Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery

MSC Fishery Assessment Report

Announcement Comment Draft Report (ACDR)

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2 Glossary

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EEZ	Exclusive Economic Zone
ETP	Endangered, Threatened or Protected species
FAO	Food and Agriculture Organization of the United Nations
Kg	Kilogram
Lb.	Pound, equivalent to roughly 2.2 kg
LOA	Length Over-All
M	Million (lbs.)
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
nm	nautical mile
OFL	Over-Fishing Level
PI	Performance Indicator
SCS	SCS Global Services
SI	Scoring Issue
SSB	Spawning Stock Biomass
t and mt	metric ton
TAC	Total Allowable Catch
WWF	World Wildlife Fund

4 Report Details

4.1 Authorship and peer review details

Audit Team

Alexander "Sandy" Morison – Morison Aquatic Sciences, Team Lead, P1 & P2, Offsite

Mr. Morison is a consultant specializing in fisheries and aquatic sciences. He has over 30 years experience in fishery science and assessment at state, national and international levels and has held senior research positions for state and national organizations in Australia. He is currently chair of the Ecologically Related Species Working Group of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and has been engaged in the Kobe process for harmonisation of measures across the tuna RFMOs.

Mr Morison has considerable experience with issues of tuna and other pelagic species through various positions in addition to his current role with CCSBT. He was Australia's representative on the Science Working Group during the establishment of the South Pacific Regional Fisheries Management Organisation and was the inaugural chair of the Jack Mackerel Working Group during that time. He has also chaired Australia's East Coast Tuna and Billfish Resource Assessment Group.

Mr. Morison has participated as part of a team undertaking MSC pre-assessments for several fisheries and is also trained as a lead auditor for MSC assessments.

- ✓ Heard Island and MacDonald Islands Mackerel Icefish: Reassessments and surveillance audits (Principle 1).
- ✓ Heard Island and MacDonald Islands Patagonian toothfish: First assessment, reassessment and surveillance audits (Principle 1).
- ✓ Lakes and Coorong Fishery (South Australia): Reassessments and surveillance audits (Principle 1).
- ✓ Macquarie Island Patagonian toothfish fishery: First assessment, reassessment and surveillance audits (Principle 1).
- ✓ Kyoto Danish Seine Fishery: Reassessment (Principle 1).
- ✓ Western Rock Lobster Fishery: Surveillance audits and reassessment. (Principle 1)
- ✓ PNA Western and Central Pacific unassociated purse seine fishery (skipjack tuna): Surveillance audits (Principle 1).
- ✓ PNA Western and Central Pacific unassociated purse seine fishery (yellowfin tuna): Expedited assessment (Principle 1).
- ✓ Northeastern Tropical Pacific purse seine yellowfin & skipjack tuna: first assessment (Principle 2).
- ✓ Tri Marine Western and Central Pacific skipjack and yellowfin tuna: first assessment (Team leader, Principle 1 and Principle 2).

- ✓ • Peel-Harvey Inlet, blue swimmer crab and sea mullet fisheries (Principle 1).
- ✓ • Western Australia deep sea crab fishery (Principle 1).
- ✓ • Australian pearl oyster fishery (Principle 1).

Mr. Morison was the facilitator for an assessment of the ecological risks from Queensland's East Coast Trawl Fishery that looked at the full range of ecological components. He was senior author of the report that synthesised background information and the results of an expert workshop, and was co-author of the summary and technical reports that described the results of the project. He was subsequently engaged to assist with an assessment of this fishery's vulnerability to climate change.

Sandy is also contracted by the Australian Fisheries Management Authority to chair the South East Fisheries Resource Assessment Group and the Shark Fisheries Resource Assessment Group, is the Scientific Representative on the South East Fishery Management Advisory Committee, and is a member of the South East Scalefish and Shark Fishery Resource Assessment Group. He has also been the scientific representative on other Resource Assessment Groups. Sandy has experience with the assessment of invertebrate, chondrichthyan and teleost fisheries including commercial and recreational fisheries in freshwater, estuarine and marine habitats and fisheries operating in tropical, temperate and polar environments.

He has particular expertise with fish age and growth and has been involved in the development and implementation of harvest strategies for several fisheries. He has over 20 publications in peer-reviewed scientific journals (8 as senior author), 8 book chapters, and over 100 project reports, technical reports, client reports and papers in workshop and conference proceedings.

For more details visit: www.morisonaqsci.com.au

The proposed team leader meets the MSC Team leader qualifications in that:

- ✓ Relevant degree and/or equivalent experience in the fisheries sector related to tasks under responsibility of a team leader (Evidence: published over 20 scientific publications and Sandy is also contracted by the Australian Fisheries Management Authority to chair the South East Fisheries Resource Assessment Group and the Shark Fisheries Resource Assessment Group, and the Tropical Rock Lobster Working Group. This includes being chair of the current and previous assessment groups that have been responsible for the assessments of Australia's orange roughy fisheries. He is also the Scientific Representative on the South East Fishery Management Advisory Committee, and is a member of the South East Scalefish and Shark Fishery Resource Assessment Group. He has also been the scientific representative on other Resource Assessment Groups)
- ✓ Completed of the latest MSC training modules applicable to this assessment (V2.1 Team Leader MSC modules) within the past five years (February 7 2019)
- ✓ Has passed new online training modules on modifications to the MSC Fisheries Standard before undertaking assessments using these modifications such as enhanced bivalves, salmon and other modifications that may be developed in the future. (Feburary 7 2019)

- ✓ Has undertaken 2 MSC fishery assessments or surveillance site visits in the last 5 years (Solomon Islands Longline Full Assessment 2019, Tri Marine WCPO Surveillance Year 2 2018)
- ✓ Has demonstrated experience in applying different types of interviewing and facilitation techniques, as verified by SCS records and previous audit reports and ASI audits.
- ✓ Is competent in the MSC Standard and current Certification Requirements, auditing techniques, and communication and stakeholder facilitation techniques, as verified by his many years as a auditor and successful witnesses of ASI
- ✓ Has affirmed he holds no conflict of interest

Gerard Dinardo, Senior Technical Specialist at SCS, Responsible for Principles 1 and 2

Dr. Gerard DiNardo has over 25 years of experience as a research fishery scientist and senior manager for NOAA Fisheries in the United States, as well as extensive knowledge, understanding, and involvement in fishery issues and processes of tuna-RFMOs and RFOs. Ensuring sustainable development and management of fisheries, including the identification of research and plans of action to support effective management decision making has been the focus throughout his career, and with a strong background and understanding of international fisheries and MSC. He holds an MSc from Long Island University, C.W. Post Center and a Ph.D from University of Maryland, where his dissertation topic was FISHMAP: An Expert System for Sampling Fish Populations.

Gerard was appointed as the Fisheries Resources Division Director of the Southwest Fisheries Science Center in San Diego, CA from 2015 to 2019. Previously, he held several positions at NMFS, including Supervisor of the Stock Assessment Program in the Fisheries Research and Monitoring Division at the Pacific Islands Fisheries Science Center. Dr. DiNardo was multiple publications related to the assessment of pelagic species, including tuna. He's held positions as Co-Chair of the Joint PICES/ISC Working Group on Ocean Conditions and the Distribution and Productivity of Highly Migratory Fish for the North Pacific Marine Science Organization, standing member of the NMFS National Stock Assessment Methods Steering Committee, science expert on the U.S.A. Delegation to the Western Central Pacific Fisheries Commission and Chair of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC).

Dr. DiNardo's experience satisfies the MSC requirements for a Team Member as described in PC2 (FCP v2.1):

- ✓ With relevant degree (PhD from the University of Maryland) and over 5 years of research experience in a marine conservation biology and fisheries
- ✓ Has passed the MSC compulsory training modules for Team Members within the last 5 years.
- ✓ Affirms they have no conflict of interest in conducting this assessment.
- ✓ The team member will be onsite

Dr. Michael Harte, Independent Contractor, Responsible for Principle 3

Dr. Michael Harte is a Professor in the College of Earth, Ocean and Atmospheric Sciences at Oregon State University in the USA, having trained in physical geography and economics in New Zealand and Canada. He is recognized internationally as a fisheries and marine policy adviser, researcher, educator and program leader. He has held senior positions in the private, public, academic and NGO sectors in Australia, the US, the Falkland Islands, Canada and New Zealand.

Dr. Harte has extensive policy and economic analysis experience working with commercial and small-scale fisheries, ecosystem-based fisheries management, bio-economic analysis of fisheries, climate impacts on fisheries, eco-labelling, cost recovery and resource rents in fisheries, and the development of policies and regulations associated with the monitoring, control and surveillance of fisheries, as well as work on seafood markets and traceability. His work spans both academic and practical fishery management domains. Dr. Harte experience satisfies the MSC requirements for a Team Member as described in PC2 (FCP v2.1):

- ✓ With relevant degree a PhD in Geography from University of Victoria, and over 5 years of research experience in management or research experience in a marine conservation biology, fisheries, and natural resources
- ✓ Has passed the MSC compulsory training modules for Team Members within the last 5 years (August 6, 2019).
- ✓ Affirms they have no conflict of interest in conducting this assessment.
- ✓ The team member will be onsite

1.2 Version details

Table 2. Fisheries program documents versions

Document	Version number
MSC Fisheries Certification Process	**Version 2.1**
MSC Fisheries Standard	**Version 2.01**
MSC General Certification Requirements	**Version 2.3**
MSC Reporting Template	**Version 1.1**

5 Unit(s) of Assessment and Certification and results overview

5.1 Unit(s) of Assessment (UoA) and Unit(s) of Certification

5.1.1 Unit(s) of Assessment

The Unit of Assessment includes the yellowfin, skipjack, and bigeye caught by the select 44 Ecuadorian, Panamanian, and US vessels that belong to members of TUNACONs using purse-seine gear (both free school and FAD) fishing within the IATTC and for some vessels, within Ecuador's EEZ management area. The purse-seine vessels include class 6 (subject to IATTC mandatory observer coverage) and class 3-5. Voluntary observer data has been collected from the class 3-5 vessels during the FIP for the fishery. These vessels are referred to as the TUNACONs fleet. In addition, there are three other vessels small purse-seine vessels flagged to the US fishing in the IATTC. These vessels target yellowfin and skipjack. There are a total of nine Units of Assessment (UoAs). Vessels target tuna using both free school and FAD sets.[1] These vessels are referred to as the small purse-seine US-based fleet.

Principle 1 has been scored separately for the three target species (i.e. bigeye, yellowfin, and skipjack). Principle 2 has been scored separately for the larger purse-seine vessels and the select 3 US vessels. For the larger vessels, FADs and free school sets are separate UoAs. P1 species of UoA1, UoA2, and UoA3 are not scored a second time as primary species. Target species that are certified under Principle 1 and has obtained an overall score >80 for P1, will have already be assessed under a higher standard of performance than those for main retained/primary under Principle 2, thus it is expected to obtain a score >80 for the relevant Principal Indicators under P2. If in a subsequent assessment one of the target P1 target species fails and is no longer considered as certified, it will then be scored under Principle 2.

There are 3 UoAs for Principle 3, consisting of the three flag states: Ecuador, US, and Panama.

The UoA and UoC are identical.

This fishery has been found to meet scope requirements (FCP v2.1 7.4) for MSC fishery assessments as it

- Does not operate under a controversial unilateral exemption to an international agreement, use destructive fishing practices, does not target amphibians, birds, reptiles or mammals and is not overwhelmed by the dispute. (FCP 7.4.2.1, 7.4.2.2, 7.4.3, 7.4.5)
- The fishery does not engage in shark finning, has mechanisms for resolving disputes (FCP 7.4.5.1), and has not previously failed assessment or had a certificate withdrawn.
- Is not an enhanced fishery, is not based on an introduced species and does not represent an inseparable or practically inseparable species (FCP 7.5.1, 7.5.2, 7.5.8-13)
- Does not overlap with another MSC certified or applicant fishery (7.5.14),
- And does not include an entity successfully prosecuted for violating forced labor laws (7.4.4)

[1] FADs are defined in this assessment to include drifting logs, and anchored/drifting FADs.

- The Unit of Assessment, the Unit of Certification, and eligible fishers have been clearly defined, traceability risks characterized, and the client has provided a clear indication of their position relative to certificate sharing (7.5.1-7.7.7).

Table 3. Unit(s) of Assessment (UoA) and Unit(s) of Certification (UoC): TUNACONs fleet

UoA 1	Description
Species	Yellowfin Tuna *Thunnus albacares*
Stock	Eastern Pacific Ocean stock
Geographical area	Vessels operating in the Inter-American Tropical Tuna Commission Convention area and Ecuador's EEZ
Harvest method / gear	Purse-seine gear types using freeschool and FAD sets
Client group	Vessels identified by TUNACONs members, including Eurofish, NIRSA, Servigrup, Tri Marine, and Jadran.
Other eligible fishers	There are no other eligible fishers.
Flag states	Vessels are flagged to Ecuador, Panama, or the United States.
UoA 2	Description
Species	Skipjack tuna *Katsuwonus pelamis*
Stock	Eastern Pacific Ocean stock
Geographical area	Vessels operating in the Inter-American Tropical Tuna Commission Convention area and Ecuador's EEZ
Harvest method / gear	Purse-seine gear types using free school and FAD sets
Client group	Vessels identified by TUNACONs members, including Eurofish, NIRSA, Servigrup, Tri Marine, and Jadran.
Other eligible fishers	There are no other eligible fishers.
Flag states	Vessels are flagged to Ecuador, Panama, or the United States.
UoA 3	Description
Species	Bigeye Tuna *Thunnus obesus*
Stock	Eastern Pacific Ocean stock

Geographical area	Vessels operating in the Inter-American Tropical Tuna Commission Convention area and Ecuador's EEZ
Harvest method / gear	Purse-seine gear types using free school and FAD sets
Client group	Vessels identified by TUNACONs members, including Eurofish, NIRSA, Servigrup, Tri Marine, and Jadran.
Other eligible fishers	There are no other eligible fishers.
Flag states	Vessels are flagged to Ecuador, Panama, or the United States.

Table 4 Unit(s) of Assessment (UoA) and Unit(s) of Certification (UoC): US-based fleet

UoA 1	Description
Species	Yellowfin Tuna *Thunnus albacares*
Stock	Eastern Pacific Ocean stock
Geographical area	Vessels operating in the Inter-American Tropical Tuna Commission Convention area. Vessels are based out of San Diego, CA.
Harvest method / gear	Purse-seine gear types using free school and FAD sets
Client group	Three small purse-seine Tri Marine vessels.
Other eligible fishers	There are no other eligible fishers.
Flag states	Vessels are flagged to the United States.
UoA 2	Description
Species	Skipjack tuna *Katsuwonus pelamis*
Stock	Eastern Pacific Ocean stock
Geographical area	Vessels operating in the Inter-American Tropical Tuna Commission Convention area. Vessels are based out of San Diego, CA.
Harvest method / gear	Purse-seine gear types using free school and FAD sets
Client group	Three small purse-seine Tri Marine vessels.
Other eligible fishers	There are no other eligible fishers.

Flag states	Vessels are flagged to the United States.

5.1.2 Scope of Assessment in Relation to Enhanced Fisheries or Introduced Fisheries –

There is no evidence of enhancement or introduced species in this fishery.

5.2 Assessment results overview

Section to be completed at the client and peer-review draft stage.

5.2.2 Principle level scores

Section to be completed at the client and peer-review draft stage.

5.2.3 Summary of conditions

Section to be completed at the client and peer-review draft stage.

6. Traceability and eligibility

6.1 Eligibility date

To be identified at the Public Comment Draft Report stage.

6.2 Traceability within the fishery

Description of Tracking, Tracing and Segregation Systems

The following traceability evaluation is for the UoC/UoA covering the TUNACONS and US-based fleet. Because some components of the assessment use set types not covered under this fishery assessment, chain of custody (CoC) is expected to begin at the point of capture; all vessels will require their own CoC certificate, which will require an evaluation of the processes in place to ensure eligibility into the MSC supply chain. This will be further evaluated during the onsite visit.

Below we've listed the main stages of the supply chain within the TUNACONS and US-based fleet fishery and the relevant tracking, tracing and segregation systems at each step:

1. **Capture of product:** All vessels in the UoA are tracked using a monitoring system (VMS) during operation. Vessels target tuna using purse seine gear, on either FADs or freeschool sets. Once the tuna is identified by the vessel, the set is made and the catch is brought onboard. The catch is sorted on the deck and retained species are placed into the pre-designated well. The captain's logbook records an estimate of the catch (volumes, species), set type, lat and long, date when fising started/ended, and the well.
2. **On-board processing:** No onboard processing occurs. Fish are placed into wells and frozen at sea.
3. **Product unloading:** Product is offloaded in port. No transshipment occurs. Many of the companies are vertically integrated companies and will offload the catch to their processing plants. EUROFISH and NIRSA have processing plants in Ecuador.
4. **Product storage:** Product is stored in wells after capture. Any transfer of fish between wells is recorded in the captain's logsheet. At this stage, it is unknown how/if storage capacity/mechanisms differ between the smaller and larger vessels (both the 3-5 class size for the TUNACONs UoA and the US-based fleet).
5. **Product sale and first change of ownership:** Several companies are vertically integrated and thus a sale may not occur at the point of offload. At the point of offload, all vessels provide the first receiver with the captain logsheet of the trip, captain statement, and well summary. The offload procedures differ between the four companies and are not discussed in detail here. The first receiver will require their own chain of custody certificate for the catch to be eligible to enter the MSC supply chain.

There are several information gaps in the traceability of the fleets, that will be followed up at during the onsite. These information gaps include:

- Traceabilty of the US-based small purse-seine and geographic areas of operation

- Storage mechanisms, and potential differences between the class 6 vessels, for the TUNACONs 3-5 class fleet
- The port requirements and government offload surveillance monitoring mechanisms
- It is currently believed that catch for the TUNACONS fleet will all be offloaded in Manta, Ecuador. This will be confirmed at the site visit, and any CoC consequences of different port offloads will be evaluated.

Table 7. Traceability within the fishery

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)? If Yes, please describe:	Vessels only target tuna using purse-seine gear. No gear types not included in the UoC would be used. However, some vessels use set types that are not covered in the assessment, though these sets are permitted in the IATTC. For this reason, chain of custody is expected to begin at the point of capture.
Will vessels in the UoC also fish outside the UoC geographic area? If Yes, please describe: *Well level segregation is believed to be maintained*	In general, the vessels are not expected to operate outside of the UoC geographic area. However, the larger Tri Marine vessels under assessment are also covered under another MSC fisheries certificate in the WCPFC (F-SCS-0094). Vessels will continue to fish in both convention areas. Currently, these Tri Marine vessels have their own CoC certificate and must segregate non-certified sets (i.e. FAD sets) from free school sets in the WCPFC, and segregate MSC-eligible catch in the WCPFC from any catch from the EPO. Non-MSC eligble catch is segregated at the well-level (or by double-nets if stored in the same well). The captain's logsheet records the location, set type, and designated well. The Tri Marine office receives a weekly update on the well report. Other vessels from TUNACONs do not currently have their own CoC certificate. A similar system regarding traceability from the set to well is believed to be in place, however, this would need to be confirmed through a chain of custody auditor. It is currently unknown if the US-based fleet fishes in areas not under assessment (e.g. US EEZ) and if yes, what mechanisms are in place to maintain segregation during storage.
Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities. If Yes, please describe how any risks are mitigated.	The fishery clients handle both certified and non-certified fish. See the section above regarding fishing activity outside the geographic area and using non-certified set types. CoC is expected to be required at the point of capture, and thus the mechanisms at processing will be subject to separate CoC evaluations.

Does transshipment occur within the fishery? If Yes, please describe:	No transshipment occurs for any vessels in the fishery.
Are there any other risks of mixing or substitution between certified and non-certified fish? If Yes, please describe how any risks are mitigated.	No other risks are known at this stage.

6.3 Eligibility to enter further chains of custody

The team has concluded and determined that the product originating from the TUNACONS and US-based fleet will be eligible to enter further certified chains of custody and be sold as MSC certified or carry the MSC ecolabel. The team has determined that Chain of Custody will be required at the vessel level because of the risk of catch from set types outside of the assessment mixing with MSC-eligible product. Lists of documents to be solicited by CoC adutior at point where CoC is required will include the captain's log-sheet, captain's statement, and well stowage plan.

Below is a list of parties/categories of parties whose product will be eligible to use the fishery certificate and sell product as MSC certified with the blue eco-label:

- NIRSA
- Tri Marine
- Eurofish
- Jadran

List of eligible landing points:

- Manta, Ecuador
- San Diego, US

6.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to Enter Further Chains of Custody

There are no IPI stocks in this fishery.

7 Scoring

7.1 Summary of Performance Indicator level scores

Table 8. Summary of Performance Indicator Scores and Associated Weights Used to Calculate Principle Scores.

			Yellowfin	Skipjack	Bigeye
Principle	Performance Indicator (PI)		Score		
One	1.1.1	Stock status	60	70	60
	1.1.2	Stock rebuilding	60	60	60
	1.2.1	Harvest strategy	80	80	80
	1.2.2	Harvest control rules & tools	85	85	85
	1.2.3	Information & monitoring	80	80	80
	1.2.4	Assessment of stock status	85	85	85

			Ecuador	Panama	USA	Ecuador	Panama	USA	USA - small fleet
			Free School Sets			FAD Sets			
Two	2.1.1	Outcome	100	100	100	100	100	100	100
	2.1.2	Management strategy	85	85	85	85	85	85	100
	2.1.3	Information/Monitoring	85	85	85	85	85	85	80
	2.2.1	Outcome	90	90	90	90	90	90	*RBF*
	2.2.2	Management strategy	65	65	65	65	65	65	75
	2.2.3	Information/Monitoring	95	95	95	95	95	95	*RBF*
	2.3.1	Outcome	70	70	70	70	70	70	*RBF*
	2.3.2	Management strategy	80	80	80	80	80	80	70
	2.3.3	Information strategy	70	70	70	75	75	75	*RBF*
	2.4.1	Outcome	100	100	100	70	70	70	90
	2.4.2	Management strategy	100	100	100	65	65	65	100
	2.4.3	Information	100	100	100	65	65	65	95
	2.5.1	Outcome	100	100	100	80	80	80	80
	2.5.2	Management	80	80	80	80	80	80	80
	2.5.3	Information	80	80	80	75	75	75	75

			Ecuador	Panama	USA (all)
Three	3.1.1	Legal &/or customary framework	65	65	80
	3.1.2	Consultation, roles & responsibilities	75	75	75
	3.1.3	Long term objectives	90	90	90
	3.2.1	Fishery specific objectives	90	90	90
	3.2.2	Decision making processes	80	80	80
	3.2.3	Compliance & enforcement	65	65	75
	3.2.4	Monitoring & management performance evaluation	80	80	80

Principle 1

7.2.1 Principle 1 background

7.2.1.1 (Yellowfin Tuna, *Thunnus albacares)*

Life History Information

Taxonomic classification

Class: Actinopterigii
Order: Perciformes
Family: Scombridae
Genus: *Thunnus*
Species: *albacares*

Behaviour

Yellowfin tuna is a highly gregarious species that has a tendency to form free-swimming schools of the same size range (85% less than 85 cm). This behavior is modified when the fish schools associate with dolphins. In this case, the size distribution is less homogenous and individuals are generally larger (70% larger than 85 cm). The main dolphin types associated with yellowfin tuna are the spotted dolphins Stenella attenuata, the spinner dolphin Stenella longirostris, and the common dolphin Delphinus sp. Yellowfin tuna also aggregates around floating objects of diverse nature including logs, debris and dead whales among other flotsam.

The horizontal distribution of yellowfin appears to be correlated to temperatures between 20° and 30°C. Prey distribution is also an important factor in the distribution of yellowfin tuna and its distribution appears to be correlated with upwelling areas and the boundaries of oceanic fronts between the Equatorial Countercurrent and the South Equatorial Current. Additionally, the thermal structure of the water column strongly determines the distribution of yellowfin tuna which appears to be limited to the placement of the thermocline. This particular behavior of the fish has favored the development of the purse seine fishery (Cole 1980). Figure XX shows that historically yellowfin tuna has been caught by purse seiners predominantly associated with dolphins although catches by purse seiners on floating objects have been important. Very little yellowfin tuna is caught in other types of fisheries (IATTC-17-2019)

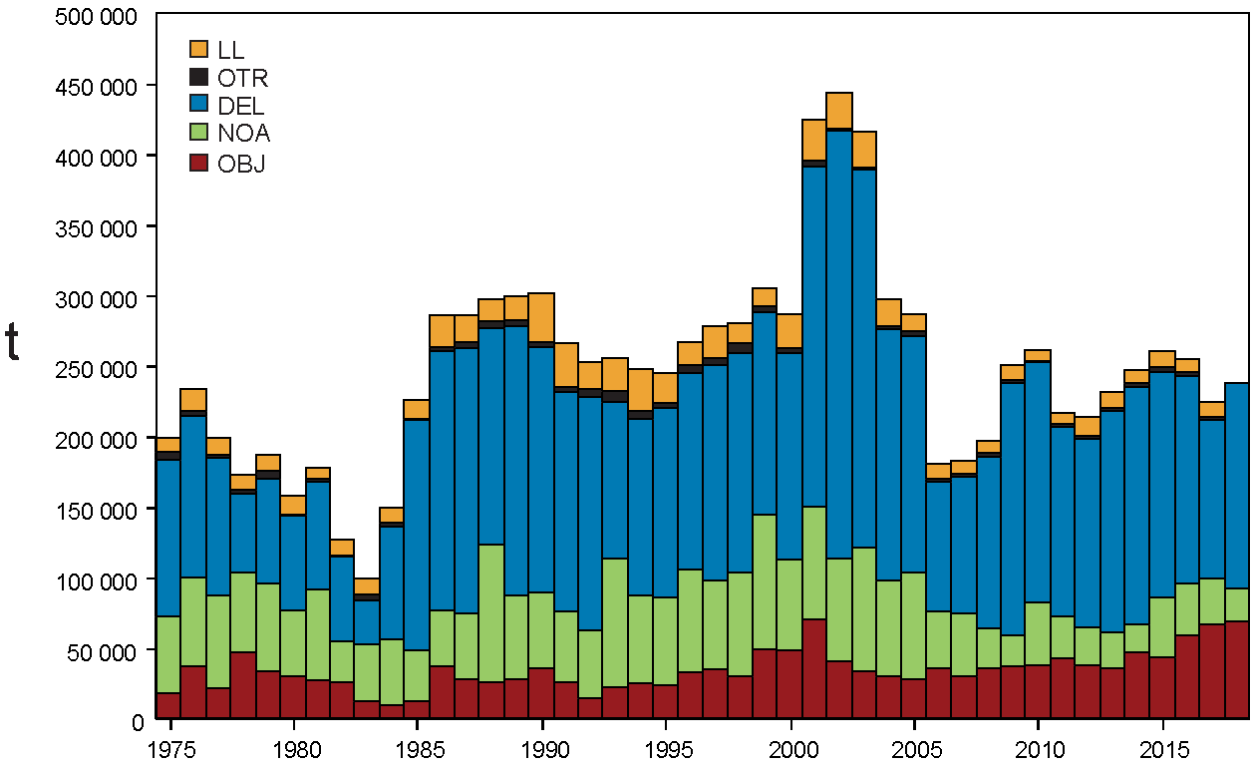


Figure XX Total catches (retained catches plus discards) for the purse-seine fisheries, by set type (DEL, NOA, OBJ), and retained catches for the longline (LL) and other (OTR) fisheries, of yellowfin tuna in the eastern Pacific Ocean, 1975-2018. The purse-seine catches are adjusted to the species composition estimate obtained from sampling the catches. The 2018 data are preliminary. Reproduced from IATTC-17-2019).

Growth and Natural Mortality

Growth of yellowfin tuna (YFT) was modeled in the latest full assessment following a Richards growth curve. However, the asymptotic length (L_∞) was poorly estimated because the data do not include many old fish (Aires-da-Silva and Maunder 2012). This problem was reflected in the results of the assessment given that the outcome was sensitive to the assumed average size of the oldest fish (Minte-Vera et al. 2015).

Maximum age recorded for yellowfin in the western-central stock was 6.5 years and the IATTC models growth up to 7.2 years. The maximum recorded length of 209 cm is larger than the L_∞ assumed by the IATTC of 185.7 cm (Cole 1980; Maunder and Aires-da-Silva 2009).

Natural mortality of yellowfin tuna has been modeled as a function of age and the curve representing this relationship has varied with the years. The latest assessment separates male from female mortality. The curve for males declines sharply from 0.7 to 0.2 in the first two years and stays at that level until the oldest age. Female mortality declines together with males but soon after they reach 0.2 it increases logistically until at about 5 years it stabilizes at around 0.6 (Figure XX; Aires-da-Silva and Maunder 2012).

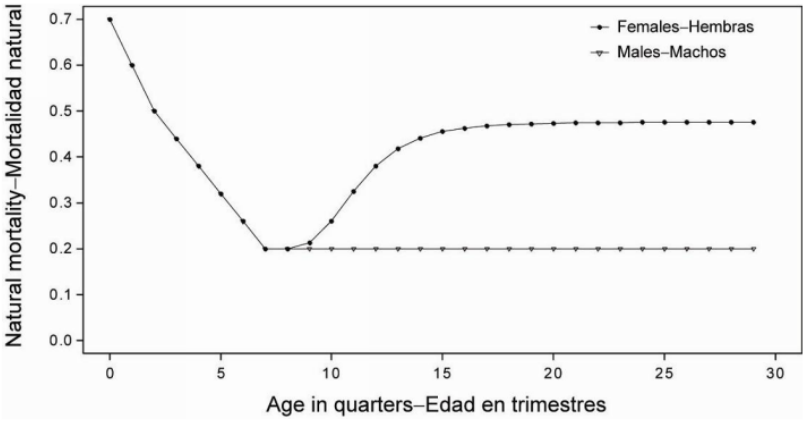


Figure XX. Natural mortality rates (M) at quarterly intervals, used for the assessment of yellowfin tuna in the ETPO. Reproduced from Aires-da-Silva and Maunder (2012).

Reproduction and Recruitment

Adult yellowfin are heterosexual without external sexual dimorphism. Sexual maturity can be reached at sizes as small as 50 cm, although most reports indicate that the usual size at maturity is around 110 cm at an age of approximately 2 or 3 years old (Cole 1980). Although spawning occurs throughout the year in warm northern equatorial waters, there may be some degree of fluctuation caused by the sequential movement of the 24 degree thermocline as summer progresses from the northern hemisphere to the south. This probably explains the observation of two cohorts that are 6 months apart in the length frequency data (Schaefer 2009). Larvae of the yellowfin tuna appear across the Pacific, probably associated with tropical and subtropical waters, peaking in density from April to June and restricted to the upper 50 or 60 m of the water column (Cole 1980).

Given the right environmental conditions, particularly temperature, yellowfin can spawn daily, or close to daily, with more than 60% of the mature females spawning every day (Schaefer 1998). This strong dependence on environmental conditions is reasonable support to a base case scenario where recruitment is assumed to be independent of the stock size. For comparison, the assessment considered the alternative scenario of a Beverton-Holt stock recruitment relationship with a shape parameter different to one (the base case of no S/R relationship). The apparent relationship in XX is explained by a possible regime shift in productivity, which increased both recruitment and spawning biomass which was first proposed by Tomlinson (2001). The trend in annual recruitment in the latest update (Minte-Vera et al. 2015) also suggests that there was a period of high productivity between 1983 and 2003 followed by a period of under-average recruitment (Figure XX). The relationship of temperature with recruitment has been further investigated by adding a temperature variable into the stock assessment model and by correlating temperature and recruitment outside the stock assessment model. No statistical relationship was found in either of the two approaches.

Stock Structure

The IATTC recognizes a single biological stock for yellowfin tuna. Potential division into two sub-stocks has been suggested with the dividing line drawn at 15° N (Schaefer 2009), but this proposition has not been verified, nor considered for stock assessments or management decisions. It is also considered that

exchange between the ETPO and the western Pacific is limited, and therefore the two regions are considered to have separate stocks. Results of tagging are limited but some have suggested the possibility of movements restricted to relatively small areas (Schaefer et al 2009). Further investigation of this potential structure at a finer scale has been suggested (Aires-da-Silva and Maunder 2012).

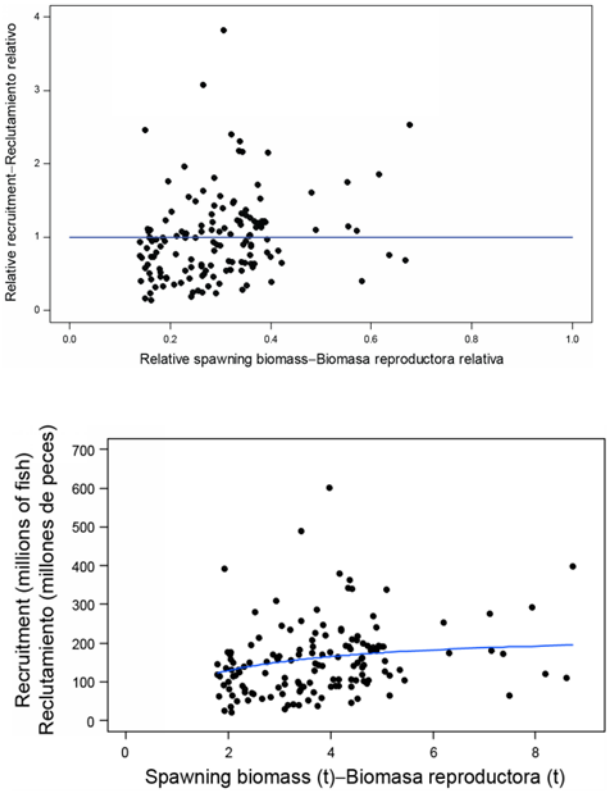


Figure XX. Estimated relationship between recruitment and spawning biomass of yellowfin tuna. a) No Stock-Recruitment relationship assumed (steepness = 1); Recruitment is scaled so that the average recruitment equals 1. Spawning biomass is scaled so that the average virgin spawning biomass equals 1. b) Stock-Recruitment relationship assumed (steepness=0.75). Reproduced from Aires-da-Silva and Maunder (2012).

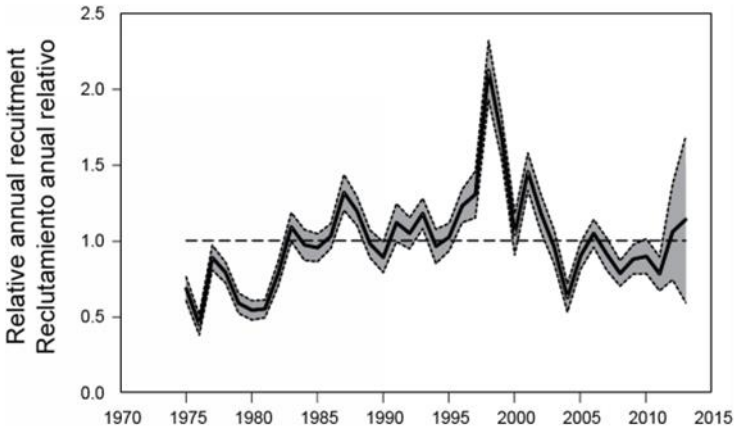


Figure XX. Estimated annual recruitment at age zero of yellowfin tuna to the fisheries of the ETPO. The estimates are scaled so that the average recruitment is equal to 1.0 (dashed horizontal line). The solid line illustrates the MLE of recruitment, and the shaded area indicates the approximate 95% confidence intervals around those estimates. Reproduced from Minte-Vera et al. (2015).

Status of stocks

The model currently used for the stock assessment of yellowfin tuna in the eastern Pacific Ocean is unable to reconcile data that apparently carry contradictory signals about the status of the stock. The low values for recent years estimated for three CPUE-based indicators (CPUE for two dolphin-associated (DEL) fisheries, standardized using spatiotemporal methods, and for the southern longline (LL-S) fishery) suggest low abundance of the population, but this is inconsistent with the increased average size of the fish in the catch of these fisheries. It is therefore not clear from the indicators whether yellowfin abundance is in fact reduced, or changes have occurred in the fisheries.

Data-based indicators were calculated for each one of the main fisheries defined in the current stock assessment model for yellowfin, in addition to overall indicators for the stock (Figure XX). The fisheries are defined by gear (longline and purse seine) and geographical area of operation, and the purse-seine fisheries are further divided by set type (floating-object, unassociated, and dolphin). The indicators for individual fisheries are catch, effort, catch per unit of effort (CPUE), and average length of the fish in the catch, and are based on data for 1975-2018. The overall indicators are total purse-seine capacity, adjusted for the seasonal closures of the fishery, and total effort, and are based on the following: (1) closure-adjusted purse-seine capacity, 2000-2018 (as for bigeye tuna, SAC-10-06); (2) purse-seine effort, in total number of sets, by set type, 1987-2018; and (3) longline effort, in total number of hooks, 1975-2017 (data from annual reports by CPCs. The total catch on floating objects includes the four discard fisheries used in the stock assessment (IATTC Stock Assessment Report 2018). The distributions of historical values for these indicators are somewhat asymmetric; therefore, to evaluate the current value of each indicator in relation to the distribution of its historical values, and the 5th and 95th percentiles are used as reference levels.

Both the number of floating-object sets and the number of days fished in such sets generally increased during the entire period, and in 2018 were at and above, respectively, the upper reference level (Figures XX and XX). Several related indicators for vessels that make more than 50% of their sets on floating objects, presented in SAC-10-06, show that the number of days fished and the number of vessels also increased over time, but less rapidly than the number of sets. The number of days fished per vessel has declined over time, while the number of floating-object sets per vessel has increased, indicating that the vessels have become more efficient at finding FADs with sufficient tuna associated with them to make a set.

The reported longline effort peaked twice, around 1990 and in the early 2000s, and has increased again since 2010; it is currently above the median (Figure XX). Prior to 2000, the Japanese fleet exerted 50% or more of the total longline effort in the EPO, but this proportion has declined continuously since then, and in 2017 was 14% (SAC-10-03).

The indicators for three of the purse-seine fisheries on floating objects (OBJ-S, OBJ-C, and OBJ-N; Figure XX) are very similar, with catch, effort, and mean length increasing in the 1990s as the floating-object

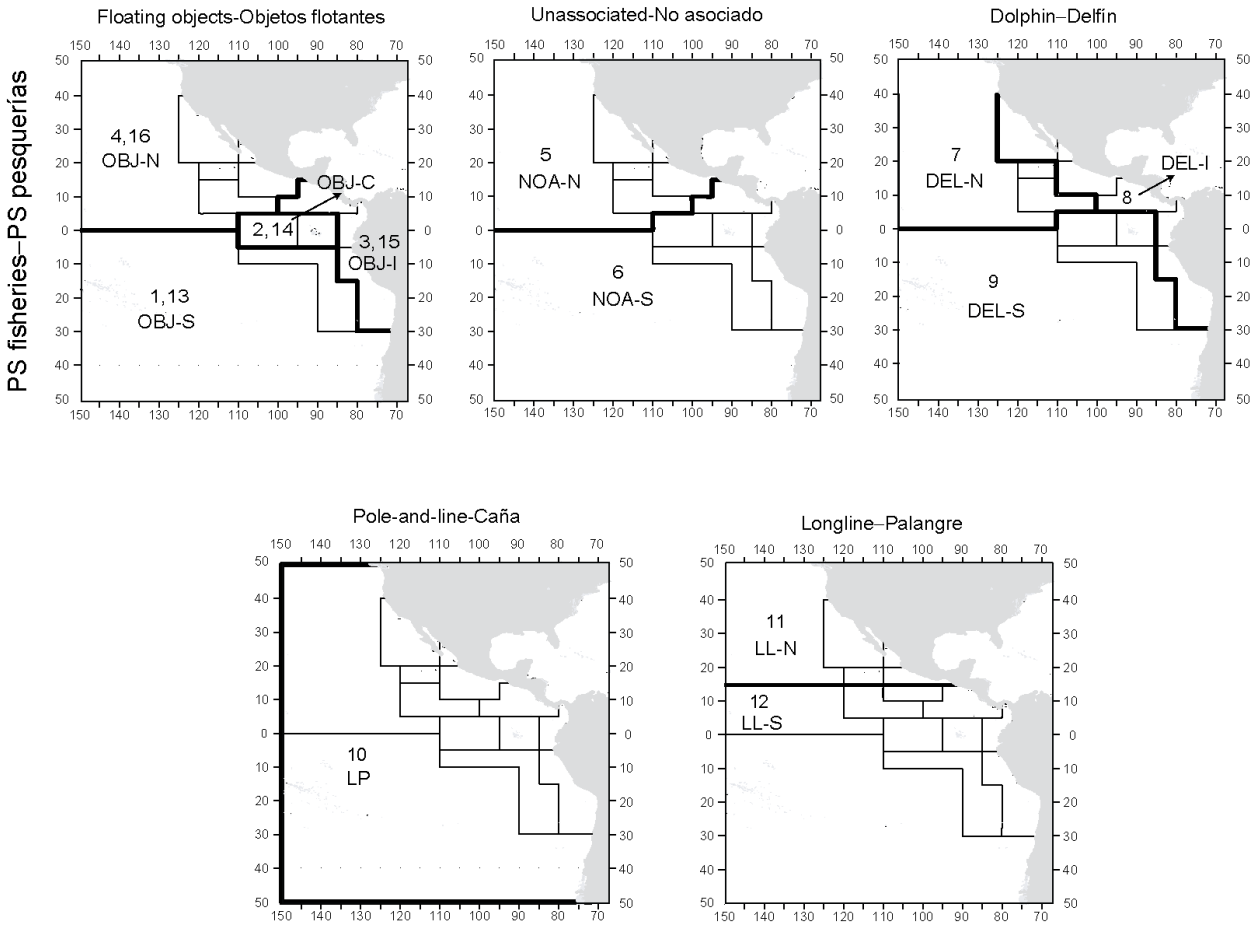


Figure XX Fisheries defined for the yellowfin stock assessment and for calculating indicators.

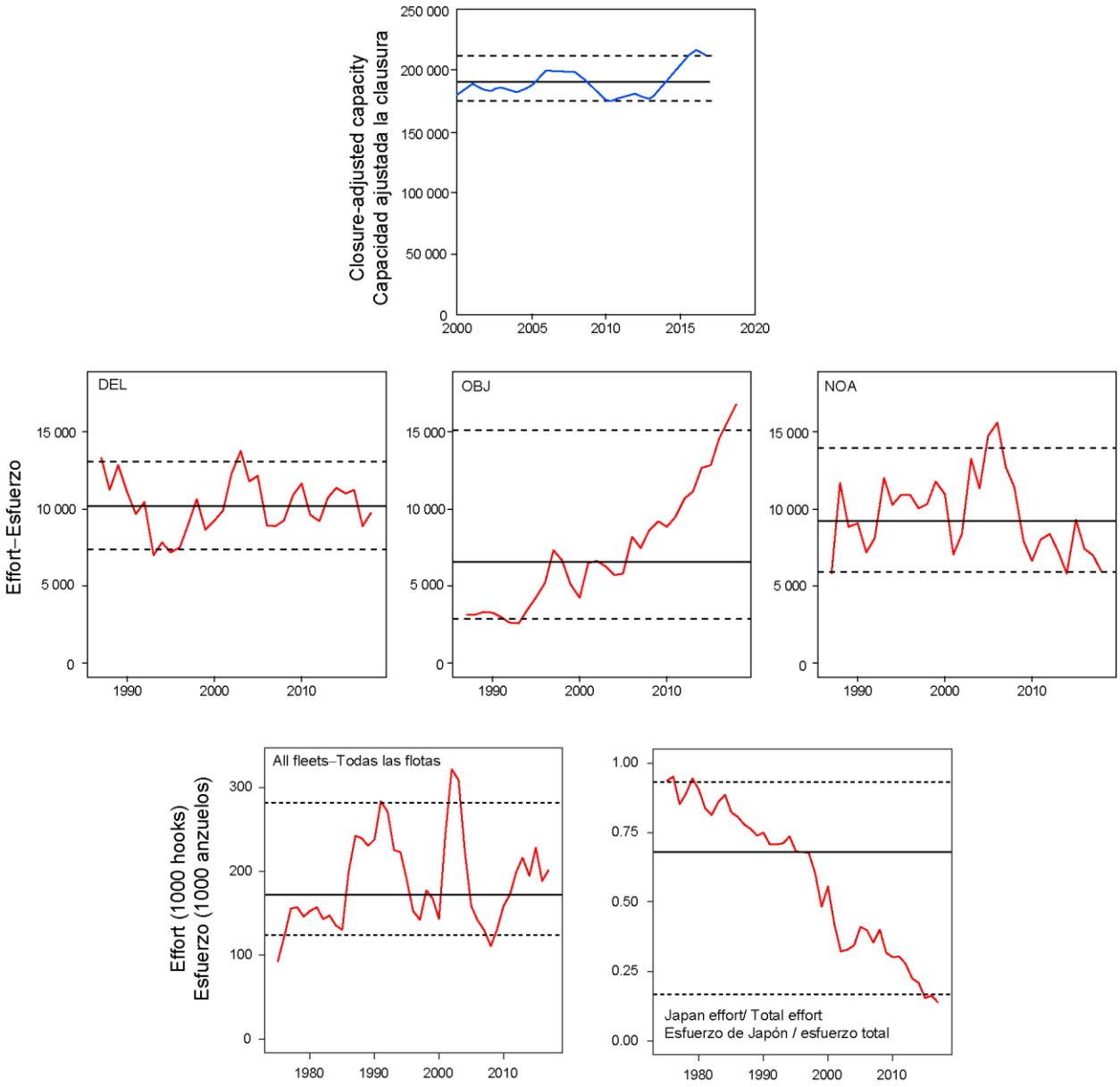
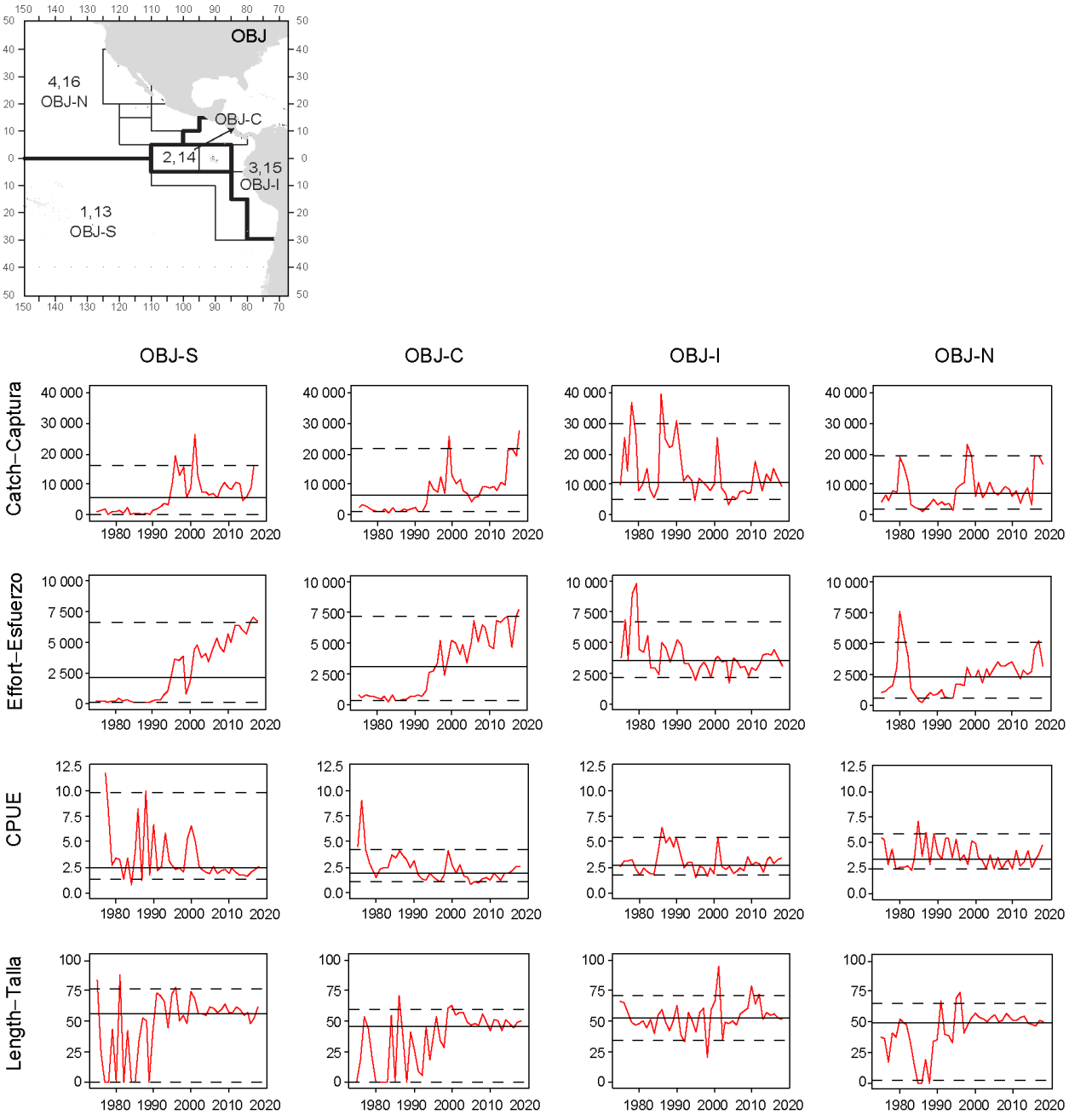


Figure XX**.** Indicators of total effort in the EPO, based on purse-seine data (closure-adjusted capacity, 2000-2018; annual total number of sets, by type, 1987-2018) and based on longline data for 1975-2017 (effort reported by all fleets, in total numbers of hooks; proportion of the effort corresponding to Japan). The dashed horizontal lines are the 5th and 95th percentiles, the solid horizontal line is the median.



FigureXX. Indicators (catch (t); effort (days fished); CPUE (t/day fished); average length (cm)) for the yellowfin tuna stock in the eastern Pacific Ocean, from purse-seine fisheries on floating objects (OBJ).

fishery expanded. The catch and effort of these fisheries are currently at or above the upper reference value, except for the OBJ-N effort, which fell substantially in 2018. The indicators for the OBJ-I fishery do not show any major trends, but have wide fluctuations and are currently around the median. The average length for all fisheries is currently around the median. Similar graphs are provided for each of the other main fisheries (see Figure XX) and the results can be found in IATTC SAC-10-08.

It is not clear from the indicators whether yellowfin abundance is reduced, or the fisheries are changing. Several hypotheses will be explored in preparation for the benchmark assessment in 2020.

1)

2) The report shall include: A brief history of fishing and management.

3)

Total Allowable Catch (TAC) and catch data

Table 9. Total Allowable Catch (TAC) and catch data

TAC	Year	YYYY	Amount	n, unit
UoA share of TAC	Year	YYYY	Amount	n, unit
UoA share of total TAC	Year	YYYY	Amount	n, unit
Total green weight catch by UoC	Year (most recent)	YYYY	Amount	n, unit
Total green weight catch by UoC	Year (second most recent)	YYYY	Amount	n, unit

7.2.1.5 (Skipjack Tuna, *Katsuwonus pelamis*

Life History Information

Taxonomic classification

Class: Actinopterigii
Order: Perciformes
Family: Scombridae
Genus: *Katsuwonus*
Species: *pelamis*

Behaviour

An early description of the schooling behavior of skipjack tuna (SKJ) reported that 71% of the fish caught by baitboats and 80% by the purse seine fishery in the eastern Pacific, were schools of pure skipjack aggregations with no yellowfin present (Forsbergh 1980). Contrary to yellowfin tuna, skipjack is not reported to school in strong association with dolphins but are seen associated with birds, drifting objects, sharks and whales. Skipjack tuna are also found in free-swimming schools of fish. Figure XX depicts total catch of skipjack in the ETPO for all fleets separated by set type. Figure XX shows that historically skipjack tuna has been caught by purse seiners predominantly associated with floating objects although catches by purse seiners on free swimming schools have been important. Very little skipjack is caught in other types of fisheries (IATTC-94-01)

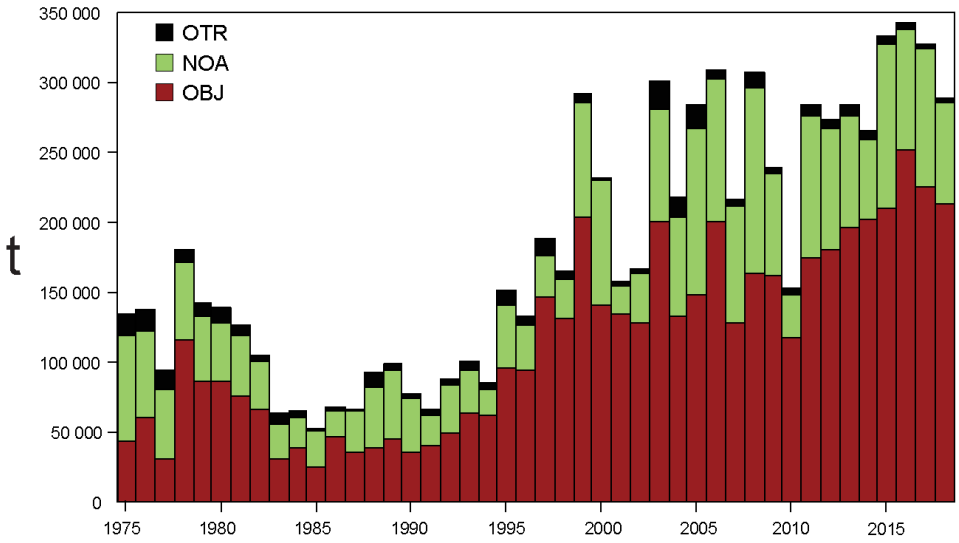


Figure XX Total catch of skipjack tuna in the eastern Pacific Ocean by type of fishery. Reproduced from IATTC-94-01. OBJ signifies object sets, NOA signifies non-object or unassociated sets, and OTR signified other set types.

Growth and Natural Mortality

Skipjack tuna is heterosexual and sexual maturity is reached at about 400 mm and spawn throughout the year in tropical waters and from spring to early fall in subtropical waters. No estimates of longevity exist, but an individual at the large end of the size range (106.5-108.4 size class) was estimated to be at least 12 years (Forsbergh 1980).

The natural mortality of the skipjack tuna has been difficult to estimate and previous values (Wild and Hampton 1994) may have been severely biased by high juvenile mortality due to tagging and adult tagged animals leaving the study area (Maunder 2012b). The latest assessment of skipjack used a length based schedule of mortality that declines sharply and irregularly from about 0.8 in small individuals to 0.15 when individuals attain approximately 60 cm, and stays at that level of mortality thereafter (Figure XX; Maunder 2012b).

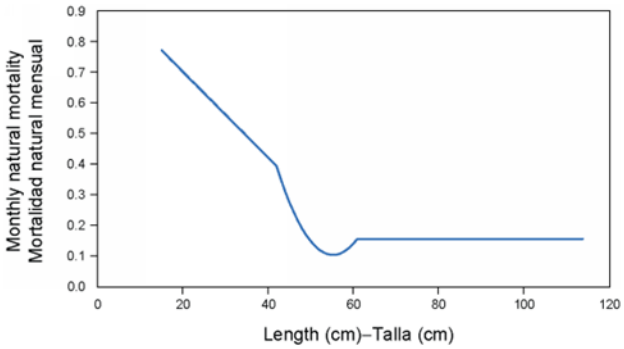


Figure XX Monthly natural mortality rates used in the SKJ assessment of 2010. Reproduced from Maunder (2012b).

Reproduction and Recruitment

Like all tunas, the skipjack is an oviparous, broadcast, batch spawner that can have fecundities much higher than other species of tuna. Skipjack becomes sexually mature very quickly once they are about 40 cm in total length and, depending on the water temperature, can spawn almost daily. The spatial pattern of spawning is “confluent throughout tropical and subtropical regions.” (Forsbergh 1980; Schaefer 2001)

No stock-recruitment relationship has been identified (Figure XX) and assessment models only restrict the degree of variability around the average. A clear correlation between recruitment and environmental variables such as temperature is uncertain. In the Western Pacific, the abundance of larvae doubles with each 1 degree of increase in water temperature from 23°C up to 29°C. On the other hand, no correlation was found between recruitment and Sea Surface Temperature and the Southern Oscillation Index inside or outside assessment models. However, it is suggested that the effect of environmental variables on recruitment in different stages of fish development should be investigated (Maunder 2002).

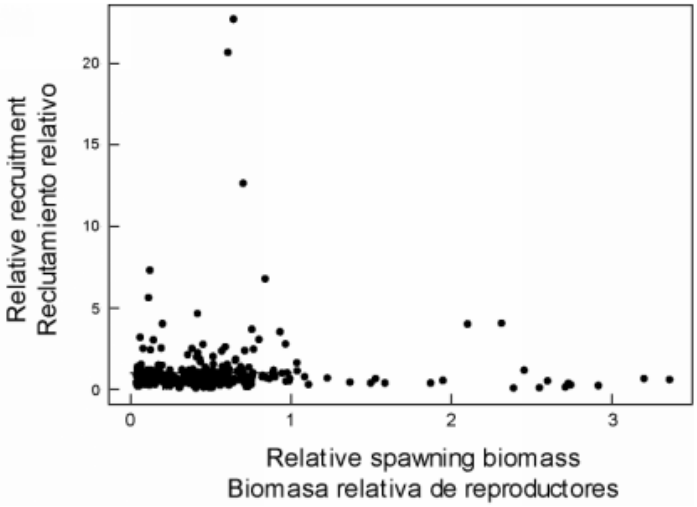


Figure XX Estimated relationship between recruitment and spawning biomass of skipjack tuna assuming dome shaped selectivity. Scales in both axes are relative to average recruitment and average unexploited spawning equal to one. Reproduced from Maunder (2002).

Distribution and Stock Structure

Skipjack tuna is an inhabitant of tropical, subtropical and warm temperate waters, and in the Pacific they are found from 40° N to 40° S across the whole oceanic basin. Water temperature above 20° C appears to be the limiting factor of the latitudinal distribution. Given the age-dependent preference regarding certain levels of temperature and oxygen, on the vertical dimension, both factors play a role on the overall distribution of the species because the thermocline may be located at different depths in different locations.

An extensive review by Schaefer (2009) concluded that a northern and a southern stock of skipjack tuna may exist, separated at about 15° N with very little mixing between them. However, research attempting to determine stock structure of skipjack has been inconclusive. Knowledge about the movement of this species indicates there is considerable movement among areas which can constitute different conceptual units either geographically or from a stock-related perspective. Tagging in the study showed movement of fish from the eastern to the western Pacific, but no tagged fish in the west were recovered in the east. Schaefer (2009) downplays the relevance of what he calls “long-range movement of a few tagged skipjack” (see IATTC 1995, Fig 64), indicating that data in the ETPO only support offshore-onshore and north-south movements, meaning the extent of the displacement capacity of skipjack is limited. Interestingly, this author points to results that concluded that skipjack may not present definite migratory movements but move in random directions within broad limits--as a diffusion process. This type of movement across a large geographic range plus a very large effective population size may be help explain the lack of genetic differentiation[2] between the Pacific and Atlantic oceanic basins (Ely et al 2005). Similarly, even rare long

[2] The analysis used the hypervariable non-coding control region I and a segment of a coding region of mitochondrial DNA

range movements that introduce small amounts of genetic exchange between populations are capable of maintaining genetic homogeneity across many genetic markers.

If these processes do not allow for interoceanic genetic differentiation, it would make it even more difficult to determine a definitive stock structure in the Pacific alone. Alternative criteria such as differences in spawning, growth and movement, as discussed by Schaefer, still need to be put in the appropriate context to make sense when no genetic differences can be identified within a population or between putative sub-units. The latest IATTC on skipjack assumes that for the purpose of stock assessment the single stock in the ETPO does not interact with skipjack in the Western and Central Pacific.

Status of stocks

Maunder and Deriso (2007) described skipjack tuna as "notoriously difficult to assess." This is due to the highly productive nature of the species and the elevated levels of variability in recruitment. Continuous spawning, rapid growth and high abundance are additional factors complicating the estimation of parameters regulating the dynamics of the species and the effect of fishing on the stock using regular assessment methods. Despite improvements in the structure of models used to assess the status of this fishery, age specific natural mortality is still very uncertain and yield per recruit appears to be maximized by catching the youngest fish in the model (Maunder and Deriso 2007; Maunder 2012b).

A number of approaches have been tested to evaluate skipjack. Maunder (2012b) tested the performance of four different approaches to assess the status of the skipjack, from the analysis of length structure, to tagging data, a coupled ecosystem-population dynamic model, and the use of alternative fishery and biological indicators.

Maunder and Deriso (2007) and Maunder (2012b) considered that the tag data analysis produced highly uncertain estimates of exploitation rates. This author also found that determination of fishing effort is problematic because "within a single trip, purse seine sets on unassociated schools are generally intermingled with floating object or dolphin associated sets." If effort cannot be determined, then reliable CPUEs cannot be produced. When skipjack is associated with FADs, it is uncertain if the CPUE of the purse seine fishery is an appropriate index of abundance. Overall, it is considered that the information in the CPUE and length data was insufficient to produce reliable estimates of stock size. Biomass estimates from the SEAPODYM analysis are much higher than those from the length based assessment, which is probably the reason why the average estimate of annual fishing mortality (0.12) is much lower than that obtained for region B in the length based assessment (0.74) (Maunder and Deriso 2007; Maunder 2012b).

To overcome the problematic and uncertain interpretation of results from previous approaches, Maunder and Deriso (2007) suggested the use of alternative indicators to determine the status of the stock and the behavior of the fishery. Even if the indicators cannot provide a measure of optimum yield, they can be adapted to define management actions based on the indicator analyses outcomes. To evaluate these indicators, the current value is compared to reference levels constructed by adding or subtracting 1.645 standard deviations to the average of the time series for each indicator. The resulting range in the time

history overall includes about 90% of the estimated values. In the latest reports, the reference levels are shown as the 5th and 95th percentiles.

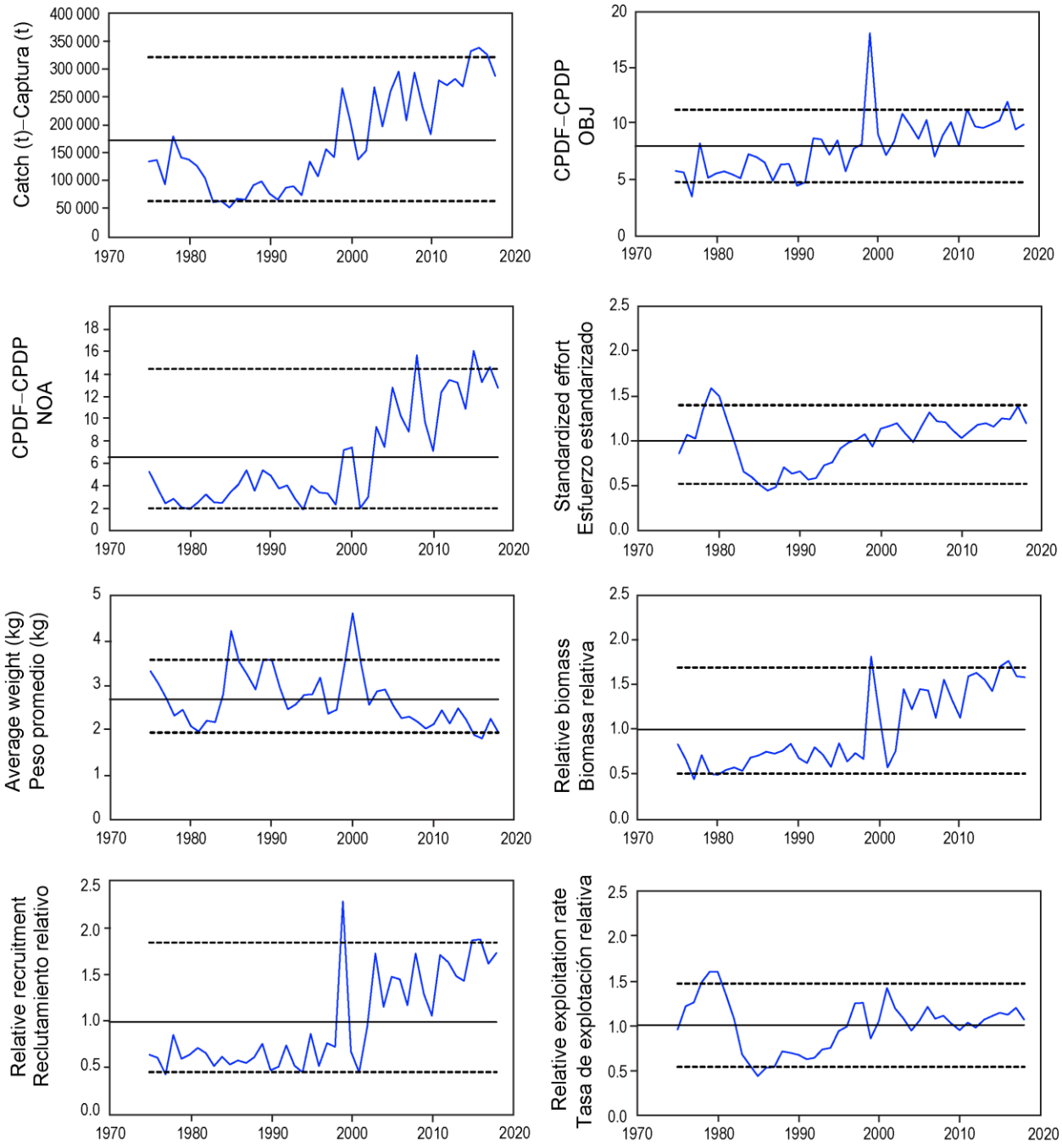


Figure 1 Indicators of skipjack tuna stock status in the ETPO. OBJ: Floating object fishery; NOA: Unassociated fishery; CPDF: Catch per day fished. Effort, biomass, recruitment and exploitation rate are standardized so that their average equals one. Reproduced from Maunder (2019).

With the exception of average weight, all other indicators increased to levels above their average in the mid-90s or early 2000s. Most of the indicators above their average show wide fluctuations. Overall, there

is no management concern for skipjack except that the exploitation rate steadily increased for about 15 to 20 years. However, from 2003 it stabilized above the average, and the data and model-based indicators have not yet detected any adverse effect of such increase. There was also a concern about declining weight under its average, but this has also stabilized since 2005. In 2009, the average weight was under the lower reference level, which could be interpreted as a sign of overexploitation. Other plausible explanations are high recent recruitments or the fishery moving to an area of smaller fish. Based on these findings, the IATTC standing on skipjack status is that "any continued decline in average length is a concern and, combined with leveling off of catch and CPUE, may indicate that the exploitation rate is approaching, or above, the level associated with MSY" (Maunder, 2019).

It should also be considered that added to the high productivity of the stock, the selectivity of the fishery may be playing a relevant role protecting recruitment. Figure XX shows that the vast majority of the catch (IATTC 2014a) is of length above the estimated narrow range (around 40 cm; Figure XX; Schaefer 2001) at which sexual maturity is attained.

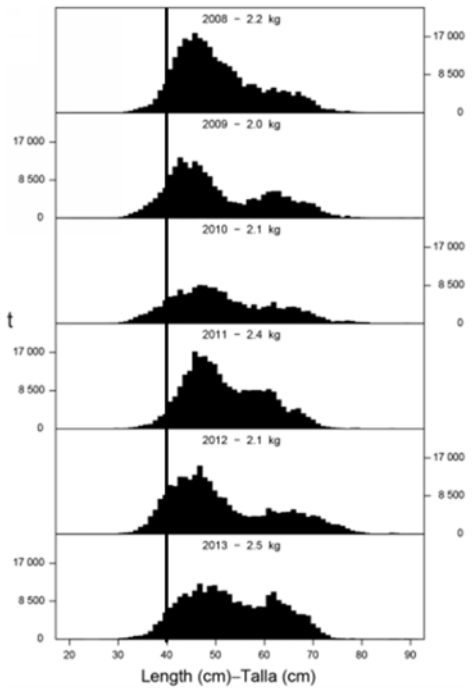


Figure XX Estimated size distributions of SKJ tuna caught by the purse seine and pole and line fisheries in the ETPO from 2008 to 2009. The vertical line represents a feasible length at maturity. Reproduced from IATTC (2014a).

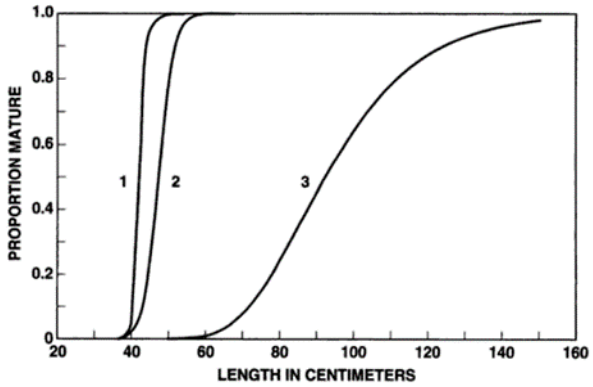


Figure XX Proportion of mature female tunas in relation to their size. 1) *Katsuwonus pelamis*; 2) *Euthynnus lineatus* and 3) *Thunnus albacares*. Reproduced from Schaefer (2001).

Total Allowable Catch (TAC) and catch data

Table 10. Total Allowable Catch (TAC) and catch data

TAC	Year	YYYY	Amount	n, unit
UoA share of TAC	Year	YYYY	Amount	n, unit
UoA share of total TAC	Year	YYYY	Amount	n, unit
Total green weight catch by UoC	Year (most recent)	YYYY	Amount	n, unit
Total green weight catch by UoC	Year (second most recent)	YYYY	Amount	n, unit

7.2.1.6 Life History Information (Bigeye, *Thunnus obesus)*

Taxonomic classification

Class: Actinopterigii
Order: Perciformes
Family: Scombridae
Genus: *Thunnus*
Species: *obesus*

Status of stocks

Various uncertainties were identified in the update assessment of bigeye tuna conducted in 2018, and its usefulness for management has been questioned. Therefore, the staff developed stock status indicators (SSIs) for bigeye, similar to those used for skipjack tuna, as an alternative basis for management advice and to monitor the stock and the fishery in the future until the uncertainties in the stock assessment are resolved. The indicators are based on relative quantities; i.e., instead of comparing a value with a reference point based on the maximum sustainable yield (MSY) of a species, it is compared with the distribution of its historical values. The six purse-seine indicators are based on data for all purse-seine vessels that fished during 2000-2018, in order to exclude the period prior to the mid-1990s when purse-seine catches of bigeye were negligible. The distributions of the historical values of these indicators are some what skewed; therefore, in order to estimate the current value of each indicator relative to its historical values, the 5th and 95th percentiles are used as reference levels.

All purse-seine SSIs, except catch, show strong trends over time, and in 2018 were at, or near, the respective reference levels, indicating high rates of exploitation, increased fishing mortality and reduced abundance of juveniles (Figure XX). Total purse-seine catch of bigeye fell from its high level in 2000, due to unfavorable environmental conditions, increased during 2003-2006, and has fallen since then, except for an increase to its average level in 2018. The catch per day fished (CPDF) of bigeye in floating-object sets generally fell during 2000-2018, reaching the lower reference level in 2018. The capacity of the purse-seine fleet, adjusted for the closures, has fluctuated since 2000, but has increased in recent years, and is now at its upper reference level. Both the number of floating-object sets and the number of days fished in such sets generally increased during the whole period, and in 2018 were above the upper reference level. The average weight of the bigeye in the catch precipitously declined from between 2000 to 2002, after which fluctuating at the median level until 2015 when it declined to the lower reference level. The increasing number of floating-object sets, particularly on fish-aggregating devices (FADs), and the decreasing average weight of the bigeye in the catch continue to indicate that the bigeye stock in the EPO is under increasing fishing pressure, and that measures additional to the current seasonal closures, such as limits on the number of floating-object sets, are necessary.

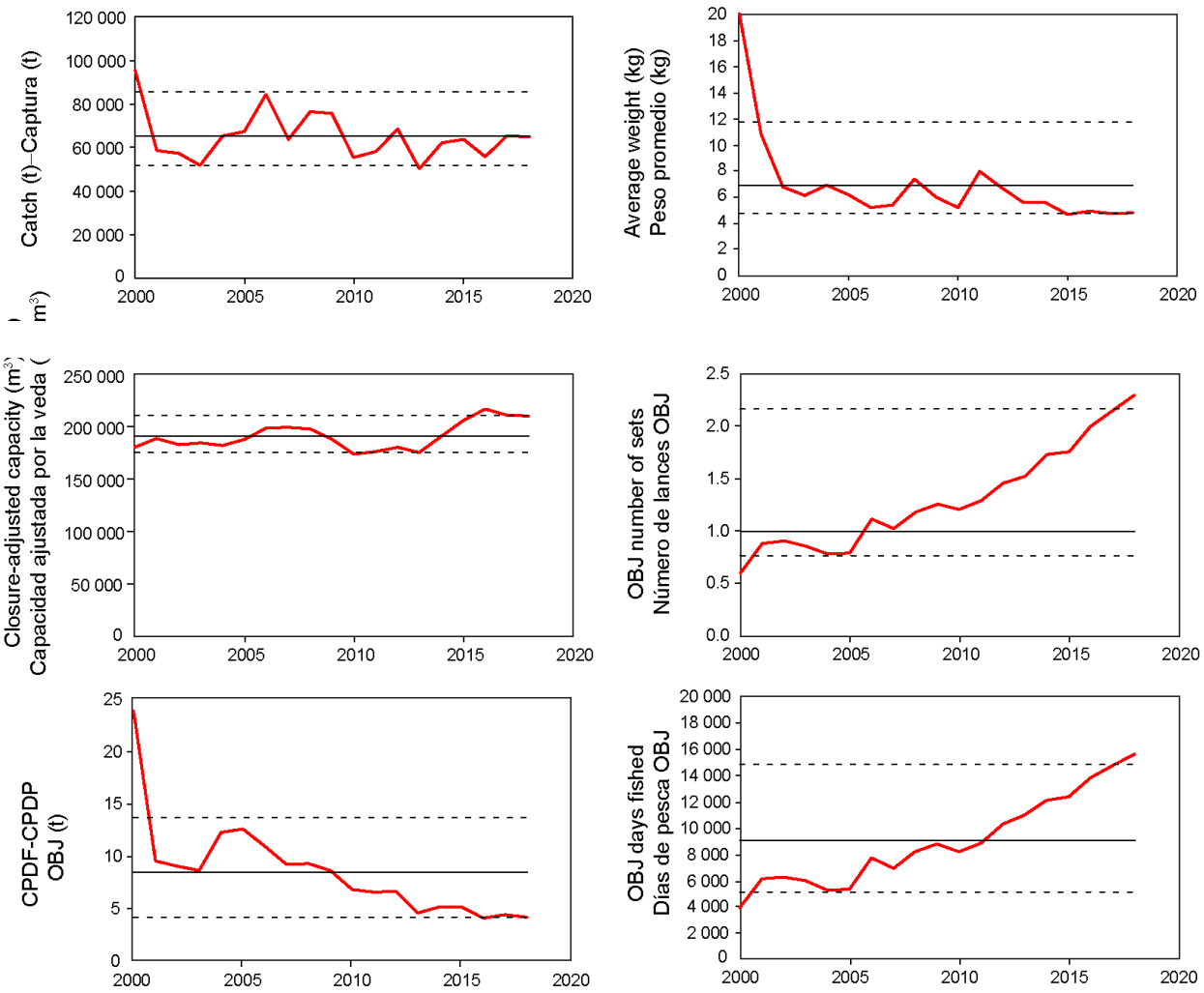


Figure XX. Stock status indicators for bigeye tuna in the EPO, based on purse-seine data, 2000-2018. The dashed horizontal lines are the 5th and 95th percentiles, the solid horizontal line is the median. CPDF:catch per day fishing; OBJ: sets on floating objects.

Two indicators for bigeye in the EPO based on longline data were also developed: abundance indicess for the LL-C and LL-S fisheries, standardized with a generalized linear model, and average length of the fish in the catch. Both abundace indices fluctuated between the median and upper limit between 1975 and 1990 afterwhich abundance declined fluctuating between the median and lower limit; occasionally dipping below the lowere limit (Figure XX). It is important to note that longline indices of abundance for recent years are highly uncertain, due mainly to the decrease in both the fishing effort and spatial coverage of the Japanese longline fleet.

For the second longline indicator, in all four longline fisheries, the time series of average length of fish in the catch do not show an apparent long-term trend, and the most recent values are within the reference limits.

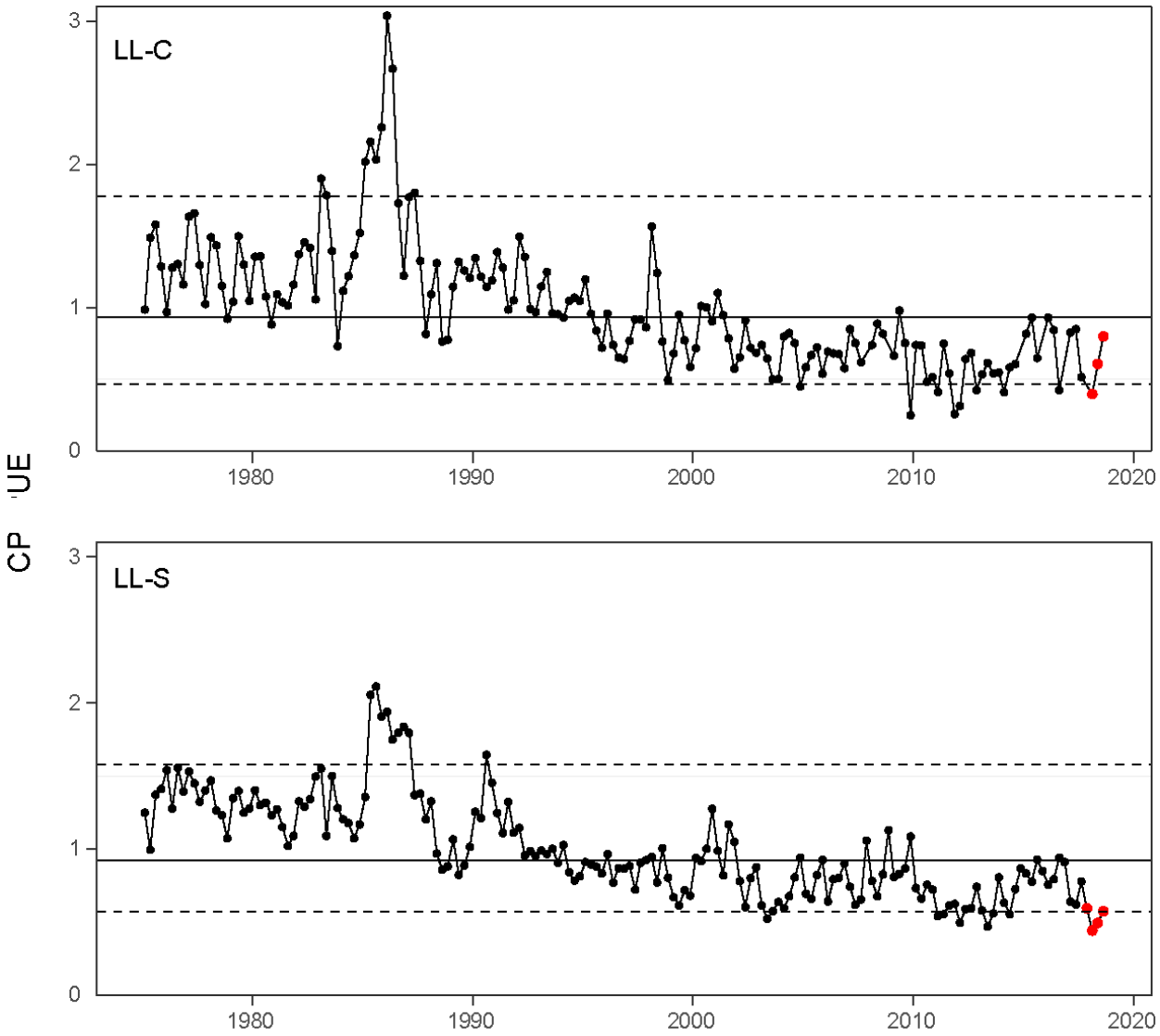


Figure XX. Indices of abundance for bigeye tuna in the central (LL-C) and southern (LL-S) longline fisheries, 1975-2018. The red dots represent updated values for the the first three quarters of 2018 and, for the LL-S fishery, also the last quarter of 2017. The solid horizontal line is the median, and the two dashed horizontal lines are the 5th and 95th percentiles

Total Allowable Catch (TAC) and catch data

Table 11. Total Allowable Catch (TAC) and catch data

TAC	Year	YYYY	Amount	n, unit
UoA share of TAC	Year	YYYY	Amount	n, unit
UoA share of total TAC	Year	YYYY	Amount	n, unit

Total green weight catch by UoC	Year (most recent)	YYYY	Amount	n, unit
Total green weight catch by UoC	Year (second most recent)	YYYY	Amount	n, unit

7.2.2 Principle 1 Performance Indicator scores and rationales

There are three sets of Principle 1 scoring tables presented below. The first set of scores are for the target stock of Eastern Pacific Ocean Yellowfin tuna, the second set, immediately following, is for Eastern Pacific Ocean Skipjack, and the third set is for the Eastern Pacific Ocean Bigeye.

PI 1.1.1 – Yellowfin tuna—Stock Status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status relative to recruitment impairment			
	Guide post	It is likely that the stock is above the point where recruitment would be impaired (PRI).	It is highly likely that the stock is above the PRI.	There is a high degree of certainty that the stock is above the PRI.
	Met?	Yes	No	No

Rationale

The adopted limit reference point for all tuna species harvested in the ETPO under the regulatory reach of the IATTC is based on worst case scenarios and precautionary assumptions of reductions in recruitment considered catastrophic (50% reduction in recruitment under a S-R relationship with h=0.75). The resulting LRP were 0.28Bmsy and 2.42Fmsy. During the Commission annual meeting of 2014 in Peru, a recommendation was made to adopt this LRP concept together with the TRP based on MSY. Using Fmsy as a target consolidated the harvest control rule already used by the Commission. The recommendation was adopted and is considered binding (IATTC 2014).

Minte-Vera et al (2019) conducted an update stock assessment of yellowfin tuna (Thunnus albacares) in the eastern Pacific Ocean (EPO), using an integrated statistical age-structured stock assessment model (Stock Synthesis Version 3.23b). “Update” stock assessment means that the base case model used in this assessment is the same as that used in the previous assessment, conducted in 2018 (Document SAC-09-06), the sole difference is that it includes new and updated data.

Based on the 2019 update assessment the SBR is substantially below the MSY level (*S*recent/*S*MSY = 0.76), as is the biomass of fish aged 3 quarters and older (*B*recent/*B*MSY = 0.84; See Kobe plot below). It is estimated that current *F* > *F*MSY, based on the current distribution of effort among the different fisheries (*F* multiplier = 0.89, approximate confidence interval CI = (0.79,0.99) and catches in 2018. This is a substantial change from the previous assessment, which estimated *F* ≈ *F*MSY (*F* multiplier = 0.99; CI = (0.88, 1.10)). These interpretations are subject to uncertainty, but do not exceed the limit reference points; however, they are highly sensitive to the assumptions made about the relationship between stock size and recruitment (steepness; *h*), the weighting assigned to the different data sets (in particular to the longline CPUE), the growth curve, and the assumed rates of natural mortality (*M*) for yellowfin, as shown in previous assessments. Given these uncertainties the authors do not indicate if the stock is overfished or experiencing overfishing relative to the TRPs based on MSY.

While the LRP have not been exceeded there is uncertainty about recent and future levels of recruitment and biomass (Minte-Vera et al 2019). In general, recruitment of yellowfin to the fisheries in the EPO is both annually and seasonally variable and may have experienced three different recruitment productivity regimes: below

average (1975-1982), mostly above average (1983-2002), and mostly below average (2003-2014) (see recruitment time series below). The 2015 recruitment was estimated to be above average, coinciding with the 2015-2016 El Niño event, while the 2016 recruitment was estimated to be below average. The recruitments of 2017 and 2018 were estimated with high uncertainty, and it is not possible to ascertain at this time whether they were below or above average.

While benchmark stock assessments for yellowfin tuna (YFT) and bigeye tuna (BET) will be conducted in 2020 following the adopted IATTC workplan to address key uncertainties (SAC-10-01), stock status indicators (SSIs) for YFT and BET have been developed, similar to those used for skipjack tuna (SAC-09-07), as an alternative basis for management advice and to monitor the stock and the fishery in the future until the uncertainties in the stock assessment are resolved. The indicators are based on relative quantities; i.e., instead of comparing a value with a reference point based on the maximum sustainable yield (MSY) of a species, it is compared to the distribution of its historical values, 5th and 95th percentiles and median (50th percentile). Current values approaching or below the 5th percentile suggesting a decline relative to the median value of the SSI, while values approaching or above the 95th percentile suggesting an increase relative to the median value of the SSI. Current values fluctuating about the median suggesting no change to the SSI.

Indicators were calculated for each one of the main fisheries defined in the current stock assessment model for yellowfin , in addition to overall indicators for the stock (Minte-Vera et al 2019). The fisheries are defined by gear (longline and purse seine) and geographical area of operation, and the purse-seine fisheries are further divided by set type (floating-object, unassociated, and dolphin). The indicators for individual fisheries are catch, effort, catch per unit of effort (CPUE), and average length of the fish in the catch, and are based on data for 1975-2018, as in the stock assessment. The overall indicators are total purse-seine capacity, adjusted for the seasonal closures of the fishery, and total effort, and are based on the following: (1) closure-adjusted purse-seine capacity, 2000-2018 (as for bigeye tuna, SAC-10-06); (2) purse-seine effort, in total number of sets, by set type, 1987-2018; and (3) longline effort, in total number of hooks, 1975-2017. The total catch on floating objects includes the four discard fisheries used in the stock assessment (see Figure xx for definitions of geographical areas).
Both the number of floating-object sets and the number of days fished in such sets generally increased during the entire period, and in 2018 were at and above, respectively, the upper reference level (95th percentile). Several related indicators for vessels that make more than 50% of their sets on floating objects show that the number of days fished and the number of vessels also increased over time, but less rapidly than the number of sets. The number of days fished per vessel has declined over time, while the number of floating-object sets per vessel has increased, indicating that the vessels have become more efficient at finding FADs with sufficient tuna associated with them to make a set. Prior to 2000, the Japanese fleet, whose index of abundance and length-frequency data are used to represent all the longline fleets, exerted 50% or more of the total longline effort in the EPO, but this proportion has declined continuously since then, and in 2017 was 14% (Minte-Vera et al 2019).

The indicators for three of the purse-seine fisheries on floating objects (OBJ-S, OBJ-C, and OBJ-N) are very similar, with catch, effort, and mean length increasing in the 1990s as the floating-object fishery expanded. The catch and effort of these fisheries are currently at or above the upper reference value, except for the OBJ-N effort, which fell substantially in 2018. The indicators for the OBJ-I fishery do not show any major trends, but have wide fluctuations and are currently around the median. The average length for all fisheries is currently around the median.

The catches of the unassociated (NOA) purse-seine fisheries have been between the lower reference level and the median since 2008, and are at the lower reference level in 2018 for NOA-N and slightly below the median for NOA-S. The recent CPDFs (catch per days fished) have fluctuated at or above the median for NOA-N, and at or below the median level for NOA-S. The average length for NOA-N has been fluctuating between the lower and the upper reference levels, while NOA-S has fluctuated between the median and the upper reference level in the last ten years.

Indicators of relative abundance, such as the standardized CPUE for LL-S and the spatiotemporal indices for DEL-N and DEL-I, have been at low levels since 2010 (LL-S) or earlier (DEL-N, DEL-I), which might indicate a low population size for yellowfin in the EPO, and may be of concern, especially given the steady increase of the number of floating-object sets. However, a decrease in population size is not consistent with the increase in the average length of the fish in the catch observed in recent years in several fisheries (LL-S, DEL-N, NOA-S, DEL-S). This increase may indicate that older, larger fish are being caught because recent strong cohorts are being harvested (DEL-N, DEL-S); alternatively, it may indicate lower natural or fishing mortality, discarding/high-grading of catches, or changes in selectivity and/or availability, which can hinder the interpretation of CPUE indicators as indices of abundance. Because the average length increased in several fisheries simultaneously, it may be an indication that a change in the population may be happening, instead of, or in addition to, changes in selectivity and/or availability.

In conclusion, it is not clear from the indicators whether yellowfin abundance is reduced, or the fisheries are changing. The current status of yellowfin tuna relative to TRPs based on MSY could not be determined due to inconsistencies in many of the key indicators, however the current SBR and F-ratio are both less than 1 (Minte-Vera et al 2019). The LRP threshold was not exceeded and the current spawning stock size appears to be significantly above the point where recruitment would be impaired (PRI). However, this result is highly sensitive to the assumptions made about the relationship between stock size and recruitment (steepness; *h*), the weighting assigned to the different data sets (in particular to the longline CPUE), the growth curve, and the assumed rates of natural mortality (*M*) for yellowfin.

Given these uncertainties and the scheduled completion of a benchmark yellowfin tuna assessment in 2020 by the IATTC, the assessment team determined that requirements for SG 60 are met, but not the requirements at the SG 80 and SG 100 levels. The assessment ream views this as a draft score and upon competition of the benchmark assessment will re-evaluate the scoring of this SI.

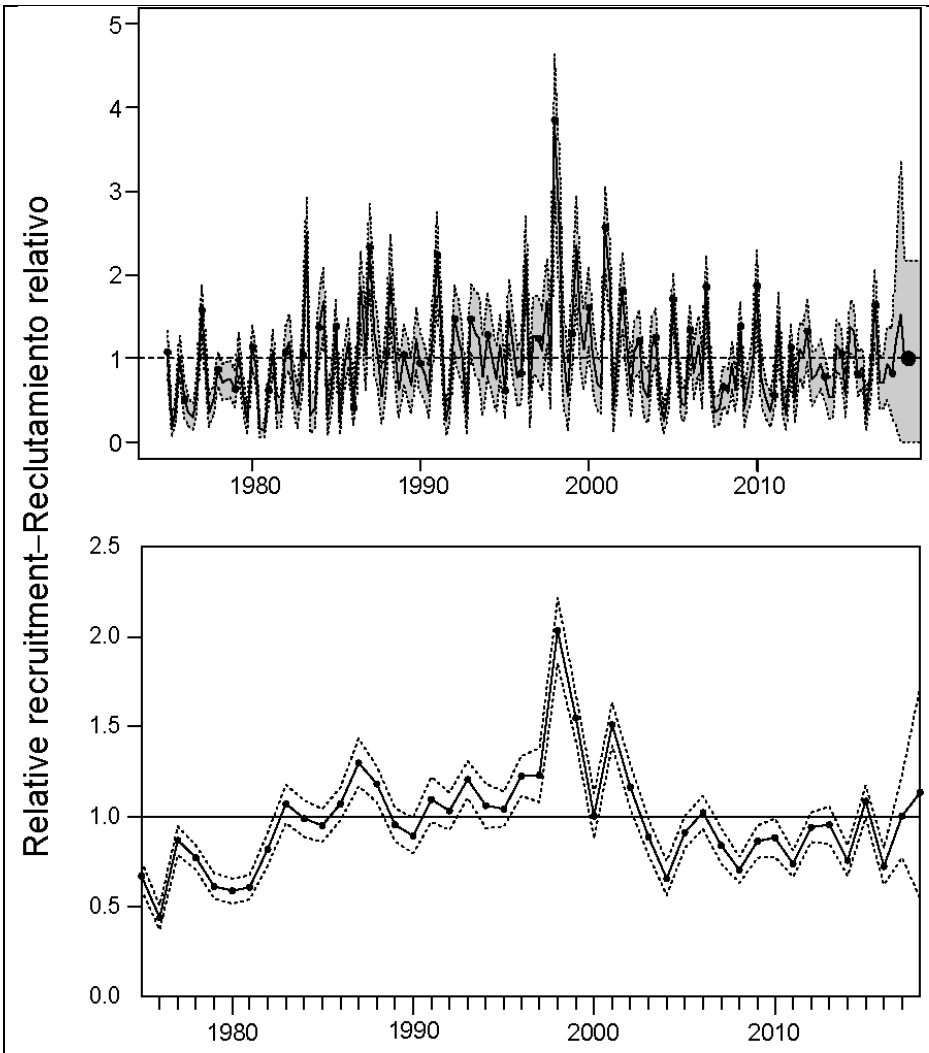


Figure XX. Estimated quarterly (top panel) and annual (bottom panel) recruitment at age zero of yellowfin tuna to the fisheries of the EPO. The estimates are scaled so that the average recruitment is equal to 1.0 (dashed horizontal line). The solid line illustrates the maximum likelihood estimates of recruitment, and the shaded area indicates the approximate 95% confidence intervals around those estimates.

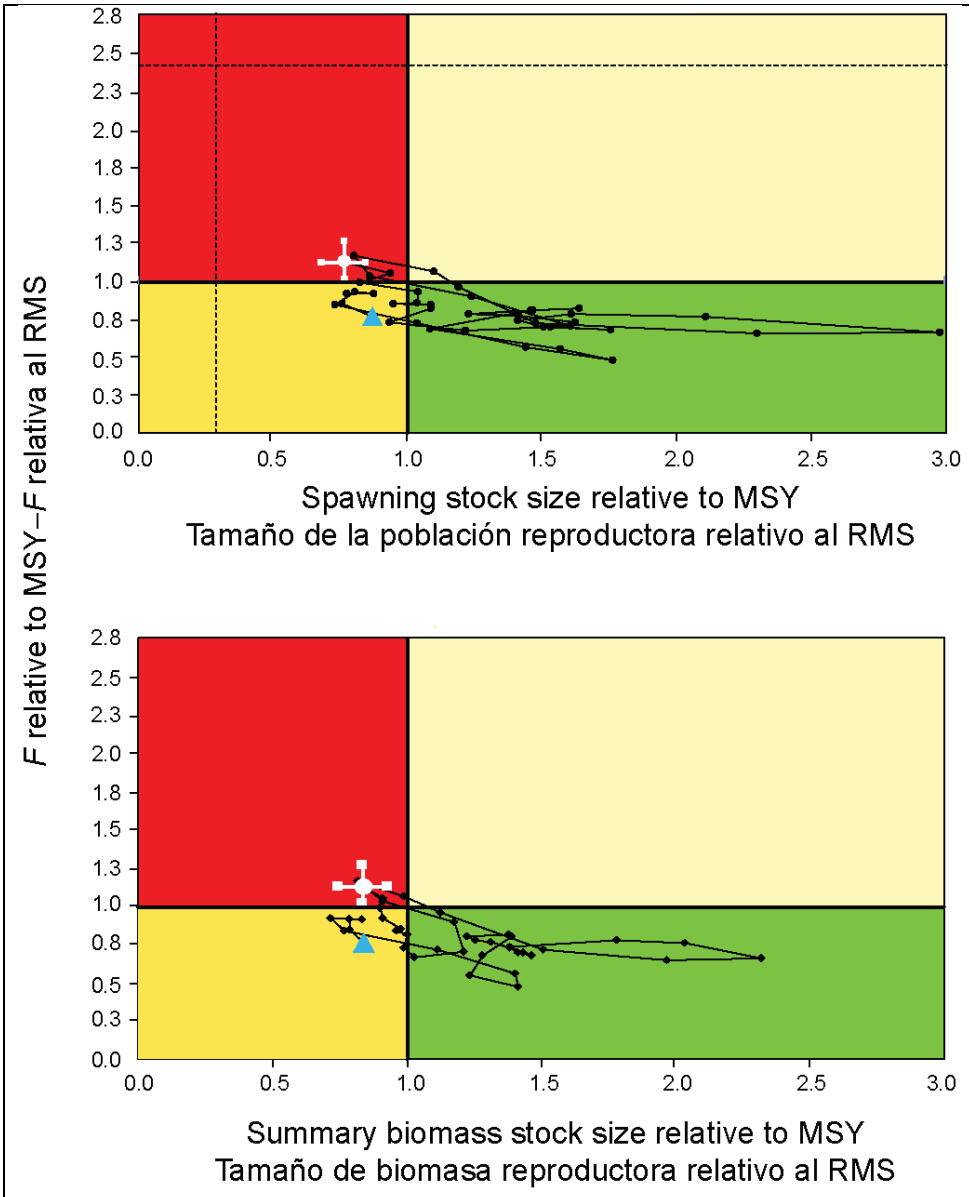


Figure XX. Kobe (phase) plot of the time series of estimates of stock size (top: spawning biomass; bottom: total biomass of fish aged 3 quarters and older) and fishing mortality relative to their MSY reference points. The panels represent target reference points (*SMSY* and *FMSY*). The dashed lines represent the interim limit reference points of 0.28 **SMSY* and 2.42**FMSY*, which correspond to a 50% reduction in recruitment from its average unexploited level based on a conservative steepness value (*h* = 0.75) for the Beverton-Holt stock-recruitment relationship. Each dot is based on the average exploitation rate over three years; the large white dot indicates the most recent estimate. The squares around the most recent estimate represent its approximate 95% confidence interval. The triangle represents the first 3-year period (1975-1977).

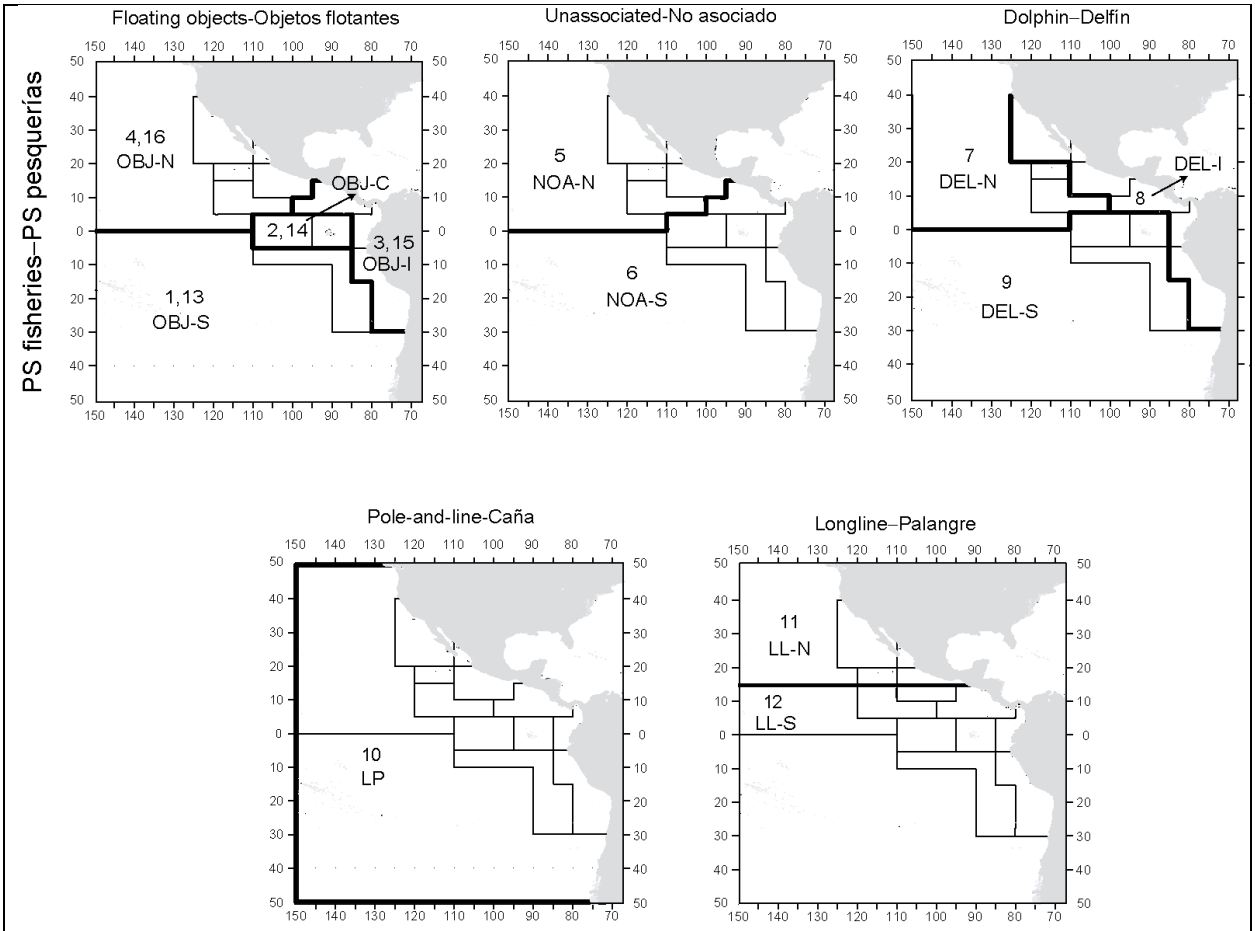


Figure XX. Fisheries defined for the yellowfin stock assessment and for calculating indicators.

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		No	No
Rationale				
Minte-Vera et al (2019) conducted an update stock assessment of yellowfin tuna (Thunnus albacares) in the eastern Pacific Ocean (EPO), using an integrated statistical age-structured stock assessment model (Stock Synthesis Version 3.23b). Based on the 2019 update assessment the SBR is substantially below the MSY level (*S*recent/*S*MSY = 0.76), as is the biomass of fish aged 3 quarters and older (*B*recent/*B*MSY = 0.84; See Kobe plot below). It is estimated that current *F* > *F*MSY, based on the current distribution of effort among the different fisheries (*F* multiplier = 0.89, approximate confidence interval CI = (0.79,0.99) and catches in 2018. This is a substantial change from the previous assessment, which estimated *F* ≈ *F*MSY (*F* multiplier = 0.99; CI = (0.88, 1.10)). These interpretations are subject to uncertainty and are highly sensitive to the assumptions made about the relationship between stock size and recruitment (steepness; *h*), the weighting assigned to the different data				

sets (in particular to the longline CPUE), the growth curve, and the assumed rates of natural mortality (*M*) for yellowfin, as shown in previous assessments. Given these uncertainties the authors did not indicate if the stock is overfished or experiencing overfishing relative to the TRPs based on MSY.

While there are uncertainties with the 2019 yellowfin tuna update stock assessment, until the benchmark stock assessment is completed in 2020 it represents the most recent information on stock status relative to TRPs based on MSY (Minte-Vera et al 2019). Based on the findings of the 2019 assessment and declining trajectory of spawning biomass in recent years (see the Kobe plot in SI (a)) the assessment team concluded that the stock is not at, or fluctuating around, a level consistent with MSY. Thus, requirements at the SG 80 level are not met. The assessment team views this as a draft score and upon competion of the benchmark assessment will reevaluate the scoring of this SI. Also, the assessment team recommends harmonizing yellowfin tuna scores to ensure consistency across MSC assessments.

References

SAC-10-01, SAC-09-07, SAC-09-06, IATTC 2014, Minte-Vera et al 2019

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	Official: $B_{0.5R0}$ → *h=0.75* $F_{0.5R0}$ → *h=0.75* $S=0.28*B_{MSY}$; $F=2.42*F_{MSY}$	B/B_{MSY} = 0.28 F/F_{MSY} = 2.42	See background section for description and reference.
Reference point used in scoring stock relative to MSY (SIb)	Official: B_{MSY}:F_{MSY} Alternative: B and R fluctuating above the average of time history	B/B_{MSY} = 1.0 F/FMSY = 1.0	See background section for description and reference.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	60-79
Information gap indicator	Information is not sufficient to score this PI. Results from the benchmark yellowfin tuna stock assessment scheduled for completion in 2020 are required to rescore the PI.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1. 2 – Yellowfin tuna—Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the stock.
	Met?	Yes	No	NA
Rationale				
b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, or it is likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is strong evidence that the rebuilding strategies are rebuilding stocks, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	Yes	No	NA
Rationale				

Access to fishing in the IATTC Convention Area is regulated by Resolution C-02-03, which requires vessels to be on the IATTC Regional Vessel Register in order to fish for tunas in the EPO. Vessels are authorized to fish by their respective flag governments, and only duly authorized vessels are included in the Register. Since 1993 all Class-6 purse-seine vessels (carrying capacity greater than 363 metric tons (t)) carry observers, who collect detailed data on catches, both retained and discarded at sea. Estimates of the total amount of the catch that is landed (retained catch) are based principally on data collected during vessel unloadings. IATTC Resolution C-17-02 requires that tropical tunas be retained upon capture, except if unfit for human consumption or due to insufficient well space during the last trip. While additional clarification on what constitutes “the last trip” has been requested, this measure sought to remove the potential of high-grading and discarding at sea, thus resulting in more reliable estimates of total catch.

Given the existing monitoring programs, the SG 60 requirements are met.

Requirements at the SG 80 level address the effectiveness of the monitoring measures. Simulation modelling by IATTC has detected a continual increase in fishing mortality (F) over time dispite measures to reduce F through fishing effort control measures (purse seine fishing closure periods) (Minte-Vera et al 2019). The relationship between fishing effort and F will be assessed as part of the yellowfin tuna benchmark assessment scheduled for completion in 2020. Thus, requirements at the SG 80 level are not met.	
References	
Minte-Vera et al (2019)	
Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	Results of the 2020 benchmark assessment and associated projection analyses will be required to determine future scoring of the SI.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.1 – Yellowfin tuna—Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	Yes	Yes	No

Rationale

IATTC adopted a HCR for tropical tunas based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02), aimed at preventing fishing mortality from exceeding the MSY level for the tropical tuna stocks (bigeye, yellowfin or skipjack). If there is a 10% or greater probability of reaching the LRP for fishing mortality or spawning biomass, the HCR triggers the establishment of additional management measures to reduce fishing mortality and rebuild the stock via fleet-specific time/area closures and catch limits (see Resolutions C-17-01 and C-17-02).

The duration of the closure is set according to the level of Fmult (FMSY/Fcurrent) for the stock requiring the strictest management, at present bigey tuna. While the harvest strategy is in theory responsive to the state of the more vulnerable species (bigeye tuna), resulting in the adoption of more precautionary measures for yellowfin tuna, the recent bigeye tuna stock assessment was considered too uncertain to provide a basis for management (Xu et al 2019).

As a result the harvest strategy for tropical tunas uses indicators specifically designed for skipjack, bigeye, and yellowfin tuna to monitor the behaviour of the fishery in terms of relative values of traits such as abundance, catch, average length and weight, and exploitation rates. The trends of these indicators are then compared to historic averages and their associated 5th and 95th percentiles, which act as surrogate/proxy reference points. These indicators are presented and reviewed at annual meetings in a manner that is designed to determine stock status compared to the average and the percentiles. Temporal closure is the main effort control for tropical tunas and is currently used in conjunction with the indicators to guide management decisions.

Therefore, it is possible to say that for YFT, the harvest strategy is expected to achieve stock management objectives and SG60 is met. Additionally, the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives, thus SG80 is met.

SG100 requires the harvest strategy to be responsive to the state of the stock and designed to achieve stock management objectives. Elements of the strategy will need to be more formally defined to trigger management measures, to assure responsiveness to yellowfin tuna stock status.The F-multiplier forms the basis of the HCR and is used to adjust the duration of the closure. It is intended to map the required reduction in exploitation to closure days, allowing for the identification of the appropriate closure duration. The F-multiplier for bigeye tuna and yellowfin tuna has been increasing over time, impacting the relationship between F and fishing effort and

the ability to identify an appropriate closure period (Minte-Vera et al 2019). To account for increases in the F-multipier, recently proposed closure periods have been adjusted upwardly, outside of the adopted harvest strategy process, based on a range of other factors centered around problems with the bigeye and yellowfin tuna stock assessments. At a minimum the harvest strategy should have a mechanism a) to assure that any change of status in SKJ, YFT, or BET, apparent via "indicators", is necessarily linked to, or triggers, a management outcome associated with the HCR and b) to assure that any change in the current operational assumptions is linked to a management outcome associated with the HCR. The movement away from a formalized harvest strategy results in the SG 100 requirements not being met.

b	**Harvest strategy evaluation**			
	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Yes	Yes	No

Rationale

Based on the results of the 2018 yellowfin stock assessment, spawning biomass (S) recovered to MSY (Srecent/SMSY = 1.08) and biomass of fish aged 3 quarters and older (B) above MSY (Brecent/BMSY = 1.35). Fishing mortality was determined to be slightly above the MSY level (FMSY; F multiplier = 0.99) (Minte-Vera et al 2018). This is evidence that the harvest strategy is achieving its objectives and requirements at SG 80 is met.

The harvest strategy was due to be evaluated in 2018 (C-16-02). However, due to problems with its application in relation to the bigeye assessment was not evaluated. Uncertainties with the bigeye assessment and harvest strategy are scheduled to be addressed in 2020 along with the completion of benchmark stock assessments for bigeye and yellowfin tuna. In the interim, IATTC scientists recommended that the provisions of C-17-02 (purse seine closure periods, bigeye tuna catch limits for longline vessels, limits on the number of active FADs by vessel class, reporting requirements, and research activities), which runs to 2021, be maintained. Therefore, the requirements for SG 100 are not met.

c	**Harvest strategy monitoring**			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

Rationale

There is a considerable amount of data that is being collected that informs various aspects of the harvest strategy. Observer coverage at 100% (for vessel categoy 6), logbook records, and additional research data gathering provide the basic inputs for assessment models that have been developed over a long period of time

and are used in conjunction with the HCR (applied indirectly to SKJ). In addition, data are systematically collected to produce indicators of the status of the YFT stock (relative measures of catch, abundance, average length and weight, and exploitation rate). Therefore, sufficient monitoring is in place to support the current harvest strategy for YFT, and would remain sufficient, should aspects of the harvest strategy be strengthened in relation to YFT in particular; SG 60 is met.

d	**Harvest strategy review**			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			No

Rationale

The IATTC does regularly conducts stock assessments (last YFT assessment was conducted in 2018), evaluates the utility of management measures and harvest strategy, and provides recommendations to improve the different mechanisms in the harvest strategy. Examples of a search for appropriate reference points and control rules are in: Maunder (2012a); Maunder and Deriso (2007); Maunder and Deriso (2013); Maunder and Deriso (2014). Changes in stock assessment methodologies to improve estimation of parameters can be followed in: IATTC (2000); Maunder and Watters (2001); Maunder and Watters (2003); Maunder (2012; Minte-Vera et al 2019). These tests and analyses are particularly important for YFT because the biological characteristics and the operational nature of the fishery has deemed the traditional indicators either unreliable or inappropriate (Minte-Vera et al 2019). IATTC has used these investigations to reach agreements on alternative indicators and reference levels that are used to assist in the determination of the status of the tropical tuna stocks (Minte-Vera et al 2019, Xu et al 2019, Maunder 2019).

There is therefore effort and expertise used to improve the workings of the harvest strategy for tropical tunas, by ongoing review and analysis of how it is performing overall and for particular species. However, the current reviews have not addressed how management action will be triggered in a formalized manner for YFT specifically, should indicators point to stock-level concerns for this less vulnerable species. Also, IATTC Resolution C-17-01 required review of the tropical tuna harvest strategy during 2018. Unfortunately, this was not accomplished and IATTC scientific staff recommended that the provisions of Resolution C-17-02 be maintained in the interim until the benchmark assessments for bigeye and yellowfin tuna, scheduled to be completed in 2020, and updated indicator indices have been reviewed. Since the harvest strategy was not reviewed in 2018, SG100 is not met.

e	**Shark finning**			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	NA	NA	NA

Rationale

Not applicable as the target is not a shark.

f	**Review of alternative measures**

	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Yes	Yes	Yes

Rationale

IATTC Resolution C-17-01 stipulates that all bigeye, skipjack and yellowfin brought on board is required to be landed, except those deemed unfit for human consumption or due to insufficient well space during the last haul. The goal of this Resolution was to eliminate the potential for setting purse seines on schools containing significant numbers of inmature tropical tunas which would eventually be discarded. Information on the compliance of this Resolution is monitored as part of the IATTC compliance process. The IATTC Ad Hoc Working Group on FADs is tasked with reviewing and recommending methodologies/technologies to the full commission on the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of target species and non-target species. The working groups meets annually, the first 1st meeting occurring in 2016. Conclusions and recommendations are presented during annual meeting of the IATTC Commission for further discussion and consideration. Thus, requirements for SG 60, SG 80, and SG100 are met.

References

IATTC-SAC (2015); Maunder (2012a); Maunder (2012b); Maunder (2019); Maunder (2015); Maunder and Watters (2001); Maunder and Watters (2003); Maunder and Deriso (2007); Maunder and Hoyle (2007); Maunder and Deriso (2013); Maunder and Deriso (2014), Minte-Vera et al 2019, Minte-Vera et al 2018.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	>80
Information gap indicator	The 2020 benchmark assessments for bigeye and yellowfin tuna, as well as documentation describing changes (if any) to the harvest strategy of tropical tunas in the IATTC Commission area are requested.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.2 – Yellowfin tuna—Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guide post	Generally understood HCRs are in place or available that are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time.
	Met?	Yes	Yes	No

Rationale

The Commission has consistently recommended the use of an HCR. IATTC Resolution C-16-02 outlines the HCR for tropical tunas in the IATTC Commission Area as:

1. If the probability that F>Flim is >10%, management measures shall be established such that there is at least a 50% probability that F will reduce to FMSY or below, and with a probability of <10% of F>Flim.

2. If the probability that SB<SBlim is >10%, management measures shall be established such that there is at least a 50% probability that SB will recover to SBMSY or above, and with a probability of <10% that SB will decline to <SBlim within two generations or 5 years, whichever is greater.

3. Purse seine closures can be established for multiple years and shall attempt to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management.

These measures are expected to keep the biomass above the LRPs, and above the PRI. Thus, requirements for SG 60 are met.

To satisfy the requirements at the SG 80 level the HCR must be “well defined”, “in place”, and “expected to keep the stock fluctuating around a target level consistent with MSY’. Based on Resolution C-16-02 the HCR is well defined. There is also evidence that the HCR is functionally in place because there has been reliable and systematic use of its main tool - temporal closures. Closures are the main tool used to control effort and are numerically explicit; utilizing as input the F multiplier parameter representing the change in effort needed to keep stocks at Fmsy or below Fmsy (IATTC 2007). The measures also ensure that the stock fluctuates around MSY by maintaining F at a rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management, in this case bigeye tuna. This approach is precautionary in that stricter management measures would be applied then if management was based on the less vulnerable species, yellowfin tuna. Thus, requirements for SG 80 are met.

To meet the requirements at the SG 100 level, HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level, taking into account the ecological role of

the stock, most of the time. The current HCR attempts to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (FMSY) for the tropical tuna species that requires the strictest management, in this case bigeye tuna. As previously noted management measures applied to yellowfin tuna and skipjack tuna established through the application of this HCR will be precautionary, and would be expected to keep the stock fluctuating at or above a target level consistent with MSY. While there has been testing to determine the utilty of this approach, the current HCR was not tested within a management strategy (MSE) framework, the leading process to test HCRs and other management strategies for their effectiveness in attaining management objectives (REF). IATTC Resolution C-19-07 recognizes the importance of MSEs in defining effective HCRs and outlines Terms of Reference (ToR) for conducting MSE workshops to foster their development for tuna species in the IATTC convention area. Subsequently, IATTC Staff developed a 5-year workplan to develop MSEs for for tropical and temperate tuna species in the EPO. Until additional testing is completed requirements at the SG 100 level are not met.

b	**HCRs robustness to uncertainty**			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a wide range of uncertainties including the ecological role of the stock, and there is evidence that the HCRs are robust to the main uncertainties.
	Met?		Yes	No

Rationale

IATTC Resolution C-16-02 established a HCR for tropical tunas in the EPO. A preliminary MSE approach, limited in scope and testing of uncertainties, was utilized to develop and test the HCR developed for all tropical tunas using bigeye as an example. While the overall harvest strategy did rebuild the bigeye stock towards the target under all management scenarios, a more comprehensive MSE is required to evaluate the robustness of the HCR (Maunder and Deriso 2016). Although simulations support the robustness of the HCR, there is still a lack of direct evidence, and, as noted, not all uncertainties have been evaluated. However, given the problems with the bigeye assessment, this may have to be re-evaluated. On this basis, the requirements at the SG 80 level are met but not those at the SG 100 level due to large remaining uncertainties in stock dynamics.

c	**HCRs evaluation**			
	Guide post	There is some evidence that tools used or available to implement HCRs are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Yes	Yes	No

Rationale

The tools to implement the HCR are set out in Resolutions C-17-01 and C-17-02 and the main tool supporting the HCR is the F multiplier (FMSY/F), which in turn determines the temporal fishing closure period. Closure period determinations are not explicitly linked to the HCR but the number of days of closure have been adjusted according to Fmult (FMSY/F) and other factors. Due to recent increases in capacity within the fisheries, closure periods are adjusted accordingly. The utility of this approach requires a relationship between exploitation and closure period, and since established closures are applied over multiple years the relationship should exhibit

temporal consistency. There is a provision for review and adjustment according to the outcome and on that basis available evidence indicates that the tools are likely to be effective at controlling exploitation rates. Requirements at the SG 80 level are met. In 2017, the closure period for 2017-2020 was extended to 72 days based on the F multiplier adjusted for capacity increases, However, due to uncertainties in the relationship between exploitation and closure period, the duration of the closure period was decided to be a matter of negotiation between IATTC members, rather then following the established HRC. Thus, requirements at the SG 100 level are not met.
References
IATTC (2007); Maunder and Deriso (2016)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	>80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.3 – Yellowfin tuna—Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Range of information**			
	Guide post	Some relevant information related to stock structure, stock productivity and	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	No
Rationale				
The Commission monitores the fishery in a variety of ways, leading to a very complete record of fishing operations, catch, size-at-catch (size-frequency sampling), bycatch, efficiency and environmental interactions. In 2016, total catch of YFT by all fleets of all size and gear was approximately 254,000 mt. Of this total, purse seiners caught approximately 242,000 mt. The total purse seine catch was obtained setting approximately 33,000 times, and out of these, only about 7,000 were by vessels smaller than 363 mt (IATTC 2019). This means that the majority of the fishing effort on YFT was monitored by an observer program that has 100% coverage for purse seiners larger than 363 mt. This coverage is by all standards large enough to consider that sufficient information is being recorded about the behaviour and performance of the fishery. Observer data is used to analyse fleet composition, stock structure, stock productivity and some biological aspects: this meets the SG 80. A more comprehensive range of information on stock structure, growth, productivity, abundance, and environmental information is needed to reduce some of the most important uncertainties. For this reason, the team concludes that the IATTC monitoring system meets the requirements at SG80 but not at SG100.				
b	**Monitoring**			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No
Rationale				

Regular stock assessments are conducted to estimate the status of stocks including BET, YFT and SKJ. To this end, extensive amounts of data are obtained by observers placed on every trip of vessels of class 4 and above. A considerable amount of information on the biology of the species has been historically obtained to get a reasonable understanding of the stock abundance, removals and dynamics, allowing for the estimation of the status of the overall fishery. Understanding of status for YFT is obtained through direct evaluation of the indicator metrics relative to historical trends. Therefore, stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule: the SG 80 is met.

The main uncertainties are well identified and understood, but some have not been fully addressed or resolved. This is probably the main limitation of the monitoring system of the IATTC, therefore the team agrees that the fishery meets the requirements at SG80 but not at SG100.

c	**Comprehensiveness of information**			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Yes	

Rationale

The fishery for YFT and the other two tropical tunas in the ETPO is conducted by many countries including Mexico and Ecuador that together hold more than half of the carrying capacity of the fleet. Other countries include Venezuela, Colombia, Panama, and Nicaragua. Although the number of boats of small capacity is similar to others of larger size, most of the capacity is in vessels of class 4 and above (nearly 95% in 2014). The UoA comprises only a fraction of the catch obtained by the Ecuadorian fleet, therefore, a large portion of the fishery is conducted by vessels out of the UoA.

Observer coverage on boats of class 4 and above (95% of total well capacity in 2018) assures that most of the vessels that are part of the UoA catching YFT are monitored by either the observer program or other programs investigating specific aspects of the biology of the species or the performance of the fleets.

IATTC stock assessments include retained catch plus discards for the different species of tuna by all gears including purse seiners, LL and pole and line. All Stock Assessment Reports (SAR) describe this in the methods section, as well as in annual reports on the tuna fishery, stocks, and ecosystem in the EPO (e.g. IATTC-94-01). This meets the requirements of this SI at SG80.

References

IATTC-94-01, IATTC 2012.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.4 – Yellowfin tuna—Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Appropriateness of assessment to stock under consideration**			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Yes	Yes
Rationale				
The latest stock assessment is appropriate for the stock and for the harvest control rule because it is the result of a long analytical process in which model performance was evaluated accounting for the main uncertainties that were previously identified (Minte-vera et al. 2019). The assessment uses an integrated statistical age-structured stock assessment model (Stock Synthesis), and requires extensive amounts of information, including data on catch (retained and discarded), indices of relative abundance (CPUE), and size compositions of the catches of the various fisheries. Assumptions have been made about biological processes such as growth, recruitment, movement, natural mortality and stock structure. The assessment is able to use all available data and was well-adapted to take account of yellowfin biology. An extensive EPO tuna tagging program was initiated in 2019 to determine tropical tuna movement dynamics and spatial structure. As sufficient data become available they can easily be incorporated into the stock assessment model. This meets the requirements for SG 100.				
b	**Assessment approach**			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Yes	Yes	
Rationale				
The stock assessment has been used to estimate the MSY-related reference points, and these have been used to determine stock status. This meets requirements for the SG 80 level.				
c	**Uncertainty in the assessment**			
	Guide post	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Yes	Yes	No
Rationale				
The latest stock assessment is the result of a long analytical process in which model performance was evaluated, accounting for the main uncertainties that were previously identified (Maunder 2012b, Minta-Vera				

2019). One of the conclusions from previous assessments was the difficulty in generation of stock status and associated measures of uncertainty based on classic reference points. To account for these uncertainties, an alternative approach was designed using indicators of relative quantities describing the status of the stock and the behavior of the fishery (Maunder and Deriso 2007). The indicators present the behavior of the stock and the fishery through relative measures of parameters such as abundance and recruitment. The approach compares the historic trend of these paramenters with the overall average and the corresponding 5th and 95th percentiles. The concept is that even if the current status of the stock is uncertain, the space inside percentiles represents a history of the stock and the fishery where even at low abundance or high effort the stock has been able to persist. In this context, as long as the indicators stay within these limits, it is reasonable to assume that the stock will continue to support the fishery.The percentiles represent boundaries that should not be exceeded because beyond them, the capacity of the stock to support such fishing intensity is unknown.

The nature of the uncertainties resulting from the application of the regular methodologies to assess the status of the stock have been identified as described above, and the development of an alternative approach is in itself a indication that uncertainty has considered meaningful, and accounted for, in the management of YFT. The existing indicator approach is a fitting solution given the nature of the biological characteristics of the species.

A benchmark assessment for YFT is scheduled for 2020 and a research plan to address assessment uncertainties has been implemented by IATTC. Its envisioned that in the near term management decisions will be based on both indicators and the new assessment.

It is unlikely that in the short term the current approach to evaluate the stock based on indicators and reference levels can be conducted in a probabilistic way. While past assessments used probabilistic projections of future stock trajectories under different model assumptions, IATTC does not outline a process for combining results from future stock assessments and indicator “scores” to assess stock status relative to reference points in a probabilistic way. Therefore the fishery meets the standard of this SI at SG80, but not at SG100.

d	**Evaluation of assessment**			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			No
Rationale				
One of the conclusions from previous assessments was the difficulty in estimating stock status based on classic reference points which forced the design of alternative indicators that are the basis of one of the approaches in the current stock assessment methodology. While this approach is appropriate given the nature of the biological characteristics of YFT, additional testing is needed, either to compute MSY reference points as established by the Commission or to test the performance of the alternative indicators associated with the current HCR. Thus requirements at SG100 are not met.				
e	**Peer review of assessment**			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Yes	No
Rationale				

The report of the stock assessment introducing the use of alternative indicators was internally peer reviewed by Robin Allen and Willian Bayliff (Maunder and Deriso 2007). The latest YFT stock assessment was reviewed at the 2019 IATTC SAC meeting (Minte-Vera et al 2019). Therefore, the fishery meets the requirements at SG80. Results of the IATTC research are often published in peer reviewed journals, particularly those related to methodologies or the overall state of stocks and the fishery (e.g. Zhu et al., 2012; Hampton et al., 2005; for a complete list of IATTC papers see (http://www.iattc.org/PDFFiles/IATTC-Outside-Journals.pdf). The Commission also assembles external expert panels to peer review stock assessments (Martell et al., 2013). The YFT stock assessment has yet to be externally peer reviewed and therefore does not meet the SG100.
References
Aranda et al. (2010); Maunder (2012b); Maunder and Watters (2003); Maunder and Harley (2005); Maunder and Deriso (2007); Zhu et al (2012); Hampton et al (2005); Martell et al (2013); Minte-Vera et al (2019)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	>80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1.1 – Skipjack tuna—

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**			
	Guide post	It is likely that the stock is above the point where recruitment would be impaired (PRI).	It is highly likely that the stock is above the PRI.	There is a high degree of certainty that the stock is above the PRI.
	Met?	Yes	Yes	No

Rationale

Skipjack tuna is a species with high and very variable recruitment. Consequently, biomass and fishing mortality are also highly variable. This tuna species present biological characteristics that complicate the estimation of parameters, mainly high fecundity, rapid growth, and high natural mortality. It is difficult to obtain a sufficiently large amount of tagging data and there may be dome shaped selectivity. Such problems, combined with difficulties in obtaining a CPUE index that is representative of abundance, yields parameter estimates with high levels of uncertainty, making the estimation of reference points based on MSY hard or impossible.

In recent years, the stock has been assessed using alternative approaches that compares changes in eight indicators of stock status observed historically (See Figure XXX below). To evaluate current values of the indicators in comparison to historical values, reference levels based on the 5th and 95th percentiles are used. The situation in 2018 can be summarized as follows:

- total catch, CPUE (both indicators), relative biomass, relative recruitment and standardized effort are estimated to be at the upper reference level;
- relative exploitation rate is close to the historical mean level;
- average weight per fish was at the lower reference level.

The number of sets by both large and small purse-seine vessels in the floating-object fishery has increased consistently for at least the past 15 years (Figure XXX, from Maunder 2019), and at the same time the catch per set has fallen. The number of days fished has not increased at the same rate, and the increased number of sets is reported likely be the cause of the increased catch and catch per day fished (CPDF) (Maunder 2014, Maunder 2019).

Overall, none of the indicators detect any adverse consequences from current levels of exploitation, except smaller average weight, which is unlikely to indicate any effect on recruitment (and may be a consequence of high recruitment). Given this and the resilient life history characteristics of skipjack, it is highly likely that the stock is above any PRI, meeting SG80.

The lack of a recent full stock assessment means that it is not possible to determine with a high degree of certainty that the stock is above the PRI with high certainty, so SG100 is not met.

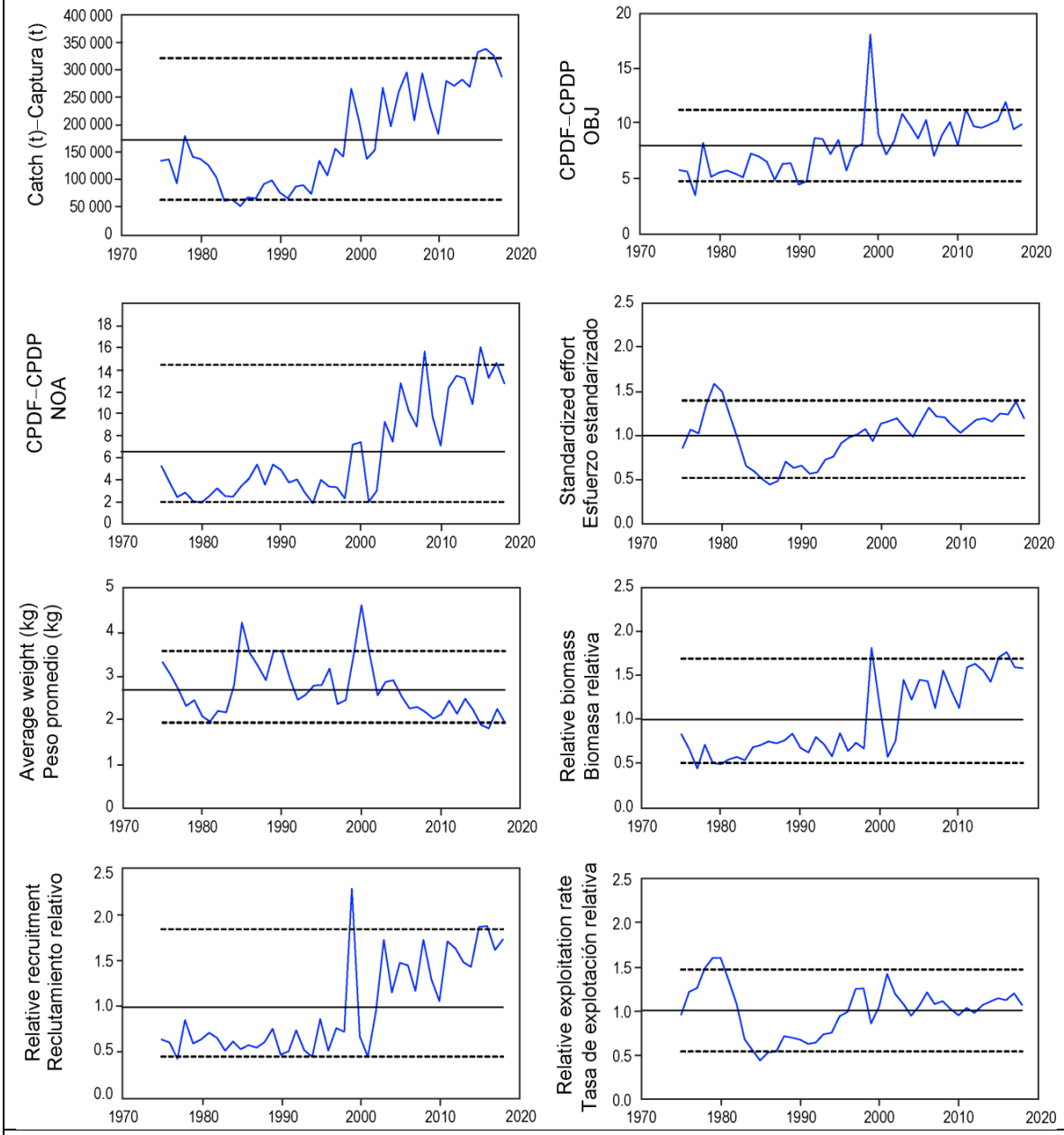


Figure XXX. Indicators of stock status for skipjack tuna in the eastern Pacific Ocean. OBJ: floating-object fishery; NOA: unassociated fishery; CPDF: catch per day fished. All indicators are scaled so that their average equals one.

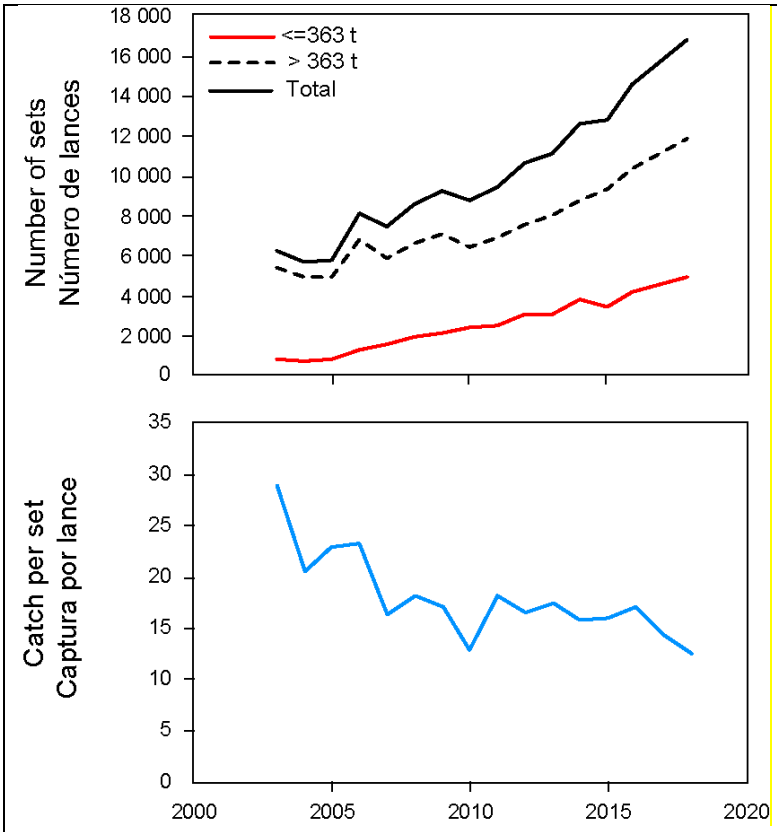


Figure XXX. Number of floating-object sets, by vessel carrying capacity and total (top panel), and catch per set in the floating object fishery (bottom panel).

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		No	No

Rationale

The management goal of the Commission is to maintain stocks at MSY. This has led to the definition of TRPs such that biomass and fishing mortality rates are near levels producing MSY. Consistent with this mandate, the discussion about what reference points are appropriate to each case has led to interesting analyses and propositions. Finally, the Commission adopted interim reference points that are applied to all species under its jurisdiction (IATTC 2014).

Given that determining MSY in skipjack is not be possible, indicators are used to assess its status (see SI a above). Current indices of biomass and recruitment are high relative to historical levels and have been above their averages since the early 2000s. However, Maunder (2019) contends that the observed increases may be an artifact caused by the increased number of sets, and thus may not be reliable indicators. IATTC staff rountinly conduct a PSA to compare skipjack status with other stocks in the EPO for which an assessment is possible, in particular bigeye tuna. Given that skipjack tuna and bigeye have similar susceptibility scores (overlap with

fisheries) but skipjack has higher productivity score (and therefore a lower BMSY and a higher FMSY), given that the status of bigeye tuna in 2016 concluded that Bcurrent>BMSY, IATTC contends this must also be true for skipjack. However, the 2018 update bigeye tuna stock assessment was considered unreliable due to increasing uncertainties and conflicting indicies, which impacts the argument proffered by IATTC. On this basis, SG 80 is not met. A benchmack bigeye tuna stock assessment is scheduled for completion in mid- 2020 at which point this SI can be reevaluated.

References

IATTC (2014); Maunder (2012); Maunder (2019); Maunder and Deriso (2007); Maunder and Deriso (2014);

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	Official: $B_{0.5R_0} \rightarrow h = 0.75$ $F_{0.5R_0} \rightarrow h = 0.75$ Alternative: B and R not under the 5th percentile of the historic time series.	Undetermined	See background section for description and reference.
Reference point used in scoring stock relative to MSY (SIb)	Official: Bmsy:Fmsy Alternative: B and R fluctuating above the average of time history. Additional indicators available	B/Bmsy = 1 F/Fmsy = 1	See background section for description and reference.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	60-79
Information gap indicator	To reevaluate SI b, in particular the PSA argument concerning bigeye and skipjack tuna, the benchmark bigeye tuna stock assessment is required. Additionally, IATTC updates to the skipjack tuna indicators would be required.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1. 2 – Skipjack tuna Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the stock.
	Met?	Yes		No
Rationale				
While a rebuilding plan for skipjack tuna has not been recommended, MSC guideline GSA2.3 states that "if PI 1.1.1 is scored lower than SG80, PI 1.1.2 must be scored." MSY-based reference points are not estimable for skipjack tuna (Maunder 2019). As a result, stock status indicators have been established to guide management decision making. and a research plan to address the uncertainties was adopted by the IATTC, including the completion of yellowfin and bigeye tuna benchmark stock assessments in 2020. Additionally, purse seining temporal closures, previously established to reduce exploitation rates in tropical tuna fisheries operating in the EPO, are in effect through 2020, as are limitations on the number of active FADs fished per vessel, bigeye tuna catch quotas for longline fisheries operating in the EPO, and reporting requirements. While these actions do not constitute a rebuilding plan, IATTC staff considered this to be a rational path forward in the short-term, and on this basis the assessment team considers this to meet SG60				
b	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, or it is likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is strong evidence that the rebuilding strategies are rebuilding stocks, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	Yes	No	No
Rationale				
Access to fishing in the IATTC Convention Area is regulated by Resolution C-02-03, which requires vessels to be on the IATTC Regional Vessel Register in order to fish for tunas in the EPO. Vessels are authorized to fish by their respective flag governments, and only duly authorized vessels are included in the Register. Since 1993 all Class-6 purse-seine vessels (carrying capacity greater than 363 metric tons (t)) carry observers, who collect detailed				

data on catches, both retained and discarded at sea. Estimates of the total amount of the catch that is landed (retained catch) are based principally on data collected during vessel unloadings. IATTC Resolution C-17-02 requires that tropical tunas be retained upon capture, except if unfit for human consumption or due to insufficient well space during the last trip. While additional clarification on what constitutes "the last trip" has been requested, this measure sought to remove the potential of high-grading and discarding at sea, thus resulting in more reliable estimates of total catch.

Given the existing monitoring programs, the SG 60 requirements are met.

Requirements at the SG 80 level address the effectiveness of the monitoring measures. Modelling by IATTC staff has detected a continual increase in fishing mortality (F) over time despite measures to reduce F through fishing effort control measures (purse seine fishing closure periods) (IATTC 2017, Minte-Vera et al 2019, Maunder 2019). The relationship between fishing effort and F, as well as exploitation rates and closure days, will be assessed as part of the tropical tuna benchmark assessment scheduled for completion in 2020. Thus, requirements at the SG 80 level are not met.

References

IATTC 2017, Minte-Vera et al 2019, Maunder 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	Information sufficient to score PI
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.1 – Skipjack tuna Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	Yes	No	No

Rationale

The IATTC has determined that for all tropical tunas it is difficult to reconcile data that apparently carry contradictory signals about the status of the stock. This needs to be resolved before the traditional stock assessment models can be used as a basis for management advice (IATTC-17-2019). This has prevented the regular use of reference points and harvest control rules on tropical tunas.

As a result of these issues the harvest strategy for tropical tunas uses indicators specifically designed for skipjack, bigeye, and yellowfin tuna to monitor the behaviour of the fishery in terms of relative values of traits such as biomass, recruitment, weight and exploitation rates. The trends of these indicators are then compared to historic averages and their associated 5th and 95th percentiles, which act as surrogate/proxy reference points. These indicators are presented and reviewed at annual meetings in a manner that is designed to determine stock status compared to the average and the percentiles.

Temporal closure is the main effort control for tropical tunas and is used in conjunction with the indicators to guide management decisions. These elements have been designed to be responsive to the state of the stock of all three tropical tunas, however, the system does not have a mechanism a) to assure that any change of status in SKJ, YFT, or BET, apparent via indicators, is necessarily linked to, or triggers, a management outcome as with the HCR and b) to assure that any change in the current operational assumptions is linked to a management outcome as with the HCR. Therefore, it was possible to say that for SKJ, the harvest strategy is expected to achieve stock management objective (SG60), but it was not possible to say with assurance, that the harvest strategy is responsive to the state of the stock (SG80). Elements of the strategy will need to be more formally defined to trigger management measures, to assure responsiveness to SKJ in particular.

Thus, requirements for the SG 60 score are met, but requirements for the SG 80 and SG 100 scores for SKJ are not met.

B	**Harvest strategy evaluation**

	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Yes	No	No

Rationale

At the SG 60 level, the SI requires that the strategy is likely to work based on prior experience or plausible argument. The current strategy restricts fishing effort of the entire fishery on the basis of indicator analyses for SKJ, YFT and BET, and the indicators used to assess change are those that are generally incorporated into traditional stock assessment models. The indicators are updated and reviewed annually and the IATTC work plan calls for the completion of a tropical tuna benchmark stock assessments starting in 2020.Therefore the requirements for SG 60 are met.

Temporal purse seine closures are the main tool of the strategy, controling exploitation rates through effort controls; utilizing as input the F multiplier parameter representing the change in effort needed to keep stocks at Fmsy or below Fmsy (IATTC 2007). The measures also ensure that the stock fluctuates around MSY by maintaining F at a rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management, in this case bigeye tuna. This approach is precautionary in that stricter management measures would be applied then if management was based on the less vulnerable species, skipjack tuna. However, the 2018 update bigeye tuna stock assessment was considered unreliable due to increasing uncertainties and conflicting indicies, which impacts the current strategy. On this basis, requirements at the SG 80 level is not met. A benchmack bigeye tuna stock assessment is scheduled for completion in mid- 2020 at which point this SI can be reevaluated.

C	**Harvest strategy monitoring**			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

Rationale

There is a considerable amount of data that is being collected that informs various aspects of the harvest strategy. Observer coverage at 100% (for vessel categories 3-6), logbook records, and additional research data gathering provide the basic inputs for assessment models that have been developed over a long period of time and are used in conjunction with the HCR (applied indirectly to SKJ). In addition, data are systematically collected to produce indicators of the status of the SKJ stock (relative measures of biomass, recruitment, weight and exploitation rate). Therefore, sufficient monitoring is in place to support the current harvest strategy for SKJ, and would remain sufficient, should aspects of the harvest strategy be strengthened in relation to SKJ in particular. On this basis, SG60 is met.

D	**Harvest strategy review**			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.

	Met?			No

Rationale

The IATTC does regularly conducts stock assessments (benchmark and updates), reviews and different types of analyses to evaluate and improve the different mechanisms in the harvest strategy. The last SKJ assessment was conducted in 2016 (IATTC 2018). Examples of a search for appropriate reference points and control rules are in: Maunder (2012a); Maunder and Deriso (2007); Maunder and Deriso (2013); Maunder and Deriso (2014); IATTC (2018) . Changes in stock assessment methodologies to improve estimation of parameters can be followed in: IATTC (2000); Maunder and Watters (2001); Maunder and Watters (2003); Maunder (2012b). These tests and analyses are particularly important for SKJ because the biological characteristics and the operational nature of the fishery has deemed the traditional indicators either unreliable or inappropriate (Maunder and Deriso 2007; Maunder 2012; Maunder 2019). Through such structed investigations, scientific staff has reached agreements that present alternative indicators and reference levels that are used to assist in the determination of the status of the SKJ stock (Maunder 2014, 2019).

IATTC scientists have also used a productivity-susceptibility analysis (PSA) to infer skipjack status based on PSA scores for bigeye tuna. with other stocks for which an assessment is possible and to use their PSA scores to infer status. Recent PSA analyses shows that skipjack has substantially higher productivity than bigeye tuna (IATTC 2019). Biomass and fishing mortality corresponding to MSY are, respectively, negatively and positively related to productivity. Therefore, since skipjack and bigeye have about the same susceptibility, which is related to fishing mortality, the status of skipjack can be inferred from the status of bigeye. The current assessment of bigeye tuna estimates that the fishing mortality is less than FMSY; therefore, the fishing mortality for skipjack should also be less than FMSY. Since effort and skipjack biomass have been relatively constant over the past 10 years, this also implies that skipjack biomass is above BMSY.While this approach provides a logical path forward, the most recent bigeye tuna update stock assessment (2018) indentified various uncertainities and inconsistencies in the data, and its utility for management purposes has been questioned (IATTC 2019). The use of stock status indicators (SSIs), similar to those used for skipjack tuna (SAC-09-07), has been identified as an alternative basis for management advice and to monitor the stock and the fishery in the future until the uncertainties in the stock assessment are resolved. Impacts of the recent bigeye tuna stock assessment determinations on the tropical tuna EPO harvest strategy, has yet to be fully reviewed, requirements at the SG100 level are not met.

E	**Shark finning**			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	NA	NA	NA

Rationale

Not applicable as the target is not a shark.

f	**Review of alternative measures**

	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Yes	Yes	Yes

Rationale

IATTC Resolution C-17-01 stipulates that all bigeye, skipjack and yellowfin brought on board is required to be landed, except those deemed unfit for human consumption or due to insufficient well space during the last haul. The goal of this Resolution was to eliminate the potential for setting purse seines on schools containing significant numbers of inmature tropical tunas which would eventually be discarded. Information on the compliance of this Resolution is monitored as part of the IATTC compliance process. The IATTC Ad Hoc Working Group on FADs is tasked with reviewing and recommending methodologies/technologies to the full commission on the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of target species and non-target species. The working groups meets annually, the first 1st meeting occurring in 2016. Conclusions and recommendations are presented during annual meeting of the IATTC Commission for further discussion and consideration. Thus, requirements for SG 60, SG 80, and SG100 are met.

References

IATTC-SAC (2015); Maunder (2012a); Maunder (2012b); Maunder (2019); Maunder (2015); Maunder and Watters (2001); Maunder and Watters (2003); Maunder and Deriso (2007); Maunder and Hoyle (2007); Maunder and Deriso (2013); Maunder and Deriso (2014); Minte-Vera et al (2019)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	60-79
Information gap indicator	Information on the development and implementation of tropical tuna HCR and harvest strategy is requested. Also, what strategies within the UoA are being implemented to support the development of a plausible tropical tuna harvest strategy.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.2 – Skipjack tuna—Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guide post	Generally understood HCRs are in place or available that are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time.
	Met?	Yes	No	No

Rationale

The Commission has consistently recommended the use of an HCR. IATTC Resolution C-16-02 outlines the HCR for tropical tunas in the IATTC Commission Area as:

- If the probability that F>Flim is >10%, management measures shall be established such that there is at least a 50% probability that F will reduce to FMSY or below, and with a probability of <10% of F>Flim.
- If the probability that SB<SBlim is >10%, management measures shall be established such that there is at least a 50% probability that SB will recover to SBMSY or above, and with a probability of <10% that SB will decline to <SBlim within two generations or 5 years, whichever is greater.
- Purse seine closures can be established for multiple years and shall attempt to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management.

These measures are expected to keep the biomass above the LRPs, and above the PRI. Thus, requirements for SG 60 are met.

At the SG 80 level, harvest control rules also need to be “well defined”. Howerver, this is not the case for Skipjack tuna, as reference points and F-multiplier are not estimable. Also, results from yellowfin and bigeye tuna stock assessments in the EPO provided reference points and estimates of F to advance a HCR for tropical tuna in the EPO, including skipjack tuna, but due to increasing uncertainties and inconsistency in population and fishery indices, these assessments are not considered reliable. The IATTC uses the status of bigeye and yellowfin tuna to manage all tropical tunas in the EPO and argues given the higher productivity of skipjack tuna relative to other tropical tunas in the EPO, its PRI is likely to be at a lower biomass level. Given that bigeye and yellowfin tuna are actively monitored, any implemented measures to avoid violating their PRIs (bigeye and yellow tuna) would ensure that the skipjack tuna PRI is avoided. Regarding MSY, IATTC uses a PSA to infer that given skipjack tunas higher productivity and lower vulnerability compared to yellowfin and bigeye tuna in the EPO, its MSY level (skipjack tuna) would be higher then the other tunas. Implemented management measures to maintain bigeye and yellowfin tuna at MSY would ensure that skipjack tuna biomas is maintained at or above a level consistent with MSY. However, these agruments do not constitute a “well defined” HCR. Also, given the recent uncertainties of the yellowfin and bigeye tuna assessments, the current HCR is not considered “well defined”. Based on these results requirements at the SG80 level are not met.

Benchmack bigeye and yellowfin tuna stock assessments, as well as the advancement of a tropical tuna HCR, are scheduled to be completed in mid- 2020 at which point this SI can be reevaluated.

b	HCRs robustness to uncertainty			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a wide range of uncertainties including the ecological role of the stock, and there is evidence that the HCRs are robust to the main uncertainties.
	Met?		Yes	No

Rationale

To account for the uncertain interpretation of results from previous approaches, Maunder and Deriso (2007) first suggested the use of alternative indicators to determine the status of the stock and the behavior of tuna fisheries in 2007. While indicators cannot provide a measure of optimum yield, they can be adapted to define management actions based on tracking the status of indicators relative to historical trends. This approach is coupled with the application of the HCR on SKJ tuna, which was built by the IATTC for more vulnerable species in the ETPO, making the approach precautionary and very likely to account for the main uncertainties associated to the assessment of SKJ. The strategy has been tested preliminarily for BET for main uncertainties about the steepness in the stock recruitment relationship, asymptotic length and natural mortality in a management strategy evaluation. The analysis, while preliminary, concluded that in general, the management procedure "works effectively to manage the stock at the MSY level, and avoid a high risk of recruitment being seriously impacted" (Maunder et al. 2015).

Therefore, the selection of the HCR meets the requirement at SG80 because it accounts for the main uncertainties in the application of the control rule on BET and by association, for uncertainties for SKJ, which cannot be derived directly given current challenges to directly estimating MSY and related quantities. However, the design of this control rule has not been tested for its performance under a wide variety of the specific uncertainties associated with the SKJ fishery, and for this reason it is concluded that the HCR doesn't meet the requirements at SG100.

c	HCRs evaluation			
	Guide post	There is some evidence that tools used or available to implement HCRs are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Yes	Yes	No

Rationale

The main tool supporting the HCR is the F multiplier, which in turn determines the temporal closure, which is an effort control. Resolutions C-17-01 and C-17-02 describe the rational and implementation process for the closures using the F-multiplier. One way to examine whether the tools used are appropriate is to examine whether their use provides an outcome consistent with the goal of the HCR as part of the harvest strategy. This is demonstrated to have been achieved in the explanation below.

There is evidence that the F multiplier in conjunction with the temporal closure has been effective in achieving the actions necessary to control exploitation levels and the outcomes expressed as the goal of the HCR (returning exploitation rates to levels corresponding to MSY). As the HCR has been calculated based the F multiplier for BET and YFT, and closures have been calculated based on BET due to its generally lower F multiplier value, we can also look to evidence of the HCR effectiveness on these species to ascertain its effectiveness. Since 2006 the F multiplier for YFT has remained relatively steady and above 1, while for BET the F multiplier has increased from 0.68 in 2006 to consistently floating near 1 since 2010. Over the period of 2006-2010 the closure period was increased, and once the F multiplier recovered above 1 the closure was dropped to 62 days, where it has remained since. These suggest the HCR has been effective in managing exploitation of these more vulnerable species for which the F Multiplier and reference points can be calculated. It is noted that in years 2013 and 2014, the estimated F multiplier allowed for a reduction in the length of the closure season, but the IATTC decided to follow the advice of the scientific staff to maintain the current length for precautionary purposes.

Furthermore, the trend of several indicators used to assess the status of SKJ tuna in the ETPO shows that at least for the last ten years, biomass and recruitment have been above the historic average. It is therefore considered that the status of the SKJ stock is healthy, not likely to be overfished nor overexploited, and that there is evidence that the implicit use of an explicit HCR based on BET or YFT, via tools that include the F multiplier and temporal closure, is functioning to effectively control exploitation rates for SKJ.

This evidence is taken to indicate that the tools in use are effective in meeting the Commission's general management goal and exploitation levels required by the HCR. This meets the MSC requirements at SG80. At the SG 100, for the tools in use -which could include the indicators used to monitor the status of the SKJ stock - there still needs to be clear evidence showing a direct link to the HCR or to skipjack tuna stock status and its effectiveness. On this basis, SG100 is not met.

References
IATTC (2007); IATTC (2012b); IATTC (2013); IATTC (2014e); IATTC (2014f); IATTC (2014g); IATTC-SAC (2016); Maunder and Deriso (2013); (Maunder et al. 2015)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	All documentation pertaining to the benchmark stock assessments and "revised" HCR are requested. These form the basis for the re-evaluation.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.3 – Skipjack tuna —Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Range of information**			
	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	No	No
Rationale				
The Commission monitores the fishery in a variety of ways, leading to a very complete record of fishing operations, catch, bycatch, efficiency and environmental interactions. In 2016, total catch of SKJ by all fleets of all size and gear was approximately 343,000 mt. Of this total, purse seiners caught approximately 342,000 mt. The total purse seine catch was obtained setting approximately 33,000 times, and out of these, only about 7,000 were by vessels smaller than 363 mt (IATTC 2019). This means that the majority of the fishing effort on SKJ was monitored by an observer program that has 100% coverage for purse seiners larger than 363 mt. This coverage is by all standards large enough to consider that some information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy. On this basis, SG 60 is met. The 2019 IATTC report on the tuna fishery, stocks, and ecosystems in the EPO states: "it is difficult to detect the effect of fishing on the population with standard fisheries data and stock assessment methods. This is particularly true for the stock of the EPO, due to the lack of age‐composition data, and especially tagging data, without which a conventional stock assessment of skipjack is not possible." (IATTC 2019). The IATTC further states that: "conventional assessment of skipjack is necessary to ascertain the status of the stock, but, as noted above, this is not possible without much more extensive tagging data. The large‐scale tagging program (Project E.4.a) that commenced in 2019 is therefore critical."(IATTC 2019, Maunder 2019). IATTC explicitly acknowledges deficiencies in the data collected up to now, and that additional data are paramount to advancing skipjack tuna stock assessments and an effective harvest strategy. On this basis, SG80 is not met.				
b	**Monitoring**			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment

			support the harvest control rule.	and management to this uncertainty.
	Met?	Yes	Yes	No

Rationale

Regular stock assessments are conducted to estimate the status of stocks including BET, YFT and SKJ. To this end, extensive amounts of data are obtained by observers placed on every trip of vessels of class 4 and above. A considerable amount of information on the biology of the species has been historically obtained to get a reasonable understanding of the stock abundance (CPUE), catch (removals and discards) and dynamics, allowing for the estimation of the status of the overall fishery. Understanding of status for SKJ is obtained through direct evaluation of the indicator metrics relative to historical trends. Therefore, stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule: the SG 80 is met.

While the main uncertainties are well identified and understood, others have yet to be fully addressed or resolved and catch the reporting from some fleets is limited. These are the main limitations of the monitoring system of the IATTC and SG100 is not met.

c	**Comprehensiveness of information**			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Yes	

Rationale

The fishery for SKJ and the other two tropical tunas in the ETPO is conducted by many countries including Mexico and Ecuador that together hold more than half of the carrying capacity of the fleet. **Other countries include Venezuela, Colombia, Panama, Nicaragua, Argentina and El Salvador.** Although the number of boats of small capacity is similar to others of larger size, most of the capacity is in vessels of class 4 and above (nearly 95% in 2014). The UoA comprises only a fraction of the catch obtained by the Ecuadorian fleet, therefore, a large portion of the fishery is conducted by vessels out of the UoA.

Observer coverage on boats of class 4 and above (95% of total well capacity in 2018) assures that most of the vessels that are part of the UoA catching SKJ are monitored by either the observer program or other programs investigating specific aspects of the biology of the species or the performance of the fleets.

IATTC stock assessments include retained catch plus discards for the different species of tuna by all gears including purse seiners, LL and pole and line. All Stock Assessment Reports (SAR) describe this in the methods section, as well as in annual reports on the tuna fishery, stocks, and ecosystem in the EPO (e.g. IATTC 2019). This meets the requirements of this SI at SG80.

References

IATTC-94-01, IATTC 2012.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	60-79
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.4 – Skipjack tuna—Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Appropriateness of assessment to stock under consideration**			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Yes	No

Rationale

The latest stock assessment is appropriate for the stock and for the harvest control rule because it is the result of a long analytical process in which model performance was evaluated accounting for the main uncertainties that were previously identified (Maunder 2012b). One of the conclusions from previous assessments was the difficulty in estimating stock status based on classic reference points, which forced the design of alternative indicators that are the basis of one of the approaches in the current stock assessment methodology.

Inconsistencies in the results from the different assessment methods suggest that the use of indicators is more appropriate to determine the status of the stock and the behavior of the fishery. Even if the indicators cannot provide a measure of optimum yield, they can be adapted to define management actions based on outcomes. In practice, the indicators are used as supportive evidence that the strategy is working as expected by the HCR. The team considered that the stock assessment is appropriate for the stock of SKJ in the ETPO and is also appropriate for the HCR as it provides information that allows management to evaluate whether the objectives of the HCR are being achieved, meeting the SG 80.

It is unlikely that in the short term, the current approach to evaluate the stock based on indicators and reference levels can be conducted in a probabilistic way. Aspects of stock structure and how environment interacts with SKJ life history and behavior, among other considerations, reamains uncertain, therefore the fishery does not yet meet SG100.

b	**Assessment approach**			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Yes	Yes	

Rationale

The stock assessment found that given the characteristics of the SKJ biology and the nature of the fishery, the best available approach to estimate stock status is through the use of fisheries and biological indicators (empirical reference points as per GCB 2.8 above) that compare the current state of the stock to the historic average and the 5th and 95th percentiles. If the stock indicators for SKJ - relative biomass and recruitment - remain above the historic average (median), it can be concluded that the harvest strategy is working in a way that is consistent with the MSY-based reference points.

This approach is following the intent outlined in guidance, to support the harvest strategy and is appropriate for the stock: this meets the requirement at SG60.

c	Uncertainty in the assessment			
	Guide post	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Yes	Yes	No

Rationale

The latest stock assessment is the result of a long analytical process in which model performance was evaluated, accounting for the main uncertainties that were previously identified (Maunder 2012b). One of the conclusions from previous assessments was the difficulty in generation of stock status and associated measures of uncertainty based on classic reference points. To account for these uncertainties, an alternative approach was designed using indicators of relative quantities describing the status of the stock and the behavior of the fishery (Maunder and Deriso 2007). The indicators present the behavior of the stock and the fishery through relative measures of parameters such as abundance and recruitment. The approach compares the historic trend of these paramenters with the overall average and the corresponding 5th and 95th percentiles. The concept is that even if the current status of the stock is uncertain, the space inside percentiles represents a history of the stock and the fishery where even at low abundance or high effort the stock has been able to persist. In this context, as long as the indicators stay within these limits, it is reasonable to assume that the stock will continue to support the fishery.The percentiles represent boundaries that should not be exceeded because beyond them, the capacity of the stock to support such fishing intensity is unknown.

The nature of the uncertainties resulting from the application of the regular methodologies to assess the status of the stock have been identified as described above, and the development of an alternative approach is in itself a indication that uncertainty has considered meaningful, and accounted for, in the management of SKJ. The existing indicator approach is a fitting solution given the nature of the biological characteristics of the species.

It is unlikely that in the short term the current approach to evaluate the stock based on indicators and reference levels can be conducted in a probabilistic way. Therefore the fishery meets the standard of this SI at SG80 but not at SG100.

d	Evaluation of assessment			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			No

Rationale

One of the conclusions from previous assessments was the difficulty in estimating stock status based on classic reference points which forced the design of alternative indicators that are the basis of one of the approaches in the current stock assessment methodology. While this approach is appropriate given the nature of the biological characteristics of SKJ tuna, additional testing is needed, either to compute MSY reference points as

established by the Commission or to test the performance of the alternative indicators associated with the current HCR. Thus requirements at SG100 are not met.				
e	**Peer review of assessment**			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Yes	No
Rationale				
The report of the stock assessment introducing the use of alternative indicators was internally peer reviewed by Robin Allen and Willian Bayliff (Maunder and Deriso 2007). Therefore, the fishery meets the requirements at SG80. Results of the IATTC research are often published in peer reviewed journals, particularly those related to methodologies or the overall state of stocks and the fishery (e.g. Zhu et al., 2012; Hampton et al., 2005; for a complete list of IATTC papers see (http://www.iattc.org/PDFFiles/IATTC-Outside-Journals.pdf). The Commission also assembles external expert panels to peer review stock assessments (Martell et al., 2013). The SKJ stock assessment has yet to be externally peer reviewed and therefore does not meet the SG100.				
References				
Aranda et al. (2010); Maunder (2012b); Maunder and Watters (2003); Maunder and Harley (2005); Maunder and Deriso (2007); Zhu et al (2012); Hampton et al (2005); Martell et al (2013); IATTC (2019)				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1.1 – Bigeye tuna—Stock Status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**			
	Guide post	It is likely that the stock is above the point where recruitment would be impaired (PRI).	It is highly likely that the stock is above the PRI.	There is a high degree of certainty that the stock is above the PRI.
	Met?	Yes	No	No

Ratio

The most recent benchmark stock assessment was conducted in 2016; update stock assessments were conducted in 2017 and 2018. The IATTC agreed LRP (SB0.5R0, assuming h = 0.75) defines the point when it is likely that recruitment would be impaired, and is below the default MSC PRI (20%SB0). Based on the base case model in the 2018 update assessment the limit reference point was 38% SBMSY (1.6 FMSY), corresponding to 8%SB0. The default MSC PRI is consistent with the SBMSY for bigeye, 21%B0.

The 2018 updated assessment estimates spawning biomass (SB2017/SBMSY) at 102%, whereas F is estimated to be above the FMSY level and the F-ratio (F2017/FMSY) is estimated at 1.15 (see the Kobe plot below). Based on the precautionary sensitivity run (h=0.75), SB is estimated to be below the MSY level.

Various uncertainties were identified in the update assessment of bigeye tuna conducted in 2018 (SAC-09-05, SAC-09 INF-B), and its usefulness for management has been questioned (IATTC 2019). Therefore, the staff developed stock status indicators (SSIs) for bigeye, similar to those used for skipjack tuna (SAC-09-07), as an alternative basis for management advice and to monitor the stock and the fishery in the future until the uncertainties in the stock assessment are resolved. The indicators are based on relative quantities; i.e., instead of comparing a value with a reference point based on the maximum sustainable yield (MSY) of a species, it is compared with the distribution of its historical values.

All purse-seine SSIs, except catch, show strong trends over time, and in 2018 were at, or near, the respective reference levels, indicating high rates of exploitation, increased fishing mortality and reduced abundance of juveniles (See indicator figure below, from Xu et al 2019). Initially, the total purse-seine catch of bigeye fell from its high level in 2000 increased during 2002-2006, and has fallen since then, except for an increase to its average level in 2018. The catch per day fished (CPDF) of bigeye in floating-object sets generally fell during 2000-2018, reaching the lower reference level in 2018. The capacity of the purse-seine fleet, adjusted for the closures, has fluctuated since 2000, but has increased in recent years, and is now at its upper reference level. Both the number of floating-object sets and the number of days fished in such sets generally increased during the whole period, and in 2018 were above the upper reference level, while the average weight of the bigeye in the catch has been generally decreasing, and has been at the lower reference level since 2015. Two indices of abundance and an index of average fish length in the catch were developed using longline data. Since the mid-80s both abundance indices have declined over time but are within the upper and lower bounds. Average fish length has remained relatively stable since the early 90s.

The increasing number of floating-object sets, particularly on fish-aggregating devices (FADs), and the decreasing average weight of the bigeye in the catch,indicate that the bigeye stock in the EPO is under increasing fishing pressure, and that additional measures to reduce fishing pressure may be necessary (IATTC 2019).

For the purpose of this particular Scoring Issue, we do not have a reliable index for recruitment. While some of the indicators portray trends many of the values are within the upper and lower reference levels. While the most recent update assessment indicated that current biomass was not approaching the LRP (see the Kobe plots below), there is uncertainity in this determination. Therefore we conclude that the stock is likely above the point where recruitment would be impaired, meeting the requirements for SG60. Due to uncertsainties surrounding the assessment and indicators, requirements at the SG80 level are not met.

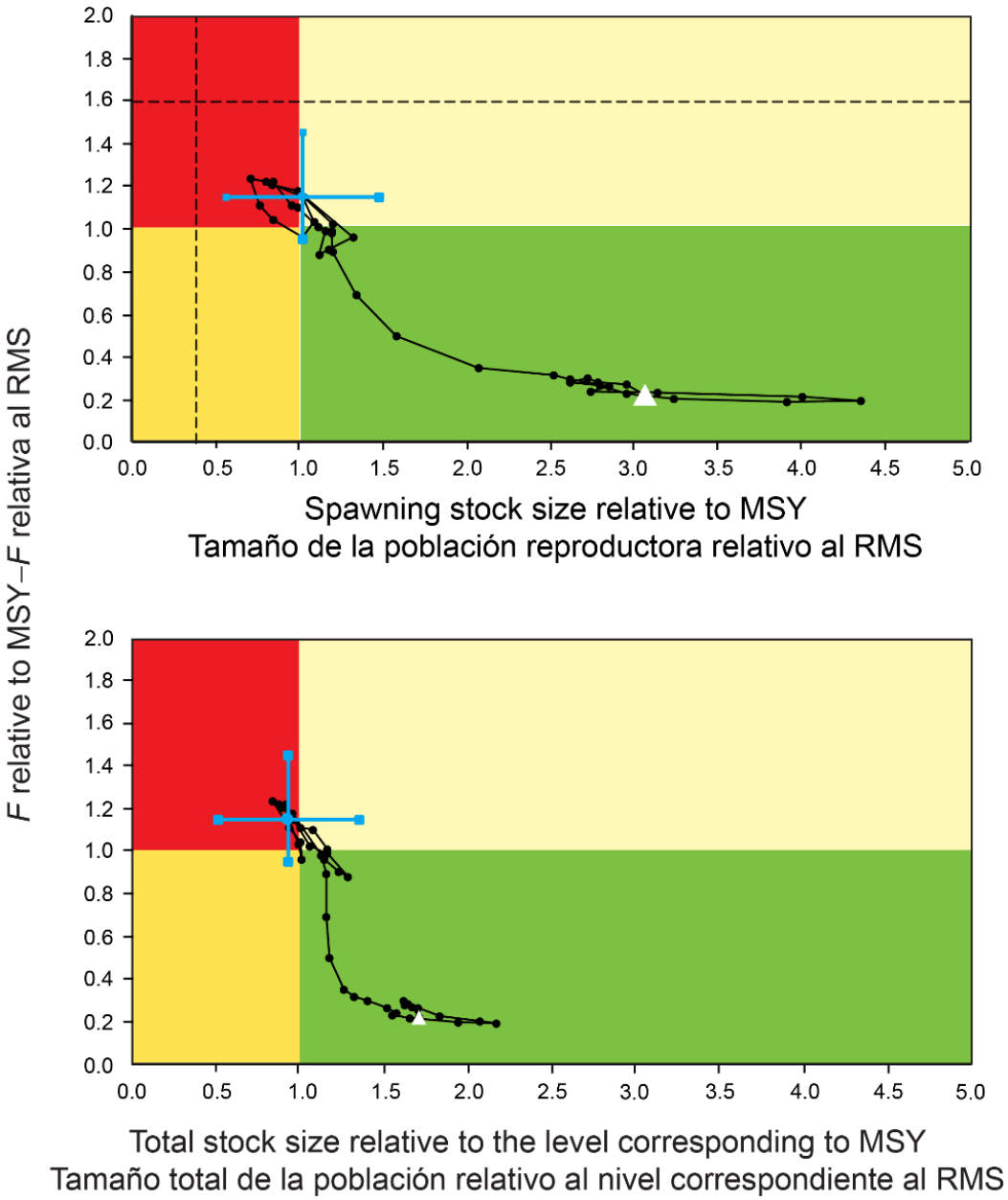


Figure XXX. Kobe (phase) plot of the time series of estimates of spawning stock size (top panel: spawning biomass; bottom panel: total biomass aged 3+ quarters) and fishing mortality relative to their MSY reference points. The colored panels represent target reference points (SMSY and FMSY; solid lines) and limit reference points (dashed lines) of 0.38 SMSY and 1.6 FMSY, which correspond to a 50% reduction in recruitment from its average unexploited level based on a conservative steepness value (h = 0.75) for the Beverton-Holt stock-

recruitment relationship. Each dot is based on the average fishing mortality rate over three years; the large dot indicates the most recent estimate. The squares around the most recent estimate represent its approximate 95% confidence interval. The triangle represents the first estimate (1975).

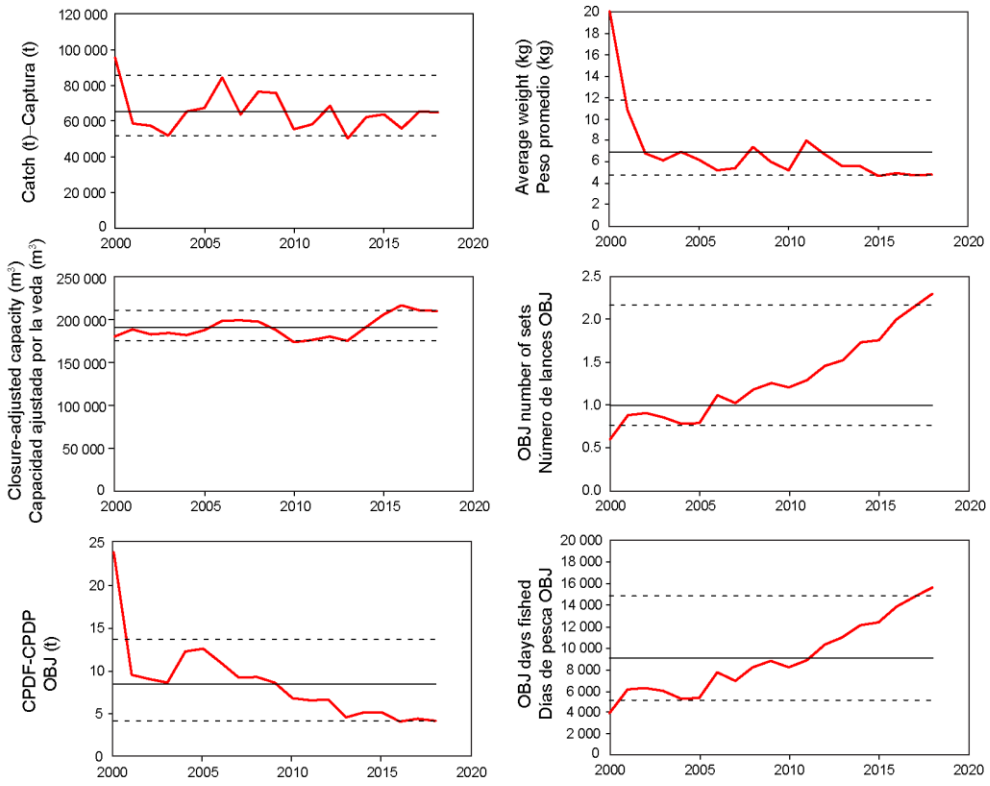


Figure XXX. **Stock status indicators for bigeye tuna in the EPO, based on purse-seine data, 2000-2018. The dashed horizontal lines are the 5th and 95th percentiles, the solid horizontal line is the median. CPDF: catch per day fishing; OBJ: sets on floating objects.**

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		No	No

Rationale

The 2018 update assessment indicates that the SB is close to the MSY level (see Figure xxx) (Aires-da-Silva and Maunder 2017). Estimates of past biomass indicate that the stock has been fluctuating around MSY since 2000. The recent estimate fishing mortality is above the MSY level, and when projecting this forward the stock is likely to decline and remain below SB at MSY, with considerable uncertainty.

Of the eight indicators used by IATTC to assess the “status” of bigeye tuna, all but one (average fish length) have either increasing or decreasing trends and current indices are at the boundry values. Given that the long term

medium value of each indicator represents MSY its unlikely that the stock is fluctuating a level consistent with MSY (Xu et al 2019). Thus, the requirements at the SG 80 level are not met. The assessment team views this as a draft score and upon competion of the bigeye tna benchmark stock assessment in 2020 will reevaluate the scoring of this SI.			
References			
SAC-09-05, SAC-09 INF-B, SAC-09-07, Aires-da-Silva and Maunder 2017, Xu et al 2019			
Stock status relative to reference points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring stock relative to PRI (SIa)	Official: F_0.5R0: S_0.5R0 Alternative: B and R not under the 5th percentile of the historic time series.	B/Bmsy = 0.38 F/Fmsy = 1.6	SB: Srecent/SMS = 0.92 F: Crecent/MSY = 1.13
Reference point used in scoring stock relative to MSY (SIb)	Official: Bmsy:Fmsy. Alternative: B and R fluctuating above the average of time history	B/Bmsy = 1.0 F/Fmsy = 1.0	See background section for description and reference.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	Information is not sufficient to score this PI. Results from the benchmark bigeye tuna stock assessment scheduled for compleion in 2020, as well as updates to the indicators, are required to rescore the PI.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1. 2 – Bigeye tuna—Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the stock.
	Met?	Yes		NA
Rationale				
While a rebuilding plan for yellowfin tuna has not been recommended, MSC guideline GSA2.3 states that "if PI 1.1.1 is scored lower than SG80, PI 1.1.2 must be scored." Due to increasing uncertainties and conflicting information the most recent assessment of BET in the EPO (2017) was considered unreliable for management purposes and for assessing stock status (Xu et al 2019). As a result, stock status indicators have been established to guide management decision making and a research plan to address the uncertainties was adopted by the IATTC, including the completion of a bigeye tuna benchmark stock assessment in 2020. Additionally, purse seining temporal closures, previously established to reduce exploitation rates in tropical tuna fisheries operating in the EPO, are in effect through 2020. While these actions do not constitiute a rebuilding plan, IATTC staff considered this to be ta rational path forward in the short-term and on this basis the assessment team considers this to meet SG60				
b	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, or it is likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is strong evidence that the rebuilding strategies are rebuilding stocks, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	Yes	No	No
Rationale				
required Access to fishing in the IATTC Convention Area is regulated by Resolution C-02-03, which requires vessels to be on the IATTC Regional Vessel Register in order to fish for tunas in the EPO. Vessels are authorized to fish by their respective flag governments, and only duly authorized vessels are included in the Register. Since 1993 all Class-6 purse-seine vessels (carrying capacity greater than 363 metric tons (t)) carry observers, who collect detailed data on catches, both retained and discarded at sea. Estimates of the total amount of the catch				

that is landed (retained catch) are based principally on data collected during vessel unloadings. IATTC Resolution C-17-02 requires that tropical tunas be retained upon capture, except if unfit for human consumption or due to insufficient well space during the last trip. While additional clarification on what constitutes “the last trip” has been requested, this measure sought to remove the potential of high-grading and discarding at sea, thus resulting in more reliable estimates of total catch. Given the existing monitoring programs, the SG 60 requirements are met. Requirements at the SG 80 level address the effectiveness of the monitoring measures. Modelling by IATTC has detected a continual increase in fishing mortality (F) over time dispite measures to reduce F through fishing effort control measures (purse seine fishing closure periods) (Xu et al 2019). The relationship between fishing effort and F will be assessed as part of the bigeye tuna benchmark assessment scheduled for completion in 2020. Thus, requirements at the SG 80 level are not met.
References
Xu et al 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	To further assess the adequacy of monitoring, results of the 2020 bigeye tuna benchmark stock assessment and updates to indicator indices, as well as associated recommendations to future research and monitoring are requested.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.1 – Bigeye tuna—Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	Yes	Yes	No

Rationale

IATTC adopted a HCR for tropical tunas based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02), aimed at preventing fishing mortality from exceeding the MSY level for the tropical tuna stocks (bigeye, yellowfin or skipjack). If there is a 10% or greater probability of reaching the LRP for fishing mortality or spawning biomass, the HCR triggers the establishment of additional management measures to reduce fishing mortality and rebuild the stock via fleet-specific time/area closures and catch limits (see Resolutions C-17-01 and C-17-02).

The duration of the closure is set according to the level of Fmult (FMSY/Fcurrent) for the stock requiring the strictest management, at present bigey tuna. While the harvest strategy is in theory responsive to the state of the more vulnerable species (bigeye tuna), resulting in the adoption of more precautionary measures for yellowfin tuna, the recent bigeye tuna stock assessment was considered too uncertain to provide a basis for management (Xu et al 2019).

As a result the harvest strategy for tropical tunas uses indicators specifically designed for skipjack, bigeye, and yellowfin tuna to monitor the behaviour of the fishery in terms of relative values of traits such as abundance, catch, average length and weight, and exploitation rates. The trends of these indicators are then compared to historic averages and their associated 5th and 95th percentiles, which act as surrogate/proxy reference points. These indicators are presented and reviewed at annual meetings in a manner that is designed to determine stock status compared to the average and the percentiles. Temporal closure is the main effort control for tropical tunas and is currently used in conjunction with the indicators to guide management decisions.

Therefore, it is possible to say that for YFT, the harvest strategy is expected to achieve stock management objectives and SG60 is met. Additionally, the harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives, thus SG80 is met.

SG100 requires the harvest strategy to be responsive to the state of the stock and designed to achieve stock management objectives. Elements of the strategy will need to be more formally defined to trigger management measures, to assure responsiveness to yellowfin tuna stock status.The F-multiplier forms the basis of the HCR and is used to adjust the duration of the closure. It is intended to map the required reduction in exploitation to closure days, allowing for the identification of the appropriate closure duration. The F-multiplier for bigeye tuna

and yellowfin tuna has been increasing over time, impacting the relationship between F and fishing effort and the ability to identify an appropriate closure period (Minte-Vera et al 2019). To account for increases in the F-multipier, recently proposed closure periods have been adjusted upwardly, outside of the adopted harvest strategy process, based on a range of other factors centered around problems with the bigeye and yellowfin tuna stock assessments. At a minimum the harvest strategy should have a mechanism a) to assure that any change of status in SKJ, YFT, or BET, apparent via "indicators", is necessarily linked to, or triggers, a management outcome associated with the HCR and b) to assure that any change in the current operational assumptions is linked to a management outcome associated with the HCR. The movement away from a formalized harvest strategy results in the SG 100 requirements not being met.

b	**Harvest strategy evaluation**			
	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Yes	No	No

Rationale

At the SG 60 level, the SI requires that the strategy is likely to work based on prior experience or plausible argument. The current strategy restricts fishing effort of the entire fishery on the basis of indicator analyses for SKJ, YFT and BET, and the indicators used to assess change are those that are generally incorporated into traditional stock assessment models. The indicators are updated and reviewed annually and the IATTC work plan calls for the completion of bigeye and yellowfin tuna benchmark stock assessments in 2020 and updating indicator indices.

Based on the 2017 stock assessment, spawning biomass was determined to potentially be below SBMSY, although the assessment is highly uncertain. Pending completion and review of the benchmark assessment it was decided to maintain the current purse seine fishing closure through 2020, as well as adoption of additional measures to reduce exploitation rates, rather than apply the HCR to bigeye tuna in full. This approach seems reasonable given the workplan and time line established by IATTC, and represeants a strategy likely to maintain the stock above PRI in the interim. However, there is not sufficient evidence to indicate that the harvest strategy will maintain spawning biomass at or above MSY. On this basis the assessment team maintains that the current strategy is likely to work, so SG60 is met. However, evidence is insufficient to show it is achieving its objectives., the SG80 is not met.

c	**Harvest strategy monitoring**			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

Rationale

There is a considerable amount of data that is being collected that informs various aspects of the harvest strategy. Observer coverage at 100% (for vessel categories 3-6), logbook records, and additional research data gathering provide the basic inputs for assessment models that have been developed over a long period of time and are used in conjunction with the HCR (applied indirectly to SKJ). In addition, data are systematically collected to produce indicators of the status of the BET stock (relative measures of catch, abundance, average length and weight, and exploitation rate). Therefore, sufficient monitoring is in place to support the current harvest strategy for BET, and would remain sufficient, should aspects of the harvest strategy be strengthened in relation to BET in particular; SG 60 in met

d	**Harvest strategy review**			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			No

Rationale

The IATTC regularly conducts stock assessments (last BET assessment was conducted in 2017), evaluates the utility of management measures and harvest strategy, and provides recommendations to improve the different mechanisms in the harvest strategy. Examples of a search for appropriate reference points and control rules are in: Maunder (2012a); Maunder and Deriso (2007); Maunder and Deriso (2013); Maunder and Deriso (2014). Changes in stock assessment methodologies to improve estimation of parameters can be followed in: IATTC (2000); Maunder and Watters (2001); Maunder and Watters (2003); Maunder (2012b; Valaro et al 2018). These tests and analyses are particularly important for BET because the biological characteristics and the operational nature of the fishery has deemed the traditional indicators either unreliable or inappropriate (Xu et al 2019). IATTC has used these investigations to reach agreements on indicators and reference levels used to assist in the determination of the status of the tropical tunastocks (Minte-Vera et al 2019, Xu et al 2019, Maunder 2019).

There is therefore effort and expertise used to improve the workings of the harvest strategy for tropical tunas, by ongoing review and analysis of how it is performing overall and for particular species. However, the current reviews have not addressed how management action will be triggered in a formalized manner for BET specifically, should indicators point to stock-level concerns for this less vulnerable species. Also, IATTC Resolution C-17-01 required review of the tropical tuna harvest strategy during 2018. Unfortunately, this was not accomplished and ITAAC scientific staff recommended that the provisions of Resolution C-17-02 be maintained in the interim until the benchmark assessments for bigeye and yellowfin tuna, scheduled to be completed in 2020, and updated indicator indices have been reviewed. Since the harvest strategy was not reviewed in 2018, SG100 is not met.

e	**Shark finning**			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	NA	NA	NA

Not applicable as the target is not a shark.

f	**Review of alternative measures**

	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Yes	Yes	Yes

Rationale

IATTC Resolution C-17-01 stipulates that all bigeye, skipjack and yellowfin brought on board is required to be landed, except those deemed unfit for human consumption or due to insufficient well space during the last haul. The goal of this Resolution was to eliminate the potential for setting purse seines on schools containing significant numbers of inmature tropical tunas which would eventually be discarded. Information on the compliance of this Resolution is monitored as part of the IATTC compliance process.

The IATTC Ad Hoc Working Group on FADs is tasked with reviewing and recommending methodologies/technologies to the full commission on the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of target species and non-target species. The working groups meets annually, the first 1st meeting occurring in 2016. Conclusions and recommendations are presented during annual meeting of the IATTC Commission for further discussion and consideration.

Based on these activitiesrequirements for SG 60, SG 80, and SG100 are met.

References

IATTC-SAC (2015); Maunder (2012a); Maunder (2012b); Maunder (2019); Maunder (2015); Maunder and Watters (2001); Maunder and Watters (2003); Maunder and Deriso (2007); Maunder and Hoyle (2007); Maunder and Deriso (2013); Maunder and Deriso (2014); Xu et al 2019; Minte-Vera et al 2019; Maunder et al 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	60-79
Information gap indicator	The 2020 benchmark assessments for bigeye and yellowfin tuna, as well as documentation describing changes (if any) to the harvest strategy of tropical tunas in the IATTC Commission area are requested.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.2 – Bigeye tuna—Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guide post	Generally understood HCRs are in place or available that are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time.
	Met?	Yes	Yes	No

Rationale

The Commission has consistently recommended the use of an HCR. IATTC Resolution C-16-02 outlines the HCR for tropical tunas in the IATTC Commission Area as:

- If the probability that F>Flim is >10%, management measures shall be established such that there is at least a 50% probability that F will reduce to FMSY or below, and with a probability of <10% of F>Flim.
- If the probability that SB<SBlim is >10%, management measures shall be established such that there is at least a 50% probability that SB will recover to SBMSY or above, and with a probability of <10% that SB will decline to <SBlim within two generations or 5 years, whichever is greater.
- Purse seine closures can be established for multiple years and shall attempt to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management.

These measures are expected to keep the biomass above the LRPs, and above the PRI. Thus, requirements for SG 60 are met.

To satisfy the requirements at the SG 80 level the HCR must be “well defined”, “in place”, and “expected to keep the stock fluctuating around a target level consistent with MSY’. Based on Resolution C-16-02 the HCR is well defined. There is also evidence that the HCR is functionally in place because there has been reliable and systematic use of its main tool - temporal closures. Closures are the main tool used to control effort and are numerically explicit; utilizing as input the F multiplier parameter representing the change in effort needed to keep stocks at Fmsy or below Fmsy (IATTC 2007). The measures also ensure that the stock fluctuates around MSY by maintaining F at a rate corresponding to the maximum sustainable yield (FMSY) for the species that requires the strictest management, in this case bigeye tuna. This approach is precautionary in that stricter management measures would be applied then if management was based on the less vulnerable species, yellowfin tuna. Thus, requirements for SG 80 are met.

To meet the requirements at the SG 100 level, HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level, taking into account the ecological role of the stock, most of the time. The current HCR attempts to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (FMSY) for the tropical

tuna**species that requires the strictest management, in this case bigeye tuna. As previously noted management measures applied to yellowfin tuna and skipjack tuna established through the application of this HCR will be precautionary, and would be expected to keep the stock fluctuating at or above a target level consistent with MSY. While there has been testing to determine the utilty of this approach, the current HCR was not tested within a management strategy (MSE) framework, the leading process to test HCRs and other management strategies for their effectiveness in attaining management objectives (REF). IATTC Resolution C-19-07 recognizes the importance of MSEs in defining effective HCRs and outlines Terms of Reference (ToR) for conducting MSE workshops to foster their development for tuna species in the IATTC convention area. Subsequently, IATTC Staff developed a 5-year workplan to develop MSEs for for tropical and temperate tuna species in the EPO. Until additional testing is completed requirements at the SG 100 level are not met.**

b	**HCRs robustness to uncertainty**			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a wide range of uncertainties including the ecological role of the stock, and there is evidence that the HCRs are robust to the main uncertainties.
	Met?		Yes	No

Rationale

IATTC Resolution C-16-02 established a HCR for tropical tunas in the EPO. A preliminary MSE approach, limited in scope and testing of uncertainties, was utilized to develop and test the HCR developed for all tropical tunas using bigeye as an example. While the overall harvest strategy did rebuild the bigeye stock towards the target under all management scenarios, a more comprehensive MSE is required to evaluate the robustness of the HCR (Maunder and Deriso 2016). Although simulations support the robustness of the HCR, there is still a lack of direct evidence, and, as noted, not all uncertainties have been evaluated. However, given the problems with the bigeye assessment, this may have to be reevaluated. On this basis, the requirements at the SG 80 level are met but not those at the SG 100 level due to large remaining uncertainties in stock dynamics.

C	**HCRs evaluation**			
	Guide post	There is some evidence that tools used or available to implement HCRs are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Yes	Yes	No

Rationale

The tools to implement the HCR are set out in Resolutions C-17-01 and C-17-02 and tThe main tool supporting the HCR is the F multiplier (FMSY/F), which in turn determines the temporal fishing closure period. Closure period determinations are not explicitly linked to the HCR but the number of days of closure have been adjusted according to Fmult (FMSY/F) and other factors. Due to recent increases in capacity within the

fisheries, closure periods were adjusted accordingly. The utility of this approach requires a relationship between exploitation and closure period, and since established closures are applied over multiple years the basis available evidence indicates that the tools are likely to be effective at controlling exploitation rates. Requirements at the SG 80 level are met. **In 2017, the closure period for 2017-2020 was extended to 72 days based on the F multiplier adjusted for capacity increases. However, due to uncertainties in the relationship between exploitation and closure period, the duration of the closure period was decided to be a matter of negotiation between IATTC members, rather then following the established HRC. Thus, requirements at the SG 100 level are not met.**
References
IATTC (2007); IATTC (2012b); IATTC (2013); IATTC (2014e); IATTC (2014f); IATTC (2014g); IATTC-SAC (2016); Maunder and Deriso (2013); (Maunder et al. 2015)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	> 80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.3 – Bigeye tuna—Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Range of information**			
	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	No
Rationale				
The Commission monitores the fishery in a variety of ways, leading to a very complete record of fishing operations, catch, size-at-catch (size frequency sampling) bycatch, efficiency and environmental interactions. In 2016, total catch of BET by all fleets of all size and gear was approximately 93,000 mt. Of this total, purse seiners caught approximately 57,000 mt. The total purse seine catch was obtained setting approximately 33,000 times, and out of these, only about 7,000 were by vessels smaller than 363 mt (IATTC 2019). This means that the majority of the fishing effort on BET was monitored by an observer program that has 100% coverage for purse seiners larger than 363 mt. This coverage is by all standards large enough to consider that sufficient information is being recorded about the behaviour and performance of the fishery. Observer data is used to analyse fleet composition, stock structure, stock productivity and some biological aspects: this meets the SG 80. A more comprehensive range of information on stock structure, growth, productivity, abundance, and environmental information is needed to reduce some of the most important uncertainties. For this reason, the team concludes that the IATTC monitoring system meets the requirements at SG80 but not at SG100.				
b	**Monitoring**			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No
Rationale				

Regular stock assessments are conducted to estimate the status of stocks including BET, YFT and SKJ. To this end, extensive amounts of data are obtained by observers placed on every trip of vessels of class 4 and above. A considerable amount of information on the biology of the species has been historically obtained to get a reasonable understanding of the stock abundance, removals and dynamics, allowing for the estimation of the status of the overall fishery. Understanding of status for BET is obtained through direct evaluation of the indicator metrics relative to historical trends. Therefore, stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule: the SG 80 is met.

The main uncertainties are well identified and understood, but some have not been fully addressed or resolved . This is probably the main limitation of the monitoring system of the IATTC, therefore the team agrees that the fishery meets the requirements at SG80 but not at SG100.

c	**Comprehensiveness of information**			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Yes	

Rationale

The fishery for BET and the other two tropical tunas in the ETPO is conducted by many countries including Mexico and Ecuador that together hold more than half of the carrying capacity of the fleet. Other countries include Venezuela, Colombia, Panama, Argentina, and Nicaragua. Although the number of boats of small capacity is similar to others of larger size, most of the capacity is in vessels of class 4 and above (nearly 95% in 2014). The UoA comprises only a fraction of the catch obtained by the Ecuadorian fleet, therefore, a large portion of the fishery is conducted by vessels out of the UoA.

Observer coverage on boats of class 4 and above (95% of total well capacity in 2018) assures that most of the vessels that are part of the UoA catching BET are monitored by either the observer program or other programs investigating specific aspects of the biology of the species or the performance of the fleets.

IATTC stock assessments include retained catch plus discards for the different species of tuna by all gears including purse seiners, LL and pole and line. All Stock Assessment Reports (SAR) describe this in the methods section, as well as in annual reports on the tuna fishery, stocks, and ecosystem in the EPO (e.g. IATTC-94-01). This meets the requirements of this SI at SG80.

References

IATTC-94-01, IATTC 2012.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.4 – Bigeye tuna—Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Appropriateness of assessment to stock under consideration**			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		No	No
Rationale				
A bigeye tuna benchmak stock assessment was completed in 2016 and updated in 2017 nad 2018 (Aires-da-Silva et al 2016, Aires-da-Silva and Maunder 2017, Xu et al 2018). The assessment uses an integrated statistical age-structured stock assessment model (Stock Synthesis), including data on catch (retained and discarded), indices of relative abundance (CPUE), and size compositions of the catches of the various fisheries. Assumptions have been made about biological processes such as growth, recruitment, movement, natural mortality and stock structure. The assessment is able to use all available data and was well-adapted to take account of yellowfin biology. The 2018 update assessment resulted in large changes to the estimates of stock status relative to reference points compared to the previous update, which was largely the result of new data on longline CPUE and length-composition incorporated into the model. The assessment was also highly sensitive to the assumptions, and not considered suitable to use in applying the HCR (Xu et al 2019). On this basis, SG80 is not met.				
b	**Assessment approach**			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Yes	Yes	
Rationale				
Past stock assessments estimated stock status in relation to the stock specific (not generic) MSY-based reference points estimated over a range of assumptions in the stock assessment. However, due to increasing uncertainties, driven by the addition of new data in the 2018 assessment, stock status determinations relative to MSY-based reference points was not possible. A bigeye tuna benchmark stock assessment is scheduled to be completed in 2020. On this basis, SG80 is met.				
c	**Uncertainty in the assessment**			

	Guide post	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Yes	Yes	No

Rationale

The latest stock assessment is the result of a long analytical process in which model performance was evaluated, accounting for the main uncertainties that were previously identified (Aires-da-Silva et al 2017, Xu et al 2019). The assessment reports trends and projections of quantities with confidence intervals. One of the conclusions from previous assessments was the difficulty in generation of stock status and associated measures of uncertainty based on classic reference points. To account for these uncertainties, an alternative approach was designed using indicators of relative quantities describing the status of the stock and the behavior of the fishery (Maunder and Deriso 2007). The indicators present the behavior of the stock and the fishery through relative measures of parameters such as abundance and recruitment. The approach compares the historic trend of these paramenters with the overall average and the corresponding 5th and 95th percentiles. The concept is that even if the current status of the stock is uncertain, the space inside percentiles represents a history of the stock and the fishery where even at low abundance or high effort the stock has been able to persist. In this context, as long as the indicators stay within these limits, it is reasonable to assume that the stock will continue to support the fishery. The percentiles represent boundaries that should not be exceeded because beyond them, the capacity of the stock to support such fishing intensity is unknown.

The nature of the uncertainties resulting from the application of the regular methodologies to assess the status of the stock have been identified as described above, and the development of an alternative approach is in itself an indication that uncertainty was considered meaningful, and accounted for, in the management of BET. The existing indicator approach is a fitting solution given the nature of the biological characteristics of the species.

A benchmark assessment for BET is scheduled for 2020 and a research plan to address assessment uncertainties has been implemented by IATTC. It's envisioned that future **management decisions will be based on both indicators and the new assessment.**

While past assessments used probabilistic projections of future stock trajectories under different model assumptions, IATTC did not outline a process for combining results from future stock assessments and indicator "scores" to assess stock status relative to reference points in a probabilistic way. Therefore, the fishery meets the standard of this SI at SG80, but not at SG100.

d	**Evaluation of assessment**			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			No

Rationale
One of the conclusions from previous assessments was the difficulty in estimating stock status based on classic reference points. To evaluate uncertainty, sensitivity runs and model diagnostics were conducted, and trends and projections of quantities in the assessment reports presented along with confidence intervals. The inability to determine stock status based classic reference points forced the design of alternative indicators that are the basis of one of the approaches in the current stock assessment process. While this approach is appropriate given the nature of the biological characteristics of BFT, additional testing is needed, either to compute MSY reference points as established by the Commission, or to test the performance of the alternative indicators associated with the current HCR. Thus requirements at SG100 are not met.

e	Peer review of assessment			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Yes	No

Rationale
The report of the stock assessment introducing the use of alternative indicators was internally peer reviewed by Robin Allen and Willian Bayliff (Maunder and Deriso 2007). The most recent BET assessment was reviewed during the 2018 IATTC SAC meeting (Xu et al. 2018) Therefore, the fishery meets the requirements at SG80. Results of the IATTC research are often published in peer reviewed journals, particularly those related to methodologies or the overall state of stocks and the fishery (e.g. Zhu et al., 2012; Hampton et al., 2005; for a complete list of IATTC papers see (http://www.iattc.org/PDFFiles/IATTC-Outside-Journals.pdf). The Commission also assembles external expert panels to periodically peer review stock assessments. External peer reviews of IATTC bigeye tuna stock assessments were conducted in 2010 and 2019 (Sibert et al 2012, Punt et al 2019). On this basis, SG100 is met.

References
Aranda et al. (2010); Maunder (2012b); Maunder and Watters (2003); Maunder and Harley (2005); Maunder and Deriso (2007); Zhu et al (2012); Hampton et al (2005); Martell et al (2013); Xu et al (2018); Sibert et al 2012; Punt et al 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	60-79
Information gap indicator	Results of the 2020 bigeye tuna benchmark assessment and updates to indicator indices are requested. Also, documents updating the status of IATTC research to address uncertainties in the assessment process are required.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

7.3 Principle 2

7.3.1 Principle 2 background

7.3.1.1 Overview of Non-target Catch

All species that are affected by the fishery and that are not part of the Unit of Certification are considered under Principle 2. This includes species that are retained for sale or personal use (assessed under Performance Indicator 2.1), bycatch species that are discarded (Performance Indicator 2.2), and species that are considered endangered, threatened or protected by the government in question or are listed by the Convention of International Trade of Endangered Species (CITES) (Performance Indicator 2.3). This section contains an evaluation of the total impact of the fishery on all components in P2 and includes both observed and unobserved fishing mortality. Unobserved mortality may occur from illegal, unregulated or unreported (IUU) fishing, biota that are injured and subsequently die as a result of coming in contact with fishing gear, ghost fishing, waste, or biota that are stressed and die as a result of attempting to avoid being caught by fishing gear. This section also considers impacts on marine habitats (Performance Indicator 2.4) and the ecosystem more broadly (Performance Indicator 2.5).

Primary species

For the purposes of a MSC evaluation, primary species are those in the catch, and within the scope of the MSC program (fishes or shellfish), and not defined by the client as the target – which by definition is evaluated under Principle 1. Primary species will usually be species of commercial value to either the UoA or fisheries outside the UoA, with management tools controlling exploitation as well as known reference points in place. In addition, the institution or arrangement that manages the species (or its local stock) will usually have some overlap in a jurisdiction with the UoA fishery.

Secondary species

Species associated with the target that is harvested under some management regime, where measures are in place intended to achieve management, and these are reflected in either limit or target reference points are evaluated as Primary species within Principle 2. In contrast, secondary species include fish and shellfish species that are **not** managed according to reference points. Secondary species are also considered to be all species that are out of the scope of the standard (birds/ mammals/ reptiles/ amphibians) and that are not ETP species. These types of species could in some cases be landed intentionally to be used either as bait or as food for the crew or for other subsistence uses, but may also in some cases represent incidental catches that are undesired but somewhat unavoidable in the fishery. Given the often unmanaged status of these species, there are unlikely to be reference points for biomass or fishing mortality in place, as well as a general lack of data availability.

Main species

For Primary and Secondary species, species may be considered "Main" based on either resilience/vulnerability and catch volume. Species that are not "Main" are Minor. Main and Minor species must meet different Performance Indicators (PIs) in P2.

Resilience/vulnerability:

If the species is considered "less resilient" and it is ≥ 2% of the catch, then it is considered Main, otherwise it is considered Minor. If the species is not considered "less resilient" and it is ≥ 5% of the catch, then it is considered Main, otherwise, it is considered Minor.

ETP Species

ETP species have been classified according to v2.01 SA3.1.5 such that:

- Species that are recognised by national ETP legislation;
- Species listed in the binding international agreements given below:
    - Appendix 1 of the Convention on International Trade in Endangered Species (CITES), unless it can be shown that the particular stock of the CITES listed species impacted by the UoA under assessment is not endangered.
    - Binding agreements concluded under the Convention on Migratory Species (CMS), including:
        - Annex 1 of the Agreement on Conservation of Albatross and Petrels (ACAP);
        - Table 1 Column A of the African-Eurasian Migratory Waterbird Agreement (AEWA);
        - Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS);
        - Annex 1, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS);
        - Wadden Sea Seals Agreement;
        - Any other binding agreements that list relevant ETP species concluded under this Convention

7.3.1.2 Overview of Species Classification

The Unit of Assessment includes a fleet of select 44 Ecuadorian, Panamanian, and US vessels that are members of TUNACONs. The purse-seine vessels include class 6 (subject to IATTC mandatory observer coverage) and class 3-5 vessels, that have in place a voluntary observer program. These vessels are referred to as the TUNACONs fleet. The assessment team reviewed the catch composition for vessels in the TUNACONs fleet across different flag states and size classes, respectively for free school and FAD sets, and did not identify any significant differences in the results of MSC categorization, consequently the P2

catch data for Panamanian, US and Ecuadorian vessels in the TUNACONs fleet are evaluated jointly under Principle 2. The team reviewed catch composition for FAD and Free School sets independently.

In addition, there are three other vessels small purse-seine vessels flagged to the US fishing in the IATTC. These vessels target yellowfin and skipjack. There is a total of nine Units of Assessment (UoAs). Vessels target tuna using both free school and FAD sets.[3] These vessels are referred to as the small purse-seine US-based fleet and are evaluated separately from the TUNACONs fleet.

The Assessment Team received UoA observer records from the client, and verified they were provided by IATTC for the TUNACONS fleet and from the observer program for the smaller Ecuadorian based vessels. Catch of tuna species in observer records was expressed as weight, while the catch of non-tuna species was expressed in numbers. Catch of non-tuna species was converted to weight based on average weight for species commonly caught by UoA vessels.

Exploratory analyses of observer records did not detect a flag (U.S.A, Ecuador, Panama), vessel weight class (3-6) or set type (free school or FAD) effect in terms of MSC classification. Regardless of how the data were analyzed MSC classifications were consistent, comprised of target, secondary-minor, and ETP. Target species accounted for >98% of the reported total catch, while secondary-minor and ETP species consistently accounted for < 0.5% of the reported total catch. All subsequent analyses are based on data combined across flags and vessel weight class. The small US-based purse-seine vessels are assessed separately for ETP concerns.

No primary species or main secondary species were identified in the free school (Table 12) or FAD sets (

Table 13).

Table 12 Free school species specific cumulative catch by weight (mt) and Relative Percent for the TUNACONS Uoa from 2015-2018. Data is pooled across flags and vessel category (3-6). Non-tuna species catch weight is estimated.

Common Name	Scientific name	Total Catch Retained (mt)	Total Catch Discarded (mt)	Total Catch (mt)	% of UoA Catch	MSC Classification
Skipjack	Katsuwonus pelamis	148259	1841	150100	88.59	Target
Yellowfin	Thunnus albacares	17676	109	17785	10.50	Target
Bigeye	Thunnus obesus	705	0	705	0.42	Target
Eastern Pacific and Striped Bonito	Sarda chiliensis, S. orientalis	581	42	623	0.37	Secondary-minor
Bullet and Frigate Tunas	Auxis thazard, A.rochei	2	119	121	0.07	Secondary-minor

[3] FADs are defined in this assessment to include drifting logs, and anchored/drifting FADs.

Whale Shark	Rhincodon typus			19.836	0.01	ETP
Silky Shark	Carcharhinus falciformis	1.698	2.508	13.175	0.01	ETP
Giant Manta	Mobula birostris			12.858	0.01	ETP
Common Dolphinfish	Coryphaena hippurus	10.226	1.425	11.651	0.01	Secondary-minor
Blue Marlin	Makaira nigricans	10.636	0.866	11.502	0.01	Secondary-minor
All other billfish	Istiophoridae & Xiphiidae	9.084	.843	10.059	<0.01	Secondary-minor
All other fish	teleosts	0.511	5.29	5.801	<0.01	Secondary-minor
Manta and Mobulid rays	Mobulid rays	0.042	0.029	5.072	<0.01	ETP & Secondary-minor
All other sharks	Other elasmobranchs	0.123	0.872	5.143	<0.01	ETP & Secondary-minor
Total Catch (mt)				169,430.26	100%	

Table 13. FAD species specific cumulative catch by weight (mt) and relative percent for the TUNACONS UoA from 2015-2018. Data is pooled across flags and vessel category (3-6). Non-tuna species catch weight is estimated. * = Sum of (Retain Catch + Discarded Catch) does not equal Total Catch.

Common Name	Scientific name	Total Catch Retained (mt)	Total Catch Discarded (mt)	Total Catch (mt)	% of UoA Catch	MSC Classification
Skipjack	Katsuwonus pelamis	169185	2248	171433	60.18	Target
Bigeye	Thunnus obesus	56481	381	56862	19.96	Target
Yellowfin	Thunnus albacares	51473	274	51747	18.16	Target
Common Dolphinfish	Coryphaena hippurus	1240.460	366.166	1606.626	0.56	Secondary-minor
Black Skipjack	Euthynnus lineatus	952	449	1401	0.49	Secondary-minor
Silky Shark	Carcharhinus falciformis	11.227	158.834	397.123	0.14	ETP
Wahoo	Acanthocybium solandri	318.461	45.548	364.009	0.13	Secondary-minor
Ocean Triggerfish	Canthidermis maculate	10.673	273.549	284.222	0.10	Secondary-minor
Bullet and Frigate Tunas	Auxis thazard, A.rochei	80	136	216	0.08	Secondary-minor
Blue Marlin	Makaira nigricans	196.280	4.205	203.083	0.07	Secondary-minor
All other fish	teleosts	31.051	59.739	90.79	0.03	Secondary-minor
Marlin, Nei	Makaira, Tetrapturus	61.050	6.071	67.922	0.02	Secondary-minor

All other sharks	Other elasmobranchs	0.687	11.18	52.118*		ETP & Secondary-minor
Black Marlin	Istiompax indica	33.357	0.717	34.075	0.01	Secondary-minor
Smooth Hammerhead Shark	Sphyrna zygaena	0.250	5.696	29.793	0.01	ETP
Eastern Pacific and Striped Bonito	Sarda chiliensis, S. orientalis	21	4	25	0.01	Secondary-minor
Whale Shark	Rhincodon typus			19.836	0.01	ETP
Unicorn Filefish	Aluterus monoceros	0.640	17.775	18.414	0.01	Secondary-minor
Manta and Mobulid rays	Mobulid rays	0.006	0.397	10.177*	<0.01	ETP & Secondary-minor
All other billfish	Istiophoridae & Xiphiidae	8.947	0.98	10.094*	<0.01	Secondary -minor
Total Catch (mt)				284,872.58	100%	

In the TUNACONS fleet several ETP species were identified (Table 14). The observer records contained no reported marine mammal interactions. There were significantly more interactions in the FAD sets (Table 16) relative to free school sets (Table 15).

Table 14. ETP species element

Common name	Species name	Justification for ETP classification		
		Relevant National Legislation	Relevant IATTC measures	CITES Listing
Sharks				
Silky shark	*Carcharhinus falciformis*		C-19-05, C-16-06, C-05-03	Appendix 2
Whale shark	*Rhincodon typus*		C-19-06, C-05-03	Appendix 2
Oceanic whitetip shark	*Carcharhinus longimanus*		C-11-10. C-05-03	Appendix 2
Scalloped Hammerhead shark	*Sphyrna lewini*		C-05-03	Appendix 2
Great Hammerhead Shark	*Sphyrna mokarran*		C-05-03C-15-04	Appendix 2
Rays				
Giant Manta	*Mobula birostris*			Appendix I
Sea Turtles				
Black/Green Turtle	*Chelonia mydas*		C-19-04	Appendix I
Hawksbill Turtle	*Eretmochelys imbricata*		C-19-04	Appendix I
Leatherback Turtle	*Dermochelys coriacea*		C-19-04	Appendix I
Loggerhead turtle	*Caretta caretta*		C-19-04	Appendix I
Marine Turtles. nei	*Testudinata*		C-19-04	Appendix I
Olive Ridley Turtle	*Lepidochelys olivacea*		C-19-04	Appendix I

Table 15 Number of ETP species caught by all vessels in TUNACONS UoA during free school sets from 2015-2018.

Common name	Species name	Total Number Discarded	Total Number Retained	Total Number Caught
Sharks				
Silky shark	*Carcharhinus falciformis*	130	88	683*
Whale shark	*Rhincodon typus*	8	0	8
Oceanic whitetip shark	*Carcharhinus longimanus*	9	-	11*
Scalloped Hammerhead shark	*Sphyrna lewini*	16	-	19*
Great Hammerhead Shark	*Sphyrna mokarran*	3	0	3
Rays				
Giant Manta	*Mobula birostris*	10	-	54*
Turtles				
Black/Green Turtle	*Chelonia mydas*	27	0	27
Hawksbill Turtle	*Eretmochelys imbricata*	3	0	3
Leatherback Turtle	*Dermochelys coriacea*	3	0	3
Loggerhead turtle	*Caretta caretta*	7	0	7
Marine Turtles. Nei	*Testudinata*	67	0	67
Olive Ridley Turtle	*Lepidochelys olivacea*	41	0	41
Grand Total		324	88	926*

* Indicates when the sum of total discarded and total retained do not equal total catch

Table 16 Number of ETP species caught by all vessels in TUNACONS UoA during FAD sets from 2015-2018.

Common name	Species name	Total Number Discarded	Total Number Retained	Total Number Caught
Sharks				
Silky shark	*Carcharhinus falciformis*	8,234	582	20,587*
Whale shark	*Rhincodon typus*	8	0	8
Oceanic whitetip shark	*Carcharhinus longimanus*	59	-	104*
Scalloped Hammerhead Shark	*Sphyrna lewini*	104	1	263*
Great Hammerhead Shark	*Sphyrna mokarran*	6	-	10*
Rays				
Giant Manta	*Mobula birostris*	7	0	7
Turtles				
Black/Green Turtle	*Chelonia mydas*	72	0	72
Hawksbill Turtle	*Eretmochelys imbricata*	7	0	7
Leatherback Turtle	*Dermochelys coriacea*	4	0	4
Loggerhead turtle	*Caretta caretta*	39	0	39
Marine Turtles. nei	*Testudinata*	308	0	308
Olive Ridley Turtle	*Lepidochelys olivacea*	259	0	259
Grand Total		9,107	583	21,668*

* Indicates when the sum of total discarded and total retained do not equal total catch.

Table 17. Fate of discarded ETP species caught by all vessels during FAD sets from 2015-2018

Common name	Species name	Discarded Dead (#)	Discarded Alive (#)	Total Discards(#)
Sharks				
Silky shark	*Carcharhinus falciformis*	1,484	2,966	8,234*
Whale shark	*Rhincodon typus*	1	7	8
Oceanic whitetip shark	*Carcharhinus longimanus*	16	43	59
Scalloped Hammerhead Shark	*Sphyrna lewini*	20	68	104*
Great Hammerhead Shark	*Sphyrna mokarran*	1	5	6
Rays				
Giant Manta	*Mobula birostris*	0	7	7
Turtles				
Black/Green Turtle	*Chelonia mydas*	1	69	72*
Hawksbill Turtle	*Eretmochelys imbricata*	0	7	7
Leatherback Turtle	*Dermochelys coriacea*	1	3	4
Loggerhead turtle	*Caretta caretta*	2	30	39*
Marine Turtles. nei	*Testudinata*	2	243	308*
Olive Ridley Turtle	*Lepidochelys olivacea*	3	235	259*
Grand Total		1,531	3,653	**9,116***

* Indicates when the sum of discarded dead and discarded alive values do not equal total reported discards.

Table 18. Fate of discarded ETP species caught by all vessels during free school sets from 2015-2018.

Common name	Species name	Discarded Dead (#)	Discarded Alive (#)	Total Discards(#)
Sharks				
Silky shark	*Carcharhinus falciformis*	33	64	130*
Whale shark	*Rhincodon typus*	0	8	8
Oceanic whitetip shark	*Carcharhinus longimanus*	3	2	9*
Scalloped Hammerhead Shark	*Sphyrna lewini*	2	14	16
Great Hammerhead Shark	*Sphyrna mokarran*	0	3	3
Pelagic Thresher Shark	*Alopias pelagicus*	0	8	8
Rays				
Giant Manta	*Mobula birostris*	0	10	10
Turtles				
Black/Green Turtle	*Chelonia mydas*	0	26	27*
Hawksbill Turtle	*Eretmochelys imbricata*	0	3	3
Leatherback Turtle	*Dermochelys coriacea*	0	3	3
Loggerhead turtle	*Caretta caretta*	0	7	7
Marine Turtles. nei	*Testudinata*	2	48	67*
Olive Ridley Turtle	*Lepidochelys olivacea*	2	29	41*
Grand Total		42	225	**332***

* Indicates when the sum of discarded dead and discarded alive values do not equal total reported discards

US Small Purse Seine UoA

Catch from the US Small purse seine UoA was summarized from logbooks. As these vessels comprise vessel classes 1-2 and are not required to carry observers, no observer data is available. The logbooks are limited in scope, providing catch data for only tuna species. No data on interactions with ETP species or catch of non-target species is collected. A qualitative approach will be used to identify secondary and ETP species not identified in the logbooks.

Table 19 .Catch data reported as reported in logbooks for two of the three vessels in the UoA for the US-based small purse-seine vessels fishing in the IATTC for years 2014 to 2018.

Common Name	Scientific name	MSC Classification	2014	2015	2016	2017	2018	% of UoA Catch
Yellowfin	*Thunnus albcares*	Target	67.74%	100%	21.84%	54.23%	31.19%	39.84%
Skipjack	*Katsuwonus pelamis*	Target	0.00%	0.00%	0.00%	3.63%	39.96%	23.08%
Yellowfin and Skipjack[4]	*T. albcares K. pelamis*	Target species	0.00%	0.00%	0.00%	0.00%	17.63%	9.78%
Bluefin	*Thunnus obesus*	Primary main	32.26%	0.00%	59.71%	25.81%	0.00%	15.10%
Bonito	*Sarda spp.*	Secondary Main	0.00%	0.00%	18.45%	16.33%	11.21%	12.19%
Total UoA Catch (MT)			**155**	**30**	**206**	**496**	**1106**	**1993**

7.3.1.3 Observer Programs/Information Sources

Tunacons Fleet IATTC Observer Program

Purse-seine vessels of carrying capacities greater than 363 mt (i.e. Class-6) have been required to carry observers since 1992 (Hinton et al. 2014) after the IATTC passed an Agreement on the Conservation of Dolphins (the "La Jolla Agreement"). This was reaffirmed in the Panama Declaration in 1995 by the Governments of Belize, Columbia, Cost Rica, Ecuador, France, Honduras, Mexico, Panama, Spain, United States of America, Vanuatu and Venezuela. Subsequently, the Agreement on the International Dolphin

[4] Catch in logbooks for these entries was recorded jointly as yellowfin and skipjack; it was not possible to distinguish the percentage of skipjack relative to yellowfin in this category and thus catch is merely reported jointly.

Conservation Program (AIDCP), provided a legally-binding multilateral agreement which entered into force in February 1999, established the International Dolphin Conservation Program (IDCP) and further enhanced the provisions of the La Jolla Agreement made in 1992. IATTC Resolution C-09-04 (made in June 2009) on the IDCP also contains the agreement among IATTC members for the "requirement of placing an observer on each trip made in the EPO by purse-seine vessels of capacity greater than 363 metric tons and ensure that at least one-half of the observers assigned each year to each national fleet are IATTC observers". There is also cross-endorsement of observers between the IATTC and WCPFC Regional Observer Program, as agreed upon in the 82nd IATTC meeting in July of 2011, to monitor vessels fishing or transiting the high seas areas of both Convention Areas (IATTC 2015b).

In 2019 there was a total of 283 active purse seine vessels registered with IATTC; to fish you must be registered. Of those, 203 vessels were classified as large purse seine vessels, with a carrying capacity greater than 363 t (vessel class 6). The remaining 80 vessels were classified as small purse seine vessels, with carrying capacities <= 363 t (vessel classes 1-5). While IATTC has not specified an observer coverage rate on smaller purse seine vessels, placement of observers has occurred on a voluntary basis. In 2015, 3-4% of all PS trips on smaller vessels were observed, increasing to 11-12% of all PS trips in 2016. While discussions to adopt mandatory observer coverage on all purse seine vessels registered with IATTC have routinely occurred during regular meetings of the Commission, the measure has not been adopted.

Funding of the observer program is obtained through levies on fishing companies which vary according to total vessel storage capacity. National observer programs in the IATTC observer program include those of Ecuador, as well as those in Columbia, Nicaragua, Panama, Venezuela, Mexico, and by the European Union. Training of observers is the same for IATTC and national observer programs, and the initial training program for new observers takes 3 weeks and covers fisheries regulation, data collection, species identification, knowledge of fishing practices, and estimation methods. Although there does not appear to be a formal program of regular training updates for observers, CPCs are advised of any significant changes to requirements, such as from new resolutions passed by the IATTC.

The level of reporting of bycatch from larger vessels in the purse seine fleet gradually increased from less than 50% of trips in the early 1990s to 100% by 2007 (Figure XX). Observers now collect information on every set undertaken during every trip, and a history of data collection is represented in Figure 2. Whenever possible, observers record:

- Identification of individuals to species or species group;
- Characteristics used to make the identification of billfish, sharks, and turtles;
- The number of individuals (mt for tunas) by size category (small, medium, and large); and
- Length measurements of billfishes (since late 1988) and sharks (since late 2004) (Hinton et al. 2014).
- Location and size of dolphin pods relative to elements of fishing gear in a purse seine set
- Dolphin mortalities

- Georeferenced locations and boat activity at pre-specified intervals corresponding to changes in activity

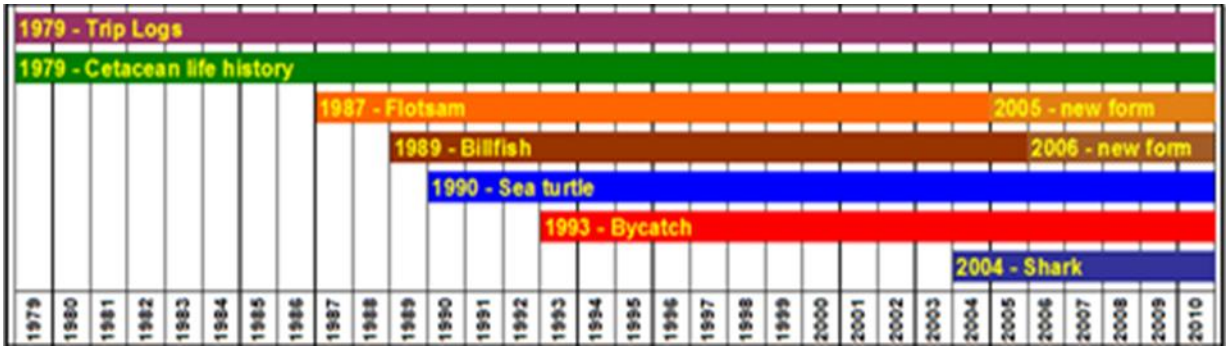


Figure 2. Time Frame of Observer Datasets as reported by the IATTC.

According to the IATTC, from 1979-2009 observers have recorded data on 11,500 trips and 356,000 sets. As described in Heckel et al. (2000) observers keep a daily log on events (date, time of day, departure, arrival, sightings, sets, geographic position, aerial assistance during a set, and other details about the fishing procedure), weather conditions (cloud cover, sea state, visibility, water temperature), and all retained catch. They also record the vessel's features and all data concerning marine mammal sightings and sets, school and object sets, sea turtle sightings, and more recently, the numbers and species composition of any discards, and interactions with protected species. Thus, although the observer programs were initially established primarily to provide information on the bycatch of dolphins in the fishery they have now been expanded and cover the much broader range of information that modern fishery observer programs normally collect.

Hinton et al. (2014) noted a key limitation of data collected by observers aboard purse seine vessels operating in the EPO after the completion of a set. The recorded data are based on animals that remain on the deck after the completion of a set whereas most bycatch is dumped overboard as soon as it is brought aboard . It was further noted that this lack of access by observers leads to uncertainties in some species identifications and underestimates of numbers of individuals. No information as to the extent of this practice aboard purse seine vessels operating in the IATTC Commission area was provided, and there have been no further reports concerning this activity. Since an independent review of the IATTC Regional Observer Program covering the period January 2016 to March 2017 did not report this activity, we assume the practice has stopped (MRAG Americas Inc. 2017) and does not impact the 2015-2018 observer data provided. Unfortunately, comparisons of bycatch through time would be problematic because of this activity.

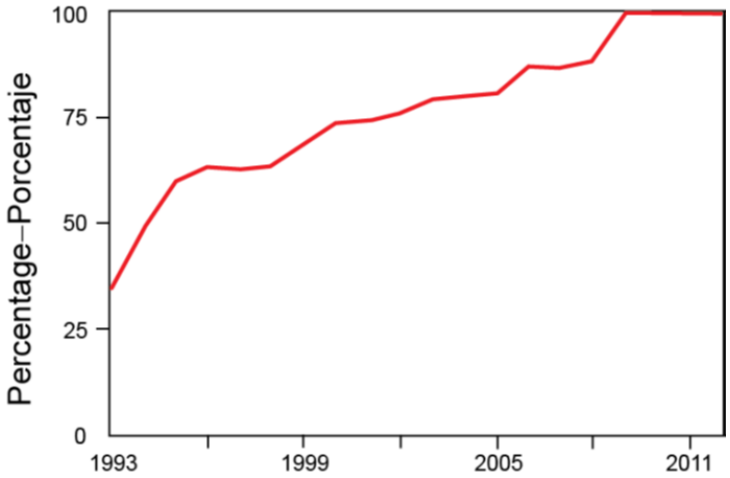


Figure 3. Percent of trips by large (carrying capacity > 363 t) purse-seine vessels in the eastern Pacific Ocean for which observer records of bycatch and discards are available, 1993-2012 (from Hinton et al. 2014).

Observers do not have a formal compliance role while at sea but are required to report any apparent violations of any rules or regulations (such as fishing in closed areas or during any time closures). Observers are de-briefed upon their return to port and these sessions cover a range of potential issues including data collection queries or problems, missing or ambiguous records, crew collaboration, potential violations of fisheries laws or regulations, and any attempts at bribery or intimidation. If potential violations of any rules or regulations are reported by an observer these are immediately forwarded to the IATTC Secretariat.

During each fishing trip, the observer prepares a summary of information pertinent to dolphin mortalities, and this is sent to the government with jurisdiction over the vessel by the Secretariat. Certain possible infractions are automatically reported to the government with jurisdiction over the vessel in question; the International Review Panel (IRP) reviews the observer data for other cases at its meetings, and any cases identified as possible infractions are likewise reported to the relevant government. The relevant government then reports back to the IRP on actions taken regarding these possible infractions.

The Assessment Team examined minutes of the 64th Meeting of the IRP (Appendix 6, Oct. 2018) as a means of examining the nature of matters that are reported to the IRP, and the outcomes of those records. The reported infractions against Ecuador concerned the lack of observers on multiple PS fishing trips (Ecuador and U.S. flagged vessels), observer harassment on Ecuador flagged vessels, fishing by Ecuador vessels with captains who have not been qualified by the AIDCP—in contravention of the agreement's requirements—even after being notified. Ecuador is investigating the infractions and will take appropriate action when they have completed their investigations. The reporting protocols for infractions is not transparent and additional information will need to be assembled during the site visit.

Unfortunately, information describing administration, protocols, and coverage rates of the observer programs, as well as the outcome of infractions reported through the IRP, was not provided by the client. This information is paramount and will need to be provided during the upcoming site visit.

While TUNACONS provided observer records from 43 vessels, spanning 3 flag states (Ecuador, US, and Panama) and 4 vessel classes (3-6) to the Assessment Team to quantify fishing interactions, the poor quality of the observer data hampered efforts to assess the fate (live/dead) of interacted animals and potential ecological impacts. For many ETP species the sum of reported number of animals discarded and reported animals retained did not equal total reported catch. Also, there were no reported marine mammal interactions in the observer data set which is inconsistent with other fisheries in the region. It was verified that the observer data were provided by IATTC and any interactions should have been included in the data set.

The IATTC requires 100% observer coverage on all large purse seine vessels (vessel class 6) operating in the EPO and there is currently no requirement to carry observers on smaller purse seine vessels (vessel classes 1-5). The TUNACONS UoA comprises 33 larger class 6 vessels, and 10 smaller class 3-5 vessels. While observer data was provided for the smaller vessels it was unclear if the data covered all fishing effort by the smaller vessels or just a portion of the effort. No information on administration, protocols, and coverage rates for the small vessel observer program was provided.

A number of overarching concerns with the observer data remain and clarification would need to be provided during the site visit.

US based Data Sources

As purse seine vessels within the US small vessel UoA are not required to carry observers, none was provided. All analyses were based on logbook information which is limited in scope; catch information is limited to only retained tuna species. As a result, analysis of bycatch and potential ecological impacts from the UoA could be conducted.

The lack of observer data, combined with limited logbook information, is concerning. Additional sources of data (e.g., captain logs) would need to be provided during the site visit.

7.3.1.4 Primary Species

Pacific Bluefin Tuna (*Thunnus orientalis*)

The catch of Pacific bluefin tuna from free school sets in the CA, USA small purse seine fishery UoA accounts for approximately 15% of the total catch and is assessed under PI 2.1 as a main primary retained species. It should be noted that Pacific bluefin tuna is the only primary species in both UoAs.

Pacific bluefin tuna are fished by fleets across its range but their relative impact has varied over time. Historically the coastal Western Pacific Ocean (WPO) fisheries had the greatest impact, and since the early 1990s the WPO purse seine fleet has increased its impact. The impact in the EPO was large before the mid-1980s thereafter decreasing significantly (ISC Pacific Tuna Working Group 2018). EPO fisheries were reported to have taken approximately 30% of the total catch in recent years. Landing in the EPO are attributed to Mexico and U.S., with the majority coming from Mexico (~ 82%) (ISC 2019).

Most of the commercial catches of Pacific bluefin in the EPO are taken by purse seiners (Figure XX), mostly off the coast of Baja California by Mexican purse seiners and California by US purse seiners. Ninety percent of this catch is estimated to have been between 60 and 100 cm in length, representing mostly fish 1 to 3 years of age. Most of the catch by Mexico is transported to holding pens where the fish are held for fattening and later sale to sashimi markets. The US catch is sold as fresh fish in local markets. Bluefin have been caught during every month of the year, but most of the fish are taken during May through October (IATTC 2018).

Prior to 1980 the average annual US purse seine catch of Pacific bluefin tuna was approximately 10,000 mt. Catches dropped precipitously after 1980 and in recent years (2014-2018) the average annual US purse seine catch amounted to approximately 256 mt, of which the UoA (for which logbooks were provided) was responsible for approximately 23% (60 mt) of the total catch.

Biology

Pacific bluefin is primarily a temperate water species but it also ranges into tropical waters. Genetic and tagging information indicates that Pacific bluefin tuna comprises a single Pacific-wide stock that is found primarily in the North Pacific Ocean (Bayliff 10994, Tseng and Smith 2012). A portion of the Pacific bluefin in the WPO migrate over to the EPO at about age 1 or 2; they stay in the EPO until about age 4 or 5, before migrating back to the WPO, where they begin to spawn (Maunder et al. 2014).

Most fish are mature by 3 years of age (Tanaka 2006). Spawning has only been reported in the western North Pacific Ocean. Pacific bluefin are estimated to live to at least 20 years of age (ISC Pacific Tuna Working Group 2018).

Stock Status

The most recent assessment of stock status concluded that the spawning biomass had been reduced to less than 6% of unfished levels, and that overfishing was still occurring (ISC Pacific Tuna Working Group 2014, ISC 2019). Pacific bluefin are categorised as Vulnerable under IUCN criteria (Collette et al. 2014).

Management

The Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-Tropical Tuna Commission (IATTC) are jointly in charge of the management of Pacific bluefin tuna, and use stock assessment determination and advice from the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC for short) and the IATTC scientific staff to establish conservation and management measures.

The IATTC managed the catch of Pacific bluefin mainly through the setting of a total catch limit. Conservation measure C-18-01 included the requirements that

> "*During 2019 and 2020, in the IATTC Convention Area, combined total commercial catches of Pacific bluefin tuna by all CPCs shall not exceed the catch limit of 6,200 metric tons. No CPC shall exceed 3,500 metric tons in 2019. Any CPC other than Mexico with historical commercial catches of Pacific bluefin tuna in the Convention Area may catch 600 metric*

tons of Pacific bluefin tuna in commercial fisheries in 2019 and 2020, combined, but not exceeding 425 metric tons in any year. The 600 metric ton catch limit for each CPC under this paragraph will be subtracted and reserved from the total catch limit for the exclusive use of that CPC. Any over-harvest shall be deducted from catch in the following year in accordance with Resolution C-18-02 [Amendment to Resolution C-16-08]. Over-harvest of the biennial catch limits established in Resolution C-16-08 shall be deducted from catch limits applicable to this Resolution. Under-harvest of biennial catch limits established in Resolution C-16-08 shall be added to catch limits applicable to this Resolution in accordance with Resolution C-18-02."

Information

The purse seine fishery in the ETPO has been monitored directly by the IATTC since the 1950s. Information is collected in accordance with the requirements of Resolution C-03-5 from 2003 on Data Provision.

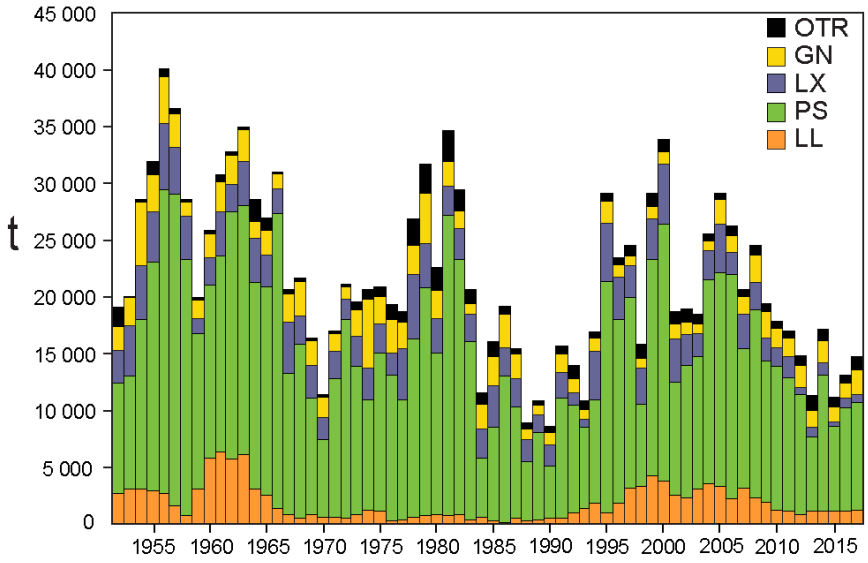


Figure 4. Retained catches (t) of Pacific bluefin tuna in the EPO, by gear, 1952-2017. GN: gillnet; LL: longline; LX: hook and line.

7.3.1.5 Secondary Species

Eastern Pacific and Striped Bonito Tuna (*Sarda* spp.)

These are assessed as a main secondary species from free school sets in the California, U.S.A. small purse seine fishery.

Biology

Bonito are coastal species that are found schooling with small tunas. They are also found around some islands. The genetic structure of these populations is not well understood, and there appears to be considerable complexity (Hall and Roman 2014). Fishbase reports the distribution of eastern Pacific bonito (*Sarda chiliensis)* in the southeast Pacific to be from northern Peru to Talcahuano, Chile with a northern

subspecies (*S. chiliensis lineolate*) found from off the coast of Alaska, southward to Cabo San Lucas at the tip of Baja California, and in the Revillagigedo Islands. Striped bonito (*S. orientalis*) is reported to be found in Hawaiian Islands and Pacific coast of USA to southern tip of Baja California and Tres Marias Islands extending to Cabo Blanco, Peru (especially during El Niño events), the Galapagos Islands and Gulf of Guayaquil (Fishbase.org).

They feed on clupeoids, other fishes, squids and decapod crustaceans and Fishbase indicates a trophic level of 4.2 ±0.69. Spawning varies with the monsoon season. On Fishbase it is recorded that a female eastern Pacific bonito (*Sarda chiliensis)* of 3 kg may produce millions of eggs per season, that is has a medium resilience with a minimum population doubling time of 1.4 - 4.4 years and a moderate to high vulnerability (51 of 100). The eastern Pacific bonito matures in its second year of life and reaches a maximum longevity 5–8 years (Hall and Roman 2014). These attributes are indicative of a quite productive species.

Status

IUCN status is Least Concern. IATTC has not assessed the status of bonito tunas, but they are short-lived species with high productivity and are not considered to be under any appreciable threat from fishing by IATTC vessels.

There has been no assessment of the status of bonito and they were not included among the 27 species selected for inclusion in a preliminary Productivity-Susceptibility Analysis (PSA) conducted for 27 species that comprised the majority of the biomass removed by Class-6 purse-seine vessels (carrying capacity greater than 363 metric tons) during 2005-2013 (IATTC-SAC 2019).

Management

There are no conservation measures directed specifically at bonito, but measures for the main target species, such as Resolution C-17-01, provide some level of protection for the other retained species.

Information

Data on bycatch species, including bonito tuna, have been recorded by observers. Information is collected in accordance with the requirements of Resolution C-03-5 (passed in 2003) on Data Provision and Resolution C-09-04 (passed in June 2009) on the international observer program.

Other minor secondary species

There were numerous secondary minor species caught by PS free-school and FAD sets in the TUNACONS UoA (Table 12 &

Table 13). No species comprised over 1% of the total catch, and therefore, are not assessed in detail in the background. We adopted an ‘all or nothing’ approach in the scoring of secondary minor species and have used blue marlin as the representative species. Readers are directed to the Principle 2 scoring rationales for more information. Mitigating ecological impacts of tuna purse-seine fisheries is paramount to effective fisheries management in the EPO. Releasing small individuals of any species (target and non-

target) through techniques and fishing gear technologies would reduce the impacts of fishing operations and improve the sustainability of the fishery. Additionally, the entanglement of species (target and non-target), including those classified as ETP species, in the trailing netting of FADs is another fishing impact that should be mitigated to improve the sustainability of the fishery. In 2006, the IATTC urged governments to reduce incidental mortality of juvenile tunas through Resolution C-04-05 (REV 2), where Article 1, paragraph b.i. states: "Develop technology for releasing juvenile tunas, particularly sorting grids". Sorting grids allow the escape of small individuals that can pass through the mesh of the grid in a purse seine.

Recognizing the importance of research to advance sustainable fishing practices, Ecuador undertook the development of its own study on sorting grids between 2009 and 2011 with the goal of identifying an effective grid technology for installation in purse seine nets on all Ecuadorian Class-6 (>364 t) tuna purse-seine vessels. It was concluded that the sorting grid represents a good alternative to bycatch mitigation, and it was suggested investigations be conducted on the behavior of the fish within the purse-seine net and the survival of the fish that are released through the sorting grid. Additionally, Ecuador also initiated bycatch mitigation research to develop non-entangling FADs and biodegradable FADs. In the EPO, TUNACONS has assumed a leadership role in these three areas of bycatch mitigation research, which are now part of the broader IATTC research plans.

7.3.1.6 Endangered, Threatened and Protected (ETP) Species

For the larger PS vessels, logbooks used in the fishery provide data on the target species that are assessed under Principle 1, and the retained species that are assessed under Principle 2. The main source of information with regard to bycatch species and ETP species, however, is from the observer programs. For these Units of Assessment that means the combined results of the IATTC's program and Ecuador's National observer program, which jointly observe Ecuadorian vessels, and the IATTC observer data was used for the larger US and Panama flagged PS vessels. No observer data was available for the smaller US based purse-seine vessels, and logbooks did not record any ETP interactions.

Sharks and Rays

Sharks and other large fishes are taken by both purse seine and longline vessels. Silky sharks (*Carcharhinus falciformis*) are the most commonly caught species of shark in the purse-seine fishery, followed by oceanic whitetip sharks (*C. longimanus*). A revised consolidated resolution on bycatch (C-04-05 Rev 2) was agreed in 2006 that requires the live release on purse seine vessels of non-target fish such as sharks, rays, billfishes, dorado, wahoo and other non-target species to the extent that this is practicable. IATTC Resolution C-05-03 discourages shark retention and establishes a limit in the amount of shark fins that can be landed, relative to the total weight of shark bodies that must be retained. This ratio of fin-to-body-weight acts as a disincentive to target sharks because the shark carcasses occupy hold space on the vessel and have little market value. The Resolution also mandates reporting of shark catches to IATTC. Resolutions C-16-06 and C-19-05 define other shark conservation measures with an emphasis on silky shark. A separate Resolution (C-11-10) entered into force in January 2012 prohibits the retention of oceanic whitetip sharks in all fisheries covered by the Antigua Convention and requires the release of animals that are alive when caught.

Resolution C-15-03 requires data collection and analysis of fish aggregating devices in order to embark on the regulation process for this fishing practice and reduce its effect on bycatch. The resolution proposes additional measures for the protection of sharks, mainly whale sharks.

Large numbers of sharks are taken as bycatch by the TUNACONS UoApurse seine fleet, especially those associated with floating objects. The two most common species of shark caught are silky and oceanic white tip sharks. In contrast to the tuna longline fishery, the number of sharks caught as bycatch in the EPO purse seine fishery is not considered to hinder the recovery of these species (Figure 5).

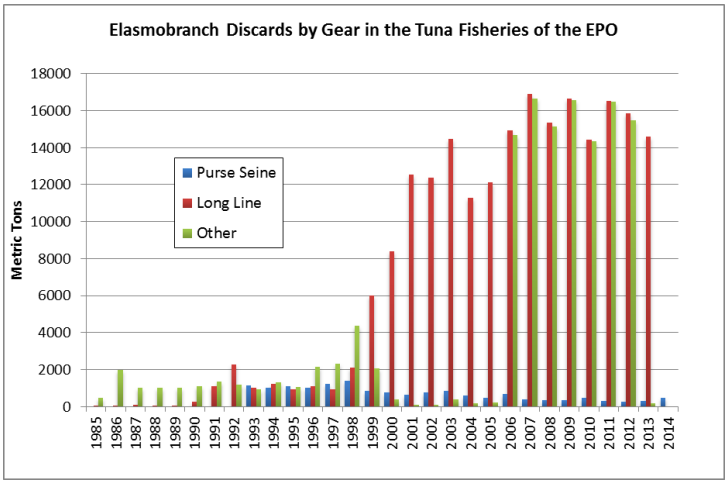


Figure 5. Elasmobranchii discards in tuna fisheries of the EPO by purse seine, longline and other vessels (IATTC, 2015).

In addition to IATTC resolutions, Ecuador explicitly prohibits shark finning and has officially established a shark monitoring program. Shark finning is also prohibited on U.S. purse seine vessels. In 2006, Ecuador issued the "National Action Plan for the Conservation and Management of Sharks in Ecuador" (PAT-EC), which establishes the legal framework for the protection and sustainable use and management of targeted and bycatch shark species at the national level (MICIP 2006). Incidental interactions with other species, in particular sharks and rays in the artisanal fisheries, are documented through a monitoring program (CMPIT) developed by the Undersecretary of Fisheries (SRP).

Current domestic regulations ban directed fishing for sharks in all Ecuadorian waters, but sharks caught in "continental" (i.e. not Galapagos) fisheries may be landed if bycaught. Sharks must be landed with fins naturally attached in all fisheries.

Shark Finning

Regulations on shark fishing and finning are generally developed, implemented, and enforced at the RFMO and member country levels, and in some cases at the fishing company level. IATTC Resolution C-05-03 calls for members to take the measures necessary to require that their fishers fully utilize any retained catches of sharks. Full utilization is defined as retention by the fishing vessel of all parts of the shark excepting head, guts, and skins, to the point of first landing.

Directed fishing for sharks is banned in all Ecuadorian waters, but sharks caught in "continental" (i.e. not Galapagos) fisheries may be landed if bycaught. Sharks must be landed with fins attached in all fisheries. Shark finning is prohibited by UoA vessels and an absence of shark finning is also critical for MSC Certification.

The only data available to the assessment team on the level of shark finning comes the Committee for the Review of Implementation of Measures Adopted by the Commission, which reported that in 2009 shark finning was observed on 3% of IATTC observed trips, resulting in 184 sharks being finned, including 70

sharks finned on 2 trips by Ecuadorian-flagged vessels. This represents a continued reduction in the numbers finned over recent years (Figure 6) (IATTC-COR 2010). A breakdown of these events by set type was not provided and silky sharks are caught in all set types.

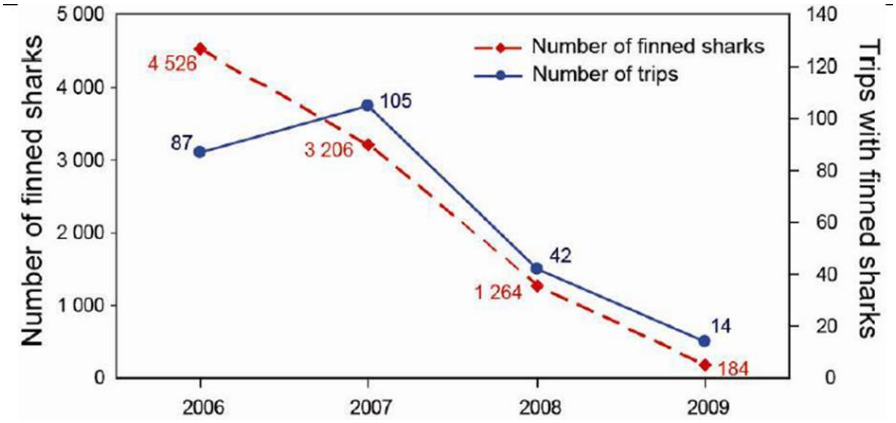


Figure 6. Observed number of sharks finned during IATTC-observed trips, 2006-2009. (from IATTC-COR 2009). Note that these data are generated for all IATTC-observed trips, not from Ecuadorian flagged vessels specifically.

More recent publicly available reports from the IATTC-COR (IATTC-COR 2012, IATTC-COR 2013 and IATTC-COR 2014) do not provide updated figures for the numbers of sharks finned nor any data on the levels of compliance with C-05-03. The minutes of the 2014 report (IATTC-COR 2014) contain the comment that "that information on sharks is limited, and that it is worrying that there are few reports from CPCs on compliance with Resolution C-05-03." The assessment team reviewed the 2017 IATTC-COR report (COR-08-03) and noted that most CPCs are providing annual reports on compliance with IATTC Resolutions and based on the provided information no shark finning was reported in 2016. However, Panama did not provide reports on compliance with Resolution C-05-03. As much of the information on at-sea shark finning activities is gathered by observers and smaller purse seine vessels (class 3-5) operating in the EPO are not required to carry observers, the full extent of compliance is unknown. Within the TUNACONS UoA, 23% of vessels fall within the small vessel category and while observer data was provided for all these vessels the level of observer coverage is unknown.

We conclude that incidents of shark finning reported by IATTC observers has significantly declined we have no recent data to indicate it is systematically taking place. However, a large number of sharks, including silky shark, are being retained despite resolutions calling for their release.

Silky Shark (Carcharinus falciformis)

Biology

Silky shark is an abundant offshore, oceanic and epipelagic and littoral, tropical species, found near the edge of continental shelves and islands but also far from land in the open sea. It occasionally occurs inshore where the water is as shallow as 18 m; in the open ocean it occurs from the surface down to at least 500 m. The silky shark is often found over deepwater reefs and slopes near islands.

Bonfil (2008) reported that on the basis of differences in life-history parameters, it was possible to identify at least three distinct populations inhabiting the northwest Atlantic, the western central Pacific, and the eastern Pacific. Genetic analysis of animals from the Pacific Ocean has also provided evidence that there are distinct eastern and western Pacific populations (Galván-Tirado et al. 2013) although the possibility of a single stock could not be excluded. Within the ETPO, marked north-south differences in the length composition of purse-seine bycatches suggest the presence of separate stocks divided approximately along the equator (Roman-Verdesoto 2014; Roman-Verdesoto and Orozco-Zoller 2005; Watson et al. 2009, cited in IATTC-SAC 2014b).

Silky sharks are viviparous with a yolk-sac placenta and have 2 to 14 young per litter. There seems to be no pronounced seasonality in birth of young. The gestation period is not known. It is primarily a fish-eater, eating pelagic and inshore teleosts including sea catfish, mullet, mackerel, yellowfin tuna, albacore, and porcupine fish, but also squid, paper nautiluses, and pelagic crabs. It is associated with schools of tuna, has earned the ire of tuna purse seiners for the damage it does to nets and catches and so is called the 'net-eater shark' in the ETPO. It reaches a maximum size of about 330 cm; males mature at about 187 to 217 cm and reach 270 to 300 cm; females mature at 213 to 230 cm and reach at least 305 cm; the size at birth is about 70 to 87 cm. A more detailed description of the distribution, biology and growth of silky sharks is contained in Rice and Harley (2013).

The FAO considers the species to have a mid-range intrinsic rebound potential. Rice and Harley (2013) regard silky sharks as a low productivity species.

Status

A stock assessment of the status of silky sharks in the area of the Eastern Tropical Pacific Ocean was attempted by IATTC staff using Stock Synthesis in 2014 but the model was unable to fit the main index of abundance adequately, and therefore the results were not considered to be reliable (IATTC-SAC 2014b). The authors recommended the use of indicators until adequate information becomes available to conduct a full assessment of silky sharks.

Aires-da-Silva et al. (2014) examined potential stock status indicators for silky sharks and determined that standardized CPUE from purse seine sets on floating objects was the best indicator for silky shark populations in the ETPO. Indices of relative abundance for the silky shark in the eastern Pacific Ocean (EPO), developed from purse-seine catch-per-set, were estimated using data from 1994 to 2016 (SAC-08-08a(i)), and again updated with data through 2018 (Figure 7; SAC-10-17). For the northern stock, standardized CPUE showed a large decline during 1994-1998 (70% or 53% depending on whether the 1994 data point is included), followed by a 9-year period (1999-2007) when CPUE is stable with low variability, and a gradually increasing trend through 2010. From 2011 to 2018 CPUE was variable, with no apparent trend. For the southern stock, standardized CPUE for floating-object sets shows an 82% decline during 1994-2004 followed by a period of stability, with very low variability, during 2004-2012. Between 2013 and 2018 CPUE was variable with no apparent trend.

Previous analyses (SAC-08-08a(i)) identified a correlation between North EPO indices, particularly for small and medium silky sharks, and interannual variability in oceanographic conditions, and thus the indices for those size categories, and for all silky sharks, were not updated because of concerns about bias. Because of recent increases in the live release of silky sharks, two indices for large silky sharks were computed and displayed in Figure 7, one including live release data (dead + live) and the other not. Taken together, the indices likely bracket the trend that would have resulted in both the north and south EPO if finning, shark handling, and data recording practices had continued unchanged since 1994. The real trend is considered to be closer to the dead + live index because sharks recorded as released alive in recent years would probably have been recorded as dead previously, and thus the dead + live index is likely a more consistent indicator. However, the observers' estimates of the sizes of sharks released alive may be unreliable, and thus the increased live releases could bias the indices by size.

Hinton et al. (2014) have noted, however, that the stock status indicators used by the IATTC have not been validated, that no formal reference points or harvest control rules based on them have been developed, and that their use for management advice will require extensive testing such as that conducted in management strategy evaluation. Nevertheless, there had been a series of precautionary recommendations developed for the IATTC (IATTC 2013) because of the concerning trends in these indicators.

A stock assessment of silky sharks in the West and Central Pacific Ocean using Stock Synthesis (Rice and Harley 2013) concluded that overfishing was occurring and that it was highly likely that the stock was in an overfished state. The assessment also estimated that catches by both the purse seine (FAD-associated sets) and longline sectors were important sources of fishing mortality. This assessment assumed there to be a single WCPFC stock but noted that the species had a circumtropical distribution. The IATTC's SAC has regularly noted that a Pacific-wide analysis of longline and purse-seine fishing is necessary to estimate the impact of fishing on the stock(s) of silky shark (e.g. IATTC-SAC 2014c).

Recently, results of a PSA have been reported for a range of species including silky shark (IATTC-SAC-10-14). This analysis differs from the PSA approach prescribed in the RBF, in particular the suite of attributes used to score susceptibility and development of a novel extension of the PSA, EASI-Fish, to account for cumulative impacts of fisheries on EPO species. IATTC routinely conducts both analyses with the goal of transitioning to EASI-Fish as more data are collected and model uncertainty minimized. The PSA results show that the susceptibility score for unassociated sets (2.14) is lower than object sets (2.57) and that silky shark are among the species with the highest overall vulnerability score (2.07).

Overall, the results of these analyses provide strong evidence that silky shark populations in the ETPO have been depleted. Aires-da-Silva et al. (2014) considered it critical that precautionary measures be implemented immediately to allow silky sharks populations to rebuild in the EPO. In addition, IATTC staff have repeatedly recommended that improving shark fishery data collection in the EPO is critical. This will facilitate the development of other stock status indicators and/or conventional stock assessments to better inform the management of the silky shark and other co-occurring shark species.

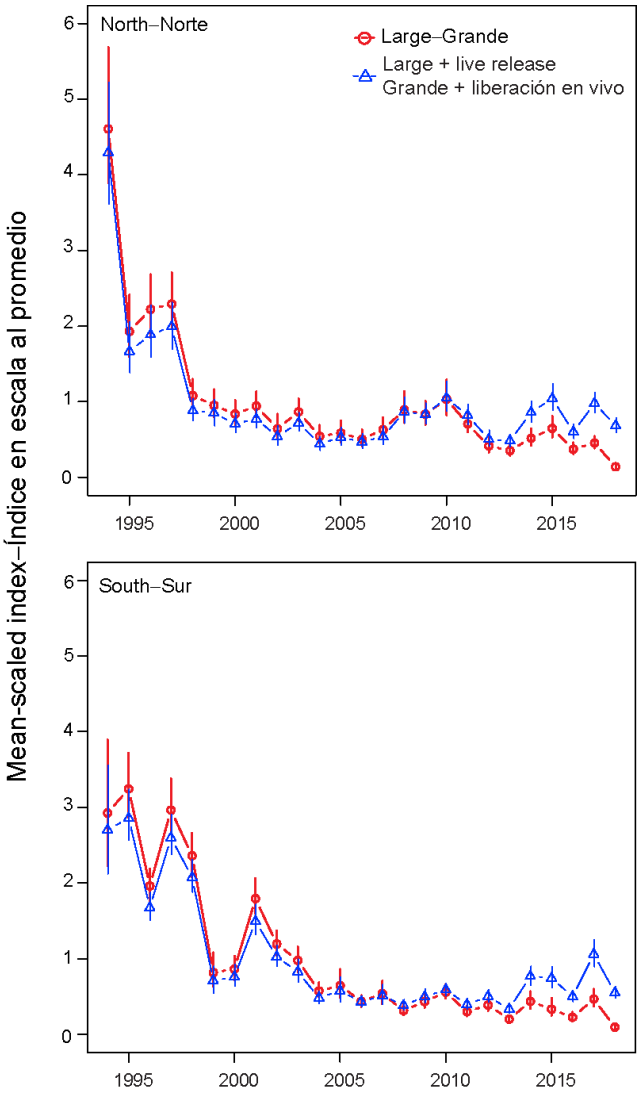


Figure 7. Mean-scaled standardized silky shark bycatch-per-set (BPS; in numbers of sharks per set) in sets on floating objects for large sharks, with and without live release, in the north (top) and south (bottom) EPO. Vertical bars indicate pointwise approximate 95% confidence intervals.

Management

IATTC Resolution C-00-08, adopted in 2000, called for fishers on purse-seine vessels to "promptly release unharmed, to the extent practicable", all non-target species, including sharks, and encouraged them to develop techniques and equipment to facilitate this. IATTC

Resolution C-05-03 passed in June 2005 concerns the conservation of sharks (including silky sharks) caught in association with fisheries in the Eastern Tropical Pacific Ocean. The main measures it contains are:

1. For the establishment and implementation, a national plan of action for conservation and management of shark stocks,
2. The provision of preliminary advice on the stock status of key shark species and propose a research plan for a comprehensive assessment of these stocks

3. To fully utilize any retained catches of sharks
4. To have onboard fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing (off-loading)
5. The prohibition of retaining on board, transhipping, landing or trading in any fins harvested in contravention of this Resolution
6. Encouragement for the release of live sharks, especially juveniles, to the extent practicable, that are caught incidentally and are not used for food and/or subsistence
7. Support for improved data collection and research on improved gear selectivity and shark nursery habitats.

Furthermore, IATTC Resolution C-04-05 passed in June 2006 contains the requirement for "fishermen on purse-seine vessels to promptly release unharmed, to the extent practicable, all sharks, billfishes, rays, dorado, and other non-target species" and for CPPs to "encourage fishermen to develop and use techniques and equipment to facilitate the rapid and safe release of any such animals." Also, for billfish, sharks and rays to:

a. Develop techniques and/or equipment to facilitate their release from the deck or from the net.
b. Seek the necessary funds to carry out experiments to determine the survival rates of released billfish, sharks and rays.
c. Define areas and periods in which any of these species are most likely to be caught.

IATTC Resolution C-16-06 passed in June 2016 and entered into force on 1 January 2017 concerns the establishment of further conservation measures for shark species, with special emphasis on the silky shark (*Carcharhinus falciformis*), for the years 2017, 2018, and 2019. The main measures include:

4) Prohibit retaining on board, transshipping, landing, or storing, in part or whole, carcasses of silky sharks (*Carcharhinus falciformis*) caught by purse-seine vessels in the IATTC Convention Area,

5) Require all longline vessels whose fishing licenses do not include sharks as a fishing target but catch sharks incidentally, to limit bycatch of silky sharks to a maximum of 20% of the total catch by fishing trip in weight,

6) Require multi-species fisheries using surface longlines (defined as those in which the majority of hooks fish at depths shallower than 100 meters and target species other than swordfish) to limit the catch of silky sharks of less than 100 cm total length to 20% of the total number of silky sharks caught during the trip,

7) Shall subject the longline fisheries referred to in paragraphs 2 and 3 to effective monitoring measures to determine if the 20% maximum is exceeded, such as through port inspections and review of observer data, and shall report to the Commission information on percentages reached, in accordance with IATTC data submission requirements,

8) Shall require vessels to not fish in silky shark pupping areas, as may be adopted by the Commission, in accordance with the recommendation of the IATTC scientific staff, in coordination with the Scientific Advisory Committee (SAC),

9) For multi-species fisheries using surface longlines that have captured more than 20% of silky sharks in weight on average, Members and Cooperating Non-Members (CPCs) shall prohibit the use of steel leaders during a period of three consecutive months each year. The average proportion of silky sharks in the catch will be calculated from data of the previous calendar year. New vessels entering the multi-species fisheries affected by this Resolution and those for which

no data are available from the period immediately prior shall be sub-ject to the provisions of this paragraph,

10) The IATTC scientific staff, in coordination with the SAC, shall recommend the most appropriate period for the purposes of paragraph 6, on the basis of the analysis of the data provided by CPCs to be taken into consideration in the revision of this measure.

11) Vessels of less than 12m length overall using manually-operated fishing gear (*i.e*. without mechanical or hydraulic winches) and that do not deliver to motherships at any time during the fishing trip are excluded from the application of this resolution. For this excluded fleet, CPCs shall work with the Commission's scientific staff on the immediate establishment of data-collection programs, which shall be presented at the meeting of the SAC in 2017.

12) CPCs shall notify the Director, before 1 October of each year, the single period of restricted use of steel leaders referred to in paragraph 6 which will be observed for the following calendar year.

13) CPCs shall keep a record of the vessels and the period to which each vessel operator or owner has committed for the enforcement of this resolution.

14) CPCs shall require the collection and submission of catch data for silky sharks, in accordance with IATTC data reporting requirements. CPCs shall also record, through observer programs and other means, for purse-seine vessels of all capacity classes, the number and status (dead/alive) of silky sharks caught and released and report it to the IATTC.

15) The Commission shall prioritize research by the scientific staff in the following areas:

a. Identification of the pupping areas of the silky shark.
b. Mitigation of bycatch of sharks, especially in longline fisheries, and survival of sharks caught by all types of gears, giving priority to gears with significant catches. Survival experiments should include studies of the effects on survival of shorter sets and the use of circle hooks.
c. Improve handling practices for live sharks to maximise post-release survival.
d. The appropriateness of the percentage limit on silky sharks catch established in paragraphs 2 and 3.

16) This Resolution shall be reviewed annually at the meeting of the SAC, in order to evaluate the adequacy of the measures, notably those in paragraphs 2, 3 and 6.

17) This Resolution shall enter into force on 1 January 2017, and shall be reviewed at the IATTC annual meeting in 2019.

IATTC Resolution C-19-05 passed in July 2019 and entered into force on 1 January 2020 extends Resolution C-16-06 on silky shark mitigation measures for an additional two years (2020 and 2021). The amendments to the Resolution increase flexibility by allowing exceptions for silky sharks accidentally caught and frozen by purse seine vessels. In those instances, the amendments require reporting rather than mitigation measures. In addition, there are inspection requirements for longline vessels that retain silky sharks, with exceptions for CPCs that prohibit retention on longline vessels.

Directed fishing for sharks is banned in all Ecuadorian waters. Sharks caught in "continental" (i.e. not Galapagos) fisheries may be landed if unintentionally caught (bycatch), and must be landed with fins attached. A previous ban on trade in shark fins was lifted in 2007.

In 2016, Ecuador stablished the Darwin and Wolf Marine Sanctuary protecting ocean and animals around the Galapagos islands, including sharks.

TUNACONS voluntary measures:

Many of the IATTC Resolutions call on CPCs to implement adopted measures in their national fisheries. Recognizes the importance of maintaining healthy and sustainable fisheries, and reducing adverse ecological impacts of purse seining, TUNACONS voluntarily developed and implemented an onboard code of good practices for its fleet (Garcia 2016).. The code is intended to be a guide for both, beginner and experienced crews to encourage good on-board handling practices and to mitigate the mortality of vulnerable species that interact in purse-seine tuna fisheries. It is a code that reflects the measures taken to improve the operations of tuna purse seiners and to minimize the impact on the marine ecosystem. In particular, the design of a non-entangling and biodegradable FAD, data collection protocols, and identification of good practices for the safe handling and release of sensitive species (i.e. sharks, turtles, etc.) that interact with tuna purse seine fisheries. To disseminate the information and build capacity within the fleet, TUNACONS hosted meetings to discuss progress on FAD development and train captains, crew, and industry on the code of good practices (TUNACONS 2018).

Information On-board observers have routinely collected data on bycatches in the EPO since 1993. However, prior to 2005, the only data collected were for sharks that died as a result of interactions with the fishery. Therefore, there are essentially no data available to total catch prior to 2005.

There is a requirement for 100% observer coverage of all PS fishing activities on larger vessels > 363 t (vessel class 6). While IATTC has not specified an observer coverage rate on smaller vessels <= 363 t (vessel class 1-5), placement of observers has occurred on a voluntary basis. In 2015, 3-4% of all PS trips on smaller vessels were observed, increasing to 11-12% of all PS trips in 2016. Logbook reports and cannery uploading records are available for both small and vessels, and in some instances are the principal sources of data for smaller vessels. However, catches of non-target species is not always recorded in logbooks, which hampers efforts to conduct even data-limited assessments for such species (SAC08-06a).

The TUNACONS Fishery Improvement Project recognized the importance of observer data and recommended expanding the observer program to cover all vessels. TUNACONS recently implemented a plan to expand 100% observer coverage to all fishing vessels, and to explore the utility (including feasibility) of using electronic monitoring technologies to collect requisite data on segments of the fleet. The Team was provided observer data covering all of their small vessels (vessel class 3-5) in the UoC (N=10).

While there are established IATTC data reporting requirements on bycatch, including number caught (retained and discarded) and fate (dead/alive), the requirements are not mandatory. The TUNACONs observer data on sharks was incomplete making interpretation by the Team difficult. For most shark species there was incomplete records on the number discarded and/or retained and when these data were provided, they did not necessarily sum to the total catch. This was particularly an issue for silky, oceanic whitetip, whale, requiem, and hammerhead sharks. Between 2015 and 2018, a total of 21,270 silky sharks were caught based on observer records. Of those caught, 8,364 animals were discarded, and 670 animals were retained. The Team was unable to determine the fate of the remaining 12,236 silky shark (Table XX).

Additionally, IATTC Resolution C-16-06 prohibits retaining on board, transshipping, landing, or storing, in part or whole, carcasses of silky sharks (*Carcharhinus falciformis*) caught by purse-seine vessels in the IATTC Convention Area. This Resolution entered into force on January 1, 2017 however, based on the observer records many of the retained silky sharks were caught outside domestic waters, and in the IATTC Convention Area in both 2017 and 2018.

Oceanic Whitetip Shark (*Carcharinus longimanus*)

Biology

The oceanic whitetip (Carcharhinus longimanus) is an oceanic-epipelagic shark, usually found far offshore in the open sea in waters 200 m deep, between about 30°N and 35°S in all oceans; it is normally found in surface waters, although it has been recorded to 152 m. It has occasionally been recorded inshore but is more typically found offshore or around oceanic islands and areas with narrow continental shelves. Evidence also suggests a stock segregation between juveniles and adults of the species; with juveniles more commonly found in equatorial waters to the west and adults more predominate to the southwest, near the identified center of abundance (10oS, 190oE) (Clarke et al. 2011b, Lawson 2011). They are viviparous with placental embryonic development, mature at 4 to 5 years of age, and reach 4 m long. Their biology has indicated that it is likely to be a species with low resilience to fishing – even among shark species - and minimal capacity for compensation (Rice and Harley 2012a). More details of the biology of this species are provided in Molony (2008). Oceanic whitetip sharks are most often caught as bycatch in the Pacific tuna fisheries, though some directed mixed species (sharks and tunas/billfish) fisheries do exist.

Status

IATTC does not perform stock assessments on oceanic whitetip shark. The unstandardized average bycatches per set of oceanic whitetip sharks also showed decreasing trends for all three set types in the ETPO (e.g. Figure 7), but the cause of this (i.e. fishery impact versus environmental) cannot be determined at this time (IATTC 2015c). On average, less than 1 mt of oceanic whitetip sharks are caught per year in each set type, with zero records of catch in the unassociated fishery.

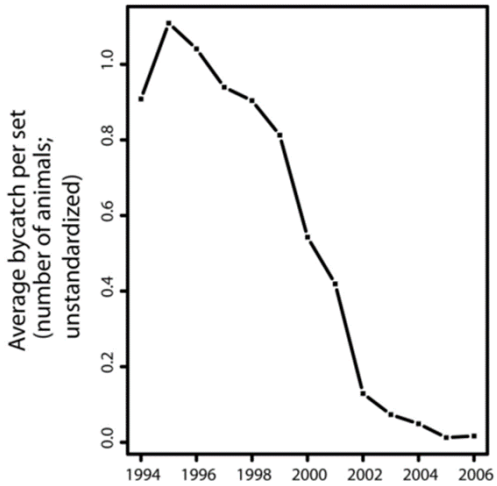


Figure 8. Unstandardised catch rates of oceanic whitetip sharks from floating object sets (1994-2006) (IATTC-SAC 2011).

Recently, results of a PSA have been reported for a range of species including oceanic whitetip shark (IATTC-SAC-09-11). This analysis differs from the PSA approach prescribed in the RBF, in particular the suite of attributes used to score susceptibility and development of a novel extension of the PSA, EASI-Fish, to account for cumulative impacts of fisheries on EPO species. IATTC routinely conducts both analyses with the goal of transitioning to EASI-Fish as more data are collected and model uncertainty minimized. The PSA results show that the susceptibility score for unassociated sets (1.00) is lower than for dolphin sets (1.69) and object sets (2.08) and that oceanic whitetip shark are only moderately vulnerable with an overall vulnerability score of 1.50. The relatively low catch of oceanic whitetip shark in PS fisheries compared to the catch in longline fisheries since 2005 is believed to contribute to the moderate score (see Figure 9).

Tremblay-Boyer et al. (2019) completed an assessment for oceanic whitetip shark in the WCPO area and concluded that despite the data limitations going into the assessment and the wide range of uncertainties considered, all of the feasible grid model runs indicate that the WCPO oceanic whitetip shark stock continues to be overfished and overfishing is occurring relative to commonly used depletion and MSY-based reference points. While the assessment estimates that overfishing is still occurring (Frecent/FMSY was 3.94) the stock assessment also estimates a slight recovery in stock biomass in recent years (2013-2016). It remains unclear whether the stock status will continue to improve or perhaps decline in the future. Stock projections based on the assessment will be undertaken to provide guidance on this issue. There now appear to be few if any major fisheries targeting oceanic whitetip. The greatest impact on the WCPO stock is attributed to bycatch from the longline fisheries, with lesser impact from purse seining (see the Oceanic Whitetip panel in Figure 9).

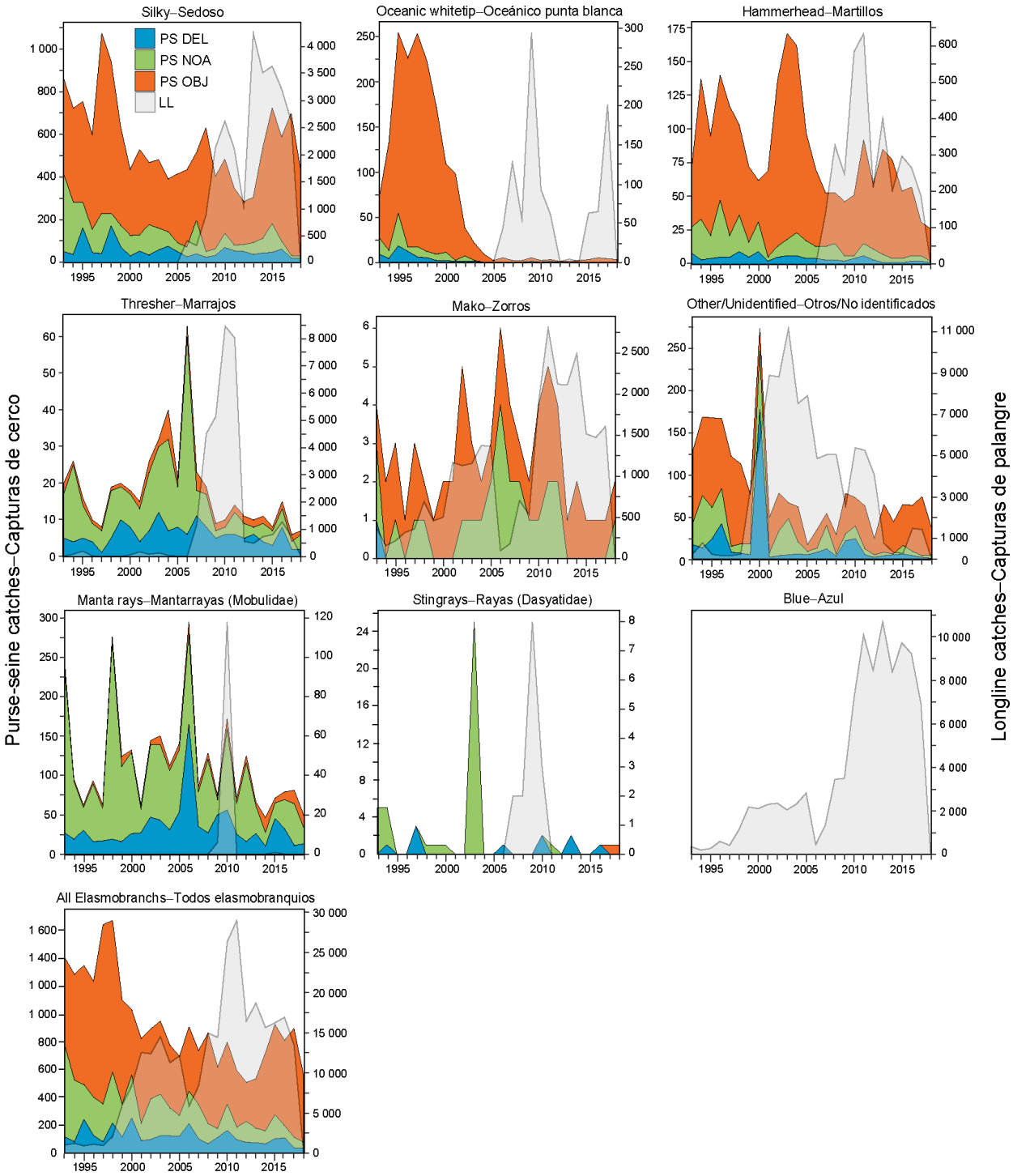


Figure 9. Retained and discarded catches of sharks and rays, in tons, reported by observers aboard large purse-seine vessels, 1993–2018, by set type (dolphin (DEL), unassociated (NOA), floating object (OBJ)) (left y-axis). Longline data (right y-axis) are considered to be minimum catch estimates. Data for the past two years should be considered preliminary; longline data for 2018 not currently available.

Management

IATTC Resolution C-00-08, adopted in 2000, called for fishers on purse-seine vessels to "promptly release unharmed, to the extent practicable", all non-target species, including sharks, and encouraged them to develop techniques and equipment to facilitate this.

IATTC Resolution C-05-03 passed in June 2005 concerns the conservation of sharks caught in association with fisheries in the Eastern Tropical Pacific Ocean. The main measures it contains are:

1. For the establishment and implementation a national plan of action for conservation and management of shark stocks,
2. The provision of preliminary advice on the stock status of key shark species and propose a research plan for a comprehensive assessment of these stocks
3. To fully utilize any retained catches of sharks
4. To have onboard fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing (off-loading)
5. The prohibition of retaining on board, transshipping, landing or trading in any fins harvested in contravention of this Resolution
6. Encouragement for the release of live sharks, especially juveniles, to the extent practicable, that are caught incidentally and are not used for food and/or subsistence
7. Support for improved data collection and research on improved gear selectivity and shark nursery habitats.

Furthermore, IATTC Resolution C-04-05 passed in June 2006 contains the requirement for "fishermen on purse-seine vessels to promptly release unharmed, to the extent practicable, all sharks, billfishes, rays, dorado, and other non-target species" and for CPPs to "encourage fishermen to develop and use techniques and equipment to facilitate the rapid and safe release of any such animals." Also, for billfish, sharks and rays to:

a. Develop techniques and/or equipment to facilitate their release from the deck or from the net.

b. Seek the necessary funds to carry out experiments to determine the survival rates of released billfish, sharks and rays.

c. Define areas and periods in which any of these species are most likely to be caught.

IATTC Resolution C-11-10 passed in July 2011 and entered into force on 1 January 2012 concerns the establishment of further conservation measures for oceanic whitetip sharks caught in association with fisheries in the Antigua Convention Area. The main measures include:

Prohibit retaining onboard, transhipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in the fisheries covered by the Antigua Convention.

Require vessels flying their flag to promptly release unharmed, to the extent practicable, whitetip sharks when brought alongside the vessel.

Record *inter alia*, through the observer programs, the number of discards and releases of oceanic whitetip sharks with indication of status (dead or alive) and report it to IATTC.

Directed fishing for sharks is banned in all Ecuadorian waters. Sharks caught in "continental" (i e not Galapagos) fisheries may be landed if unintensionally caught (bycatch), and must be landed with fins attached. A previous ban on trade in shark fins was lifted in 2007.

In 2016, Ecuador stablished the Darwin and Wolf Marine Sanctuary protecting ocean and animals around the Galapagos islands, including sharks.

Information

Similar information concerning observer coverage and logbooks, described for silky sharks, applies to oceanic whitetip shark. Additionally, so do the same reporting concerns. Between 2015 and 2018 observers reported a total catch of 120 oceanic whitetip sharks. Of the reported total catch, 28 animals were discarded and there was no information provided on the number of retained animals.

Observers reported on the fate of 68 discarded oceanic whitetip sharks and 72% were reported alive at the time of release. Given the relatively small number of oceanic whitetip sharks caught in this fishery between 2015 to 2018, 120 animals, and assuming a 28% immediate discard mortality rate, 34 oceanic whitetip sharks would be killed over the course of 4 years. Given there will likely be latent mortality effects, say an additional 30% mortality, the total number of dead animals would increase to 70 animals. The estimated number of dead oceanic whitetip sharks resulting from UoA purse seine fishing activities is relatively small compared to the magnitude of the longline catch and associated mortality in the IATTC area.

Whale Shark (Rhincodon typus)

Biology

Whale sharks (*Rhincodon typus*) are globally distributed in tropical and warm temperate seas. Approximately 75% of the global whale shark population lives in the Indo-Pacific region, the remaining 25% in the Atlantic Ocean, and their populations are potentially part of a single, global meta-population (Sequeira et al. 2013). They are known to undertake multi-annual and very long-distance migrations including between different parts of the Pacific Ocean (Norman 2005). They are also known to be resident year-round in some areas but to use a different habitat in different seasons, being visible on the surface at sometimes of year and swimming deeper and further away from shore at others, presumably in response to prey distributions (Cagua et al. 2015).

Because whale sharks are listed as endangered on the IUCN Red List, traditional biological sampling approaches are not permitted and very little in know about their life history. They are known to be ovoviviparous and are reported as highly fecund (for a shark). Their life span has been estimated as 60 to over 100 years, while a recent study in the Maldives estimated a maximum life span of male whale sharks at 130 years (Perry et al, 2018). Age at maturity has been reported as nine years (Norman 2005), 25 years (Perry et al., 2018), and 30 years (Harley et al. 2013). Using minimally invasive techniques over a 10-year

period, male whale sharks in the Maldives were estimated to grow to almost 62 feet (Perry et al., 2018). More details of the biology of this species are provided in Molony (2008).

Status

Whale sharks in the EPO have not been assessed. There is data on the whale shark interaction rates with PS fisheries in the EPO interactions observed in the UoA can be compared. From 2003 through 2016, 867 whale sharks have been involved in 718 interactions with the tuna purse seine fishery in the EPO. The rate of interactions was very low, averaging about 3 per 1000 sets, but quite variable, with a peak of about 12 in 2006, and a low and steady trend since 2014 (Figure 10). Within the UoA, 16 whale sharks were caught from 2015 through 2018 and the interaction rate estimated across all set types and flags was 1.0 animals per 1000 sets, similar to EPO PS interaction rates observed since 2014.

From 2003 and 2016, on average 93% of whale sharks caught in EPO PS fisheries were released alive, although release rates varied among years; in 2007 it was 100%; the low of 77.5% was in 2013. Of the 16 whale sharks caught by vessels in the UoA from 2015 through 2018, 94% (N=15) were released alive; similar to the EPO PS survival rate.

Currently, there is no data on whale shark post release mortality rates. However, studies are underway to provide baseline estimates of post release mortality.

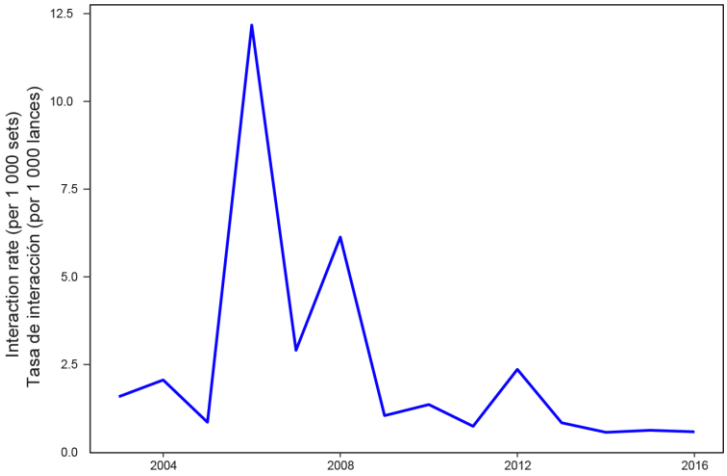


Figure 10. Interaction rates of whale sharks with the purse-seine fishery, per thousand sets, all set types combined, 2003-2016.

Management

IATTC Resolution C-00-08, adopted in 2000, called for fishers on purse-seine vessels to “promptly release unharmed, to the extent practicable”, all non-target species, including sharks, and encouraged them to develop techniques and equipment to facilitate this.

IATTC Resolution C-18-05 passed in August 2018 concerns the collection and analyses of data on fish-aggregating devices and section 4 of the Resolution focuses on measures pertaining to whale shark. The main measures pertaining to whale shark are:

1. Prohibiting CPC flag vessels from setting a purse-seine net on a school of tuna associated with a live whale shark, if the animal is sighted prior to the commencement of the set.
2. CPCs shall require that, in the event that a whale shark is not deliberately encircled in the purse-seine net, the master of the vessel shall:
    a. ensure that all reasonable steps are taken to ensure its safe release; and
    b. report the incident to the relevant authority of the flag CPC, including the number of individuals, details of how and why the encirclement happened, where it occurred, steps taken to ensure safe release, and an assessment of the life status of the whale shark on release (including whether the animal was released alive but subsequently died).

IATTC Resolution C-19-06 passed on July 2019 is a stand-alone Whale Shark Resolution (separate from C-18-05 on FADS) to more clearly mandate measures intended to prevent vessels from setting purse seines on whale sharks, maximize the chances for safe release of unintentionally encircled individuals, and mandate detailed reporting of such encounters.

Directed fishing for sharks is banned in all Ecuadorian waters. Sharks caught in “continental” (i e not Galapagos) fisheries may be landed if unintentionally caught (bycatch) and must be landed with fins attached. A previous ban on trade in shark fins was lifted in 2007.

In 2016, Ecuador stablished the Darwin and Wolf Marine Sanctuary protecting ocean and animals around the Galapagos islands, including sharks.

Information

Interactions between whale sharks and the purse-seine fishery for tunas are known to occur in the eastern Pacific Ocean (EPO), although they are relatively uncommon. Observers of the Inter-American Tropical Tuna Commission (IATTC) and of the national programs that constitute the On-Board Observer Program of the Agreement on the International Dolphin Conservation Program (AIDCP), who are required aboard all large purse-seine vessels (vessels gross tonnage > 363 t), to collect data on these interactions. Similar information concerning observer coverage and logbooks, described for silky sharks, applies to whale sharks. Additionally, so do the same reporting concerns.

On-board observers have routinely collected data on bycatches in the EPO, including whale sharks, since

1993. However, prior to 2005, the only data collected were for sharks that died as a result of interactions with the fishery. Interactions with whale sharks are rare, and the number of mortalities of whale sharks recorded by observers is very small. Moreover, on the forms used by the observers, whale sharks were grouped with several other shark species in an "Other identified shark" category. Therefore, there are essentially no data available prior to 2005.

IATTC Resolution C-00-08, adopted in 2000, called for fishers on purse-seine vessels to "promptly release unharmed, to the extent practicable", all non-target species, including sharks, and encouraged them to develop techniques and equipment to facilitate this. It did not mention whale sharks specifically. Implementing this measure required a better understanding of the interactions of whale sharks with the tuna fishery, including their fate after release, and the development of suitable release techniques, and during 2003-2004 an experimental program was implemented during which on-board observers collected some information on these interactions. This resulted in data on the date, time, location, and set type, as well as the fate of the whale shark, in 130 interactions; however, no size data were collected.

Resolution C-05-03, adopted in 2005, was the first to address sharks exclusively. It resulted in the Shark Record, a dedicated data-collection form for sharks (including whale sharks), on which observers record information on sharks released alive, as well as biological data such as length.

Resolution C-13-04 on fish-aggregating devices, adopted in 2013, and currently in force as Resolution C16-01, was the first to address whale sharks specifically. Although it did not establish any data-reporting requirements, it did require that any bycatches of whale sharks be reported "to the relevant authority of the flag CPC, including the number of individuals, details of how and why the encirclement happened, where it occurred, steps taken to ensure safe release, and an assessment of the life status of the whale shark on release."

Between 2015 and 2018 observers aboard UoA vesssels reported a total catch of 16 whale sharks, 8 caught in FAD sets and 8 caught in free school sets. Whale shark catch rates between set types differed, 0.7 animals/1000 FAD sets and 1.4 animals/1000 free school sets. All whale sharks caught in free school sets were released alive and one caught during FAD fishing operations died during release. The catch of whale sharks by UoA vessels is considered low and will not hinder the recovery of these species.

Other ETP Shark Species

The reported UoA catch of other ETP shark species in both FAD and free school sets from 2015-2018 includes scalloped hammerhead shark, great hammerhead shark, and pelagic thresher shark (Tables 13 and 14). While the combined reported catch of great hammerhead and pelagic thresher sharks from 2015 - 2018 was slightly higher in FAD sets (N=20 animals) compared to free school sets (N=14 animals), the catch rates by set type were similar (approximately 2 animals/1000 sets).

The reported catch of scalloped hammerhead shark was significantly higher in FADS sets (N=263) compared to free school sets (N=19), and catch rates were also significantly different (FAD sets = 25 animals/1000 sets; free school sets = 3 animals/1000 sets).

Based on observer records from 2015 to 2018 only one scalloped hammerhead shark was retained. There were no giant hammerhead or pelagic thresher sharks retained. While IATTC Resolutions C-05-03, C-16-06 and C-19-05 address conservation measures for shark species, including a prohibition on the retention of purse seine caught sharks in the IATTC Convention Area, most of the agreed measures may not be binding.

The number of scalloped hammerhead, great hammerhead, and pelagic thresher sharks caught as bycatch by the UoA vessels is not considered to hinder the recovery of these species. The major source of fishery related mortalities on sharks in the EPO owes to longline fishing activities.

Mobulid Rays

Most information provided on the status and biology of the rays comes from the IUCN Redlist.

- The rays included in this assessment belong to the family Mobulidae, and feature both Manta rays and Mobula rays. Species under consideration in this assessment due to presence in the catch records of the UoA include:
- Giant manta, Manta birostris, IUCN: Vulnerable
- Manta ray, unidentified
- Smoothtail manta, Mobula thurstoni, IUCN: Near Threatened
- Spinetail manta, Mobula japanica, IUCN: Near Threatened
- Chilean devil ray, Mobula tarapacana, IUCN: Data Deficient
- Munk's devil ray, Mobula munkiana, IUCN: Near Threatened

The recently passed (June 2015) IATTC Resolution C-15-04 summarizes the common characteristics of these rays driving their special regulatory protection. The resolution preamble states:

"…Considering that Mobulid rays (the family Mobulidae, which includes Manta rays and Mobula rays), are extremely vulnerable to overfishing as they take a long time to reach sexual maturity, have long gestation periods, and often give birth to only a few pups; Recognizing that the giant manta ray (Manta birostris) is considered vulnerable by the International Union for Conservation of Nature (IUCN) and the Munk's devil ray (Mobula munkiana) and the smoothtail devil ray (Mobula thurstoni) are considered near threatened by the IUCN; Noting that Mobulid rays are caught as bycatch when fishing for tuna in IATTC fisheries, as presented at the IATTC Scientific Advisory Committee meeting in April 2013, and release methods for these animals do exist; and Further noting the 2014 and 2015 IATTC staff's conservation recommendations and the fact that the Commission adopted recommendations on the handling of Mobulid rays on a voluntary basis;…"

Rays of the family Mobulidae are characterized by late maturity, lengthy gestation, and long lifespan. They are migratory across the tropical and temperate seas where much purse seine tuna fishing takes place. They are vulnerable to exploitation for these reasons, and the species identified in this assessment range from IUCN classification of Data Deficient to Vulnerable. There is some concern over an increasing market for rays, particularly in China for gill plates.

The recent IATTC resolution prohibits any retention of Mobulid rays (whole or parts) and requires that Mobulid rays be released alive whenever possible. If caught unintentionally and frozen they must be surrendered at landing/off-loading. The Resolution increased demands on the observer program to record discard versus retention and status (dead or alive) of all Mobulid rays. There are further details

regarding enforceable best practices for the safe release of rays (including prohibition of gaffing and reference to WCPFC-SC8-2012/EB-IP-12).

Giant mantas currently account for the greatest proportion of the Mobulid catch in the fishery, accounting for 0.003% of the catch from 2015-2018. The maximum take of giant mantas in any given year was 14mt in the free set fishery in 2017, though the average across the 4-year period (2015-2018) was 4mt and the minimum was 0mt (2015 and 2016). All other Mobulids are caught in much lower volumes, with an average catch of between 2.0mt across all 5 other Mobulid species. In total, Mobulids (including giant mantas) account for <0.003% of the catch from 2015-2018.

Turtles

Status

A total of 837 individuals of five species of sea turtles were reported to have been caught by vessels in the UoA between 2015 and 2018, of which all but 13 were released alive (Tables 18 and 19). The species involved are the olive ridley (N=300) , loggerhead (N=46), leatherback (N=7), green (N=99), and hawksbill (N=10) turtles. An additional 375 unidentified turtles were caught by vessels in the UoA between 2015 and 2018. The overall turtle capture rate was estimated at 50 per 1,000 sets and varied by species; for green turtle the capture rate was 6 per 1,000, olive ridley 18 per 1,000 sets, loggerhead 3 per 1,000 sets, hawksbill 0.6 per 1.000 sets, leatherback 0.4 per 1,000 sets, and for unidentified turtles 23 per 1,000 sets.

Olive ridley turtles are the commonly captured species in the ETPO because they are the most abundant species in the region and are also attracted to floating objects (Hall and Martin 2014). Their numbers in the ETPO are also reported to be increasing (Eguchi et al. 2007) although the IUCN records global populations to be decreasing.

Hall and Martin (2014) reported that between 1993 and 2009, 63 percent of the turtle captures happened in sets on floating objects (which are not part of this assessment), 25 percent in school sets, and the remaining 12 percent in dolphin sets. The number of incidental mortalities in the EPO purse seine fishery has decreased in recent years across all set types (Figure 10).

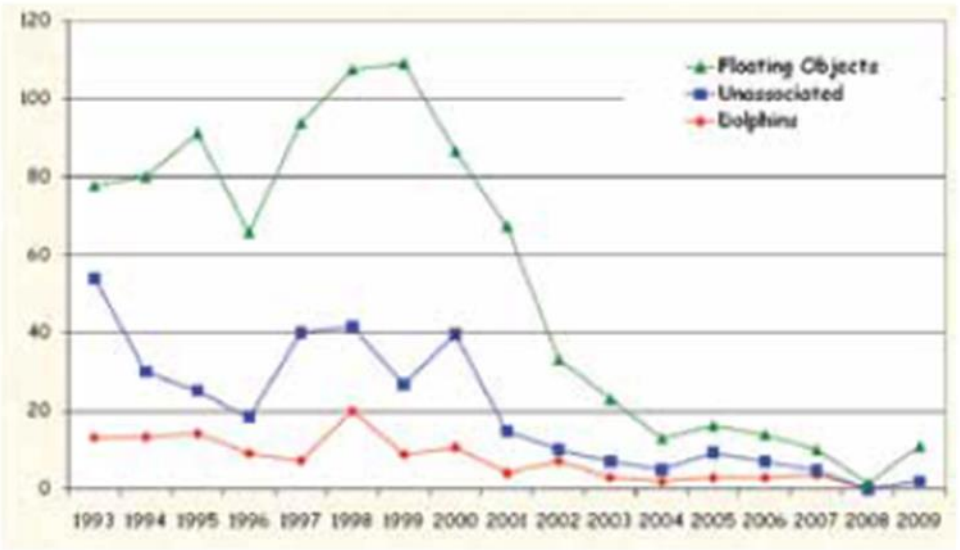


Figure 11. Incidental mortality of sea turtles in the ETPO purse seine fishery by set type, 1993-2008. (from Hall and Roman 2014).

Numbers of sea turtle mortalities and interactions in sets by large purse-seine vessels on floating objects (OBJ), unassociated tunas (NOA), and dolphins (DEL) for 1993–2018 is shown in Figure 11. The mortalities of sea turtles due to purse seining for tunas are probably less than those due to other human activities, which include exploitation of eggs and adults, beach development, pollution, entanglement in and ingestion of marine debris, and impacts of other fisheries.

The populations of olive ridley and leatherback turtles are designated as vulnerable, those of green and loggerhead turtles are designated as endangered, and those of hawksbill turtles as critically endangered, by the International Union for the Conservation of Nature (IUCN website accessed 1 January 2020).

Management

IATTC Resolution C-07-03, adopted in 2007, establishes non-binding actions by IATTC CPCs to:

1. Implement the FAO Guidelines to reduce the bycatch, injury, and mortality of sea turtles in fishing operations and to ensure the safe handling of all captured sea turtles, in order to improve their survival.
2. Beginning in 2008, report to the IATTC annually by 30 June on the progress of implementation of the FAO Guidelines, including information collected on interactions with sea turtles in fisheries managed under the Convention.
3. Enhance the implementation of their respective sea turtle bycatch, injury, and mortality reduction measures that are already in place (using best scientific information) and collaborate with other CPCs in the exchange of information in this area.
4. Implement observer programs for fisheries under the purview of the Commission that may have impacts on sea turtles and are not currently being observed, taking into consideration economic and practical feasibility.
5. Require fishermen on vessels targeting species covered by the Convention to bring aboard, if

practicable, any comatose or inactive hard-shell sea turtle as soon as possible and foster recovery, including resuscitation, before returning it to the water.

6. CPCs with purse seine vessels fishing for target species covered by the Convention in the EPO shall:
   a. Avoid encirclement of sea turtles to the extent practicable.
   b. Take actions necessary to monitor Fish Aggregating Devices (FADs) for the entanglement of sea turtles, and provide the monitoring results to the Commission as part of the requirement of paragraph 2.
   c. Require fishermen to release all sea turtles observed entangled in FADs.
   d. Conduct research and development of modified FAD designs to reduce sea turtle entanglement. Take measures to encourage the use of designs found to be successful at such reduction.
7. CPCs with longline vessels fishing for target species covered by the Convention in the EPO shall:
   a. Require fishermen to carry and, when sea turtle interactions occur, employ the necessary equipment (e.g. de-hookers, line cutters, and scoop nets) for the prompt release of incidentally caught sea turtles.
   b. Continue to improve techniques to further reduce sea turtle bycatch.
   c. Expeditiously undertake fishing trials to determine the feasibility and effectiveness of appropriate combinations of circle hooks and a. bait, depth, gear specifications, fishing practices, and other measures in reducing the bycatch, injury, and mortality of sea turtles, assess their effects on the catch of target and other bycatch species, and provide results to the IATTC.
   d. At future meetings of the Commission, consider measures related to the use of circle hooks and other gear modifications, taking into account the results of research and fishing trials.
8. The Commission staff shall review information submitted as part of paragraph 2 of this Resolution, results of research and fishing trials provided by CPCs (including the development of modified FADs and effectiveness of circle hook/bait combinations), and any new information available regarding proven techniques to reduce sea turtle bycatch, injury and mortality in fisheries targeting tuna and tuna-like species. Results of this review shall be made available to all CPCs and shall be presented at the next meeting of the IATTC Bycatch Working Group, with the view toward strengthening these resolutions as necessary.

IATTC Resolution C-19-04, adopted in 2019 and entering into force on 1 January 2021, strengthens actions in Resolution C-07-03 and provides safe handling and release guidelines for sea turtles.

The Ecuadorian government adheres to these international regulations, and has also included ecosystem considerations in the National Action Plans for Sharks/Rays and Mahi Mahi, which are captured with the same gears as tunas. Ministerial Agreement 031, R.O No.451 (27 Oct 2004) prohibits target capture, transporting, possession, processing, and commercialization of specimens below the length of 80cm. The focus of this measure is to protect incidentally caught juvenile tunas and dolphinfish. Executive Decree 486, RO No. 137 (30 June 2007), Executive Decree 902 (reformed) applies to whale shark (*Rhincodon typus*), basking shark (*Cetorhinus maximus*), great white shark (*Carcharodon Carcharias*), and sawfish (*Pristis sp*.), and establishes that in case of incidental capture, live or dead, specimens must be returned to sea. Ministerial Agreement 093, RO No. 273 (7 Sept 2010) prohibits targeted fishing on the giant manta ray (*Manta birostris*) and other manta rays (*Mobula japanica, M. thurstoni, M. munkiana and M. tarapacana*).

Sea turtles are given legal protection in the United States and its waters under the Endangered Species Act (ESA), which lists the hawksbill, leatherback, Kemp's ridley and green turtle as endangered; the loggerhead is listed as threatened. This designation makes it illegal to harm, harass or kill any sea turtles, hatchlings or their eggs. It is also illegal to import, sell, or transport turtles or their products.

In addition to the ESA regulations, US vessels are required to follow all measures contained in IATTC Resolutions C-07-03 and C-19-04. NOAA Fisheries is also required to produce and submit annual reports on protected species interactions with fisheries to the US Congress and summaries to the respective RFMOs. While all of these regulations focus on bycatch mitigation they also protect the structure and dynamics of the ecosystem.

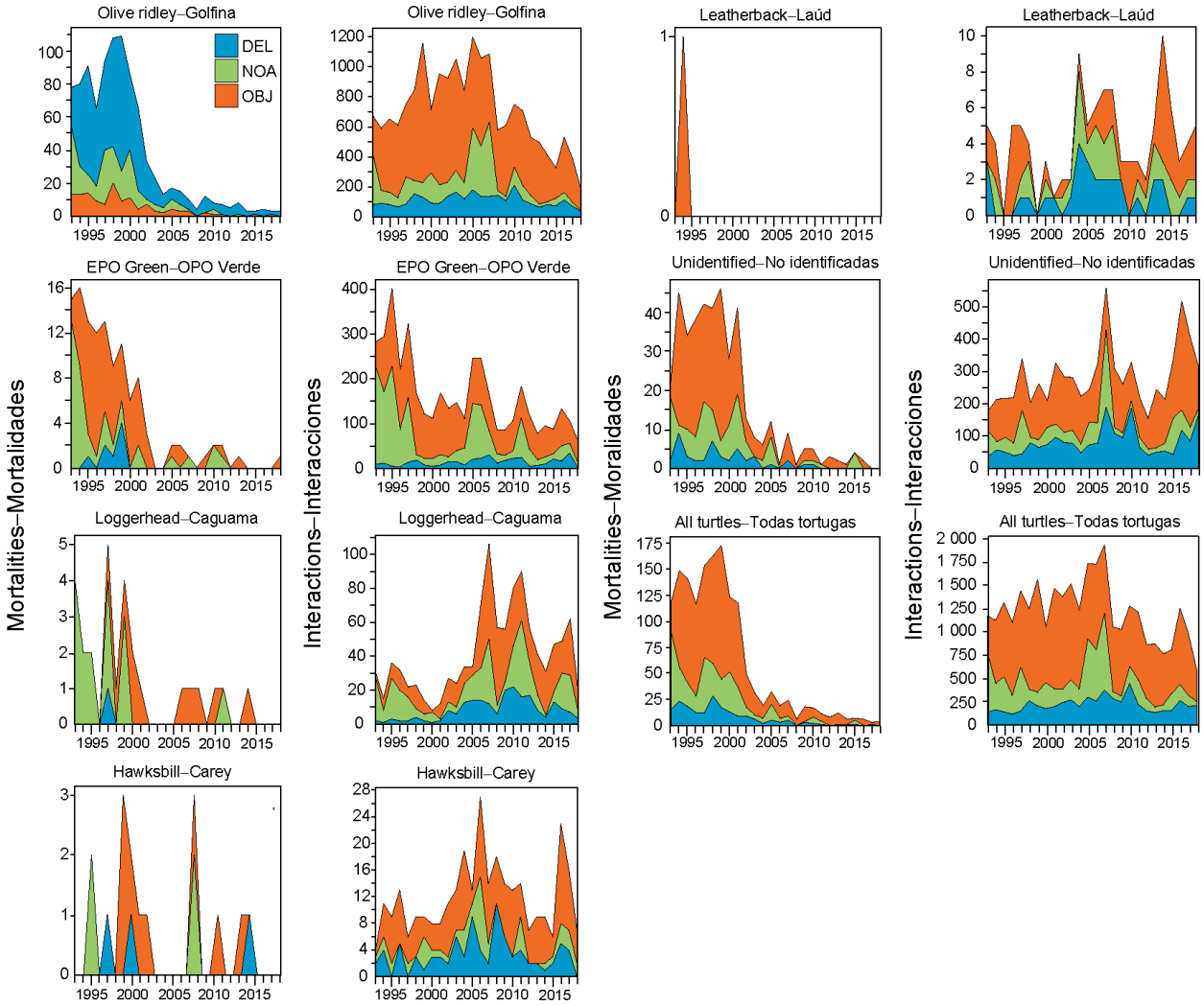


Figure 12. Sea turtle interactions and mortalities, in numbers of animals, for large purse-seine vessels, 1993–2018, by set type (dolphin (DEL), unassociated (NOA), floating object (OBJ)).

Seabirds

Seabird mortalities from purse seine fishing are very rare. Nevertheless, there is the potential for the fishery to have indirect effects on seabirds. Foraging tuna drive small prey fish to the surface, providing foraging opportunities for plunge-diving species like boobies and terns. In addition to driving the prey to the surface, subsurface predators make prey available to the birds by injuring or disorienting the prey, and by leaving scraps after feeding on large prey. Reductions in the abundance of tuna may reduce the number of such foraging opportunities. Pelagic and offshore foraging seabirds are particularly reliant on large predatory fish, such as tuna and mackerel (Scomberomorus spp.), to drive prey to the surface (Great Barrier Reef Marine Park Authority 2012). In some areas, decreases in the abundance of sub-surface predators have been associated with declines in the availability of prey to pelagic foraging seabirds (Au and Pitman, 1986) and are thought to contribute to their poor foraging success and reproductive output (Erwin and Congdon 2007) and subsequent poor recruitment and/or breeding participation two years later (Devney et al. 2009a). Correlations between tuna abundance and seabird foraging success do not

necessarily indicate a causal relationship, however, as both seabirds (Catry et al. 2013, Devney et al. 2009b, Erwin and Congdon2007, Weeks et al. 2013) and tuna (Lehodey et al. 1997, 2006) are known to be influenced by local or broad scale oceanographic events and changes in sea surface temperature.

There are approximately 100 species of seabirds in the tropical ETPO and feeding opportunities for some seabird species are dependent on the presence of tuna schools feeding near the surface (IATTC-SAC 2014). Reductions in the populations of tuna or dolphins therefore have the potential to reduce the feeding opportunities for such seabirds.

This issue has been assessed by the IATTC's SAC as part of its evaluation of ecosystem considerations (IATTC SAC-09-11). This assessment notes that seabirds are affected by the variability of the ocean environment in addition to any effects of the tuna fishery. It reports that during the 1982-1983 El Niño event seabird populations throughout the tropical and Northeastern Tropical Pacific Ocean experienced breeding failures and mass mortalities, or migrated elsewhere in search of food. Some species, however, were apparently not affected and, in general, it was considered that seabirds that forage in upwelling areas of the ETPO and Peru Current suffer reproductive failures and mortalities due to food shortage during El Niño events, while seabirds that forage in areas less affected by El Niño episodes may be relatively unaffected. There is particular concern for the waved albatross, because it is endemic to the EPO and nests only in the Galapagos Islands.

Any potential impacts of the fishery may be detected as changes in the abundance of species of seabirds that are found in association with schools of tuna or other predators. The IATTC-SAC (2014c) reports that, according to the Report of the Scientific Research Program under the U.S. International Dolphin Conservation Program Act, prepared by the NMFS in September 2002, there were no significant temporal trends in abundance estimates over the 1986-2000 period for any species of seabird, except for a downward trend for the Tahiti petrel (Pseudobulweria rostrata), in the tropical ETPO. There were no suggestions in these reports, however, that fishing activities were implicated in this decline.

The IATTC has adopted two measures on seabirds (section 9.3); also, the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and BirdLife International have updated their maps of sea-bird distribution in the EPO, and have recommended guidelines for seabird identification, reporting, handling, and mitigation measures (SAC-05 INF-E, SAC-07-INF-C(d), SAC-08-INF-D(a), SAC-08-INF-D(b), SAC-08-INF-D(d)). Additionally, ACAP has reported on the conservation status for albatrosses and large petrels (SAC-08-INF-D(c)).

On this basis, the purse seine fishery is assessed as not having any significant impact on populations of seabirds.

7.3.1.7 Habitat Impacts

Overview

When assessing the status of habitats and the impacts of fishing, teams are required to consider the full area managed by the local, regional, national, or international governance body(s) responsible for fisheries management in the area(s) where the UoA operates (this is called the "managed area" for assessment purposes).

According to MSC FCPV2.1 GSA 3.13.3, the assessment team must determine and justify which habitats are commonly encountered, vulnerable marine ecosystems (VMEs), and minor (i.e., all other habitats) for scoring purposes, [where]:

"A commonly encountered habitat shall be defined as a habitat that regularly comes into contact with a gear used by the UoA, considering the spatial (geographical) overlap of fishing effort with the habitat's range within the management area(s) covered by the governance body(s) relevant to the UoA; and

A VME shall be defined as is done in paragraph 42 subparagraphs (i)-(v) of the FAO Guidelines (definition provided in GSA 3.13.3.25) [as having one or more of the following characteristics: uniqueness or rarity, functional significance, fragility, Life-history traits of component species that make recovery difficult, and/or structural complexity]. This definition shall be applied both inside and outside EEZs and irrespective of depth."

Both commonly encountered and VME habitats are considered 'main' habitats for scoring purposes (GSA 3.13.3).

[5] According to MSC FCPV2.1 GSA 3.13.3.2: VMEs have one or more of the following characteristic, as defined in paragraph 42 of the FAO Guidelines:

- Uniqueness or rarity – an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems
- Functional significance of the habitat – discrete areas or habitats that are necessary for survival, function, spawning/reproduction, or recovery of fish stocks; for particular life-history stages (e.g., nursery grounds, rearing areas); or for ETP species
- Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities
- Life-history traits of component species that make recovery difficult – ecosystems that are characterised by populations or assemblages of species that are slow growing, are slow maturing, have low or unpredictable recruitment, and/or are long lived
- Structural complexity – an ecosystem that is characterised by complex physical structures created by significant concentrations of biotic and abiotic features"

Impacts on Pelagic Habitats

Status

Purse seine vessels fishing on the high seas operate in deep oceanic waters and do not physically contact the seafloor during their operations. Any impacts of the fishery will therefore be confined to direct or indirect effects on the surface waters in which the fishery operates. These habitats are essentially open ocean waters whose ability to support the target fish populations is related to their temperature, salinity and nutrient levels which determine the productivity of the lower trophic levels. These are primarily driven by variations in basin wide weather patterns through their effect on the frequency, location and strength of upwelling events, eddy systems and thermal fronts. Purse seine fishing is not considered capable of affecting these key habitat drivers at a broad scale or even local levels of productivity and no further consideration is given to this aspect of pelagic habitats.

Floating objects, however, are an additional component of pelagic habitats that are relevant to purse seine tuna fisheries. Natural floating objects are colonized or sought out by a range of marine creatures, including tuna. This has led them to be targeted by fishing operations and to the development of artificial floating structures that are deployed as FADs. Fishers have progressed from a reliance on natural encountered objects, to the modification of found objects, then the transport of natural or modified objects to other areas, and eventually to the building and systematic deployment of sophisticated items of technology complete with tracking devices and sensors that can report water temperature and the quantities of fish surrounding the FAD (Hall and Roman 2014). Purse seine fishing on floating objects (whether natural or FADs), therefore, has the potential to have an impact on these habitats and hence to affect the productivity of such communities.

Habitat Type: Commonly Encountered

Status

Purse seine vessels fishing on the high seas operate in deep oceanic waters and do not physically contact the seafloor during their operations. Any impacts of the fishery will therefore be confined to direct or indirect effects on the surface waters in which the fishery operates. These habitats are essentially open ocean waters whose ability to support the target fish populations is related to their temperature, salinity and nutrient levels which determine the productivity of the lower trophic levels. These are primarily driven by variations in basin wide weather patterns through their effect on the frequency, location and strength of upwelling events, eddy systems and thermal fronts. Purse seine fishing is not considered capable of affecting these key habitat drivers at a broad scale or even local levels of productivity and no further consideration is given to this aspect of pelagic habitats.

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objects to other areas, and eventually to the building and systematic deployment of sophisticated items of technology complete with tracking devices and sensors that can report water temperature and the quantities of fish surrounding the FAD (Hall and Roman 2014). Purse seine fishing on floating objects (whether natural or FADs), therefore, has the potential to have an impact on these habitats and hence to affect the productivity of such communities.

Habitat Type: Vulnerable Marine Ecosystems (VME)

The Galápagos Islands and their surrounding waters form the Galápagos Province of Ecuador, the Galápagos National Park, and the Galápagos Marine Reserve. Due to the Galapagous islands unique history and biodiversity the Team considers it to be a VME. The Inter-Institutional Management Authority of the Galapagos Marine Reserve, through Resolution No. 011-2000 of November 15, 2000, prohibited the capture, landing and commercialization of shark in the Galapagos Archipelago. While direct fishing activities are prohibited, there is a potential for indirect impacts from FAD purse seining on the VME due to (1) ghost fishing by entanglement of animals in the net used to build FADs, especially sharks and sea turtles and (2) marine debris created by lost and abandoned FADs, which may wash onto coral reef areas.

Few studies have quantified the impact of FADs that are lost or abandoned, showing data on FAD loss and stranding events (Maufroy et al. 2015; Escalle et al. 2018; Zudaire et al. 2018). Fishers usually deactivate FADs that are drifting out of the fishing grounds in order to avoid paying communication fees for FADs that are not productive but also to activate a new FAD within the fishing ground due to FAD limitation resolutions. These deactivations make it difficult to know the fate and quantify loss and abandoned FADs and thus their impacts.

All RFMOs have now adopted measures to promote the use of non-entangling (NE) FADs. Most of the fleets are using Low Risk Entanglement (LER) FADs which means that if mesh net is used for the tail, it must be tied as tightly as practicable in the form of sausages or have a stretched mesh size less than 7 cm in a panel with weight at the end (Res C-18-05; Murua et al. 2016).

One of the primary research area in recent years has been to develop biodegradable FADs. Several tests are ongoing or have been done using natural materials or fibers to build the rafts and tails of FADs (coconut fiber, cotton, manila hemp, yute, sisal, bamboo, balsa wood, etc.) (Delgado de Molina et al., 2004; Delgado de Molina et al., 2007; Franco et al., 2009, 2012;Lopez et al., 2016; Moreno et al. 2017a,b) but still none have yielded a conclusive solution, either because the number of FADs deployed was not enough to get significant results or because research has not finalized yet.

Discussions within the IATTC on FAD management and data needs have been facilitated through efforts of the Ad hoc Permanent Working Group on FADs. While initial meetings of the working group focused on procedure, recent Resolutions (C-17-01, C-17-02) concern conservation measures for tropical tuna in the EPO, including measures that (1) limit the number of active fishing FADs based on vessel class, (2) establish an annual FAD closure period of 72 days and a 30 day closure (9 October to 8 November) of the *corralito* area (west of the Galopogus Islands), (3) requiring the retention of all caught bigeye, skipjack, and yellowfin tuna, and (4) enhanced data collection protocols.

7.3.1.8 Ecosystem Impacts

Ecosystem interactions relevant to tuna fishing include the impacts of the removal of a large biomass of top predators on the structure and function of the pelagic ETPO ecosystem. Removing upper-level predators through both the directed fishery for yellowfin, bigeye, and skipjack, as well as incidental retention of other large pelagics, bycatch of smaller scombrids (bullet tuna, black skipjack and juvenile tunas), removals of sharks, billfish and larger pelagic piscivorous fish (e.g. billfish, dolphinfish etc.). All such removals have the potential to impact the dynamics and abundance of their prey populations, thereby also affecting prey availability to other large pelagic predators at similar trophic levels.

Status

This issue has been assessed by the IATTC's SAC (IATTC-SAC 2014c). Its report notes that recent peer-reviewed literature provides strong evidence that large-scale changes in biological production have occurred but that these have resulted from physical forcing in the subtropical and tropical Pacific Ocean. Fisheries were not considered to be the main driver of such changes.

At one level, the continued productivity of the purse seine fishery in the ETPO is evidence that the structure and function of the ecosystem has not been compromised by the fishery. From an examination of the biomass, size and trophic status of the top predators in the Pacific Ocean Sibert et al. (2006) conclude that, despite fisheries having removed in excess of 50 million mt of tuna and other top level predators from the Pacific Ocean from 1940 to 2004, the trophic level of the catch has decreased slightly (but that of the population has not changed) and there have been substantial, though not catastrophic, impacts on these top-level predators and minor impacts on the ecosystem in the Pacific Ocean.

The SAC also notes that the ETPO fishery covers a broad area that is likely to include regions with different ecological characteristics, so understanding the potential impacts of the fishery will require data and analyses at finer spatial scales than the entire ETPO (IATTC SAC-10-14).

Management

The IATTC does not have measures that are specifically focused on ecosystem structure and function but it does have a comprehensive range of resolutions that address all of the main components of the ecosystem in which the fishery operates (catch, bycatch, ETP species). Ensuring that key components of an ecosystem are maintained is the most effective way that wider ecosystem structure and function are also maintained.

The identification of suitable ecosystem metrics and appropriate management systems that respond to changes in such metrics is an area of continued research but very limited implementation. The IATTC-SAC (SAC-10-04) has noted that several ecosystem metrics or indicators, including community size structure, diversity indices, species richness and evenness, overlap indices, trophic spectra of catches, relative abundance of an indicator species or group, and numerous environmental indicators, have been proposed. Whereas there is general agreement that multiple system-level indicators should be used, there is concern

over whether there is sufficient practical knowledge of the dynamics of such metrics and whether a theoretical basis for identifying precautionary or limit reference points based on ecosystem properties exists. Ecosystem-level metrics are not yet commonly used for managing fisheries. Thus the situation for assessment and management at the ecosystem level in the ETPO is not unusual or necessarily undesirable.

The ability to predict responses of ecosystems to management interventions, even using the most sophisticated ecosystem models currently available, is limited by both limits on data and the stochastic responses often shown. For the ETPO in particular, the complex climate-driven variability in basin and regional-scale productivity adds to the management difficulties. Fulton (2010) considers that whole-of-system models that seek to represent the dynamics of the ecosystems and their responses to natural and anthropogenic changes to be most effective when used as strategic tools, to address questions that are at scales where there is still a lot of uncertainty about how systems function. It is not yet clear whether useful Performance Indicators based on ecosystem-level properties might be developed.

The Ecuadorian government has also included ecosystem considerations in the National Action Plans for Sharks/Rays and Mahi Mahi, which are captured with the same gears as tunas. Ministerial Agreement 031, R.O No.451 (27 Oct 2004) prohibits target capture, transporting, possession, processing, and commercialization of specimens below the length of 80cm. The focus of this measure is to protect incidentily caught juvenile tunas and dolphinfish. Executive Decree 486, RO No. 137 (30 June 2007), Executive Decree 902 (reformed) applies to whale shark (*Rhincodon typus*), basking shark (*Cetorhinus maximus*), great whiute shark (*Carcharodon Carcharias*), and sawfish (*Pristis sp*.), and establishes that in case of incidental capture, live or dead, specimens must be returned to sea. Ministerial Agreement 093, RO No. 273 (7 Sept 2010) prohibits targeted fishing on the giant manta ray (*Manta birostris*) and other manta rays (*Mobula japanica, M. thurstoni, M. munkiana and M. tarapacana*). While all of these regulations focus on bycatch mitigation they also protect the structure and dynamics of the ecosystem.

Information

In addition to data collected on all the main targets of the ETPO fishery, there has been and continues to be collection of information and assessments on a wide range of other components of the ETPO ecosystem:

- Data on the bycatches of large purse-seine vessels are being collected, and governments are urged to provide bycatch information for other vessels.
- Data on the spatial distributions of the bycatches and the bycatch/catch ratios have been collected for analyses of policy options to reduce bycatches.
- Information to evaluate measures to reduce the bycatches, such as closures, effort limits, etc., has been collected.
- Assessments of habitat preferences and the effect of environmental changes have been made.

Information on how ecosystem structure and function might respond to fisheries, climate change or any other agents of change is becoming increasingly sophisticated through the development of ecosystem

models. For the Pacific Ocean, an Ecopath-with-Ecosim (EWE) model has been developed to gain insight into the relationships among the various species in the system, to explore the ecological implications of alternative methods of harvesting tunas and how fishing and climate variation might affect the animals at middle and upper trophic levels (Olson and Watters 2003, Hinke et a. 2004). Using this model, it has been found that in general, animals with relatively low turnover rates were influenced more by fishing than by the environment, and animals with relatively high turnover rates more by the environment than by fishing (IATTC-SAC 2014c). It also found that the ecosystem showed wasp-waist-like structure, with short-lived and fast-growing cephalopods and fishes in intermediate trophic levels comprising the vast majority of the biomass. There were also complex responses whereby several waist groups and alternate trophic pathways from primary producers to apex predators can cause unpredictable effects when the biomasses of particular functional groups are altered.

Another ecosystem model, SEAPODYM has also been developed (Lehodey et al., 2003; Lehodey, 2005, Lehodey et al. 2008). This consists of: a biogeochemical model, which acts as a forcing field, providing hydrodynamic flows and low trophic level states; a box-model of forage components, representing vertically structured mesopelagic fish, cephalopods and crustacean groups; and an age-structured fish population model that can also include fishing pressure and multiple fleets. Predation dynamically links the forage and top predator model, but the physical properties (e.g. water movements, oxygen, temperature and primary production) supplied by the biogeochemical model contribute to the handling of feeding, recruitment and movement dynamics (Fulton 2010). The model was developed with the expectation that it could be used for management of tuna stocks in the context of climate and ecosystem variability, and to investigate potential changes due to anthropogenic activities including global warming, fisheries pressures and management scenarios (Lehodey et al. 2008). SEAPODYM has now been used to investigate expected changes to fish populations under climate change scenarios (Lehodey et al. 2013). As far as we are aware, however, it has not been used to estimate the level of impact on the structure or function of the ecosystem from the combined removals of the fishery.

Ecosystem model are data intensive, and while good physical data describing the dynamics of the EPO are available, biological information on most of the EPO species is scant. These data and their relationships form the basis of ecosystem models. An alternative approach for such data-lim-ited situations is Ecological Risk Assessment (ERA), a tool for prioritizing management action or further data collection and research for potentially vulnerable species.

'Vulnerability' is defined here as the potential for the productivity of a stock to be diminished by direct and indirect fishing pressure. The IATTC staff has applied an ERA approach called 'productivity-susceptibility analysis' (PSA) to estimate the vulnerability of data-poor, non-target species caught in the EPO purse-seine fishery by large (Class-6) vessels and in the longline fishery. PSA considers a stock's vulnerability as a combination of its susceptibility to being captured by, and incur mortality from, a fishery and its capacity to recover, given its biological productivity (see IATTC-94-01). This analysis is routinely updated and new species added as data become available.

As a result, the overall impact of the purse seine fishery on the ecosystem structure and function is believed to have been reduced in recent years and will continue to decrease after the latest resolutions that aim to regulate FADs entre into force. While there remains uncertainty in the status of several populations, including dolphin and sharks, the impacts are not considered to be sufficient to disrupt key elements underlying the ecosystem structure and function to a point where there would be serious or irreversible harm.

7.3.2 Principle 2 Performance Indicator scores and rationales

The MSC guidance indicates that the CAB should normally identify separate UoAs (and associated UoCs) for each discrete gear type or fishing method that is to be assessed (MSC FCP v2.1). For the purposes of scoring P2, two separate UoAs in the EPO have been established based on gear type and location of fishing operations. The TUNACONS UoA is comprised of 43 purse seine vessels from 5 fishing companies (Eurofish, NIRSA, Servigrup, Grupo Jadran, and Tri Marine) and three countries (Ecuador, Panama, and US). Fishing vessel carrying capacities range from 270 t to 2,304 t and fishing generally occurs in high seas areas of the EPO equatorial region. The U.S. Small Purse Seine UoA is comprised of three small purse seine vessels from the U.S. with carrying capacities ranges from 127 t to 145 t. Fishing is limited to free school sets and conducted in waters adjacent to San Pedro, California U.S.A.

The different set types (FAD vs Free school) are considered different fishing methods and separate UoA and separate scores are provided for FAD and Free School set types. When the assessment team identified any discrete variations in impact between the different set types, the rationales are presented separately, otherwise rationales for FAD and free school sets are presented jointly. The same approach was employed for flag states, which were evaluated jointly, except for PIs where there were differences in management arrangements.

PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guide post	Main primary species are likely to be above the PRI. OR If the species is below the PRI, the UoA has measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are highly likely to be above the PRI. OR If the species is below the PRI, there is either evidence of recovery or a demonstrably effective strategy in place between all MSC UoAs which categorise this species as main, to ensure that they collectively do not hinder recovery and rebuilding.	There is a high degree of certainty that main primary species are above the PRI and are fluctuating around a level consistent with MSY.
	Met?	Tunacons Free sets: Yes	Tunacons Free sets: Yes	Tunacons Free sets: Yes

		Tunacons FAD sets: Yes US Small PS UoA: Yes	Tunacons FAD sets: Yes US Small PS UoA: Yes	Tunacons FAD sets: Yes US Small PS UoA: Yes
Rationale				
Tunacons (Free and FAD sets) UoAs: There are no primary species. If a team determines that a UoA has no impact on a particular component, it shall receive a score of 100 under the Outcome PI (MSC FCP v2.1 SA3.2.1). **US Small PS UoA** Pacific bluefin tuna is categorized a main primary species. No biological reference points have been established for Pacific bluefin tuna. The most recent assessment of stock status concluded that the spawning biomass had been reduced to less than 6% of unfished levels, and that overfishing was still occurring relative to the potential biomass-based reference points evaluated (SSBMED and 20%SSBF=0 (ISC Pacific Tuna Working Group 2018, ISC 2019). The species is likely below the PRI, and measures are in place that are expected to ensure that the UoA does not hinder recovery and rebuilding. On this basis, requirements at the SG 60 level are met. While there has been increases in recruitment levels to the historical average in the last 2 years, the impact of this on the stock is unclear at this time. A benchmark assessment is scheduled to be completed in July 2020 and will provide contemporary information on stock status and recruitment levels. The assessment team is not aware of other MSC UoAs which categorise Pacific bluefin as main. The reported catch of Pacific bluefin tuna from the UoA from 2014 to 2018 ((301 t) is small relative to the total catch of the stock over the same period (66,454 t), and amounts to approximately 0.5% of the total catch. The relatively small catch of this species by all US commercial fisheries (1,322 t), which includes the US Small purse seine UoA, has been shown to have no influence on the recovery of the species (ISC Pacific Tuna Working Group 2018). Additionally, the US implemented strong management measures in 2019 under IATTC Resolutions C-18-01 and C-18-02, capping the total allowable annual commercial catch of Pacific bluefin tuna at 300 t. On this basis, the team determines that the SG80 is met (FCP v2.1 SA3.4.6) For this UoA, the team received catch data from logbooks, which record information on target species (tuna species), consequently there may be unknown primary species interacting with this fishery. The team will employ a qualitative information-gathering process during the site visit to determine whether there are any additional primary main species unaccounted for in the logbooks and will employ a precautionary approach in the classification of main and minor species (MSC FC v2.1 GSA3.4.2). The RBF approach may be employed if necessary			
b	Minor primary species stock status			
	Guide post			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?			Tunacons Free sets: Yes

				Tunacons FAD sets: Yes US Small PS UoA: Yes

Rationale

Tunacons (Free and FAD sets) UoAs:
There are no minor primary species. SG100 is met.

US Small PS UoA
No primary species have been recorded in data obtained from the logbooks. Based on the available information the team determines that the SG100 is met. The team will employ a qualitative information-gathering process during the site visit to determine whether there are any primary minor species unaccounted for in the logbooks (MSC FC v2.1 GSA3.4.2). The RBF approach may be employed if necessary.

References

ISC Pacific Tuna Working Group 2018, ISC 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA >80
Information gap indicator	- Qualitative information to be collected on any other potential primary species when during site visit

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are measures in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.	There is a partial strategy in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.	There is a strategy in place for the UoA for managing main and minor primary species.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes

Rationale

Tunacons (Free and FAD sets) UoAs:
There are no primary species, thus the 'if necessary' clause is not triggered and SG60 and SG80 are met by default (MSC FCP v2.1 GSA3.5.1). In order to score a 100 on this component, MSC requires that a management strategy should be in place for the UoA for P2 species to address any incidental impacts, including gear loss (MSC FCP v2.1 GSA3.5.1).

The UoA has spearheaded a number of voluntary research activities to mitigate bycatch and impacts of gear loss, including development and testing of sorting grids and non-entangling FADs to reduce bycatch of non-target species, and development of biodegradable FADs to minimize habitat/ecological impacts from lost or derelict FADs. In addition, the UoA has adopted good practices for handling bycatch at sea that should increase survival of released non-target species, codified IATTC Resolutions C-99-07, C-16-01, and C-17-02 as part of the Ecuadorian regulatory framework, implemented 100% observer coverage of trips taken by small purse seine vessels (classes 3-5), and proposed a FAD management plan aimed at maintaining the operational efficiency of the tuna purse seine fleet through the implementation of standards, actions, and novel technologies (Garcia 2016). Together these measures constitute a strategy for managing main and minor species.

US Small PS UoA
Pacific bluefin tuna: A Pacific bluefin tuna rebuilding plan with targets and acceptable risk levels is currently in place. The management strategy, proposed at the joint WCPFC NC-IATTC WG meeting, guided projections conducted by the ISC to provide catch reduction options that would achieve the initial rebuilding target with at least 60% probability by 2024 and a second rebuilding target with at least 60% probability by 2034. Projections were also conducted to provide relevant information for a potential increase in catch if the probability of achieving the initial rebuilding target exceeds 75% by 2024 (ISC 2017).

The projection based on the base-case model that mimicked the current management measures by the WCPFC (CMM 2017-08) and IATTC (C-16-08) under the low recruitment scenario resulted in an estimated

98% probability of achieving the initial rebuilding target by 2024. This estimated probability is above the threshold (75% or above in 2024) prescribed by the harvest strategy. The low recruitment scenario is more precautionary than the recent 10 years recruitment scenario. In the harvest strategy, the recruitment scenario is switched from the low recruitment to the average recruitment scenario beginning in the year after achieving the initial rebuilding target. The estimated probability of achieving the second rebuilding target 10 years after the achievement of the initial rebuilding target or by 2034, whichever is earlier, is 96%. This estimate is above the threshold (60% or above in 2034) prescribed by the harvest strategy (ISC 2017).

As noted above, WCPFC CMM 2017-08 and IATTC Resolution C-16-08 were tested as part of the projections and established catch limits and minimum size restrictions in all fisheries harvesting Pacific bluefin tuna. On this basis the requirements for the SG 60 and SG 80 and SG100 levels are met for Pacific bluefin tuna.

Because of the limited information available on the catches of the fleet, it is unknown if the fishery interacts with additional primary species. The team will employ a qualitative information-gathering process during the site visit to determine whether there are any additional primary main species unaccounted for in the logbooks (MSC FC v2.1 GSA3.4.2). This may impact scoring in all SIs of this PI. The RBF approach may be employed if necessary. For now the scoring of this PI is based on recorded species.

b	**Management strategy evaluation**			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: Yes

Rationale

Tunacons (Free and FAD sets) UoAs:
There are no primary species, following the logic of clause GSA3.5.1 (MSC FCP v2.1) SG60 and S80 are not scored.

Research to minimize the catch of non-target species during purse seining operations (both free school and FAD sets) and development of biodegradable FADs is paramount in most RFMOs. In the EPO, TUNACONS has voluntarily spearheaded efforts to develop biodegradable FADs to minimize ecological impacts (EcoFADs) and reduce the catch of non-target species through the development and testing of sorting grids. While the initial results were considered promising, and TUNACONs is committed to replacing traditional FADs with EcoFADs and developing techniques and technologies to mitigate bycatch, additional testing following a robust experimental design is required to assess the utility and feasibility of proposed measures. On this basis the SG 100 level is not met.

US Small PS UoA
Pacific bluefin tuna: As explained above in SI(a), a rebuilding plan has been adopted to rebuild Pacific bluefin tuna and tested under a suite of management measures. In all cases the rebuilding targets were met. While testing indicates the strategy will work, the results are model-based, and do not included recent changes to the population. A benchmark assessment is scheduled for 2020 at which time adopted management measures based projection outputs will be assessed, providing the higher level of confidence to achieve SG 100. On this basis the requirements at the SG 60 and SG 80 levels are met, but the SG 100 level is not met.

The score is subject to change if additional primary species are identified during the qualitative information-gathering process to be conducted during the site visit.				
c	**Management strategy implementation**			
	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: Yes
Rationale				
Tunacons (Free and FAD sets) UoAs: There are no primary species, following the logic of clause GSA3.5.1 (MSC FCP v2.1) S80 is not scored. TUNACONs is currently testing and analysing new alternative materials to replace traditional FADs with biodegradable prototypes, or EcoFADs, that minimize the negative impact on the ecosystem, and have proposed a FAD management plan aimed at maintaining operational efficiency. However, additional testing is required to provide clear evidence that the strategy is achieving the overall objective. On this basis the SG 100 level is not met. **<u>US Small PS UoA</u>** Update assessments by the ISC have shown slight increases in biomass since the adoption of the rebuilding plan. Additionally, contemporary recruitment indices have increased to average levels consistent with the implementation of management measures, and the relative number and average size of Pacific bluefin tuna appear to be increasing. It is unclear if these changes are due to actual increases in population size or changes in availability due to shifting environmental conditions. The benchmark assessment scheduled for 2020 should provide clear evidence to determine if the overall objective set out in scoring issue a(a) is being achieved. On this basis, requirements at the SG 80 level are met, but the SG 100 requirements are not met. Score subject to change if additional primary species are identified during the qualitative information-gathering process to be conducted during the site visit.				
d	**Shark finning**			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	NA	NA	NA
Rationale				
Not scored. No primary species are sharks.				
e	**Review of alternative measures**			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-	There is a regular review of the potential effectiveness and practicality of alternative measures to	There is a biennial review of the potential effectiveness and practicality of alternative measures to

		related mortality of unwanted catch of main primary species.	minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?		Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA

Rationale

Tunacons (Free and FAD sets) UoAs:
There are no primary species, and thus there is no unwanted catch and the 'review of alternative measures' scoring issue (e) is not scored (FCP v2.1 GSA3.5.3).

US Small PS UoA
Bluefin tuna is the only main primary species and all catch is retained. Thus there is no unwanted catch and the 'review of alternative measures' scoring issue (e) is not scored.

References

ISC 2017, Garcia 2016,

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA >80
Information gap indicator	No additional information is required.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impact on main primary species**			
	Guide post	Qualitative information is adequate to estimate the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is adequate to assess the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status.
	Met?	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes
Rationale				
Tunacons (Free and FAD sets) UoAs: Quantitative information is collected via the observer programs for the Tunacons fleets, given the low impact of the UoA on primary species, the team determines this level of information is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status. SG100 is met. **<u>US Small PS UoA</u>** Pacific bluefin tuna: Catch reporting (logbooks) of Pacific bluefin tuna is mandatory in both WCPFC and IATTC, as well as catches from domestic fisheries in both Japan, Mexico, and the US, and these data are routinely incorporated into the stock assessment and projections. This meets the SG 60, SG 80, and SG100 requirements. Score subject to change if additional primary species are identified during the qualitative information-gathering process to be conducted during the site visit..				
b	**Information adequacy for assessment of impact on minor primary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.

	Met?			Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes

Rationale

Tunacons (Free and FAD sets) UoAs:
There are no minor primary species recorded. The team considers the quantitative information from the observer programs is sufficient to meet the SG100.

US Small PS UoA
There are no minor primary species recorded, the SG100 is met.

Score subject to change if additional primary species are identified during the qualitative information-gathering process to be conducted during the site visit.

c	**Information adequacy for management strategy**			
	Guide post	Information is adequate to support measures to manage main primary species.	Information is adequate to support a partial strategy to manage main primary species.	Information is adequate to support a strategy to manage all primary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: Yes

Rationale

Tunacons (Free and FAD sets) UoAs:
While there are no primary species, a strategy is in place for the UoA to effectively manage main and minor primary species. However, some of the measures that constitute the strategy outlined in PI 2.1.2 (a) are still in the pilot phase or recently implemented (e.g. EcoFADS, sorting grids, etc.), and sufficient information to evaluate with a high degree of certainty whether the strategy is achieving its objective is lacking at this point in time. On this basis, the SG 100 level is not met

US Small PS UoA
Mandatory catch monitoring (logbooks) of all Pacific bluefin tuna fisheries has been established in the WCPFC and IATTC, encompassing both the commercial and recreational sectors. Size sampling programs have been established for all fisheries, as well as programs to provide independent measures of abundance (close-kin) to advance the assessments. A recruitment monitoring program is ongoing and studies to assess exchange rates between the western Pacific and eastern Pacific Ocean have been implemented. Stock assessments (benchmark and updates) are routinely conducted to assess achievement of objectives and stock status. These activities are adequate to determine with a high degree of certainty if the strategy is achieving its objective.
Score subject to change if additional primary species are identified during the qualitative information-gathering process to be conducted during the site visit.

References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA >80
Information gap indicator	Tunacons: Provide information of the status of EcoFAD and sorting grid research, and its integration into the IATTC research plan. Provide documentation indicating a commitment to continually observe all purse seine vessels. Provide documentation on the feasibility of using electronic monitoring as an observation platform.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guide post	Main secondary species are likely to be above biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are highly likely to be above biologically based limits. OR If below biologically based limits, there is either evidence of recovery or a demonstrably effective partial strategy in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a high degree of certainty that main secondary species are above biologically based limits.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: RBF will be employed, no scores available at ACDR
Rationale				
Tunacons (Free and FAD sets) UoAs: There are no main secondary species, SG100 is met automatically. <u>US Small PS UoA</u> Eastern Pacific and striped bonito tuna were identified as main secondary species for this fleet. The catch from free school sets has represented approximately 12% of the total catch on average from 2014 to 2017. The status of bonitos has not been assessed by the IATTC but they are short-lived and productive species and are				

classified by the IUCN as being of least concern. They are therefore likely to be within biologically based limits but, in the absence of any formal assessment, and given potential complexity in stock structuring and probable relatively high susceptibility, this status could not be asserted to be highly likely. The RBF will be used to score this performance indicator.

b	Minor secondary species stock status			
	Guide post			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: RBF will be employed, no scores available at ACDR

Rationale

Tunacons (Free and FAD sets) UoAs:
FADs and Free School Sets: There is a wide range of secondary-minor species that are caught in small numbers (< 1%) regardless of fishing strategy (FAD or free school).

Although the quantities are sufficiently small to provide a high degree of certainty that the fishery's impact on these bycatch species is small and the fact that most of these species are classified data-poor, there have been no assessments/analyses that demonstrate that these species are above biologically-based limits.

Due to these data limitations, IATTC staff routinely apply an ecological risk assessment approach, productivity-susceptibility analysis (PSA), to estimate the vulnerability of data-poor, non-target species caught in the EPO purse seine fishery by large (Class-6) vessels and in the longline fishery. PSA considers a stock's vulnerability as a combination of its susceptibility to being captured by, and incur mortality from, a fishery and its capacity to recover, given its biological productivity.

In the purse seine fisheries, vulnerability was highest for elasmobranchs, namely bigeye and pelagic thresher shark (Alopias superciliosus and A. pelagicus). Billfishes, dolphins, other rays, ocean sunfish, and yellowfin and bigeye tunas were classified as moderately vulnerable, while the remaining species, all teleosts had the lowest vulnerability scores (IATTC 2019).

While PSA analyses do not provide stock status determinations relative to biologically based limits similar to those resulting from traditional stock assessments, the vulnerability scores provide information on impacts due to fishing and on this basis SG100 is not met.

<u>US Small PS UoA</u>
There are no minor secondary species currently reported. The assessment team will employ a qualitative information-gathering process during the site visit to determine whether there are any secondary species

unaccounted for in the logbooks and will employ a precautionary approach in the classification of main and minor species (MSC FC v2.1 GSA3.4.2).
References
IATTC 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA: TBD – pending RBF results
Information gap indicator	RBF will be used to score secondary species outcomes for the US Small PS UoA. - Qualitative information to be collected on any other potential primary species when during site visit
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a partial strategy in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a strategy in place for the UoA for managing main and minor secondary species.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: Yes
Rationale				

Tunacons (Free and FAD sets) UoAs:
None of the bycatch species have been considered to be 'main' and therefore a strategy for main bycatch species is not necessary to meet SG60 and SG80 requirements which are met by default.

Resolution C-04-05 (Rev 3) (IATTC 2019) is considered to represent a strategy that is in place to manage the impact of the fishery on bycatch and to maintain the current very low level of impact. It contains the requirements (among others)

- Require fishermen on purse-seine vessels to promptly release unharmed, to the extent practicable, all sharks, billfishes, rays, dorado, and other non-target species and
- Encourage fishermen to develop and use techniques and equipment to facilitate the rapid and safe release of any such animals.

Additionally, provisions in Resolution C-19-01 call for the design and deployment of non-entangling and biodegradable FADs (EcoFADs) to reduce the entanglement of non-target species and ecological impact. TUNACONS has voluntarily conducted research in these areas and is committed to replacing traditional FADs with EcoFADs in their fleet. TUNACONS has also spearheaded research to minimize the catch of non-target species during purse seining activities through development and placement of sorting grids in the nets and implemented a program requiring 100% observer coverage of all trips taken by small purse seine vessels in the fleet (classes 3-5).

These strategies have been designed to address impacts on bycatch and there is ongoing monitoring of bycatch levels through the observer programs. Also, due to uncertainties in the tropical tuna stock assessments, limits on the number of active FADs deployed at any time on purse seine vessels (vessel classes 3-6) operating in the EPO have been adopted (Resolution C-17-02). While not necessarily directed at secondary species, and only in affect through 2020, this measure will result in catch reductions of all species, including secondary species. A potential multi-year extension of the FAD deployment limit, including development of a region-wide FAD management plan, will be discussed in late-2020.

Based on these activities, requirements of the SG 100 level are met.

US Small PS UoA
Eastern Pacific and striped bonito tuna: There are no measures adopted by the IATTC that are specifically directed at bonito tunas, but current knowledge of their status is insufficient to determine whether any are required. There are measures that have been adopted by the IATTC, however, which could assist in maintaining these bonitos within biologically based limits. Resolution C-17-01 is primarily aimed at the main target species but also includes specific time and area closures (which are designed to constrain effort) and a direction "to continue the experiments with sorting grids for juvenile tunas and other species of non-target fish in the purse seine nets of vessels that fish on FADs and on unassociated schools". If eventually developed and used, such sorting grids could reduce the catch of bonitos.

The process for regular updates of catches, overviews of fishery developments and the adoption of Resolutions for other tuna species by the IATTC is indicative of a strategy that would be responsive and lead to appropriate measures if they became required for bonito tunas.

This meets the requirements of the SG 60, SG 80, and SG 100 levels. Because of the limited information available on the catches of the fleet, it is unknown if the fishery interacts with additional secondary species. The team will employ a qualitative information-gathering process during the site visit to determine whether there are any additional secondary species unaccounted for in the logbooks (MSC FC v2.1 GSA3.4.2). This may impact scoring in all SIs of this PI. The RBF approach may be employed if necessary. For now the scoring of this PI is based on recorded species.

b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
None of the bycatch species have been considered to be 'main' and therefore a strategy for main secondary species is not necessary to meet SG60 and SG80 requirements which are met by default.

There is some objective basis for confidence that the strategy that is in place will work from the large amount of information that has been collected showing that there is minimal catch of minor secondary species. Also, preliminary results of the sorting grid research and development of non-entangling FADs show promise but additional research is required. There has been no formal testing of the strategy, however, and in particular no evaluation of the post-release survival of the discarded component of the catch

On this basis, requirements at the SG100 level are not met.

US Small PS UoA

Eastern Pacific and striped bonito tuna: The strategy identified for bonito tunas is the IATTC monitoring and assessment framework that is considered to be able to identify the need for measures should they be required and lead to their implementation. Experience with other tuna conservation measures in the EPO provides some objective basis for confidence that this would work. This meets the requirements of the SG 60 and SG 80 levels.

Without specific measures to evaluate, however, there can be no guarantee that the current level of mortality of bonito tunas in free school sets would be maintained. Therefore, there is not a high confidence that this strategy will work and therefore the requirements of the SG 100 level are not considered to be met.

c	Management strategy implementation			
	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
FADs and Free School: Resolution C-04-05 (Rev 3) (IATTC 2019) is considered to represent a strategy that is in place to manage the impact of the fishery on bycatch and to maintain the current very low level of impact. It contains the requirements (among others):

- Require fishermen on purse-seine vessels to promptly release unharmed, to the extent practicable, all sharks, billfishes, rays, dorado, and other non-target species and
- Encourage fishermen to develop and use techniques and equipment to facilitate the rapid and safe release of any such animals.

While data from the observer programs demonstrate the catch of minor secondary species is low (<1%), a significant portion of the catch is retained regardless of flag (Ecuador, Panama, and US) or set type (FAD and free school). For FAD sets, 95% of billfish caught are retained, while 78% and 7% of large fish and small fish caught, respectively, are retained. Dolphinfish and wahoo comprise the majority of large fish retained, while filefish and triggerfish comprise the majority of small fish retained. For free school sets, 88% of billfish caught are retained, while 80% of large fish and 36% of small fish caught, respectively, are retained. On this basis, requirements at the SG80 and SG100 levels are not met.

US Small PS UoA
The strategy outlined above to manage the impact of the fishery on bycatch, and to maintain the current very low level of impact, apply to this UoA. While the catches are relatively small, totalling approximately 248 ST from between 2016 and 2018, based on the logbooks provided, 100% of the catch is retained. On this basis, requirements at the SG80 level are met. Because of the limited information available on the catches of the fleet, it is unknown if the fishery interacts with additional secondary species and on this basis the SG 100 level is not met.

d	Shark finning

	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Tunacons UoAs (Free and FAD sets) *Ecuador UoA:*Yes *Panama UoA:* Yes *USA UoA:* Yes US Small PS UoA: Yes	Tunacons UoAs (Free and FAD sets) *Ecuador UoA:* No *Panama UoA:* No *USA UoA:* No US Small PS UoA: No	Tunacons UoAs (Free and FAD sets) *Ecuador UoA:* No *Panama UoA:* No *USA UoA:* No US Small PS UoA: No
Rationale				

Tunacons (Free and FAD sets) UoAs:

The only data available to the assessment team on the level of shark finning comes from the Committee for the Review of Implementation of Measures Adopted by the Commission. Historical data, dating back to 2009, indicates that shark finning incidents were observed in Ecuadorian-flagged vessels. The most recent report on compliance with the IATTC resolutions available to the team was for 2016 (COR-08-03), which indicates that "In 2016, there was only one case of shark mutilation or " desalting " (cutting the fins and discarding the rest of the body of the animal) that contravened that provision, that of the Peruvian ship […]"

More recent publically available reports from IATTC do not provide updated figures for the number of sharks finned nor any data on the level of compliance with C-05-03, or any other IATTC resolution. Since 2012, the reports constitute minutes of the annual Meeting of the Committee for the Review of Implementation of Measures Adopted by the Commission (See IATTC-COR (2012) – IATTC-COR (2019)) and provide no detailed information on sharks. It was noted in the minutes of the 2014 report (IATTC-COR 2014) "that information on sharks is limited, and that it is worrying that there are few reports from CPCs on compliance with Resolution C-05-03." The lack of transparency about CPCs compliance with their obligations to IATTC resolutions and sufficient independent evidence on compliance with Resolution C-05-03 by the UoA, makes scoring difficult. Given flag states may have different policies regarding shark finning, including monitoring and enforcement, this SI is scored by flag.

Ecuador

While there is historical evidence of shark finning on Ecuadorian vessels, recent observer data (2015-2018) reported no shark finning events. Of the 31 Ecuadorian flagged vessels 21 are Class-6 purse seiners, requiring 100% observer coverage of all fishing trips. The remaining 10 vessels are not obligated to carry observers, however, observer data was provided for these vessels for the years 2015-2018 (or some portion of these years). What is not clear is whether these data constitute 100% of their fishing trips. Also, there were significant inconsistencies in the observer data pertaining to sharks, and for many species the sum of retained catch and discarded catch did not equal the total reported catch.

Other than observer data, no other independent data is available to validate that shark finning is not occurring. Domestically Ecuador has banned fishing for sharks in all Ecuadorian waters, but sharks caught outside of their EEZ may be landed if caught incidentally (bycatch). Additionally, sharks that are landed must have all fins attached and a previous ban on trade in shark fins was lifted in 2007. Although regulations banning shark finning are in place there is no evidence to verify compliance nor does there appear to be a transparent process in place to deal with non-compliance.

The team considered that the 100% observer coverage of large purse seine vessels (class size 6) and observer coverage of smaller purse seine vessels (class size 3-5), provides some external validation to demonstrate that shark finning is not occurring, additionally there are regulations in place requiring the landing of all sharks with fins naturally attached (MSC FCP v2.1 GSA2.4.5 – GSA2.4.7). The SG60 is met. Because the team does not have

access to recent information on compliance on requirements related to shark finning, it cannot be said that the SG80 is met.

Panama
There is no historical evidence of shark finning on Panamanian vessels, and contemporary observer data based on 100% observer coverage does not report any shark finning activity. Unfortunately, there is no other independent information to corroborate finning is not taking place. Domestic regulations in Panama prohibit shark fishing in all Panamanian waters, while industrial fishers operating outside their EEZ must land all sharks with fins attached naturally. Artisanal fishers may land the fins separately, but the weight ratio must be no more than 5% fins to whole weight of sharks.

The team considered that the 100% observer coverage of large purse seine vessels (class size 6), provides some external validation to demonstrate that shark finning is not occurring, additionally there are regulations in place requiring the landing of all sharks with fins naturally attached (MSC FCP v2.1 GSA2.4.5 – GSA2.4.7). The SG60 is met. Because the team does not have access to recent information on compliance on requirements related to shark finning, it cannot be said that the SG80 is met.

US
There is no historical evidence of shark finning on US vessels, and contemporary observer data based on 100% observer coverage does not indicate shark finning activities. Unfortunately, no other independent data is available to corroborate finning is not taking place. Domestic regulations apply to US vessels in the UoA and provisions enforced through the Shark Finning Prohibition Act of 2000 which amended the Magnesson Stevens Act to prohibit shark finning in the United States. The law prohibits any person under U.S. jurisdiction from engaging in the finning of sharks, possessing shark fins aboard a fishing vessel without the corresponding carcass, and landing shark fins without the corresponding carcass. The Shark Finning Prohibition Act also requires NOAA Fisheries to provide the US Congress with an annual report describing efforts to implement the law. The Shark Conservation Act of 2010 was signed into law, amending the High Seas Driftnet Fishing Moratorium Protection Act and the MSA, and requires all sharks in the United States, with the exception of smooth dogfish, to be brought to shore with their fins naturally attached. While significant regulations, including reporting requirements and sanctions are in place, there is still no independent evidence that shark finning is not taking place. The Team considers independent verification to be paramount to the scoring of this SI and on this basis requirements at the SG60 level are met.

US Small PS UoA
Domestic regulations apply to US vessels in the UoA and provisions enforced through the Shark Finning Prohibition Act of 2000 which amended the Magnusson Stevens Act to prohibit shark finning in the United States. The law prohibits any person under U.S. jurisdiction from engaging in the finning of sharks, possessing shark fins aboard a fishing vessel without the corresponding carcass, and landing shark fins without the corresponding carcass. The Shark Finning Prohibition Act also requires NOAA Fisheries to provide the US Congress with an annual report describing efforts to implement the law. The Shark Conservation Act of 2010 was signed into law, amending the High Seas Driftnet Fishing Moratorium Protection Act and the MSA, and requires all sharks in the United States, with the exception of smooth dogfish, to be brought to shore with their fins naturally attached. The State of California, where these UoA vessels offload, also have strict laws prohibiting shark finning and require all sharks to be landed with fins naturally attached. Additionally, the California Department of Land and Natural Resources conducts inspections of catches from US vessel and there are no reports of UoA vessels conducting shark finning activities. All catch from the UoA must be offloaded in California, and therefore, is subject to intermittent California DLNR monitoring and surveillance efforts.

The team considered the current regulations, including reporting requirements and sanctions, as well as intermittent port monitoring and no evidence of shark finning. The SG 60 level is met. Because there is no observer data and logbooks contain no information on non-target catches, the SG 80 level is not met.

e	Review of alternative measures to minimise mortality of unwanted catch			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all secondary species, and they are implemented, as appropriate.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: No
Rationale				

Tunacons (Free and FAD sets) UoAs:
FADS and Free School: None of the bycatch species have been considered to be 'main' and therefore there are no unwanted catch of main secondary species. SG60 and SG80 are met by default.

The IATTC Working Group on Bycatch meets annually to discuss results of ongoing bycatch mitigation research conducted by CPCs, improvements in monitoring, and perspectives for future research. The working group also provides recommendations to the SAC and Commission based on research findings.

IATTC staff and CPCs annually develop and update multi-year research plans that cover a variety of projects aimed at reducing UoA related mortality of unwanted catch. Key projects include the development and testing of sorting grids to reduce catches of juvenile bigeye tuna and other small fish, as well as the development and testing of non-entangling and biodegradable FADs. TUNACONS recently entered into a strategic alliance with IATTC for scientific and technical cooperation in projects that strengthen the sustainable management of tuna populations in the EPO and for the implementation of a pilot test project of FADs built with degradable materials.

To build capacity, promote communication, and review protocols to minimize mortality of unwanted catch, TUNACONS hosts training workshops with fishers about the IATTC regulations, proper handling of bycatch, and how to test the EcoFAD prototypes. The workshops provide a mechanism to gather input from fishers on EcoFAD design and testing protocols. TUNACONS also hosts focused workshops to exchange experiences and advance research, the most recent being the International Workshop On Experiences Of The Use Of The Sorting Grid in April 2018.

The ISSF routinely host Skipper Workshops as a platform for scientists and fishers to openly discuss fishing operations and for scientists to pass on information about best practices. Since the first workshop in 2009, skippers and fisheries scientists have been engaging through workshops to improve the sustainability standards in tropical tuna purse seine fisheries across the world. Over 100 workshops have taken place in 5 continents, covering vessels from more than 25 flag states. Ecuador hosted its first workshop in 2010, and since 2012 hosted workshops annually. The 2019 workshop attracted 173 participants, 70 skippers, 96 crew members, and 7 fleet representatives/managers.

While there are regular reviews of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch, a score of SG 100 requires that the alternative measures

also be implemented as appropriate. Key research activities identified in the IATTC research plans to reduce the catch of unwanted secondary species (sorting grids and EcoFADs) are moving forward, research to estimate post release mortality of secondary species is not conducted. On this basis the SG 100 level is not met. US Small PS UoA TUNACONS UoA Bonito tuna is the only main secondary species and based on logbook data the total catch is retained. It is unclear at this time if any measures to reduce the catch of bonito tuna are implemented. Also, since there is no observer data there could potentially be additional secondary species.
References
IATTC-COR 2010, IATTC-COR 2012, IATTC-COR 2013, IATTC-COR 2014, IATTC-COR 2015, IATTC-COR 2016, IATTC-COR2017, IATTC-COR 2018, IATTC-COR 2019, IATTC 2006, Hinton et al. 2014

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets Ecuador - 60-79 Panama - 60-79 US – 60-79 Tunacons FAD sets Ecuador - 60-79 Panama - 60-79 US – 60-79 US Small PS UoA - 60-79
Information gap indicator	Provide documentation supporting compliance with shark finning regulations, including Most recent report on compliance with IATTC measures in 2018 Alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species for the US-based fleet

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guide post	Qualitative information is adequate to estimate the impact of the UoA on the main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and adequate to assess the impact of the UoA on main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and adequate to assess with a high degree of certainty the impact of the UoA on main secondary species with respect to status.
	Met?	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: NA
Rationale				
Tunacons (Free and FAD sets) UoAs: There are no main secondary species. Thus, SG100 is met by default. **US Small PS UoA** Eastern Pacific and striped bonito: The catch of Eastern Pacific and striped bonito is recorded in logbooks so some quantitative information is available. This meets the requirements of the SG 60 and SG 80 levels. There is not verifiable information on catches such that the consequences on the population can be assessed. Data on retained catch are recorded but assessments of status are not attempted so it has not been demonstrated whether the information collected is sufficient to determine their status. RBF will be employed to score this element.				
b	Information adequacy for assessment of impacts on minor secondary species			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary

				species with respect to status.
	Met?			Tunacons Free sets: Yes Tunacons FAD sets: Yes US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
FADs and Free School: While a wide range of species are caught by the UoA (more so in FAD sets), catches are relatively small (< 1%). Catch monitoring in the UoA is accomplished through mandatory and voluntary observer programs providing information on removals. There is good information from the high level of observer coverage on vessels in the UoA (requirement is for 100% coverage for class 6 vessels, and voluntary for smaller vessels), and comprehensive catch data from logbooks and landings records. This provides quantitative data on the FADS and Free school sets. This provides quantitative data that is adequate to demonstrate, the low impact of the UoA on them. Therefore, the SG100 requirements are met.

US Small PS UoA
No at-sea information is collected for this fishery. Therefore, it cannot be said that some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status. SG100 is not met.

c	Information adequacy for management strategy			
	Guide post	Information is adequate to support measures to manage main secondary species.	Information is adequate to support a partial strategy to manage main secondary species.	Information is adequate to support a strategy to manage all secondary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: Yes	Tunacons Free sets: No Tunacons FAD sets: No US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
FADs and Free School: None of the bycatch species have been considered to be 'main' and therefore a strategy for main secondary species is not necessary to meet SG60 and SG80 requirements which are met by default.

The information available is provided by the 100% observer coverage of large purse vessels (vessel class 6), as well as voluntary observer coverage of small purse seine vessels (vessel class 3-5), which records details of all retained and discarded catches. Despite information from small purse seines vessels there is no data to verify what proportion of their fishing effort is monitored and information on post release mortality of released secondary species is not available. On this basis, requirements at the SG 100 level are not met.

US Small PS UoA

Eastern Pacific and striped bonito: Ortega-Garcia and Jakes-Cota (2019) conducted an exploratory analysis of available data on Pacific bonito (Sarda chiliensis lineolata) in the North Pacific Ocean. While a number of uncertainties in available data were identified and information required for formal stock assessment models is not available, the authors did conclude that information to support development of simple indicators of stock status can proceed. We view the development of indicators as a partial strategy and this meets the requirements at the SG 80 level, but not at the SG 100 level for bonito.	
References	
IATTC 2019 Ortega-Garcia and Jakes-Cota 2019 (https://www.iattc.org/Meetings/Meetings2019/SAC-10/INF/_English/SAC-10-INF-J_Pacific%20bonito.pd	
Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA: TDB - RBF
Information gap indicator	More information on observer coverage rates of small purse seine vessels is sought. Additionally, information describing the observer program is required. RBF will be used to assess scores for US small PS.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Effects of the UoA on population/stock within national or international limits, where applicable			
	Guide post	Where national and/or international requirements set limits for ETP species, the effects of the UoA on the population/ stock are known and likely to be within these limits.	Where national and/or international requirements set limits for ETP species, the combined effects of the MSC UoAs on the population /stock are known and highly likely to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a high degree of certainty that the combined effects of the MSC UoAs are within these limits.
	Met?	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA	Tunacons Free sets: NA Tunacons FAD sets: NA US Small PS UoA: NA
Rationale				
Tunacons (Free and FAD sets) UoAs: Limits have not been established for ETP species caught by UoA vessels. IATTC has international requirements for set limits regarding dolphin species in the RFMO. No dolphins were identified as captured by the UoA, however, the absence of marine mammal interactions will be followed up at the onsite. The IATTC has placed international set limits for silky sharks, but this only applies to longline vessels and not the UoA. At this time, SI a is scored as NA. **US Small PS UoA** There are no limits established for ETP species.				
b	Direct effects			
	Guide post	Known direct effects of the UoA are likely to not hinder recovery of ETP species.	Direct effects of the UoA are highly likely to not hinder recovery of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles:* Yes *Sharks: No* *Mobuid Rays:* Yes US Small PS UoA: RBF will be employed, no scores available at ACDR	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No US Small PS UoA: RBF will be employed, no scores available at ACDR

Rationale

TUNACONS UoA

Tunacons (Free and FAD sets) UoAs:

Given different interaction rates between FAD and free-school, these sets have been evaluated separately for this PI. For the purposes of scoring, ETP species are those protected by IATTC resolutions and interacting with the UoA, and includes 5 species of sea turtles (green, olive ridley, loggerhead, leatherback and hawksbill turtles), 6 species of sharks (silky shark, great hammerhead shark, smooth hammerhead shark, scalloped hammerhead shark, whale shark, and oceanic whitetip shark), and 1 species of mobulid rays (giant manta ray). As no marine mammals interactions were reported by UoA vessels from 2015 – 2018, scoring will only focus on sharks, rays, and turtles. The reported catch of all ETP species by UoA vessels was consistently low, each species accounting for < 0.1% of the total UoA catch.

Sea Turtles:

While FAD sets and free school sets interacted with all 5 species, more interactions were observed in FAD sets (N=689) compared with and free school sets (N=148). Regardless of set type, approximately 50% of interactions involved green turtles, olive ridley turtles, and loggerhead turtles, while 45% of the interactions were not identified to the species level. Interactions with FAD sets resulted in 9 mortalities (1 green turtle, 1 leatherback turtle, 2 loggerhead turtles, 3 olive ridley, and 2 unidentified sea turtles) and interactions with free school sets resulted in 4 mortalities (2 olive ridley turtles and 2 unidentified sea turtles).

Based on the observer data the effects of the fishery are considered known for all species and the mortalities of one green turtle and two loggerhead turtles are likely not to hinder their recovery. Green turtle nesting trends in the EPO have been increasing since the early 1990s, while nesting trends for loggerhead in the Pacific ocean have been relatively stable since the 1990s. Olive ridley turtles are the most abundant sea turtle species in the EPO (> 6,000,000 animals; IATTC SAC-08-INF C (2017)) and the mortalities of 5 olive ridley turtles is likely not to hinder their “recovery”. Leatherback turtles are classified as critically endangered on the IUCN Red List and while all nesting beach trends (number of nesting females) have similar declining patterns since 2002, current abundance levels are low and vary by rookery (ranging from 20 to 150). The mortality of one leatherback by the UoA over 4 years is likely not to hinder the recovery of this species. Therefore, it cannot be said that direct effects are highly unlikely to hinder impacts of ETP species. On this basis, the SG 60 and SG 80 levels are met.

Sharks:

While FAD sets and free school sets interacted with all 6 ETP shark species, most interactions were observed in FAD sets (N=20,972) compared with and free school sets (N=714) between 2015 and 2018, and the majority of interactions involved silky sharks. The reported catch of all ETP shark species by UoA vessels was consistently low, each species accounting for < 0.1% of the total UoA catch.

A total of 8 whale shark interactions were observed between 2015 and 2018 in each fishing set type (FAD and free school). All whale sharks caught in free school sets were released alive and one mortality was reported from FAD sets. A total of 263 scalloped hammerhead shark interactions were observed in FAD sets, and 20 mortalities were reported. Within free school sets 19 interactions with scalloped hammerhead sharks were observed and 2 mortalities reported. A total of 476 smooth hammerhead shark interactions were observed in FAD sets and 29 mortalities reported. Within free school sets 18 interactions with smooth hammerhead sharks were observed and 5 mortalities reported. A total of 10 great hammerhead shark interactions were observed in FAD sets and one mortality reported. Within free school sets 3 interactions with great hammerhead sharks were observed and no mortalities reported. A total of 104 oceanic whitetip sharks’ interactions were observed in FAD sets, 16 mortalities reported. Within free school sets 11 interactions with oceanic whitetip sharks were observed, and 3 mortalities reported. A total of 20,587 interactions with silky shark were observed in FAD sets, and 1,484 mortalities reported. Within free school sets 683 interactions were observed, and 33 mortalities reported. Based on the reported direct effects for the UoA, the effects of the fishery on ETP shark species are

therefore known and considered negligible. The SG 60 level is met. Due to inconsistencies in observer data described below the SG 80 and SG 100 levels are not met.

Mobulid Rays

Interactions with the giant manta was greatest in free school sets compared to FAD sets (54 interactions in free school sets, 7 interactions in FAD sets). Of the 54 observed interactions in free school sets, 10 animals were discarded alive and the fate of the remaining 44 animals is unknown. Of the 7 observed interactions in FAD sets, all were released alive Observe annual interactions in the UoA are significantly lower than average annual number of interactions observed in EPO purse seine fisheries between 1993 and 2016 (Stewart et al 2018). On average annual interactions by the UoA constitute approximately < 0.1% of the total purse seine interactions in the EPO. Based on the reported direct effects for the UoA, the effects of the fishery on ETP mobulid species are therefore known and considered negligible. On this basis the SG 60 level is met.

Due to inconsistencies with the observer data that impacts FAD and free school sets, the assessment team is unable to determine if the direct effects of the UoA are highly likely to not hinder recovery of shark and mobulid ETP species. For many ETP shark species and giant manta the sum of reported discarded and retained animals did not equal the total reported catch. For some species the difference was significant, and the actual direct effects could be substantially higher. The issue is particularly concerning for silky shark where the fate (retained or discarded) of 11,771 animals caught in FAD sets and 465 animals caught in free schools sets in unknown. In addition, the impacts of post release mortality associated with the discarding of ETP species by the UoA is unknown as is entanglement of ETP species in the FAD. For the giant manta, the issue was limited to free schools sets. On this basis, the SG 80 and SG 100 levels for ETP sharks caught by free school sets and FAD sets are not met. For the giant manta the SG 80 level for FAD sets is met but not the SG 100 level. For free school sets the SG 80 and SG 100 levels are not met for the giant manta..

US Small PS UoA

Observers are not required on UoA vessels and logbooks only record catches of tuna species. Therefore, the direct effects of the UoA are unknown. RBF will be used to score this PI at the onsite. Given the catch information for the UoA above, SG60 is tentatively believed to be met. Scoring is subject to change based on RBF outcome.

c	Indirect effects			
	Guide post		Indirect effects have been considered for the UoA and are thought to be highly likely to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the UoA on ETP species.
	Met?		Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: Yes	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No
Rationale				

Tunacons (Free and FAD sets) UoAs:
Sea turtles: There are no obvious mechanisms whereby FAD and free school sets would have any measurable indirect impacts on sea turtles.

Sharks: There are no obvious mechanisms whereby FAD and free school sets would have any measurable indirect impacts on sharks.

Mobulid rays: There are no obvious mechanisms whereby FAD and free school sets would have any measurable indirect impacts on mobulid rays.
This meets the requirements of the SG80 and SG100 levels.

US Small PS UoAs with the large purse-seine fleet, there are no obvious mechanisms whereby free school sets would have any measurable indirect impacts on ETP species. However, as observers are not required on UoA vessels and logbooks only record catches of tuna species, there is not a high degree of confidence that there are no significant detrimental indirect effects of the UoA on ETP species. SG100 is not met. Scoring subject to change based on RBF results.

References

IATTC SAC-08-INF C (2017), Stewart et al 2018

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Tunacons Free sets : 60-79 Tunacons FAD sets 60-79 US Small PS UoA: TDB - RBF
Information gap indicator	TUNACONS UoA: More information sought on protected species training requirements, quality assurance/quality control protocols for observer data, and shark retention policies. US Small PS UoA: Documentation on ETP species interactions is required or verification that no interactions occur. Documentation on catches besides tuna and ETP species is required to assess indirect effects.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

TUNACONS FAD sets

Element	SI a	SI b	SI c	Element score	PI score
Sea Turtles	N/A	80	100	90	**75**
Sharks	N/A	60	100	70	
Rays	N/A	80	100	90	

TUNACONS Free School Sets

Element	SI a	SI b	SI c	Element score	PI score
Sea Turtles	N/A	80	100	90	**70**
Sharks	N/A	60	100	70	
Rays	N/A	60	100	70	

PI 2.3.2 – ETP species management strategy

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** - **meet national and international requirements;** - **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place (national and international requirements)**			
	Guide post	There are measures in place that minimise the UoA-related mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Tunacons Free sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA Tunacons FAD sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA US Small PS UoA: NA	Tunacons Free sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA Tunacons FAD sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA US Small PS UoA: NA	Tunacons Free sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA Tunacons FAD sets: *Sea Turtles:* NA *Sharks:* NA *Mobuid Rays:* NA US Small PS UoA: NA
Rationale				
Limits have not been established for ETP species caught by either the large purse-seine fleet or the small US purse-seine fleet.				
b	**Management strategy in place (alternative)**			
	Guide post	There are measures in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a strategy in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a comprehensive strategy in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species.
	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No*

		Sharks: Yes *Mobuid Rays:* Yes US Small PS UoA: Yes	*Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No	*Sharks:* No *Mobuid Rays:* No US Small PS UoA: No
Rationale				
Tunacons (Free and FAD sets) UoAs: There are a range of established measures within IATTC that form a strategy for managing the fishery's impact on sharks, rays, turtles, sea birds and marine mammals. These measures include non-retention policies, 100% observer coverage (on Class 6 vessels), skipper training, detailed release procedures, requirements for the carriage and use of specific equipment to aid release, and formal reporting requirement. Also, limits on the number of active FADs that can be deployed at any one time have been established based on vessel size. Sea Turtles: IATTC Resolutions C-19-04, C-04-05 (Rev 3) and C-07-03 are designed to mitigate the impact of tuna fishing vessels on sea turtles by requiring CPCs to implement a range of measures to reduce the incidental catch and promote the survival of those that were caught. Sharks: IATTC Resolutions C-19-05, C-19-06, C-16-04, C-11-10, and C-05-03 are designed to mitigate the impact of tuna fishing vessels on sharks by requiring CPCs to implement a range of measures to reduce the incidental catch, restrict retention and finning, collect scientific data, and promote the survival of those that were caught. Mobulid Rays: IATTC Resolution C-15-04 is designed to mitigate the impact of tuna fishing vessels on mobulid rays by requiring CPCs to implement a range of measures to reduce the incidental catch, restrict retention, collect scientific data, and promote the survival of those that were caught. These activities and measures outlined in the resolutions constitute a comprehensive strategy designed to provide protection consistent with national and international requirements, while at the same time advancing our understanding of fishery interactions and ecological requirements of ETP species. This meets the requirements of the SG 60 and SG80 levels. Evidence of testing of the strategy was not provided thus the SG100 is not met. **US Small PS UoA** Measures outlined above for the TUNACONS UoA apply here when fishing in the IATTC Commission area. In addition, UoA vessels are required to follow measures established through the NMFS in accordance with the MMPA, MSA, and ESA (if applicable). Observers are not required on the UoA vessels and there is no information of ETP interactions. Logbooks only record catches of tuna species and are insufficient to assess interactions with non-tuna species. Without knowing the extent of ETP interactions, we do not consider there to be a strategy in place. On this basis, requirements for the SG 60 level are met but not the SG 80 and SG 100 requirements.			
c	**Management strategy evaluation**			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the measures/strategy will work, based on information directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.

	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No* *Sharks: No* *Mobuid Rays:* No US Small PS UoA: No
Rationale				
Tunacons (Free and FAD sets) UoAs: Sea Turtles, Sharks, and Mobulid Rays: Conservation measures aimed at reducing ETP interactions with fisheries and ensuring their survival upon release have been adopted internationally by all tuna RFMOs. Reducing the removal of animals from populations generally benefits the population and is the rationale behind many of the conservation measures. These measures are considered likely to work based on theory, as well as past experience; requirements for the SG60 level are met. Established measure within the IATTC have been established and applied directly to the UoA, including non-retention policies, 100% observer coverage (on Class 6 vessels), skipper training and workshops, detailed release procedures, requirements for the carriage and use of specific equipment to aid release of ETP species, and formal reporting requirement. In addition, limits on the number of active FADs that can be deployed at any one time have been established based on vessel size and applied to the UoA. These activities and measures applied to the UoA constitute a strategy, and provide an objective basis that the strategy will work; requirements at the SG80 level are met. The strategy has not been tested through quantitative analysis (i.e., MSE analyses) to assess the utility of the measures/activities. On this basis, SG100 is not met. **US Small PS UoA** Conservation measures aimed at reducing ETP interactions with fisheries and ensuring their survival upon release have been adopted internationally by all tuna RFMOs and form the basis for US policies. Reducing the removal of animals from populations generally benefits the population and is the rationale behind many of the conservation measures. These measures are considered likely to work based on theory, as well as past experience; requirements for the SG60 level are met. Since no observer data has been collected and logbooks only record information on tuna catches we do not know what other species are being caught. On this basis, requirements at the SG 80 and SG 100 levels are not met.				
d	**Management strategy implementation**			
	Guide post		There is some evidence that the measures/strategy is being implemented successfully.	There is clear evidence that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b).

	Met?		Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No* *Sharks: No* *Mobuid Rays:* No US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
Sea Turtles, Sharks, and Mobulid Rays: Evidence that elements of the strategy are being implemented successfully includes the collection and submission of observer records from all large purse seine vessel (class 6) trips and some trips associated with smaller purse seine vessels (class 3-5), as well as participation by UoA vessel captains and crew at skipper workshops conducted annually in Ecuador by ISSF, and adoption of best practices by the UoA. On this basis SG 80 is met.

Little documentation was provided by the client as evidence that all measures and elements of the strategy are being implemented successfully. Numerous infractions have been noted for Ecuador purse seine vessels and discussed during meetings of the International Review Panel. These reports are no longer available which speaks to the lack of transparency. In its 2017 Report to Congress, National Marine Fisheries Service (NMFS) identified Ecuador as having been engaged in IUU fishing based on reported violations of international conservation and management measures during 2014, 2015, and 2016. In its 2019 report to Congress, NMFS identified Ecuador as undermining the effectiveness of conservation and management measures required by IATTC by failing to comply with its measures. While there has been 100% observer coverage on class-6 purse seine vessels in the UoA and some coverage on smaller vessels, there are major inconsistencies in the observer program that impact estimates of total mortality for ETP shark, sea turtles, and mobulid ray species. For many of these species the sum of reported discards and retained animals does not equal the reported total catch. In addition, the fate (alive or dead) of discarded animals is not consistently reported, dispite a provision in numerous IATTC resolutions requiring this information to be reported. On this basis, there is evidence that the strategy is not being implemented successfully, SG100 is not met.

US Small PS UoA
Since there is no observer data and logbooks are not recording interactions with non-tuna species, there is no evidence that the measures are being implemented successfully. Requirements at the SG 80 and SG 100 levels are not met.

e	**Review of alternative measures to minimize mortality of ETP species**			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No

		Mobuid Rays: Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: Yes	*Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: Yes	*Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No US Small PS UoA: No

Rationale

Tunacons (Free and FAD sets) UoAs:
Sea Turtles, Sharks, and Mobulid Rays:: The IATTC Ad Hoc Working Group on FADs is tasked with reviewing and recommending methodologies/technologies to the full commission on the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of target species and non-target species. An example is the research on grids to minimize the catch on unwanted target and non-target species. The working groups meets annually, the first 1st meeting occurring in 2016. Conclusions and recommendations are presented during annual meeting of the IATTC Commission for further discussion and consideration. Thus, requirements for SG 60 and SG 80.

US Small PS UoA
The same processes described above for the TUNACONS UoA apply here. Additionally, regular reviews are conducted within the US Government to assess utility and implementation requirements of alternative measures.
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References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets >80 Tunacons FAD sets >80 US Small PS UoA: 60-79
Information gap indicator	Both UoAs: More information is sought on the procedures and policies regarding infractions. Also, protocols for the observer program and coverage rates are requested, as well as documentation explaining why there are inconsistencies in the observer records.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.3.3 – ETP species information

PI 2.3.3		Relevant information is collected to support the management of UoA impacts on ETP species, including: - Information for the development of the management strategy; - Information to assess the effectiveness of the management strategy; and - Information to determine the outcome status of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts**			
	Guide post	Qualitative information is adequate to estimate the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for ETP species.	Some quantitative information is adequate to assess the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: RBF	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: RBF	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No* *Sharks: No* *Mobuid Rays:* No US Small PS UoA: RBF
Rationale				
Tunacons (Free and FAD sets) UoAs: Sea Turtles, Sharks, and Mobulid Rays: The information collected on ETP species from logbooks and by 100% observer coverage of both set types from large purse seine vessels and observer data from small purse seine vessels is sufficient to assess the UoA related mortality of sea turtles, sharks, and mobulid ray even with the observed inconsistencies in the observer data. By testing various assumptions about the ETP species with missing fate data (e.g., all dead, all alive, etc.) recovery risk profiles can be developed. On this basis, requirements for SG60 and SG80 are met. As a result of the inconsistencies with the observer data there is not a high degree of certainty with estimates of UoA-related impacts, mortalities and injuries, and subsequent consequences to ETP species. For all ETP species				

(sea turtles, sharks, and mobulid rays) approximately half of their observed total catch is not designated as retained or discarded, and for silky shark the number of interactions with no designation is 11,771 animals (57% of the total catch). On this basis, requirements at the SG100 level are not met.

US Small PS UoA
There is no observer data and logbook information is insufficient to qualitatively and quantitatively estimate the UoA related mortality on ETP species. RBF will be used to score this performance indicators. It is expected that SG80 will be met, as this degree of information is available for the species in the larger purse-seine vessel UoA. Score subject to change based on RBF outcome.

b	**Information adequacy for management strategy**			
	Guide post	Information is adequate to support measures to manage the impacts on ETP species.	Information is adequate to measure trends and support a strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Tunacons Free sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes Tunacons FAD sets: *Sea Turtles:* Yes *Sharks:* Yes *Mobuid Rays:* Yes US Small PS UoA: No	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No* *Sharks: No* *Mobuid Rays:* No US Small PS UoA: No	Tunacons Free sets: *Sea Turtles:* No *Sharks:* No *Mobuid Rays:* No Tunacons FAD sets: *Sea Turtles: No* *Sharks: No* *Mobuid Rays:* No US Small PS UoA: No

Rationale

TUNACONS UoA
ETP Species: Given that observer and logbook data will be required to develop trends and support a strategy, and recognizing the present limitations of the data set, the information is adequate to support measures to manage the impacts on ETP species. Thus, requirements at the SG 60 level are met. Due to the magnitude and breadth (impacting all ETP species) of inconsistencies in the observer data set, trends can not be adequately measured to support a partial or comprehensive strategy to manage impacts on ETP species Thus, requirements at the SG 80 and SG 100 levels are not supported.

US Small PS UoA
There is no observer data and logbook information cannot be determined to be adequate to support measures to manage the impacts on ETP species at this stage. This will be reviewed in greater detail at the onsite, however, currently the requirements at the SG 60 level are not met.

References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Tunacons Free sets 60-79 Tunacons FAD sets 60-79 US Small PS UoA: TDB - RBF
Information gap indicator	TUNACONS UoA: More information is sought on the observer program---administration, protocols, coverage, vessel selection, etc US Small PS UoA: documentation on non-tuna catches and interactions with ETP species are required.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.1 – Habitats outcome

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates		
Scoring Issue		SG 60	SG 80	SG 100
a	**Commonly encountered habitat status**			
	Guide post	The UoA is unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	TUNACONS UoA FADs: Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA FADs: Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA FADs: No Free school: Yes US Small PS UoA: No

Rationale

TUNACONS UoA

Free school: There is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to pelagic habitats. Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the fishery. The combination of 100% observer coverage, data from logbooks, VMS tracks of vessels and observer reports, provides good evidence that the fishery operates in areas and in a manner in which there is no serious or irreversible harm to habitats. This meets the requirements of the SG 60, SG 80 and SG 100 levels

FADs: The deployment of purse seine nets on FADs would never routinely contact demersal habitats and there is no potential for serious or irreversible harm to pelagic habitats from the use of this fishing gear (Brown 2016). Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the fishery. The combination of 100% observer coverage, data from logbooks, VMS tracks of vessels and observer reports, provides good evidence that the fishery operates in areas and in a manner in which there is no serious or irreversible harm to habitats.

However, there is potential for entanglement of animals in the trailing webbing of deployed FADs. This is of particular concern for ETP species. The magnitude of entanglements is presently unknown but research to assess the extent of entanglements is part of larger IATTC/CPCs research plans. On this basis, the SG60 and SG80 levels, but not the SG100 level.

US Small PS UoA

There is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to pelagic habitats. Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant

impacts on seabed habitats from the fishery. The fishery does not deploy FAD sets. However, due to the lack observer coverage and limited data from logbooks (tuna catch only) there is insufficient evidence to determine if the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.

This meets the requirements of the SG 60 and SG 80 levels but not the SG 100 level.

b	**VME habitat status**			
	Guide post	The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or ir reversible harm.
	Met?	TUNACONS UoA: FADs:Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes

Rationale

TUNACONS UoA

FADs: There is the potential for lost or derelict FADs becoming beached on coral reefs or drifting into marine protected areas/marine reserves, both considered to be VMEs. The spatial footprint of FAD fisheies in the EPO surrounds the Galapagos National Park and Marine Reserve, and also operate in the vicinity of other protected areas and coral reefs (Figure 13, Figure 14, Figure 15). Annual FAD deployments and retrievals recorded by observers up to 2017 in the EPO indicate a large increase in 2017 to well over 20,000. The number of FADs recovered has increased, but not in direct proportion to the increase in deployments, so the difference between deployments and recoveries has also grown significantly. This gap reflects a variety of situations: lost FADs, abandoned FADs, active FADs (including those entering the Western Pacific). While the exact number of lost FADs is unknown, the potential for them ending up in interacting with VMEs exists. These could be expected to cause some local damage at beaching sites, but these numbers would be unlikely to reduce structure and function of any coral reefs to a point where there would be serious or irreversible harm (meaning it would be unable to recover to at least 80% of its unimpacted structure, biological diversity and function within 5-20 years, if the impact were to cease entirely). Nevertheless, this issue has not been well studied, so evidence about the impact is minimal. Cumulative impacts over many years is a concern for which there is also insufficient information.

This meets the requirements of the SG 60 level but not of the SG 80 level.

Free School: No VMEs are affected by Free school sets so this scoring issue is not relevant.

US Small PS UoA

No VMEs are affected by the US small PS free school sets so this scoring issue is not relevant.

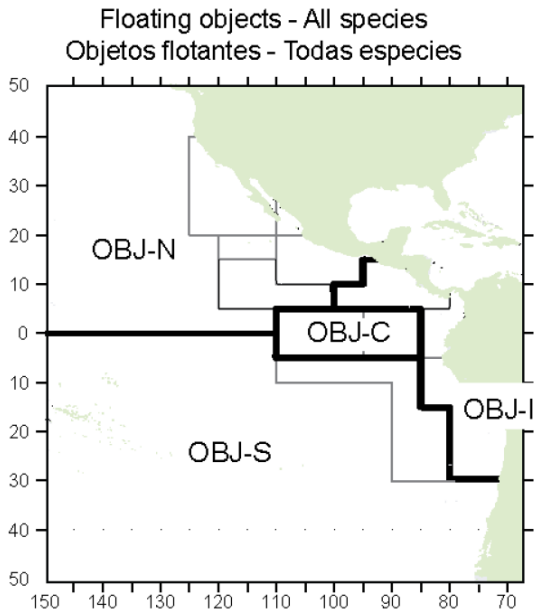


Figure 13 The floating object fisheries (OBJ) defined by the IATTC staff for analyses of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. OBJ-N is the northern floating object fishery, OBJ-S is the southern floating object fishery, OBJ-C is the central floating object fishery, and OBJ-I is the inshore floating object fishery

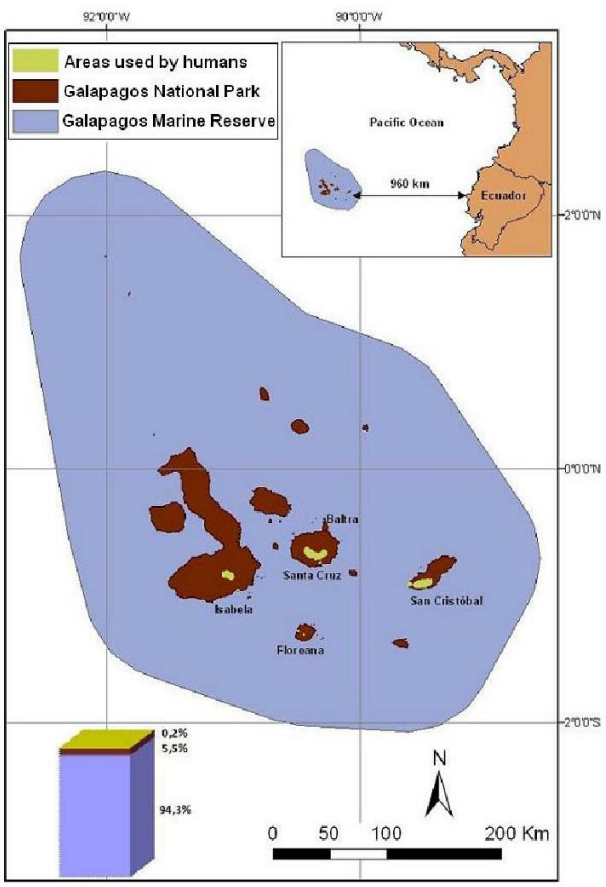


Figure 14 Map of the location of the Galapagos Islands, showing protected areas and areas used by humans (mostly agricultural zones).

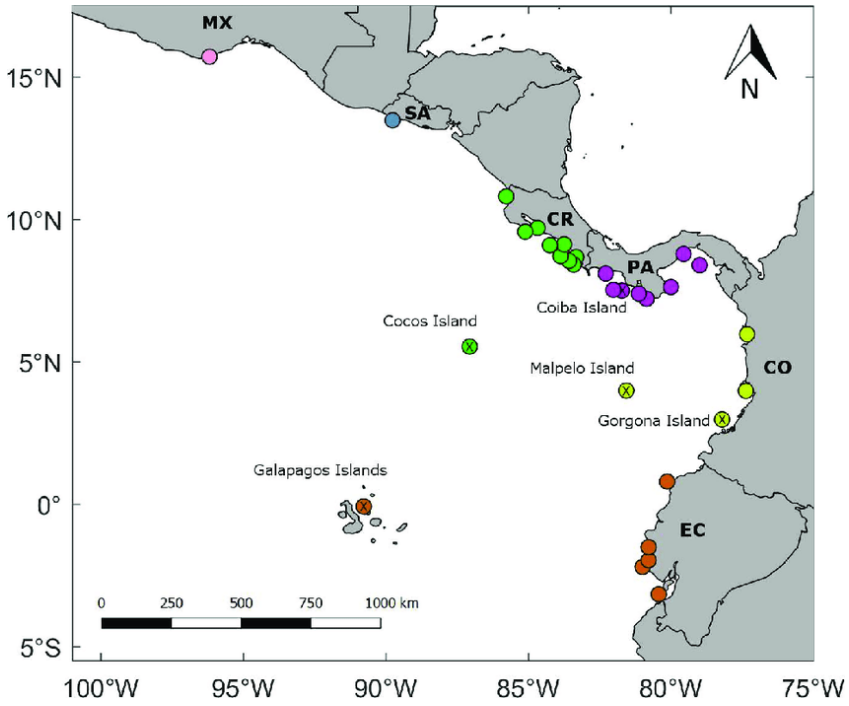
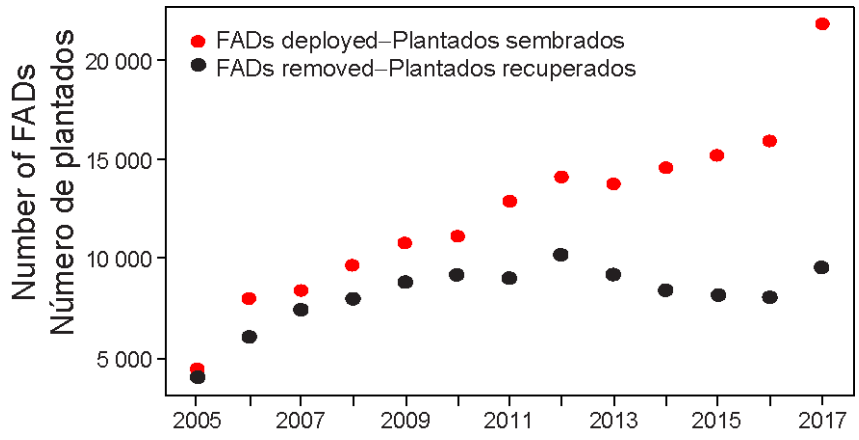


Figure 15 Marine protected areas (MPAs) with coral reef in the equatorial eastern Pacific region. MPAs color-coded by country. MPAs are marked with a cross inside the circle.



Number of FADs observed deployed and retrieved annually in the EPO, 2005-2017 (Hall and Roman 2019).

C	Minor habitat status

	Guide post			There is evidence that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA Free school - No

Rationale

TUNACONS UoA

FADs: The habitats of the area of the fishery have not been well studied. So, although we would consider it unlikely that the purse seine fishing on FADs or the FADs themselves could cause serious or irreversible harm to the structure and function of any benthic habitats, evidence in support of this is lacking. The requirements of the SG 100 level are therefore not met.

Free school: there is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to pelagic habitats (whether minor or not). Evidence is provided from the same sources (VMS, observer records and logbooks). This meets the requirements of the SG 100 level.

US Small PS UoA

Free school: There is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to pelagic habitats (whether minor or not). However, due to the lack observer coverage and limited data from logbooks (tuna catch only) there is insufficient evidence to determine if the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. On this basis, the requirements at the SG 100 level are not met.

References

Hall and Roman 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	TUNACONS UoA FADs: 60-79 Free School: > 80 US Small PS UoA >80
Information gap indicator	Information on the number of FADs used, lost, and their fates by the TUNACONS UoA is requested.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	TUNACONS UoA: FADs: Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: No

Rationale

FADs: Purse seine sets on FADs do not interact with any seafloor habitat during fishing operations and are not considered capable of affecting the epipelagic habitat. The requirement for 100% observer coverage provides confidence that catches are being appropriately reported by set type. This is considered to be a strategy that would ensure that any change to this situation would be detected.

The extent of habitat impacts from drifting FADs that become beached on shorelines or VMEs is unknown. Given the proximity of the fishery to the Galapagos Island Marine Reserve and other MPAs there is a high probability that derelict FADs will become beached on VMEs (see PI 2.4.1 b). While its highly unlikely that the beaching of FADs willcause unacceptable impacts, corroborating evidence is not yet available. There are restrictions on the number of active drifting FADs that can be deployed (IATTC Resolution C-17-02, MAP-SRP-2018-0061), a 72-day EPO-wide purse seine fishing closure period, and a time/area purse seine closure for 31 days west of the Galapagos Islands known as the “corralito” has been adopted. These are considered measures, all aimed at reducing exploitation rates on tropical tunas, and not directed at habitat protection and management.

In 2018 the Ecuadorian Governement developed a FAD management plan for its industrial tuna fleet which could advance knowledge about the possible impacts of FADs on habitats, ecosystems, and species. As part of the plan the UoA has taken the lead on developing new alternative materials to replace traditional FADs with biodegradable prototypes, or EcoFADs, that minimize the negative impact on the ecosystem. Since the plan was only recently enacted no information on implementation or compliance within the industrial tuna fleet, including the UoA, is available. Until information concerning implementation and compliance are available we consider provisions in the plan to constitute measures, but not a partial strategy. On this basis, this meets the requirements of the SG 60 level but not of the SG 80 and SG 100 levels.

Free School: There is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to the epipelagic habitat. Knowledge in relation to the way free school purse seine fishing gear is used, as well as the sea areas where the fleet operates (open ocean, deep waters), is sufficient to discount any significant impacts on seabed habitats from the fishery. The requirement for 100% observer coverage of large purse vessels and observer coverage on smaller vessels, combined with data from logbooks, VMS tracks of vessels and observer reports, provides a strategy that would ensure that any change to this situation would be detected.

On this basis, this meets the requirements of the SG 60, SG 80 and SG 100 levels.

US Small PS UoA

The UoA only fishes free school sets. There is no possibility that the fishery would routinely contact demersal habitats and no potential for serious or irreversible harm to the epipelagic habitat. Knowledge in relation to the way free school purse seine fishing gear is used, as well as the sea areas where the fleet operates (open ocean, deep waters), is sufficient to discount any significant impacts on seabed habitats from the fishery. However, the lack of observer data provides no verification that any change to this situation would be detected. SG80 is met as the 'if necessary' clause does not apply, but the lack of evidence prevents an SG100 score.

b	**Management strategy evaluation**			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or habitats involved.
	Met?	TUNACONS UoA: FADs- Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: No

Rationale

TUNACONS UoA

FADs: Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the operation of the fishing gear itself and purse seine sets are not considered capable of affecting the epipelagic habitat. The IATTC adopted measures for 100% coverage for large purse seine vessels (vessel class 6) and the UoA places observers on smaller vessels. This enables monitoring of the reporting of catches by set type, providing high confidence on information from the fishery.

For beached FADs that potentially impact shoreline habitats, including VMEs, without information on the exact number of drifting FADs in use, their rate of loss and their fates, we cannot assign a level of confidence. The measures outlined in si (a), while considered to likely work, have only recently been adopted and no data is available to assess confidence.

This meets the requirements of the SG 60 level, but not of the SG 80 and SG 100 levels.

Free school: Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the operation of the fishing gear and free school purse seine sets are not considered capable of affecting the epipelagic habitat. The IATTC adopted measures for 100% coverage of large purse seine vessels and the UoA places observers on smaller purse seine vessels. This enables monitoring of the reporting of catches by set type, providing confidence on information from the fishery. While no testing has been conducted it is not necessary to confirm this.

This meets the requirements of the SG 60, SG 80, and SG 100 levels.

US Small PS UoA
The UoA only fishes free school sets. Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the operation of the fishing gear and free school purse seine sets are not considered capable of affecting the epipelagic habitat. This meets requirements at the SG 60 level and SG80 as there is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved.

As observer data is lacking for this UoA and there has been no formal testing of measures to assess utility in achieving goals, there is not a high degree of confidence that the measures are working. Requirements at SG 100 levels are not met.

c	**Management strategy implementation**			
	Guide post		There is some quantitative evidence that the measures/partial strategy is being implemented successfully.	There is clear quantitative evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FAD: No Free school: Yes US Small PS UoA: No

Rationale

TUNACONS UoA
FADs: Information on the spatial extent and on the timing and location of purse-seine fishing gear is collected by at-sea observers (100% Observer coverage) and by VMS (100% coverage), and thus some quantitative information is being collected. However, data collected from these measures allow for bycatch estimation and not habitat impact evaluations. Data collection programs (or measures) to support habitat impact evaluations resulting from derelict or lost FADs landing on shorelines or VMEs have only recently been proposed and information on implementation, compliance and utility is not available. On this basis, requirements at the SG 80 and SG 100 levels are not met.

Free School: Purse seine free school sets do not interact with any seafloor habitat during fishing operations and free school purse seine sets are not considered capable of affecting the epipelagic habitat. Information on the spatial extent and on the timing and location of use of the purse-seine fishing gear is collected by at-sea observers (100% Observer coverage) and by VMS (100% coverage), and thus there is accurate monitoring that provides quantitative evidence of successful implementation in that all purse seine sets are correctly classified and required data are reported.

This meets the requirements of the SG 80 and SG 100 levels.

US Small PS UoA
The UoA only fishes free school sets. Knowledge in relation to the way purse seine fishing gear is used as well as the sea areas where the fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on seabed habitats from the operation of the fishing gear and free school purse seine sets are not considered capable of affecting the epipelagic habitat. Given that the purse-seine gear is known to not make

contact with the sea floor, it can be considered that some quantitative evidence to assess if the measures are being implemented successfully. However, because there is no observer confirmation of this it cannot be said there is clear quantitative evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a). SG 100 levels is not met.

d	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs**			
	Guide post	There is qualitative evidence that the UoA complies with its management requirements to protect VMEs.	There is some quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is clear quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	TUNACONS UoA: FADs - Yes Free school: Not Relevant US Small PS UoA: Not Relevant	TUNACONS UoA: FADs - No Free school: Not Relevant US Small PS UoA: Not Relevant	TUNACONS UoA: FADs - No Free school: Not relevant US Small PS UoA:Not Relevant

Rationale

<u>TUNACONS UoA</u>

FADs: Potential impacts from the UoA on VMEs are from derelict or lost FADs beaching on coral reefs or protected areas (e.g., marine reserve), and from fishing in marine reserves. There are no overarching management requirements to protect VMEs except for Ecuador's prohibition on industrial fishing in the Galapagos Islands Marine Reserve which spans 47,000 km^2, and there has been no evidence that the UoA is violating the prohibition. Other measures that effect the number of FADs deployed, and ultimately the number lost, is the 72-day purse seine closure period and limits on the number of activily deployed FADs based on vessel size. Again, there is no evidence that the UoA is not complying with these measures. We consider this to be qualitative evidence of compliance and requirements at the SG 60 level are met.

While the IATTC lacks a comprehensive FAD management plan that requires the reporting of lost FADs, measures contained in Resolutions C-15-03, C-16-01, C-17-02, and C-18-05 called for the collection of requisite data to advance development of a comprehensive FAD plan. Measures contained in the Resolutions called for all CPCs to require owners and operators of flagged purse seine vessels to identify and register all deployed FADs in accordance with the Commission scheme and record identification information for each FAD encountered during fishing operations. CPCs are required to submit the data collected to the IATTC Director no later than 60 days prior to each regular meeting of the SAC. Additionally, as stipulated by the Permenant Ad-Hoc Working Group on FADs, CPCs would provide to the IATTC staff the same daily raw buoy data received by original users (i.e. vessels, fishing companies). As noted in the report from 93rd Meeting of the IATTC, Ecuador did not provide any information (IATTC 2018). On this basis requirements at the SG 80 and SG 100 levels are not met.

Free School: No VMEs are affected by the large free school fleet, so this scoring issue is not relevant.

<u>US Small PS UoA</u>

No VMEs are affected by the US small PS free school sets so this scoring issue is not relevant.

References

FAD Management Plan-**Ecuador (http://iattc.org/Meetings/Meetings2018/IATTC-93/Presentations/_English/FAD-03b-PRES_Ecuador%20FADs%20Management%20Plan.pdf), IATTC 2018 (https://www.iattc.org/Meetings/Meetings2018/IATTC-93/Docs/_English/IATTC-93-MINS_93rd-Meeting-of-the-IATTC.pdf)**	
Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	TUNACONS UoA FAD: 60-79 TUNACONS UoA free school: >80 US Small PS UoA: >80
Information gap indicator	TUNACONS UoA: Provide information explaining why requested information on FADs was not provided to the IATTC. Provide documentation indicating the status of Ecuadors FAD management plan and how TUNACONS supporting and complying with the plan. If available provide documentation and evidence that TUNACONS complies with requirements to protect VMEs. US Small PS: information regarding common habitat interactions will be followed up at during the onsite
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.3 – Habitats information

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	The types and distribution of the main habitats are broadly understood. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and vulnerability of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	TUNACONS UoA: FADs: Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes

Rationale

<u>TUNACONS UoA</u>

FADs: Following GPF7.1.5 “main” habitats includes habitats that are commonly encountered by the UoA or VMEs.

Commonly encountered habitats: FAD sets take place in the epipelagic habitat and so purse seines themselves do not interact with benthic habitat during their operation. The distribution of the pelagic habitat is known over the spatial range within which the fishery operates from widely available sea charts and bathymetric maps of the Eastern Pacific Ocean. There are no vulnerable pelagic habitats.

VMEs: As described above, derelict FADs potentially impact on coral reefs. The distribution of reefs in the eastern Pacific Ocean has been mapped and their vulnerability to a range of potential threats evaluated Figure 1). Since there is significat FAD fishing in the offshore equatorial area between about 100°W to the western boundary of the IATTC Convention Area at 150°W, and in this region the North and South Equatorial Currents travel westerly, FADs are likely to move to the west into the WCPFC Convention Area (Figure 2). The distribution of coral reefs in the western Pacific Ocean has been mapped, their area estimated to be 14,353 sq km, and their vulnerability to a range of potential threats evaluated Figure 3; Burke et al 2018). However, the distribution of all habitats in both regions that might be impacted by the FAD fishery is not well known. On this basis, requirements of the SG 60 and SG 80 levels are met but not of the SG 100 level.

Free school: Free school sets take place in the epipelagic habitat and so do not interact with benthic habitat during their operation. The distribution of the pelagic habitat is known over the spatial range within which the

fishery operates from widely available sea charts and bathymetric maps of the Eastern Pacific Ocean. There are no vulnerable pelagic habitats.

On this basis, requirements of the of the SG 60, SG 80, and SG 100 levels are met.

US Small PS UoA

The UoA only fishes free school sets. Free school sets take place in the epipelagic habitat and so do not interact with benthic habitat during their operation. The distribution of the pelagic habitat is known over the spatial range within which the fishery operates from widely available sea charts and bathymetric maps of the Eastern Pacific Ocean. There are no vulnerable pelagic habitats.

On this basis, requirements of the of the SG 60, SG 80, and SG 100 levels are met.

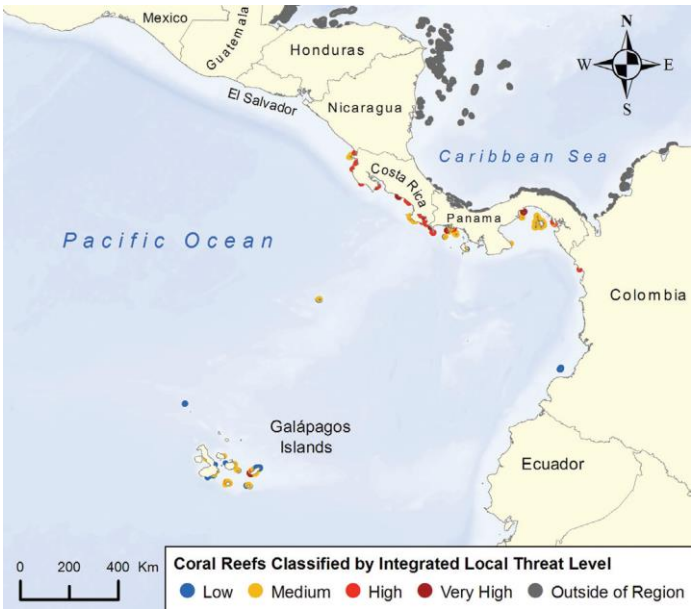


Figure 1. Reefs at risk in the Eastern Pacific Ocean (From Burke et al. 2012).

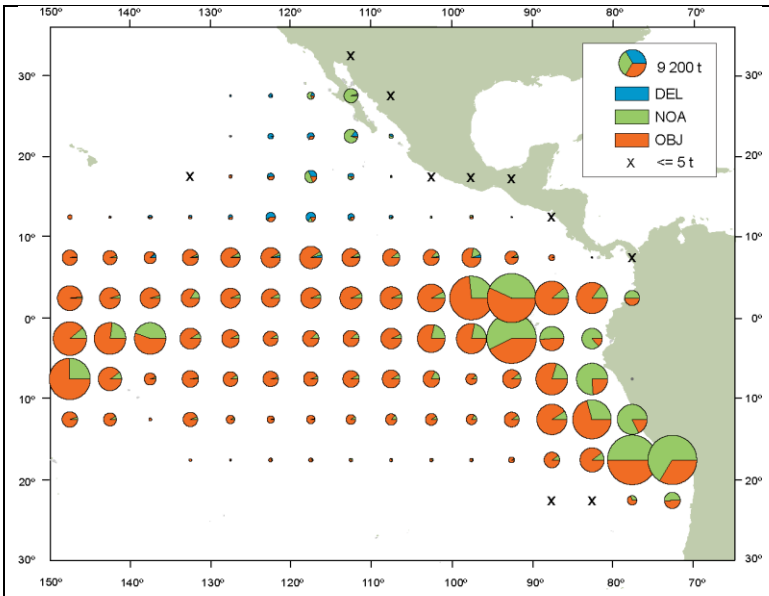


Figure 2. Average annual distributions of the purse-seine catches of skipjack, by set type, 2013-2017. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas (from IATTC 2019).

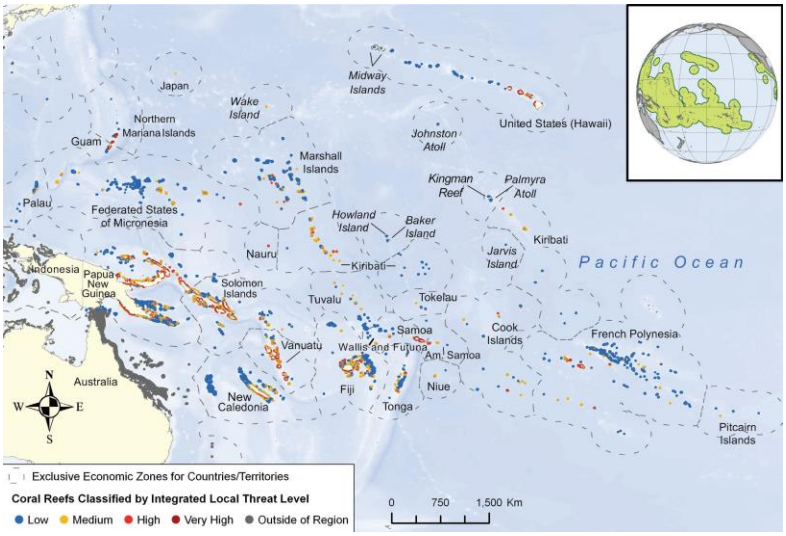


Figure 3. Reefs at risk in the western Pacific Ocean (from Burke et al 2012).

b	**Information adequacy for assessment of impacts**

	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on all habitats have been quantified fully.
	Met?	TUNACONS UoA: FADs - Yes Free school- Yes US Small PS UoA: Yes	TUNACONS UoA: FADs - No Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs - No Free school - Yes US Small PS UoA: No

Rationale

FADs:
Commonly encountered habitats- Information on the spatial extent and on the timing and location of use of the purse seine fishing gear is collected by at-sea observers (100% Observer coverage of large purse seine vessels and observer coverage of smaller purse seine vessels) and by VMS (100% coverage) and thus there is accurate, near real-time monitoring of the spatial extent of interaction, and the timing and location of use of this component of the fishing gear. Purse seine sets are not considered capable of affecting the epipelagic habitat and does not interact with benthic habitat during its operation. However, the physical impacts of the gear have not been quantified fully.

VMEs: Presently there is insufficient information on loss rates and FAD tracks to know that many drifting FADs become beached on coral reefs. The potential impacts of such beaching are broadly understood and the impacts of other marine debris (that would have similar impacts) has been incorporated in an analysis of risks to coral reefs (Burke et al. 2012). Data collection programs to estimate FADs losses and tracks were initiated in 2018. There is reliable information on the spatial locations of fishing, but not on the locations of FADs that are lost and become beached. This lack of reliable information on the spatial extent, timing and location of FAD interactions with coral reefs hinders a full understanding of the nature of the impacts of the gear on these habitats.
This meets the requirements of the SG 60 level but not of the SG 80 level.

Free school: Information on the spatial extent and on the timing and location of use of the purse seine fishing gear is collected by at-sea observers (100% Observer coverage of large purse seine vessels and observer coverage of smaller purse seine vessels) and by VMS (100% coverage) and thus there is accurate, near real-time monitoring of the spatial extent of interaction, and the timing and location of use of the fishing gear. Free school purse seine sets are not considered capable of affecting the epipelagic habitat and does not interact with benthic habitat during its operation.
This set type meets the requirements of the SG 60, SG 80 and SG 100 levels

US Small PS UoA

The UoA only fishes free school sets. Free school sets take place in the epipelagic habitat and so do not interact with benthic habitat during their operation. The distribution of the pelagic habitat is known over the spatial range within which the fishery operates from widely available sea charts and bathymetric maps of the Eastern Pacific Ocean. Free school purse seine sets are not considered capable of affecting the epipelagic habitat. This information is adequate to allow for identification of the main impacts of the UoA on the main habitats and SG80 is met. However, the physical impacts of the gear on all habitats have been quantified fully, SG100 is not met.

c	**Monitoring**			
	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.
	Met?		TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: Yes

Rationale

TUNACONS UoA

FADs: Commonly encountered habitats: For FAD sets, the habitat relevant to the use of a purse seine is the pelagic water column and no hard substrate is impacted by this component of the gear. The physical, chemical and biological properties of the EPO are regularly monitored. The client vessels all operate under a VMS scheme and thus there is accurate, near real-time monitoring of the spatial extent of interaction, and the timing and location of use of the fishing gear.

VMEs

Reporting the number of lost FADs is not required. Recent data collection programs should provide information to estimate losses as long as all CPCs comply. However, full compliance has not been achieved and any increase in risk to the VMEs from derelict FADs would not be detected. Also, the distributions of all benthic habitats that are potentially impacted by FAD sets are not monitored.

On this basis, the requirements of the SG 80 and SG 100 levels are not met.

Free school: For free school sets, the habitat under consideration is the pelagic water column and no hard substrate is impacted by the fishery. The physical, chemical and biological properties of the EPO are regularly monitored. The client vessels all operate under a VMS scheme and thus there is accurate, near real-time monitoring of the spatial extent of interaction, and the timing and location of use of the fishing gear.

SG 80 and SG 100 requirements are met.

US Small PS UoA

The client vessels all operate under a VMS scheme and thus there is accurate, near real-time monitoring of the spatial extent of interaction, and the timing and location of use of the fishing gear. Adequate information continues to be collected to detect any increase in risk to the main habitats. The physical, chemical and biological properties of the EPO are regularly monitored. SG100 is met.

References
Burke et al. 2012, IATTC 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	TUNACONS UoA: 60-79 US Small PS UoA: 60-79
Information gap indicator	Provide documentation regarding compliance of C-18-05. Provide documentation on compliance with Ecuadors FAD management plan. Provide documentation on observer coverage for vessel class 3-5 vessels of the UoA from 2015-2018. Document the number of "lost" FADs by vessel class and geographic zone from 2015-2018.

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Ecosystem status**			
	Guide post	The UoA is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	TUNACONS UoA: FADs -Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs -Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs - No Free school - Yes US Small PS UoA: No
Rationale				

TUNACONS UoA

There are aspects that are relevant to both set types, and aspects which pertain only to FAD sets.

FADs and Free school: There has been a range of models of the structure and functioning of the Pacific Ocean pelagic ecosystems developed that support the main tuna fisheries and their responses to fishing and climate change (e.g. Allain et al. 2007, Allain et al. 2015, Griffiths and Fuller 2019, Kitchell et al. 1999, Lehodey et al. 2013, Leroy et al. 2013, Sibert et al. 2006).

The analyses of Sibert et al. (2006) indicate that the total removals of the fishery have been large (in excess of 50 million mt) which has led to reduced abundance of large fish and decreases in trophic level of the catch (but not the supporting populations). It was concluded that there had been substantial but not catastrophic impacts on the top-level predators, but only minor impacts on the ecosystem in the Pacific Ocean.

Griffiths and Fuller (2019) developed time series for a range of ecological indicators derived from an updated Ecopath with Ecosim (EwE) ecosystem model of the eastern tropical Pacific Ocean (ETP). The indicators provide a long-term view of the EPO ecosystem and the potential impacts that may be attributed to the tuna fishery. The major impact on the target species, especially bigeye, in the EPO results from the increased effort and efficiency of the purse-seine fishery on floating objects (primarily drifting artificial fish-aggregating devices (FADs)) (Griffiths and Fuller 2019). The effort on FADs in the EPO has increased five-fold in the past 25 years, from 2,556 sets in 1993, when the FAD fishery began, to 15,488 sets in 2017 (Figure 1); during 2008–2012 and 2013–2017, the number of FAD sets increased by 48% and 46%, respectively. While indicators showed that the ecosystem structure had changed over the 48-year analysis period, the changes are not considered ecologically detrimental.

Overall, findings indicated that tuna fishery impacts on top-level predators in the Pacific Ocean were substantial but that ecosystem impacts were likely to be minor. These studies suggests it is unlikely that neither the UoA fishery in particular nor the whole EPO tuna fishery, are having an irreversible impact on ecosystem structure or functioning to a point where there would be a serious or irreversible harm.

For Free school sets this meets the requirements of the SG 60, SG 80 and SG 100 levels

For FAD sets only, there is the additional issue of the potential broader impact of FADs that is beyond the fish removed by fishing. The presence of drifting FADs has the potential to alter the distribution and migration of tunas (Leroy et al. 2013, Phillips et al. 2017). FADs have been shown to influence the behavior and movement patterns of skipjack, yellowfin, and bigeye tuna, with the juveniles of each species occupying shallower habitats when associated with FADs (Schaefer and Fuller 2002, 2005, 2010, Fuller et al. 2015). There is some evidence that indicated that FADs both attract and retain tuna, and may affect distribution and migrations of tuna (Leroy et al. 2013). Other studies support the proposal that the large majority of residences at floating objects by tuna are moderately short, and that there is little evidence to suggest that their biology, movement behaviours or entrainment to a region are being significantly affected (Phillips et al. 2017).

Phillips et al. (2017) suggest that processes working at different scales may explain the inter- and intra-individual variability in fish behavior that they observed for bigeye and yellowfin tuna. They suggested that there was an interaction between fine scale variability in the availability of prey, the local density of conspecifics, and the multi-species composition of the schools themselves whilst islands and other bathymetric features may affect vertical behaviour at larger spatial scales. They concluded that purse-seiners set on floating objects because they bring tuna to a more easily found locality in horizontal space, and then aggregate them in relative shallow water through this surface behaviour. The surface-association events they identified varied greatly. While some events were clear and prolonged, the large majority are not, and extended surface-association behaviour was rarely exhibited immediately prior to capture.

Leroy et al. (2013) noted that the ways in which FADs interact with the biotic components of tuna environmental preferences, through prey concentration, increased feeding on juvenile conspecifics, or incorrect habitat utilization, need further investigation, including tuna foraging and the effect of FADs on the behavior of other important species in the pelagic ecosystem.

This is an area of active research to address the concern that the widespread use of FADs may be having important ecosystem effects. If there was 100% monitoring of all purse seine fishing we would expect that the monitoring and assessment programs that are in place for the EPO fisheries would be able to detect any major effects. However, mandatory observer coverage only applies to large purse seine vessels (vessel class 6) in the EPO, and small purse, which are part of the UoA, are not required to carry observers. While the UoA provided observer data for the small purse seine vessels, the coverage rate is unclear and only spans 2015-2019. Understanding ecosystem effects requires longer time series of total removals of all species from the EPO which currently is not available.

On this basis, requirements at the SG 60 and SG 80 levels are met, but the SG 100 level is not met.

US Small PS UoA

The UoA only fishes free school sets and the same rationale outlined above for the TUNACONS UoA apply here. Overall, findings indicated that tuna fishery impacts on top-level predators in the Pacific Ocean were substantial but that ecosystem impacts were likely to be minor. These studies suggests it is unlikely that neither the UoA fishery in particular nor the whole EPO tuna fishery, are having an irreversible impact on ecosystem structure or functioning to a point where there would be a serious or irreversible harm. On this basis, requirements at the SG 60 and SG 80 levels are met.

Since there is no observer data there is no evidence available, and the capture of non-target species is therefore not reliably assessed, it cannot be determined that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. On this basis, requirements at the SG 100 level are not met.

References	
Allain et al. 2007, Allain et al. 2015, Griffiths and Fuller 2019, Kitchell et al. 1999, Lehodey et al. 2013, Leroy et al. 2013, Phillips et al. 2017, Sibert et al. 2006	
Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	TUNACONS UoA FADs – 80 Free school - ≥80 US Small PS UoA - 80
Information gap indicator	Information sufficient to score PI
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are measures in place, if necessary which take into account the potential impacts of the UoA on key elements of the ecosystem.	There is a partial strategy in place, if necessary, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a strategy that consists of a plan, in place which contains measures to address all main impacts of the UoA on the ecosystem, and at least some of these measures are in place.
	Met?	TUNACONS UoA: FADs -Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs:Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: Yes US Small PS UoA: No

Rationale

TUNACONS UoA

FADs and Free school: The 1995 FAO Code of Conduct for Responsible Fisheries stipulates that "States and users of living aquatic resources should conserve aquatic ecosystems" and that "management measures should not only ensure the conservation of target species, but also of species belonging to the same ecosystem or associated with or dependent upon the target species". The Code also provides that management measures should ensure that "biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected", and that "States should assess the impacts of environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks, and assess the relationship among the populations in the ecosystem".

Consistent with these instruments, one of the functions of the IATTC under the 2003 Antigua Convention is to "adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened". Consequently, the IATTC has recognized ecosystem issues in many of its management decisions since 2003. This is apparent in the conservation resolutions for tropical tuna (C-02-04 and C-17-02), sea turtles (C-04-05 Rev 3, C-19-04), sharks (C-16-05, C-19-05), mobulid rays (C-15-04), and other species (C-00-08, C-04-05), as well as FADs (C-16-01, C-17-02). Although not specifically designed to manage impacts on the ecosystem, the range of measures in place is considered to represent a strategy that works to achieve the intended outcome. We note that there is no specific ecosystem management plan for the EPO but also SA3.17.3.2 states that 'It may not be necessary to have a specific "ecosystem strategy" other than that which comprises the individual strategies for the other components under P1 and P2.'

There are measures in place to address the main impacts of the UoA as these would arise from the directed fishing at skipjack, yellowfin, and bigeye tuna, including sorting grid experiments conducted on Ecuadorian purse seine vessels to reduce the bycatch of small fish (tuna and other fish). The potential impacts of FADs themselves on tuna behavior that have been discussed under PI 2.5.1 are not considered to be main impacts and are therefore not considered relevant to this scoring issue.

This meets the requirements of the SG 60 and SG 80 levels but not the and SG 100 level.

US Small PS UoA
As SG80 is met in 2.5.1, the 'if necessary' clause is not triggered and SG80 is met by default. The absence of collection of at-sea data for ETP and other species means that the strategy in place cannot be considered sufficient to address all main impacts of the UoA on the ecosystem. SG100 not met.

b	**Management strategy evaluation**			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems).	There is some objective basis for confidence that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved.	Testing supports high confidence that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved.
	Met?	TUNACONS UoA: FADs -Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs:Yes Free school: Yes US Small PS UoA: Yes	TUNACONS UoA: FADs: No Free school: No US Small PS UoA: No

Rationale

TUNACONS UoA

FADs and Free school: The strategy used by the IATTC involves maintaining target species (skipjack, yellowfin, and bigeye tuna) at their BMSY level, while at the same time minimizing mortality of non-target species. The strategy considers the significant sources of fishery related risks to the EPO ecosystem, namely the removal of target species, risks associated with impacts of bycatch and discarding of a wide range of non-target species. Overall, this strategy is considered likely to work. However, due to increasing uncertainties in recent tropical tuna assessments in the EPO and inconsistencies in stock indicators, IATTC was unable to proffer stock status determinations. Benchmark assessments for yellowfin and bigeye tuna are scheduled to be completed in April/May 2020, allowing for determinations of stock status. While there is confidence that the strategy will work once the benchmark assessments are completed, testing the strategy in an integrated framework will require additional analysis.

This meets the requirements of the SG 60 and SG 80 levels, but not the SG 100 levels.

US Small PS UoA

The rationale outlined above for the TUNACONS UoA applies here. However, there is no available observer data for this UoA and logbooks only record catches of tuna species. Therefore there is no direct information about the UoA to measure confidence that the measures are achieving their goals. However, it can be said that sufficient information on the ecosystem involved continues to be collected, and SG80 is met. While there is confidence that the strategy will work once the benchmark assessments are completed, testing the strategy in an integrated framework will require additional analysis.

c	**Management strategy implementation**			
	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving

				its objective as set out in scoring issue (a).
	Met?		TUNACONS UoA: FADs - Yes Free school - Yes US Small PS UoA: No	TUNACONS UoA: FADs - No Free school - No US Small PS UoA: No

Rationale

TUNACONS UoA

FADs and Free Schools: As previously indicated, current regional stock assessments are considered unreliable for management purposes and it is anticipated that benchmark assessments completed in April/May 2020 will allow for reliable stock status determinations, and implementation of harvest strategies and management measures to maintain target species at about the BMSY level (Maunder 2019). The requirement for 100% observer coverage of large purse seine vessels (vessel class 6) and voluntary observer coverage of small purse seine vessels in the UoA provides a valuable mechanism for gathering information relevant to monitoring ecosystem impacts. While there is some evidence that the measures are being implemented successfully there is no evidence on compliance for IATTC reloutions (e.g., FAD reporting). On this basis requiremetns at the SG 80 level are met but not at the SG 100 level.

US Small PS UoA

As there is no observer data for this UoA and logbooks only record catches of tuna species, there is no evidence that the measures are being implemented successfully. Requirements at the SG 80 and SG 100 levels are not met.

References

Maunder 2019

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	TUNACONS UoA: FADs and Free school ≥80 US Small PS Uoa: 60-79
Information gap indicator	Provide compliance information for pertinent IATTC Resolution. Seek information on protected species interactions in the small US purse seine fishery.

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	Information is adequate to identify the key elements of the ecosystem.	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	TUNACONS UoA: FADs - Yes Free school - Yes US Small PS UoA: Yes	TUNACONS UoA: FADs -No Free school - Yes US Small PS UoA: Yes	
Rationale				
TUNACONS UoA FADs and Free school: A number of organisations are collecting data to improve the knowledge of the structure of the Pacific Ocean pelagic ecosystem. This occurs through observer programs (e.g. bycatch composition and quantities), trophic analyses (e.g. stomach contents, stable isotopes), and mid-trophic level sampling (e.g. acoustics and net sampling of micronekton and zooplankton). The adoption of 100% observer coverage for the large purse seine vessels operating in the EPO and voluntary observer coverage by the UoA of small vessels (vessel class 3-5), as well as research sorting grids will improve the availability of relevant data. However, trophic analyses and mid-trophic level sampling are conducted on a project-by-project basis and are not continuous in space and time. More importantly, small purse seine vessels operating in the EPO, which account for 28% of the total vessels, are not required to carry observers and are rarely sampled, and their logbooks contain limited information on non-target species, and none on discards of targeted species. On this basis, information is adequate to identify the key elements of the ecosystem, meeting SG 60 requirement. **US Small PS UoA** Many of the measures discussed above for the TUNACONS TUNACONS UoA apply here and are adequate to identify key elements of the ecosystem. As these vessels use only free school sets, it can be said that information is adequate to broadly understand the key elements of the ecosystem. SG80 is met.				
B	**Investigation of UoA impacts**			
	Guide post	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and some have been investigated in detail.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and have been investigated in detail.
	Met?	TUNACONS UoA: FADs – Yes Free school – Yes US Small PS UoA: Yes	TUNACONS UoA: FADs – Yes Free school – Yes US Small PS UoA: Yes	TUNACONS UoA: FADs – No Free school – No US Small PS UoA: No
Rationale				
TUNACONS UoA				

FADs and Free school: Using seven ecological indicators that describe changes in the structure and dynamics of the EPO ecosystem during 1970–2017 due to tuna fishing has been characterized using an Ecopath with Ecosim (EwE) ecosystem model of the EPO (Griffiths and Fuller 2019). Based on information from large purse seine vessels, pole-and-line, and pelagic longline the model predicts that limiting the number of floating-object and unassociated sets to the 2016-2018 average would maintain the ecosystem structure in its present state and slightly increase the biomass of most target tuna species, but a significant reduction in purse-seine effort (and most likely longline effort as well) would be needed to restore the EPO ecosystem to its state prior to the expansion of the FAD fishery in 1993. Trophic information, particularly predator stomach contents data and experimental determination of consumption rates, is needed to improve the ecosystem model and the reliability of forecast outputs. Main impacts of the fishery on the key ecosystem elements can be inferred from existing information and some have been investigated in detail, though not to the extent to meet SG 100 requirements.

The potential impacts of FADs themselves on tuna behaviour that have been discussed under PI 2.5.1 are not considered to be main impacts and are therefore not considered relevant to this scoring issue.

This meets the requirements of the SG 60 and SG 80 levels.

US Small PS UoA
The lack of observer data and comprehensive logbook data for this UoA does not allow for inferences about impacts on key ecosystem elements. Requirements at the SG 60 and SG 80 levels are met but not the SG 100 level.

c	**Understanding of component functions**			
	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are known.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are understood.
	Met?		TUNACONS UoA: FADs - Yes Free school - Yes US Small PS UoA: No	TUNACONS:: FADs - Yes Free school - Yes US Small PS UoA: No

Rationale

<u>TUNACONS UoATUNACONS</u>
FADs and Free school: Information on target and non-target species (bycatch and ETP species) is gathered by the IATTC through logbook data and observer programs, as well as being available via a number of historical research projects. Sufficient information is available to identify the range of species that are impacted and to determine their respective roles such as their trophic level and potential roles in transfer of energy and nutrients between various pelagic habitats (epipelagic, mesopelagic and bathypelagic) or between pelagic and demersal habitats.

In order to improve the availability of data, the Kobe Bycatch Technical Working Group (KBTWG) was established in 2009 with the aim to Identify, compare and review the data fields and collection protocols of logbook and observer bycatch data being employed by each Tuna RFMO. The KBTWG provides guidance for improving data collection efforts and, to the extent possible, the harmonization of data collection protocols among tuna RFMOs. These data will improve future analysis of ecosystem functions. The information gathered is sufficient to identify species impacted and understand the main functions of the ecosystem components.

Requirements at the SG 80 and SG 100 levels are met

US Small PS UoA

Since both observer data and comprehensive logbook data are not available, its is impossible to identify the range of species that interact with this UoA. Given that this UoA operates further north then the TUNACONS UoA, the diversity of species interactions likely differs. Due to the lack of information, requirements at the SG 80 and SG 100 levels are not met. RBF results for primary, secondary, and ETP species may change this score.

d	**Information relevance**			
	Guide post		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		TUNACONS UoA: FADs - Yes Free school Yes US Small PS UoA: Yes	TUNACONS UoA: FADs - No Free school - No US Small PS UoA: No
Rationale				

TUNACONS UoA

FADs and Free schools: Information is collected through logbooks, observer programs and other research activities on the impacts of the fishery on target and non-target components. This is sufficient to allow some of the main consequences for the ecosystem to be inferred. Observer coverage of large purse seine vessels is 100% and the UoA voluntarily places observers on small purse seine vessels. These data combined with logbook and VMS data are adequate to allow main consequences of the ecosystem to be inferred. However there is information on impacts to the ecosystem. The SG 80 level is met but not the SG 100 level.

This meets the requirements of the SG 80 level but not of the SG 100 level.

US Small PS UoA

While no observer data is collected the number of vessels in the UoA is small (N=3) and catch levels of target species relative to the overall catch in the EPO is extremely small < 0.01% the reported catches are likely sufficient to infer main consequences to the ecosystem. However, no direct information on impacts to the ecosystem is available. On this basis the SG 80 level is met but not the SG 100 level.
The large

e	**Monitoring**			
	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		TUNACONS UoA: FADs - Yes Free school - Yes US Small PS UoA: No	TUNACONS - No Free school -- No US Small PS UoA: No
Rationale				

TUNACONS UoA

FADs and Free school: : As indicated above, data are collected on the key target and non-target species taken by the fishery through logbooks and the regional observer programs. Available information is sufficient to allow analyses to detect an increase in risk levels to ecosystem components. On this basis, requirements at the SG 80 level is met. However, in the absence of a comprehensive strategy for ecosystem management which incorporates the collection of broader ecosystem information than existing systems, as well as comprehensive observer and logbook programs, SG 100 is not met.

US Small PS UoA

Since both observer data and comprehensive logbook data are not available, its is impossible to identify the range of species that interact with this UoA. Given that this UoA operates further north then the TUNACONS UoA, the diversity of species interactions likely differs. Due to the lack of information, requirements at the SG 80 and SG 100 levels are not met.

References	
Griffiths and Fuller 2019	
Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	TUNACONS UoA: Free School 60-79 FAD set 60-79 US Small PS UoA: 60-79
Information gap indicator	Both UoAs: Documentation describing projected plans for observer coverage in the UoA is requested. Documentation describing any proposed data collection plans for the UoAs.
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

7.1 Principle 3

7.1.1 Principle 3 background

7.1.1.1 Regional Level Management

Management of the UOA has international and national components. There is a formalised framework and legal basis for regional management of tuna stocks in the Eastern Pacific Ocean (EPO) through the Inter-American Tropical Tuna Commission (IATTC) which is the regional fisheries management organisation (RFMO) mandated with the conservation and management of the fisheries for tunas (including yellowfin and skipjack tuna) and other species taken by tuna-fishing vessels in the EPO. The IATTC was established in 1949. Current members are Belize, Canada, China, Colombia, Costa Rica, Ecuador, El Salvador, the European Union, France, Guatemala, Japan, Kiribati, Mexico, Nicaragua, Panama, Peru, Republic of Korea, Chinese Taipei, United States, Vanuatu, and Venezuela. Bolivia, Honduras, Indonesia and Liberia are cooperating non-members.

The objective of the IATTC is to ensure the long-term conservation and sustainable use of tuna and tuna-like species and other species of fish taken by vessels fishing for tunas and tuna like species in the Eastern Tropical Pacific Ocean, in accordance with the relevant rules of international law. In 1976, the IATTC's responsibilities were broadened to address the problems arising from the interaction of dolphin with tuna fisheries in the EPO. Defined policy objectives were to maintain a high level of tuna production while minimizing the incidental catch of dolphin, the stocks of which were to be kept at or above levels that ensure their survival. "The Agreement on the International Dolphin Conservation Programme" (AIDCP) (1999), is implemented by the IATTC and it provides the Programme's secretariat.

The adoption of resolutions requires agreement of all attending members. Agreed management measures are binding on parties to the Convention. The original Convention has been strengthened by the Antigua Convention (IATTC 2003), which has an objective to "ensure the long-term conservation and sustainable use of the fish stocks in the Convention area in accordance with the relevant rules of international law". The convention entered into force on August 27, 2010.

The international laws mentioned in the Antigua Convention are the United Nations Convention on the Law of the Sea (UNCLOS) (1982); the Rio Declaration on Environment and Development and Agenda 21 adopted by the United Nations Conference on Environment and Development (1992); the Johannesburg Declaration and Plan of Implementation adopted by the World Summit on Sustainable Development (2002); the Code of Conduct for Responsible Fisheries of the Food and Agriculture Organization (FAO) 1995; the Agreement to Promote Compliance with

International Conservation and Management Measures by Fishing Vessels on the High Seas, 1993 and International Plans of Action, both of which fall within the framework of the Code and the 1995 UN Fish Stocks Agreement (UNFSA).

The IATTC brings together participant members to reach agreements through consensus to make management decisions and oversee the implementation of agreed measures, which currently include seasonal closures. The Commission is also responsible for supporting cooperation related to gathering and interpreting data to facilitate management of tuna stocks in the Eastern Tropical Pacific Ocean at levels permitting maximum sustainable yields. Observer information and vessel registration are also coordinated through the IATTC in collaboration with nation states.

Decisions adopted by the Commission are binding for all members 45 days after their notification. The "Committee for the Review of Implementation of Measures Adopted by the Commission" was established in the Antigua Convention "to monitor compliance with management measures, as well as to share information on the actions taken by the Members to ensure compliance by their vessels with measures agreed pursuant to the Convention" (Antigua Convention, Annex 3). The Committee also has duties to:

"Analyze information by flag and other necessary information; provide information, technical advice and recommendations relating to the implementation of, and compliance with, conservation and management measures; recommend means of promoting compatibility of the fisheries management measures of the members of the Commission; recommend means of eliminating fishing that undermines management measures; and recommend the priorities and objectives of the program for data collection and monitoring".

The Antigua Convention creates a formal scientific committee with objectives including:

"review plans, proposals and research programs, and provide advice; review assessments, analyses, research or other work and recommendations prepared by the scientific staff prior to their consideration by the IATTC; recommend specific issues and items to be addressed by the scientific staff; recommend the priorities and objectives of the program for data collection and monitoring; and develop and promote cooperation between and among the members of the Commission through their research institutions".

To ensure that the IATTC management framework is consistent with national laws, each contracting state must take the measures necessary for the implementation of and compliance with the Convention and related conservation and management measures including the adoption of the necessary laws and regulations.

In terms of long-term objectives, the Antigua Convention has the responsibility to "to ensure the long-term conservation and sustainable use of the fish stocks covered by this Convention, in accordance with the relevant rules of international law". As emphasised in the 2005 plan for the management of regional fishing capacity (IATTC, 2005), the management of fishing capacity should:

"facilitate the conservation and sustainable use of tuna stocks in the ETPO and the conservation of the marine environment. It should be consistent with the precautionary approach, the need to minimize by

catch, waste, and discards, and ensure selective and environmentally safe fishing practices and the protection of biodiversity in the marine environment".

The Convention has an explicit provision regarding the precautionary approach and ecosystem-based management. Objectives with respect to Endangered Threatened or Protected (ETP)species are also provided by the IATTC Convention and for dolphins directly by the AIDCP.

Table XX IATTC Active resolutions of particular relevance to the Units of Assessment.[6]

Purpose	Management measures
Bigeye, yellowfin & skipjack (longline and purse seine fisheries)	C-16-02, C-17-02,
Pacific Bluefin	C-16-03, C-18-01, C-18-02
Silky shark Oceanic whitetip shark Sharks Whale sharks (purse seines) Mobulid rays	C-05-03, C-11-10, C-15-04, C-16-04, C16-06, C-18-05, C-19-05, C-19-06,
Sea turtles	C-04-05, C-19-04
Dolphins	Addressed under Agreement on the International Dolphin Conservation Program
Seabirds	C-11-02
Scientific observers	C-18-07
Monitoring, control and surveillance activities	C-04-03, C-11-07, C15-011C-14-02, C-19-02
Data, data processing and availability	C-15-01, C-03-04, C-04-10, C-15-07
FADs	C-99-07, C-19-01
Monitoring, Compliance and Surveillance	C-04-03, C-11-08, C-11-07, C-12-07, C-14-02, C-19-02

IATTC has the longest-established regional scientific and enforcement program and is unusual in that it has a regional observer program fully coordinated by the Secretariat, with its own observers, but also with the participation of national programs. There is 100% coverage for purse seiners above 363 mt capacity which has been mandatory since 2000. The main purpose of this observer program is to monitor the incidental catch of dolphins in the purse-seine fishery. The observer program is also used for scientific and research purposes, as well as for monitoring compliance with IATTC management and conservation measures.

Weekly reports from observers are transmitted to the Secretariat of the IATTC via e-mail, fax, or radio. The International Review Panel is responsible for reviewing IATTC observer reports and determining infractions. The observer reports from both the programs constitute highly valuable collections of fisheries data.

[6] https://www.iattc.org/PDFFiles/Resolutions/IATTC/Compendium-of-active-resolutions-and-recommendations.pdf

All vessels over 24m length catching tuna within the region must have VMS (Resolution C-14-02). IATTC uses its vessel registers to establish a 'positive list' and identify IUU vessels (Resolution C-19-02), information which is shared with other RFMOs. Vessels not entered into the record are deemed to be unauthorized to fish for, retain on board, transship or land tuna and tuna-like species.

Members and co-operating non-Members (CPCs) of the IAATC report annually on compliance with a list of IATTC resolutions listed in Resolution C-11-07 and as updated periodically. These reports are reviewed by Committee for the Review of Implementation of Measures adopted by the Commission. The Committee also reviews information compiled by the Director of the IATTC on possible non-compliance with IATTC resolutions from the reports of the IATTC observers for purse-seine fishing vessels and at-sea transshipment as well as other available information. Alleged infractions by vessels flagged to CPCs are reported by the Director of the IATTC to the respective national government bodies. CPCs are required to respond to these notices. At the end of each Committee meeting, for each CPC, the compliance record, areas of possible improvement as well as any recommended actions are recorded in the report of the Committee, which is then sent to the IATCC. The compliance information discussed by Committee meetings is confidential and not released publicly making it challenging to assess the actual compliance records CPCs.

With reference to interactions with dolphins, it is relevant to note that the International Review Panel (IRP) under the IATTC is responsible for reviewing observer data, examining potential infractions against AIDCP requirements and issuing infractions to offending vessels when violations are reported. Infractions include "major violations" such as using explosives during fishing or fishing without an observer, and "other violations" such as lack of appropriate gear on board or failing to perform a dolphin rescue procedure.

The IATTC is subject to regular internal review. This is demonstrated by the various committees and working groups that meet regularly and report their findings to the Commission and which are published. including:

- Comprehensive review functions and responsibilities of the Scientific Advisory Committee established under Antigua Convention Article XI);
- Review functions and responsibilities of the Committee for the Review of Implementation of Measures (established under Antigua Convention Article XVIII) are set forth in Annex 3 of the Antigua Convention;
- The Commission may engage external scientific experts to carry out periodic peer reviews of scientific information and advice provided by the Commission may; and
- The business and meetings of the IATTC are transparent and conducted annually and as a consequence, the status of conservation and management objectives are the subject of review of public opinion and subsequent political ramifications.

The IATTC has also carried out an external performance review in 2016 (Moss-Adams 2016) but this appears to be the only external review commissioned by the IATTC to have been published. Some aspects of IATTC work, such as stock assessment may be subject to assessment by CPC

scientific advisors. For example, in the USA the Science and Statistical Committee of the Pacific Fisheries Management Council may review of stock assessments conducted or commissioned by the IATTC. Independent academic or other recent reviews of Regional Fishery Management Organization performance that include the IATTC have been conducted by McCluney et al. (2019) and Medley et al. (2019).

7.1.1.2 National/Flag State Management

Ecuador

Ecuador's Constitution of 2008 provides the legal foundations for the management of its fisheries. Article 14 declares as a public interest the preservation of the environment and the conservation of ecosystems. Article 395 declares "The State will ensure a sustainable model of development, environmentally balanced and respectful of cultural diversity, which preserves biodiversity and the natural regeneration of ecosystems, and ensures that the needs of present and future generations are met." This article together with article 396 also gives effect to the precautionary approach in natural resource management. Article 281 states: "Food sovereignty constitutes a strategic objective and an obligation of the state to ensure that individuals, communities, peoples, and nationalities achieve the self-sufficiency of healthy and culturally appropriate foods on a permanent basis.

Fisheries are managed and regulated under the Fisheries and Fisheries Development Law, first passed in 1974 it was amended in 1985, 2005, and 2016. The 2016 amendments were made to give effect to the National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing and included administrative sanctions and penalties. The objective of this Plan is to define the national policies for fighting IUU fishing in the jurisdictional waters of Ecuador and the adjacent high seas.

Ecuador has ratified the UN Convention on the Law of the Sea (2012), the UN Fish Stocks agreement (2016), and the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2019). A comprehensive new fisheries law, the Organic Fisheries and Aquaculture Law has been drafted and is now progressing towards passage. A key purpose is to modernize Ecuador's fisheries law and give better legislative effect to its international obligations.

The Under Secretariat for Fishery Resources (SRP) of the Ministry of Production, Exterior, Investment and Fisheries (MPCEIP) is responsible of the supervision and implementation of the national fisheries policy, ensures compliance with fisheries laws and regulations, elaborates fisheries development plans and programs, coordinates the activities of the public and private sectors, manages fisheries financial credit, approves reports and plans of companies in the fisheries sector, and commissions studies on the activity, management, and development of the fishing sector.

Other agencies associated with the regulation of fisheries include the Servicio Nacional de Aduana del Ecuador (SENAE) that addresses international trade and customs for the import and export of seafood. The National Directorate of Aquatic Spaces (DIRNEA) is the national maritime police authority and is responsible for on-the water fisheries enforcement and for satellite monitoring that it carries out in coordination with SRP.

The National Council for Fisheries Development consists of government officials and a representative of the commercial fishing sector. It is responsible for the development of the national fisheries policy, the approval of the fisheries development plans and programmes, and the yearly assessment of the results in order to allow authorities to make necessary changes. The Council also participates in the drafting of bills and regulations implementing the national policy, establishes prices and percentages concerning the amount of fish and fishery products to be allocated to the national market, determines which aquatic species can be exploited according to the technical reports of the National Fisheries Institute (INP), and issues the reports required by the Law and its Regulations.

The tuna fishery in Ecuador's EEZ and on the adjacent high seas is managed within the IATTC framework. The Resolutions and Recommendations made by the IATTC for the conservation of tunas in the ETPO are formally adopted by the Ecuadorian government. Resolutions are translated into regulations through Ministerial agreements issued by the Under Secretariat for Fishery Resources. Ministerial Agreement 174 adopts and adapts all IATTC's conservation measures and includes them in the Ecuadorian legal system. This allows for national level sanctions to be applied. Agreement MPCEIP-SRP-2019-0027-A is the latest regulation that adopts and adapts all IATTC's conservation measures and includes them in the Ecuadorian legal system.

In October 2019, Ecuador received a yellow card from the European Union over shortcomings in the mechanisms that the country has put in place to ensure compliance with its international obligations as a flag, port and market state. The shortcomings noted by the European Union include:

- The legal framework in place is outdated and not in line with the international and regional rules applying to the conservation and management of fishing resources.
- Law enforcement is hampered by this outdated legal framework, inefficient administrative procedures and a lenient approach towards infringements. As a result, the sanctioning system is neither depriving the offenders from the benefits accruing from IUU fishing, nor deterrent.
- There are serious deficiencies in terms of control, notably over the activity of the tuna fishing and processing industries.

In particular the EU noted that the sanctioning scheme:

"…remains based on a weak and outdated legal framework, which lacks a definition of IUU activities and provides for a level of sanctions which fails to ensure deterrence of these sanctions. The maximum fine imposed in Ecuador for industrial vessels in 2018, irrespective of the gravity of the infringement and the value of the fishery products. involved, did not exceed 4 500 USD. In addition, Ecuadorian authorities also acknowledged that they face legal and practical issues to recover the fines, and cumbersome administrative procedures often result in practical impossibility to address recidivism. Information provided by Ecuadorian authorities also suggests uneven approach in relation to the application of sanctions, notably as regards the confiscation of illegal catches."

The EU goes on to state:

"… failure to enforce deterrent sanctions also resulted in recidivism by Ecuadorian vessels operating in the IATTC area and therefore additional breaches of the conservation and management measures adopted by this organisation. The absence of a structured and risk-based strategy for the management of inspection activities also results in a failure to ensure that the main compliance risks are addressed… ."

The yellow card triggers a formal dialogue in which the Commission and the third country work together to solve all issues of concern. Ecuador is undertaking a series of fisheries reforms to address the issues raised by the European Union. Most notable is the updating of national fisheries legislation, described previously, to bring it into line with the international and regional rules applying to the conservation and management of fishing resources.[7] Also updated will be the monitoring, control and surveillance regime that includes fisheries enforcement and sanctions. Other actions involving multiple government agencies include:[8]

- Ensure implementation and effective compliance with the revised fisheries legislation.
- Strengthen the administrative sanctions regime.
- Improve Monitoring, Control and Surveillance (MCS) systems with respect to in international and regional regulations.
- Strengthen systems for the registration of fishing licences.
- Improve the traceability of fishery products to prevent fish caught by vessels engaged in illegal fishing from being marketed or imported.
- Strengthen and improve cooperation with other States; and

[7] http://nube.acuaculturaypesca.gob.ec:85/index.php/s/S9XnRZMmCkS6qhK#pdfviewer
[8] http://nube.acuaculturaypesca.gob.ec:85/index.php/s/wS9I2QfhHfBaGQF

- Ensure compliance with reporting and recording obligations to the IATTC and other RFMOs.

The United States has also raised concerns about the effectiveness of Ecuador's MCS regime.[9] Specifically, NOAA fisheries identified Ecuador for failing to comply with IATTC Resolution C-11-07 (Resolution on the Process for Improved Compliance of Resolutions Adopted by the Commission). Resolution C-11-07 requires IATTC Members to investigate possible cases of non-compliance with IATTC resolutions involving fishing vessels flagged to them and report the results of their investigations to the IATTC Director. Records from IATTC and correspondence between NMFS and Ecuador indicate that in 2016 and 2017, Ecuador failed to fully investigate numerous alleged violations of IATTC resolutions by fishing vessels flagged to Ecuador.

Ecuador opened administrative investigations for all the cases identified by the US that formed the bases for its identification. The Government of Ecuador concluded that all but one case warranted punitive actions. Ecuador imposed monetary sanctions in those cases that warranted punitive action and provided the United States with documentation of these sanctions. Thirteen cases reached final resolution with sanctions imposed, corroborated with documentation. For the case that did not warrant punitive action, Ecuador determined, following an investigation, that the vessel did not commit an infraction of the conservation and management measure. The US remains concerned that by the recurrent vessel-specific issues, which have been the basis for Ecuador's repeated identifications for IUU fishing in NOAA Fisheries' Biennial Reports to Congress (2011, 2013, 2015, 2017, and 2019).

Ecuador's government adopted **as public policy the National Tuna Action Plan in December 2019. The plan is a management tool for ensuring the sustainability of tuna fisheries.** It includes objectives for: reducing bycatch; strengthening the monitoring and management of environmental impacts; strengthening traceability; developing environmental education programs and improving scientific research. The plan was developed as a coordinated effort between the national fishing authority, tuna industry association, civil society organisations and other stakeholders. The plan is also part of government and industry efforts to respond to the yellow card issued by the European Union.

Private sector stakeholders in the industrial tuna fishery tend to be members of one or more of three organizations: (i) the Association of Tuna Boat Owners (ATUNEC), (ii) the National Chamber of Fisheries (CNP), and (iii) the Chamber of Tuna Processors (CEIPA). ATUNEC integrate independent tuna boat owners, CNP incorporate mainly processors that have their own tuna fleets, and CEIPA integrate most tuna processors. The tuna industry is vertically integrated, and these organisations include most of the producers, processors, exporters and traders related to

[9] https://www.fisheries.noaa.gov/foreign/international-affairs/identification-iuu-fishing-activities#findings-and-analyses-of-foreign-iuu-fishing-activities

the Ecuadorian fishery (e.g., Starkist, NIRSA, SALICA). Key NGOs engaged with the fishery are WWF, Conservation International and the International Seafood Sustainability Foundation (ISSF). WWF has been advocating sustainable tuna fisheries in the EPO and works directly with the Ecuadorian tuna industry. Conservation International has minor direct involvement with the industrial tuna sector. ISSF promotes improvement of global tuna fisheries to become MSC certified. ISSF actively work with the Ecuadorian tuna industry and participates in the meetings of the IATTC. Major players of the Ecuadorian tuna industry are members of ISSF.

Ecuador's constitution provides for public participation. It guarantees civil and political rights, and emphasises participative democracy. Article 95 provides for participation as leading players in decision making, planning and management of public affairs. The Organic Law of Citizen Participation of 2010, regulates mechanisms of direct democracy established in the Constitution, determining process, requirements, times and effects of each mechanism. The right to public is provided for in the Organic Law on Transparency and Access to Public Information enacted on in 2004. The **National Tuna Action Plan was developed with stakeholder input and consultative meetings. However, processes for regular input into fisheries management are less clear. Public meetings of the** National Council for Fisheries Development are one mechanism for stakeholder engagement, however the frequency of these meetings and means of stakeholder participation is not readily apparent.

Panama

Panama's legislation and regulations related to fisheries are unconsolidated. The current fishing law dates to 1959 (Law decree 17 of July 9, 1959) and since then additional laws, executive decrees and administrative resolutions have been promulgated to manage different components of Panama's fisheries. These include:

- Executive Decree 83 of April 5, 2005
- Executive Decree 89 of July 19, 2002
- Law July 17, 1959 (Fishing Law)
- Law 5 of January 17, 1967 (Sailing Act)
- Law 18 of May 31, 2007
- Law 44 of November 23, 2006
- ARAP Administrative Resolution September 28, 2017

Panama passed Executive Decree No. 160 of June 6, 2013, which set forth procedures to impose administrative sanctions for violations of the regulations on aquatic, coastal/marine, and fishery

resources included in Law 44 of November 23, 2006. A vessel wanting to change owners or cancel its registration must now pay any pending fines or present a bond of $1 million. Before this decree came into force, vessels fined for violations could cancel their Panamanian registration and thereby avoid paying their fines.

Executive Decree No. 161 of June 6, 2013, provides the mechanisms of inspection, monitoring, and control of nationally registered fishing and fishing support vessels that operate internationally. Executive Decree No. 162 of June 6, 2013, establishes and regulates fishing and fishing support licenses for vessels that fish internationally.

The Aquatic Resources Authority of Panama (Autoridad de los Recursos Acuáticos de Panamá; ARAP) is the main authority for managing fisheries. It was created in 2006. Other institutions with a role in sector include the Vice-Ministry of Foreign Affairs. the General Accounting Office, and the Maritime Authority.

Panama has ratified the UN Convention on the Law of the Sea (in 1995), the UN Fish Stocks agreement (in 2008) and the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (in 2016). Executive decrees 160, 161 and 162 address administrative sanctions, mechanisms for the monitoring, control and surveillance, and the permitting of fishing and fishing support vessels respectively. Fishing and fishing support vessels licensed to operate in international waters are available online (https://arap.gob.pa/listado-embarcaciones-apoyo-y-captura/). In 2019, Panama signed an agreement with Global Fishing Watch to make the real-time position of its distant water fishing fleet from its vessel monitoring system publicly available [10]. How the resolutions and recommendations made by the IATTC for the conservation of tunas in the ETPO are formally adopted by the Panamanian government and translated into regulations is unclear from the material publicly available.

In 2017, the government of Panama approved the Action Plan for Sustainable Fisheries. The Plan is intended to guide the reform of the outdated legal framework and improve coordination at the sectoral and inter-institutional levels. It guides the work of ARAP and the National Commission for Responsible Fisheries. The plan has four key areas

- Develop and strengthen institutional capacity and inter-agency coordination for the sustainable development of fisheries and aquaculture.
- Increase the benefits of fisheries and aquaculture production based on improving quality, diversification, innovation and traceability in the value chain.
- Develop the fisheries and aquaculture sectors, promoting a culture of responsible use that allows equitable exploitation and permanence for future generations.

[10] https://arap.gob.pa/wp-content/uploads/2019/04/Memora%CC%81ndum-de-entendimiento-entre-ARAP-y-Global-Fishing-Watch-Inc..pdf

- Improve management based on information analysis and participatory management, strengthening the control of use and access to fishery and aquaculture resources.

The Action Plan was published following extensive stakeholder consultation. ARAP provides regular on-line updates of progress against action items in the plan grouped by these key areas. The last update available covered the period to April 2019[11].

The Action Plan for Sustainable Fisheries also guides the work of the National Responsible Fisheries Commission that can recommend initiatives to achieve sustainable development of fisheries sector, as well as policies and measures that are necessary, in order to regulate fishing activity in Panama's EEZ. This Commission has 17 members, of which seven are representatives of fisheries stakeholders. One position is open to a representative of the purse seine fishery. The role of the Commission with respect to international tuna fisheries is unclear at this time.

ARAP has been developing a new fishing law for several years. As outlined in the Action Plan for Sustainable Fisheries, the new law will replace the Fisheries Act of 1959 and incorporate ecosystem approaches to fisheries management and co-management to give effect to sustainability, the precautionary approach, citizen participation, cooperation and effective fisheries enforcement. It will also give effect to the international conventions to which Panama is party. This work is being conducted in consultation with sectoral and civil society stakeholders. According to ARAP progress reports the drafting of this law is on track for completion soon. A draft of the proposed law was made available to stakeholders as part of public consultation that occurred in 2016.[12]

In October 2019, Panama received a yellow card from the European Union over shortcomings in the mechanisms that the country has put in place to ensure compliance with its international obligations as flag, port and market state. The shortcoming reported by the European Union include:

- Serious deficiencies in terms of control, notably over the activities of the fishing and fishing related activities of vessels flying the flag of Panama.
- These deficiencies undermine the reliability of the traceability system upon which the certification of the legality of the catches is based.
- Law enforcement is affected by inefficient administrative procedures and a lenient approach towards infringements. As a result, there are significant delays in the imposition of sanctions and the sanctioning system is not depriving the offenders from the benefits accruing from IUU fishing or acting as a deterrent.
- Serious deficiencies in the implementation of the Port State Measures Agreement in order to prevent fish stemming from IUU fishing activities reaching national and international markets and to effectively prevent IUU vessels from receiving port services

[11] https://arap.gob.pa//avances-plan-de-accion-pesca-sostenible-en-panama/
[12] https://arap.gob.pa/descargas/5697

Panama had already received a yellow card in November 2012, which was then lifted in October 2014. According to the European Union, the second card was based on the identification of various shortcomings that constitute significant backtracking compared to improvements observed from 2012 to 2014. It is the first country to be given a yellow card by the European Union twice.

The industrial fisheries sector is organized through the National Association of the Panamanian Fisheries Industry (ANDELAIPP), the Panamanian Association of the Tuna Industry (APIA) and the Association of Producers, Processors and Exporters of Seafood (APPEXMAR). These three belong to the National Council of Private Enterprise (CONEP) and the Panamanian Exporters Association (APEX). There are several NGOs participate in fisheries issues. These include the MarViva Foundation; the Development and Sustainable Fisheries Center (CeDePesca); and the International Fisheries Foundation (FIPESCA). There is evidence that ARAP consults annually with interested stakeholders about conservation and management proposals for tuna and related species fisheries in the IATTC. It is not clear that there are formal mechanisms for incorporating stakeholder input the Panamanian Governments position and there is limited information about which stakeholders are invited to ARAP technical meetings.

Panama has several regulatory instruments in place that relate to transparency of the public sector. Law No. 6 of 22 January 2002, which handles transparency of the public sector (Panama's Freedom of Information legislation). Law No. 33 of 25 April 2013, which makes provision for an Information Officer to exist within each public institution with responsibility for proactive transparency, open data and information requests. According to the OECD (2019), there is a gap between the intent of these legal frameworks and the practice of institutions across Panama. Panama appears to lack instruments such as guidance on the governance and use of data, as well as support for publishing government data.[13] ARAP has a transparency webpage, apparently meeting statutory requirements. It is unclear how and to what extent stakeholders and the public can seek information that is not otherwise available on the ARAP website, including for example, meeting minutes and documentation of reasons for decisions made by ARAP.

United States

The Magnuson Fishery Conservation and Management Act 1976 is the primary law governing marine fisheries management in USA federal waters. It was enacted to promote the USA fishing industry's optimal exploitation of coastal fisheries by "consolidating control over territorial waters" and establishing eight regional councils to manage fish stocks. The Act has been amended several times in response to continued overfishing of major stocks. In 1996, it was amended to mandate the use of annual catch limits and accountability measures to end

[13] OECD 2019. Digital Government Review of Panama: Enhancing the Digital Transformation of the Public Sector, OECD Publishing, Paris

overfishing, provide for widespread market-based fishery management through limited access privilege programs, minimize by catch, establish fishery information monitoring systems, protect fish habitat and promote increased international cooperation. As part of this reform, it was renamed the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

The reforms to the MSFCMA occurring in 1996 called on the Secretary of Commerce to work multilaterally through various fora, such as Regional Fishery Management Organizations (RFMOs), to address illegal, unreported and unregulated (IUU) fishing and bycatch of protected living marine resources. The most recent version of the MSFCMA was authorized in 2007.

The USA has not ratified the UN Convention on the Law of the Sea. It has ratified the UN Fish Stocks agreement (1996), and the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2016).

The MSFCMA extends to USA fleets operating on the high seas. The US purse seine fleet operating in the ETPO is also subject to the authority of the High Seas Fishing Compliance Act, which governs the conduct of USA fishing vessels on the high seas, and under which a high seas fishing permit is required for a USA fishing vessel to be used for commercial fishing anywhere on the high seas.

NOAA Fisheries implements the legally binding resolutions that the IATTC adopts by drafting regulations for U.S. fisheries operating in the IATTC Convention Area under the Tuna Conventions Act. The West Coast Region's Highly Migratory Species program also regularly engages with NOAA Fisheries' Southwest Fisheries Science Center, Pacific Islands Fisheries Science Center, and Pacific Islands Regional Office to coordinate IATTC data reporting requirements for the U.S. fleet fishing in the eastern Pacific Ocean. Clear guidance is provided to all US flagged vessels operating in the IATTC area as set out in several documents including:

- The NOAA Fisheries IATTC Vessel Register Compliance Guide; and
- The Compliance Guide Fishing Restrictions for Tropical Tuna in the Eastern Pacific Ocean for 2018-2020 and FAD Construction Requirements.

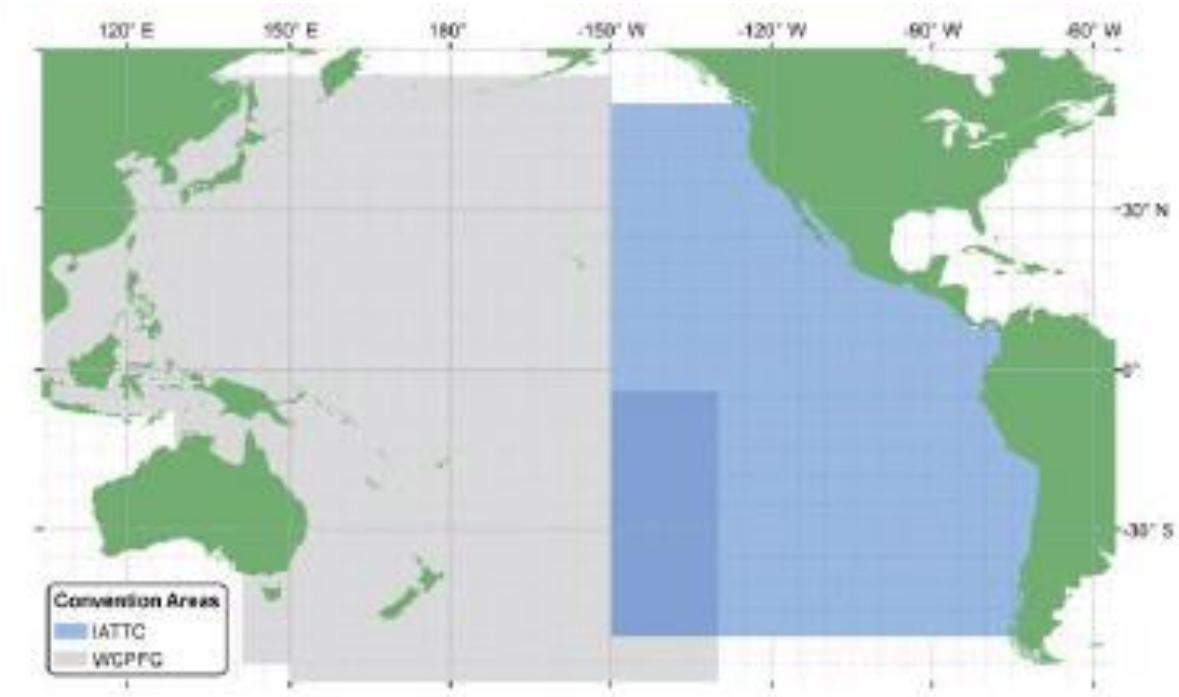
Regulations implemented under the Tuna Conventions Act are made in accordance with resolutions of the IATTC and apply to U.S. fishing vessels targeting or pursuing highly migratory species within the IATTC area. Proposed regulations are posted on the Federal Register for public comment. Also, the U.S. Department of Commerce, in consultation with the Department of State appoints a General Advisory Committee (GAC) to the U.S. Section to the IATTC and a Scientific Advisory Subcommittee (SAS) that advises the GAC. The U.S. Section consists of the four U.S. Commissioners to the IATTC and representatives of the State Department, NOAA, Department of Commerce, other U.S. Government agencies, and stakeholders. The GAC advises the U.S. Section on the development of U.S. policies, positions, and negotiating tactics at upcoming IATTC meetings. The purpose of the SAS is to advise the GAC on scientific matters. NOAA Fisheries West Coast Region staff provide administrative support for the GAC and SAS. The meetings of the GAC

and SAS are open to the public. The nature of public comment is up to the Chairs for the GAC and SAS to decide.

7.1.1.3 Area of Operation and Relevant Jurisdictions

The UoA fleet (flagged to Ecuador, Panama and USA) fishes in the 200-mile Exclusive Economic Zones (EEZ) of Ecuador and the Inter-American Tropical Tuna Commission (IATTC) management area (**Error! Reference source not found.**. The IATTC boundaries established by the Antigua Convention are East of 150°W, South of 50°N, and North of 50°S) and therefore all client tuna fishing activities are regulated under the jurisdiction of the IATTC. As a condition of their voluntary membership in this multilateral agreement, member countries must adhere to the Commission's regulations. The key components of the governance and fishery management framework for the fishery: Are the IATTC and the Ecuadorian, Panamanian and United States National Government.

Figure XX IATTC management area: (Source ISSF 2019)



7.1.2 Principle 3 Performance Indicator scores and rationales

PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** - **Is capable of delivering sustainability in the UoA(s);** - **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** - **Incorporates an appropriate dispute resolution framework**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Compatibility of laws or standards with effective management**			
	Guide post	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes	Ecuador: No Panama: No US: No
Rationale				

IATTC
The Antigua Convention of 2003 governs fishing for tuna and tuna like species on the high seas and in zones of national jurisdiction (Medley and Powers 2015). The objective of the Antigua Convention is to ensure the long-term conservation and sustainable use of the fish stocks in the Convention area in accordance with the relevant rules of international law.

The Antigua Convention explicitly recognizes the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the Rio Declaration on Environment and Development and Agenda 21, the Johannesburg Declaration and Plan of Implementation adopted by the World Summit on Sustainable Development (2002), the FAO Code of Conduct for Responsible Fisheries (1995), including the 1993 FAO Compliance Agreement and International Plans of Action adopted by FAO within the framework of the Code of Conduct, and the 1995 UN Fish Stocks Agreement (UNFSA). The promotes the implementation of these international agreements within its area of jurisdiction to deliver management outcomes consistent with MSC Principles 1 and 2. However, although Conservation and Management Measures adopted by the Commission are binding, agreement is by consensus and therefore co-operation is effectively not binding, so SG 100 is not met.

Ecuador
Fisheries are managed and regulated under the Fisheries and Fisheries Development Law, first passed in 1974 it was amended in 1985, 2002, and 2016. The 2016 amendments were made to give effect to the National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing. The Resolutions and Recommendations made by the IATTC for the conservation of tunas in the ETPO are formally adopted by the Ecuadorian government. Resolutions are translated into regulations through Ministerial agreements issued by the Under Secretariat for Fishery Resources. Ministerial Agreement MPCEIP-SRP-2019-0027-A is the latest regulation that adopts and adapts all IATTC's conservation measures and includes them in the Ecuadorian legal system.

Ecuador has also ratified the UN Convention on the Law of the Sea (2012), the UN Fish Stocks agreement (2016), and the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2019).

However, the European Union has recently documented shortcomings In Ecuador's legal framework for fisheries management:

- The legal framework in place is outdated and not in line with the international and regional rules applying to the conservation and management of fishing resources.
- Law enforcement is hampered by this outdated legal framework, inefficient administrative procedures and a lenient approach towards infringements. As a result, the sanctioning system is neither depriving the offenders from the benefits accruing from IUU fishing, nor deterrent.

SG 60 is met because there is an effective national legal system and a framework for cooperation with other parties, where necessary to deliver management outcomes consistent with MSC Principles 1 and 2. SG 80 is not met because while there is an effective national legal system there is documented evidence from external parties that there is not organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.

Panama

The current fishing law dates to 1959 (Law decree 17 of July 9, 1959) and since then additional laws, executive decrees and administrative resolutions have been promulgated to manage different components of Panama's fisheries. These include:

- Executive Decree 83 of April 5, 2005
- Executive Decree 89 of July 19, 2002
- Law July 17, 1959 (Fishing Law)
- Law 5 of January 17, 1967 (Sailing Act)
- Law 18 of May 31, 2007
- Law 44 of November 23, 2006
- ARAP Administrative Resolution September 28, 2017

Panama passed Executive Decree No. 160 of June 6, 2013, which set forth procedures to impose administrative sanctions for violations of the regulations on aquatic, coastal/marine, and fishery resources included in Law 44 of November 23, 2006. A vessel wanting to change owners or cancel its registration must now pay any pending fines or present a bond of $1 million. Before this decree came into force, vessels fined for violations could cancel their Panamanian registration and thereby avoid paying their fines.

Executive Decree No. 161 of June 6, 2013, provides the mechanisms of inspection, monitoring, and control of nationally registered fishing and fishing support vessels that operate internationally. Executive Decree No. 162 of June 6, 2013, establishes and regulates fishing and fishing support licenses for vessels that fish internationally.

The Aquatic Resources Authority of Panama (Autoridad de los Recursos Acuáticos de Panamá; ARAP) is the main authority for managing fisheries. It was created in 2006. Other institutions with a role in sector include the Vice-Ministry of Foreign Affairs. the General Accounting Office, and the Maritime Authority.

In October 2019, Panama received a second yellow card from the European Union over shortcomings in the mechanisms that the country has put in place to ensure compliance with its international obligations as flag, port and market state. The European Union documented:

- Serious deficiencies in terms of control, notably over the activities of the fishing and fishing related activities of vessels flying the flag of Panama.
- That these deficiencies undermine the reliability of the traceability system upon which the certification of the legality of the catches is based.
- Law enforcement is affected by inefficient administrative procedures and a lenient approach towards infringements. As a result, there are significant delays in the imposition of sanctions and the sanctioning system is not depriving the offenders from the benefits accruing from IUU fishing or acting as a deterrent.
- Serious deficiencies in the implementation of the Port State Measures Agreement in order to prevent fish stemming from IUU fishing activities reaching national and international markets and to effectively prevent IUU vessels from receiving port services

SG 60 is met because there is an effective national legal system of legislation and regulations and a framework for cooperation with other CPCs under the IATTC and other international agreements, to deliver management outcomes consistent with MSC Principles 1 and 2. SG 80 is not met because there is evidence from the European Union suggesting that organised cooperation with other parties may not be effective to deliver management outcomes consistent with MSC Principles 1 and 2.

United States
The Magnuson Fishery Conservation and Management Act 1976 is the primary law governing marine fisheries management in USA federal waters. The MSFCMA extends to USA fleets operating on the high seas.

The USA has not ratified the UN Convention on the Law of the Sea. It has ratified the UN Fish Stocks agreement (1996), and the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (2016).

The US purse seine fleet operating in the EPO is subject to the authority of the High Seas Fishing Compliance Act, which governs the conduct of USA fishing vessels on the high seas, and under which a high seas fishing permit is required for a USA fishing vessel to be used for commercial fishing anywhere on the high seas. Regulations implemented under the Tuna Conventions Act are made in accordance with resolutions of the IATTC and apply to U.S. fishing vessels targeting or pursuing highly migratory species within the IATTC area. More widely, NOAA Fisheries participates in various fisheries organizations to achieve effective and responsible marine stewardship and ensure sustainable fisheries management. This include RFMOs covering the Atlantic, Indian, Pacific, and Southern Oceans, as well global and other multilateral living marine resource agreements.

The arrangements in these Acts and agreements provide a comprehensive suite of management and enforcement powers designed to deliver management outcomes consistent with MSC Principles 1 and 2. They also provide for organized and cooperation with other parties with the MSFCCA making specific reference to the management of international fisheries and the Tuna Conventions Act providing specific mechanisms arrangements to participate in the IATTC and cooperate with other CPCs. In particular they create mechanisms to

- Agree on and comply with conservation and management measures to ensure the long-term sustainability of straddling fish stocks and highly migratory fish stocks;
- Establish appropriate cooperative mechanisms for effective monitoring, control, surveillance and enforcement; and
- Agree on decision-making procedures which facilitate the adoption of conservation and management measures in a timely and effective manner

SG 60 and SG 80 are met as there is evidence of an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2. SG 100 is not met. Although Conservation and Management Measures adopted by the IATTC are binding, agreement is by consensus and therefore co-operation between CPCs is not binding in practice.

b	**Resolution of disputes**			
	Guide post	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes	Ecuador: No Panama: No US: No
Rationale				

IATTC
Several mechanisms exist for dealing with legal disputes at the international level. Part VII of the Antigua Convention establishes a framework for dispute resolution. Although this does not specify a concrete mechanism, it does define an avenue for arriving at a solution in the case of a difference between two or more members of the Commission. Disputes can be dealt with at the IATTC annual meetings of the Parties through consultation and conciliation. Technical disputes might be resolved by an appropriately composed expert or technical panel. As a last step, disputes might be resolved through either the International Court of Justice or the International Tribunal for the Law of the Sea (ITLOS), though this recourse is most likely to be used by states which have ratified the 1995 UN Fish Stocks Agreement (UNFSA).

The system of adoption of resolutions and recommendations proposed by members of the Commission is transparent. Members are fully informed of the issues under consideration and are able to participate in informed discussion. Independent observers, including NGO and IGOs, are present at such meetings and would observe any resolutions and justifications that are presented. Observers are allowed to make presentations to members, though this is only available if members and the chairperson do not object. Disputes resolved in this way would still not necessarily be entirely transparent in the sense that how a resolution is reached may not be fully reported. Non-parties to the convention can apply to become Co-operating Non-parties, which also implement the measures and requirements set by IATTC, even if not becoming a full member of the Commission. There is no formal system of arbitration or conciliation where differences arise among parties over recommendations.

There are explicit and transparent decision-making and dispute resolution mechanisms defined and in place, meeting SG60. The system appears to be generally effective. There are no outstanding disputes among members for the fisheries considered here, but no disputes have been referred to ICJ/ITLOS. Overall, available evidence suggests the system is meeting SG80. The effectiveness of the other informal IATTC mechanisms is unclear and overall the mechanisms have yet to be tested and proven effective. These issues mean the IATTC dispute resolution mechanisms do not meet SG100.

Ecuador
There is no mechanism for the resolution of disputes apparent in Ecuador's fisheries laws and related instruments. The Ecuadorian judicial system is ruled by statutory law, not by common law or judicial precedents. The General Organic Code of Procedures which came into force in 2016 and instituted a new procedural system for all trial proceedings, except criminal and constitutional matters. The Organic Administrative Code, entered into force in 2018 and regulates administrative procedures, including appeals and extraordinary challenges before all public entities. Further information is needed to understand if how the Organic Administrative Code applies to fisheries in general and the UOA specifically.

SG 60 is met as the management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system. SG 80 is not met because it cannot be currently determined that there is a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA. In the absence of an obvious structure for dispute resolution specific to fisheries, the team will employ participatory techniques during the site visit to identify and evaluate the presence of dispute resolution mechanisms used in Ecuador for the UoA (MSC FS v2.01 GSA4.3).

Panama
There is no mechanism for the resolution of disputes apparent within Panama's fisheries laws and related instruments. The Panamanian judicial system is ruled by statutory law, not by common law or judicial precedents. Disputes are resolved under the Law 38 The Administrative Procedures Law of 2000 that provides an appeal process if a r**esponsible party believes that their right has been violated due to the** imposition of an administrative **sanction**. Further information is needed to understand if and how the disputes are resolved in Panama's fisheries in general and the UOA specifically.

SG 60 is met as the management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system. SG 80 is not met because it cannot be currently determined that there is a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA. In the absence of an obvious structure for dispute resolution specific to fisheries, the team will employ participatory techniques during the site visit to identify and evaluate the presence of dispute resolution mechanisms used in Ecuador for the UoA (MSC FS v2.01 GSA4.3).

United States
At the domestic level, legal disputes are handled under the Administrative Procedures Act, which governs the process by which federal agencies (e.g. NOAA/NMFS) develop and issue regulations. Opportunities are provided for the public to comment on notices of proposed rulemaking. The US court system follows well-established procedures that have been tested and proven effective in resolving legal disputes. In the case of lawsuits filed against the management agency, the public "administrative record" (the basis for decision making—including everything in the public record on all fisheries related issues) is used to demonstrate how NMFS made its decisions. NMFS also has legal responsibility for reviewing and approving fisheries management plans, implementing and enforcing regulations, and administering supporting programs**.**

The US legal system at all levels is acknowledged to be transparent and considered to be effective in dealing with most issues as appropriate for the context of the UoA and SG 80 is met. However, since SG 100 is not met for the IATTC, no part of the UOA can be scored higher than SG 80 because this SI is interpreted to mean dispute resolution at the national and international levels must be considered together.

c	Respect for rights			
	Guide post	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: No US: Yes

Rationale

IATTC
The IATTC Antigua Convention (Part VI Article XXIII) states that the Commission will adopt measures to assist developing countries to carry out their responsibilities to carry out their obligations under the Convention and will improve the capacity for fisheries development in national jurisdictions.

Legal rights of people dependent on fishing for food or livelihood are protected through national interests of Parties to the Convention. The Convention deals with the rights of a State's access to resources rather than individuals.

Smaller vessels and more artisanal gears are excluded from many measures. Pole-and-line, troll, and sport fishing vessels, and purse-seine vessels less than 182 metric tons carrying capacity and longline vessels less than

24m length are exempt from various measures designed to limit fishing activity on bigeye and yellowfin tuna stocks. Furthermore, purse-seine vessels with between 182 and 272 metric tons carrying capacity are provided for higher fishing effort provided that they carry an observer for the International Dolphin Conservation Program (AIDCP). These exemptions are clearly designed to protect some artisanal fleet.

IATTC has an intention and has a management system that observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. Therefore the international management system meets the requirement for SG60 and SG80. However, such mechanisms are not formal commitments and SG100 is not met.

Ecuador
Article 281 of Ecuador's constitution states: "Food sovereignty constitutes a strategic objective and an obligation of the state to ensure that individuals, communities, peoples, and nationalities achieve the self-sufficiency of healthy and culturally appropriate foods on a permanent basis. Its fisheries laws enshrine this concept as does a clear recognition and protection of artisanal fishing in regulation and management actions. SG 100 is met as the management system has a mechanism to formally commit to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

Panama
Panama's Fishery Law of 1959 recognises subsistence fishing but not artisanal fishing. When vessels greater than 10 GRT were classified as industrial fishing, vessels less than 10GRT effectively became effectively classified as artisanal. The Action Plan for Sustainable Fisheries addresses artisanal fisheries management and development and provides mechanisms to observe the legal rights thereby meeting SG 80. It does not commit Ecuador to legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2 so SG 100 is not met.

United States
The MSFCMA requires a provision in all fishery management plans to: "… assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for:
Participants in the fisheries and fishing communities affected by the plan or amendment;
Participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;"

The make-up of the regional fishery management councils and their advisory panels, together with public meetings, assure that existing arrangements will be taken into account in the development of fishery management plans. These provisions of the law do not guarantee that existing legal or customary rights will be incorporated into a management plan but fishery management plans can formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. Any failure to recognize existing legal rights would be subject to challenge in the courts and the law is written so as to encourage consideration of customary rights. The nature of the consultative process of FMP development means that customary rights will be given consideration.

SG100 is met as the management system has a mechanism to formally commit to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Ecuador: 60-79 Panama: 60-79 US: ≥80
Information gap indicator	More information sought for SI 3.1.1b (dispute resolution mechanisms) for Ecuador and Panama

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	**Roles and responsibilities**			
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes

Rationale

IATTC
Functions, roles and responsibilities are explicitly defined at the international level. The IATTC was established to define roles and responsibilities for its contracting parties and co-operating non-contracting parties. The performance of the Secretariat is sound and well regarded as both efficient and effective by the Parties.

Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction meeting SG100.

Ecuador
The roles and responsibilities of organisations and individuals who are involved in the management process are clearly defined and understood by all relevant parties, particularly at the national level. The Under Secretariat for Fishery Resources of the Ministry of Production, Exterior, Investment is responsible of the supervision and implementation of the national fisheries policy, ensures compliance with fisheries laws and regulations, elaborates fisheries development plans and programs, coordinates the activities of the public and private sectors, manages fisheries financial credit, approves reports and plans of companies in the fisheries sector, and commissions studies on the activity, management, and development of the fishing sector. The National Council for Fisheries Development is responsible for the development of the national fisheries policy, the approval of the fisheries development plans and programmes, and the yearly assessment of the results in order to

allow authorities to make necessary changes. The non-statutory National Tuna Plan establishes roles, responsibilities and accountability against actions.

Organisations and individuals involved in the management process have been identified and functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction meeting SG80. However, both European Union and the US have provided evidence of deficiencies in terms of control, notably over the activity of the tuna fishing and processing industries and in the reporting to the IATTC of possible infractions and taking action against infractions reported by the IATTC to the country under C-11-07. This indicates that functions, roles and responsibilities are not well understood for all areas of responsibility and interaction and therefore SG100 is not met.

Panama

The Aquatic Resources Authority of Panama (ARAP) is the main authority for managing fisheries. Other institutions with a role in sector include the Vice-Ministry of Foreign Affairs. the General Accounting Office, and the Maritime Authority. Panama's Action Plan for Sustainable Fisheries is intended to improve coordination at the sectoral and inter-institutional levels. It guides the work of ARAP and the National Commission for Responsible Fisheries. The plan establishes clear roles, responsibilities and accountability against actions.

Organisations and individuals involved in the management process have been identified and functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction meeting SG80. However, the European Union has found that there are serious deficiencies in terms of control, notably over the activities of the fishing and fishing related activities of vessels flying the flag of Panama and in implementation of the Port State Measures Agreement. In particular, the EU documents evidence of significant delays in the imposition of sanctions and deficiencies in the implementation of the Port State Measures Agreement that mean Panama is not taking sufficient action to deter IUU fishing. This suggests that functions, roles and responsibilities are not well understood for all areas of responsibility and interaction and therefore SG100 is not met.

United States

The USA arrangements are the most formalized with the General Advisory Committee (GAC) to the U.S. Section to the IATTC and a Scientific Advisory Subcommittee (SAS) that advises the GAC. The U.S. Section consists of the U.S. Commissioners to the IATTC and representatives of the State Department, NOAA, Department of Commerce, other U.S. Government agencies, and stakeholders. Clear guidance is provided to all US flagged vessels operating in the IATTC area as set out in several documents including:

- The NOAA Fisheries IATTC Vessel Register Compliance Guide; and
- The Compliance Guide Fishing Restrictions for Tropical Tuna in the Eastern Pacific Ocean for 2018-2020 and FAD Construction Requirements.

The Tuna Conventions Act (1950) establishes responsibilities for record keeping and reporting requirements, prohibitions, tuna management measures, vessel monitoring system requirements, incidental catch requirements, and FAD restrictions and other matters. NOAA Fisheries' West Coast Highly Migratory Species program provides policy advice, scientific and technical and administrative support for international fisheries agreements and related issues in the eastern Pacific Ocean.

Collectively, these actions, measures and guidance indicates that organisations and individuals involved in the management process have been identified and functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility. SG100 is therefore met.

b	**Consultation processes**			
	Guide post	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.
	Met?	Ecuador Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes	Ecuador: No Panama: No US: No

Rationale

IATTC

The IATTC holds a meeting every year, and specialist working groups (comprising scientists and specialists from the contracting parties) convene meetings on a regular (usually annual) basis. Information from these meetings is used by decision-makers and forms the basis of the management advice provided by IATTC. “Local knowledge” at the international level is assumed to refer to national information and experience. IATTC allows for participation by non-members and observers, including NGOs and ensures they have timely access to relevant information.

The IATTC management system demonstrates consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained demonstrates consideration of the information obtained. SG 80 is therefore met. However, information used by management other than the scientific information is not so clearly reported. Although much of this information can be inferred from various sources, it is not necessarily clear how different sources of information are weighted. This includes information on compliance, economics and social issues. Therefore SG 100 is not met.

Ecuador

Ecuador’s constitution provides for public participation. It guarantees civil and political rights, and emphasises participative democracy. The organizations that participate in tuna-related consultation process are the fishing associations (ATUNEC, CNP, CEIPA), the Fishery authority (SRP), and national scientists. Through a series of formal and informal mechanisms (i.e., emails, phone calls, official letters, bilateral meetings), actions of SRP taken at the national level are coordinated with IATTC.

Ecuador’s government adopted as public policy the National Tuna Action Plan in December 2019. It includes objectives for: reducing bycatch; strengthening the monitoring and management of

environmental impacts; strengthening traceability; developing environmental education programs and improving scientific research. The plan was developed as a coordinated effort between the national fishing authority, tuna industry association, civil society organisations and other stakeholders. This demonstrated that the management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system. This meets SG60.

Additional information is needed to assess if Ecuador meets SG80 or SG100. The right to public is provided for in the Organic Law on Transparency and Access to Public Information enacted on in 2004. The National Tuna Action Plan was developed with stakeholder input and consultative meetings. However, processes for regular input into fisheries management are less clear. Public meetings of the National Council for Fisheries Development are one mechanism for stakeholder engagement, however the regulatory of these meetings and means of stakeholder participation is not readily apparent. Since SG 100 is not met at the regional (IATTC) level, SG 100 cannot be reached for any component of the UOA.

Panama

In 2017, Panama approved the Action Plan for Sustainable Fisheries. The Action Plan was published following extensive stakeholder consultation. ARAP has also held public consultations about the proposed fisheries law in 2016. There is also evidence that the Aquatic Resources Authority of Panama consults annually with interested stakeholders about conservation and management proposals for tuna and related species fisheries in the IATTC. It is not clear that there are formal mechanisms for incorporating this stakeholder input the Panamanian Governments position. There is limited information about which stakeholders are invited to ARAP technical meetings and about whether management system demonstrates consideration of the information obtained.

SG60 is met because the management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system. However, additional information is required to assess whether **the management system demonstrates consideration of the information obtained** therefore SG80 is not met. Since SG 100 is not met at the regional (IATTC) level, SG 100 cannot be reached for any component of the UOA.

United States

The USA consultative arrangements consist of a General Advisory Committee (GAC) to the U.S. Section to the IATTC and a Scientific Advisory Subcommittee (SAS) that advises the GAC. The U.S. Section consists of the U.S. Commissioners to the IATTC and representatives of the State Department, NOAA, Department of Commerce, other U.S. Government agencies, and stakeholders. The GAC and SAS meet before IATTC meetings each year. Additionally, proposed regulations are regularly (as appropriate) posted on the Federal Register for public comment and explicit consideration of submissions is demonstrated and reasons for final decisions are routinely given .

SG100 would be met for the USA since management mechanisms include consultation processes that regularly seek and accept relevant information, including local knowledge and explains how the information is used or not used. However, since SG 100 is not met at the regional (IATTC) level, SG 100 cannot be reached for any component of the UOA.

c	**Participation**

	Guide post		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: No

Rationale

IATTC

Consultation occurs at several levels within the IATTC management system. The opportunity to become a Contracting Party or Co-operating Non-contracting Party is open to all, including non-states. Membership has increased over time and there is a high level of participation.

The Commission may be joined by any government that is a member of the United Nations (UN) and that is a member of a Specialized Agency of the United Nations. In addition, any inter-governmental economic integration organization constituted by States that have transferred to it competence over the matters governed by the IATTC Convention, such as the EU. The Convention is open to accession by any State or regional economic integration organization (e.g. EU) that had already acceded to the previous 1949 Convention, has coastline in the Convention Area, has vessels fishing stocks covered by this Convention or is invited to accede on the basis of a decision by the Parties. Interested NGOs have an opportunity to observe at meetings.

A special fund, which is administered by the IATTC has been created for strengthening the institutional capacity of developing countries for the sustainable development of fisheries for highly migratory species (Resolution C-14-03).

A number of stocks are shared with WCPFC. There is a memorandum of understanding that governs the co-operation between the two RFMOs. The Secretariats have representatives at each other's meetings where appropriate, as well as a specific WCPFC-IATTC consultative meeting. There is also an agreement over the endorsement of regional high-seas observers.

There is sufficient evidence that the IATTC consultative process provides opportunity and encouragement for all interested and affected parties to be involved and facilitates their effective engagement meeting SG100.

Ecuador

Private sector stakeholders in the industrial tuna fishery tend to be members of one or more of three organizations: (i) the Association of Tuna Boat Owners (ATUNEC), (ii) the National Chamber of Fisheries (CNP), and (iii) the Chamber of Tuna Processors (CEIPA). The tuna industry is vertically integrated, and these organisations include most of the producers, processors, exporters and traders related to the Ecuadorian fisheries. Key NGOs engaged with the fishery are WWF, Conservation International and the International Seafood Sustainability Foundation (ISSF).

Ecuador's constitution provides for public participation. It guarantees civil and political rights and emphasises participative democracy. Article 95 provides for participation as leading players in decision making, planning and management of public affairs. The Organic Law of Citizen Participation of 2010, regulates mechanisms of direct democracy established in the Constitution, determining process, requirements, times and effects of each mechanism. The right to public is provided for in the Organic Law on Transparency and Access to Public Information enacted on in 2004.

The National Tuna Action Plan was developed with stakeholder input and consultative meetings. However, processes for regular input into fisheries management are less clear. Public meetings of the National Council for Fisheries Development are one mechanism for stakeholder engagement, however means of stakeholder participation is not readily apparent.

Consultation processes provide an opportunity for all interested and affected parties to be involved meeting SG80. It cannot be concluded that Ecuador facilitates the effective engagement of affected parties and therefore SG100 cannot be awarded.

Panama
The industrial fisheries sector is organized through the National Association of the Panamanian Fisheries Industry (ANDELAIPP), the Panamanian Association of the Tuna Industry (APIA) and the Association of Producers, Processors and Exporters of Seafood (APPEXMAR). These three belong to the National Council of Private Enterprise (CONEP) and the Panamanian Exporters Association (APEX). There are several NGOs participate in fisheries issues. These include the MarViva Foundation; the Development and Sustainable Fisheries Center (CeDePesca); and the International Fisheries Foundation (FIPESCA).

There is evidence that ARAP consults with interested stakeholders about conservation and management proposals for tuna and related species fisheries in the IATTC as well as for wider legislative and policy matters related to fisheries management. It is not clear that there are formal mechanisms for incorporating stakeholder input the Panamanian Governments position and there is limited information about which stakeholders are invited to ARAP technical meetings.

Consultation processes provide an opportunity for all interested and affected parties to be involved meeting SG80. It cannot be concluded that Panama facilitates the effective engagement of affected parties and therefore SG100 cannot be awarded.

United States
The USA consultative include a General Advisory Committee (GAC) to the U.S. Section to the IATTC and a Scientific Advisory Subcommittee (SAS) that advises the GAC. The U.S. Section consists of the U.S. Commissioners to the IATTC and representatives of the State Department, NOAA, Department of Commerce, other U.S. Government agencies, and stakeholders. Proposed regulations implementing IATTC resolutions and recommendations are posted on the Federal Register for public comment. The nature of public comment is up to the Chairs for the GAC and SAS to decide.

Consultation processes provide an opportunity for all interested and affected parties to be involved meeting SG80. It cannot be concluded that the USA facilitates the effective engagement of affected parties and therefore SG100 cannot be awarded.

References

Aquatic Resources Authority of Panama 2017. Action Plan for Sustainable Fisheries https://arap.gob.pa/avances-plan-de-accion-pesca-sostenible-en-panama/

Aquatic Resources Authority of Panama. Laws and Administrative Resolutions https://arap.gob.pa/legislacion/

IATTC 1990. Inter-American Tropical Tuna Commission Rules of Procedure

Medley, P.A.H, J. Gascoigne and J. Akroyd. 2019. An Evaluation of the Sustainability of Global Tuna Stocks Relative to Marine Stewardship Council Criteria (Version 6). ISSF Technical Report 2019-02. International Seafood Sustainability Foundation, Washington, D.C., USA

Ministry of Production, Exterior, Investment and Fisheries (Ecuador) 2017. Report of the Ecuadorian Tuna Sector. http://www.produccion.gob.ec/wp-content/uploads/2019/06/Reporte-del-sector-atunero-ingles.pdf

Ministry of Production, Exterior, Investment and Fisheries (Ecuador) 2019. National Tuna Action Plan.

McCluney, J. K., Anderson, C. M., & Anderson, J. L. 2019. The fishery performance indicators for global tuna fisheries. *Nature communications*, *10*(1), 1641.

NOAA Fisheries 2017 Magnuson-Stevens Fishery Conservation and Management Act https://www.fisheries.noaa.gov/resource/document/magnuson-stevens-fishery-conservation-and-management-act.

NOAA Fisheries n.d. IATTC Vessel Register Compliance Guide. https://archive.fisheries.noaa.gov/wcr/publications/fisheries/migratory_species/iattc-rvr-compliance-guide.pdf

NOAA Fisheries n.d. The Compliance Guide Fishing Restrictions for Tropical Tuna in the Eastern Pacific Ocean for 2018-2020 and FAD Construction Requirements. https://archive.fisheries.noaa.gov/wcr/publications/fishery_management/hms_program/hms_complianceguide_fads-tropicaltuna2019.pdf

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Ecuador: 60-79 Panama: 60-79 US: ≥80
Information gap indicator	More information sought for SI 3.1.2b (consultation processes that regularly seek and accept relevant information) for Ecuador and Panama
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	**Objectives**			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC Fisheries Standard and the precautionary approach, are implicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are explicit within and required by management policy.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Partial Panama: Partial US: Partial

Rationale

In relation to the fishery being considered, the long-term objectives that guide decision-making consistent with MSC Fisheries Standard and the precautionary approach are those established by the IATTC and followed by Ecuador, Panama and the United States in national law.

The IATTC Antigua Convention, Article II has the objective to ensure the long-term conservation and sustainable use of the fish stocks covered by this Convention, in accordance with the relevant rules of international law. In addition, it states that the members of the Commission shall be cautious, or apply a precautionary approach, in cases where information is uncertain, unreliable or inadequate, in regard to conservation and management. The IATTC Convention provides clear, long-term objectives that guide decision making under Principle 1. The long-term objectives for each stock are clear enough that the science-based advice and management of these stocks can be evaluated. The IATTC Convention has an explicit provision regarding the precautionary approach and ecosystem-based management which forms part of the MSC Principles and Criteria. Objectives with respect to ETP species are also provided by the IATTC Convention and more directly by the AIDCP.

Protection for all resources within the same ecosystem is provided for, consistent with Principle 2. In Article VII paragraph 1, the functions of the Commission provide for measures to protect all species belonging to the same ecosystem as the target stocks, to reduce bycatch (specifically co-ordinate with the AIDCP), develop more “environmentally safe” fishing gears and apply the precautionary approach, all of which meet requirements under Principle 2. In addition, the Convention explicitly requires that the Commission promote the application of the provisions under the FAO Code of Conduct, which includes the ecosystem approach to fisheries management as well as many of the same requirements as the MSC P&C.

Management policies in Ecuador, Panama and the USA guiding decision making as described under PI 3.1.1 are consistent with MSC Fisheries Standard and the precautionary approach is explicit within management policy

Overall, there are explicit objectives incorporating the precautionary approach and ecosystem-based management that meet the MSC fisheries standards in IATTC and national management arrangements, meeting SG 60 and SG80. However, there are elements of the management system where it is not yet clear that the precautionary approach is required and applied in practice across all stocks (e.g. bigeye and yellowfin tuna) thus SG 100 is partially met.

References

Aquatic Resources Authority of Panama 2017. Action Plan for Sustainable Fisheries https://arap.gob.pa/avances-plan-de-accion-pesca-sostenible-en-panama/

IATTC 1990. Inter-American Tropical Tuna Commission Rules of Procedure

Medley, P.A.H, J. Gascoigne and J. Akroyd. 2019. An Evaluation of the Sustainability of Global Tuna Stocks Relative to Marine Stewardship Council Criteria (Version 6). ISSF Technical Report 2019-02. International Seafood Sustainability Foundation, Washington, D.C., USA

Ministry of Production, Exterior, Investment and Fisheries (Ecuador) 2017. Report of the Ecuadorian Tuna Sector. http://www.produccion.gob.ec/wp-content/uploads/2019/06/Reporte-del-sector-atunero-ingles.pdf

Ministry of Production, Exterior, Investment and Fisheries (Ecuador) 2019. National Tuna Action Plan.

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NOAA Fisheries 2017 Magnuson-Stevens Fishery Conservation and Management Act https://www.fisheries.noaa.gov/resource/document/magnuson-stevens-fishery-conservation-and-management-act.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Ecuador: ≥80 Panama: ≥80 US: ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.1 – Fishery-specific objectives

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue		SG 60	SG 80	SG 100
a	**Objectives**			
	Guide post	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery-specific management system.	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Partial Panama: Partial US: Partial

Rationale

The IATTC Convention offers guidance and principles on which management plans might be based. This includes objectives which not only apply to target stocks, but also the ecosystem. These objectives are relatively general and covered under PI 3.1.3. These objectives have been used in developing scientific advice.
There is a long-term management plan to limit fishing capacity to sustainable levels C-02-03). Short-term objectives are clearly laid out and are measurable for purse seine at least. IATTC now has a closed vessel registry which should help prevent increases in capacity, if not reduce it.
Each conservation measure has a short-term objective which is clearly stated. Resolution c-16-02 sets out harvest control rules for yellowfin, bigeye and skipjack. Resolution C-17-02 establishes conservation measures for the tropical tunas for 2018 to 2020, including measures for fishing on fish aggregating devices (FADs). Resolution C-18-05 includes additional measures addressing the deployment and monitoring of FADs.

These IATTC conservation measures contain explicit and specific intentions and objectives, and also allow for monitoring of the performance against these objectives, the fisheries meet SG80.
However, although broadly measurable, long and short-term objectives they are not necessarily well-defined, particularly in relation to achieving MSC Principles 1 & 2. Stock assessments are not available for all species (e.g. skipjack), and proxies for MSY have not been determined. Therefore, objectives may be somewhat vague with respect to determining precise status using reference points, for example. Since they are not consistently well defined, SG 100 is only partially met.

References

IATTC 2019. Compendium of active resolutions and recommendations (in force, January 2019).

Medley, P.A.H, J. Gascoigne and J. Akroyd. 2019. An Evaluation of the Sustainability of Global Tuna Stocks Relative to Marine Stewardship Council Criteria (Version 6). ISSF Technical Report 2019-02. International Seafood Sustainability Foundation, Washington, D.C., USA

McCluney, J. K., Anderson, C. M., & Anderson, J. L. 2019. The fishery performance indicators for global tuna fisheries. *Nature communications*, *10*(1), 1641.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Ecuador: ≥80 Panama: ≥80 US: ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery		
Scoring Issue		SG 60	SG 80	SG 100
a	**Decision-making processes**			
	Guide post	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	
Rationale				
In this fishery this Scoring Issue relates primarily to the role and operations of the IATTC as it is the body tasked with developing and implementing management arrangements. Decision-making processes are in place, which are established, responsive and largely transparent. Information used for decision-making is published. Decisions are made by consensus and there is no objection or opting out procedure. Resolutions are binding, but recommendations are non-binding. All management measures apply equally inside EEZ and on high seas. Parties enforce management measures within their own EEZ. IATTC requires that decisions are made through consensus. Members can in theory veto resolutions. Members can vote, but cooperating non-members are not entitled to take part in voting. While there is no evidence that a lack of consensus has prevented necessary conservation measures being adopted, it is possible that the requirement for consensus slows up decisions while negotiations may take place. Despite this, decision-making processes are in place that result in measures and strategies to achieve objectives, meeting SG80.				
b	**Responsiveness of decision-making processes**			
	Guide post	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.

		wider implications of decisions.	account of the wider implications of decisions.	
	Met?	Ecuador: Yes Panama: Yes USA: Yes	Ecuador: Yes Panama: Yes USA: Yes	Ecuador: No Panama: No USA: No

Rationale

IATTC
Each national section has one vote (Rules of Procedure Rule III). All decisions, resolutions, recommendations, and other official actions of the Commission are taken only by a unanimous vote of all of the High Contracting Parties to the Convention (Rule IV). This allows some activities of the Commission to be blocked\
Consultation includes trying to ensure participants are aware of their responsibilities. Training workshops are provided to captains authorized to fish in IATTC waters. Meetings include AIDCP Seminars for fishermen and an ETP Captain's Training Workshop, which are required for inclusion in the list of qualified captains.
The decision-making is transparent. IATTC resolves most disputes by consensus at its annual meetings. While the outcome of such decisions is transparent as it is published as a resolution from the annual meetings, and initial positions and the information used for the basis of the decision is available (as technical reports provided to the meeting or as proposals for resolutions from some Parties), exactly how a decision is reached is not always evident. The system makes sure that all Commission members are fully informed of the issues under consideration and are able to participate in informed decision-making.

The decision-making is adaptive in that decisions are evaluated by the various specialist meetings and feedback is provided to the Commission. The Commission appears to respond appropriately by approving new resolutions **serious and other important issues**. For example, in 2019, new resolutions were passed by the Commission to regulate FADs and address the conservation of sea turtles, silky shark and whale sharks. Whether this will always be timely is less clear. With a requirement for consensus such decisions might be delayed to the extent of endangering a stock or fishery.

It can be shown that it deals with serious and important issues in a transparent, timely and adaptive manner meeting SG80. Consensus decision-making may not deal with all issues with contentious issues being sidelined and therefore all issues may not be addressed. SG100 is not met.

c	**Use of precautionary approach**			
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Ecuador: Yes Panama: Yes US: Yes	

Rationale
The IATTC Antigua Convention requires that the members of the Commission, directly and through the Commission, apply the precautionary approach, as described in the relevant provisions of the Code of Conduct and/or the 1995 UN Fish Stocks Agreement . Specifically, the Convention requires that Commission be more cautious when information is uncertain, unreliable or inadequate and does not use the absence of adequate scientific information as a reason for postponing or failing to take conservation and management measures. Article VII of the Convention requires that the Commission adopts measures that are based on the best scientific evidence available to ensure the long-term conservation and sustainable use of the fish stocks covered by this Convention. The Commission is also tasked to determine whether, according to the best scientific information available, a specific fish stock covered by this Convention is fully fished or overfished and, on this basis, whether an increase in fishing capacity and/or the level of fishing effort would threaten the conservation of that stock. Based on the above information it is evident that decision-making processes for the IATTC are based on precautionary approach and use the best available information, meeting SG80.

d	Accountability and transparency of management system and decision-making process			
	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	Information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on the fishery's performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: No

Rationale
The highest level of accountability for this fishery rests with the IATTC as the body responsible for the overall management of the resource and as the "decision making" entity. Recommendations from research, monitoring, evaluation and performance review are published formally. Similarly, reports of the plenary sessions of meetings are published formally and are publicly available. All information available for the decision making is published, allowing any stakeholder to draw their own conclusions, and there is frequent feedback from NGOs, scientists and other stakeholders.

However, while reports are available, it is not clear that they represent all information that is used. There is no formal, detailed explanation linking the information provided to the decision that results. The decisions are presented in the resolutions as results, with minimal justification.

With detailed formal public reporting of decisions and information on which those decisions are based, the IATTC fisheries meet SG80. Overall, SG 100 is not met because it cannot be demonstrated that all stakeholders receive information that describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity**.**

e	**Approach to disputes**			
	Guide post	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: No

Rationale

The primary management system in relation to this Scoring Issue is the IATTC. The Commission is the overarching management authority; it sets management arrangements and seeks to assess compliance by Members with the arrangements. It also has dispute resolution and review arrangements which have not as yet been used.

The IATTC is not subject to any court challenges as of 2020. It does not indicate any disrespect or defiance of the law through repeated violations. There is no evidence that other entities flout the law, with the notable exception of particular fishing companies and fishing vessels, which are listed on the IUU fishing list. Therefore, excluding these, IATTC and its Parties meet the SG60.

Given that there are no current outstanding judicial disputes and that so far members have avoided resorting to using international law to settle disputes, the management system meets SG80. By resolving disputes through IATTC meetings the Parties have pro-actively avoided legal disputes however there is no evidence, due to a lack of legal challenge, that judicial decisions would be rapidly implemented.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Ecuador: ≥80 Panama: ≥80 US: ≥80
Information gap indicator	More information sought for SI 3.2.2b Ecuador and Panama
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	**MCS implementation**			
	Guide post	Monitoring, control and surveillance mechanisms exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes	Ecuador: No Panama: No US: No

Rationale

IATTC
At the regional level, the IATTC seeks to improve compliance mainly via vessel registration, but procedures also include catch and effort monitoring and diplomatic and other pressures applied to nation states.

Most information on compliance comes from port monitoring and observer programs. The IATTC has the longest-established regional scientific and enforcement program. The regional observer program is fully coordinated by the Secretariat, with its own observers, but also with the participation of national programs There is 100% coverage for purse seiners above 363 mt capacity.

IATTC member vessels over 24m length catching tuna within the region must have VMS. This is particularly important for time-area closure for bigeye. Other resolutions include measures to reduce bycatch mortality of dolphins, seabirds, sea turtles and sharks. These resolutions on bycatch of sharks and turtles have been effective, but there is some evidence that not all vessels comply with requirements.

IATTC uses its vessel registers to establish a 'positive lists' and identify IUU vessels, information which is shared with other RFMOs (Resolutions C-11-05, C-14-01). This record is based on information submitted by parties and cooperating non-parties. Importantly, vessels not entered into the record are deemed to be unauthorized to fish for, retain on board, transship or land tuna and tuna-like species. There is also a shared IUU vessel list.

CPCs of the IAATC report annually on compliance with a list of IATTC resolutions listed in Resolution C-11-07 (and as updated periodically). These reports are reviewed by Committee for the Review of

Implementation of Measures adopted by the Commission. The Committee also reviews information compiled by the Director of the IATTC on possible non-compliance with IATTC resolutions from the reports of the IATTC observers for purse-seine fishing vessels and at-sea transshipment as well as other available information. Alleged infractions by vessels flagged to CPCs are reported by the Director of the IATTC to the respective national government bodies. CPCs are required to respond to these notices. At the end of each Committee meeting, for each CPC, the compliance record, areas of possible improvement as well as any recommended actions are recorded in the report of the Committee, which is then sent to the IATCC. The compliance information discussed by Committee meetings is confidential and not released publicly making it challenging to assess the actual compliance records CPCs.

Ultimately, flag States are responsible to the relevant RFMO for any failure to ensure that measures are implemented and for the resulting violations of those measures by States' vessels.

MCS arrangements at the regional level meet SG 60 and SG 80 requirements. MCS arrangements at the regional level do not demonstrate a consistent ability to enforce relevant management measures, strategies and/or rules by all CPCs as indicated by recent reports on MCS effectiveness by the EU and the US. This is in large part because flag States are responsible to the IATTC for any failure to ensure that measures are implemented and for the resulting violations of those measures by States' vessels meaning SG 100 at the regional IATTC/leveli s not met.

Ecuador

An important role for all Flag States is implementation of IATTC MCS requirements under their commitment to IATTC and this reflected in Ecuador's fisheries legislation. Fisheries are managed and regulated under the Fisheries and Fisheries Development Law, first passed in 1974 it was amended in 1985, 2005, and 2016. The 2016 amendments were made to give effect to the National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated fishing. The objective of this Plan is to define the national policies for fighting IUU fishing in the jurisdictional waters of Ecuador and the adjacent high seas.

> However, the system is not comprehensive and the ability to consistently enforce relevant management measures is not apparent. In October 2019, Ecuador received a yellow card from the European Union over shortcomings in the mechanisms that the country has put in place to ensure compliance with its international obligations as a flag, port and market state. The shortcomings noted by the European Union included that law enforcement is hampered by an outdated legal framework, inefficient administrative procedures and a lenient approach towards infringements.

The yellow card triggers a formal dialogue in which the Commission and the third country work together to solve all issues of concern. Ecuador is undertaking a series of fisheries reforms to address the issues raised by the European Union. Most notable is the updating of national fisheries legislation, described previously, to bring it into line with the international and regional rules applying to the conservation and management of fishing resources. Also updated will be the monitoring, control and surveillance regime that includes fisheries enforcement and sanctions.

MCS mechanisms are in place and there is a reasonable expectation that they are effective, but Ecuador has not yet demonstrated an ability to enforce relevant management measures, strategies and/or rules. SG 60 requirements are met but those for SG 80 are not.

Panama
In 2009, a National Action Plan to prevent, discourage and eliminate Illegal Undeclared and Unregulated Fishing (INDNR) was produced containing comprehensive MCS actions. It identified the implementing authorities as the Maritime Authority of Panama, through the Directorate of Merchant Marine, the National Air Service, the National Customs Authority, the Ministry of Health, through the Directorate of Public Health, Department of Food Protection, and the Ministry of Foreign Relations through the Directorate-General for International Economic Relations.

Executive decrees 160, 161 and 162 address administrative sanctions, mechanisms for the monitoring, control and surveillance, and the permitting of fishing and fishing support vessels respectively. Decree 160 of 2013 established a fisheries monitoring and control centre to manage VMS information. It also made logbooks mandatory for vessels greater than 20m, specified required observer coverage and established a system of vessel inspection. Fishing and fishing support vessels licensed to operate in international waters are available online (https://arap.gob.pa/listado-embarcaciones-apoyo-y-captura/). In 2019, Panama signed an agreement with Global Fishing Watch to make the real-time position of its distant water fishing fleet from its vessel monitoring system publicly available.

In October 2019, Panama received a yellow card from the European Union over shortcomings in the mechanisms that the country has put in place to ensure compliance with its international obligations as flag, port and market state. These shortcomings include:

- Deficiencies in terms of control, notably over the activities of the fishing and fishing related activities of vessels flying the flag of Panama.

- Deficiencies in the implementation of the Port State Measures Agreement in order to prevent fish stemming from IUU fishing activities reaching national and international markets and to effectively prevent IUU vessels from receiving port services

Panama had already received a yellow card in November 2012, which was then lifted in October 2014. It is the first country to be given a yellow card by the European Union twice.

Although MCS mechanisms are established by Executive decrees 160, 161 and 162 and there is a reasonable expectation that they are effective meeting SG 60. However, based on the available evidence, Panama has not demonstrated an ability to enforce relevant management measures, strategies and/or rules so SG 80 is not met.

USA
The US purse seine fleet operating in the ETPO is subject to the authority of the High Seas Fishing Compliance Act (https://gov.ecfr.io/cgi-bin/text-idx?SID=dcd6b143e127c00dc90cb4f25c328e3f&mc=true&node=pt50.11.300&rgn=div5), which governs the conduct of USA fishing vessels on the high seas, and under which a high seas fishing permit is required for a USA fishing vessel to be used for commercial fishing anywhere on the high seas. MCS related mechanisms specific to the IATTC region are set out in several documents including:

- The NOAA Fisheries IATTC Vessel Register Compliance Guide; and
- The Compliance Guide Fishing Restrictions for Tropical Tuna in the Eastern Pacific Ocean for 2018-2020 and FAD Construction Requirements.

The NOAA website provides evidence of fisheries enforcement cases in relation to USA vessels (from 2010) including Enforcement Decisions and Orders (see http://www.gc.noaa.gov/enforce-office6.html) and Enforcement Charging Information (see http://www.gc.noaa.gov/enforce-office7.html). It also provides information on prohibitions, landing restrictions, and catch documentation schemes.

The USA monitoring, control and surveillance system has been implemented and has demonstrated an ability to enforce relevant management measures, strategies and/or rules meeting SG80 levels. Since IAATC MCS measures are not sufficiently comprehensive to meet SG 100, US MCS measures cannot meet SG100.

b	**Sanctions**			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: Yes	Ecuador: No Panama: No US: No

Rationale

IATTC
IATTC established conservation management measures and related resolutions and enforcement is carried out by the national authorities. Blacklisting of non-member vessels (IUU lists) has become a widespread practice among all RFMOs including IATTC There no trade sanctions against nation states, although theoretically these may be possible. Sanctions are only applied to fishing entities, such as IUU vessels and vessels that are detected as being non-compliant with resolutions).
On the whole, sanctions appear to be applied among countries consistent with their involvement in IATTC. IUU fishing remains a problem. Some non-compliance has been detected by the observer programmes, which is used as the basis for routinely reviewing compliance. Some non-compliance appears persistent. The reason for this non-compliance is unclear. However, seeing that this non-compliance is reported by observers on board, and there is little effort to hide these activities, the fishers in these cases are most likely unaware of their responsibilities. Overall, non-compliance is measured, it does not appear substantial and efforts are being undertaken to reduce it.
Sanctions to deal with non-compliance certainly exist and there is evidence that they are applied, meeting SG60. Limited evidence suggests that they are probably an effective deterrent, which meets the SG80, but does not meet SG100.

Ecuador
Ecuador has legislation specifying sanctions for infractions in the UOA. The current sanction system is based on the Fisheries Law which was adopted in 1974 and complemented in 2016 by the Decree

852. However, the sanctions contemplated in the Decree 852, and which were originally designed to compensate for the weakness of the ones in the 1974 Fisheries Law, have been seldom applied since the entry into force of this Decree.

The sanctioning scheme remains based on a weak and outdated legal framework, which lacks a definition of IUU activities and provides for a level of sanctions which fails to ensure deterrence of these sanctions. The maximum fine imposed in Ecuador for industrial vessels in 2018, irrespective of the gravity of the infringement and the value of the fishery products. involved, did not exceed 4 500 USD.

According to the European Commission, Ecuadorian authorities also acknowledged that they face legal and practical issues to recover the fines, and cumbersome administrative procedures often result in practical impossibility to address recidivism. Information provided by Ecuadorian authorities to the European Commission indicates an uneven approach in relation to the application of sanctions, notably as regards the confiscation of illegal catches. As a result, the sanctioning system is neither depriving the offenders from the benefits accruing from IUU fishing, nor deterrent.

In particular, the EU noted that the sanctioning scheme:

> "…remains based on a weak and outdated legal framework, which lacks a definition of IUU activities and provides for a level of sanctions which fails to ensure deterrence of these sanctions. The maximum fine imposed in Ecuador for industrial vessels in 2018, irrespective of the gravity of the infringement and the value of the fishery products. involved, did not exceed 4 500 USD. In addition, Ecuadorian authorities also acknowledged that they face legal and practical issues to recover the fines, and cumbersome administrative procedures often result in practical impossibility to address recidivism. Information provided by Ecuadorian authorities also suggests uneven approach in relation to the application of sanctions, notably as regards the confiscation of illegal catches."

The EU goes on to state:

> "… failure to enforce deterrent sanctions also resulted in recidivism by Ecuadorian vessels operating in the IATTC area and therefore additional breaches of the conservation and management measures adopted by this organisation.

Sanctions to deal with non-compliance exist in Ecuador and there is some evidence that they are applied meeting SG60. However, they appear inconsistently applied and do not provide effective deterrence so SG80 is not met.

Panama

Panama passed Executive Decree No. 160 of June 6, 2013, which set forth procedures to impose administrative sanctions for violations of the regulations on aquatic, coastal/marine, and fishery resources included in Law 44 of November 23, 2006. A vessel wanting to change owners or cancel its registration must now pay any pending fines or present a bond of $1 million. Before this decree came into force, vessels fined for violations could cancel their Panamanian registration and thereby avoid paying their fines.

Executive Decree No. 161 of June 6, 2013, provides the mechanisms of inspection, monitoring, and control of nationally registered fishing and fishing support vessels that operate internationally. Executive Decree No. 162 of June 6, 2013, establishes and regulates fishing and fishing support licenses for vessels that fish internationally.

In addition, the Panamanian agencies have implemented inter-institutional cooperation and now exchange information on fishing vessels and national and international fishery inspections. The automation of catch certificates has been regulated; fishing license information can now be verified online.

Despite measure take from 2012 to 2014 in response to the EU's first yellow card, Panama received a second yellow card in 2019. The European Commission determined that law enforcement is affected by inefficient administrative procedures and a lenient approach towards infringements. The EU concluded there are significant delays in the imposition of sanctions and the sanctioning system is neither depriving the offenders from the benefits accruing from IUU fishing, nor deterrent.

Sanctions to deal with non-compliance exist in Panama and there is some evidence that they are applied meeting SG60. However, they appear inconsistently applied and do not provide effective deterrence so SG80 is not met.

USA

There is clear evidence of legal requirements being enforced by USA authorities and transcripts of legal proceedings provide evidence of the sanctions that have been implemented. The NOAA website provides evidence of fisheries enforcement cases in relation to USA vessels (from 2010) including Enforcement Decisions and Orders (see http://www.gc.noaa.gov/enforce-office6.html) and Enforcement Charging Information (see http://www.gc.noaa.gov/enforce-office7.html). It also provides information on prohibitions, landing restrictions, and catch documentation schemes. The USA also independently reviews all its vessels' IATTC observer records, beyond those flagged for potential non-compliance by the IATTC.

SG60 and SG80 requirements are met in the case of the USA but it cannot be concluded whether the available information demonstrably indicates effective deterrence so SG100 is not met.

c	**Compliance**			
	Guide post	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Ecuador: Yes Panama: Yes USA: Yes	Ecuador: Yes Panama: Yes USA: Yes	Ecuador: No Panama: No USA: No

Rationale
IATTC The IATTC has a permanent working group on compliance that reviews and monitors compliance with IATTC management measures (IATTC-COR 2014). As well as undertaking analysis of information on compliance and reporting the findings to the IATTC, the working group also recommends measures to promote compatibility among the national fisheries management measures, addressing matters related to compliance with fisheries management measures. Unfortunately, reports of these meetings do not go into detail on possible infractions and more detailed information discussed at the meetings is treated as confidential. Available information suggests there is some evidence to demonstrate fishers comply with the management system. However, the confidential nature of much of the information in relation to this Scoring Issue means that there is not a high degree of confidence in relation to compliance, preventing SG 100 being met. SG 60 and SG 80 requirements are met. Ecuador Available information suggests there is some evidence to demonstrate fishers comply with the management system including, when required, providing information of importance to the effective management of the fishery. However, the confidential nature of much of the information in relation to this Scoring Issue means that there is not a high degree of confidence in relation to compliance, preventing SG 100 being met. SG 60 and SG 80 requirements are met. Panama Available information suggests there is some evidence to demonstrate fishers comply with the management system including, when required, providing information of importance to the effective management of the fishery. However, the confidential nature of much of the information in relation to this Scoring Issue means that there is not a high degree of confidence in relation to compliance, preventing SG 100 being met. SG 60 and SG 80 requirements are met. USA The comprehensive US MCS, system of sanctions and a review of fisheries enforcement cases in relation to USA vessels (from 2010) including Enforcement Decisions and Order and Enforcement Charging Information means evidence exists to demonstrate US fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery. Review of logbook information, observer data and other compliance information by US Authorities provides a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery. SG 100 is met.

d	**Systematic non-compliance**			
	Guide post		There is no evidence of systematic non-compliance.	
	Met?		Ecuador: Yes Peru: Yes	

			US: Yes	

Rationale

IATTC
Non-compliance with conservation measures is likely opportunistic or possibly down to ignorance of the resolutions and/or the lack of sanctions. Non-compliance does not appear to be systematic and does not threaten the sustainability of the fishery.

Ecuador
Non-compliance with conservation measures is likely opportunistic or possibly down to ignorance of the resolutions and/or the lack of sanctions. Non-compliance does not appear to be systematic and does not threaten the sustainability of the fishery. The reported infractions in US and EU documents is a small percentage of the Ecuadorian tuna fleet.

Panama
Non-compliance with conservation measures is likely opportunistic or possibly down to ignorance of the resolutions and/or the lack of sanctions. Non-compliance does not appear to be systematic and does not threaten the sustainability of the fishery.

USA
A review of fisheries enforcement cases in relation to USA vessels including Enforcement Decisions and Order and Enforcement Charging Information shows no evidence of systematic non-compliance by US flagged vessels. SG80 is met.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Ecuador: 60-79 Panama: 60-79 US: ≥80
Information gap indicator	More information sought for SI 3.2.3 c and SI 3.2.3d for Ecuador and Panama and from the IATTC for SI 3.2.3d
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue		SG 60	SG 80	SG 100
a	**Evaluation coverage**			
	Guide post	There are mechanisms in place to evaluate some parts of the fishery-specific management system.	There are mechanisms in place to evaluate key parts of the fishery-specific management system.	There are mechanisms in place to evaluate all parts of the fishery-specific management system.
	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: No
Rationale				
The IATTC has extensive mechanisms in place to evaluate the management system as demonstrated by the various committees and working groups of IATTC that meet regularly and report their findings to the Commission. As well as the annual Commission meetings, regular meetings include those for the Scientific Advisory Committee, the Committee for the Review of Implementation Measures and the International Review Panel. Reports from meetings of the various groups are available on the IATTC website. **The fishery does not have mechanisms in place to evaluate all parts of the management system. A major omission is the inability to transparently evaluate of flag-state compliance with IATTC requirements under C-011-07.** IATTC has in place mechanisms to evaluate key parts of the management system, as demonstrated by the various committees and working groups that meet regularly and report their findings to the Commission as well as a 2016 performance review of IATTC. In addition, there is an annual International Review Panel of IDCP, where, amongst other issues, the observer programmes are evaluated. SG60 and SG80 requirements are met as there are mechanisms in place to evaluate key parts of the fishery-specific management system. SG100 is not met as it is not clear that these arrangements cover all parts of the fishery-specific management system.				
b	**Internal and/or external review**			
	Guide post	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.

	Met?	Ecuador: Yes Panama: Yes US: Yes	Ecuador: Yes Panama: Yes US: Yes	Ecuador: No Panama: No US: No

Rationale

The focus of this Scoring Issue is the IATTC. The Commission has overall responsibility for developing and implementing a fishery specific management system, Members are bound by the arrangements in the management system and required to implement these in domestic legislation and policy.

The IATTC is subject to regular internal review. This is demonstrated by the various committees and working groups that meet regularly and report the**ir findings to the Commission and which are published. including:**

- **Comprehensive review functions and responsibilities of the Scientific Advisory Committee established under Antigua Convention Article XI);**
- **Review functions and responsibilities of the Committee for the Review of Implementation of Measures (established under Antigua Convention Article XVIII) are set forth in Annex 3 of the Antigua Convention;**
- **The Commission may engage external scientific experts to carry out periodic peer reviews of scientific information and advice provided by the Commission may; and**
- **The business and meetings of the IATTC are transparent and conducted annually and as a consequence, the status of conservation and management objectives are the subject of review of public opinion and subsequent political ramifications.**

The IATTC has carried out an external performance review in 2016 (Moss-Adams 2016). This implies that the RFMO meets SG80 with respect to "occasional external" review. However, the management system is not subject to regular internal and external review, thus SG 100 is not met.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	Ecuador: ≥80 Panama: ≥80 US: ≥80
Information gap indicator	Information sufficient to score PI
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	
Condition number (if relevant)	