Albacore Tuna

Thunnus alalunga

Image ©Monterey Bay Aquarium

South Pacific Ocean

Troll/Pole

October 21, 2014

Alexia Morgan, Consulting Researcher

Disclaimer

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

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.

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 found throughout the world's oceans and are caught by a variety of gears. This report focuses on albacore tuna caught in the South Pacific troll and pole fisheries.

In the South Pacific Ocean, albacore tuna populations are healthy and fishing mortality rates are sustainable. The troll and pole fishery contributes only a small amount to the total catch of albacore in this region. Troll and pole fisheries are highly selective and interactions with species of concern, such as marine mammals, sea turtles and sea birds are not reported. Some shark species may be caught but in very low amounts. Additionally, this type of gear has little to no impact to bottom habitats.

The Western and Central Pacific Fisheries Commission is responsible for the management of albacore tuna in the South Pacific Ocean. Although few management measures are in place for albacore tuna in the South Pacific Ocean, they have a healthy status, low bycatch and low impacts on bottom habitats.

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 South 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).

Table of Contents

About Seafood Watch® 2

Guiding Principles 3

Summary 4

Assessment 9

Criterion 1: Stock for which you want a recommendation 9

Criterion 2: Impacts on Other Species 12

Criterion 3: Management effectiveness 14

Criterion 4: Impacts on the habitat and ecosystem 22

Acknowledgements 25

References 26

Introduction

Scope of the analysis and ensuing recommendation

This report is for the South Pacific troll and pole fisheries for albacore tuna (*Thunnus alalunga*).

Overview of the species and management bodies

Albacore tuna are widely distributed in temperate and tropical waters in all ocean. There are six managed populations of albacore tuna: North and South Pacific Ocean, North and South Atlantic Ocean, Indian Ocean and Mediterranean Sea (ISCAWG 2011).

Globally (including in the South Pacific Ocean), longline fisheries catch the majority of albacore tuna (Hoyle et al. 2012) (ISSF 2013b). Albacore catches have increased since the 1950s, remaining around 400,000 t over the past decade (ISSF 2013b).

The Western and Central Pacific Fisheries Commission manages albacore tuna in the South Pacific Ocean.

Production Statistics

Troll and pole fisheries are not major fisheries for albacore tuna in the South Pacific. The New Zealand troll fishery has operated since the 1960s and an additional troll fishery has occurred in the central Pacific since the mid-1980s. Since 2000, catches of albacore tuna in the South Pacific have increased to more than 80,000 mt, with troll catches typically being less than 10,000 mt per year (Hoyle et al. 2012).

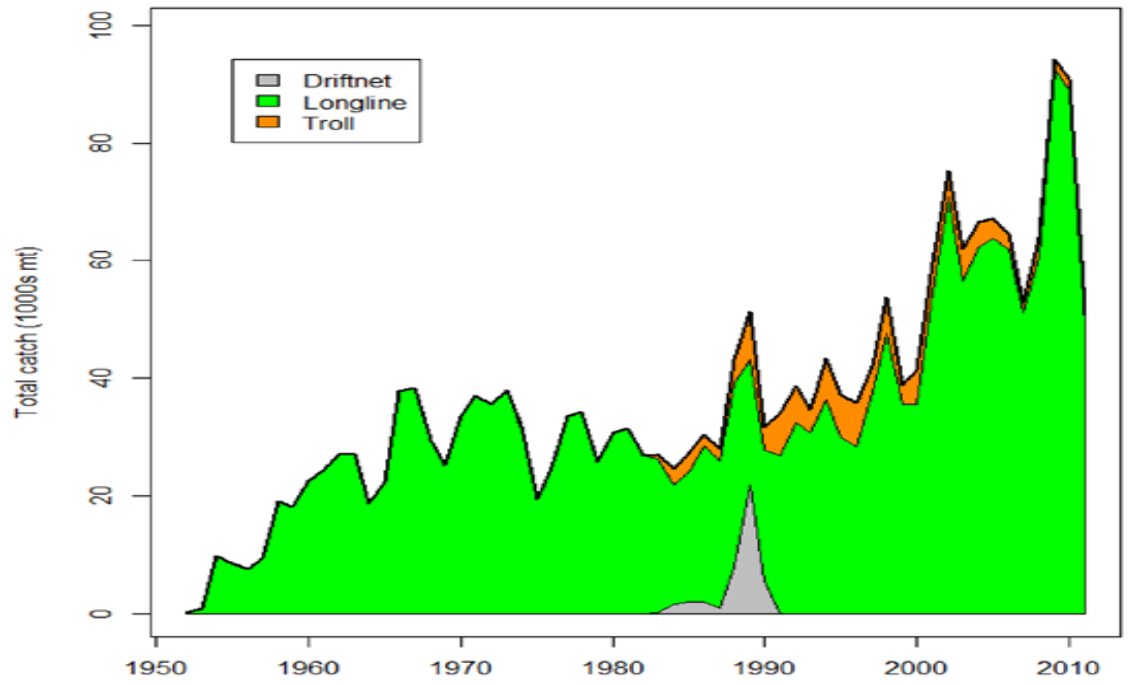

Figure 1: Catches of albacore tuna in the South Pacific between 1950 and 2011 by gear type (Hoyle et al. 2012).

Importance to the US/North American market

During 2013, the United States imported most of its albacore tuna from Thailand (39%). Additionally, the United States imports large amounts of albacore include Vietnam (20%) and Indonesia (16%) (NMFS 2014).

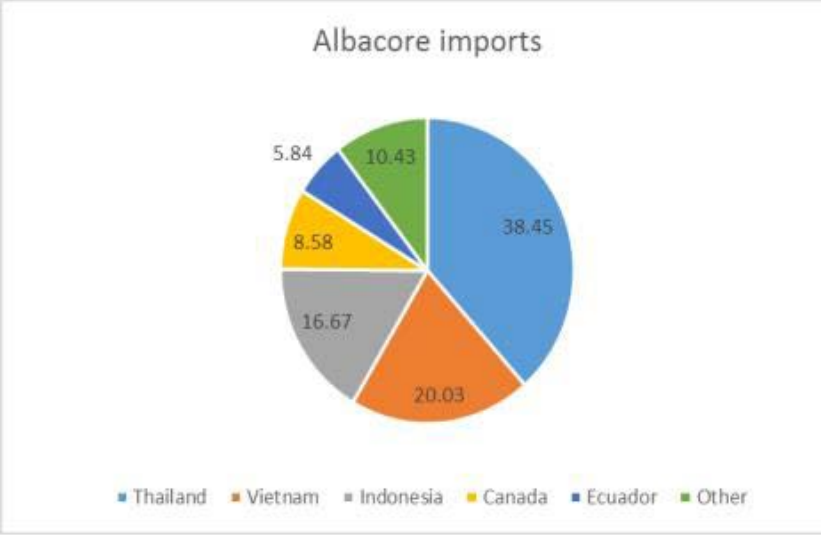

Figure 2: Major contributors to US albacore tuna imports in 2013, all countries and regions (%) (country of origin) (NMFS 2014).

Common and market names

Albacore tuna is also known as germon, longfinned tuna, albecore, 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**	**Stock Status**	**Fishing Mortality**	**Subscore**
South Pacific Troll/Pole	2.00:Medium	4.00:Low Concern	3.67:Low Concern	**Green (3.831)**

Albacore tuna in the South Pacific Ocean are healthy and fishing mortality rates are low. In addition, the troll and pole fishery contributes only a little to overall mortality rates for albacore in this region.

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 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.

South 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 2011). 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 - Stock Status

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.*

South Pacific, Troll/Pole

Low Concern

Albacore tuna in the South Pacific was last assessed in 2012 and the results were very similar to previous assessments (2009 and 2011). According to the model, the total biomass of albacore tuna has been reduced to around 82% (62%–93%) of unfished levels, while the spawning biomass (mature females) has

been reduced to 63% (35%–80%) of unfished levels. Both of these are considered moderate levels of depletion. The current ratio of the current total biomass and spawning biomass to that needed to produce the maximum sustainable yield (Bcurrent/BMSY = 1.6 (1.4-1.9) and SBcurrent/SBMSY = 2.6 (1.5-5.2)) are both above 1. However, several issues were addressed during this assessment, chiefly, the unrealistic declines in abundance during the early part of the time series and the high uncertainty surrounding increases in recruitment in recent years (Hoyle et al. 2012). We have awarded a 'low concern' score because, while the model suggests a healthy stock, there is a large amount of uncertainty surrounding these results.

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 (≤ 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.*

South Pacific, Troll/Pole

Low Concern

According to the most recent stock assessment (2012), the ratio of the current fishing mortality rate to that needed to produce the maximum sustainable yield was less than 1 ($F_{current}/F_{MSY}$ 0.21 (0.04-1.08)). There is a low risk that overfishing is occurring; however, since the range does include the potential that overfishing is occurring (i.e., ratio above 1), and because fishing mortality rates have been increasing over time for both adults and juveniles, we have awarded a 'low' and not a 'very low' concern score.

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: South Pacific, Troll/Pole						
Subscore:	**5.000**	**Discard Rate:**	**1.00**	**C2 Rate:**	**5.000**	

Species	Inherent Vulnerability	Stock Status	Fishing Mortality	Subscore
ALBACORE TUNA	Medium	4.00: Low Concern	3.67: Low Concern	**3.831**

Bycatch in the South 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. Minimal bycatch of skipjack, bluefin, yellowfin and bigeye tuna as well as bonito, dolphinfish and billfish have been reported (Powers et al. 2007). Although baitfish are used in this fishery, the 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 (Gillet 2012). Due to these reasons, no baitfish species are not 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

South Pacific, Troll/Pole

< 20%

The average discard rate in tuna pole and line fisheries is 0.1%, although it is slightly higher in the Western and Central Pacific Ocean, 0.4% (Kelleher 2005). Troll and pole and line fisheries depend

heavily on the use of baitfish, which most often comes from other fisheries (Gillett 2012). However, the amount of tuna caught is much great 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 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
South 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**
South Pacific Troll/Pole	Moderately Effective	N/A	Highly Effective	Highly Effective	Moderately Effective	Highly Effective	Moderately Effective

The United Nations Straddling and Highly Migratory Fish Stocks Agreement (1995) indicated that the management of straddling and highly migratory fish stocks should be carried out through regional fisheries management organizations (RFMOs). RFMOs are the only legally mandated fishery management body on the high seas and within EEZ waters. There are currently 18 RFMOs (www.fao.org) that cover nearly all of the world's waters. Member countries must abide by the management measures set forth by individual RFMOs in order to fish in their waters (Cullis-Suzuki and Pauly 2010). Some RFMOs manage all marine living resources within their authority (i.e., General Fisheries Commission for the Mediterranean (GFCM)), while others manage a group of species such as tunas (i.e., Inter-American Tropical Tuna Commission (IATTC)).

This report focuses on albacore tuna caught in the South Pacific Ocean. In this region, they are managed by the Western and Central Pacific Fisheries Commission (WCPFC) the RFMO for the Western and Central Pacific Ocean (see below for member countries), even though their range extends beyond the WCPFC convention area. Very few management plans have been instituted for albacore tuna in the South Pacific Ocean, but the population is healthy and therefore not in need of a recovery plan. The WCPO has been moderately effective with regard to enforcement and inclusion of stakeholder input. We have scored only the 'harvest strategy' section because bycatch in this fishery is low and we consider 'all species kept.'

WCPFC members: Australia, China, Canada, Cook Islands, European Union, Federated States of Micronesia, Fiji, France, Indonesia, Japan, Kiribati, Republic of Korea, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, United States of America, Vanuatu.

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.

South Pacific, Troll/Pole

Moderately Effective

Few management measures have been enacted for albacore tuna in the South Pacific region of the Western and Central Pacific Ocean; however, their population has remained healthy. The Western and Central Pacific Fisheries Commission (WCPFC) has limited the number of fishing vessels actively fishing for albacore to not exceed 2005 levels or historical levels (2000-2004). In addition, member countries shall work to ensure the long-term sustainability of albacore tuna in this region, which includes collaborative research (WCPFC 2010b). Biomass based limit reference points have been adopted by the WCPFC for albacore tuna and are used to determine the status of their populations. However, target reference points are not yet in place and there are no harvest control rules (ISSF 2013a). We have awarded a 'moderately effective' score based on the current management scheme.

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.

South Pacific, Troll/Pole

N/A

No recovery plan is needed because albacore tuna in the South Pacific is not overfished (Hoyle et al. 2012), so we have awarded a score of 'highly effective.'

Subfactor 3.1.3 – Scientific Research and Monitoring

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

South Pacific, Troll/Pole

Highly Effective

Albacore tuna stocks are monitored and assessed on a regular basis (ISCAWG 2011), and include information on catches, catch per unit effort, length frequency information and tagging data. In addition, considerable work towards the development of limit reference points has be conducted by the WCPFC for albacore tuna in the South Pacific (ISSF 2013). We have therefore awarded a score of 'highly 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.

South Pacific, Troll/Pole

Highly Effective

The most recent assessment for albacore tuna in the South Pacific did not provide any suggestions on the need for any specific management measures. However, the scientific committee did suggest that longline fishing mortality needs to be reduced to maintain the economic viability of the fishery (WCPFC 2013b). We have awarded a score of 'highly effective' because this advice does not pertain to the troll and pole fishery.

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.

South Pacific, Troll/Pole

Moderately Effective

The Western and Central Pacific Fisheries Commission (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 members' compliance 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 western and central Pacific Ocean south of 20N and east of 175E. The area north of 20N and west of 175W had an activation date for VMSs of December 31, 2013 (WCPFC 2012c). There are measures in place allowing for the boarding and inspection of vessels in the convention area (WCPFC 2006) and the WCPFC maintains a list of illegal, unreported and unregulated vessels (WCPFC 2010a). 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).

A recent study, which developed a standard way of assessing transparency in RFMOs, found the WCPFC had a lack of transparency with regard to the availability of compliance related data. Also found, was a lack of incentives for countries to comply with management measures, and no processes for responding to non-compliance (Gilman and Kingma 2013). Koehler (2013) also found issues with the WCPFC in regards to compliance transparency, specifically because the WCPFC's compliance assessment process (there is a compliance monitoring scheme in place) (WCPFC 2013) is closed to the public and it has no way of dealing with non-compliance. In 2013, the Commission finally started releasing information on the compliance of individual nations (WCPFC 2013g).

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.

South Pacific, Troll/Pole

Highly Effective

Management measures enacted by the WCPFC have shown mixed results in their ability to meet stock management objectives of principal market species (Gilman et al. 2013). However, in terms of the target species in this fishery, albacore tuna, populations have remained healthy, and so we have awarded a

score of 'highly 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 rating is given if the management process is transparent and includes stakeholder input.

South Pacific, Troll/Pole

Moderately Effective

The Western and Central Pacific Fisheries Commission allows for accredited observers to participate in most meetings. Historically, the WCPFC has lacked transparency in some factors (Gilman et. al. 2013), but there has been improvement in recent years. We have therefore awarded a score of 'moderately effective.'

Bycatch Strategy

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

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.).

South Pacific, Troll/Pole

Highly Effective

Bycatch in troll and pole fisheries is minimal (Kelleher 2005).

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.

South Pacific, Troll/Pole

Ineffective

Troll and pole vessels fishing for albacore tuna are exempt from the 5% observer coverage required in other fisheries in the western and central Pacific Ocean (WPFC 2006). However, little bycatch is caught in this fishery, and so we have awarded a score of 'moderately effective.'

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.

South Pacific, Troll/Pole

Moderately Effective

The most recent assessment for albacore tuna in the South Pacific did not provide any suggestions on the need for specific management measures. An analysis of all RFMOs found that management on the high seas is inadequate. In terms of theoretical performance, the WCPFC scored the highest, 74% out of 100%, but its score was much lower for actual performance (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). We have therefore awarded a score of '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 consistent enforcement of regulations and verification of compliance.

South Pacific, Troll/Pole

Moderately Effective

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

Vessel monitoring systems are required on all vessels fishing for highly migratory species in the western and central Pacific Ocean south of 20N and east of 175E. The area north of 20N and west of 175W will have an activation date for VMSs set at a later time (WCPFC 2012b). There are measures in place allowing for the boarding and inspection of vessels in the convention area (WCPFC 2006) and the WCPFC maintains a list of illegal, unreported and unregulated vessels (WCPFC 2010a). 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).

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. EBFM 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.
South Pacific Troll/Pole	5.00:None	0.00:Not Applicable	3.00:Moderate Concern	**Green (3.873)**

Troll and pole fisheries have limited 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.

South 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.*

South 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.*

South Pacific, Troll/Pole

Moderate Concern

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, ecological risk assessments are being conducted, and there is an ecosystem monitoring and analysis section within the Secretariat of the Pacific Community, which provides scientific assistance to the WCPFC (SPC 2010). 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 and few baitfish fisheries are managed (Gillet 2012)(FAO 2014).

Acknowledgements

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.

Seafood Watch® would like to thank eight anonymous reviewers for graciously reviewing this report for scientific accuracy.

References

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

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

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

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

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

Gilman, E. and Kingma, E. 2013. Standard for assessing transparency in information on compliance with obligations of regional fisheries management organizations: validation through assessment of the Western and Central Pacific Fisheries Commission. Ocean Coastal Management 84:31-39.

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

Hoyle, S., Hampton, J. and Davies, N. 2012. Stock assessment of albacore tuna in the South Pacific Ocean. Scientific Committee Eighth Regular Session, 7-15 August 2012, Busan, Republic of Korea. WCPFC-SC8-2012/SA-WP-04-REV1. 123 p.

Inter-American Tropical Tuna Commission (IATTC). 2012. Conservation and Management Measures for bluefin tuna in the eastern Pacific Ocean. Resolution C-12-09, 83rd Meeting, La Jolla, CA, 25-29 June 2012.

ISC Albacore Working Group. 2011. Stock assessment of albacore tuna in the North Pacific Ocean in 2011. Scientific Committee Seventh Regular Session, Pohnpei, Federated States of Micronesia, 9-17, August 2011. WCPFC-SC7-2011/SA-WP-10

International Seafood Sustainability Foundation (ISSF). 2013b. ISSF stock status ratings 2013 status of the world fisheries for tuna. ISSF Technical Report 2013-4, April 2013

International Seafood Sustainability Foundation (ISSF). 2013a. ISSF stock assessment workshop: control rules and reference points for tuna RFMOs. ISSF Technical Report 2013-03. International Seafood Sustainability Foundation, Washington, DC. 34 p.

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

NMFS. 2014. Commercial fisheries statistics: annual trade data by product, country/association. National Marine Fisheries Service.

Powers, J., Laurs, M. and Hough, A. 2007. Certification report fo AAFA south Pacific albacore troll/jig fishery. Moody Marine LTD Ref: 82022/SP v4.

Western and Central Pacific Fisheries Commission (WCPFC). 2013a. Conservation and management measure for compliance monitoring scheme. Conservation and Management Measure 2013-02. Tenth Regular Session, 2-6 December 2013, Cairns, Australia.

Western and Central Pacific Fisheries Commission (WCPFC). 2013b. Commission for the Conservation and Management of highly migratory fish stocks in the Western and Central Pacific Ocean Summary Report. Scientific Committee Ninth Regular Session, 6-14 August, 2013, Federated States of Micronesia.

Western and Central Pacific Fisheries Commission (WCPFC). 2012a. Conservation and management measure for compliance monitoring scheme. Conservation and Management Measure 2012-02. Commission Ninth Regular Session, Manila, Philippines, 2-6 December 2012.

Western and Central Pacific Fisheries Commission (WCPFC). 2012b. Commission vessel monitoring system. Conservation and Management Measure 2011-02. Commission Eighth Regular Session, Tumon, Guam, 26-30 March 2012.

Western and Central Pacific Fisheries Commission (WCPFC). 2010a. Conservation and management measure to establish a list of vessels presumed to have carried out illegal, unreported and unregulated fishing activities in the WCPO. Conservation and Management Measure 2010-06. Seventh Regular Session, Honolulu, HI, 6-10 December 2010.

Western and Central Pacific Fisheries Commission (WCPFC). 2010b. Conservation and management measure for South Pacific albacore. Conservation and Management Measure-2010-051. Seventh Regular Session, Honolulu, HI, December 6-10, 2010.

Western and Central Pacific Fisheries Commission (WCPFC). 2007. Conservation and management measure for the -regional observer programme. Conservation and Management Measure 2007. Fourth Regular Session, Tumon, Guam, USA, 2-7 December 2007.

Western and Central Pacific Fisheries Commission (WCPFC). 2006. Western and central Pacific fisheries commission boarding and inspection procedures. Conservation and Management Measure 2006-08. Third Regular Session, Apia, Samoa, 11-15 December 2006.