higher, up to 0.4%, in some fisheries operating in the Western and Central Pacific Ocean (Kelleher 2005). For example, the discard rate in the Canadian North Pacific albacore troll and pole fishery has recently been reported to be 0.02% of the total catch by weight (Holmes 2012). Troll and pole and line fisheries depend heavily on the use of baitfish (baitfish most often come from other fisheries) (Gillett 2012). However, the amount of tuna caught is much greater than the amount of baitfish used. The tuna to bait ratio is typically around 30 to 1, although this can vary by fishery due to differences in the baitfish used, and the fishing technique (Gillett 2010). Therefore, we have left the score as <20%.

Criterion 3: Management effectiveness

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

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

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and <=3.2=Yellow or Moderate Concern*
- *Score <=2.2 or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = Red or High Concern*
Rating is Critical if either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical.

Criterion 3 Summary

Region / Method	Management of Retained Species	Management of Non-Retained Species	Overall Recommendation
Canada North Pacific Troll/Pole	3.000	All Species Retained	Yellow(3.000)
Japan North Pacific Troll/Pole	3.000	All Species Retained	Yellow(3.000)
United States North Pacific Troll/Pole	3.000	All Species Retained	Yellow(3.000)

Factor 3.1: Harvest Strategy

Scoring Guidelines

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

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

- *2 (High Concern)—At minimum, meets standards for ‘moderately effective’ for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated ‘ineffective.’*
- *1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated ‘ineffective.’*
- *0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of illegal, unregulated, and unreported fishing occurring.*

Factor 3.1 Summary

Factor 3.1: Management of fishing impacts on retained species							
Region / Method	Strategy	Recovery	Research	Advice	Enforce	Track	Inclusion
Canada North Pacific Troll/Pole	Moderately Effective	N/A	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective
Japan North Pacific Troll/Pole	Moderately Effective	N/A	Highly Effective	Highly Effective	Moderately Effective	Highly Effective	Highly Effective
United States North Pacific Troll/Pole	Moderately Effective	N/A	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective

This report focuses on albacore tuna caught by three nations within the North Pacific Ocean: Canada, Japan and the United States. These fisheries are independently managed by their respective nation’s fishery policies. The Pacific Fishery Management Council has jurisdiction within the US EEZ waters, Fisheries and Oceans Canada has jurisdiction within Canada’s water, and within Japanese waters, the Ministry of Agriculture, Forestry and Fisheries is in charge. However, these fisheries target highly migratory species that have a range spanning into international waters. Albacore populations in the North Pacific Ocean are also managed through two regional fishery management organizations (RFMOs), the Western and Central Pacific Fisheries Commission (WCPFC) in the Western and Central Pacific Ocean (WCPO) and the Inter-American Tropical Tuna Commission (IATTC) in the Eastern Pacific Ocean. Fleets must abide by the respective RFMO's management measures when they are members of the RFMOs. All three nations (Canada, Japan and the US) are members of both RFMOs. For this report, we have scored the management sections according to the individual country’s effectiveness. We consider all species to be kept, due to the low bycatch rate in this fishery and, therefore, only the 'harvest strategy' section is scored.

Subfactor 3.1.1 – Management Strategy and Implementation

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

Canada North Pacific, Troll/Pole

Moderately Effective

Albacore tuna in Pacific waters is managed by the WCPFC in the western and central Pacific, and the IATTC in the eastern Pacific. These two commissions combine to be the Regional Management Organization, and Canada is a party to both, meaning they must abide by their management measures when fishing within the respective convention areas. While the IATTC's convention area includes the entire eastern Pacific region up to the North American coastline, the WCPFC measures are designed primarily for the high seas, with the goal of compatible measures in each country's EEZ (some measures do apply to EEZ waters).

Measures were adopted by the WCPFC and IATTC in 2005. Those management measures included maintaining current catch levels in order to maintain the long-term sustainability of the stock, and the WCPFC was to work with members of the IATTC to agree on consistent management measures for the North Pacific population (IATTC 2005)(WCPFC 2005). In 2013, IATTC adopted a new resolution requiring member countries to report the average catches of North Pacific albacore tuna between 2007 and 2012 by gear type, along with a list of vessels that fish for albacore in the North Pacific. In addition, the Commission plans to work toward the development of target and limit reference points, as well as the development of harvest control rules for this species (IATTC 2013).

In addition to the IATTC and WCPFC measures, Canada has developed a management plan in the North Pacific that uses a risk averse and precautionary manner, based on the best scientific advice to conserve albacore tuna populations (FOC 2012). Under this plan, there is a treaty between the United States and Canada, allowing Canadian fishermen to fish in US waters during certain times of the year, with a limited number of vessels allowed under this treaty. In addition, there are fishing seasons, area restrictions, and catch and effort reporting requirements (FOC 2012), but no precautionary harvest guidelines or quotas are in place for albacore tuna. The majority of Canadian troll vessels fish in coastal waters of Canada and the United States, but some fishing does occur in international waters.

Japan North Pacific, Troll/Pole

Moderately Effective

Albacore tuna in Pacific waters is managed by the WCPFC in the western and central Pacific, and the

IATTC in the eastern Pacific. These two commissions are regional fishery management organizations (RFMOs) and Japan is a party to both, meaning they must abide by their management measures when fishing within the respective convention areas. While the IATTC's convention area includes the entire eastern Pacific region up to the North American coastline, the WCPFC measures are designed primarily for the high seas, with the goal of compatible measures in each country's EEZ (some measures do apply to EEZ waters).

Measures were adopted by the WCPFC and IATTC in 2005. Those management measures included maintaining current catch levels in order to maintain the long-term sustainability of the stock. Additionally, the WCPFC was to work with members of the IATTC to agree on consistent management measures for the North Pacific population (IATTC 2005)(WCPFC 2005). In 2013, IATTC adopted a new resolution, requiring member countries to report the average catches of North Pacific albacore tuna between 2007 and 2012 by gear type, along with a list of vessels that fish for albacore in the North Pacific. In addition, the Commission plans to work toward the development of target and limit reference points, as well as the development of harvest control rules for this species (IATTC 2013).

Japan has both offshore and distant water pole, and line fisheries for albacore tuna (Brodziak and Ishimura 2010). The Ministry of Agriculture, Forestry and Fisheries is responsible for the management of albacore tuna in Japanese waters. In domestic waters, fisherman report catch and effort through a logbook program (Okamoto and Bayliff 2003), but there are no catch limits in place (Yagi 2002). We have awarded a score of 'moderately effective' because few management measures are in place at domestic level.

United States North Pacific, Troll/Pole

Moderately Effective

Albacore tuna in Pacific waters is managed by the WCPFC in the western and central Pacific, and the IATTC in the eastern Pacific. These two commissions are RFMOs (the United States is a party to both) and all must abide by their management measures when fishing within the respective convention areas. While the IATTC's convention area includes the entire eastern Pacific region up to the North American coastline, the WCPFC measures are designed primarily for the high seas, with the goal of compatible measures in each country's EEZ (some measures do apply to EEZ waters).

Measures were adopted by the WCPFC and IATTC in 2005. Those management measures included maintaining current catch levels in order to maintain the long-term sustainability of the stock and the WCPFC was to work with members of the IATTC to agree on consistent management measures for the North Pacific population (IATTC 2005)(WCPFC 2005). In 2013, IATTC adopted a new resolution requiring member countries to report their average catch of North Pacific albacore tuna between 2007 and 2012 by gear type, and submit a list of vessels that fish for albacore in the North Pacific. In addition, the Commission plans to work toward the development of target and limit reference points, and to develop

harvest control rules for this species (IATTC 2013).

Domestically, albacore tuna is managed under the Pacific Fishery Management Council Fishery Management Plan for US West Coast Fisheries for Highly Migratory Species. This plan utilizes precautionary measures to preserve albacore and other highly migratory stocks, but no precautionary harvest guidelines or quotas are in place for albacore tuna (PFMC 2011). In addition, there is a treaty between the US and Canada that allows for licensed vessels to fish in respective waters (PRFMC 2011). We have, therefore, awarded a ‘moderately effective’ score.

Subfactor 3.1.2 – Recovery of Species of Concern

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

N/A

No recovery plan is needed because North Pacific albacore tuna are not overfished (ISCAWG 2014).

Subfactor 3.1.3 – Scientific Research and Monitoring

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

Highly Effective

Albacore tuna stocks are monitored and assessed on a regular basis and the last assessment was conducted in 2011 (ISCAWG 2014). Information on catches, catch per unit effort, and size at catch data from multiple fisheries targeting albacore tuna in the North Pacific was included in the assessment (ISAWG 2011). We have awarded a 'highly effective' score because assessments, which include fishery dependent data, are conducted on a regular basis.

Subfactor 3.1.4 – Management Record of Following Scientific Advice

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

Canada North Pacific, Troll/Pole

Highly Effective

There are no TACs currently in place, either domestically or internationally, for albacore tuna. However, we have awarded a score of 'highly effective' because Canada has complied with all other international measures and scientific advice as well as developed domestic measures.

Japan North Pacific, Troll/Pole

Highly Effective

The Japanese management system does allow for the use of the total allowable catch or effort (TAC/TAE) system to be utilized. This system is not currently used for albacore tuna, but the population is considered healthy at current fishing rates (Yagi 2002) (ISCAWG 2014). Japan is a cooperating member of the Western and Central Pacific Fisheries Commission and the Inter-American Tropical Tuna Commission (manages albacore tuna on the high seas), and appears to comply with required management measures. We have therefore awarded a 'highly effective' score.

United States North Pacific, Troll/Pole

Highly Effective

The United States fishery management plan for highly migratory species calls for the inclusion of scientific advice when species with international boundaries become overfished. Albacore tuna is not currently overfished so it does not fall under this category and the recent assessment did not call for any

additional management measures to be put into place. We have awarded a score of ‘highly effective’ because the United States has taken action for other highly migratory species (i.e., bigeye) for which this has occurred (PFMC 2011) and because they have adhered to international measures.

Subfactor 3.1.5 – Enforcement of Management Regulations

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

Canada North Pacific, Troll/Pole

Highly Effective

Domestically, Canada has a compliance plan that includes the use of marine enforcement officers, public awareness campaigns, and aerial surveillance (FOC 2012). According to the latest assessment of Canada's conservation practices, the majority of vessels provided accurate and on time catch, effort and landings data in 2010. Canada also has a good compliance record with international reporting requirements (FOC 2012). We have awarded a ‘highly effective’ score to account for domestic measures since the majority of fishing occurs in Canadian and US waters.

Japan North Pacific, Troll/Pole

Moderately Effective

Domestically, Japan uses vessel monitoring and landing site inspections and air and sea surveillance (Yagi 2002). The effectiveness of domestic measures are not known, so we have awarded a ‘moderately effective’ score.

United States North Pacific, Troll/Pole

Highly Effective

Domestically, the Pacific Fishery Management Council is in charge of enforcement, such as air and sea surveillance (PFMC 2011) through the US Coast Guard and NOAA Office of Law Enforcement. We have therefore, awarded a ‘highly effective’ score.

Subfactor 3.1.6 – Management Track Record

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

Highly Effective

Domestically, Canada has conservation goals that include supporting the development of management practices based on the best scientific information (FAO 2012). Japan has a management system in place for the conservation and management of marine resources (Yagi 2002) and the United States has measures within its albacore tuna management plan to enact management measures once albacore become overfished (PFMC 2011). Albacore stocks are healthy and thus we have awarded a ‘highly effective’ score.

Subfactor 3.1.7 – Stakeholder Inclusion

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

Canada North Pacific, Troll/Pole

Highly Effective

Domestically, Canada has an open and transparent consultation process during the development of management measures (FOC 2012). An assessment of this consultation process during 2010, indicated that the objectives were met (FOC 2012). We have awarded a ‘high’ score for domestic measures.

Japan North Pacific, Troll/Pole

Highly Effective

Japan uses a co-management system, meaning the government shares power with resource users, to manage the various fisheries sectors (Schmidt 2003). We have, therefore, awarded a 'highly effective' score.

United States North Pacific, Troll/Pole

Highly Effective

The Pacific Fishery Management Council, in charge of albacore in US waters, allows for the input and inclusion of stakeholder views in determining management plans, including rebuilding overfished species (PFMC 2011). We have, therefore, awarded a 'highly effective' score.

Bycatch Strategy

Factor 3.2: Management of fishing impacts on bycatch species						
Region / Method	All Kept	Critical	Strategy	Research	Advice	Enforce
Canada North Pacific Troll/Pole	Yes	No	Highly Effective	Moderately Effective	Highly Effective	Highly Effective
Japan North Pacific Troll/Pole	Yes	No	Highly Effective	Moderately Effective	Moderately Effective	Moderately Effective
United States North Pacific Troll/Pole	Yes	No	Highly Effective	Moderately Effective	Moderately Effective	Moderately Effective

There is little bycatch in these fisheries, so we consider all species to be retained.

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.).

Canada North Pacific, Troll/Pole

Highly Effective

Bycatch rates in troll and pole fisheries are very low (Kelleher 2005) and Canada has measures in place to report any incidental bycatch (Holmes 2012). We have, therefore, awarded a 'highly effective' score.

Japan North Pacific, Troll/Pole**Highly Effective**

Bycatch in troll and pole fisheries is extremely low, but any bycatch species would likely be recorded and reported (Yagi 2002).

United States North Pacific, Troll/Pole**Highly Effective**

Bycatch in troll and pole fisheries is extremely low. However, any bycatch interactions with the albacore tuna troll/pole fishery are reported in logbooks (PRFMC 2011).

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.

Canada North Pacific, Troll/Pole**Moderately Effective**

Bycatch is reported, but there is no observer program currently in place, and thus, we have awarded a 'moderately effective' score (FOC 2012).

Japan North Pacific, Troll/Pole**Moderately Effective**

Vessels fishing for "fresh fish" north of 20N must implement observer programs and achieve 5% coverage by the end of 2014 (WCPFC 2012c). This monitoring level is very low and data collection protocols are considered deficient (Gilman et al. 2013). We have awarded a 'moderate' score.

United States North Pacific, Troll/Pole

Moderately Effective

Vessels fishing for "fresh fish" north of 20N must implement observer programs and achieve 5% coverage by the end of 2014 (WCPFC 2012c). This monitoring level is very low and data collection protocols are considered deficient (Gilman et al. 2013). We have awarded a 'moderately effective' score.

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.

Canada North Pacific, Troll/Pole

Highly Effective

Canada has developed a management plan in the North Pacific that uses a risk averse and precautionary manner, based on the best scientific advice, to conserve albacore tuna populations (FAO 2012). We have awarded a 'high' score because Canada has complied with international measures as well as developed domestic measures.

Japan North Pacific, Troll/Pole

Moderately Effective

It is unclear if managers always adhere to scientific advice in Japan. Their management system does allow for the use of the total allowable catch or effort (TAC/TAE) system to be utilized, but this system is not currently used for albacore tuna (Yagi 2002). However, the latest stock assessment for albacore tuna in the North Pacific did not call for additional management measures (ISCAWG 2014). So we have awarded a 'moderately effective' score.

United States North Pacific, Troll/Pole

Moderately Effective

An analysis of all regional fisheries management organizations (RFMOs) found, universally, that management on the high seas is inadequate. While the WCPFC scored the highest, 74% out of 100%, in terms of its theoretical performance, however, the score was much lower, 66.7%. The high theoretical

performance score may reflect this newer RFMO's ability to conform to more recent conservation measures (Cullis-Suzuki and Pauly 2010). However, no RFMO conforms to all scientific advice, so we have awarded a 'moderately effective' score.

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 consistent enforcement of regulations and verification of compliance.

Canada North Pacific, Troll/Pole

Highly Effective

Domestically, Canada has a compliance plan that includes the use of marine enforcement officers, public awareness campaigns, and aerial surveillance (FOC 2012).

Internationally, the WCPFC has a compliance monitoring scheme in place that assesses members' compliance with obligations, identifies areas of conservation and management that may need refinement, responds to non-compliance, and monitors and resolves non-compliance issues. The Commission evaluates compliance by members annually with respect to: catch and effort limits and reporting for target species, spatial and temporal closures, observer and vessel monitoring systems (VMS) coverage and provision of scientific data (WCPFC 2012a).

Vessel monitoring systems are required on all vessels fishing for highly migratory species in the convention area south of 20N and east of 175E. The area north of 20N and west of 175W will set the activation date for VMSs at a later time (WCPFC 2012b). There are measures in place allowing for the boarding and inspection of vessels in the convention area (WCPFC 2006b) and the WCPFC maintains a list of illegal, unreported and unregulated vessels (WCPFC 2010b). However, assessing the effectiveness of these enforcement measures is difficult because there is a general lack in the transparency of information with regards to surveillance activities, infractions and enforcement actions, and outcomes (Gilman et al. 2013).

We have awarded a 'highly effective' score to account for domestic measures, since the majority of fishing occurs in Canadian and US waters.

Japan North Pacific, Troll/Pole

Moderately Effective

The WCPFC has a compliance monitoring scheme in place that assesses members' compliance with obligations, identifies areas of conservation and management that may need refinement, responds to non-compliance and monitors and resolves non-compliance issues. The Commission evaluates compliance by members annually with respect to: catch and effort limits and reporting for target species, spatial and temporal closures, observer and vessel monitoring systems (VMS) coverage and provision of scientific data (WCPFC 2012a).

Vessel monitoring systems are required on all vessels fishing for highly migratory species in the WCPO south of 20N and east of 175E. The area north of 20N and west of 175W will set the activation date for VMSs at a later time (WCPFC 2012b). There are measures in place allowing for the boarding and inspection of vessels in the convention area (WCPFC 2006b) and the WCPFC maintains a list of illegal, unreported and unregulated vessels (WCPFC 2010b). In the Eastern Pacific Ocean, vessels larger than 24 m in length must use VMSs (IATTC 2004). However, assessing the effectiveness of these enforcement measures is difficult because there is a general lack in the transparency of information with regards to surveillance activities, infractions and enforcement actions and outcomes (Gilman et al. 2013).

Domestically, Japan uses vessel monitoring and landing site inspections and air and sea surveillance (Yagi 2002), but the effectiveness of these measures are not known, so we have awarded a 'moderately effective' score.

United States North Pacific, Troll/Pole

Moderately Effective

The WCPFC has a compliance monitoring scheme in place that assesses members' compliance with obligations, identifies areas of conservation and management that may need refinement, responds to non-compliance and monitors and resolves non-compliance issues. The Commission evaluates member compliance annually with respect to: catch and effort limits and reporting for target species, spatial and temporal closures, observer and VMS coverage and provision of scientific data (WCPFC 2012a).

Vessel monitoring systems are required on all vessels fishing for highly migratory species in the Convention Area south of 20N and east of 175E. The area north of 20N and west of 175W will set the activation date for VMSs at a later time (WCPFC 2012b). There are measures in place allowing for the boarding and inspection of vessels in the convention area (WCPFC 2006b) and the WCPFC maintains a list of illegal, unreported and unregulated vessels (WCPFC 2010b). However, assessing the effectiveness of these enforcement measures is difficult because there is a general lack in the transparency of information with regards to surveillance activities, infractions and enforcement actions and outcomes (Gilman et al. 2013). We have therefore awarded a 'moderately effective' score.

Criterion 4: Impacts on the habitat and ecosystem

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

The final score is the geometric mean of the impact of fishing gear on habitat score (plus the mitigation of gear impacts score) and the ecosystem-based fishery management score. The Criterion 2 rating is determined as follows:

- *Score >3.2=Green or Low Concern*
 - *Score >2.2 and <=3.2=Yellow or Moderate Concern*
 - *Score <=2.2=Red or High Concern*
- Rating cannot be Critical for Criterion 4.*

Criterion 4 Summary

Region / Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Overall Recomm.
Canada North Pacific Troll/Pole	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	Green (3.873)
Japan North Pacific Troll/Pole	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	Green (3.873)
United States North Pacific Troll/Pole	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	Green (3.873)

Troll and pole gear has minimal impact or contact with bottom habitats.

Justification of Ranking

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

Scoring Guidelines

- *5 (None)—Fishing gear does not contact the bottom*
- *4 (Very Low)—Vertical line gear*
- *3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g., gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally*

- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

None

Vertical gear rarely impact bottom habitats.

Factor 4.2 – Mitigation of Gear Impacts

Scoring Guidelines

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

Canada North Pacific, Troll/Pole

Japan North Pacific, Troll/Pole

United States North Pacific, Troll/Pole

Not Applicable**Factor 4.3 – Ecosystem-Based Fisheries Management***Scoring Guidelines*

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

Canada North Pacific, Troll/Pole**Japan North Pacific, Troll/Pole****Moderate Concern**

Ecosystem impacts are not addressed in current management plans in Canada and it is unknown if they are addressed in Japan. One of the core articles of the WCPFC Convention is to assess the impacts of fishing on target and non-target species. There are management measures in place to protect bycatch and target species and ecological risk assessments are being conducted. There is a section on Ecosystem Monitoring and Analysis within the Secretariat of the Pacific Community, which provides scientific assistance to the WCPFC (SPC 2010). IATTC has objectives that address incorporating ecosystem considerations into management and work has been done within IATTC to create ecosystem-based models, along with other types of analysis. IATTC considered management measures aimed at

protecting dolphins, sea turtles and sea birds as addressing ecosystem considerations (IATTC 2012c). However, troll and pole fisheries rely on live baitfish, which could include "exceptional species" such as anchovy or sardines, and the effect of the removal of these species on the ecosystem is unknown. Few baitfish fisheries are managed (Gillet 2012)(FAO 2014).

United States North Pacific, Troll/Pole

Moderate Concern

The Pacific Fishery Management Council has developed a Pacific Coast Fishery Ecosystem Plan, which was developed by the council to enhance their current species specific management with broader ecosystem components. The draft was adopted in April of 2013, and will be reviewed again in 2015 (PFMC 2013). In addition, troll and pole fisheries rely on live baitfish, which could include "exceptional species" such as anchovy or sardines, which are managed off the US west coast but are not necessarily under other jurisdictions (Gillet 2012)(FAO 2014).

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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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