Updated Pre-assessment of Pacific Longline Tuna (Thai Union) fishery against the Marine Stewardship Council Fisheries Standard

Confidential Report
Version 4.0

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1 Glossary

Acronym	Definition
ALC	Automatic Location Communicator
B_0	equilibrium unexploited total biomass
$B_{Fcurrent}$	equilibrium total biomass at $F_{current}$
B_{init}	Initial biomass at the start of the stock assessment model (for the albacore assessment, B_{1960})
B_{MSY}	equilibrium total biomass at MSY
CCM	WCPFC Commission Members, Cooperating non-Members, and participating Territories
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMM	WCPFC Conservation and Management Measure
CNM	WCPFC cooperating non-member
CoC	Chain of Custody
CPUE	Catch per Unit Effort
EA	Ecosystem Approach
EAFM	Ecosystem Approach to Fisheries Management
EEZ	Exclusive Economic Zone
eNGO	Environmental Non-Governmental Organisation
ENSO	El Niño Southern Oscillation
EMS	Electronic Monitoring System
ERA	Ecological Risk Assessment
ETP	Endangered, threatened or protected species
FAME	SPC Division of Fisheries, Aquaculture and Marine Ecosystems
FAO	Food and Agricultural Organization
FEP	Fishery Ecosystem Plan (American Samoa)
FFA	Pacific Islands Forum Fisheries Agency
FFC	Forum Fisheries Committee
FL	Fork Lengths
FIP	Fishery Improvement Programme
F_{MSY}	Fishing mortality at age resulting in MSY
FSM	Federated States of Micronesia
HCR	Harvest Control Rule
HMS	Highly Migratory Species
IATTC	Inter-American Tropical Tuna Commission
IPOA	International Plan of Action
ISC	International Scientific Committee for Tuna and Tuna like Species in the N. Pacific Ocean

ISSF	International Seafood Sustainability Foundation
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated (fishing)
LRP	Limit Reference Point
M	Mortality
MCS	Monitoring, Control and Surveillance
MEY	Maximum Economic Yield
MFMRD	Ministry of Fisheries and Marine Resources Development
MMR	Ministry of Marine Resources (Cook Islands)
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
MSY, Y_{FMSY}	equilibrium yield at F_{MSY}
NC	Northern Committee (of the WCPFC)
Nm	Nautical mile
NOAA	National Oceanic and Atmospheric Administration
NPOA	National Plan of Action
NTADS	Non-target and dependent species
PAE	Party Allowable Effort
PCDR	Public Comment Draft Report
PNA	Parties to the Nauru Agreement
PRI	Point of Recruitment Impairment
RFMO	Regional Fisheries Management Organisation
SB	Spawning Biomass
SB_0	Equilibrium unexploited spawning potential
$SB_{Fcurrent}$	Average current spawning potential in the absence of fishing
SBinit	Initial spawning potential at the start of the stock assessment model (for the albacore assessment, SB_{1960})
SC	Scientific Committee (of the WCPFC)
SEAPODYM	Spatial Ecosystem and Population Dynamics Model
SIDS	Small Island Developing States
SP	Spawning potential - equivalent measure to spawning stock biomass under the assumption that reproductive output is proportional to biomass over the size at maturity – but can take account of other patterns of reproductive output.
SPA	South Pacific Albacore
SPC	Pacific Community (formerly Secretariat of the Pacific Community, and before that the South Pacific Commission; the organization has retained the acronym SPC despite the new name)

SPREP	Secretariat of the Pacific Regional Environment Programme
SRP	WCPFC Strategic Research Plan
TAC	Total Allowable Catch
TAE	Total Allowable Effort
TCC	Technical Compliance Committee (of the WCPFC)
TMP	Management Plan on Tuna Fisheries for the Federated States of Micronesia
TRP	Target Reference Point
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UoC	Unit of Certification
VB	von Bertalanffy
VDS	Vessel Day Scheme
VMS	Vessel Monitoring System
VR	Variation Request
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
$Y_{Fcurrent}$	Equilibrium yield at $F_{current}$

2 Executive summary

This document presents the results of an updated pre-assessment against the Marine Stewardship Council (MSC) Fisheries Standard for sustainable fishing (Version 2.01) using the most relevant information. The fishery being assessed is the Pacific Longline Tuna (Thai Union) fishery. The fishery targets albacore (*Thunnus alalunga*) and catches bigeye (*T. obesus*) and yellowfin (*T. albacares*). The pelagic longline vessels are flagged to China and Vanuatu and fish on the high seas in the Pacific. The fishery is managed regionally by the Western and Central Pacific Fisheries Commission (WCPFC) in the Western and Central Pacific Ocean (WCPO) and by the Inter American Tropical Tuna Commission (IATTC) in the Eastern Pacific Ocean (EPO). The aim of the document is to give updated guidance on gaps against the MSC standard that could be improved by a Fisheries Improvement Project (FIP).

This pre-assessment considered publicly available data and site visits. Data was collected from the WCPFC and IATTC website and other publicly available studies. Additional information was obtained from existing MSC fishery assessments and the fishery itself.

Overall, all stocks but EPO yellowfin tuna would pass Principle 1, with two conditions per stock. All stocks are well above the Point of Recruitment Impairment (PRI) and fluctuating around F_{MSY} and are not likely to be subject to overfishing. However, the continued lack of HCRs for tuna species continues to be the main issue for P1. The recent stock assessment for EPO yellowfin showed a drop in biomass below MSY, meaning a rebuilding plan needs to be put in place. PI 1.1.2 for rebuilding is the PI which does not score SG60. Note, harmonisation conversations regarding these stocks are ongoing and this is subject to change.

For Principle 2, primary and secondary species score well. All primary species are thought to be above the point of recruitment impairment (PRI), with suitable management in place. Both the WCPO and EPO ETP species outcome and information failed to score more than SG80 due to the poor stock status, lack of information and the vulnerability of those species to be captured in longline operations in the Pacific. There is management in place for ETP species such as marine turtles and some shark species in both Regional Fisheries Management Organisation areas.

For Principle 3, the pre-assessments considered the WCPFC and IATTC RFMO management systems, which predicted scores of 80 or above for all PIs except decision-making (PI 3.2.2) in the case of south Pacific albacore UoAs (note most recent harmonisation discussions have closed this condition, however it shall remain in this preassessment until formal notice is provided). This raises a condition for PI 3.2.2, as is the case with all currently certified south Pacific albacore MSC fisheries. All flag states were also assessed in this report. Issues with lack of information hampered scoring for China in particular. All of which would currently most likely fail at full assessment for high seas UoAs.

In general, the key strengths of the fishery are:

- The governance and management of the fisheries at a RFMO level is well documented and well implemented.
- Primary and secondary species stocks appear to be above PRI.

The key weaknesses in the fishery are:

- Lack of a formal harvest strategy and harvest control rules for the target stocks (bigeye, yellowfin and albacore) and lack of rebuilding plan for EPO yellowfin;

- Lack of management and information for manta and mobula ray and some other shark species;
- Lack of information on ETP species encounters;
- Lack of information in Principle 3 PI's, transparency and possibly poorly managed flag states on the high seas in the case of China.

In conclusion, two Performance Indicators in this assessment scored <60, which was for ETP species outcome and information (2.3.1 and 2.3.3) and Eastern Pacific yellowfin Rebuilding (PI 1.1.2). In Principle 1 there were 4 out of the 7 PIs that scored less than 80 across all UoAs.

3 Report details

3.1 Aims and constraints of the pre-assessment

This document presents the results of a pre-assessment against the Marine Stewardship Council (MSC) Fisheries Standard for sustainable fishing (Version 2.0). The fishery being assessed is the Pacific Longline Tuna (Thai Union) fishery. The fishery targets albacore (*Thunnus alalunga*) and catches bigeye (*T. obesus*) and yellowfin (*T. albacares*). The pelagic longline vessels are flagged to China and Vanuatu and fish on the high seas in the Pacific. The fishery is managed regionally by the Western and Central Pacific Fisheries Commission (WCPFC) in the Western and Central Pacific Ocean (WCPO) and by the Inter American Tropical Tuna Commission (IATTC) in the Eastern Pacific Ocean (EPO). The aim of the document is to give updated guidance on gaps against the MSC standard that could be improved by a Fisheries Improvement Project (FIP).

There are three principles in the MSC standard:

Principle 1 – Sustainable fish stocks, target fish stocks must be kept at a sustainable level.
Principle 2 – Minimising environmental impacts, the fishery should be managed in a way that maintains the structure, productivity, function and diversity of the fisheries ecosystem.
Principle 3 – Effective management, the fishery must have a responsive management system in place and management must meet all local, national and international laws.

Fisheries assessed against the MSC Fisheries Standard are evaluated against 28 Performance Indicators (PIs) within the three principles. There are six performance indicators for Principle 1, split between two components, outcome (2 PIs) and management (4 PIs). Principle 2 has 15 performance indicators split into three components (outcome, management strategy, information) for primary species, secondary species, endangered threatened and protected species, habitats and ecosystem. Principle 3 has seven performance indicators split between two components, governance and policy (3 PIs) and fishery specific management system (4 PIs).

PIs are scored for the fishery based on the MSC specific scoring guidelines (SGs). For a fishery to be certified, the fishery must score a minimum of 60 against all 28 PIs and an average of 80 across each of the three principles. Performance indicators that score between 60 and 79 will be given a condition to achieve a score of 80 or above within a specific timeframe. After certification, the fishery will undergo annual audits and will be re-assessed every five years.

The MSC decision rule for reaching the final recommendation is as follows:

- No PIs can score below 60.
- The aggregate score for each Principle, rounded to the nearest whole number, is 80 or above.

The aggregate score for each Principle is the sum of the weighted score of each Performance Indicator within that Principle.

The purpose of this updated pre-assessment is to revaluate the status of the fishery in relation to the MSC Fisheries Standard and to identify deficiencies. A pre-assessment cannot fully duplicate a full assessment against the MSC standard. A full assessment involves expert team members and public consultation stages that are not included in a pre-assessment. A pre-assessment provides a provisional

assessment of a fishery based on a limited set of information provided by the client; its conclusions as to the outcome of a full assessment are always somewhat uncertain.

4 Units of Assessment

4.1 Units of Assessment

Unit of Certification (UoC) vs. Unit of Assessment (UoA)

The UoC is defined as consisting of the target stock(s), fishing method or gear type(s), vessel type(s) and/or practices, fishing fleets or groups of vessels, or individual fishing operators pursuing that stock including those client group members initially intended to be covered by the certificate.

The UoA can be defined as consisting of the target stock(s), fishing method or gear type(s), vessel type(s) and/or practices, fishing fleets or groups of vessels, or individual fishing operators pursuing that stock, including any other eligible fishers that are outside the unit of certification.

In summary, the UoA = UoC and any other eligible fishers identified at the start of assessment.

For the purposes of this pre-assessment, no other eligible fishers were identified; the UoA is therefore the same as the UoC.

The UoAs are divided by tuna stock and operating fleet flag, China and Vanuatu. China and Vanuatu-flagged vessels are targeting stocks in both the WCPO and EPO. High seas operations are conducted by all flagged vessels. Vanuatu flagged vessels are managed by Tunago and Chinese vessels are managed by Ping Tai Rong. They are as follows:

- North Pacific stocks of albacore fished in western and central Pacific Ocean (WCPO) and eastern Pacific Ocean (EPO) by the two different flags and managed jointly by WCPFC and IATTC (EEZs and high seas).
- South Pacific stocks of albacore fished in western and central Pacific Ocean (WCPO) and eastern Pacific Ocean (EPO) by the two different flags and managed by WCPFC (EEZs and high seas).
- Western and central Pacific bigeye fished in the western and central Pacific Ocean (WCPO) by the two different flags and managed by WCPFC (EEZs and high seas).
- Eastern Pacific bigeye fished in the eastern Pacific Ocean (WCPO) by the two different flags and managed by IATTC (EEZs and high seas).
- Western and central Pacific yellowfin fished in the western and central Pacific Ocean (WCPO) by the two different flags and managed by WCPFC (EEZs and high seas).
- Eastern Pacific yellowfin fished in the eastern Pacific Ocean (WCPO) by the two different flags and managed by IATTC (EEZs and high seas).

Table 1 – UoAs considered for this FIP

Species	Gear Type	Stock	Flag
Albacore	Longline	North Pacific	China
			Vanuatu
Albacore	Longline	South Pacific	China
			Vanuatu
Bigeye	Longline	Western and Central Pacific	China
			Vanuatu

Bigeye	Longline	Eastern Pacific	China
			Vanuatu
Yellowfin	Longline	Western and Central Pacific	China
			Vanuatu
Yellowfin	Longline	Eastern Pacific	China
			Vanuatu

These UoAs could be further broken down by area of operations, i.e. separating by EEZ or high seas, but this is a task for the full assessment and is not considered here.

4.2 Harmonisation

A note on north and south Pacific albacore and western and central Pacific yellowfin stocks: In July 2015, the MSC implemented their internal MSC Tuna Strategy to address issues regarding Highly Migratory Species (HMS) managed by RFMOs. In early 2016 the MSC developed a pilot harmonisation workshop to create a single point for harmonisation among fishery assessments with a focus on harmonising scores for Principle 1. This pilot considered scoring of WCPO yellowfin and North and South Pacific albacore tuna. Although there have been new stock assessments since and the pilot was not repeated, the scoring of these stocks remains harmonised between tuna fisheries in the MSC programme.

The MSC requires overlapping fisheries to harmonise assessment outcomes, but not conditions or timelines. There are currently 54 HMS fisheries (counting each stock per fishery in the case of multiple stocks in a single fishery, separately) in the MSC programme, 43 with outstanding conditions in relation to Reference Points, Harvest Control Rules and Harvest Strategies in Principle 1. While conditions have been harmonised (as per Annex PB of the FCP v2.1), the associated timelines have not. This lack of coherence amongst RFMO HMS fisheries and CABs has resulted in inconsistencies between in-assessment and certified fisheries and undermines the influence the MSC programme may have on mobilising RFMOs toward developing harvest strategies for HMS stocks. To address this problem, all CABs involved with tuna fisheries in the MSC programme entered a joint variation request (VR) to the MSC in November 2018 that proposed a “hard deadline” approach to Principle 1 conditions timelines for highly migratory species stocks subject to harmonisation in the MSC programme. In February 2019, the MSC responded to the joint VR with the following course of action:

- All tuna and tuna-like fisheries (herein, tuna fisheries) certified against Certification Requirements v1.3 will be upgraded to v2.0 to foster harmonisation efforts.
- Timelines for P1 conditions (limited to those with respect to harvest strategies and harvest control rules) will be aligned for all fisheries on the same stock.
- These timelines will be based on the calendar year that RFMO workplans are due to be completed, for all stocks where relevant workplans exist.
- Fisheries currently in assessment and new fisheries are not directly covered under this variation request, but CABs have committed to apply the same logic with respect to harmonising condition timelines aligned against RFMO work plans.

The result of this is that should the WCPFC workplan for the development of suitable harvest strategies and harvest control rules fall behind, all fisheries would firstly be behind target on those conditions, and following a further year, if there was no progressive action, all overlapping fisheries would be suspended from the MSC fisheries programme. Currently, the deadline for WCPFC fisheries is December 2021, in line with the 2017 WCPFC workplan. This milestone will be audited in early 2022). For WCPFC this process has recently been triggered, in that at WCPFC16 (December 2019) the interim harvest strategy workplan was extensively revised, with deadlines for the tropical stocks (skipjack, yellowfin and bigeye) pushed back. So far, CABs and MSC have not had time to react to this situation, but it should result in certified yellowfin and bigeye fisheries being audited as 'behind target' on P1 conditions in 2020. The situation with fisheries still in assessment is unclear.

4.3 Version details

The report uses the MSC Fisheries Standard v2.01, the Fisheries Certification Process v2.1 and MSC pre-assessment reporting template v3.1. The default assessment tree was used without adjustments. The Risk-Based Framework was not used. Note, the introductions to each section are replicated from multiple other assessments to align with MSC templates

4.4 Data availability

Data was collected as follows:

- International Management: Information about the functioning and management of the fishery (operations, data gathering and analysis, management structures and responsibilities, management plans, regulations, enforcement etc.), including WCPFC and IATTC Measures and Resolutions.
- National submissions to RFMOs; that includes summaries of logbook and observer data; catch composition, including the WCPFC Tuna Fishery Yearbook 2018.
- RFMOs: Information about regional management, tropical tuna harvest strategy and management objectives, bigeye stock assessment, regional observer programme and longline observer coverage, ongoing work on ETP species (sharks, rays, turtles) and marine pollution management measures, decision-making processes.
- Relevant MSC Public Certification Reports: country management (P3) for Vanuatu and China. Including:
    - Fiji albacore and yellowfin tuna longline, 2017. MSC full assessment; Lloyds Register (Acoura)
    - French Polynesia albacore and yellowfin longline MSC full assessment; Control Union Pesca Ltd
    - American Samoa EEZ albacore and yellowfin tuna longline, 2017. MSC full assessment; Control Union Pesca Ltd
    - Pacific tuna longline pre-assessment, 2017; Key Traceability
    - SZLC CSFC & FZLC FSM EEZ longline yellowfin and bigeye tuna, 2018; Control Union Pesca Ltd
    - WPSTA Western and Central Pacific skipjack and yellowfin free school purse seine, 2018. MSC full assessment; SCS Global Services

4.5 Fishery Description

The fishery under assessment is within the scope of the MSC Fisheries Standard (7.4 of the MSC Certification Process v2.1):

- The target species is not an amphibian, reptile, bird or mammal.
- The fishery does not use poisons or explosives.
- The fishery is not conducted under a controversial unilateral exemption to an international agreement.
- The client or client group does not include an entity that has been successfully prosecuted for a forced labour violation in the last two years.
- The fishery has in place a mechanism for resolving disputes, and disputes do not overwhelm the fishery.
- The fishery is not an enhanced fishery as per the MSC FCR 7.4.6; and
- The fishery is not an introduced species-based fishery as per the MSC FCR 7.4.7.

Pelagic longline gear is used globally to capture tuna and tuna-like species. Longline gear in this fishery is deployed from a single vessel across many miles of ocean. The vessel deploys a single mainline using line shooters that is periodically buoyed with floatation devices and thinner branchlines (with baited hooks) are then attached to the mainline between the floats (Figure 1).Within this simple framework, a variety of configurations and operational practices can be employed to specifically target different depths and species of fish (Control Union Pesca Ltd, 2018). A single set by vessels in the client fleet usually consists of a mainline that is up to 135 - 150km in length with ca. 20 - 50 m long branchlines attached at intervals along the length of the line. The distance between floats is about 1km, with about 17 - 30 hooks between floats. The depth of main line ranges between 220 – 260 metres in the water column. Wider circle hooks rather than J-hooks are consistently used in the fishery, as verified by the team during the site visit, finfish is only used as bait and shark lines and wire leaders are banned in the fishery as per Conservation Management Measure (CMM) on the conservation and management of sea turtles (CMM 2018-04), which requires vessel operators to use at least one of three mitigation methods for turtles, for example the use of large circle hooks in longline fisheries or only finfish as bait.

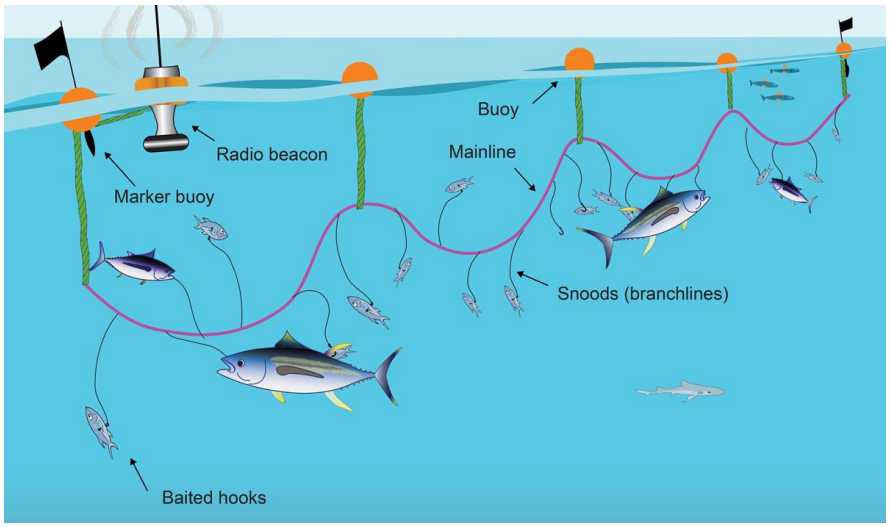

Figure 1. Typical pelagic longline gear configuration (source: http://www.afma.gov.au/portfolio-item/longlining/)

4.5.1 Total Allowable Catch (TAC) and catch data

There are no TACs for any of the target stocks of this assessment. Regional catches have been presented here for the WCPO from WCPFC catch statistics

Table 2. Catch figures for all fleets in tonnes (source Tuna Fishery Yearbook 2018)

Tuna stock	2016	2017	2018
North Pacific albacore tuna	56,808	59,994	56,715
South Pacific albacore tuna	68,263	93,290	82,136
Western central Pacific bigeye tuna	149,364	129,744	147,985
Eastern Pacific bigeye tuna	83,861	92,845	86,959
Western central Pacific yellowfin tuna	640,296	695,107	690,207
Eastern Pacific yellowfin tuna	210,946	193,771	159,278

The team received the following fishery-specific catch data from the client group, which has been amalgamated and anonymised for the sake of the updated preassessment. Further information to designate species, especially those listed as bycatch, was done through site visits with the vessel owners and skippers. Further to this, Electronic Monitoring has been installed on half of the vessels and a full catch composition is being composed.

Table 3 - Catch figures for all vessels within the FIP from 2016-2019 in tonnes provided by the fishing companies

Species	Total catch 2016 – 2019 (MT)	Total %	Designation
Albacore	6099.9	76.19	P1
Yellowfin	563.4	7.04	P1
Bigeye	434.4	5.43	P1
Striped Marlin	38.2	0.48	P2 - Primary, Minor
Sword Fish	79.9	1.00	P2 - Primary, Minor
Oilfish	74.3	0.93	P2 - Secondary, Minor
Blue Marlin	114.	1.42	P2 - Primary, Minor
Skipjack	122.9	1.54	P2 - Primary, Minor
Sailfish	33.3	0.42	P2 - Secondary, Minor
Non-Specific Bycatch	446.2	5.57	P2 - Primary, Main

5 Principle 1

5.1 Principle 1 – Low Trophic Level (LTL) species

None of the target species for this assessment are key Low Trophic Level (LTL) species, as they do not meet the requirements for key LTL species defined in paragraphs SA2.2.8 – SA2.2.10 of the MSC Fisheries Certification Requirements v2.0. The stocks are not involved in large portions of the trophic connections in the ecosystem; large volumes of the energy does not pass through the stocks between lower and higher trophic levels; and there are many other species at their trophic level through which energy can be transmitted from lower to higher trophic levels. They are not one of the species types listed in Box SA1, nor do they feed predominantly on plankton.

5.2 WCPO bigeye tuna background

Stock: Genetic analysis does not suggest significant population differentiation across the tropical Pacific (Grewe and Hampton, 1998), however for management purposes, bigeye is divided into two separate stocks: western and central Pacific (or WCPO) and eastern (or EPO) bigeye. The species grows relatively quickly, attaining a maximum length of ~200 cm. Individuals are considered to be mature between 80 and 120 cm in length. Work on bigeye growth has been the subject of recent research activities by scientists (Farley et al., 2018), leading to a new, more optimistic stock assessment in 2017 (McKechnie et al., 2017) and updated in 2018 (Vincent et al., 2018) compared to the previous assessment in 2014 (Davies et al., 2014).

Stock status: The most recent stock assessment (McKechnie et al., 2017) was later updated in 2018 to incorporate the updated growth curve from 'Project 81' (Vincent et al., 2018). These analyses surmised that all models with the updated new growth function put SB above the limit reference point (LRP) and that with the new growth function, estimated that recruitment has increased spawning potential in the last few years. Table 4 gives the stock assessment output from the Scientific Committee (SC)14 uncertainty grid (WCPFC, 2018a). SC14 concluded that the 'updated new' growth model reflected the best scientific information available, so did not incorporate the outputs with the old growth model into the data used to provide scientific advice to WCPFC.

Despite this, all models also estimated that there had been substantial decline in the abundance of bigeye across the time series. In terms of the probabilities of stock status relative to reference points, using the SC14 grid the SB is estimated to be above the limit reference point with high probability (36 out of 36 models), and F is estimated to be below F_{MSY} with 94% probability (2 out of 36 models) (WCPFC, 2018a). Figure 2 presents a Majuro plot comparing new and old growth models in relation to F and SB.

Table 4. Summary of reference points over the 36 models in the structural uncertainty grid. Note that $SB_{recent}/SB_{F=0}$ is calculated where SB_{recent} is the mean SB over 2012-2015 (WCPFC, 2018a).

Parameter	Min.	10%	Median	90%	Max.
F_{recent} / F_{MSY}	0.59	0.67	0.77	0.93	1.06
SB_{latest} / $SB_{F=0}$	0.30	0.35	0.42	0.48	0.53

SB_{latest} / SB_{MSY}	1.15	1.31	1.62	1.93	2.19
SB_{recent} / $SB_{F=0}$	0.25	0.30	0.36	0.41	0.45
SB_{recent} / SB_{MSY}	0.96	1.12	1.38	1.66	1.88
SB_{MSY} / $SB_{F=0}$	0.26	0.26	0.28	0.30	0.30

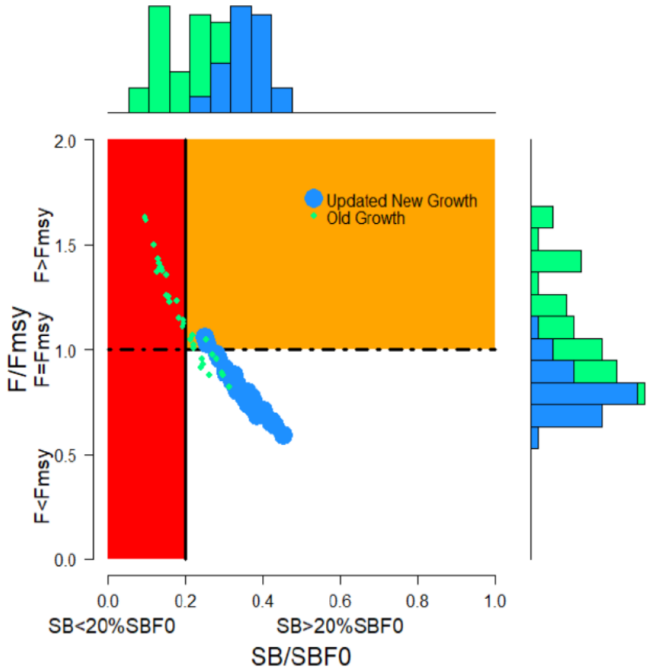

Figure 2. Majuro plot showing the outcome of each of the 72 models in the grid from the assessment update in 2018, with the updated new growth model in blue and the old growth model in green (these results discarded by the Scientific Committee). The red area shows SB below the LRP, while the orange area shows F higher than F_{MSY} (Figure 7 in Vincent et al. (2018)).

Reference points: WCPFC has agreed an explicit limit reference point (LRP) for bigeye (and other stocks) of 20%$_{SBcurrent,F=0}$, where 'current' is defined as the most recent ten-year period for which data are available for the stock assessment. The acceptable level of risk of breaching the limit reference point was agreed at WCPFC13 (in 2016) to be not greater than 20% but is not defined further than that. Pending agreement on a target reference point (TRP) the spawning biomass depletion ratio ($SB/SB_{F=0}$) is to be maintained at or above the average $SB/SB_{F=0}$ for 2012-2015. The harvest strategy workplan (see below) set 2019 as a deadline for defining a TRP for bigeye and yellowfin, but this was not achieved at WCPFC16, and the workplan has been revised to push this deadline back to 2021 (WCPFC16 outcomes report; WCPFC 2019a, Attachment H).

Harvest strategy: CMM 2014-06 commits WCPFC to developing a formal harvest strategy for key stocks, including those considered here (although the terminology was changed in 2019 to 'management procedure'). The Commission agreed a workplan to implement the CMM, which has been revised several times; most recently at WCPFC16 in December 2019. The stock is further

managed through CMM 2018-01, which has the purpose to create 'a bridge to the adoption of a harvest strategy for bigeye, skipjack, and yellowfin stocks and/or fisheries in accordance with the work plan and indicative timeframes set out in the Agreed Work Plan for the Adoption of Harvest Strategies under CMM 2014-06, which includes the development of management objectives and target reference points. The SC determined that although the bigeye stock appears not to be experiencing overfishing and is not in an overfished condition, fishing mortality should not be increased from the current level to maintain current or increased spawning biomass (CMM 2018-01). CMM 2018-01 expires at the end of 2020, and a further 'bridging measure' will have to be agreed at WCPFC17 (December 2020) because the revised harvest strategy workplan does not now foresee a formal management procedure being agreed for bigeye and yellowfin until sometime after 2022 (WCPFC 2019a).

CMM 2018-01 provides a series of management measures in order to restrict effort of tropical tunas, which includes bigeye and particularly for the purse seine fishery, which accounts for 45% of bigeye catch (in 2017; WCPFC 2018)(see Table 5). These include a three-month ban on deploying, maintaining or setting on FADs during July- September, including the high seas and EEZs, in the area 20°N-20°S (with some exemptions for PNA vessels operating under the VDS); a maximum of 350 instrumented FADs to be in use, per vessel, at any one time and zone-based and high seas purse seine effort control. Where limits may be exceeded by a CCM or group of CCMs, CMM 2018-01 further states that they will be deducted from the limits for the following year (Table 5). Longline fisheries catching bigeye are also subject to restrict on catch limits (Table 6). Chinese flagged vessels are subject to bigeye catch limits.

Table 5. Purse seine effort/catch limits under CMM 2018-01 (* = limits not notified to the Commission, ** = The United States notified the Secretariat of the combined US EEZ and high seas effort limits on 1 July 2016 (1828 fishing days on the high seas and in the U.S. EEZ (combined)).

Coastal CCM or group of CCMs	High Seas purse seine effort limit (days)	Zone-based purse seine effort control/catch limit in tonnes
PNA	N/A	44,033 days
Tokelau	N/A	1000 days
Cook Islands	N/A	1,250 days
Fiji	N/A	300 days
Nuie	N/A	200 days
Samoa	N/A	150 days
Tonga	N/A	250 days
Vanuatu	N/A	200 days
Australia	N/A	30,000 mt SKJ 600 mt BET 600 mt YFT
French Polynesia	N/A	0

Indonesia	0	*
Japan	121	1500 days
Korea	N/A	*
New Zealand	N/A	40,000 mt SKJ; nothing specified for other species
New Caledonia	N/A	20, 000 mt; nothing specified for other species
Philippines	Separate measures for Philippines, see CMM 2018-01	*
Taiwan	95	*
USA**	1270	558 days
Wallis and Futuna	N/A	*
China	26	N/A
EU	403	N/A
Ecuador	Subject to CNM on participatory rights	N/A
El Salvador	Subject to CNM on participatory rights	N/A

Table 6. Longline catch limits imposed for bigeye under CMM 2018-01.

Bigeye catch limits by flag
CCMs Catch Limits CHINA 8,224 INDONESIA 5,889* JAPAN 18,265 KOREA 13,942 CHINESE TAIPEI 10,481 USA 3,554 *Provisional and maybe subject to revision following data analysis and verification
Japan will make an annual one-off transfer of 500 metric tonnes of its bigeye tuna catch limit to China.

With regard to unwanted catch, the fisheries specifically target bigeye, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for bigeye are presumed to be minimal, although this would have to be shown at full assessment. For the purpose of this pre-assessment, it was assumed that there is no 'unwanted catch'[1] of bigeye in this fishery.

PNA harvest strategy and the VDS: There is some management of bigeye under the PNA vessel day scheme, which limits purse seine effort in the EEZs of the Parties to the Nauru Agreement (PNA) which between them cover >50% of WCPO purse seine effort.

Information and stock assessment: The most recent stock assessment (McKechnie et al., 2017, updated in 2018) is conducted by SPC using MULTIFAN-CL. It includes a wide range of information to make the analysis, collecting data on types fisheries targeting the stock, catch, effort, CPUE, length/weight frequency and tagging studies, all of which is used to compile a robust and comprehensive evaluation of data ranging from 1952 to 2015.

5.3 WCPO yellowfin tuna background

Stock: The WCPO stock of yellowfin is considered to be discrete, although some there is some evidence of longitudinal movement eastwards across the equator. From a management perspective the west-east boundary is 150°W (Tremblay-Boyer et al., 2017). Yellowfin are fast growing, reaching a maximum length of ~180 cm and maturing at ~100 cm. It is thought that growth rates are slower in Indonesia/Philippines waters than in the wider WCPO. This however is not taken into account in the stock assessment model, which uses a single growth schedule across all regions. Tagging recapture data suggests individuals of four years old are common (Tremblay-Boyer et al., 2017).

Stock status: The most recent stock assessment (Tremblay-Boyer et al., 2017) estimates that the stock is not overfished nor is overfishing occurring. The probability that the spawner biomass is below the point of recruitment impairment (PRI) is less than 5%, as is the probability that F is above F_{MSY}. The stock assessment estimates that F has increased continuously since the start of fishing and although recent recruitment has been relatively high, spawner biomass is estimated to have declined across the whole period for all models and for most of the regions.

Table 7 presents the summary of the uncertainty grid in the assessment. Figure 3 presents the Majuro plots for the full grid and key sensitivities.

Table 7. Summary of stock status estimates relative to reference points, across all 72 models in the structural uncertainty grid used to characterise uncertainty; latest = 2015, recent = 2011-14; $SB_{F=0}$ = average spawning potential in the absence of fishing for 2005-14, following the definition of the LRP agreed by the SC. Taken from Table A6 in Tremblay-Boyer et al., 2017.

Parameter	Min.	25%	Median	75%	Max.
F_{recent} / F_{MSY}	0.54	0.66	0.73	0.82	1.13

[1] SA3.1.6: The term 'unwanted catch' shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid and did not want or chose not to use.

SB_{latest} / $SB_{F=0}$	0.16	0.30	0.39	0.43	0.50
SB_{latest} / SB_{MSY}	0.80	1.24	1.41	1.62	1.91
SB_{recent} / $SB_{F=0}$	0.15	0.27	0.35	0.39	0.45
SB_{recent} / SB_{MSY}	0.81	1.28	1.43	1.59	1.93
SB_{MSY} / $SB_{F=0}$	0.16	0.25	0.26	0.29	0.35

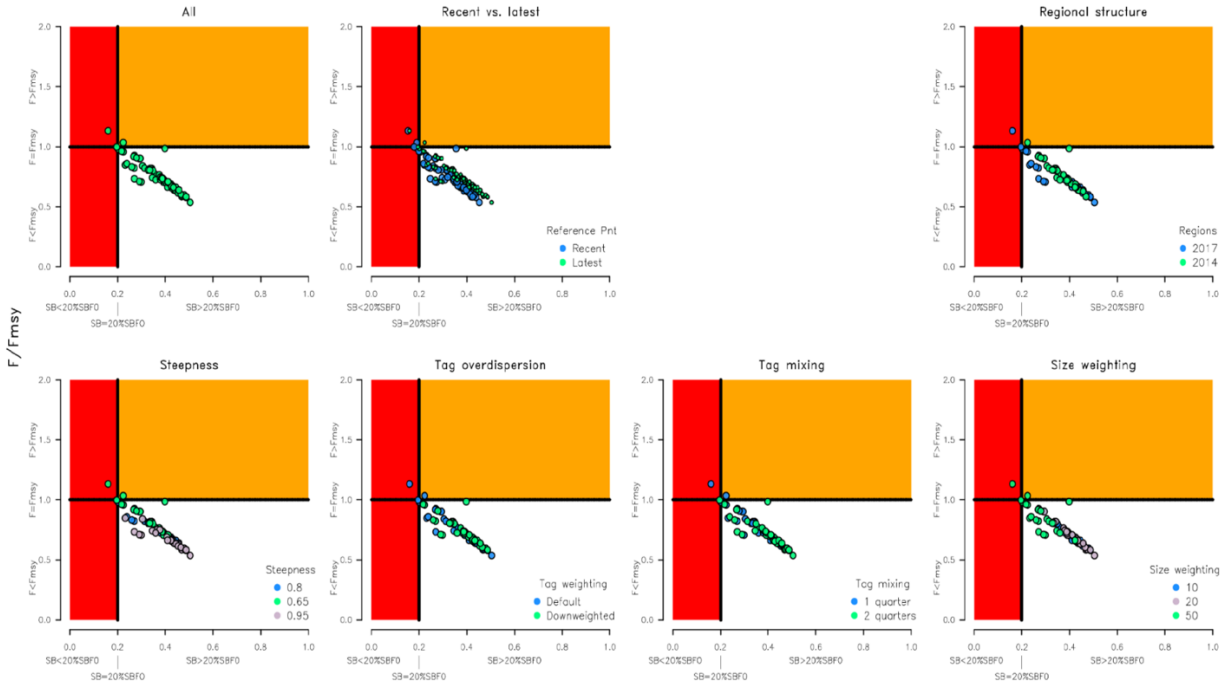

Figure 3. Majuro plots summarising the results for each of the models in the structural uncertainty grid individually; y-axis = F/F_{MSY}; orange zone = $F>F_{MSY}$; x-axis = $SB/SB_{F=0}$ (contrary to how it is labelled in the original figure); red zone = $SB<20\%SB_{F=0}$, i.e. LRP agreed by WCPFC. All figures show SB_{latest}, except where otherwise indicated. Top left: all models for SB_{latest}; top middle: ditto, also including SB_{recent}. Remaining five models show key sensitivity runs, with blue the diagnostic case model in each case: Top right: regional structure; bottom left: steepness; bottom mid-left: tag overdispersion; bottom mid-right: tag mixing; bottom right: size data weighting. Figure A41 in Tremblay-Boyer et al., 2017.

Reference points: See bigeye above in Section 5.2.

Harvest strategy: As per bigeye in Section 5.2.

Information and stock assessment: As for bigeye, the stock assessment is conducted by SPC using MULTIFAN-CL. The most recent stock assessment (Tremblay-Boyer et al., 2017) relies on longline and purse seine CPUE, length-frequency from port sampling and tagging data. Overall, SPC considers the model output to be relatively robust.

5.4 EPO bigeye background

Stock: For general information on bigeye tuna, see Section 5.2 above. The purse-seine catches of bigeye are substantially lower close to the western boundary of the EPO (150°W); the longline catches are more continuous, but relatively low between 160°W and 180°W. Recruitment in EPO bigeye is highly variable. It is hypothesised that recruitment of EPO bigeye is affected by environmental conditions; specifically, being higher during El Nino events and lower in La Nina periods (Xu et al., 2018).

Stock status: The updated stock assessment in 2018 (Xu et al., 2018) estimates that the stock is not overfished, however, according to the base case model, recent F is above F_{MSY}, although recent S remains above the MSY level. At this level of F, and assuming average recruitment, S is predicted to decline to ~0.17, which is below the MSY level. This estimate of F is a substantial change from the previous update assessment in 2017, which estimated that $F<F_{MSY}$.

IATTC scientific staff identified a range of uncertainties and concerns with the stock assessment in 2018 and concluded that it was not sufficiently robust to be used to provide management advice. They have developed and are implementing a workplan (Maunder et al., 2018) to improve the stock assessment, but in the meantime use a range of indicators to evaluate stock status, rather than a formal stock assessment (Xu et al. 2019). Xu et al. (2019) outline the six data-based indicators which have been developed for bigeye. Rather than using reference points based on maximum sustainable yield, the current value of each indicator is compared to its distribution of historical values. The indicators are based on data from all purse seine vessels that fished during 2000-2018, to avoid the period covering the floating-object fishery expansion in the mid-1990s. All stock status indicators for 2018, except catch, are at, or near, their respective reference levels that indicate high exploitation rates, increasing fishing mortality and reduced abundance over time.

Reference points: The management goal of the Commission is to maintain stocks at MSY. To assess whether a stock is above the point where recruitment is impaired (PRI) a limit reference point is defined for all tuna species harvested in the EPO. The limit reference points for bigeye is set at $0.38*S_{MSY}$ which correspond to a 50% reduction in recruitment from its average unexploited level based on a conservative value of steepness (i.e. h = 0.75) for the Beverton-Holt stock-recruitment relationship. In 2014, this LRP was proposed by the SAC and accepted by the Commission, along with a TRP based on MSY (IATTC 2014a, b). This LRP is below the MSC default level for the PRI ($50\%B_{MSY}$ or $20\%B_0$), so these defaults are used for scoring instead. Since $20\%S_0$ is close to the level of S_{MSY} estimated analytically, this was not considered a suitable proxy for the PRI, so 50% of S_{MSY} is used.

Harvest strategy: IATTC agreed a harvest control rule for tropical tunas in Resolution C-16-02, based on the reference points set out above. The HCR is as follows:

- If the probability that $F>F_{lim}$ is >10% for the most vulnerable stock, management measures shall be established such that there is at least a 50% probability that F will reduce to F_{MSY} or below, and with a probability of <10% of $F>F_{lim}$;
- If the probability that $SB<SB_{lim}$ is >10%, management measures shall be established such that there is at least a 50 % probability that SB will recover to SB_{MSY} or above, and with a probability of <10% that SB will decline to $<SB_{lim}$ within two generations or five years, whichever is greater.

Overall, the harvest strategy is relatively simple, i.e. if fishing mortality is higher than the level consistent with producing MSY, then reduce F to F_{MSY}. The harvest strategy is implemented by restricting effort of the entire fishery for yellowfin, bigeye and skipjack, based on the stock with the highest F relative to F_{MSY} (F-ratio; measured in IATTC as the F-multiplier (F-mult) which is F_{MSY}/F – NB: this is the inverse ratio from F/F_{MSY}, habitually used by the other tuna RFMOs including WCPFC). Allowable fishing effort is based on the stock with the lowest estimate of F-mult therefore fishing mortality on the other two stocks must also be below F_{MSY}. The 2018 update assessment for bigeye estimated F-mult to be 0.87 (see above); considerably below the previous estimate and the lowest of the three stocks. According to the HCR, this estimate, plus any changes in fleet capacity, should have been used to adjust the closure period. However, because the assessment was not considered robust, the number of days for 2019 was not changed, pending external review, evaluation and revision of the stock assessment methodology (see below).

Resolution C-16-02 does not specify the tools that should be used to implement the HCR, but Resolution C-17-02 for 2018-2020, applying to purse seine vessels with >182 t carrying capacity, and to longline vessels >24 m LOA.

- 72 days closure for purse seine vessels in 2017, 2018, 2019 and 2020;
- One-month closure in the area shown in Figure 4, which is from 9 October-8 November;
- Active FAD limits per purse seine vessel, from 70-450 according to vessel class (size);
- Bigeye catch limits: for key distant water fleets as shown in Figure 5 (with up to 30% transferable); for other CPCs the greater of 2001 catches or 500 t;
- Measures to be evaluated according to the results of stock assessments in 2018, 2019 and 2020, and adjusted accordingly.

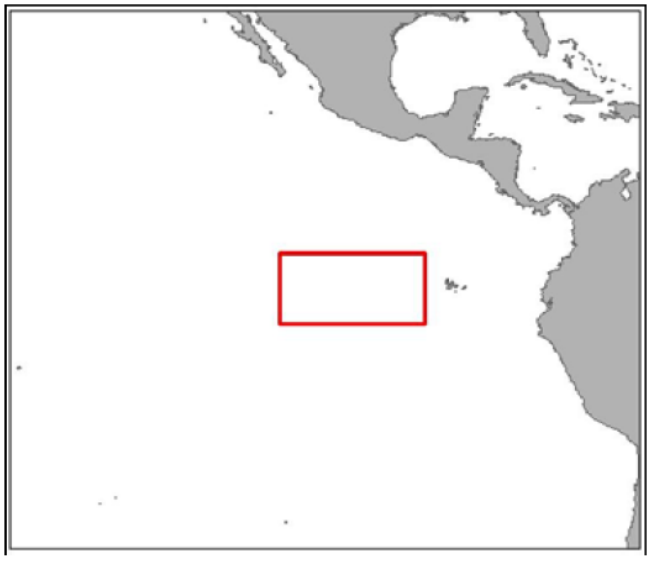

Figure 4. Closed area from 29th September – 29th October under C-17-01 (Figure 1 in Resolution text).

Metric tons	2018-2020
China	2,507
Japan	32,372
Korea	11,947
Chinese Taipei	7,555
United States	750

Figure 5. Bigeye longline catch limits under Resolution C-17-02

Chinese vessels are subject to catch limits of bigeye tuna, however due to the catch limit being so low and China not contributing more than half of the total catches of either bigeye stocks it is not addressed under Principle 1 as it is unlikely to affect the ability of the HCR to constrain overall catches. It is however considered under Principle 3.

There is not a direct link between these measures and the HCR, as there would be, for example, if target reference points were used to establish a TAC, as is done elsewhere. In the past, the number of days of closure have been adjusted according to the F-ratio for the most vulnerable species. The 2018 update assessment for bigeye estimated F-mult to be 0.87, so according to the HCR, this estimate, plus any changes in fleet capacity, should be used to adjust the closure period, as set out in Figure 6 (i.e. to 107 days in 2019).

	Bigeye	Yellowfin
F multiplier from the stock assessment	0.87	0.99
Capacity increase	1.0%	1.0%
F multiplier adjusted for capacity increase	0.86	0.98
Days of closure[3]	107	71

Figure 6. Calculations for closure period for 2019, based on F-mult and adjustments for changes in capacity (from IATTC, 2018)

In fact, however, IATTC scientists advised using F-mult from yellowfin (i.e. no change to the closure), on the following basis (IATTC, 2018):

- The large change in F-mult over one year is implausible.
- The probability of LRPs being exceeded remains <10%, including for the sensitivity analysis.
- The assessment is not considered reliable enough; specifically, it is considered too sensitive to new data and some other issues.
- Capacity in the purse seine fleet has decreased slightly from 2017.
- The current closure is 72 days, while the previous level of 62 days was used in the three-year average for calculating F-mult for each stock.

IATTC scientists have developed a plan to address the issues with the stock assessment (Maunder et al., 2018), in the hope that this can be done before C-17-02 expires in 2020; presumably they consider the 72-day closure sufficiently precautionary for bigeye in the short-term. In the longer term, under the strategic plan it is proposed to conduct a comprehensive Management Strategy Evaluation (MSE) for bigeye tuna and plan MSEs for the other tropical tuna species, including the multi-species fishery for tropical tunas. This is based on the same methodology as used for the current stock assessment, i.e. using the Stock Synthesis (SS) modelling platform to develop operating models (assumed to represent the underlying true dynamics) based on current assessments was developed. Simulated data are generated, and modified stock assessments are implemented, often including mis-specified

processes and parameters to represent some of the uncertainty and structural errors of real assessments (Maunder et al., 2015).

Information and stock assessment: As with other assessments, catch data is taken from a number of fisheries. For the most recent assessment in 2019 (Xu et al.) new or updated longline catch information were available for China, Japan, Korea, Taiwan, the US, French Polynesia, and Vanuatu, amongst others. Port technicians complement the collection of information and verify the accuracy of the catch recorded by the observers. Tagging, size composition and effort data was also taken into account in the model runs.

5.5 EPO yellowfin background

Stock: For general information on yellowfin tuna, see Section 5.3 above.

Stock status: The most recent formal stock assessment (Xu et al., 2018) suggests that the 5%/95% confidence intervals for spawning stock sit at approximately 50% MSY, which means that there is approximately a 5% probability that the stock is below the MSC default for the PRI. The 2019 assessment (Minte-Vera, 2019a) uses indicators rather than a formal assessment model, because the model was not considered robust. These indicators (catch, average weight per fish, closure-adjusted capacity and three FAD-related indicators) are all at levels set as the outer safe limit, except for catch. Fishing mortality rates for yellowfin tuna are above maximum sustainable yield (MSY) levels (F multiplier = 089). The spawning biomass ratio at the start of 2019 was below MSY levels. Yellowfin tuna in the eastern Pacific Ocean are overfished and undergoing overfishing

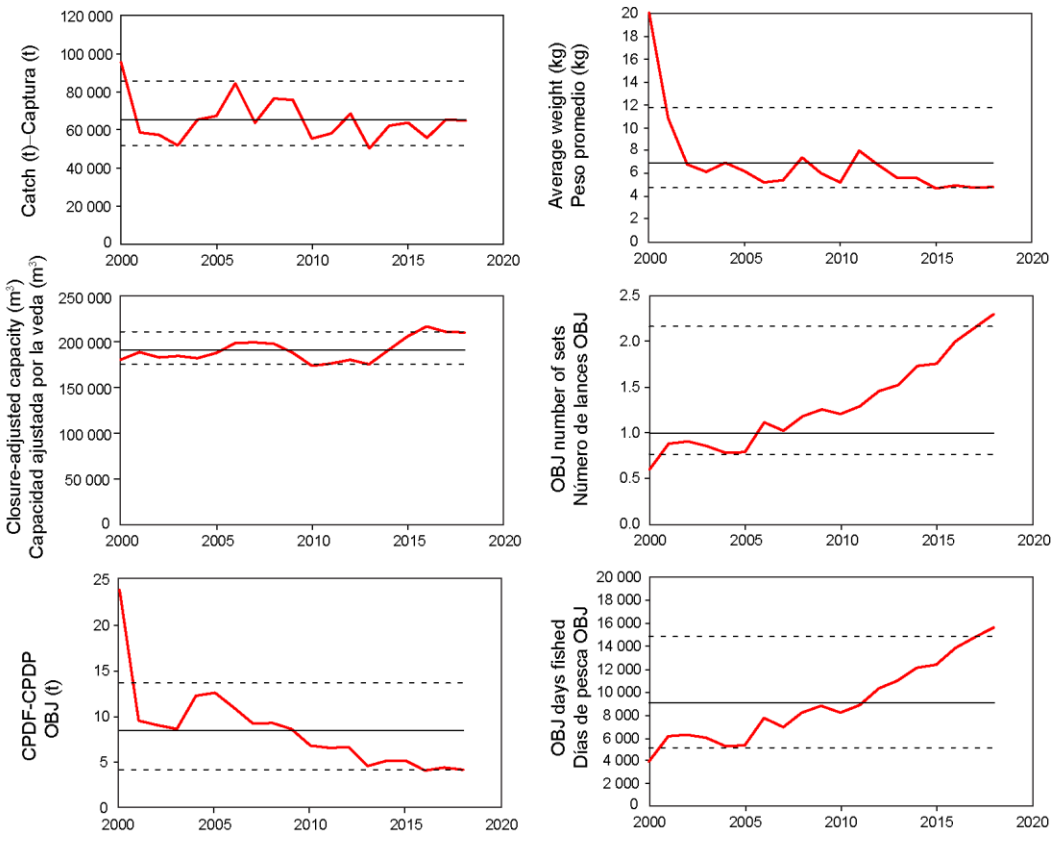

Figure 7. Stock status indicators for bigeye tuna in the EPO, based on purse-seine data, 2000-2018. The dashed horizontal lines are the 5th and 95th percentiles, the solid horizontal line is the median. CPDF: catch per day fishing; OBJ: sets on floating objects.

Reference points: As for bigeye, the management goal of the Commission is to maintain stocks at MSY. This has led to the definition of target and limit reference points such that biomass and fishing mortality rates are maintained at levels that produce MSY, i.e. S (SB) $_{MSY}$ and F_{MSY} respectively. To assess whether a stock is above the point where recruitment is impaired (PRI) a limit reference point is defined for all tuna species harvested in the EPO. The limit reference point for yellowfin is set at $0.28*S_{MSY}$ which correspond to a 50% reduction in recruitment from its average unexploited level based on a conservative value of steepness (i.e. h = 0.75) for the Beverton-Holt stock-recruitment relationship. In 2014, this LRP was proposed by the SAC and accepted by the Commission, along with a TRP based on MSY (IATTC 2014a, b). In practice, as for EPO bigeye, F_{MSY} is used as the management target.

Harvest strategy: See Section 5.4 above. In 2019, the updated stock assessment for yellowfin showed F-mult<1, i.e. following the harvest strategy the closure days should be increased. The situation is the same for bigeye in 2018, however, in that IATTC scientific staff had no confidence in the stock assessment (in fact, the external review of the assessment raised issues for the bigeye methodology which also apply to yellowfin). Pending a benchmark assessment in 2020 which will consider all these issues, there is no application of the HCR in 2020 as in 2019 (Minte-Vera et al. 2019b).

Information and stock assessment: As with other assessments, catch data is taken from a number of fisheries. For the most recent assessment in 2019 (Minte-Vera et al.), the indicators used were catch, effort, catch per unit effort (CPUE) and average length of fish in the catch, and are based on data from 1975 – 2018. Research is planned to revise the model and several of its assumptions in preparation for the benchmark assessment in 2020. Meanwhile, data-based indicators have been developed for the yellowfin stock, similar to those for the skipjack and bigeye tuna stocks.

5.6 South Pacific albacore background

Stock: There are considered to be two stocks of albacore tuna in the Pacific Ocean, one in the northern hemisphere and the other in the southern hemisphere. This conclusion is based on a number of reasons, including sampling of larval and adult fish, lower catch rates of albacore around the equator, and genetic data showing variations between those fish found in the north and those found in the south (Tremblay-Boyer et al., 2018). Albacore tend to grow to around or just above 80 cm and inhabit tropical and sub-tropical areas of the Pacific between ~10^{o} – 25^{o} during the summer months. They make seasonal migrations between tropical and sub-tropical waters, which are thought to correspond with the seasonal shifts in the 23-28^{o}C sea surface temperature isotherm. Their growth rates vary by sex (males tend to be larger) and longitude, with individuals in the east growing larger than their western counterparts. Fish are commonly caught at ten years old or more, but the level of natural mortality still poses questions within the stock assessment model (Tremblay-Boyer et al., 2018).

Stock status: The stock is estimated to be in good health, with the spawning biomass estimated to be ~52% of the unfished level, which is below the target reference point (TRP; which takes economic considerations into account) but above SB_{MSY}. F is also below F_{MSY} with high probability (>>90%) (Table 8). Current stock status is presented in the form of dynamic Kobe plots and Majuro plots (Figure 8 and Figure 9).

Table 8. Summary of stock status in relation to reference points across the 72 models in the uncertainty grid; C=catch, $YF_{current}$=equilibrium yield at $F_{current}$; F_{mult}=multiplier of current effort required to fish at F_{MSY}; latest=2016; recent=2012-15 (Tremblay-Boyer et al., 2018).

	Mean	Median	Min	10%	90%	Max
C_{latest}	61719	61635	60669	60833	62704	63180
MSY	100074	98080	65040	70856	130220	162000
$YF_{current}$	71579	71780	56680	62480	80432	89000
fmult	6.2	4.96	1.89	2.44	12.05	17.18
F_{MSY}	0.07	0.07	0.05	0.05	0.09	0.1
$F_{recent}/F_{\mathrm{MSY}}$	0.23	0.2	0.06	0.08	0.41	0.53
SB_{MSY}	71407	68650	26760	39872	100773	134000
SB_0	443794	439800	308800	353870	510530	696200
SB_{MSY}/SB_0	0.16	0.17	0.07	0.1	0.21	0.23
$SB_{F=0}$	469004	462633	380092	407792	534040	620000
$SB_{\mathrm{MSY}}/SB_{F=0}$	0.15	0.15	0.06	0.09	0.2	0.22
SB_{latest}/SB_0	0.55	0.56	0.33	0.42	0.69	0.74
$SB_{latest}/SB_{F=0}$	0.53	0.52	0.3	0.37	0.69	0.77
$SB_{latest}/SB_{\mathrm{MSY}}$	4	3.42	1.45	1.96	7.07	10.74
$SB_{recent}/SB_{F=0}$	0.51	0.52	0.32	0.37	0.63	0.72
$SB_{recent}/SB_{\mathrm{MSY}}$	3.88	3.3	1.58	1.96	6.56	9.67

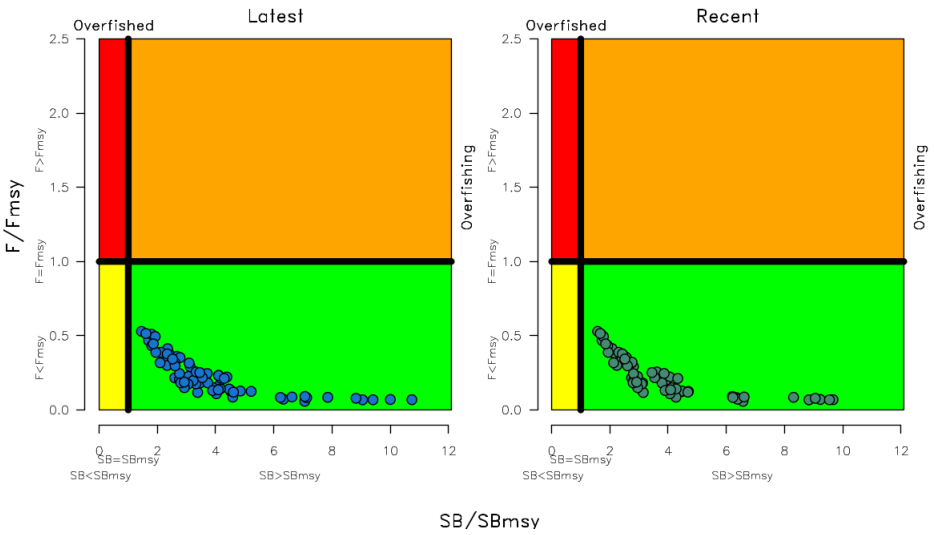

Figure 8. South Pacific albacore: Kobe plots summarising the results for each of the models in the structural uncertainty grid for SB_{latest} (left) and the SB_{recent} (right) relative to MSY reference points. (Tremblay-Boyer et al. 2018).

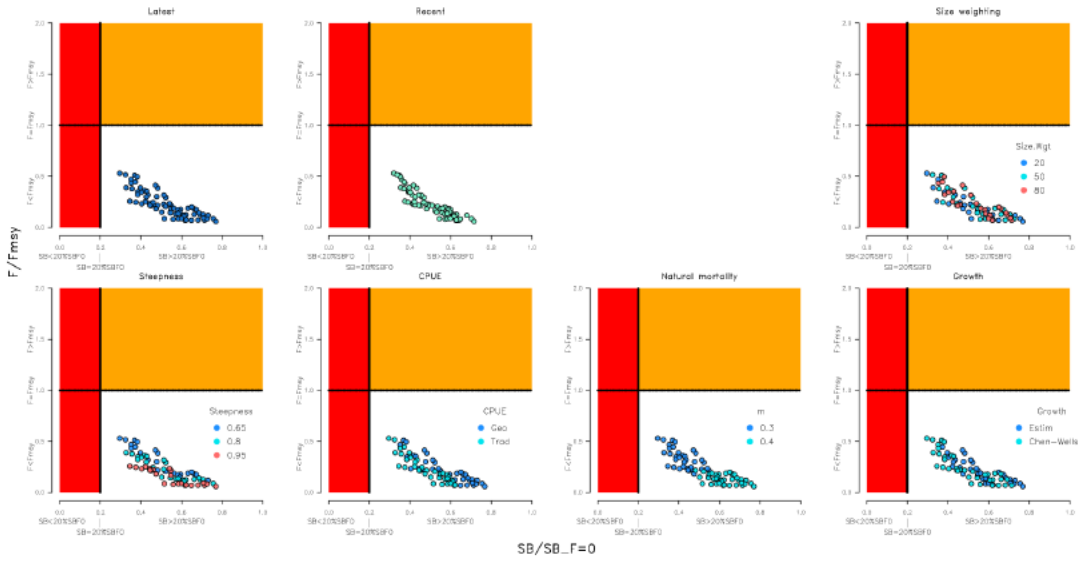

Figure 9. South Pacific albacore: Majuro plots summarising the results for each of the models in the structural uncertainty grid. The plots represent estimates of stock status in terms of spawning potential depletion and fishing mortality. The red zone represents spawning potential levels lower than the agreed limit reference point. The orange region is for fishing mortality greater than F_{MSY}. The points represent SBlatest for each model run except the two second from the left which show SB_{recent}. Otherwise, the different panels and colour-coding represent different sensitivity runs. Tremblay-Boyer et al., 2018.

Reference points: The point of recruitment impairment (PRI) is not currently known, but WCPFC have adopted a limit reference point (LRP) for south Pacific albacore of $20\%SB_{F=0}$. An interim target reference point (TRP) of 56% $SB_{F=0}$ was agreed in December 2018 at the 15th Annual meeting of the WCPFC.

Harvest strategy: South Pacific albacore is de facto managed by WCPFC although the stock extends into the EPO. The harvest strategy is set out in CMM 2015-02. The management objective of 2015-02 is that effort (expressed as the number of active vessels targeting SPA) should not increase over recent historical levels (defined as 2005 or 2002-04) (CMM 2015-02, paragraph 1). The adoption of a TRP (mentioned in the paragraph above) aims to achieve an 8% increase in CPUE relative to 2013 levels for economic reasons, which is estimated by SPC to correspond to a SB level of $56\%SB_{F=0}$. This will be adjusted as necessary based on stock estimates in future assessments. A 20-year timeframe was agreed for achieving this management target. The next stage in the WCPFC workplan under CMM 2014-06, to which all MSC overlapping fisheries' conditions are bound, is for analysis of options for HCRs based on this management target. The revised workplan (WCPFC 2019a, Attachment H) sets a deadline for the adoption of a management procedure for SPA of 2022.

Information and stock assessment: The latest stock assessment was completed in 2018 (Tremblay-Boyer et al.) and like other tuna stocks uses catch, effort and size frequency, tag recapture data and biological information. The stock assessment model used is MCFL, as for bigeye and yellowfin WCPO stocks.

5.7 North Pacific albacore background

Stock: The other of the two Pacific albacore stocks. See above in 5.6 for background.

Stock status: The most recent stock assessment was published in 2017 (Albacore Working Group, 2017). The stock is not overfished, with $F_{2012\text{-}2014}$ estimated to be ~61% of F_{MSY}, with the SB at ~2.5 times the LRP. Current fishing intensity ($F_{2012\text{-}2014}$) was estimated to be below all MSY-proxy reference points except $F_{50\%}$ (Table 9). Figure 10 provides a Kobe plot showing stock status relative to the LRP and equivalent fishing intensity.

Table 9. North Pacific albacore: Estimates of MSY, female spawning biomass (SSB) and F-based reference-point ratios for the base case assessment and important sensitivity analyses. Note that in this case, F is not instantaneous fishing mortality, but is calculated as 1-SPR (SPR is the equilibrium SSB per recruit that would result from the current year's fishing mortality). Current fishing intensity is defined as the average fishing intensity during 2012-2014 ($F_{2012\text{-}2014}$). (Albacore Working Group, 2017).

Quantity	Base Case	M = 0.3 y^{-1}	Growth CV = 0.06 for L_{inf}
MSY (t) [A]	132,072	92,027	118,836
SSB_{MSY} (t) [B]	24,770	42,098	22,351
SSB_0 (t) [B]	171,869	270,879	156,336
SSB_{2015} (t) [B]	80,618	68,169	63,719
$SSB_{2015}/20\%SSB_{current,\ F=0}$ [B]	2.47	1.31	2.15
$F_{2012\text{-}2014}$	0.51	0.74	0.57
$F_{2012\text{-}2014}/F_{MSY}$	0.61	0.89	0.68
$F_{2012\text{-}2014}/F_{0.1}$	0.58	0.90	0.65
$F_{2012\text{-}2014}/F_{10\%}$	0.56	0.81	0.63
$F_{2012\text{-}2014}/F_{20\%}$	0.63	0.91	0.71
$F_{2012\text{-}2014}/F_{30\%}$	0.72	1.04	0.81
$F_{2012\text{-}2014}/F_{40\%}$	0.85	1.21	0.96
$F_{2012\text{-}2014}/F_{50\%}$	1.01	1.47	1.16

A – MSY includes male and female juvenile and adult fish
B – Spawning stock biomass (SSB) in this assessment refers to mature female biomass only.

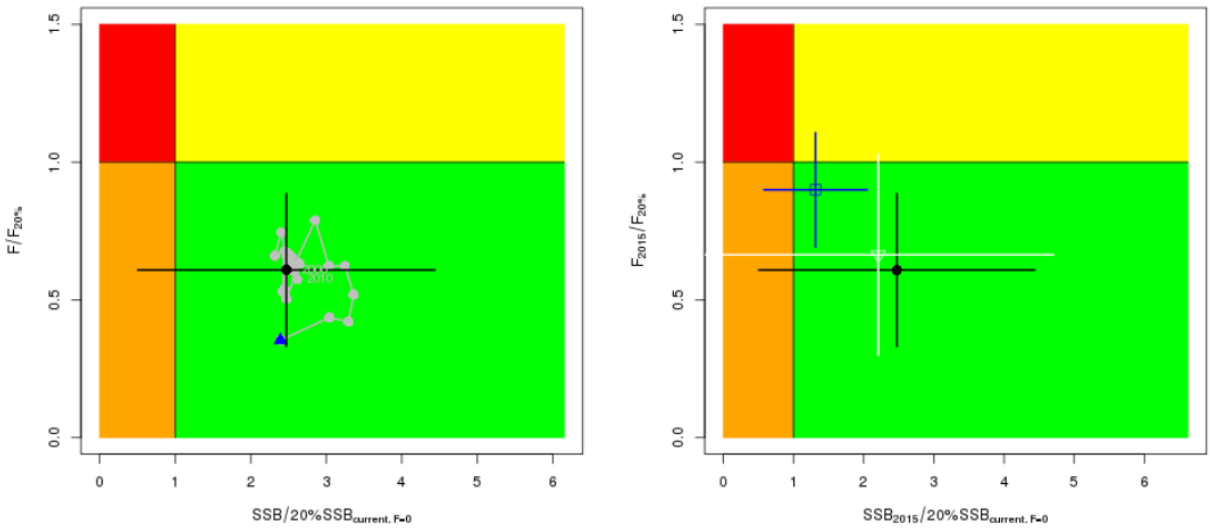

Figure 10. North Pacific albacore: Left: Kobe plot showing stock status relative to the LRP (20%$SSB_{F=0}$) and equivalent fishing intensity ($F_{20\%}$; calculated as 1-$SPR_{20\%}$) over the base case modelling period (1993-2015). The blue triangle indicates the start year (1993) and the black circle with 95% confidence intervals the terminal year (2015). Right: Kobe plot showing stock status and 95% confidence intervals in the terminal year (2015), for the base case model (black; closed circle) and important sensitivity runs: M = 0.3 y-1 (blue); CV = 0.06 for Linf in the growth model (white). Albacore Working Group, 2017.

Reference points: As with the south Pacific stock, PRI is not known, so the WCPFC agreed LRP of 20%$SB_{F=0}$ is again used (see CMM 2019-03). A TRP in not yet in place for this stock.

Harvest strategy: Management of NPA is shared jointly between WCPFC and IATTC, who each have a harmonised management measure in place (WCFPC: CMM 2019-03; IATTC: Resolutions C-05-02 and C-18-03). The management objective fixed in these measures is that F should not increase beyond 'current levels' (i.e. levels which were current in 2005 – defined as $F_{2002\text{-}4}$).

In 2017, the WCPFC Northern Committee agreed an 'interim harvest strategy' for North Pacific albacore (see WCPFC (2017c); Attachment H); this was endorsed by the WCPFC plenary ((WCPFC 2017b); paragraph 206). This incorporates the LRP of 20%$SB_{F=0}$. It does not fix a TRP but notes that this should be determined as part of a MSE included under the Northern Committee's future work. The Albacore Working Group (ALBWG) of ISC have held five MSE workshops covering NP albacore.

The interim harvest strategy incorporates a management objective and a decision rule relating to the LRP, as follows:

- Management objective (para. 1): *The management objective for the North Pacific albacore fishery is to maintain the biomass, with reasonable variability, around its current level in order to allow recent exploitation levels to continue and with a low risk of breaching the limit reference point.*
- Decision rule (para. 3): *In the event that, based on information from ISC, the spawning stock size decreases below the LRP at any time, NC will, at its next regular session or intersessionally if warranted, adopt a reasonable timeline, but no longer than 10 years, for rebuilding the spawning stock to at least the LRP and recommend a CMM that can be expected to achieve such rebuilding within that timeline*.

It is worth noting that the decision rule contradicts the management objective, in that the objective is to maintain the stock at a level which has a low risk of breaching the LRP, while the decision rule does not require any action until the stock has actually breached the LRP. It likewise contradicts a statement in the same section of the Northern Committee report: '*NC recommends a management strategy for the stock that ensures that the risk of the biomass decreasing below the LRP is low*' (WCPFC, (2017c), p. 50), as well as WCPFC's decision (WCPFC 2016) that harvest strategies should ensure that the risk of falling below the LRP is not higher than 20%.

WCPFC's CMM 2014-06, committing WCPFC to the development of formal harvest strategies and harvest control rules, applies to NP albacore as well as skipjack and the other tropical stocks. The work to develop the harvest strategy has, however, been delegated to the Northern Committee. The Northern Committee have, like WCPFC, agreed a harvest strategy workplan for NP albacore in 2018. The previous 2017 workplan proposed that the MSE work should end in 2020, but the 2018 version makes no such promise for either 2020 or 2021. There was no change in 2019 (Northern-Committee 2019) (see Attachment G). In the meantime, the Northern Committee is tasked with reviewing the requirements and the implementation of CMM 2019-03 and recommend changes where necessary. The US is providing funding to support the MSE process for NP albacore, with an expert based at IATTC (Tony Beeching, WCPFC, pers. Comm to Dr J Gascoigne).

Information and stock assessment: Similar to the other target stocks mentioned here, sources of information for the stock assessment includes catch data, abundance and size information, as well as tagging studies and information from the main fisheries catching north Pacific albacore. Resolution C-13- 03 of IATTC strengthens the data requirements from C-05-02 / CMM 2019-03, with templates for both catch and effort data.

6 Pre-assessment results

6.1 Pre-assessment results overview

6.1.1 Overview

WCPO stocks of yellowfin and bigeye tuna and both albacore stocks would pass Principle 1, with two conditions per stock, in relation to harvest strategies and harvest control rules. All stocks are well above the Point of Recruitment Impairment (PRI) with the exception of EPO yellowfin and bigeye which are not currently fluctuating around F_{MSY} and therefore subject to the rebuilding PI scoring (PI 1.1.2). The continued lack of HCRs for tuna species continues to be the main issue for P1.

For Principle 2, primary and secondary species score well. All primary species are thought to be above the point of recruitment impairment (PRI), with suitable management in place. Both the WCPO and EPO ETP species outcome and information failed to score more than SG80 due to the poor stock status, lack of information and the vulnerability of those species to be captured in longline operations in the Pacific. There is management in place for ETP species such as marine turtles and some shark species in both Regional Fisheries Management Organisation areas.

For Principle 3, the pre-assessments considered the WCPFC and IATTC RFMO management systems, which predicted scores of 80 or above for all PIs. All flag states were also assessed in this report. Issues with lack of information hampered scoring China in particular, all of which would currently most likely fail at full assessment for high seas UoAs.

6.1.2 Recommendations

This section is provided to highlight to the client fishery what may be necessary prior to, or during the full assessment, which has not been covered by this pre-assessment. It seeks to prepare the client for further information requests and full assessment site visit activities.

Firstly, it will be necessary to continue to try and obtain the aggregated observer data from SPC/IATTC. This provides the third-party data on bycatch and ETP species' interactions which are necessary to score PIs in Principle 2. Ideally this information would be split by area of operation to make for a more accurate P2 assessment. Other data that may be requested include instructions to captains, particularly in reference to marine pollution policies and ETP species handling, VMS data for the fleet, (via management authorities), fleet records of ETP species interactions, species and volumes of baits used, and traceability information. Information on hook loss per set should also be collected to answer the questions of lost gear, which is addressed under the 'habitat' PIs.

A note on sharks, compliance records/incidences of shark finning from observer reports or sanctions/penalties imposed on client vessels will need to be considered here in order to score shark finning scoring issues. This fishery has not been caught carrying out the practice of shark finning and have stringent shark finning policies. All vessels are listed on the independent, third party ISSF Proactive Vessel Register too.

With regard to stakeholder involvement in the full assessment, it will be necessary to engage with the national management bodies in both the coastal states in which the fisheries operate and the distant

water fishing nations which conduct fishing activities. This is necessary for a full understanding of the management structures and implementation of relevant CMMs/resolutions and national management regulations. Also expect a certain amount of interest from NGO groups. This is not necessarily a negative, as they may have research/studies that may be useful for the assessment, but also, they may have concerns regarding the assessment. Sometimes this is due to further public pressure but also due to unfamiliarity with the MSC assessment process. Where possible the client fisheries should look to engage with these groups prior to announcement, during the preparation of the Announcement Comment Draft Report (ACDR). Further details of the full assessment process can be found on the MSC website.

It is also necessary prior to full assessment to conduct a review of the traceability systems in operation in these fisheries. Information was not provided in this pre-assessment and it will be necessary to understand how catch from different UoAs are handled. A crucial part of the traceability assessment is that there is a system in place to demonstrate appropriate records are available tracing the path of the fishery products back to the UoAs. Particular points to consider are the point of intended change of ownership for the product, separation systems in place, potential for mixing of certified and non-certified product and whether separate chain of custody certification will be needed prior to the change of ownership (CoC will always be required following the first change of ownership).

Full assessment typically take around 12 months from start to finish, so the more comprehensive the data collection, the more streamlined the assessment timeline. Please note that delays may occur to the assessment timeline if significant stakeholder comments or objections to the certification of the fishery are received.

6.2 Principle 1

Table 10. Summary of Principle 1 Performance Indicator level scores – WCPO bigeye tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**≥80**	**No**
Rationale or key points		
Based on the most recent stock assessment in 2017 (McKechnie et al., 2017) and its update (Vincent et al., 2018), there is a high degree of certainty that the stock is above the point of recruitment impairment (PRI). The LRP is 20%$SB_{F=0}$, with SB_{recent} = 36%$SB_{F=0}$ =1.8LRP; SB_{latest} = 42%$SB_{F=0}$ = 2.1LRP (median of SC uncertainty grid). The stock has been fluctuating around a level consistent with MSY (SB_{MSY} is the default target in the absence of a formal Target Reference Point). SB_{recent} = 1.38SB_{MSY}; SB_{latest} = 1.62 SB_{MSY} (median of SC uncertainty grid).		
1.1.2 – Stock rebuilding	**N/A**	**N/A**
Rationale or key points		
As PI 1.1.1 scored at least SG80, this PI does not need to be scored (as FCP SA2.3.1).		
1.2.1 – Harvest Strategy	**60 – 79**	**No**
Rationale or key points		
At present, a formal harvest strategy is not in place for the stock, although WCPFC have committed to deliver one through its harvest strategy workplan (most recently updated at WCPFC16 (WCPFC, 2019a). Status quo projections provide a basis on which to evaluate the extent to which the harvest strategy is expected to achieve stock management objectives but as yet it cannot be said that all the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80.		
1.2.2 – Harvest control rules and tools	**60 – 79**	**No**
Rationale or key points		
WCPFC have an agreed, legally binding framework in place to establish formal harvest strategies and control rules for their main stocks, including WCPO bigeye. A HCR can be considered to be 'available' for this stock. SG60 is met. Since the harvest strategy is not 'in place', it cannot be said that the HCRs are robust to the main uncertainties nor do they include well-defined target exploitation levels. SG80 is not met.		
1.2.3 – Information and monitoring	**≥80**	**No**
Rationale or key points		

It is considered that a comprehensive range of information on stock structure, stock productivity, abundance, UoA removals fleet composition etc. is available. There is regular monitoring of stock removals from this UoA and other fisheries, allowing for regular stock assessments and which are sufficient to support the HCR. SG80 is met.		
1.2.4 – Assessment of stock status	**≥80**	**No**
Rationale or key points		
The assessment is conducted using an integrated assessment model Multifan-CL (MFCL) that is able to combine a range of datasets and to model several components. The stock assessment estimates stock status relative to a range of reference points, including SB and F reference points and depletion and MSY-based reference points. The stock assessment has been tested and shown to be robust. It has been both internally and externally peer reviewed.		

Table 11. Summary of Principle 1 Performance Indicator level scores – WCPO yellowfin tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**≥80**	**No**
Rationale or key points		
Based on the most recent stock assessment in 2017 (Tremblay-Boyer et al., 2017), there is a high degree of certainty that the stock is above the point of recruitment impairment (PRI). The LRP is 20%$SB_{F=0}$, with SB_{recent} = 32%$SB_{F=0}$ =1.6LRP; SB_{latest} = 35%$SB_{F=0}$ = 1.75LRP (median of final grid). The stock is fluctuating around a level consistent with MSY (SB_{MSY} is the default target in the absence of a formal TRP). SB_{recent} = 1.39SB_{MSY}; SB_{latest} = 1.39 SB_{MSY} (median of SC uncertainty grid), meaning that SG80 is at least met.		
1.1.2 – Stock rebuilding	**N/A**	**N/A**
Rationale or key points		
As PI 1.1.1 scored at least SG80, this PI does not need to be scored (as FCP SA2.3.1).		
1.2.1 – Harvest Strategy	**60 – 79**	**No**
Rationale or key points		
As per bigeye, yellowfin is part of the WCPFC workplan (WCPFC, 2019a) and WCPFC are committed to implementing a formal harvest strategy. Without one in place, SG80 cannot be met. The stated objective of the WCPFC harvest strategy as defined in CMM 2018-01 is to maintain status quo biomass, pending agreement on a formal target reference point, due this year according to the latest version of the harvest strategy workplan.		

This fishery targets yellowfin specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for yellowfin are minimal. Hence there is no 'unwanted catch'[2] of yellowfin in this fishery. C-2018-01, paragraph 24 states all bigeye, skipjack and yellowfin brought on board is required to be landed, except that unfit for human consumption. SG60 is met.		
1.2.2 – Harvest control rules and tools	**60 – 79**	**No**
Rationale or key points		
As with bigeye, as a formal harvest strategy is not in place for this stock, SG80 cannot be met for HCRs. WCPFC have an agreed, legally binding framework in place to establish place formal harvest strategies and control rules for their main stocks, including WCPO yellowfin (see CMM 2014-06).		
1.2.3 – Information and monitoring	**≥80**	**No**
Rationale or key points		
It is considered that a comprehensive range of information on stock structure, stock productivity, abundance, UoA removals fleet composition etc. is available. There is regular monitoring of stock removals from this UoA and other fisheries, allowing for regular stock assessments and which are sufficient to support the HCR.		
1.2.4 – Assessment of stock status	**≥80**	**No**
Rationale or key points		
As per bigeye, comprehensive stock assessments are completed for this stock using MFCL. The assessments are tested and shown to be robust. The assessment takes into account uncertainty and evaluates stock status relative to reference points in a probabilistic way. It has also been subject to peer review.		

Table 12. Summary of Principle 1 Performance Indicator level scores – EPO bigeye tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**60 - 79**	**No**
Rationale or key points		
For SIa, to achieve SG60 it has to be likely (≥ 70th %ile), for SG80 is has to be highly likely (≥ 80th %ile) and for SG100 there has to be a high degree of certainty (≥ 95th %ile) that current stock status is above the PRI; i.e. above 50%S_{MSY} or 20%$S_{0.}$ The most recent formal stock assessment (Xu et al., 2018) suggests that the 5%/95% confidence intervals for spawning stock sit at approximately 50% MSY, which means that there is approximately a 5% probability that the stock is below the MSC default		

[2] * SA3.1.6: The term 'unwanted catch' shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid and did not want or chose not to use.

for the PRI. The 2019 assessment uses indicators rather than a formal assessment model, because the model was not considered robust. These indicators (catch, average weight per fish, closure-adjusted capacity and three FAD-related indicators) (Figure 7) are all at levels set as the outer safe limit, except for catch. Since these limits are well before the point at which recruitment should be impaired, SG80 is met for SIa.

The management goal of the Commission is to maintain stocks at MSY. In order to score SG80, the stock must be fluctuating at or around a level consistent with MSY. The 2018 stock assessment was not considered robust and pending re-evaluation there was no estimate of S/S_{MSY} in 2019. Overall given the conclusions of the 2019 indicator analysis, there is not sufficient evidence that the stock is fluctuating around a level consistent with MSY. SG80 is not met for SIb.

1.1.2 – Stock rebuilding	**60 – 79**	**N/A**

Rationale or key points

As the score for PI 1.1.1 for bigeye was less than SG80, PI 1.1.2 "stock rebuilding" must be addressed, in lieu of a condition, which is required for all other PIs failing to meet SG80. The decline in stock status to below MSY level is not well understood due to various uncertainties. As a precautionary measure, the Commission should ensure that catches are reduced to end overfishing and allow the SSB to recover to SSB_{MSY} levels. At this stage, no catch limits are specified for the bigeye stock. The current management measure for bigeye and the other target species in this assessment is C-17-02 (conservation measures for tropical tunas in the eastern Pacific Ocean during 2018 – 2020 and amendment to Resolution C-17-01.

A workplan has been developed to address the issues identified in the assessment review, aimed at increasing the Committee's ability to provide more concrete and robust advice by the 2019 meeting of the Scientific Committee. An external review was part of the workplan and that was done in March 2019 and is available online, and there is evidence that the work is on schedule. Therefore, monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe. SG60 is met. As yet, there is no evidence the rebuilding strategies are rebuilding stocks. SG80 is not met.

1.2.1 – Harvest Strategy	**60 – 79**	**No**

Rationale or key points

In 2016, IATTC adopted a HCR for tropical tunas based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02). If the estimated fishing mortality is higher than F_{MSY} for either stock, then fishing mortality should be reduced to F_{MSY}. To achieve this there are currently two management tools used by the IATTC that are agreed among fishing nations and passed as IATTC Resolutions. The first is in the form of season closures, while the second is limits on fishing capacity. Currently, this harvest strategy is set out in C-17-02, which is due to operate for 2018-2020, with a review of the strategy due before 2021. C-17-02 stipulates that the Commission scientists should review stock status (the F-mult) each year for bigeye (yellowfin and skipjack) and adjust the length

of the closure according to the stock with the lowest F-mult (see under 1.2.2). The harvest strategy would be expected to achieve stock management objectives, i.e. MSY and SG60 is met for SIa.

This fishery targets bigeye specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for bigeye are minimal. Hence there is no 'unwanted catch'[3] of bigeye in this fishery. C-17-02, paragraph 24 states all bigeye, skipjack and yellowfin brought on board is required to be landed, except that unfit for human consumption.

1.2.2 – Harvest control rules and tools	**60 – 79**	**No**

Rationale or key points

The HCR for EPO tropical tunas is set out in Res. C-16-02 (see Section 5.4 for details). The HCR is well-defined, reducing the exploitation rate if $F>F_{MSY}$ and so is likely to reduce F as the point of recruitment impairment (PRI) is approached.
There is some current concern about the stock assessment model used to estimate F-mult for bigeye, but an extensive review is underway, and since the stock is not close to the LRP, the HCR should be robust to this uncertainty in the short term (until 2021).

The tools to implement the HCR are set out in Res. C-17-02; the key tool is the seasonal closure. The HCR has not been implemented (i.e. the closure has not been adjusted according to F-mult) for 2019 and 2020, pending review of the stock assessment methodology. A full review of the HCR is due in 2021. The seasonal closure of 72 days is likely to be sufficient to control the exploitation rate to ensure that the PRI is not crossed, meeting SG60 for SIc. However, it cannot be argued to be likely to achieve the exploitation rates set out in the HCR (i.e. the reference points); in their review of indicators for bigeye, IATTC scientists expressed the view that additional measures are likely to be required to maintain the stock within safe limits in the medium term. If there is a stock recruitment relationship, which is a common assumption in many other tuna stock assessments, then effort would have to be reduced significantly. SG80 is not met.

1.2.3 – Information and monitoring	**≥80**	**No**

Rationale or key points

Sufficient information (on stock structure, stock productivity, fleet composition), is available to monitor and assess stock status including reporting and size-frequency sampling by each fleet and catch-per-unit-effort data from these fleets. Biology and life history is relatively well understood and sufficient for stock assessment. Overall these data are sufficient for stock assessments to monitor status and mortality rates to support a harvest strategy, despite the current problems with the assessment.

Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the HCR, and indicators of catch and effort are available and monitored with

[3] * SA3.1.6: The term 'unwanted catch' shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid and did not want or chose not to use.

sufficient frequency to support the HCR, including annual updates of the stock assessment (better practice than other tRFMOs). Catches are reasonably well monitored and are sufficient for stock assessment. There has been an IATTC observer program since 1993 for larger vessels, and the United States has had an observer program from the 1970s. Observer coverage has allowed discards of tuna to be estimated, as well as estimates of bycatch of other species. The level of monitoring is sufficient for the harvest strategy. Overall, this meets SG80.		
1.2.4 – Assessment of stock status	**60 - 79**	**No**
Rationale or key points		
The assessment was benchmarked in 2016 and updated in 2017 and 2018. The 2018 assessment suggested a large drop in F-mult. relative to the previous update and was not considered by its authors to be realistic. A subsequent external review revealed a series of critical uncertainties. For this reason, the stock assessment was not considered sufficient to provide management advice or to apply the HCR for 2019 or 2020, and the assessment instead relied on estimating a series of indicators. A workplan for the improvement of the stock assessment is in place and in implementation and the assessment will be benchmarked (along with the yellowfin assessment) during 2020, taking into account the external review and in time for the revision of the HCR in 2021. SG60 is met but SG80 is not met.		

Table 13. Summary of Principle 1 Performance Indicator level scores – EPO yellowfin tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**60 – 79**	**No**
Rationale or key points		
An updated assessment was conducted in 2019. The limit reference points for EPO yellowfin is set at $0.28*S_{MSY}$. As with bigeye, the IATTC LRP for yellowfin is below the MSC default level for PRI ($50\%B_{MSY}$ / $20\%B_0$), so these defaults are used for scoring instead. Since $20\%S_0$ is close to the level of S_{MSY} estimated analytically ($27\%S_0$); this was not considered a suitable proxy for the PRI, so 50% of S_{MSY} is used. To achieve SG60 for SIa, it has to be likely (≥ 70th %ile), for SG80 is has to be highly likely (≥ 80th %ile) and for SG100 there has to be a high degree of certainty (≥ 95th %ile) that current stock status is above the PRI; i.e. above $50\%S_{MSY}$ or $14\%S_0$). According to the approximate 5%/95% CIs (**Error! R eference source not found.**) the lower bound estimate of S is well above this level. This means that there is <5% probability that the stock is below the PRI. Since 2011, when the SBR fell as a result of the series of low recruitments that coincided with a series of strong La Niña events, it has been estimated to be at, or slightly below, the MSY level. At the start of 2019 it was estimated to be 0.21, below the MSY level (0.27). Fishing mortality rates for yellowfin tuna are now above maximum sustainable yield (MSY) levels (F multiplier = 0.89), a substantial change from the last assessment. Yellowfin tuna in the eastern Pacific Ocean are now overfished and undergoing overfishing (Minte-Vera et al. 2019). Current stock status relative to the MSY reference point (S_{MSY}=3,638 t) is S_{recent} /S_{MSY} = 0.76 (base case model). For SIb, the stock is no longer at or fluctuating around a level consistent with MSY. Given uncertainty on the stock status, it is probable that fishing mortality needs to be reduced to achieve MSY and therefore SG80 is not met. A condition would not be raised for this PI, instead dealt with under PI 1.1.2 – stock rebuilding.		
1.1.2 – Stock rebuilding	**60 – 79**	**No**
Rationale or key points		
As the score for PI 1.1.1 for yellowfin was less than SG80, PI 1.1.2 “stock rebuilding” must be addressed, in lieu of a condition, which is required for all other PIs failing to meet SG80. The decline in stock status to below MSY level is not well understood due to various uncertainties. As a precautionary measure, the Commission should ensure that catches are reduced to end overfishing and allow the SSB to recover to SSB_{MSY} levels. At this stage, no catch limits are specified for the yellowfin stock. The current management measure for yellowfin and the other target species in this assessment is C-17-02 (conservation measures for tropical tunas in the eastern Pacific Ocean during 2018 – 2020 and amendment to Resolution C-17-01. A workplan has been developed to address the issues identified in the assessment review, aimed at increasing the Committee’s ability to provide more concrete and robust advice by the 2019 meeting of the Scientific Committee. An external review was part of the workplan and that was done in March		

2019 and is available online, and there is evidence that the work is on schedule. Therefore, monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe. SG60 is met. As yet, there is no evidence the rebuilding strategies are rebuilding stocks. SG80 is not met.		
1.2.1 – Harvest Strategy	**60 – 79**	**No**
Rationale or key points		
See rationale for bigeye above.		
1.2.2 – Harvest control rules and tools	**60 – 79**	**No**
Rationale or key points		
See rationale for bigeye above.		
1.2.3 – Information and monitoring	**≥80**	**No**
Rationale or key points		
See rationale for bigeye above.		
1.2.4 – Assessment of stock status	**60 -79**	**No**
Rationale or key points		
See rationale for bigeye above.		

Table 14. Summary of Principle 1 Performance Indicator level scores – South Pacific albacore tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**≥80**	**No**
Rationale or key points		
The PRI for this stock is not known. WCPFC has adopted 20%$SB_{F=0}$ as a limit reference point (LRP) for the stock, where $SB_{F=0}$ is calculated as the average over the period 2006–2015. This LRP was used as the PRI and stock status was referenced against 20%$SB_{F=0}$ by calculating SB_{recent} /$SB_{F=0.}$ According to the latest stock assessment (Tremblay-Boyer et al., 2018), the reference points and the minimum value of $SB_{recent}/SB_{F=0}$ and $SB_{latest}/SB_{F=0}$ are all above 0.20. This means there is a high degree of certainty that the stock is above the PRI. In relation to the stock fluctuating around a level consistent with MSY, in no case for either 'recent' or 'latest', is stock biomass estimated to be below SB_{MSY}. Stock trajectories suggest that stock biomass has fluctuated without trend since ~1990, therefore the stock has been at a level above SB_{MSY} in recent years. Stock assessments estimates of catch relative to MSY suggest that catch has only exceeded MSY in a very few years (2009 and 2010 in the time series from 1960). The minimum value of SB_{recent}/SB_{MSY} is 1.58 and so SB_{recent} is greater than SB_{MSY}.		
1.1.2 – Stock rebuilding	**N/A**	**N/A**
Rationale or key points		
As PI 1.1.1 scored at least SG80, this PI does not need to be scored (as FCP SA2.3.1).		
1.2.1 – Harvest Strategy	**60 – 79**	**No**
Rationale or key points		
CMM 2014-06 sets out the roadmap to establishing a harvest strategy for key stocks managed by WCPFC. Under CMM 2014-06 WCPFC have also agreed a workplan with indicative timeframes to adopt or refine harvest strategies for south Pacific albacore, which is reviewed annually. At WCPFC15 (December 2018), the Commission adopted an interim TRP for SPA with the objective of an 8% increase in longline CPUE (estimated by SPC to be achieved at 56%$SB_{F=0}$). According to the most recent iteration of the workplan (WCPFC16, Dec. 2019), a management procedure is due to be agreed for SPA in 2022. In relation to SG60 for SIa, the stock is estimated to be well above MSY and the current harvest strategy is likely to keep the stock above LRP. In relation to SG80, the harvest strategy is required to be 'responsive to the state of the stock'. While some progress has been made (e.g. agreement of an interim TRP), the existing harvest strategy currently in place (i.e. CMM 2015-02) simply requires that effort is not increased above recent historical levels and makes no reference to the agreed reference points nor to changes to be made according to the stock status. Furthermore, it has a range of problems (SIDS exemption, nothing north of 20°S, defining vessels 'actively targeting' SPA) which makes its impact on the stock difficult to predict (although in practice it seems to be working). On this basis, SG80 is not met.		

Currently the stock is above PRI with a high degree of certainty and F is and has always been below F_{MSY}. Therefore, it appears that the harvest strategy is working and is achieving its objectives. Its performance has not, however, been 'fully evaluated', hence SG80 is met for SIb.

All the major fisheries report both catch and effort data (operational or aggregated; mainly the former) to SPC. CCMs are required to report annual to WCPFC the details of their fisheries (Part 1 reports) and compliance with the CMMs (Part 2 reports). There is therefore monitoring in place, sufficient to meet SG60 for SIc.

This fishery targets albacore specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for albacore are minimal, according to the stock assessment report. Hence there is no 'unwanted catch' of albacore in this fishery.

1.2.2 – Harvest control rules and tools	**60 – 79**	**No**

Rationale or key points

A HCR may be considered to be 'available' and 'expected to reduce the exploitation rate as the PRI is approached' at SG60 if i) 'stock biomass has not previously been reduced below B_{MSY} or has been maintained at that level for a recent period of time' (SA2.5.2a of FCR v2.0) and ii) 'there is an agreement or framework in place that requires the management body to adopt HCRs before the stock declines below B_{MSY}' (SA2.5.3b of FCR v2.0). The stock is above B_{MSY} with high probability and under CMM 2014-06 there is an established a workplan and agreed timetable for the adoption of well-defined harvest control rules, with an agreement to adopt a HCR in 2021. The process is therefore underway although some delays have been evident in the past. A TRP was finally agreed at WCPFC15 (2018), putting the revised workplan back on track. Overall, at present although a generally understood HCR is in place no well-defined HCRs are in place and so only SG60 is met for SIa.

As there is no formal HCR so it cannot be robust to the main uncertainties. The SG80 requirements are not met for SIb.

Recent average fishing mortality is estimated to be well below F_{MSY} (median F_{recent} /F_{MSY} =0.20, 80 percentile range 0.08-0.41), which level is likely to maintain the stock above the LRP. Pilling et al. (2015) shows that fishing the stock at MSY level would require a massive increase in effort from current levels. A well-defined HCR is being developed under CMM 2014-06. An interim limit and target reference point has been agreed, and HCRs will be evaluated for the main sources of uncertainty using Management Strategy Evaluation (MSE) (Pilling et al., 2018). Overall, therefore, under the MSC requirements and guidance for 'available' HCRs, SG60 is met. SG80 is not met for SIc.

1.2.3 – Information and monitoring	**≥80**	**No**

Rationale or key points

It is considered that a comprehensive range of information on stock structure, stock productivity, abundance, UoA removals fleet composition etc. is available. There is uncertainty around natural mortality growth rates, with more information on age and growth highlighted as a priority requirement. There are also no tagging data available for albacore. However, there is regular monitoring of stock removals from this UoA and other fisheries, allowing for regular stock assessments and which are sufficient to support the HCR. Formal stock assessments have taken place every few years (2012, 2015, 2018). In between formal stock assessments, SPC provide some information on trends in fishery indicators (total catch, nominal CPUE, catch at length and at weight), to guide management (e.g. Brouwer et al., 2018b). The assessment method used (MFCL) requires all catch and effort to be allocated to fisheries, where ideally the fisheries are defined to have selectivity and catchability characteristics that do not vary greatly over time. The assessment does not include the albacore fishery (catch or CPUE) east of 130°W, but this does not appear to be an issue related to availability of data and is considered under 1.2.4. SG80 is met for this PI.

1.2.4 – Assessment of stock status	**≥80**	**No**
Rationale or key points		
The assessment is conducted using the integrated assessment model Multifan-CL (MFCL). MFCL is able to take into account features of the fisheries (catchability, selectivity) and the biology of the stock (in a population model). The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA. At least SG80 is met for SIa. A target and limit reference point have been defined, with the TRP estimated in terms of SB directly from the stock assessment. The stock assessment model is able to estimate a range of reference points according to various different methodologies. SG80 is met for SIb. Numerous sensitivity runs were undertaken during the assessment, allowing a set of axes of uncertainty to be developed which were then used in to construct the uncertainty grid of model runs on which the advice is based. SG80 is met for SIc. The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored, for example, externally to the stock assessment, there is consideration each year of how to improve the input data (e.g. addition of new Japanese data in the most recent assessment; new methods of standardisation via geo-statistics). At least SG80 is met SId and overall for this PI.		

Table 15. Summary of Principle 1 Performance Indicator level scores – North Pacific albacore tuna

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**≥80**	**No**

Rationale or key points
The PRI for the stock is not known. The default PRI is taken here to be the LRP agreed by WCPFC, i.e. 20%$SB_{F=0}$. The most recent stock assessment by the Albacore Working Group of ISC was in 2017. The assessment estimated SB (base case model) to be ~2.5 times above the LRP. Wide Confidence Intervals (CIs) because of significant uncertainties in the assessment mean that that lower 5% CI for SB has marginally overlapped the LRP throughout the time series, as estimated by the stock assessment (see Figure 10). On this basis, SG80 is met for SIa. In respect to SIb, the stock assessment estimates SSB_{MSY} to be lower than the WCPFC LRP (~15%$SSB_{2015,\ F=0}$). In this circumstance, MSC proposes that 2xPRI / 40%$SB_{F=0}$ could be used as a suitable proxy for SSB_{MSY} in the sense intended by MSC. The Albacore Working Group set out three different model scenarios in the report: the base case and the two key one-off sensitivities; i.e. an alternative with M=0.3/yr instead of a sex- and age-specific M ogive, and an alternative with a different growth model. For the base case and the alternative growth model, point estimates of SB_{2015} are estimated to be >2 times higher than the LRP (2.47 times higher for the base case model, 2.15 times higher for the alternative growth model) i.e. above 40%$SB_{F=0}$ (taken as a proxy for SSB_{MSY} for the purposes of this scoring). For the M=0.3 model, however, SSB_{2015} is estimated to be 1.31 x LRP or 0.26 x $SB_{F=0}$; i.e. below the proxy reference point. On this basis, we can reasonably say that it is highly likely that SB is at or above a level consistent with MSY, as defined in a precautionary way by MSC, but there may not be a 'high degree of certainty' that the stock is above that level. SG80 is met.

1.1.2 – Stock rebuilding	**N/A**	**N/A**

Rationale or key points
As PI 1.1.1 scored at least SG80, this PI does not need to be scored (as FCP SA2.3.1).

1.2.1 – Harvest Strategy	**≥80**	**No**

Rationale or key points
The harvest strategy is in two parts: i) the interim harvest strategy as proposed by the NC and accepted by WCPFC in 2017 and ii) CMM 2019-03 / Resolution C-05-02, which are both still in force, although 2005-03 is due to be replaced in the WCPO by CMM 2019-03 which is similar. All have essentially the same management objective, which is to maintain the stock at 'current' levels ('current' being a different time period between the two; i.e. 2015 for the interim harvest strategy and 2002-4 for 2005-03/C-05-02, but similar levels of SB and F (AWG, 2017) (see also PI 1.1.1). This level is perceived to have a low risk of the biomass declining below the LRP. SG80 requires that the harvest strategy be responsive to the status of the stock. The stock status has varied very little over the stock assessment time series (see PI 1.1.1) making this difficult to judge (no response has been required). The conclusions of the MSC harmonisation workshop (MSC, 2016) in relation to this PI were that since there is a regular review of 2005-03 / C-05-02 by the Northern Committee in relation to the most recent stock assessment and status quo projections, the framework is available to respond to the stock status, and the various elements of the harvest strategy (i.e. monitoring, stock

assessment, management targets) work together to ensure that this happens. On this basis, it was agreed that SG80 is met for SIa in relation to the regional harvest strategy. Since the harvest strategy has not changed in substance, this analysis still applies.

Fishing mortality is below F_{MSY} and the stock is above SSB MSY (P1.1.1a) and the stock is highly likely to be above the PRI (P1.1.1b) The SG80 level is therefore met for SIb.

Monitoring is in place that is expected to determine whether the harvest strategy is working. This is through the recording of all catch and effort data for all fleets targeting the stocks (through logbooks) and through the collection of biological data, such as size composition, length or weight frequencies and sex information). SG60 is met for SIc.

The harvest strategy (i.e. 2005-03/2019-03/C-05-02) is reviewed annually by the Northern Committee; most recently via status quo projections, as well as by IATTC and WCPFC who review management measures and the advice of their scientific bodies during their annual meetings. SG100 is met for SId.

This fishery targets albacore specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for albacore are minimal, according to the stock assessment report. Hence there is no 'unwanted catch' of albacore in this fishery.

1.2.2 – Harvest control rules and tools	**60 – 79**	**No**

Rationale or key points

WCPFC have an agreed, legally binding framework in place to establish place formal harvest strategies and control rules for their main stocks, including NP albacore (see CMM 2014-06) although for implementation purposes, responsibility for NP albacore has been passed to the Northern Committee. For this purpose, a MSE process is underway which is based at IATTC. SA2.5.3b is therefore met for both RFMOs. On this basis, for a HCR can be considered to be 'available' for this stock. SG60 is met. Since the harvest strategy is not 'in place', SG80 is not met for SIa.

As the HCR is still under development, SG80 cannot be met for SIb, which requires HCRs to be robust to the main uncertainties.

Since the HCR is only considered to be 'available' (see 1.2.2a), only SG60 can be met for SIc, which at least requires Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.

1.2.3 – Information and monitoring	**≥80**	**No**

Rationale or key points

At a minimum, sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy. This includes stock

productivity, fleet composition for those vessels targeting the stock, stock abundance, CPUE and fishery removals.

Standardised abundance indices based on CPUE for the main fisheries are available to the ALBWG for stock assessment, which takes place every ~three years. Catch data is provided to ISC and the provision of data is reviewed annual by the Northern Committee. Member states must report total annual catch and annual effort and submit catch logbooks for each trip completed.

ISC Members are required to report the following data for fishery monitoring: total annual catch (live weight by species), total annual effort (active vessels by fishery), summary logbook data and biological data if available. These data are sufficient to support the harvest strategy (via stock assessments and status quo projections which are used in management decision-making). SG80 is met for SIc.

There is adequate information on all other fishery removals from the stock. SId is met at SG80.

1.2.4 – Assessment of stock status	**≥80**	**No**

Rationale or key points

The assessment for albacore tuna is carried out with Stock synthesis (SS3). SS3 is a statistical age-structured population modeling framework that has been applied in a wide variety of fish assessments globally. The 2017 stock assessment model (AWG, 2017) is a sex-specific, length-base, age-structured, forward-simulating, fully integrated statistical model. The model takes into account spatial and temporal extent of fisheries, biology of the stock, such as growth and recruitment, natural mortality, total catch, abundance, size composition and historical fishing operations. On this basis, the assessment is able to take into account all the main features of the biology of the species and the operation of the fisheries. At least SG80 is met for SIa.

The 2017 assessment (AWG, 2017) provides estimates north Pacific albacore stock status relative to a range of reference points which are also estimated within the stock assessment (F, B and SSB; MSY-based, and depletion-based). SG80 is met for SIb.

The stock assessment takes uncertainties into account, so that at least SG80 is met for SIc. The model conducts sensitivity analysis to evaluate changes in data series and attempts to evaluate stock status relative to reference points.

The stock assessment has been tested and shown to be robust. AWG conducted extensive sensitivity analyses to evaluate alternative assumptions on the assessment results. These included sensitivity to biological assumptions (growth, CV of L inf, M, h) and sensitivity to data inputs (alternative CPUE indices, size composition weighting). It was concluded that the assessment has been tested using a systematic exploration of the interactions among different sets of assumptions. SG100 is met for SId.

The albacore assessments are internally reviewed by the ALBWG. The results are reviewed by the ISC Plenary, the WCPFC Scientific Committee, and the staff of the IATTC. SG80 is at least met for SIe.

6.4 Principle 2

6.4.1 Principle 2 background

Principle Two outlines the fishery's potential impacts on the ecosystem in which the fishery operates. The following key components are assessed; primary species, secondary species, endangered, threatened or protected (ETP) species, habitats and ecosystem.

A primary species is defined as:

- Species not covered under P1.
- Species within the scope of the MSC programme.
- Species where management tools and measures are in place to manage the stock in relation to a Limit Reference Point (LRP) or Target Reference Point (TRP).

A secondary species is defined as:

- Species not managed and do not meet primary species criteria.
- Species that are out of the scope of the programme but do not meet ETP criteria.

ETP species is defined as:

- Species recognised by national ETP legislation.
- Species listed in binding international agreements (e.g. Convention on Migratory Species (CMS).
- Species classified as 'out-of-scope' which are assessed by the IUCN Red List as 'vulnerable' or above.

Primary and secondary species are defined as 'main' species when the following criteria are met:

- The catch comprises 5 % or more by weight of the total catch of all species by the UoA.
- The species is classified as 'less resilient' and comprises 2 % or more by weight of the total catch of all species by the UoC. Less resilient is defined here as having low to medium productivity, or species for which resilience has been lowered due to anthropogenic or natural changes to its life-history.
- The species is out of scope but is not considered an ETP species (secondary species only).
- Exceptions to the rule may apply in the case of exceptionally large catches of bycatch species.

As the pre-assessment is lacking actual fishery/UoA specific data, Principle 2 analysis is based on other MSC assessments for the WCPO and EPO. Data mainly comes from logbook summaries and Part 1 Annual Report submissions. Only 'main' species have been considered for further evaluation in this pre-assessment. Bait species have been assumed to be 'main' to aid future assessments, although the author has no information on actual bait species used by the UoAs. The most commonly used baits have again been taken from other MSC full assessments for longline fisheries in the Pacific.

Table 16 lists the scoring elements predicted for this assessment and their Principle 2 category designations.

Table 16. Scoring elements identified for this assessment

Component	Scoring elements	Scientific name	Designation	UoAs to which applicable	Justification	Data-deficient
P1 or P2 primary if not the UoA target species	South Pacific albacore tuna	*Thunnus alalunga*	Main if primary	Both WCPO and EPO UoAs	Managed, likely >5%	No
	North Pacific albacore tuna	*Thunnus alalunga*	Main if primary	Both WCPO and EPO UoAs	Managed, likely >5%	No
	Western and central Pacific bigeye tuna	*Thunnus obesus*	Main if primary	WCPO UoAs only	Managed, likely >5%	No
	Western and central Pacific yellowfin tuna	*Thunnus albacares*	Main if primary	WCPO UoAs only	Managed, likely >5%	No
	Eastern Pacific bigeye tuna	*Thunnus obesus*	Main if primary	EPO UoAs only	Managed, likely >5%	No
	Eastern Pacific yellowfin tuna	*Thunnus albacares*	Main if primary	EPO UoAs only	Managed, likely >5%	No
	South-west Pacific swordfish	*Xiphias gladius*	Main	WCPO UoAs only	Managed, likely >5%	No
	Pacific Saury	*Cololabis saira*	Main	Both WCPO and EPO UoAs	Managed, likely >5%	No
	Pacific striped marlin	*Kajikia audax*	Minor	Both WCPO and EPO UoAs	Managed, likely <5%	No
	Western and central Pacific skipjack tuna	*Katsuwonus pelamis*	Minor	WCPO UoAs only	Managed, likely <5%	No
	Eastern Pacific skipjack tuna	*Katsuwonus pelamis*	Minor	EPO UoAs only	Managed, likely <5%	No

Secondary	South-east Pacific swordfish	*Xiphias gladius*	Main	EPO UoAs only	Not managed, likely >5%	No
	Western and central North Pacific swordfish	*Xiphias gladius*	Main	Both WCPO and EPO UoAs	Not managed, likely >5%	No
	Pacific blue marlin	*Makaira nigricans*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	No
	Pelagic stingray	*Pteroplatytrygon violacea*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
	Wahoo	*Acanthocybium solandri*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
	Mahi mahi	*Coryphaena hippurus*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
	Oifish	*Ruvettus pretiosus*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
	Opah	*Lampris guttatus*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
	Black marlin	*Istiompax indica*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not

						evaluated in this report
	Indo-Pacific Sailfish	*Istiophorus platypterus*	Minor	Both WCPO and EPO UoAs	Not managed, likely <5%	Yes, but 'minor' species not evaluated in this report
ETP	Olive ridley turtle	*Lepidochelys olivacea*	N/A	Both WCPO and EPO UoAs	CMM 2008-03; C-07-03; CMS Appendix I; CITES Appendix I; Vulnerable on IUCN Redlist	No, as fishery impact can be analytically determined
	Green turtle	*Chelonia mydas*	N/A	Both WCPO and EPO UoAs	CMM 2008-03; C-07-03; CMS Appendix I; CITES Appendix I	No, as fishery impact can be analytically determined
	Hawksbill turtles	*Caretta caretta*	N/A	Both WCPO and EPO UoAs	CMM 2008-03; C-07-03; CMS Appendix I; CITES Appendix I	No, as fishery impact can be analytically determined
	Leatherback turtle	*Dermochelys coriacea*	N/A	Both WCPO and EPO UoAs	CMM 2008-03; C-07-03; CMS Appendix I; CITES Appendix I; Critically Endangered on IUCN Redlist	No, as fishery impact can be analytically determined
	Sea birds	N/A	N/A	Both WCPO and EPO UoAs	CMM 2018-03; C-05-01	No, as fishery impact can be analytically determined
	Silky shark	*Carcharhinus falciformis*	N/A	Both WCPO and EPO UoAs	CMM 2013-08; CMS Appendix II	No, as fishery impact can be

						analytically determined
	Oceanic whitetip shark	*Carcharhinus longimanus*	N/A	Both WCPO and EPO UoAs	CMM 2011-03; CITES Appendix II	No, as fishery impact can be analytically determined
	Giant manta	*Mobula (Manta) birostris*	N/A	Both WCPO and EPO UoAs	CMS Appendix I; CITES Appendix II	No, as fishery impact can be analytically determined
	Mobula *nei*	*Mobula* spp.	N/A	Both WCPO and EPO UoAs	CMS Appendix I; CITES Appendix II	No, as fishery impact can be analytically determined
	Blue shark	*Prionace glauca*	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be analytically determined
	Longfin mako shark	*Isurus paucus*	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be analytically determined
	Shortfin mako shark	*Isurus oxyrinchus*	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be analytically determined
	Porbeagle shark	*Lamna nasus*	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be

						analytically determined
	Thresher sharks	*Alopias* spp.	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be analytically determined
	Hammerhead sharks	*Sphyrna* spp.	N/A	Both WCPO and EPO UoAs	CMS Appendix II	No, as fishery impact can be analytically determined

6.4.2 Cumulative impacts

The MSC introduced requirements for cumulative impact assessments in Principle 2 with the release of the Fisheries Certification Requirements v2.0. These requirements are to ensure that MSC certified fisheries will no longer cumulatively be at risk of generating negative impacts on Principle 2 species (and habitat).

- For primary species, cumulative impacts assess whether the collective impact of overlapping MSC fisheries are hindering the recovery of 'main' primary species that are below a point of recruitment impairment (PRI); i.e. ensuring that the combined impact of MSC fisheries are not harming the recovery of the stock.
- For secondary species, the same intent applies when a species is below a biologically based limit, but only in cases where two or more MSC fisheries have 'main' catches that are 'considerable', defined as a species being 10 per cent or more of the total catch.
- For ETP species, the combined impacts of MSC fisheries on all ETP species needs to be evaluated, but only in cases where either national and/or international requirements set catch limits for ETP species and only for those fisheries subject to the same national legislation or within the area of the same binding agreement';
- For habitats, in contrast, cumulative impacts are evaluated in the management PI (PI 2.4.2). The requirements here aim to ensure that vulnerable marine ecosystems (VMEs) are managed cumulatively to ensure serious and irreversible harm does not occur.

These have been analysed and the conclusion was cumulative impacts were not relevant for this fishery.

Primary species

There were a number of 'main' primary species identified in this report. The majority of these are the target species in the various UoAs in this report. Background for these are provided in Section 5 and not discussed further here but are scored in the rationales later in the report. The remaining 'main' primary species identified in Table 16 were south-west Pacific swordfish (WCPO UoAs) western central north Pacific swordfish (WCPO and EPO UoAs).

WCPO UoAs only - Southwest Pacific swordfish (*Xiphias gladius*): With regard to swordfish, multiple stocks have been identified in the Pacific Ocean. There is a current lack of understanding of the stock structure and to the degree to which individuals migrate and sub-populations mix. Genetic studies indicate that there is not uniform gene flow among Pacific swordfish populations (WCPFC SC, 2017a). In the Pacific, there is genetic evidence of three independent populations (north, southwest and southeast) with no mixing across the equator in the western Pacific (Farley, 2016). The other two stocks of potential relevance are the south-east Pacific (applying only to EPO UoAs given the stock's geographical distribution) and western and central North Pacific stocks. The former of which, is not specifically managed by RFMOs and so are categorised as secondary species in this assessment.

Swordfish are one of the most widely distributed pelagic species, distributed globally, and observed from 50°N to 50°S and at all longitudes in the Pacific Ocean. Swordfish biological parameters such as growth rates and maturity in the southwest Pacific have been subject of numerous studies that have provided different estimates. Recent work conducted in 2016 provided for more robust results on these parameters. Swordfish in the southwest Pacific live longer and grow slower than what was previously thought (WCPFC SC, 2017a); studies conducted by Farley et al. (2016) estimate a maximum age of 21 years.

The most recent stock assessment for the southwest Pacific swordfish population used integrated assessment models MULTIFAN-CL. The outcomes indicates that the stock is likely not overfished and not subject to overfishing (Figure 11) (WCPFC SC, 2017a). The WCPFC has yet to adopt limit and target reference points for swordfish so the stock assessment results were included both spawning potential depletion and maximum sustainable yield (MSY) related reference points. Across the model grid, the terminal spawning potential depletion estimated for all runs, $SB_{latest}/SB_{F=0}$, was above 20%$SB_{F=0}$. The median estimate was 0.35 (range 0.26–0.49). The median ratio of SB_{latest} to SB_{MSY} was 1.61 (range 0.85 – 4.06, 11% of which were <1.0). The median estimate of F_{recent}/F_{MSY} was 0.86 (range 0.42–1.46), with 23 out of the 72 runs (32%) indicating that F_{recent}/F_{MSY} >1. Runs where overfishing was indicated were generally those with a steepness of 0.65 assumed (WCPFC SC 2017a).

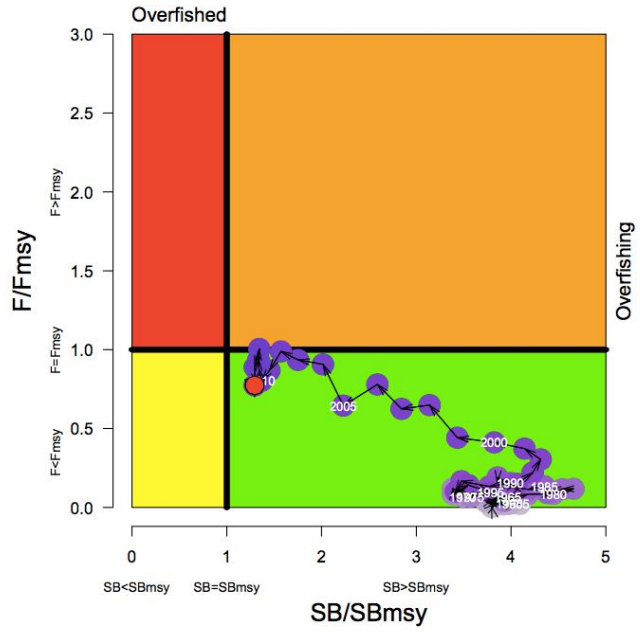

Figure 11. Majuro for the diagnostic case model representing stock status in terms of spawning potential depletion and fishing mortality. The red zone represents spawning potential levels lower than 20% of *SBrecent/SBF=0* which is marked with the solid black line. The orange region is for fishing mortality greater than *FMSY* (marked with the black dashed line). The green pink circle is $SB_{recent}/SB_{F=0}$ (Source: WCPFC SC, 2017a).

The WCPFC has a CMM specifically for swordfish, CMM 2009-03. This CMM provides for a range of measures to manage the swordfish catch in the WCPO. These measures include:

- Limiting the number of fishing vessels in the Convention Area south of 20°S.
- Limiting the amount of swordfish caught by fishing vessels flagged to each country in the Convention Area south of 20°S to the amount caught in any one year during the period 2000–2006.
- CCMs shall not shift their fishing effort for swordfish to the area north of 20°S.
- CCMs have nominated the maximum total catch of swordfish that it shall continue to be permitted to fish in the area south of 20°S. This amount shall be no more than their maximum verified catch declared to the Commission for any one year in the period 2000-2006.
- CCMs shall cooperate to protect the long-term sustainability and economic viability of the fisheries for swordfish in the southwest Pacific, and in particular shall cooperate on research to reduce uncertainty with regard to the status of swordfish stocks.
- CCMs shall report to the Commission the total number of vessels that fished for Swordfish and the total catch of swordfish.

As an interim measure, until the Commission adopts a scheme relating to compliance with CMMs which includes responses when a flag State exceeds any limits assigned to it, if it is determined by the Commission that the catch of vessels flying the flag of a CCM exceeds the total catch specified for them under paragraphs 2 and 4 above, that CCM will be subject to a reduction in their catch limit equal to the exceeded amount. The reduction will apply in the year immediately after it has been determined that the catch limit has been exceeded.

WCPO and EPO UoAs - Western and central North Pacific swordfish: The latest stock assessment for this region was conducted in 2018 by the ISC Billfish Working Group (WCPFC SC, 2018a). The results of which are that population biomass was around 71,000 mt in the last three years of the assessment (2014 – 2016). Compared to MSY-based reference points, the spawning stock biomass in 2016 was 87% above SSB_{MSY} and the current fishing mortality (average for ages 1 to 10 during 2013-2015) was 45% below F_{MSY} (Figure 12). Overall, the base case model indicated that the WCNPO swordfish stock is not likely overfished and is not likely experiencing overfishing relative to MSY-based or 20% of unfished spawning biomass-based reference points.

WCPFC16 (December 2019) agreed a harvest strategy for North Pacific swordfish, following a proposal by the Northern Committee (WCPFC 2019b). The strategy sets F_{MSY} as a limit reference point (or in practice a trigger reference point) and states that if F is evaluated as exceeding F_{MSY} the Northern Committee will agree measures to reduce it.

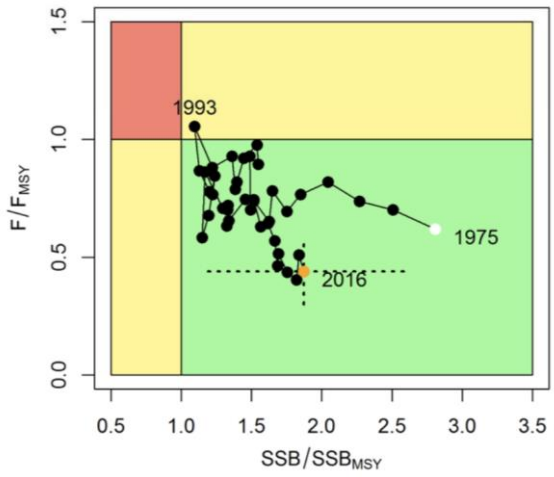

Figure 12. Kobe plot of the time series of estimates of relative fishing mortality (average of age 1-10) and relative spawning stock biomass of Western and Central North Pacific Ocean swordfish (*Xiphias gladius*) during 1975-2016. The white circle denotes the first year (1975) and the orange circle denotes the last year (2016) of the assessment time horizon.

Pacific Saury (*Cololabis saira*): This is the main and only bait species used in the fishery, no squid are currently used. Pacific Saury are generally found offshore, usually near the surface in schools. They feed on small crustaceans, and eggs and larvae of fishes. They are found in the North Pacific from Korea and Japan eastward to Gulf of Alaska and southward to Mexico. They are a Highly migratory species. migrates seasonally to southern Japan and adjacent waters in the winter, and Hokkaido and the Kuril Islands in the summer.

Generally, Pacific saury catches by China, Japan, Korea, Russia and Chinese Taipei tended to increase from the 1990s to 2000s, with the lowest value in 1998 and 1999 (158-160 th. t) and the highest one in 2008 (607 th t) and 2014 (621 th. t). In 2015, catch decreased and was the lowest for the last 13 years (about 350 th. tons).

Saury is managed by the new RFMO, the North Pacific Fisheries Commission (NPFC), charged with managing the high seas in the northern Pacific. The NFPC has set an ambitious objective of ensuring 'the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur.' Understanding the behaviours of the fleets within the Convention area represents a critical first step towards achieving these goals and managing for transparency, traceability, and sustainability within NPFC fisheries.

Secondary species

EPO UoAs only - Southeast Pacific swordfish: The most recent stock assessment was conducted in 2011. The results of the assessment indicate that the stock is not experiencing overfishing and is not overfished. Further to this the spawning biomass ratio is about 1.45 indicating that the spawning biomass is about 50 percent above the carrying capacity, and substantially above the level which is expected to produce catch at the MSY level. There have been high recruitments to swordfish stock and that the recent catch levels over the past five years (29,293 t in 2016) were at levels at about MSY (~25,000 t) (IATTC, 2017a).

Japanese horse mackerel/scad (*Decapterus maruadsi*): This migratory species is found throughout the Indo-West Pacific, from south China to the Mariana Islands (Fishbase website). There is little literature on this species, however a five-year tagging study (1996 – 1999) and risk assessment was completed by the Southeast Asian Fisheries Development Centre (SEAFDEC). The purpose of this was to better understand the population structure and implications for regional management of this species, as it is considered to be a metapopulation (Ali and Katoh, 2014). *D.maruadsi* and other scad are primarily caught by purse seine, but also by ring net and gillnet gears. Landings of scads by purse seine in the South China Sea indicate an overall declining trend since 2002. SEAFDEC conducted its own PSA using the MSC Certification Requirements (version 2.0) methodologies based on the tagging study. Based on this information, the species matures at around two years old and has a maximum age of nine years. It is highly fecund as a broadcast spawner. It is however at a higher trophic level than other small pelagic species. Considering its high- productivity attributes and the relatively small impact from this fishery, it is anticipated that this species would score well at full assessment.

ETP species

Elasmobranchs: It should be noted that some countries in the WCPO have designated their EEZs as extensive shark sanctuaries (Palau, Kiribati, **FSM**, Marshall Islands, Tokelau, Samoa, New Caledonia, **French Polynesia** and the **Cook Islands**). These sanctuaries ban the capture, removal, possession, trade, and sale of sharks and shark products, within the respective EEZs. This has an impact on the designation of shark species within Principle 2. Under SA3.1.2 (FCP v2.1), an assessment team shall consider each P2 species within only one of the primary species, secondary species or ETP species components. As some of the waters in the UoAs are designated shark sanctuaries, all elasmobranchs would be considered as ETP species if Principle 2 is aggregated, i.e. not divided by area of operation. Criteria for ETP scoring is more precautionary than scoring for secondary species for example, so this

is considered the more robust approach. For this assessment, only the regionally recognised ETP shark's species have been discussed, but the above is something to note on the approach to the full assessment. Only key elasmobranch species have been considered specifically in this report. In lieu of fisheries specific data, the author used Peatman et al., 2019 to highlight regional trends in longline bycatch (Figure 13 - Figure 15).

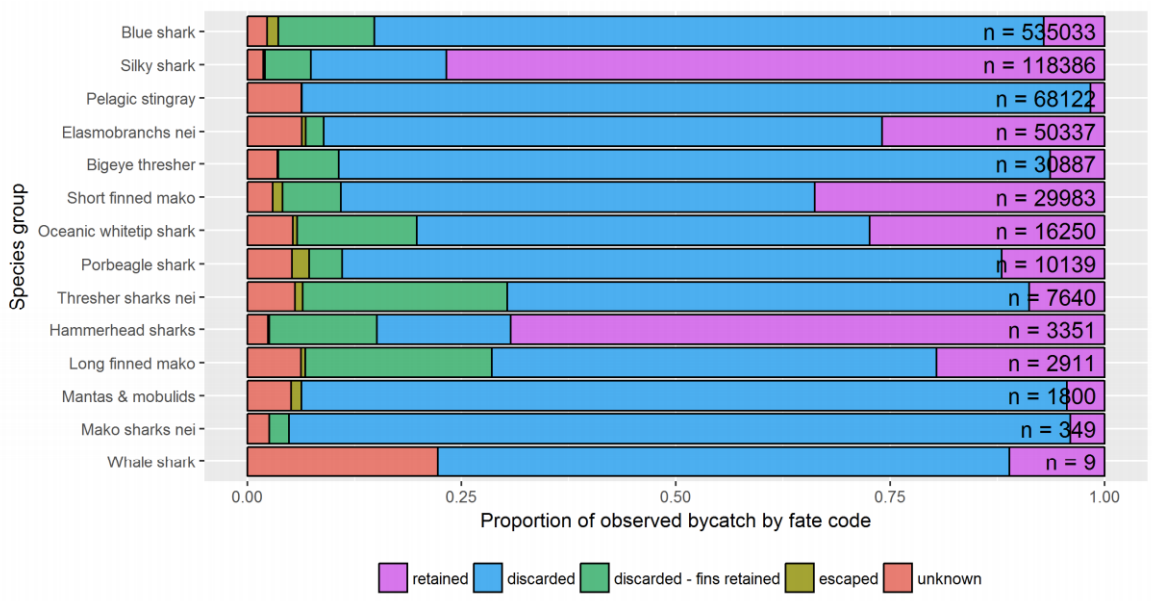

Figure 13. Recorded fate of observed sharks and rays catch by species/species group, as a proportion of total observed catch (number of fish) for the species/species group in the longline fisheries. The number of records is provided (n = …) (Peatman et al., 2019).

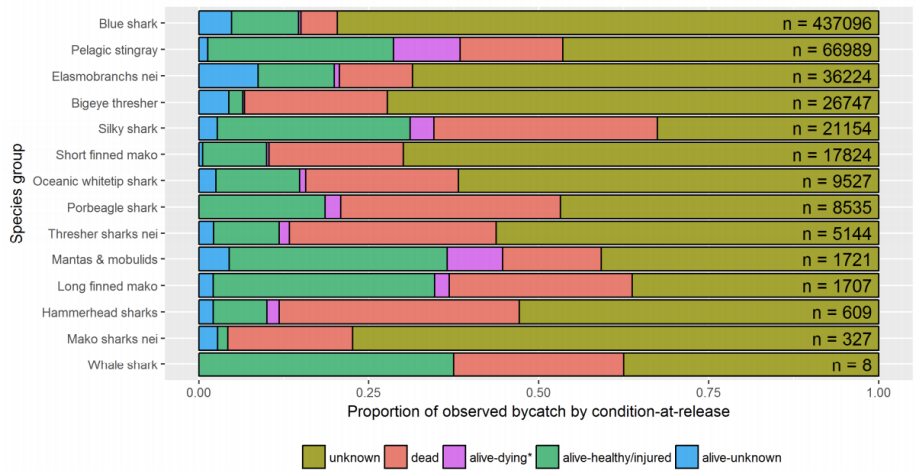

Figure 14. Recorded condition at release of observed sharks and rays catch by species/species group, as a proportion of total observed catch (number of fish) for the species/species group in the longline

fisheries. The number of records is provided (n = … for each species/group). Note – alive-dying* is individuals that alive but considered unlikely to survive.

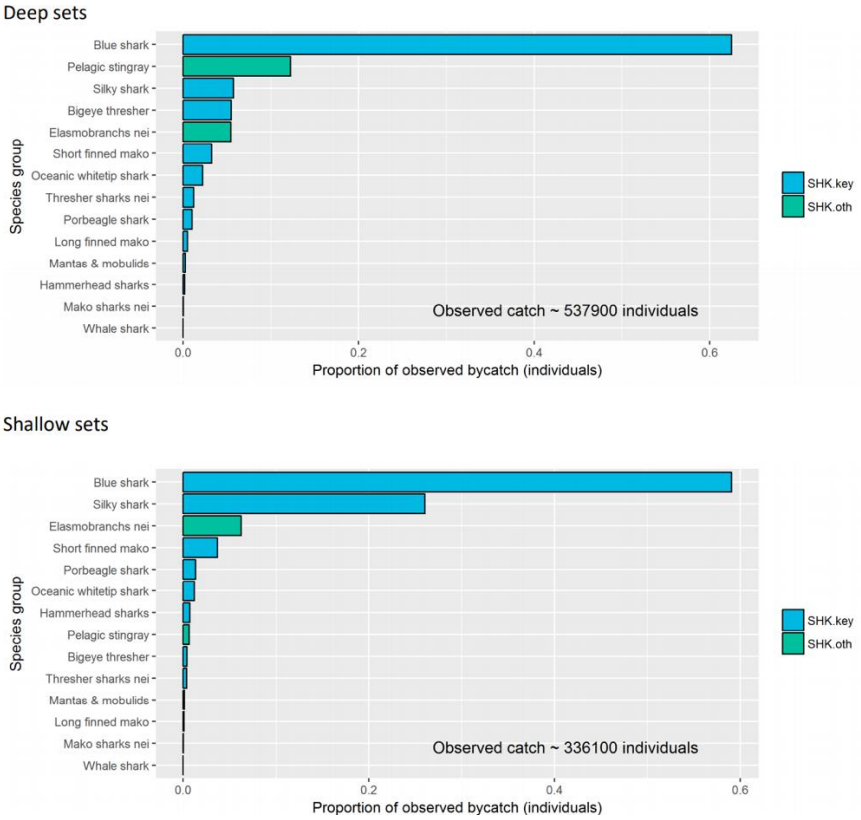

Figure 15. Proportion of observed sharks and rays catch (number of fish) by species/species group in the longline fisheries in deep sets (top) and shallow sets (bottom).

Silky shark: Silky sharks were listed on CITES as an Appendix II species in 2017[4], are listed on CMS as an Appendix II species in 2015[5] and a species-specific CMM (2013-08). Therefore, in accordance with MSC requirements, silky sharks are considered an ETP species.

Silky sharks can grow to 350 cm in length, but typically found around 250 cm weighing over 300 kg and living up to 25 years of age for males. Sexual maturity occurs around 230 cm[6], with female maturing at >12 years of age and living up to 36 years of age. Their generation time is between 11 and 14 years. Females generally have litters of around six pups after a nine to 12-month gestation, with one resting year (or possibly more) between litters (CoP 2016).

WCPO: The most recently completed WCPO stock assessment was conducted in 2013 (Rice and Harley 2013) This stock assessment uses the stock assessment model and computer software known as Stock Synthesis (version 3.21B). The model is an age structured, spatially aggregated and two sex model. The catch, effort, and size composition of catch are grouped into four fisheries, all of which cover the time period from 1995 through 2009. The conclusions of the assessment were that the stock is both experiencing overfishing and is also overfished. Estimated fishing mortality has increased to levels far

[4] https://www.speciesplus.net/#/taxon_concepts/67979/legal
[5] https://www.speciesplus.net/#/taxon_concepts/66508/legal
[6] https://www.fishbase.de/Summary/SpeciesSummary.php?ID=868&AT=Silky+shark

in excess of F_{MSY} ($F_{CURRENT}/F_{MSY}$ = 4.48) and across nearly all plausible model runs undertaken estimated F values were much higher than F_{MSY} (the 5th and 95th quantiles are 1.41 and 7.96) (Figure 16).

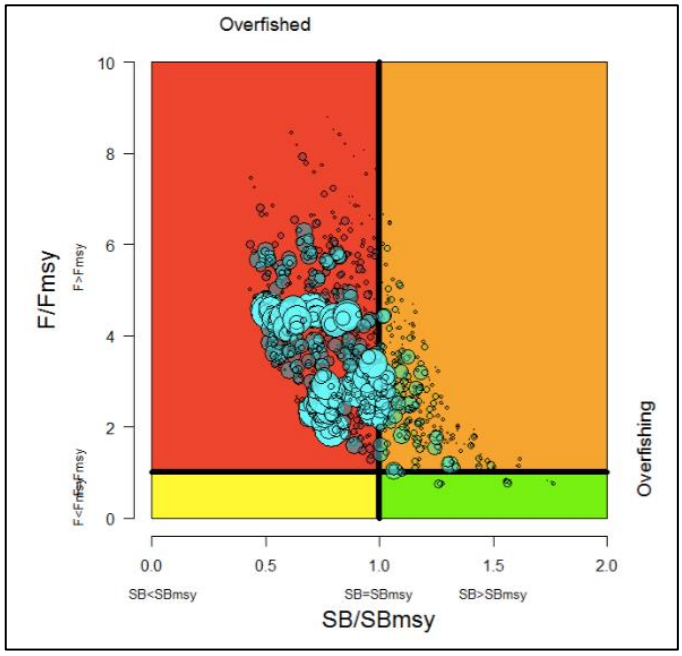

Figure 16. Kobe plot from the grid based only on the SPC Longline and Japanese Research and Training Vessel CPUEs (Rice and Harley, 2013).

Silky sharks in the WCPO are caught as bycatch by longline as well as through purse seine operations. Therefore, the WCPFC have come to the conclusion on how to best manage this species, and that is through mitigation measures which would provide the best opportunity to improve the status of the silky shark population. The use of observer data could provide some insights into which measures would be the most effective.

As a result, in the WCPO, the WCPFC have developed and implemented, in addition to CMM-2010-07 as discussed in previous sections of this report, CMM-2013-08 for silky sharks. This CMM brings in the following binding measures on members:

1. Commission Members, Cooperating Non-Members and Participating Territories (CCMs) shall prohibit vessels flying their flag and vessels under charter arrangements to the CCM from retaining on board, transhipping, storing on a fishing vessel, or landing any silky shark caught in the Convention Area, in whole or in part, in the fisheries covered by the Convention.

2. CCMs shall require all vessels flying their flag and vessels under charter arrangements to the CCM to release any silky shark that is caught in the Convention Area as soon as possible after the shark is brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible.

3. CCMs shall estimate, through data collected from observer programs and other means, the number of releases of silky shark caught in the Convention Area, including the status upon release (dead or alive), and report this information to the WCPFC in Part 1 of their Annual Reports.

4. The Commission shall consider the special needs of Small Island Developing States and Territories (SIDST), including supplying species identification guides for their fleets and develop guidelines and training for the safe release of sharks.
5. Observers shall be allowed to collect biological samples from silky sharks caught in the Convention Area that are dead on haul back in the WCPO, provided that the samples are part of a research project approved by the Scientific Committee. In order to get approval, a detailed document outlining the purpose of the work, number of samples intended to be collected and the spatio-temporal distribution of the sampling effect must be included in the proposal. Annual progress of the work and a final report on completion will be presented to the Scientific Committee.
6. CCMs and the Scientific Committee shall continue work on bycatch mitigation measures and live release guidelines to avoid the initial catch of this species wherever possible and maximise the number of incidentally caught individuals that can be released alive[7].

Since its inception, compliance with this CMM has been questioned by various countries and some observer data suggests that some countries are not adhering to the CMM. In 2016, observers recorded, among other matters, compliance against the CMM with particular focus regarding the no retention requirements. In total, 801 purse seine and 252 longline trips were observed (Table 17) (WCPFC 2017b).

Table 17. Number of silky sharks and their fate recorded by observers during purse seine and longline trips in 2016 (Source: WCPFC 2017b).

2016 Period	Number Caught	Discarded Body, Fins Retained	Body and Fins Retained	Condition when Cut off or Discarded			Total Cut off before landing
				Alive	Dead	Unknown	
Jan 1 –Dec 31 Purse-seine	32643	97	41	3494	17573	11438	0
Jan 1 – Dec 31 Long line	1467	0	4	1155	308	0	770
Total	**34110**	97	45	4649	17881	11438	770

Focusing on the longline operations, 1467 silky sharks were observed with a total of around 26.7% recorded as dead when discarded. Alarmingly, there were also 138 individuals retained either body and fins or just fins. This is clearly in contravention of the CMM which has a zero-retention policy for all gears. Any alleged infringements are notified by the Secretariat in the WCPFC online compliance case file system (WCPFC 2017b).

EPO: In 2013, the attempted stock assessment for silky sharks suffered from major uncertainties in fishery data, mainly on the annual catch rates in the earlier years of the time series for all fisheries. Since traditional stock assessment methods were not viable, in 2014 IATTC proposed a suite of possible stock status indicators (SSIs) that could be considered for managing the silky shark in the EPO (SAC-05-11a), including standardised bycatch-per-set (BPS) indices from the purse-seine fishery. Although there has been an increased effort to ensure the safe release of these sharks alive since the enactment of C-05-03 restricting shark finning (and C-16-06 limiting bycatch of silky sharks to a maximum of 20% of the total catch by fishing trip in weight, not fishing in pupping areas), and best handling practice material, much uncertainty still remains with respect to population status in the

[7] https://www.wcpfc.int/system/files/CMM%20201308%20CMM%20for%20Silky%20Sharks_0.pdf

EPO. In addition, a recent Pacific-wide silky shark assessment (Clarke et al. 2018) highlighted the need for a better understanding of movements and stock structure of the species in the Pacific Ocean.

Oceanic whitetip shark: Oceanic whitetip sharks (*Carcharhinus longimanus*) has its own WCPFC CMM (CMM 2011-03) Therefore, in accordance with MSC requirements, oceanic whitetip shark is considered an ETP species.

This species is distributed worldwide in epipelagic tropical and subtropical waters (warmer than 20°C) between the latitudes of 30° North latitude and 35° South. Its range includes the western Atlantic Ocean from Portugal to the Gulf of Guinea and possibly the Mediterranean Sea, usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water. Stock structure is unknown.

The most recent stock assessment for this species/stock (Tremblay-Boyer et al., 2019) was performed in the Stock Synthesis modelling framework (Methot & Wetzel, 2013). The four-fleet structure used as per the previous assessment (Rice et al., 2012), splitting the longline fishery into bycatch and target fleets, and the purse-seine fishery into fleets of associated and unassociated sets. A new addition included the 2019 assessment was the inclusion of discard mortality scenarios in historical catches. This was important to try and account for potential impacts of the non-retention of individuals enforced through the CMM and accounted for mortality at different stages of the discarding process from catch event itself, crew handling and post release mortality. The stock assessment concluded that the stock in the WCPO stock of this species is both overfished and overfishing is occurring based on SB/SB_{MSY} and F/F_{MSY} reference points, which is the same conclusion as Rice et al., 2012. The 2019 assessment found that F-based reference points improved in the period since the activation of its CMM (2013 – 2016). Despite the relative improvements in F-based reference points since 2013, the median value of F/F_{crash} over all 648 grid runs for 2016 remains above 1 (median: 1.41, 95%CI: 0.98–2.15), indicating that the population should go extinct on the long-term under current levels of fishing mortality (Tremblay-Boyer et al., 2019). Although the greatest impact is perceived to be from longline fisheries, purse seine fisheries also contributes.

WCPFC have developed and implemented, in addition to CMM-2010-07 as discussed in previous sections of this report, CMM 2011-04 for oceanic whitetip sharks[8]. This CMM brings in the following binding measures on members:

1. Prohibit vessels from retaining on board, transhipping, storing on a fishing vessel, or landing any oceanic whitetip shark, in whole or in part, in the fisheries covered by the Convention.
2. Release any oceanic whitetip shark that is caught as soon as possible after the shark is brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible.
3. CCMs shall estimate, through data collected from observer programs and other means, the number of releases of oceanic whitetip shark, including the status upon release (dead or alive), and report this information to the WCPFC in Part 1 of their Annual Reports.

[8] https://www.wcpfc.int/system/files/CMM-2011-04-Conservation-and-Management-Measure-Oceanic-Whitetip-Sharks.pdf

4. The Commission shall consider the special needs of Small Island Developing States and Territories, including supplying species identification guides for their fleets and develop guidelines and training for the safe release of sharks.

5. Observers shall be allowed to collect biological samples from oceanic whitetip sharks that are dead on haul back in the WCPO, provided that the samples are part of a research project approved by the Scientific Committee. In order to get approval, a detailed document outlining the purpose of the work, number of samples intended to be collected and the spatio-temporal distribution of the sampling effect must be included in the proposal. Annual progress of the work and a final report on completion will be presented to the Scientific Committee.

Compliance with this CMM over time has improved with most countries now complying to the requirements of the CMM. In 2016, observers recorded, among other matters, compliance against the CMM with particular focus regarding the no retention requirements. In total, 801 purse seine and 252 longline trips were observed. Focusing on the purse seine operations, 190 oceanic whitetip sharks were observed with a total of around 40% recorded as dead when discarded. No oceanic whitetip shark ware retained by vessels during this period of time (Table 18). Any alleged infringements are notified by the Secretariat in the WCPFC online compliance case file system (WCPFC 2017b).

Table 18. Number of oceanic whitetip sharks and their fate recorded by observers during purse seine and longline trips in 2016 (Source: WCPFC 2017b).

2016 Period	Number Caught	Discarded Body, Fins Retained	Body and Fins Retained	Condition when Cut off or Discarded			Total Cut off before landing
				Alive	Dead	Unknown	
Jan 1 –Dec 31 Purse seine	190	0	0	60	76	54	0
Jan 1 – Dec 31 Long line	441	1	0	275	37	128	195
Total	**631**	1	0	335	113	182	195

With regard to the EPO, the IATTC has also developed and implemented several specific Resolutions regarding the take of shark (as discussed earlier under Silky shark), including Oceanic whitetip shark. These are mainly:

- Resolution C-05-03;
- Resolution C-16-04;
- Resolution C-04-05; and
- Resolution C-16-05.

Specifically, in relation to oceanic whitetip sharks, IATTC have implemented Resolution C-11-10: Resolution on the Conservation of Oceanic Whitetip Sharks Caught in Association with Fisheries in the Antigua Convention Area[9].

Porbeagle shark (*Lamna nasus*): Porbeagle sharks were listed on the CMS as an Appendix II species in 2009[10] and so in accordance with MSC requirements, is considered an ETP species. The porbeagle shark can grow up to about 350 cm in length but is more common at around 250 cm weighing 230 kg

[9] https://www.iattc.org/PDFFiles/Resolutions/_English/C-11-10-Conservation-of-oceanic-whitetip-sharks.pdf

[10] https://www.cms.int/en/species/lamna-nasus

and living up to 30 years of age[11]. Porbeagles reach sexual maturity at around the age of 12 - 18 years for females and in males around an age of 6 - 11 years. Females generally only have four pups per litter annually and a gestation period around eight to nine months[12]. Given these life characteristics, porbeagle are susceptible and vulnerable to overfishing and overexploitation.

The first stock assessment of porbeagle sharks in the southern hemisphere (includes WCPO and EPO) was conducted in November 2017. Estimated values of fishing mortality were compared to a MIST (F_{crash}) which indicates a level of fishing expected to lead to population extinction in the long-term. For all regions combined (Eastern Atlantic Ocean to Western Pacific Ocean) the fishing mortality was less than 9% of the MIST in all years assessed (1992–2014) and fell to half that level in more recent years, with at most just a 4% probability of exceeding the MIST in 2010–2014. For other more precautionary MISTs fishing mortality is less than 12% of the F_{lim} and less than 18% of the F_{msm} in all of the years assessed. These scenarios are based on 100% capture mortality; assuming that some porbeagles survive their encounter with the fishery would reduce the estimated risk levels even further. The assessment noted that there were several areas that required further improvement in order for the assessment to be more robust. Currently both WCPFC and IATTC have not established any specific target or limit reference points for this species. WCPFC has adopted CMM 2010-07 as outlined in above sections, however IATTC has no such measures.

Thresher sharks (*Alopias* spp.): All three species of thresher sharks are CMS Appendix II listed species. All species exhibit similar biological characteristics and face the same challenges with regard to fishing mortality. They are predominantly caught by longline fishing gear (either target or bycatch), usually unmanaged globally, and sort after for their fins, making them highly susceptible to any form of fishing pressure. The stock status is unknown in the Pacific and to date there has been no stock assessment or analysis conducted on this species. Currently WCPFC nor IATTC have not established any stock assessment, specific target or limit reference points for this species.

Blue shark (*Prionace glauca*): Blue shark was listed on the Convention on the Conservation of Migratory Species of Wild Animals (CMS) as an Appendix II species and therefore qualifies as ETP. Blue shark are widely distributed throughout temperate and tropical waters of the Pacific Ocean. Two stocks are recognised in the Pacific, one in the north and another in the south Pacific. These stocks are distinguished based on biological and fishery evidence. Blue sharks' range in size, averaging around 335 cm in length, weighing approximately 205 kg and live until 20 years of age. They are believed to mature around 170 – 220 cm in length[13]. catches in the north Pacific have gradually declined over the years with around 52,000 mt caught in 2005 to an average of around 35,000 mt annually in 2013-2015 (Figure 17) (WCPFC SC 2017b).

[11] https://www.fishbase.de/Summary/SpeciesSummary.php?ID=88&AT=porbeagle

[12] https://www.cms.int/en/species/lamna-nasus

[13] http://www.fishbase.org/Summary/SpeciesSummary.php?ID=898&AT=blue+shark

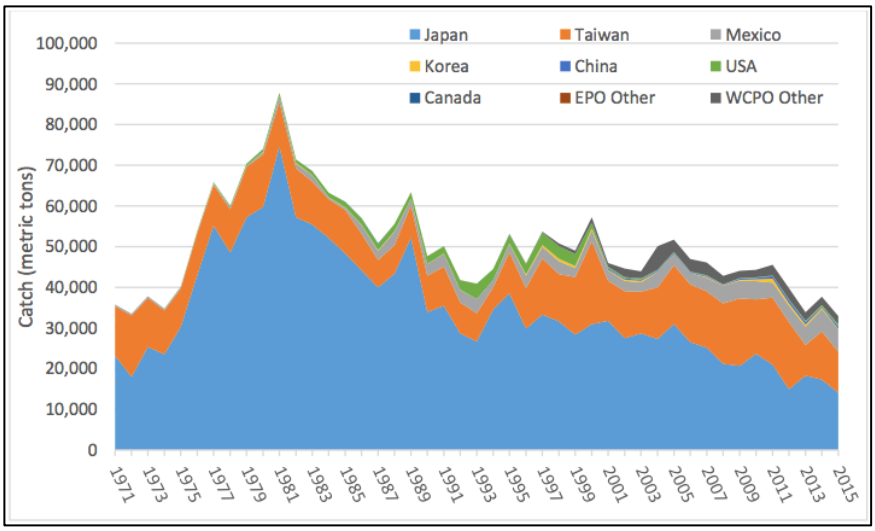

Figure 17. Total catch (total dead removals) of north Pacific blue shark by nation or region (Source: WCPFC SC 2017b).

The latest stock assessment for north Pacific blue sharks was conducted in 2016 (WCPFC SC, 2017b). Stock status is reported in relation to maximum sustainable yield (MSY). Female spawning biomass in 2015 (SB_{2015}) was 71% higher than at MSY and estimated to be 308,286 mt. The recent annual fishing mortality ($F_{2012-2014}$) was estimated to be well below F_{MSY} at approximately 37% of F_{MSY}. The conclusion of the stock assessment is that the blue shark stocks are not overfished, and that overfishing is not occurring (Figure 18) (WCPFC SC 2017b).

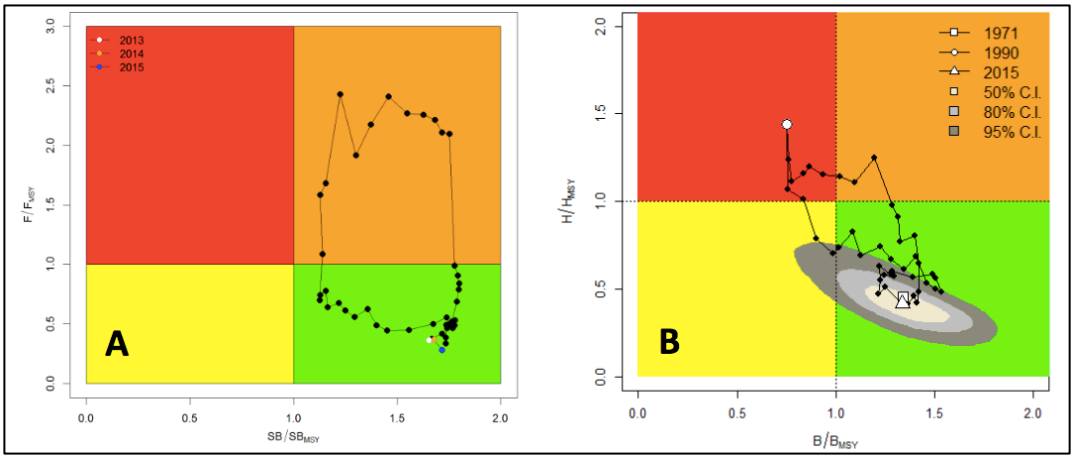

Figure 18. Kobe plots of the trends in estimates of relative fishing mortality and biomass of north Pacific blue shark between 1971–2015 for the reference case of (A) the SS stock assessment model, and (B) the BSSPM stock assessment model (Source: WCPFC SC 2017b).

The south Pacific stock assessment was last attempted in 2016 (Rice and Harley, 2013). The stock assessment relied on MULTIFAN-CL which fits size-based, age- and spatially-structured population models to data from multiple sources. No estimates of MSY-related quantities were possible and there were many uncertainties in the assessment. More work is needed on growth, mortality, reproduction and movement for South Pacific blue shark should be prioritized to overcome the paucity of biological data for this stock. Currently WCPFC nor IATTC have not established any specific target or limit

reference points for the northern blue shark stock. Instead, as mentioned above, the management of this species is directed toward the default MSY-based reference point.

Shortfin mako shark (*Isurus oxyrinchus*): Shortfin mako sharks were listed as Appendix II species under CMS in 2009[14]. Shortfin mako sharks are a key target shark species for many fisheries globally, from tuna longline to drift gillnet fisheries. They are prized for their meat and fins. This species is a coastal, oceanic species occurring from the surface to at least 500 m depth and is widespread in temperate and tropical waters of all oceans from about 50°N to 50°S. It is occasionally found close inshore. It is not normally found in waters below 16°C (Caillet et al., 2009).

The most recent stock assessment for shortfin mako sharks was performed in 2018 for the north Pacific Ocean stocks by the International Scientific Committee (ISC) for Tuna and Tuna-Like Species in the north Pacific Ocean. For the purposes of the assessment, a single stock was assumed in the NPO based on evidence from genetics, tagging studies, and lower catch rates near the equator compared to temperate areas. The results show that, relative to MSY, the north Pacific shortfin mako stock is likely (>50%) not in an overfished condition and overfishing is likely (>50%) not occurring. Furthermore, the assessment looked at future projections (over the next ten years) for the stock. It found that the spawning abundance was expected to increase gradually if fishing pressure remained stable or decreased relative to 2013 – 2015 levels. Although the model's ability to project into the future is highly uncertain given the uncertainty in fishery data and key biological processes within the model (WCPFC SC 2018b) (Figure 19).

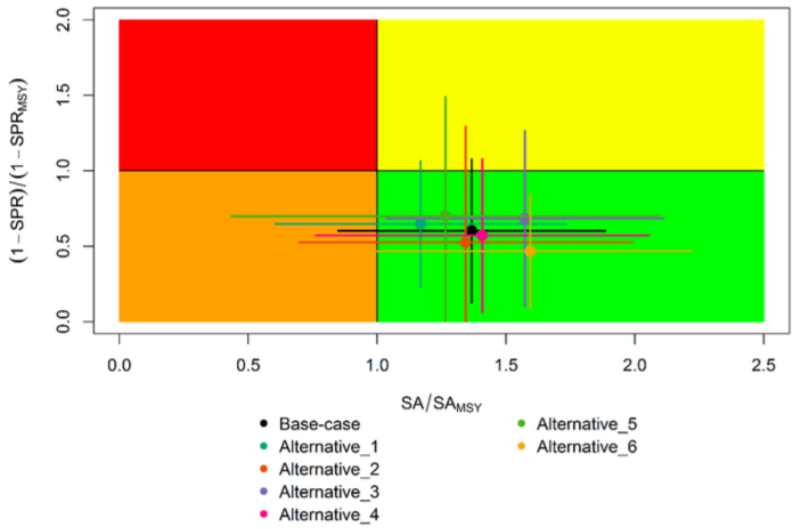

Figure 19. Kobe plot of shortfin mako sharks in the north Pacific Ocean indicating the ratio of spawning abundance (number of mature female sharks) relative to SA at MSY (SA_{MSY}), and the ratio of fishing intensity relative to fishing intensity at MSY ($1\text{-}SPR_{MSY}$) for the end year (2016) of the base case model and six alternative states of nature: Alternative_1) higher catch, Alternative_2) lower catch; Alternative_3) higher uncertainty on Japan shallow-set CPUE index (1975-1993) (CV=0.3); Alternative_4) fit to Japan offshore distant water longline shallow-set fleet (JPN_SS_I; 1975-2016) and Hawaii longline shallow-set fleet (US_SS; 2005-2016), and no fit to initial equilibrium

[14] https://www.speciesplus.net/#/taxon_concepts/11685/legal

catch; Alternative_5) low steepness, h=0.260; and Alternative_6) high steepness, h=0.372. Solid lines indicate 95% confidence intervals (Source: WCPFC SC 2018b).

There is no stock assessment for the south Pacific stock and currently both WCPFC and IATTC have not established any management or specific target or limit reference points for this species.

Longfin mako shark (*Isurus paucus*): This species was listed as Appendix II species under CMS in 2009[15]. This species is considered uncommon but has a global oceanic distribution in tropical waters. It is highly susceptible to tropical tuna longline fishing gear and is often caught as bycatch of these fisheries. Longfin mako sharks are often misidentified with the shortfin mako shark and catches of this species are likely to be well underestimated. While the stock of longfin mako sharks in unknown, it is highly likely that they have declined due to fishing pressure.

The stock status of this species is unknown, and no stock assessment or analysis has been conducted in either the WCPO or EPO. Currently both WCPFC and IATTC have not established any management or specific target or limit reference points for this species.

Hammerhead sharks (*Sphyrna lewini, S. mokarran, S. zygaena*): There are three species of hammerhead shark of note in this assessment, the great, scalloped and smooth hammerhead sharks. All three of these species were listed on Appendix II species on CMS in 2015[16][17]. All of which are sensitive to fishing pressure. The great hammerhead shark is a tropical shark species and widely distributed globally (from latitudes 40°N to 35°S). This species can be found both inshore and offshore waters going down to a depth of around 80 metres (Denham et al., 2007). The scalloped hammerhead is a coastal and semi oceanic species that is circumglobal in coastal warm temperate and tropical seas, from the surface and intertidal to at least 275 m depth. The oldest age estimate obtained was 30.5 years for both males and females (Baum et al, 2009). The smooth hammerhead is one of the larger hammerhead sharks, found world-wide in temperate and tropical seas, with a wider distribution than the other hammerheads. It is semi pelagic and occurs on the continental shelf. Gestation period appears to be around ten to 11 months with litter sizes of 32 pups (Casper et al., 2009).

The stock statuses are unknown but given the life characteristics of these species, it is likely to be declining. To date there have not been any stock assessment or analysis conducted for any of the hammerhead species form either WCPO or EPO. Currently both WCPFC and IATTC have not established any management or specific target or limit reference points for this species.

Giant manta ray: The giant manta ray (*Mobula birostris*), was first listed on Appendix II of CITES in 2013[18]. It is considered as vulnerable on the IUCN Redlist. Giant manta rays are circumglobal in tropical and temperate waters. Despite its global distribution, the species is not encountered often and are not generally found in large numbers and do not form large schools (>30 individuals) like other manta rays. There are data gaps and uncertainty regarding population sizes and currently unknown. However, globally there are many small subpopulations (< 1,000 individuals). Through satellite

[15] https://www.speciesplus.net/#/taxon_concepts/11843/legal
[16] https://www.speciesplus.net/#/taxon_concepts/66537/legal
[17] https://www.speciesplus.net/#/taxon_concepts/66538/legal
[18] https://www.speciesplus.net/#/taxon_concepts/11277/legal

tracking studies and international photo-identification matching projects, it appears that interchange between these subpopulations is very low. Individuals exhibit site fidelity to specific regions, as well as critical habitats within them, such as cleaning stations and feeding sites.

The data that is available regarding populations indicate that these local populations are likely to be in decline, with a high rate of population reduction in several regions, up to as much as 80% over the last three generations (approximately 75 years), and globally a decline of >30% is strongly suspected[19]. The average life span of this species is unknown but believed to be a relatively long-lived species. Reaching widths of 700 cm, with anecdotal reports up to 910 cm (Marshall et al., 2018). Size at maturity varies slightly throughout its range. Generation time is suspected to be 25 years based on conservative estimates of life history parameters from the reef manta ray (Dulvy et al. 2014). Generation time is the average age of adults which can be approximated as halfway between age at first maturity and maximum age. Thus, female mantas may be actively breeding for 30 years and the age at which 50% of total reproductive output is achieved would be approximately 24–25 years[20].

Both WCPFC and IATTC now have management measures on mobulid rays, which includes the manta ray, CMM 2019-05 and C-15-04 respectively. There are also best handling practice guides available on the WCPFC website. CMM 2019-05 will come into effect on 1 January 2021. It will then be prohibited to target or intentionally set on mobulid rays, retain them on board, transship and land. Their prompt release alive and unharmed will be required, as will the surrender of whole animals if unintentionally caught and landed in purse seine operations. C-15-04 is very similar in its requirements and has been in place in the EPO since 1 August 2016.

Furthermore, the WCPFC 13 adopted that manta and mobula rays shall be considered WCPFC key shark species for assessment and thus listed under the Shark Research Plan, noting that data gaps may preclude a traditional stock assessment approach (WCPFC, 2016).

Mobula ray: While the mobula/devil ray genus group was not identified down to actual individual species level (Brouwer et al., 2018a), all mobulids/devil rays are considered ETP under the MSC standard given that all mobula/devil ray species are listed under CITES and CMS as well as on the IUCN Red List. The species of mobula/devil rays that are listed and found in the WCPO include:

- *Mobula alfredi* (reef manta ray) - Vulnerable[21]
- *Mobula eregoodootenkee* (longhorned pygmy devil ray) - CITES and CMS Appendix II[2223], IUCN Redlist Near Threatened[24].
- *Mobula japanica* (spinetail devil ray) - CITES and CMS Appendix II[2526], Near Threatened[27]

[19] http://www.iucnredlist.org/details/198921/0
[20] http://www.iucnredlist.org/details/198921/0
[21] http://www.iucnredlist.org/details/195459/0
[22] https://www.speciesplus.net/#/taxon_concepts/66515/legal
[23] https://www.speciesplus.net/#/taxon_concepts/68411/legal
[24] http://www.iucnredlist.org/details/41832/0
[25] https://www.speciesplus.net/#/taxon_concepts/68408/legal
[26] https://www.speciesplus.net/#/taxon_concepts/66512/legal
[27] http://www.iucnredlist.org/details/41833/0

- *Mobula tarapacana* (sicklefin devil ray) – CITES Appendix II[28], CMS Appendix I[29], Vulnerable[30] on IUCN Redlist.
- *Mobula thurstoni* (bentfin devil ray) - CITES and CMS Appendix II[3132], IUCN Redlist Near Threatened[33]

While the SPC observers do not tend identify these down to individual species level, it is expected that the identification of such animals will significantly improve over the near term due to the WCPFC now treating mobulids the same as key shark species in the fishery and development of appropriate identification guides to help with this task. For the purposes of this assessment, it is not possible to pick out individual species, therefore, all the above have been included in the assessment as the collective mobula nei, for scoring purposes and be treated similar to that of the giant manta ray above (the new WCPFC CMM applies). Peatman et al.'s (2019) data illustrate the mobula rays nei are not caught in large numbers compared to other elasmobranchs such as blue shark and silky shark (Figure 13).

Marine turtles: All sea turtles are listed under CMM 2018-04 in the WCPFC and C-07-03 in IATTC convention areas. These provide protection and required mitigative action in capture fisheries in the region. Six out of the seven marine sea turtle species are threatened with extinction. Fisheries bycatch has been ranked as the most significant threat to sea turtle populations globally, followed by climate change. A global comparison of calculated impact scores between three classes of gear types (longlines, nets and trawls) was conducted. Longlines were found to have similar interaction rates and to affect the same size of sea turtles as the other gear types but had a significantly lower mortality rate and thus had a significantly lower overall impact score (Clarke et al. 2014).

For green turtles (*Chelonia mydas*) in this assessment, two, possibly three populations are identified (Central West Pacific, Central South Pacific and the East Pacific)[34] and are endangered, according to IUCN, although this assessment is quite old (Seminoff, 2004). The detailed picture is complex: since the 1970s/80s, nesting in Mexico and southeast Asia (Indonesia and the Philippines) has declined significantly, while nesting at the Galapagos is stable and nesting in Australia and Hawaii has increased.

The population structure of hawksbill turtles (*Eretmochelys imbricata*) is unclear; they are solitary nesters and therefore difficult to monitor. Hawksbills encountered in this assessment's UoAs could nest almost anywhere around the Pacific[35], although the largest nesting sites in the 'vicinity' are in Australia and Indonesia, according to IUCN, who list the species as 'critically endangered' (Mortimer and Donnelly, 2008). Again, deliberate capture s seen as the main risk to the species, along with removal of eggs and degradation of nesting habitat, although fisheries bycatch gets an honourable mention.

[28] https://www.speciesplus.net/#/taxon_concepts/68410/legal
[29] https://www.speciesplus.net/#/taxon_concepts/66514/legal
[30] http://www.iucnredlist.org/details/60199/0
[31] https://www.speciesplus.net/#/taxon_concepts/66513/legal
[32] https://www.speciesplus.net/#/taxon_concepts/68409/legal
[33] http://www.iucnredlist.org/details/60200/0
[34] http://www.nmfs.noaa.gov/pr/species/turtles/green.html
[35] http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.html

For leatherback turtles (*Dermochelys coriacea*), individuals in UoAs might belong to the Eastern Pacific population unit or the Western Pacific population unit[36], nesting either in Central America or in Papua New Guinea and the Solomon Islands. Both are critically endangered according to IUCN (Wallace et al., 2013); they estimate population size as 633 mature individuals / 475 females (Eastern Pacific) and 1438 mature individuals / 1078 females (Western Pacific).

Wallace et al. (2010) defined 58 sea turtle Regional Management Units (RMUs) globally, comprising multiple nesting sites, nesting populations and breeding populations, defining core distribution areas that are considered optimal for assessing the conservation status of marine turtles and for management applications (Figure 20).

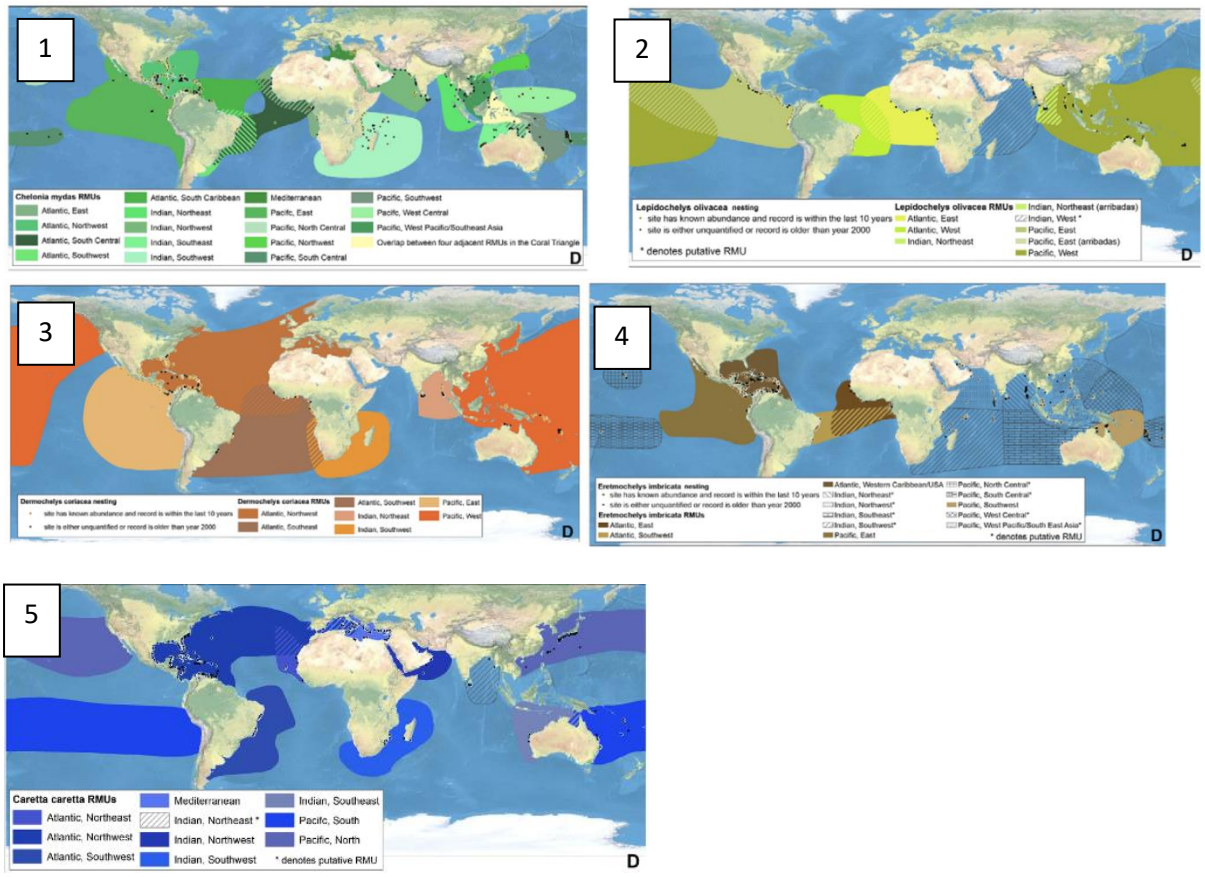

Figure 20. Sea turtle Regional Management Units according to Wallace et al. (2010). The fishery under assessment overlaps with the *Chelonia mydas* Pacific west central and Pacific southwest RMU (1), *Lepidochelys olivacea* Pacific west and Pacific east RMU (2), *Dermochelys coriacea* Pacific west RMU (3), *Eretmochelys imbricata* Pacific south central and south west RMU (4) and *Caretta caretta* Pacific south RMU (5).

Protective legislation covers multiple turtle species, rather than having individual CMMs for example for a specific species, as in the case of oceanic whitetip or silky sharks. WCPFC have conducted trials and analysis of data over many years to understand the best way to reduce sea turtle interactions within their respective fisheries. These have led to the adoption of management measures to mitigate sea turtle interactions. The WCPFC have adopted CMM 2018-04 – Conservation Management

[36] http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.html

Measure of Sea Turtles which covers both longline and purse seine operations. Relevant to the purse seine fishery, this CMM requires members to:

- Avoid encirclement of turtles wherever possible.
- Release all turtles observed to be entangled in FADs or other fishing gear.
- Carry and employ dip nets, when appropriate, to handle turtles;
- Use at least one of three methods to mitigate capture of turtles, including only using large circle hooks and only using finfish as bait (as opposed to squid).

In the EPO, C-07-03 provides the mitigation measures to reduce bycatch of turtles in the tuna fisheries. Similar to the WCPFC requirements, the Resolution states, in addition to data collection through observer programmes, the mandatory carrying of de-hookers, line cutters and dip nets on board vessels. Slightly behind the WCPFC, the Resolution does not make the use of circle hooks obligatory, but does require expeditious fishing trials to "determine the feasibility and effectiveness of appropriate combinations of circle hooks and 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."

Cetaceans: It is highly possible that cetaceans will interact with longline fisheries in the Pacific, which is why they have been considered in this pre-assessment. There are two main types of interaction between cetaceans and longlines: depredation and capture via hooking and entanglement, the latter often following on from the former (Gilman et al., 2006a; Anderson, 2014). Although relative to other fishing gear such as gillnets, longline fishing generally does not pose as much of a threat, many individuals suffer mortality and serious injury as a result of the interactions (Gilman et al., 2006a; Garrison, 2007 cited in Werner et al. (2015)).

Both WCPFC and IATTC currently do not have any management or requirements regarding cetaceans by their respective longline fisheries, although the issue was discussed at WCPFC16 and passed to SPC and the SC for data evaluation and review during 2020. However, both WCPFC (CMM 2011-03 – for Protection of Cetaceans from Purse Seine Fishing Operations[37]) and IATTC do have management measures and requirements for their respective purse seine sector with regard to dolphins.

Despite specific longline management, the Pacific Islands where the fishery mainly operates are however signatories to the Memorandum of Understanding (MoU) for the Conservation of Cetaceans and their Habitats in the Pacific Island Region (15 September 2006) which is a Multilateral Environmental MoU concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) and protects all populations of cetaceans (whales and dolphins) in the Pacific Island Region (area between the Tropic of Cancer and 60° South latitude and between 130° east longitude and 120° West longitude).

Seabirds: Given that the distributions of albatrosses and large petrels, which are main at-risk species susceptible to capture in pelagic longline fisheries, occur poleward of 20° latitude in both hemispheres, it is highly unlikely that this fishery overlaps with these species. However, the team considered potential impacts of this fishery on vulnerable seabird species on a precautionary basis.

[37] https://www.wcpfc.int/system/files/CMM-2011-03-Conservation-and-Management-Measure-Protection-Cetaceans-Purse-Seine-Fishing-Operations.pdf

Watling (2002), based on interviews with WCPO industry stakeholders and observer data, indicates that although seabird interactions with longline vessels operating in tropical and subtropical areas of the WCPO are very rare (except in the Hawaii-based longline fisheries) this does not preclude the possibility of highly threatened seabird populations being impacted. Gilman (2006b) equally concluded that observer data available at that time were insufficient to support a conclusion with any high level of certainty that no pelagic longline fisheries operating in the tropical Pacific Islands region excluding Hawaii could be contributing to existing or cause future seabird population declines.

Filippi et al. (2010) compared the distribution of seabirds and their likelihood of capture in relation to longline fishing effort in the WCPFC area. The study used a Productivity-Susceptibility Analysis (PSA) to identify the areas of greatest risk of occurrence and impacts of bycatch, the species of greatest concern for population level impacts and the fisheries which contributed the greatest risk. The resulting areas of likely species-level effects of fishing in the WCPFC Convention Area are shown in Figure 21. As can be seen from the map, this fishery is located in a low-risk area for seabird interactions.

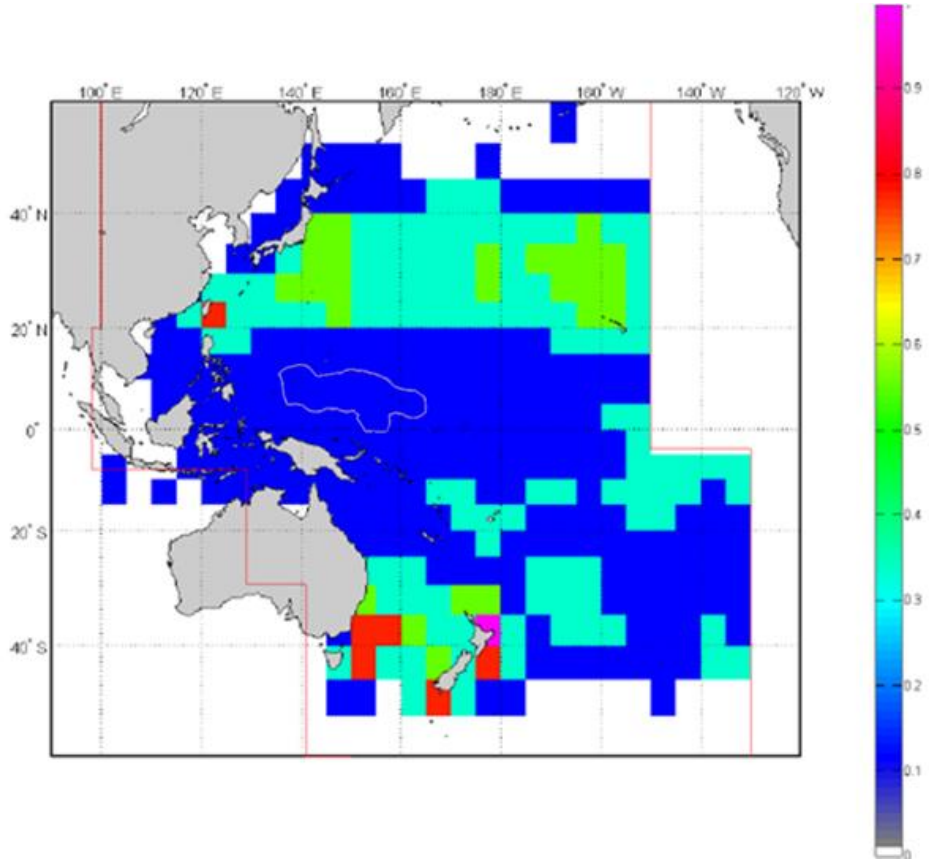

Figure 21. Areas of likely species-level effects of fishing in the WCPFC Convention Area. Highest risk areas - pink, Medium-high - orange; Medium – green; Medium-low – pale blue; Low – dark blue; Negligible risk – White. Map adapted from Filippi et al. (2010).

In December 2017 (WCPFC14), CMM 2017-06 was agreed on mitigating the impact of fishing for highly migratory fish stocks on seabirds. Sea bird mitigation is covered by IATTC Resolution C-10-02.

Habitats

This fishery is strictly a pelagic fishery and does not interact with benthic habitats. All UoAs' operations in WCPO and EPO are undertaken in deep oceanic waters and do not physically come into contact with any substrata (seafloor, seamount, corals, etc.), nor do they have any impact on any physical habitat during operations. Vessels in both the WCPO and EPO fisheries would be subject to Vessel Monitoring Systems (VMS) under CCM 2007-02 and Resolution C-14-02, which monitor the movements of fishing vessels in the respective Convention Areas. As such, the water column is the only habitat to be considered potentially impacted and it is not considered a Vulnerable Marine Ecosystem (VME) and therefore is not believed to be an issue in longline fisheries. According to MSC interpretation, in pelagic fisheries, the commonly encountered habitat is the water column. According to GSA3.13.2: "… impacts on the biotic aspects of pelagic habitats could be considered". This is addressed under Principle 1 and Principle 2 (primary, secondary and ETP species), which examine direct and indirect effects, and unwanted catch of target and non-target species.

One issue which needs to be considered is that of unobserved mortality due to ghost fishing by discarded or lost fishing gear which may consist of monofilament and/or hooks. The FAO's definition of ghost fishing as lost or abandoned fishing gear that continues to catch fish. No fishery-specific information was received from the fishery as to the numbers of estimates of hook loss in the fishery, but it recommended that this be available for the full assessment team in due course. This could be in the form of hooks per vessel, per day, or by trip and also when lines are cut, for example when a shark is set free.

Based on publicly available scientific literature, lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the ghost fishing mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The conclusion in this pre-assessment is that the UoAs are highly unlikely to interact with benthic features to reduce structure and function of any habitats. This would be evidenced at full assessment by VMS data of fleets' movements and information about hook loss by vessel.

Ecosystem

The impacts of tuna fishing on the ecosystem are complex and not fully understood. Tuna are high trophic level predators so there is some concern their removal could negatively impact the ecosystem. Trophic cascades, where removing top predators leads to changes downwards through the trophic food web, and changes to the target populations or the diversity of other species have all been identified as potential outcomes resulting from their removal (Baum and Worm 2009, Schindler et al. 2002). Conflicting arguments have been made by Sibert et al. (2006) and Baum and Worm (2009), concerning the potential for ecosystem impacts from the removal of top predators. Allain et al. (2012) used ecosystem modelling to suggest the ecosystem responds to both top down and bottom up processes. This fishery takes a small proportion of the total removal of species and therefore does not likely contribute to irreversible ecosystem impacts. An additional piece of fact finding is required to understand waste management within the UoA.

The MSC definition of 'key ecosystems elements' is "the features of an ecosystem considered as being most crucial to giving the ecosystem its characteristic nature and dynamics and are considered relative

to the scale and intensity of the UoA. They are features which are most crucial to maintaining the integrity of its structure and functions and the key determinants of the ecosystem resilience and productivity" (MSC FCP v2.1 - SA3.16.3).

The impacts of the UoAs on retained species, bycatch, ETP species as well as habitats have all been considered and described in the above sections of this report. However, other risks exist, and further impacts of the fishery may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function by the removal of pelagic species. There are a myriad of general papers that outline the declines of predatory fish species, and the potential/likely impacts to the ecosystem through disturbance of trophic dynamics.

In the Pacific Ocean, exploited tuna populations have declined steadily to levels near the equilibrium biomass that is likely to produce MSY for each stock. The impacts of the fishery on retained species, bycatch, ETP species, as well as habitats have all been considered and described in previous sections of this report. However, other risks exist, and further impacts of the fishery may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function. Such impacts are considered further here.

Perhaps the most serious risk to ecosystem structure and function that can result from the operation of industrial scale fisheries are potential large changes in food-web dynamics related to the removal of significant proportions of key predator species. There are numerous general papers that outline the declines of predatory fish species, and the potential/likely impacts to the ecosystem through disturbance of trophic dynamics.

In the WCPO, the WCPFC Scientific Committee (SC) has access to a myriad of research outcomes, including, but not limited to, stock assessments, bycatch analysis, ETP observations and mitigation measures. The WCPFC, through its SC and the SPC, have been gathering additional information and investigating the WCPO tuna fisheries impact and interaction with the surrounding ecosystem since its inception. Ecosystem and trophic knowledge come from the significant number of biological samples such as stomach samples (dietary), zooplankton and forage species, stable isotope analysis and fish condition to name a few. Observer data and port sampling has become especially important in recent times given the 100% coverage now being achieved in the WCPO for all purse seine activity, although remains poor for longline operations.

Given the potential impacts to ecosystem function, the WCPFC (through the SPC) have continued to investigate the ecosystem and trophic impacts of these removals, developing the pelagic trophic dynamic study. The long-term objective of the study is to develop ecosystem approaches of fisheries management by building ecosystem models to assess fishing and environmental impacts on the whole ecosystem and evaluate management options (Allain et al., 2009). Through these detailed studies to date, the WCPFC has been able to construct several robust and detailed biodynamic trophic Ecopath-Ecosim models[38] but they still require further testing and ground-truthing before being fully applied to WCPFC fisheries as a tool[39]. Some of these earlier model outputs are provided in Figure 22.

[38] http://oceanfish.spc.int/en/ofpsection/ema/ecosystem-a-multispecies-modelling/ecopath
[39] http://oceanfish.spc.int/en/ofpsection/ema

It is likely that industrial tuna fisheries (purse seine and longline) have caused a change in the structure and function of the trophic ecology of the WCPO given the vast quantities of key predator species that have been removed. However, there is evidence to suggest the impacts are not serious or irreversible. Allain et al. (2007) found that most species rebuilt to virgin biomass after five years of no fishing (Figure 22). Furthermore, these UoAs under assessment are longline operations taking a mere fraction of the catch from the WCPO and EPO and is highly unlikely to have any impact on the ecosystem.

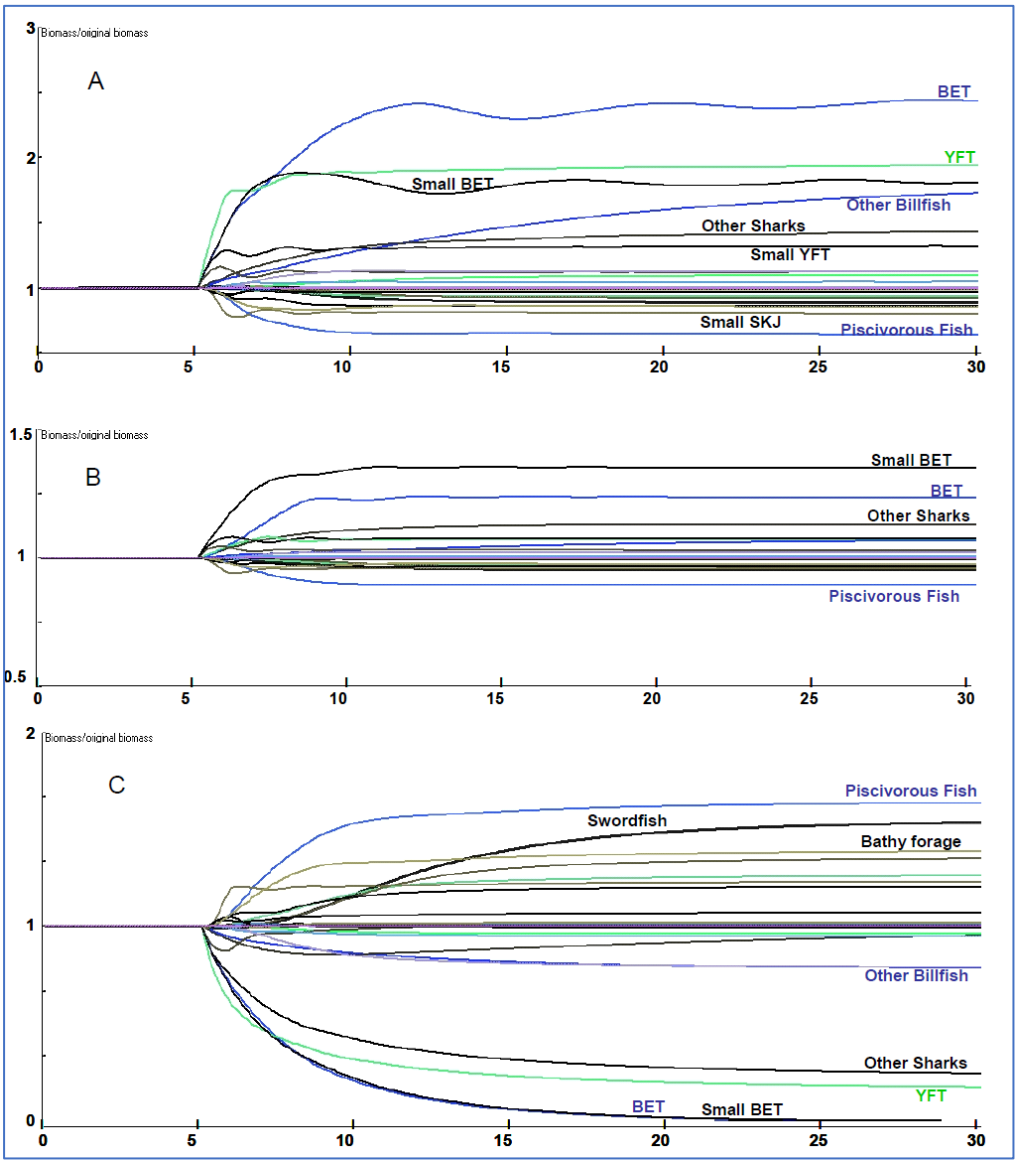

Figure 22. Biomass/Original Biomass ratio trajectories of the ecosystem components over 30 years with three different Ecosim scenarios: A) complete removal of all fisheries after five years, B) removal of FAD purse seine after five years, other fisheries maintained at current level, C) all fisheries doubled after five years and maintained at that level (Source: Allain et al., 2007).

In summary, the WCPFC has a significant amount of comprehensive and high-quality information and monitoring available to it regarding all areas of information. Main interactions between the fishery and these ecosystem elements including impacts of removals, large scale oceanographic events, change of variability, climate change can be inferred from existing information, and have been

investigated. The main functions of the Components (i.e., target, primary, secondary and ETP species and habitats) in the ecosystem are well known. Furthermore, there is sufficient information available from extensive ecosystem modelling and analysis on the impacts of the fishery on the Components (esp. retained tuna and non-tuna discarded components) and elements (esp. trophic structure) to allow the main consequences for the ecosystem to be inferred.

The most recent summary of the fishery for tunas in the EPO and an evaluation of the pelagic ecosystem and considerations was provided in 2016 (IATTC, 2017b and IATTC, 2017c). Ecological studies conducted by the IATTC have generally focused on the food web and on comparisons with pelagic food webs in other regions. These studies have revealed many of the key trophic connections in the pelagic EPO, and have formed the basis for representing food-web interactions in an ecosystem model to explore indirect ecosystem effects of fishing (Figure 23). The tropical tunas in the EPO act as mesopredators more than apex predators.

Food-web studies in the EPO have progressed by applying stable-isotope analyses of body tissues and diet analyses of the predators' stomach contents for estimating the trophic inter-relationships of the tunas, other predators, their prey, and plankton. The research collaboration among the IATTC and outside research organisations seeks to develop amino acid compound-specific isotopic analysis as a tool that can provide a rapid and unbiased evaluation of trophic position for a wide variety of marine organisms and to use this information to validate output from trophic mass-balance ecosystem models. To accomplish this goal, the research combines laboratory experiments and field collections in contrasting ecosystems that have important fisheries.

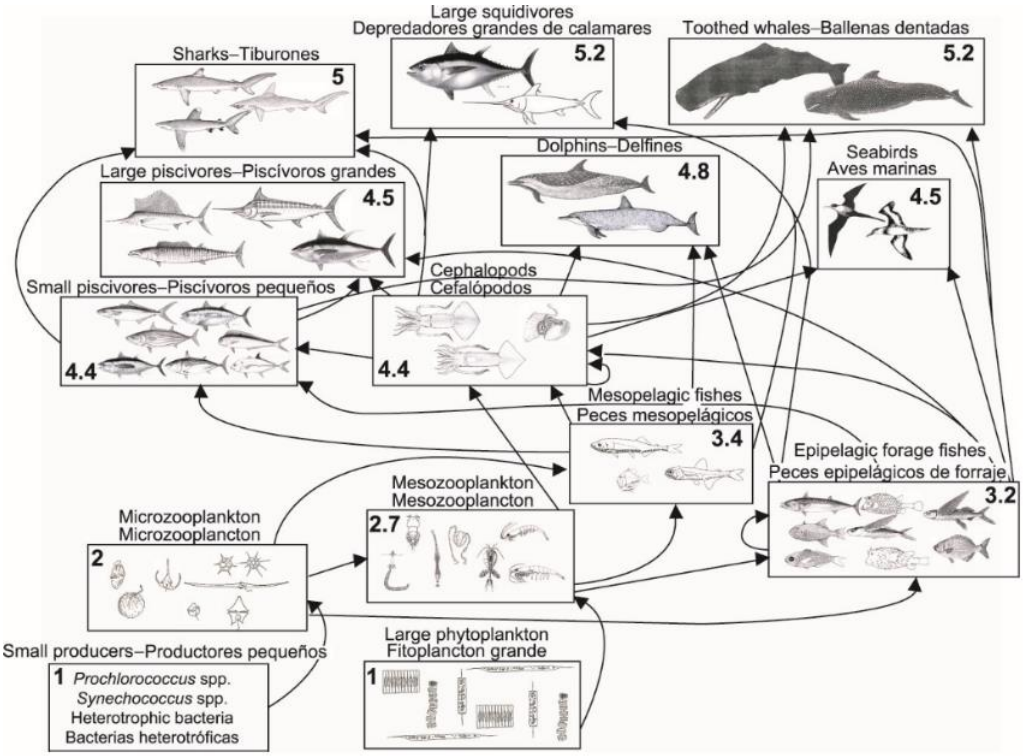

Figure 23. Basic food web of the pelagic ecosystem in the EPO. Numbers in each box indicate approximate trophic level of each group. (Source: IATTC 2017b).

A global analysis on predator-prey interactions for yellowfin, bigeye and albacore tunas, collected over a 40-year period from the Pacific, Indian and Atlantic Oceans, was conducted to quantitatively assess broad, macro-scale trophic patterns in pelagic ecosystems. This study revealed, for the first time, the global expanse of pelagic predatory fish diet and global patterns of micronekton diversity. Ommastrephid squids were consistently one of the top prey groups by weight across all tuna species and in most ocean bodies. Interspecific differences in prey were apparent, with epipelagic scombrid and mesopelagic paralepidid fishes globally important for yellowfin and bigeye tunas, respectively, while vertically migrating euphausiid crustaceans were important for albacore tuna in the Pacific Oceans. Diet diversity showed global and regional patterns among tuna species. In the central and western Pacific Ocean, characterized by low productivity, a high diversity of micronekton prey was detected while low prey diversity was evident in highly productive coastal waters where upwelling occurs. Spatial patterns of diet diversity were most variable in yellowfin and bigeye tunas while a latitudinal diversity gradient was observed with lower diversity in temperate regions for albacore tuna. These results suggest that the current expansion of warmer, less productive waters in the world's oceans may alter foraging opportunities for tunas due to regional changes prey abundances and compositions (IATTC 2017b).

Both the IATTC and WCPFC operate under the UN Convention on the Law of the Sea (UNCLOS) and the United Nations Fish Stocks Agreement. Article 119 of UNCLOS obliges member states to implement certain aspects of the ecosystem-based approach when establishing measures to conserve marine living resources in the high seas. Article 5 of the 1995 United Nations Fish Stocks Agreement also details certain features of the ecosystem approach (EA), including the need to preserve marine biodiversity and to maintain the integrity of marine ecosystems.

The pelagic ecosystem is generally characterised by the vast spatial scale, mobility of species and limited knowledge of ecosystem functioning and diversity; each creating increased challenges for effective management. Within the UoAs, there is a range of measures in place in order to ensure that in combination with other fisheries, the UoAs do not cause serious or irreversible harm to ecosystem structure and function.

The IATTC does not have measures that are specifically focussed 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). IATTC has a significant amount of comprehensive and high-quality information and monitoring available to it. Main interactions between the fishery and these ecosystem elements including impacts of removals, large scale oceanographic events, change of variability, climate change can be inferred from existing information, and have been investigated. The main functions of the Components (i.e., target, primary, secondary, ETP species and habitats) in the ecosystem are well known. Furthermore, there is sufficient information available from extensive ecosystem modelling and analysis on the impacts of the fishery on the Components (esp. retained tuna and non-tuna discarded components) and elements (esp. trophic structure) to allow the main consequences for the ecosystem to be inferred.

Table 19. Summary of Principle 2 Performance Indicator level scores – WCPO

Performance Indicator	Draft scoring range	Data deficient?
2.1.1 – Primary Outcome	**≥80**	**No**
Rationale or key points		

Likely main primary bycatch species have been identified as albacore, bigeye and yellowfin (those species which are not the target (P1) species of the UoA in question). Addition to target species, SW Pacific swordfish has also been identified as 'main' primary species (see Table 16). P1 species are not further discussed here. See Table 10, Table 11,
Table 14, Table 15 for information on albacore, bigeye and yellowfin tuna relevant to WCPO UoAs.

SW Pacific swordfish: The latest stock assessment was in 2017 and indicated the stock is not likely to be overfished or subject to overfishing. The median estimate of F_{recent}/F_{MSY} was 0.86 (range 0.42–1.46), with 23 out of the 72 runs (32%) indicating that $F_{recent}/F_{MSY} > 1$. Runs where overfishing was indicated were generally those with a steepness of 0.65 assumed.

WCNP swordfish: The latest stock assessment for this region was conducted in 2018 by the ISC Billfish Working Group (WCPFC SC, 2018a). The assessment estimates that population biomass was around 71,000 mt in the last three years of the assessment (2014 – 2016). Compared to MSY-based reference points, the spawning stock biomass in 2016 was 87% above SSB_{MSY} ($SB/SB_{MSY} = 1.87$) and the current fishing mortality (average for ages 1 to 10 during 2013-2015) was 45% below F_{MSY} ($F/F_{MSY} = 0.55$).

Pacific saury: The stock assessment in 2017 consisted of running the Bayesian state-space surplus production model for the Pacific saury in the Western North Pacific Ocean (WNPO) with the most recent summary of available fishery-dependent and fishery-independent data. Commercial catches of Pacific saury from Japan, Chinese Taipei, Korea, China, Russia and Vanuatu in the WNPO area were collected from 1950 to 2016. Relative abundance indices available for WNPO saury consisted of standardized catch-per-unit effort (CPUE) of stick-held dip net fisheries from Japan (1980-2016), Chinese Taipei (2001-2016), Russia (2001-2016), Korea (2001-2015), and China (2003-2016); and biomass survey from Japan (2003-2017). Three base case models, differing in catchability of the biomass survey index, developed in the previous assessment were updated through 2016. The results of updated stock assessment indicated that the base case model 3 with survey catchability (q) prior being defined from 0 to larger than 1 gave the lowest biomass estimates compared to the models 1 (survey $q < 1$) and 2 (survey $q = 1$). Biomass estimates were sensitive to the updated input data for the model 3, but not found in other models. The stock status is the same as the previous assessment (i.e., not overfishing and not overfished). It should be noted that the biomass estimates of Western North Pacific saury were relative lower during 2015 to 2016 compared to the average of biomass estimates during 2010 to 2016.

All species therefore are considered at least highly likely to be above the point of recruitment impairment (PRI). SG80 is met for all scoring elements.

2.1.2 – Primary Management	≥80	No
Rationale or key points		
There is a strategy in place for the main primary species (bigeye, yellowfin, albacore) (CMM 2019-03, 2014-06, 2018-01) and given that stocks are above the PRI and fluctuating around a level consistent with MSY (see Table 10, Table 11, Table 14, Table 15 above), there is an objective basis for concluding that the strategy in place has been implemented successfully. SG80 is met. For SW Pacific swordfish, CMM 2009-03 is in place in the WCPO. is CMM provides for a range of measures to manage the Swordfish catch in the WCPO. These measures include limiting the number of fishing vessels in the Convention Area south of 20°S. Given that the stock is at least highly likely to be above PRI, there is objective basis for confidence the partial strategy will work and is implemented successfully. In the absence of target or limit reference points and a formal harvest strategy, only SG80 may be awarded as the measures in CMM 2009-03 are considered to be part of a partial strategy rather than a full strategy. For WCNP swordfish, WCPFC16 (December 2019) agreed a harvest strategy for North Pacific swordfish, following a proposal by the Northern Committee (WCPFC 2019b). The strategy sets F_{MSY} as a limit reference point (or in practice a trigger reference point) and states that if F is evaluated as exceeding F_{MSY} the Northern Committee will agree measures to reduce it. For Pacific Saury, the amount of bait likely to be used by this fishery is trivial in comparison to the biomass and landings from the bait stocks. This, together with the fact that the volume of bait use is known and that each bait species has a stock assessment, constitutes a partial strategy to ensure that the fishery has no impact on the stock. It does not, however, meet MSC's definition of a strategy. Saury is managed by the new RFMO, the North Pacific Fisheries Commission (NPFC), charged with managing the high seas in the northern Pacific. The NFPC has set an ambitious objective of ensuring 'the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur.' Understanding the behaviours of the fleets within the Convention area represents a critical first step towards achieving these goals and managing for transparency, traceability, and sustainability within NPFC fisheries. Results released in 2017 showed that Pacific saury is not being overfished, and that it is believed that a certain level of stocks is maintained. However due to the nature of the new science, the precautionary approach is recommended. The amount of bait used by this fishery is trivial in comparison to the biomass and landings from the bait stocks. This constitutes a partial strategy to ensure that the fishery has no impact on the stock. SG80 is met for bait. It does not, however, meet MSC's definition of a strategy as given above, so SG100 is not met.		
2.1.3 – Primary Information	**≥80**	**No**
Rationale or key points		

For WCN Pacific swordfish, as a main, highly valuable commercial species, catch details are well-documented by the fisheries in fishery dependent (logbooks) and independent (port sampling, observers) sources, which are reviewed by research and government agencies and RFMOs. Quantitative information on 'main' and 'minor' primary species is available, including bait (landing and discards) from a range of fishery dependent (logbooks) and independent (port sampling, observers) sources which are reviewed by research and government agencies. Each of the primary species (including bait species) has a detailed stock assessment (PI 2.1.1a), that provides quantitative information on total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting recruitment. In all cases, the impact of these UoAs on these stocks can be evaluated as negligible with a high degree of certainty. With regard to bait species, there is likely quantitative information on the purchase of bait, although this was not obtained for this report. At least SG80 is met for all scoring elements.		
2.2.1 – Secondary Outcome	**≥80**	**No**
Rationale or key points		
No species were identified as 'main' secondary species (see Table 16), therefore all are scored an automatic ≥80. Minor species were not considered in this report.		
2.2.2 – Secondary Management	**≥80**	**No**
Rationale or key points		
No species were identified as 'main' secondary species (see Table 16), therefore all are scored an automatic ≥80. Minor species were not considered in this report.		
2.2.3 – Secondary Information	**≥80**	**No**
Rationale or key points		
No species were identified as 'main' secondary species (see Table 16), therefore all are scored an automatic ≥80. Minor species were not considered in this report.		
2.3.1 – ETP Outcome	**<60**	**Yes**
Rationale or key points		
It should firstly be noted that there are no national or international formal catch limits, which would trigger management actions for the ETP species identified in this assessment. This PI relates to direct and indirect effects of the longline UoAs' activities and whether direct effects are likely or high likely		

not to hinder recovery of ETP species. It is difficult to score due to lack of fishery-specific information from the fishery, but none-the-less, scoring elements are discussed below.

Silky sharks: The only stock assessment for this species estimates that it is overfished (Rice and Harley, 2013), but was based on poor and now out-of-date data. According to Peatman et al., 2019 80% of elasmobranchs caught in tropical shallow longline fisheries are silky sharks. Given its vulnerable status and life history, the lack of observer data, it cannot be evidenced that known direct effects of the UoA are likely to not hinder recovery. Based on this argument, SG60 is not met. No indirect effects were thought to be attributed to longline operations.

Oceanic whitetip sharks: The most recent stock assessment (Tremblay-Boyer et al., 2019) assesses the stock as overfished and predicts population extinction in the long-term under current rates of fishing mortality. Given its vulnerable status and life history, the lack of observer data, it cannot be evidenced that known direct effects of the UoA are likely to not hinder recovery. SG60 is not met.

Blue sharks: According to Peatman et al., 2019, blue sharks are the most commonly caught elasmobranch on longlines. Their presence varied according to the fisheries, and were particularly prevalent in shallow-set longline, accounting for 70-90% in the south and north temperate fisheries respectively. Blue sharks are thought to be most likely discarded in longline fisheries (Peatman et al., 2019), but their condition upon release is often not recorded, but still appears to be better survival than other shark species, for example hammerheads which survive poorly when caught and predominantly dead when released. The latest stock assessment for north Pacific blue sharks was conducted in 2016 (WCPFC SC, 2017b). Stock status is reported in relation to maximum sustainable yield (MSY). Female spawning biomass in 2015 (SB_{2015}) was 71% higher than at MSY and estimated to be 308,286 mt. The recent annual fishing mortality ($F_{2012\text{-}2014}$) was estimated to be well below F_{MSY} at approximately 37% of F_{MSY}. The conclusion of the stock assessment is that the blue shark stocks are not overfished and that overfishing is not occurring. For the north Pacific, given that $B>>B_{MSY}$ and $F<<F_{MSY}$, the fishery cannot be thought to be hindering recovery. SG80 is likely met.

The most recent stock assessment for the south Pacific stock however estimates that the stock is depleted and does not attempt to include discards or post-release mortality. Given the lack of data and potentially low observer coverage, it can only be said that known effects are likely not to hinder recovery. Only SG60 is met.

Mako sharks: Recently listed as ‘endangered’ on the IUCN Red List, these species (shortfin and longfin) are very vulnerable to fishing pressure in pelagic fisheries. The study by Peatman et al., 2019 shows that there has been a reduction in mako over the data set (2003 – 2017), with around 20,000 tonnes caught in that time in the region across the longline fisheries (~38,600 tonnes in 2017). Mako sharks are more associated with the temperate water sets than the tropical sets, so there may well be different impacts depending on whether the UoA a tropical species (bigeye and yellowfin) or albacore. It was estimated that ~20% of the longfin mako shark were retained. As with other shark species here, the lack of data, especially fishery-specific data, makes estimating the direct impact of the fisheries on mako sharks difficult. Given its new IUCN status and lack of stock

assessment, it could not be established whether the known direct effects are likely to hinder the recovery of mako sharks. SG60 is not met.

Thresher sharks: Peatman et al., 2019 report a reduction in the catch estimates of thresher sharks over the time period of data (2003 – 2017), with around 21,000 individuals being caught in the region in 2017 (~711 tonnes). Fins only were retained for ~25% of the thresher sharks. Given the species' concern status, lack of species information, decreasing population trend and the low level of observer data for this fishery, a high likelihood of known direct effects of the UoA cannot be awarded. SG80 is not met.

Porbeagle sharks: More commonly caught in southern temperate water shallow sets, this species is not a common species caught in longline operations in the Pacific and is generally discarded (although more than 25% were dead on release) when encountered (Peatman et al., 2019). The first stock assessment of porbeagle sharks in the southern hemisphere (includes WCPO and EPO) was conducted in November 2017. Estimated values of fishing mortality were compared to a MIST (F_{crash}) which indicates a level of fishing expected to lead to population extinction in the long-term. Given the likely areas of fishing effort of this fishery it is likely not to hinder recovery, but without better information, only SG60 is met.

Hammerhead sharks: The stock statuses are unknown but given the life characteristics of these species, it is likely to be declining. To date there have not been any stock assessment or analysis conducted on any of the hammerhead species form. They are relatively uncommonly caught on longlines, except in shallow tropical sets, with 18.3% of sets encountering a species of hammerhead. Survival of hammerheads on longlines is known to be poor and according to Peatman et al., 2019 there is a high level (nearly 75%) of retention in longline fisheries in the region. Without more information, it is not possible to ascertain whether direct effects are likely to hinder recovery of hammerhead sharks. SG60 is not met.

Manta and mobula rays: Interactions with longline fisheries do occur. Peatman et al., 2019 present information that 10 – 35% of manta rays are released alive/healthy or injured. Given the relatively low proportion of these rays compared to other elasmobranchs (between 0.3% and 5.2% of sets record catches of mobulid rays according to Peatman et al., 2019) and the assumption the UoAs will adhere to the CMM and Resolutions of the WCPFC and IATTC (and therefore attempt to release manta and mobula rays); the author considered the UoAs unlikely to hinder recovery of this species. Therefore SG 60 is met. Given the lack of observer data, more information is needed for SG80 to be met.

No indirect effects were thought to be attributed to longline operations for elasmobranch species.

Marine turtles: Six out of the seven marine sea turtle species are threatened with extinction. Fisheries bycatch has been ranked as the most significant threat to sea turtle populations globally, followed by climate change. A global comparison of calculated impact scores between three classes of gear types (longlines, nets and trawls) was conducted. Incidental catch of marine turtles in longline fisheries is one of the most serious threats to marine turtle populations (Gilman and Huang,

2017). Gilman and Huang (2017) summarised the following in the case of longline fisheries, “fish bait also reduced hard-shelled turtle deep hooking. Wider circle hooks reduced both leatherback and hard-shelled turtle catch rates relative to narrower J and tuna hooks and reduced the proportion of caught hard-shelled turtles that were deeply hooked.” It is not necessarily possible to interpret low numbers of interactions with low impact. Turtle populations in some areas are small and localised and even minimal mortalities can have an impact either directly or indirectly (Gascoigne et al., 2015). Indirect effects for turtles were perceived to be surrounding disturbance around inshore nesting areas, given these are deep water fisheries, this is unlikely to be impacted. Additionally, plastic disposal and waste management issues are increasing problems in fisheries. Clukey et al., 2017 noted 100% olive ridley, 90% green and 80% of loggerhead turtles captured as bycatch in longline operations in the Pacific had ingested plastic. Whilst this particular study didn’t note any adverse health impacts directly relating to plastic ingestion, the indirect effects at this stage are unclear and need further study. Given there is no fishery-specific data on the fleets operating in this fishery, including whether there are waste management protocols; there is uncertainty around both the direct and indirect effects of the fishery. On a precautionary basis, SG80 cannot be awarded for turtle populations.

Cetaceans: There are two main types of interaction between cetaceans and longlines: depredation and entanglement, the latter often following on from the former (Anderson, 2014). The study by Gilman et al. (2006a) found only one interaction with a toothed whale in the Palau longline fishery. On this basis, the team considered it highly likely that the UoA is not hindering recovery of cetacean species. For indirect effects, noise disturbance is likely to be minimal because the number of vessels is limited in a number of cases. It is known that marine mammals have changed their foraging behaviour in response to the availability of fish on longlines – individual fishers will try to mitigate this by avoiding setting or hauling in the presence of mammals if possible. Aside from the risk of bycatch (considered above), it has been shown in other fisheries (e.g. orcas in toothfish fisheries) that the impact on the mammals themselves is positive, as one would expect. However, as per the rationale of marine turtles, the issue of marine plastics cannot be ruled out as an indirect effect. Without further information on fleet waste management, SG80 cannot be awarded on a precautionary basis.

Seabirds: The category of ETP species is unlikely to be an issue, given the tropical nature of the fishery. Given that the distributions of albatrosses and large petrels, which are main at-risk species susceptible to capture in pelagic longline fisheries, occur poleward of 20 degrees latitude in both hemispheres, it is highly unlikely that this fishery overlaps with these species. Indirect effects were thought to be disturbance around nesting and roosting areas and marine waste. As these are in more poleward latitudes, effects were considered to be unlikely not to create unacceptable impacts. As with marine turtles and cetaceans, the issue of waste management in the fishery needs to be clarified before awarding a score of SG80 or above for seabirds.

No MSC fishery in the regions have failed on ETP but without fishery independent data, it was not possible to give an accurate score. Problems with under or misreporting, especially with low observer for a number of flag states coverage and poor stock status of some ETP species (silky and oceanic whitetip sharks for example), a condition is highly likely. At this stage, this PI scores <60.

2.3.2 – ETP Management	60 – 79	No
Rationale or key points		
Sharks: There are various CMMs in place at regional level which relate to shark bycatch. CMM 2010-07 is the overarching measure on sharks which stipulates *inter alia* that fins on board vessels should total no more than 5% of the weight of sharks on board up to the first point of landing and that CCMs should develop a national NPOA in line with the FAO's IPOA. At best, this constitutes measures in place which are expected not to hinder the recovery of ETP shark species. Assumed low observer coverage prevents any score higher than SG60 being met. It should be noted also that more shark species are receiving protected statuses, so the need for stronger measures for shark species generally within the fishery should look to be adopted. Silky sharks: CMM 2013-08 is in place for this species specifically. It requires the prohibition of retaining the shark or its products on-board. Number must be recorded by the fishery itself and if accidentally captured, best efforts made for their safe release. There are therefore measures in place to ensure the UoAs do not hinder the recovery of the stock. The lack of fishery-specific data ad assumed low observer coverage precludes a higher score than SG60 here, as there is no evidence that the measures are being implemented or reviewed. Oceanic whitetip sharks: As with silky sharks, CMM 2011-04 has be enacted for this species. Otherwise rationale as per silky sharks. There are therefore measures in place to ensure the UoAs do not hinder the recovery of the stock. The lack of fishery-specific data ad assumed low observer coverage precludes a higher score than SG60 here, as there is no evidence that the measures are being implemented or reviewed. Giant manta and mobula rays: There is now a CMM for mobulid rays (CMM 2019-05), which comes into effect on 1 January 2021. WCPFC 13 adopted that manta and mobula rays shall be considered WCPFC key shark species for assessment and thus listed under the Shark Research Plan, noting that data gaps may preclude a traditional stock assessment approach. CMM 2019-03 covering non-target species requires those species not retained should be promptly released to the water unharmed. SC12 also recommended that the WCPFC considers adopting guidelines for safe release of mobulid rays caught incidentally in WCPFC fisheries, and a good practice guide has been produced and distributed to inform fishers of the best techniques for releasing sharks and rays. This constitutes measures enough to meet SG60. SG80 cannot be awarded due to the lack of formalised, directed management for mobulids. Cetaceans: There are no management requirements regarding cetaceans for longline fisheries (only purse seine). Despite specific longline management, the Pacific Islands where the fishery operates (Australia, **Cook Islands**, **FSM**, **Fiji**, **French Polynesia**, Marshall Islands, Nauru, New Zealand, Niue, Palau, PNG, Samoa, Tokelau, Tonga, **Vanuatu**, UK, USA, Solomon Islands, Kiribati and Tuvalu) are however signatories to the Memorandum of Understanding (MoU) for the Conservation of Cetaceans and their Habitats in the Pacific Island Region. On the basis that cetaceans are unlikely to		

be a problem for the fishery under assessment, the team considered this requirement to constitute a strategy and sufficient for SG80 to be met.

Seabirds: Based on the analysis by Filippi et al. (2010), like cetaceans, ETP seabirds are not deemed to be an issue in these fisheries given the areas of operation. SG80 is met.

Marine turtles: All tuna RFMOs have been working to eliminate and mitigate interactions with sea turtles over many decades. WCPFC have adopted CMM 2008-03 – Conservation Management Measure of Sea Turtles which covers both longline and purse seine operations. The WCPFC has also developed several guidelines for handling sea turtles when captured by purse seine operations and vessels are required to ensure their safe release wherever practicable. Longline vessels must also carry and use dip-nets in accordance with these WCPFC guidelines; only use large circle hooks and whole finish for bait. The measures are considered likely to work based on research on turtle interactions/bycatch issues in longline fisheries (Gilman and Huang, 2017 for example). SG60 is at least awarded.

2.3.3 – ETP Information	**60-79**	**No**

Rationale or key points

For all scoring elements, there is some quantitative information adequate to assess whether the UoA is a threat to the recovery of ETP species and to support a strategy. This data comes in the form of observer reports and electronic monitoring. This records volume and fate. Further work needs to be done on condition on release and continuing to engage to get human observers on board. This is supported by robust processes and training delivered to skippers on ETP species identification and accurate reporting to improve the quality and quantity of data. This information means it will score SI(a)80. An ecological risk assessment is currently being planned for 2020 and this alongside more data will help us be able to assess with a high degree of certainty the magnitude of the UoAs impact on ETP species and increase this score to SI(b)80.

Regarding SI(b) information is adequate to support measures but not strategies to manage impacts on ETP species. An ecological risk assessment is currently being planned for 2020 and this alongside more data will help us be able to assess with a high degree of certainty the magnitude of the UoAs impact on ETP species and increase this score to SI(b)80.

Overall the score would be SG60-79 and current actions will ensure the score increases in the FIPs lifetime.

2.4.1 – Habitats Outcome	**≥80**	**No**

Rationale or key points

The fishery takes place in deep water and does not interact with benthos or indeed other habitats such as sea mounts for operational reasons, such as entanglement issues of the mainlines. The conclusion in this pre-assessment therefore is that the UoAs are highly unlikely to interact with benthic features to reduce structure and function of any habitats. This would be evidenced at full

assessment by VMS data of fleets' movements and information about hook loss by vessel. SG80 is likely to be met with the collections of the above-mentioned data directly from the fisheries.		
2.4.2 – Habitats Management	**≥80**	**No**
Rationale or key points		
Knowledge of demersal habitats is not relevant to this fishery. Since the gear does not interact with habitats, the (lack of) physical impacts are clear. SG80 is met by default.		
2.4.3 – Habitats Information	**≥80**	**No**
Rationale or key points		
Knowledge of demersal habitats is not relevant to this fishery, as there is no interactions between the benthos and seamounts with the fishing gear. The main habitats is the water column. Impacts on biota are addressed in other P1 and P2 PIs. Since the gear does not interact with habitats, the (lack of) physical impacts are clear. SG80 is met by default.		
2.5.1 – Ecosystems Outcome	**≥80**	**No**
Rationale or key points		
The MSC definition of 'key ecosystems elements' is "the features of an ecosystem considered as being most crucial to giving the ecosystem its characteristic nature and dynamics and are considered relative to the scale and intensity of the UoA. They are features most crucial to maintaining the integrity of its structure and functions and the key determinants of the ecosystem resilience and productivity" (MSC FCP v2.1 - SA3.16.3). The impacts of the UoAs on retained species, bycatch, ETP species as well as habitats have all been considered and described in the above sections of this report. However, other risks exist, and further impacts of the fishery may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function by the removal of pelagic species. There are a myriad of general papers that outline the declines of predatory fish species, and the potential/likely impacts to the ecosystem through disturbance of trophic dynamics. Through their Scientific Committee, WCPFC have continued to investigate the ecosystem and trophic impacts of these removals through various studies and ecosystem models. WCPFC have developed the pelagic trophic dynamic study as an example. The long-term objective of the study is to develop ecosystem approaches of fisheries management by building ecosystem models to assess fishing and environmental impacts on the whole ecosystem and evaluate management options. Through these detailed studies to date, the WCPFC has been able to construct several robust and detailed biodynamic trophic Ecopath-Ecosim models including the Seapodym model. It is likely that industrial tuna fisheries (purse seine and longline) have caused a change in the structure and function of the trophic ecology of the WCPO given the vast quantities of key predator species that have been removed. However, there is evidence to suggest the impacts are not serious or		

irreversible. Allain et al. (2007) found that most species rebuilt to virgin biomass after five years of no fishing.

The WCPFC has a significant amount of comprehensive and high-quality information and monitoring available to it. Main interactions between the fishery and these ecosystem elements including impacts of removals, large scale oceanographic events, change of variability, climate change can be inferred from existing information, and have been investigated. The main functions of the Components (i.e., target, primary, secondary, ETP species and habitats) in the ecosystem are well known. Furthermore, there is sufficient information available from extensive ecosystem modelling and analysis on the impacts of the fishery on the Components (esp. retained tuna and non-tuna discarded components) and elements (esp. trophic structure) to allow the main consequences for the ecosystem to be inferred. SG80 is likely met and is in line with other MSC certified fisheries in the region.

2.5.2 – Ecosystems Management	**≥80**	**No**

Rationale or key points

The FAO code states that fisheries management should ensure the conservation not only of target species, but also sympatric non-target species (Allain et al., 2010). This resolution is now explicit in WCPFC measures, although tuna fisheries remain managed on a single-species basis. The WCPFC's application of the FAO code extends to the highly migratory fish species including tuna through CMM-2013-01 on the management of bigeye, yellowfin and skipjack and CMM-2010-05 on the management of albacore, as well as to the management of non-target species, in particular through Resolution 2005-03 on Non-Target Fish Species. Work is also underway via in-country EAFM work. SG80 is likely to be met.

2.5.3 – Ecosystems Information	**≥80**	**No**

Rationale or key points

There is increasing effort by a range of organisations to collect detailed data on the structure of the Pacific Ocean pelagic ecosystem. This effort occurs through observer programmes, trophic analyses and mid-trophic level sampling. Ecopath, Ecosim and Seapodym models are being developed and their results fed into the SPC's work. This means information on the main functions of the components (P1, primary, secondary, ETP, and habitats) in the WCPO ecosystem are known and the main impacts of the UoAs on those key ecosystem elements can be inferred from existing information. This is adequate to detect any increase to risk level. SG80 is met.

Table 20. Summary of Principle 2 Performance Indicator level scores – EPO

It should be noted that at full assessment WCPO and EPO would be scored separately, given they are considered to be different ecosystems. For the purposes of this pre-assessment however, where there was no material difference, the reader is directed back to the previous scoring table.

Performance Indicator	Draft scoring range	Data deficient?
2.1.1 – Primary Outcome	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.1.2 – Primary Management	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.1.3 – Primary Information	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.2.1 – Secondary Outcome	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.2.2 – Secondary Management	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.2.3 – Secondary Information	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.3.1 – ETP Outcome	**<60**	**No**
Rationale or key points		

2.3.2 – ETP Management	**60 – 79**	**No**
Rationale or key points		
As per Table 19.		
2.3.3 – ETP Information	**<60**	**No**
Rationale or key points		
As per Table 19.		
2.4.1 – Habitats Outcome	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.4.2 – Habitats Management	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.4.3 – Habitats Information	**≥80**	**No**
Rationale or key points		
As per Table 19.		
2.5.1 – Ecosystems Outcome	**≥80**	**No**
Rationale or key points		

In common with the WCPO ecosystem rationale above, the impacts of the UoAs on retained species, bycatch, ETP species as well as habitats have all been considered and described in the above sections of this report. However, other risks exist, and further impacts of the fishery may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function by the removal of pelagic species. There are a myriad of general papers that outline the declines of predatory fish species, and the potential/likely impacts to the ecosystem through disturbance of trophic dynamics.

In the EPO a number of ecosystem studies have been undertaken. Significant work has been conducted on food web studies and understanding the predator prey relationships over a decadal scale. From some of these studies, it was found that the tropical tunas in the EPO act as mesopredators more than apex predators. The research collaboration among the IATTC and outside research organisations is also seeking to develop amino acid compound-specific isotopic analysis as a tool that can provide a rapid and unbiased evaluation of trophic position for a wide variety of marine organisms and to use this information to validate output from trophic mass-balance ecosystem models. To accomplish this goal, the research combines laboratory experiments and field collections in contrasting ecosystems that have important fisheries.

The IATTC does not have measures that are specifically focussed 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). IATTC has a significant amount of comprehensive and high-quality information and monitoring available to it. Main interactions between the fishery and these ecosystem elements including impacts of removals, large scale oceanographic events, change of variability, climate change can be inferred from existing information, and have been investigated. The main functions of the Components (i.e., target, primary, secondary, ETP species and habitats) in the ecosystem are well known. Furthermore, there is sufficient information available from extensive ecosystem modelling and analysis on the impacts of the fishery on the Components (esp. retained tuna and non-tuna discarded components) and elements (esp. trophic structure) to allow the main consequences for the ecosystem to be inferred. SG80 is likely met for the UoAs and is in line with other MSC certified fisheries in the region.

2.5.2 – Ecosystems Management	**≥80**	**No**

Rationale or key points

Article 119 of UNCLOS obliges member states to implement certain aspects of the ecosystem-based management approach when establishing measures to conserve living marine resources. Article 5 of the 1995 UNFSA also details certain features of the ecosystem approach, including the need to preserve marine biodiversity and to maintain the integrity of marine ecosystems.

As observers of both UNCLOS and UNFSA, the IATTC have introduced binding Resolutions for all key tuna stocks taken within the EPO that limit and control harvest to acceptable levels, as well as several key Resolutions which aim to mitigate, reduce, eliminate fishery interactions with ETPs and key shark species (although, as mentioned not directly on ecosystem structure and function). There is continued data collection and monitoring through the likes of observer coverage, logbooks, VMS and ongoing ecosystem and trophic research. Considering these information sources, the efforts of IATTC

go some way to restrain UoA impacts. Given there have not been any been any known ecosystem collapses in any of the oceans since the beginning of these fisheries (although major changes to the ranges of several species have been observed that may reflect some ecosystem or environmental changes (MRAG, 2014)), there is some objective basis for confidence that the measures in place are working.

Although not specifically designed to manage impacts on the ecosystem, the range of measures used by the IATTC represents a 'partial strategy' that works to achieve the proposed outcome. The measures are also likely to indicate a need for change/greater levels of management effort due to ineffectiveness of the partial strategy. There is some evidence that the measures (partial strategy) are being implemented successfully. Target tuna stocks are likely to be within biologically based limit reference points. Additional evidence that the 'partial strategy' is working is also available, through updating of stock assessments, increased sharing of information, and co-operation amongst Parties, the increased levels of research undertaken by IATTC members in the Pacific Ocean fisheries, agreement over new and expanded management initiatives through the adoption of IATTC Resolutions. Therefore, SG80 is met.

2.5.3 – Ecosystems Information	**≥80**	**No**

Rationale or key points

IATTC has a significant amount of comprehensive and high-quality information and monitoring available to it regarding all areas of information. Main interactions between the fishery and these ecosystem elements including impacts of removals, large scale oceanographic events, change of variability, climate change can be inferred from existing information, and have been investigated. The main functions of the components (i.e., target, primary, secondary and ETP species and habitats) in the ecosystem are well known. Furthermore, there is sufficient information available from extensive ecosystem modelling and analysis on the impacts of the fishery on the components (esp. retained tuna and non-tuna discarded components) and elements (esp. trophic structure) to allow the main consequences for the ecosystem to be inferred. Therefore, it is considered that information is adequate to broadly understand the key elements of the ecosystem. The level of monitoring through observer programmes, trophic analyses and mid-trophic level sampling, data is adequate to detect increases in risk level. On this basis, at least SG 80 is met.

6.5 Principle 3

The fishing operations are conducted throughout the western and central Pacific Ocean (WCPO) and the eastern Pacific Ocean (EPO). Both the WCPO and EPO tuna fisheries are managed under Regional Fisheries Management Organisations (RFMOs). The RFMOs for WCPO and the EPO are the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC), respectively (Figure 24).

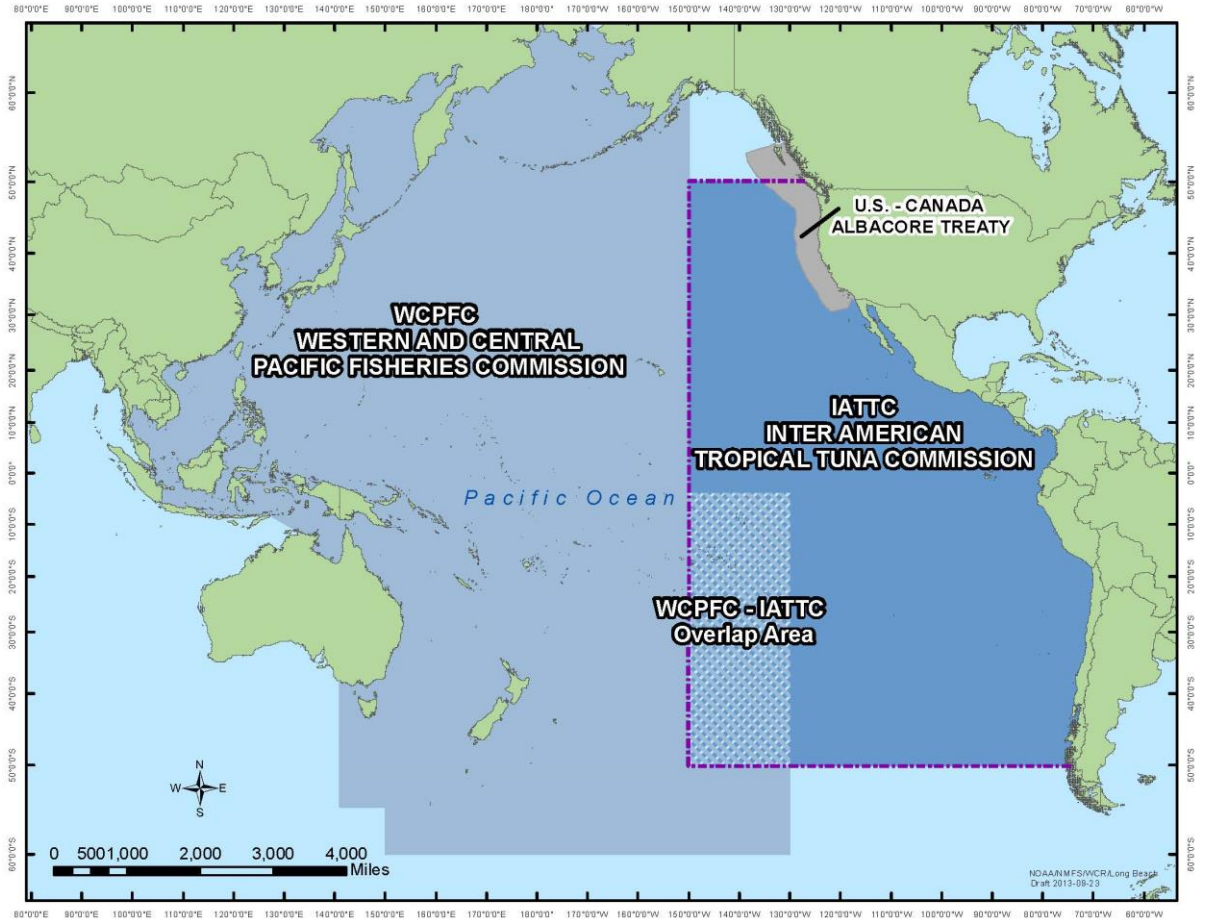

Figure 24. The Pacific Ocean and the management areas of the WCPFC and the IATTC. (Note the central Pacific area of overlapping jurisdictions at 130°W – 150°W, this is called the "Overlap" area) Source: WCPFC, 2011.

Western and Central Pacific Fisheries Commission: The WCPFC was formed under the 'Convention for the Conservation and Management of Highly Migratory Fish Stocks in the WCPO' which officially came into force in 2004 (WCPFC 2000), in order to manage tuna and tuna-like species in the defined Convention Area (Figure 24). The WCPFC Convention includes many provisions found in the United Nations Fish Stocks Agreement (UNFSA). Under the Convention, the governing body called the Commission was formed. The Commission is made up of representatives from countries that have ratified the Convention. The Convention seeks to address issues in the management of high seas fisheries due to the following issues:

- Unregulated fishing.
- Over-capitalisation.
- Excessive fleet capacity.

- Vessel re-flagging to escape controls.
- Insufficiently selective gear.
- Unreliable databases; and
- Insufficient multilateral cooperation between countries.

There are three subsidiary bodies supported by the Commission: Scientific Committee (SC), Technical and Compliance Committee (TCC), and Northern Committee (NC).
The Commission is currently made up of the following members (WCPFC website 2019):
Australia, China, Canada, Cook Islands, European Union, Federated States of Micronesia, Fiji, France, Indonesia, Japan, Kiribati, Republic of Korea, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, United States of America, Vanuatu.

The Participating Territories are:
American Samoa, Commonwealth of the Northern Mariana Islands, French Polynesia, Guam, New Caledonia, Tokelau, Wallis and Futuna.

Cooperating Non-members are:
Ecuador, El Salvador, Nicaragua, Panama, Liberia, Thailand, Vietnam.

Inter-American Tropical Tuna Commission: The IATTC was first established under the 1949 Convention and is responsible for the management of tuna and tuna-like species in the EPO (Figure 24). The Antigua Convention strengthened and replaced the 1949 Convention, coming into force in 2010. The Convention is open to:

- Parties to the 1949 Convention.
- States not Party to the 1949 Convention with a coastline bordering the Convention Area.
- States whose vessels fish for fish stocks covered by the Convention and States that are invited to join the Convention.

The IATTC Convention includes many provisions found in the United Nations Fish Stocks Agreement (UNFSA) and is committed to the long-term conservation and the sustainable use of fish stocks covered by the Convention. The governing body of the IATTC are members of the Commission, which can include up to four Commissions appointed by each Member (IATTC, 2003). Current Members of the IATTC include Belize, Canada, China, Colombia, Costa Rica, Ecuador, El Salvador, European Union, France, Guatemala, Japan, Kiribati, Korea, Mexico, Nicaragua, Panama, Peru, Chinese Taipei, United States, Vanuatu and Venezuela. Cooperating Non-Members include Bolivia, Honduras, Indonesia and Liberia.

6.5.1 Other Regional and Sub-regional organisations

Forum Fisheries Agency: There are significant FFA member country EEZ longline fisheries for albacore, bigeye and yellowfin tuna, with well over half of the catch taken from within these zones in the western Pacific. Despite a number of attempts, there has been no agreement reached on an overall catch cap (or allocation) for in-zone catches of albacore (at the moment) by FFA member countries,

as has occurred for the PNA purse seine skipjack fishery. The majority of catch of yellowfin and bigeye is taken in the equatorial region, particularly within the EEZs of PNA member countries. In addition, increasing catches of albacore have been taken north of 20°S, including within the EEZs of other FFA member countries.

FFA is based in Honiara, Solomon Islands, and has 18 members, including Cook Islands. Other members are Australia, Federated States of Micronesia, Fiji, French Polynesia (PIF membership granted September 2016), Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. FFA was established to help countries sustainably manage and develop the fishery resources that fall within their 200-mile EEZs. FFA is an advisory body providing expertise, technical assistance and other support to its members who make sovereign decisions about their tuna resources and participate in regional decision-making on tuna management through agencies such as the WCPFC and has two major programmes of relevance to the management framework under consideration:

- Fisheries management – providing policy and legal frameworks for the sustainable management of tuna.
- Fisheries operations – supporting monitoring, control and surveillance of fisheries as well as treaty administration, information technology and vessel registration and monitoring.

These programmes provide advice on:

i) Appropriate legal frameworks for national tuna management, including members'

ii) Obligations under various treaties and arrangements.

iii) Appropriate fisheries management frameworks including the incorporation of the principles of ecosystem-based fisheries management.

iv) Effective fisheries administration, including access arrangements, licensing of foreign and domestic fishing vessels, governance of fisheries administrations, economic implications of different management systems, and the use of new systems and technologies.

v) Development and implementation of monitoring, control and surveillance systems and effective compliance regimes including the provision of support services including a vessel regional register, VMS and observer programmes; and

vi) The development of regional co-operation in fisheries management.

FFA also services regional fisheries treaties and arrangements and provides capacity building in the area of fisheries management. The governing body of FFA, the Forum Fisheries Committee (FFC), provides a valuable forum for the discussion of matters of common interest. FFC (and FFC sub-group) outcomes and subsequent inputs into WCPFC have been instrumental in many of the key conservation and management initiatives agreed in that forum.

Parties to the Nauru Agreement (PNA): PNA is an alliance of Pacific Island states whose national waters collectively account for a significant proportion of the WCPO tuna catch and about half of the purse seine catch. The Nauru Agreement is a sub-regional agreement made to facilitate cooperation in the management of fisheries resources of common interest.

The Nauru Agreement is a binding Treaty-level instrument considered to be a sub-regional or regional fisheries management arrangement for the purpose of the UNFSA and the WCPFC Convention. The PNA countries (FSM, Solomon Islands, Tuvalu, Kiribati, Marshall Islands, Papua New Guinea, Nauru and Palau; also, Tokelau although not a full member participates in the Vessel Day Scheme (VDS)), have worked collaboratively since 1982 to manage the tuna stocks within their national waters through the Agreement. The PNA operates its secretariat from Majuro in the Marshall Islands. Its objectives are to enhance regional solidarity and to promote economic control and participatory rights over the tuna resources in PNA waters. The primary focus of the PNA is to:

Develop strategic fisheries conservation and management initiatives:

- Develop initiatives to maximise the sustained direct and indirect economic benefits to the Parties; and
- Maximise the profitability of the fishery and ancillary industries within the PNA.

The PNA coordinate the implementation of management measures with a view to enhancing economic benefits from the fishery, including harmonising the terms and conditions of access for distant water fishing vessels/fleets and granting preferential access to vessels of the Parties in order to encourage domestic participation in the fishing industry. This includes operating an access and management regime, which optimises revenue collection for the parties, as well as promoting the development of the Parties' indigenous fishery sector.

The Nauru Agreement is implemented through binding Implementing Arrangements and associated Arrangements, which include:

- The 1st Implementing Arrangement, 1983, setting minimum licensing standards, including reporting, inspection and on-board observation, vessel identification and "good standing" on the FFA regional register;
- The 2nd Implementing Arrangement, 1990, adding additional conditions relating to VMS, high seas reporting and a prohibition on transshipment at sea;
- The Palau Arrangement, 1995, limiting the purse seine fishery, initially by limiting vessel numbers, but now through the Vessel Day Scheme (VDS);
- The FSM Arrangement: 1994, establishing arrangements for preferential access among the parties for vessels meeting certain standards for the provision of domestic economic benefits;
- The 3rd Implementing Arrangement (3IA) 2008, applying a FAD closure, 100% observer coverage and catch retention/no tuna discards in PNA EEZs, and prohibition of fishing in high seas pockets for licensed vessels.

All PNA members have legal, institutional and policy frameworks, including tuna management plans, in place to manage the purse seine and longline fisheries in PNA waters and to implement the requirements of WCPFC, the PNA Agreement and the Vessel Day Scheme (VDS). In 2017, PNA implemented a Vessel Day Scheme for longline fisheries.

The PNA has driven much of the management reform in the purse seine and longline fisheries, including the introduction of an input control system based on vessel day limits (the Vessel Day

Scheme, VDS), closures of high seas pockets, seasonal bans on use of Fish Aggregating Devices (FADs), satellite tracking of boats, in port trans-shipment, 100 per cent observer coverage of purse seine vessels, closed areas for conservation, mesh size regulations, tuna catch retention requirements, hard limits on fishing effort, prohibitions against targeting whale sharks, shark action plans, and other conservation measures to protect the marine ecosystem.

Secretariat of the Pacific Community (SPC): Based in Noumea, New Caledonia, the SPC is an intergovernmental organisation that provides technical and policy advice to its members. SPC has 26 member countries and territories, including American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna.

The Oceanic Fisheries Programme (OFP) within the SPC Division of Fisheries, Aquaculture and Marine Ecosystems (FAME) provides Kiribati and the other Pacific Island members of SPC with scientific information and advice necessary to rationally manage fisheries exploiting the region's resources of tuna, billfish and related species. The OFP also is, under contract, the scientific service provider to the Commission, as allowed for under Article 13 of the Convention. The OFP has three sections:

- Statistics and Monitoring: including compilation of catch and effort data, data processing and technical support for port sampling programmes and observer programmes in member countries and territories, training in fisheries statistics and database management, statistical analyses and the provision of statistical support to the WCPFC.
- Tuna Ecology and Biology: including analysis of the biological parameters and environmental processes that influence the productivity of tuna and billfish populations, focusing on age and growth, movement and behaviour as observed from classical or electronic data archiving tags, and diet in a more general study devoted to the food web of the pelagic ecosystem; and development of mathematical models to understand environmental determinants of tuna fishery production, including impacts of climate fluctuation;
- Stock Assessment and Modelling: including regional stock assessments for the WCPFC, development of tuna movement and simulation models, bio-economic modelling, and scientific input to national tuna management plans and support for national EAFM analyses, tag-recapture database management. Confidential (to SPC and national governments) National Tuna Fisheries Status Reports are also produced.

Table 21. Summary of Principle 3 Performance Indicator level scores – WCPFC

Performance Indicator	Draft scoring range	Data deficient?
3.1.1 – Legal and customary framework	**≥80**	**No**
Rationale or key points		
The WCPFC, which officially came into force in 2004, was formed under the 'Convention for the Conservation and Management of Highly Migratory Fish Stocks in the WCPO (WCPFC 2000), to manage tuna and tuna-like species in the defined Convention Area (Figure 24). The WCPFC Convention includes many provisions found in the United Nations Fish Stocks Agreement (UNFSA). Under the Convention, the governing body called the Commission, was formed. The Commission is made up of representatives from countries that have ratified the Convention. The dispute settlement mechanism for the WCPFC is set out under Article 31 of the Convention. This authorises the formation of a panel to settle disputes raised by CCMs if and when raised and to review decisions made by the Commission itself. The dispute settlement mechanism outlined in the Convention allows for a transparent process to occur. At the time of writing this report, no sanctions have not been issued by WCPFC, so there have not been any disputes as a consequence and the panel has not been formed. While the mechanisms for dispute resolution are transparent and considered to be effective in dealing with most issues at both the national and regional level, they have only been tested and proven to be effective at a national level (as no disputes with WCPFC recorded), so only SG 80 is considered met for SIb. The RFMO improve the management of tuna and tuna-like species in the region through the adoption of CMMs (WCPFC). All members of the WCPFC are legally bound to apply these measures to their fisheries operating in the Convention Areas. The WCPFC is unique in that it protects the inhabitants of Small Island Developing States (SIDS), which are members to the WCPFC, for example, under Article 5 of the Convention states that "in order to conserve and manage highly migratory fish stocks in the Convention area…. the members of the Commission shall… (h) take into account the interests of artisanal and subsistence fishers". Under Article 10, paragraph 3, the Convention States that "in developing criteria for allocation of the total allowable catch or total allowable effort the Commission shall take into account…. (d) the needs of small island developing States and territories and possessions, in the Convention area whose economies, food supplies and livelihoods are overwhelmingly, dependent on the exploitation of marine living resources and (g) the needs of coastal communities which are dependent on the fishing stock". This demonstrates formal commitment to the legal rights created for subsistence fishers. SG100 is met for SIc.		
3.1.2 – Consultation, roles and responsibilities	**≥80**	**No**
Rationale or key points		
The functions, roles and responsibilities of member countries of the WCPFC have been identified in various Articles of the Convention's. The roles and responsibilities of the Commission and Committees have also been well defined by the WCPFC. The RFMO allow observers to attend some meetings and the terms for which an observer must adhere have been well defined.		

There are extensive formal and informal consultation processes at the WCPFC that regularly seek and accept information from members and cooperating non-members. The Commission is active in assisting and facilitating the regular and timely provision of fisheries data and information for assessment by the Commission secretariat and scientific providers, such as SPC.

The Commission actively uses information from the fishery and its member states to inform fisheries management decisions and assist in the formulation of CMMs. The RFMO also has formal cooperative relationships with other organisations. Other organisations, NGOs for example, as interested and affected stakeholders are permitted to attend meetings but there cannot be said that there is opportunity and encouragement for participation, nor are all stakeholders' engagement with WCPFC facilitated. SG80 is met for SIc.

3.1.3 – Long term objectives	**≥80**	**No**

Rationale or key points

The WCPFC is responsible for decision-making for regional management measures. These conservation management measures (CMMs) cover not only target species but also Principle 2 elements such as ETP species and the ecosystem. The WCPFC have clear long-term objectives that are used to help guide the decision-making process. The various CMMs adopted clearly lay out their objectives. Evidence that these objectives are guiding, or are starting to guide decision-making, is provided in various Commission reports and in CMMs, making them explicit in the management policy. The precautionary approach is outlined in Article 5 of the Convention: Article 5(c) requires the Commission to apply the precautionary approach in decision-making and Article 6 outlines the process by which this will be applied. On this basis, at least SG80 is met.

3.2.1 – Fishery specific objectives	**≥80**	**No**

Rationale or key points

The WCPFC apply fishery specific objectives using various CMMs applied to both target and bycatch species. The outcomes are consistent with the MSC's Principles 1 and 2. For Principle 1, these are explicit and measurable, by defining spawning biomass depletion ratios against average $SB/SB_{F=0}$ for previous years as targets which would serve to limit fishing effort. Objectives are not as well defined or measurable for P2 outcomes. For example, there are CMMs for the conservation of silky sharks (CMM 2013-10), seabirds (CMM 2017-06) and sea turtles (CMM 20018-04) but these are concerned with improving their live release, rather than improving biomass in a measurable way. Regardless, at least SG80 is met for this PI.

3.2.2 – Decision making processes	**80**	**No**

Rationale or key points

The WCPFC have defined a clear decision-making process. The decision-making process within the WCPFC is by consensus. If consensus cannot be made, a vote can be made. The decision-making process for CMMs are open. SG80 is met for SIa.

Using the information reported by SC for example stock assessments for target species and non-target species, the WCPFC makes management decisions in order to respond to serious issues that might arise, for example when a stock becomes overfished, as was the case for bigeye following the 2014 stock assessment (Harley et al., 2014) and bigeye overfishing between 2011 and 2017. WCPFC have not always been successful in responding to all serious issues, for example the case of south Pacific albacore and the development of a TRP and developing HCRs and MSEs. This led to a condition for all MSC certified fisheries targeting south Pacific albacore. This condition is now closed, as a TRP has been agreed. SG80 is met for SIb.

WCPFC Convention Article 5(c) requires the Commission to apply the precautionary approach in decision-making and Article 6 requires the application of the precautionary approach and use of a Scientific Committee (SC) to ensure that the Commission obtains the best scientific information available for its consideration and decision-making. SIc meets SG80.

With regard to access of information on fishery performance and management actions, the WCPFC maintains a publicly accessible website where meeting minutes, reports and scientific reports from the Commission and subsidiary bodies are posted and are freely available for download. The national and regional websites provide a high level of public access and transparency, showing how scientific information is used to inform management actions, which are then monitored for effectiveness and discussed. SG80 is met for SId.

The WCPFC consensus decision-making process provides a mechanism to avoid legal disputes, and certainly the lack of disputes to date can offer some evidence that this proactively works. SG80 is at least met for SIe.

3.2.3 – Compliance and enforcement	**≥80**	**No**

Rationale or key points

No information was received on compliance within the UoAs identified in this pre-assessment. It should be noted that WCPFC's policies on compliance do not take up the main part of the scoring for this PI. Below outlines what is in place regionally.

WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transshipment monitoring. These are formalised through CMMs and implemented by the CCMs. To the regional extent, it is possible to award SG80 for SIa as a monitoring, control and surveillance (MCS) system has been implemented through the provisions set out in CMMs, which demonstrate an ability to enforce relevant management measures, strategies and/or rules by the UoAs/CCMs.

Sanctions to deal with non-compliance do exist at the regional level, and this is mainly through the IUU vessel listing process under CMM 2010-06, which provides incentives to comply (along with other MCS CMMs), as the list is published of vessels is published on the WCPFC website. SIb meets SG80.

The WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state and transshipment controls, observers and logbooks. To date, no significant contraventions of regulations have been reported, which provides confidence that fishers comply with the management system. On this basis, SG80 is met for SIc.

There is no evidence of systematic non-compliance. SG80 is met for SId.

3.2.4 – Management performance evaluation	**≥80**	**No**

Rationale or key points

There is a regional annual report developed by the WCPFC Secretariat, which details compliance of members with the reporting provisions of the Commission. An internal review is also conducted by the WCPFC through assessing the implementation and performance of the CMMs through reports of member countries to the Commission and stock assessments. This allows Commission meetings to provide an overall review of key processes and outcomes. Stock assessments undertaken by SPC are also subject to peer review and external review to ensure that the scientific processes remain robust. SG80 is met for SIa.

The WCPFC has taken out external performance reviews. Countries provide annual reports to the Commissions on their compliance with the various CMMs. The Commission meetings review progress with the management measures in terms of their success and implementation. SG80 is met for SIb as the external reviews are not held on a regular basis.

Table 22. Summary of Principle 3 Performance Indicator level scores – IATTC

Performance Indicator	Draft scoring range	Data deficient?
3.1.1 – Legal and customary framework	**≥80**	**No**
Rationale or key points		
The IATTC was first established under the 1949 Convention and is responsible for the management of tuna and tuna-like species in the EPO. The Antigua Convention strengthened and replaced the 1949 Convention, coming into force in 2010. The Convention is open to Parties to the 1949 Convention, States not Party to the 1949 Convention with a coastline bordering the Convention Area, The RFMO improve the management of tuna and tuna-like species in the region through the adoption of Resolutions (IATTC). All members of IATTC are legally bound to apply these measures to their fisheries operating in the Convention Areas. As an RFMO, conventions under the IATTC become legally binding to signatory nations (Parties) via mechanisms that exist within the sovereign legal systems of any given Party. 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. SIa meets the SG80 score. Dispute resolution is provided for through Part VII of the Antigua Convention, which outlines how disputes between Commission members can be addressed. Further to this, IATTC annual meetings provide a forum to discuss disputes. If needed, disputes may also be settled through either the International Court of Justice or the International Tribunal for the Law of the Sea (ITLOS). SG80 is met for SIb. Legal rights of people dependent on fishing for food or livelihood are protected through national interests of Parties to the Convention. While IATTC has a management system that observes the legal rights established by custom there is a lack of formal commitment in implementation. SG80 requirements are met for SIc.		
3.1.2 – Consultation, roles and responsibilities	**≥80**	**No**
Rationale or key points		
The functions, roles and responsibilities of member countries of the IATTC have been identified in various Articles of the Convention's. The roles and responsibilities of the Commission and Committees have also been well defined by the RFMO. The performance of the IATTC Secretariat is sound and well regarded as both efficient and effective by the Parties (Medley and Powers 2015). Roles and responsibilities are explicitly defined at the national level for key areas. Key areas include providing catch and monitoring data to the Secretariat, taking part in various meetings sharing information and making decisions, meeting the requirements for conservation and other		

recommendations for IATTC and applying appropriate levels of control and surveillance. SIa meets SG80.

The IATTC allow observers to attend some meetings and the terms of being an observer have been well defined. Consultation at the international level is formalised, and there are well-developed mechanisms for obtaining and using appropriate information. Opportunities to become Contracting Parties or Co-operating Non-Contracting Parties are open to all, including non-states. The RFMO also has formal cooperative relationships with other organisations. "Local" information is sought from the CPCs and working groups, which form the basis of management decision-making. Scientific reports state the source of information used and how it guides management. Non-scientific information, such as compliance with resolutions is not so clearly evident. At least SG80 is met.

3.1.3 – Long term objectives	**≥80**	**No**

Rationale or key points

The IATTC have clear long-term objectives that are used to help guide the decision-making process. The various Resolutions adopted clearly lay out their objectives. Various Articles of the IATTC require the effective long-term management of tuna and tuna-like species. For example, Article IV, paragraph 1 explicitly requires the "precautionary approach, as described in the relevant provisions of the Code of Conduct and/or the UNFSA, for the conservation, management and sustainable use of fish stocks". Based on this evidence SG 80 is met as there are clear explicit objectives incorporating the precautionary approach and ecosystem-based management (through stipulating its importance in Article VII of the Antigua Convention).

3.2.1 – Fishery specific objectives	**≥80**	**No**

Rationale or key points

Well-defined, long-term objectives for target stocks (Principle 1) and the ecosystem (Principle 2) are defined for IATTC in the Antigua Convention, and their management actualised through management resolutions. Some resolutions have clear, measurable objectives, for example C-16-02, HCRs – "on the basis of the best available scientific information and the precautionary approach, the IATTC has used as an operational harvest control rule (HCR) limiting fishing mortality (F) at levels that do not exceed the level corresponding to the maximum sustainable yield (MSY)", where for ecosystems components, resolutions serve to mitigate impacts of fishing, rather than defining limits (except in the case of dolphin mortality limits in the EPO purse seine fishery). On this basis, at least SG80 is met, as IATTC has 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.

3.2.2 – Decision making processes	**≥80**	**No**

Rationale or key points

The decision-making processes within IATTC are explicitly defined in Article IX of the Antigua Convention, with decisions being made by consensus and are thought to result in measures and strategies to achieve the fishery-specific objectives. SG80 is met for SIa.

Management decisions, for example resolutions are published on the IATTC website and may be accessed by anyone and are based on scientific information, such the outcomes of regular stock assessments for target species. There is evidence that decision-making processes deal with serious and other important issues in a transparent, timely and adaptive manner meeting SG80 for SIb.

As outlined in the Antigua Convention, the precautionary approach is engrained into the decision-making processes at IATTC. As mentioned above in 3.2.1, the precautionary approach and use of best scientific information forms the objective for the BET, YFT and SKJ HCRs. According to Medley & Gascoigne (2019), the requirement to use the best scientific information is evidenced through the large number of meetings that have been conducted and reports written for the Commission, which provide analyses and advice based on all available information. SG80 is met for SIc.

The IATTC website provides outcomes and recommendations from various area, i.e. research, performance and monitoring, which are published in a range of reports from the plenary meeting, stock assessments and other working groups. Whilst these are publicly available, Medley and Gascoigne (2019) mention that it is not clear whether the reports present all information used in decision-making. SG80 is at least met for SId.

As with WCPFC, no legal disputes have been recorded to date. The process for dispute resolution and the lack of use of the international court, one could argue that IATTC proactively avoids such disagreements. SG80 is met.

3.2.3 – Compliance and enforcement	**≥80**	**No**

Rationale or key points

IATTC demonstrates a MCS system through the implementation of resolutions and monitoring of fleets through a number of ways; logbooks, the observer programme (which although is not regionalised, requires CPCs to place observers on 100% of purse seine trips and at least 5% of longline vessels above 24 metres in length. IATTC uses its vessel registers to establish a ‘positive list’ (C-11-05) and identify IUU vessels (A-04-07), information which is shared with other RFMOs. The observer programme serves not only to collect scientific information but also for compliance to resolutions imposed by IATTC. VMS is also required for vessels operating in the EPO. Some Port State Measures have also been introduced and since 2003 a Catch Documentation Scheme for bigeye tuna, with bolsters the information coming in from observers. SIa meets SG80 but isn’t comprehensive enough to meet anything higher.

Sanctions exist and are applied but only to fishing entities such as IUU vessels and vessels detected as being non-compliant with resolutions. Enforcement is the responsibility of the national management bodies. Non-compliance does still occur but not on large scale and efforts have been

attempted to reduce levels (Gascoigne and Medley, 2019). Still, sanctions are thought to act as effective deterrence. SIb meets SG80.

The Committee for the Review of Implementation of Measures Adopted by the Commission is a permanent group which reviews compliance with IATTC resolutions. Annual reports are produced but do not give the exact nature of infractions. Other MSC certifications and reports (Morgan et al., 2016; Medley and Gascoigne, 2019 for example) suggests there is some evidence to demonstrate fishers comply with the management system, however as much of this is confidential, it is difficult to have any high degree of confidence in relation to compliance, meaning only SG 80 is met for SIc.

There is no evidence of systematic non-compliance, so SG80 is met for SId.

3.2.4 – Management performance evaluation	**≥80**	**No**

Rationale or key points

There are extensive mechanisms in place to evaluate the IATTC management system as evidenced by various committees and working groups meeting regularly and reporting their findings to the Commission, as well as a 2016 performance review of IATTC (Medley and Gascoigne, 2019), however as not all aspects of the management system are evaluated (the harvest control rules for example), the highest score that may be awarded for IATTC is SG80 for SIa.

As mentioned in the paragraph above, IATTC is subject to regular internal review. As the last external review was in 2016, and the next one planned is not public, it can only be said that the external reviews are occasional. SG80 is none the less awarded for SIb.

6.5.2 National management systems

China: Fisheries are managed by the Bureau of Fisheries, Ministry of Agriculture. China's marine capture production in 2016 was estimated around 15 million tonnes by FAO. In the past few years, the Chinese fishery and aquaculture sector has seen some transformation towards a more responsible and sustainable manner including quality improvement, product diversity, economic efficiency improvement, strengthen business integration along the value chain and economies of scale (FAO, 2017).

Table 23. Summary of Principle 3 Performance Indicator level scores – China

Performance Indicator	Draft scoring range	Data deficient?
3.1.1 – Legal and customary framework	**60 - 79**	**No**
Rationale or key points		
The Bureau of Fisheries and Fisheries Management, under Ministry of Agriculture P. R. China, is the highest level of fisheries administration in China. The Bureau is designated to set up strategies and policies for fisheries development, implement laws and enforcements, build up regulations and agreements and enhance fisheries management. China is a member of both the WCPFC and IATTC, providing evidence that they have suitable framework to cooperate with other parties including in addition to RFMOs, the SPC, for whom is responsible for the regional observer programme in the WCPO. The legal framework also involves regional levels with more than 20 bilateral fishery cooperation agreements signed with different states (FAO, 2017). SG80 is met for SIa. With regard to dispute resolution (SIb), Chapter 5 – Legal Liability of the Chinese Fisheries Law, Article 33 states: "The administrative sanctions stipulated in this Law shall be decided by departments of fishery administration or their subordinate fishery superintendency agencies. Any party who refuses to accept the decision on an administrative sanction may file a suit in a people's court within 30 days after receiving notification of the decision. If the party neither files a suit nor complies with the decision within the time limit, the agency that made the decision shall request the people's court to compel execution of the decision. However, a party which is engaged in maritime operations must comply with the sanction before filing a suit." This demonstrates that there is at least a mechanism for the resolution of legal disputes. Neither its transparency nor effectiveness can be commented on, as no evidence could be found. For now, SG60 is at least met. The main fishery law which can be found publicly is the, "Fisheries Law of the People's Republic of China", fishery workers' lawful rights and interests are stated in Chapter 1 General Provisions. It does not specify specifically subsistence fishers however, so the extent to which subsistence fishers' rights are protected could not be determined. SG60 is at least met for SIc as a general respect is shown.		
3.1.2 – Consultation, roles and responsibilities	**60 - 79**	**No**
Rationale or key points		

The Bureau of Fisheries and Fisheries Management has a clearly defined roles and responsibilities, with procedures that align with the WCPFC. These are built into government processes, but it is unclear if all areas of responsibility and interaction are explicitly defined and well understood (Morgan et al., 2018). China would therefore only meet the SG80 level for SIa.

This report uses the scorings from Morgan et al., 2018, who had on-site meetings for the full assessment. For China, it was "not clear how particular stakeholders are contacted or why by the competent authority, or *for what matters* or *how often (regularity)*, nor are generalised minutes or transparent records of consulted participants available. It is not clear whether these arrangements are formalised in policy or legislation. It is also unclear if they can be initiated at any time, rather than just in the lead up to the WCPFC annual meeting". On this basis SG80 was not met, as only evidence could be found of the management system obtaining information for stakeholders, not that it regularly sought the relevant information. SG60 only is met for SIb.

According to Morgan et al., 2018, interested parties have the opportunity to participate in consultation processes. Authorities are said to engage with parties prior to meetings, in formulating positions on CMMs. Stakeholder groups are reported to be from industry, government and NGOs. SG80 was awarded for SIc.

3.1.3 – Long term objectives	**≥80**	**No**

Rationale or key points

Long term objectives of fisheries management in China have been addressed in the official policy documents and stated in their 'thirteenth five-year strategy for marine fishery development'. The Chinese fishery not only focused on the harvest but also endeavours to enhance the management and aims for sustainable development.

From the perspective of China's overall fishery development, the competent authorities have some long-term plans and targets, such as: vessel and gear control (so-called "Double Control"), fishers' alternative livelihood development, vessel scrapping, marine fishing production "zero growth" or "negative growth", etc. To ensure objectives achieved on time, the state has also formulated corresponding policy guidelines – "Thirteenth Five-Year Plan for National Fisheries Development". Local fisheries authorities develop management objectives and plans that are consistent with the region based on national-level goals and plans.

Local targets and plans are subject to national policy decisions and are more specific than national plans. For target fisheries, the implementation of TAC, limiting the size of the mesh, limiting the minimum catchable size of catch and the proportion of juvenile fish are all specific targets to be implemented at local levels. SG80 is met for this PI.

3.2.1 – Fishery specific objectives	**N/A**	**Yes**

Rationale or key points

This PI is not relevant for China, as the fishery does not take place in Chinese waters. Please refer to either the WCPFC (

Table 21) or IATTC (Table 22) rationales, depending under which RFMO jurisdiction the UoA of interest resides.

3.2.2 – Decision making processes	**60 - 79**	**Yes**

Rationale or key points

According to FCRv2.0 “The focus for this PI is on the decision-making processes themselves, and if they actually produce measures and strategies within the fishery-specific management system. It is not an evaluation of the quality of those measures and strategies as this is covered elsewhere in the tree structure under P1 and P2 (GSA 4.8)”… “Established” decision-making processes should be understood to mean that there is a process that can be immediately triggered for fisheries-related issues, the process has been triggered in the past and has led to decisions about sustainability in the fishery”. The management system of relevance to this SI is at the RFMO level, either WCPFC or IATTC depending on the UoA, as the fishery is not taking place in Chinese waters. Please see the rationales for either WCPFC (

Table 21) or IATTC (Table 22) for SIa.

According to Morgan et al., 2018, it is not clear as to whether China has well-developed and responsive (transparent, adaptive, timely) processes nor that national measures routinely apply to serious and other important (flag State) issues. This rationale was based on a lack of evidence during the full assessment process. “The assessment team received evidence of Chinese pre-meeting arrangements that provide one process for consultation on WCPFC issues prior to decisions being made at the regional level to develop a national position on proposed CMMs” (Morgan et al., 2018). In line with the WPSTA assessment, SG80 is not met for SIb.

With regard to the precautionary approach (SIc), information being available to stakeholders on request (SId) and the management system’s approach to disputes (SIe), the RFMO management level is deemed most relevant and should be focussed on for this PI, rather than the national level management. Please see the rationales for either WCPFC (

Table 21) or IATTC (Table 22) for these scoring issues (all awarded at least SG80).

3.2.3 – Compliance and enforcement	**60 – 79**	**No**

Rationale or key points

A MCS system for all vessels operating in the WCPO and EPO are in place. Vessels must complete logbooks, host observers, comply to VMS regulations and Port State Measures. In the WCPO, China will host observers from the SPC regional observer programme and in the EPO be responsible for deploying sufficient numbers of observers from the national pool. Observers are tasked with recording compliance of RFMO CMMs and Resolutions, as well as recording biological data. According to Morgan et al. (2018), “China has published a “Notice of the Ministry of Agriculture General Office on Fishing Violation of Distant Water Corporation and Fishing Vessels” which provides

details of “serious measures against the corporations, fishing vessels and responsible persons that violate the law”. This is not a substantial document, but it does provide information on actions taken and fines imposed.” On this basis, SG80 is met for SIa.

Currently, licensing is the main approach to manage Chinese vessels conducting fishery activities, where there is a gap to evaluate post-licensing activities conducted by fishing vessels. Liabilities are defined in the ‘Fisheries Law of the People's Republic of China’ where the most serious scenario is to confiscate the vessel. Though some laws and regulations were set to manage Chinese fishing vessels, IUU fishing is well-known worldwide by Chinese fishing vessels. Poor regulation and weak global enforcement are some of the key factors behind it and is not well-controlled by Chinese flagged vessels and legal authorities. Based on the information available, sanctions to deal with non-compliance exist and there is some evidence that they are applied, SG60 requirements are therefore met. However, there is not sufficient evidence to conclude they are consistently applied and provide an effective deterrence, meaning SG80 requirements are not met for SIb.

There are no Chinese vessels on the WCPFC IUU list for 2019 nor on the IATTC IUU list, which provides some evidence that the fishery is compiling with the management system. SG80 is met for SIc.

There is no evidence of systematic non-compliance, so SG80 is met for SId.

It must also be noted that Chinese vessels are subject to catch limits of bigeye tuna, however due to the catch limit being so low and China not contributing more than half of the total catches of either bigeye stocks it is not addressed under Principle 1 as it is unlikely to affect the ability of the HCR to constrain overall catches. It is however considered under Principle 3 and is likely to raise a condition for PI3.2.3.

3.2.4 – Management performance evaluation	**60 – 79**	**Yes**

Rationale or key points

The management system has internal processes to evaluate management performance. These include evaluations of policy, research, operations, compliance and enforcement. These are carried out on a regular basis. SG80 is therefore met for SIa.

There is no evidence of any external reviews, which is not to say that there haven’t been any. In the absence of information SG80 cannot be met for SIb.

Vanuatu: The main fisheries law of Vanuatu is the Fisheries Act of 1982 and 2014. Under this Law, the Director of the Fisheries Department plans the management and development of Vanuatu fisheries. The development of the plans must include the input of various stakeholders. Every fisheries plan shall:

- Identify the fishery and assess the present state of its exploitation;
- Specify the management and development measures to be taken;
- Specify the licensing program to be followed for each fishery.

Vanuatu is a signatory or party to the following:

- Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean;
- Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR);
- Antigua Convention (IATTC);
- United Nations Convention on the Law of the Sea (UNCLOS).
- The Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region.
- United Nations Fish Stocks Agreement (UNFSA).
- Food and Agriculture Organization Compliance Agreement (FAO).
- FAO Port State Measure Agreement.

In addition, Vanuatu has a Treaty regarding fisheries with some Pacific Island States, along with the United States of America (Vanuatu 2006, GRVDF 2013).

Table 24. Summary of Principle 3 Performance Indicator level scores – Vanuatu

Performance Indicator	Draft scoring range	Data deficient?
3.1.1 – Legal and customary framework	**≥80**	**No**
Rationale or key points		
The Vanuatu Government manages tuna fisheries through the Fisheries Division of the Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity (MALFFB). The Fisheries Act 2014 and Fisheries Regulations 2009, are the two main legislative instruments governing the management of fisheries resources in Vanuatu's EEZ. Vanuatu is party to a range of international and regional legal instruments such as the WCPF Convention, UNCLOS and UNFSA that relate to conservation, management and development. Consequently, there is an obligation to apply the principles in those agreements, including the precautionary approach, in their EEZ. Vanuatu is party to the Tokelau Arrangement which came into force in December 2014. The Arrangement between most South Pacific members of FFA, provides for a co-operative framework for these coastal states/territories to set management measures specifically for south pacific albacore within their EEZs. SG80 is met for SIa. Under the Vanuatu legal system there is a provision under the Fisheries Act, where appeals against decisions made by the Director of Fisheries can be made by way of request to the Minister for a re-consideration of the decision. The Fisheries Act is a publicly accessible document, which therefore		

provides a transparent mechanism, which is considered to be effective in dealing with most disputes. SG80 is met for SIb.

The protection of the customary rights is explicit in the Fisheries Act Part 2, Section 4 (h), (i), (j), (k), which provides for the adoption of measures to ensure that levels of fishing do not exceed those commensurate with the sustainable use of fishery resources and takes into account the interests of artisanal, subsistence fisheries and local communities and maintain traditional forms of sustainable fisheries management. SG80 is met for SIc.

3.1.2 – Consultation, roles and responsibilities	**≥80**	**No**

Rationale or key points

The roles and responsibilities of the MALFFB are outlined in Part 3 of the Fisheries Act 2014. The Minister is responsible for providing general policy guidance on fisheries matters and delegating responsibilities and direction to the Director. The responsibilities of the Director include the promotion and facilitation of the development of Fisheries Management Plans, the management and co-ordination of the conservation, management, development and sustainable use of fisheries resources, and the management and control of Vanuatu fishing vessels within and beyond Vanuatu waters. A Fisheries Management Advisory Council (FMAC) comprised of members from the fishing industry, artisanal fishers, offshore fishers, NGOs and relevant government agencies was established, pursuant to Part 3 Section 9 of the Fisheries Act 2014, to provide recommendations to the Director on policy matters relating to fisheries conservation and management. SG80 is met for SIa.

Through the FMAC and formal consultations with all relevant stakeholders the Vanuatu government has developed and implemented plans such as the Tuna Management and Development Plan 2014. Within Part 4, Section 11 specifies the need to consult with fishers, local authorities and other persons likely affected by the fishery management plan. The WCPFC, FFA and Vanuatu government work together through consultation to incorporate local knowledge into decision-making, which is reflected in the implementation of management measures that address the needs of member states. SG80 is met for SIb.

With regard to participation (SIc), the process outlined above certainly provides opportunity for all interested and affected parties to be involved, this is evidenced by the FMAC, which plays hosts to a number of organisations with interest in the fishery. Additionally, Part 4, Section 11 explicitly states that decision-making processes must “take into account any relevant traditional fishing methods and practices including traditional management systems and strategies”, demonstrating a formal commitment to the legal rights of subsistence fishers. SG100 is met for SIc.

3.1.3 – Long term objectives	**≥80**	**No**

Rationale or key points

The Fisheries Act 2014, Part 2 specifies that the main objectives are to conserve, manage and develop fisheries in Vanuatu in order to ensure its long-term sustainable use for the benefit of the people of

Vanuatu and effectively discharge obligations under Scheduled Treaties and agreements in which Vanuatu is party to. The main principles that support the objectives of the Act are to ensure that management measures are based on the best scientific evidence available and are designed to maintain and restore target stocks at levels capable of producing maximum sustainable yield or other reference points, take into account fishing patterns, the interdependence of stocks and any generally recommended international minimal standards, to apply the precautionary principle in accordance with the Act and to assess the impacts of fishing, other human activities and environmental factors on target stocks, non-target species and species belonging to the same ecosystem or dependent upon or associated with target stocks. Long term objectives are also included in the Vanuatu National Fisheries Sector Policy 2016 and the Revised Tuna Fishery Management Plan 2014. These objectives are required by the MALFFB to be implemented. SG80 is met.

3.2.1 – Fishery specific objectives	**≥80**	**No**

Rationale or key points

The Revised Tuna Fishery Management Plan 2014 covers all Vanuatu waters, including the consideration of the area of Vanuatu's Exclusive Economic Zone around Matthew and Hunter. Within the plan, four key short term objectives provide guidance for the management of the tuna fisheries.to ensure that the exploitation of the tuna resources that are found in and pass through Vanuatu waters are compatible with the sustainability of the stock and that the harvest is taken in a way that maximises long term economic and social benefits. SG80 is met.

3.2.2 – Decision making processes	**≥80**	**No**

Rationale or key points

The Fisheries Act 2014 Part 4 outlines the procedures for decision making. In order to assess and recommend management, development and conservation measures the Director must consult with appropriate Government Ministries and Departments, fishermen, local authorities or other persons likely to be affected. Also, the Director must consult wherever practical with the appropriate fisheries management authorities of other States in the region and in particular with those that share the same interrelated stocks. SG80 is therefore met for SIa.

The Fisheries Management Advisory Council (FMAC) is responsible for making firm rules around decision-making to ensure decisions are subject to informed, independent critique and transparency. Part 2 Section 5 of the Fisheries Act 2014 specifically ensures the application of the precautionary approach. Part 2, Section 4 specifies the Principles of the Act, which include "collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes…". The Vanuatu Tuna Management Plan was revised in 2014. This was in accordance with Part 2, Section 11 (Fisheries management plans), which respects the need to be adaptive, take into account the 'present state of its (each fishery) characteristics and exploitation, and take into account other States in the region with a view to achieve harmonisation of their respective fishery management and development plans. Its revision

was made to ensure that "good management of the resource" but also other issues such as "minimising or avoiding the incidental catch of vulnerable or protected species including seabirds, sea turtles, sharks and other mammals". On this basis SG80 is met for SIb.

In addition to Part 2, Section 5 of the Fisheries Act (2014), the precautionary approach principles are also reflected in the Revised Tuna Management Plan 2014, Fisheries Regulations 2009 section for marine turtles and mammals, and the Plan of Action on Sharks 2015. SIc meets SG80.

Vanuatu is a party to all decisions at WCPFC level and participates in the Scientific Committee and Commission meetings where final decisions are made at a regional level. The public can access information concerning the fishery's performance and management on the Fisheries Division Facebook site. Information available on Facebook shows how scientific information is used to inform management actions, which are then monitored for effectiveness. SId meets SG80.

There is no evidence to suggest that the Fisheries Division is disrespectful to, or defiant of local laws or legally binding agreements reached at the regional and international level. SG 80 is met for SIe.

3.2.3 – Compliance and enforcement	**60 – 79**	**No**

Rationale or key points

The Fisheries Division's MCS programme adheres to national management measures and regionally adopted management measures formulated by the WCPFC. The MCS programme is responsible for the management of VMS system, monitoring catch log sheets, licensing of fishing vessels, managing the national observer programme and conducting at-sea inspections with two patrol vessels. The Fisheries Act 2014 Part 19 outlines the requirements and responsibilities for the maintenance of the MCS system. SG80 is met for SIa as there is a MCS in place, which demonstrable ability to enforce relevant CMMs.

Part 19 of the Fisheries Act (2014) also details the sanctions applied for non-compliance to regulations concerning VMS, Port State Measures and catch documentation. In most cases this is monetary fines (for example someone who falsifies catch certification for an import of seafood into Vanuatu can face fines of up to VT5000,000,000 (US$ 4,281,551)) but prison terms are also possibilities depending on the severity of the crime. "A person who divulges information from a vessel monitoring system, to any other person not authorised to receive the information, commits an offence punishable on conviction by a fine not exceeding VT100,000,000 (US$855,809), or by a term of imprisonment of not more than two years, or both". Property seizure is also another possible sanction for non-compliance. These are therefore expected to provide effective deterrence and so SG80 is met for SIb.

The lack of violations from the fleet reported by the Fisheries Division (only 20 minor infractions with 100% being resolved since 2014) leads to the conclusion that the sanctions are either effective and provide effective deterrence or insufficient to identify offenders. Observer reports from 2014 were the most recent that the Fisheries Division had available. The observer coverage was only 2.7% which is well below the 5% regional requirement. SG80 could not be awarded on this basis for SIc.

There is no evidence of systematic non-compliance. SId meets SG80 on this basis.		
3.2.4 – Management performance evaluation	**60 - 79**	**No**
Rationale or key points		
As a WCPFC CCM it must also send annual reports to the Commission on its performance with compliance of CMMs. There is therefore a system in place to evaluate key parts of the fishery specific management system, which is reviewed on an annual basis. SIa meets SG80. The fisheries-specific management system is subject to review on a regular basis as evidenced by 10 revisions of the Fisheries Act, 3 revisions of the Tuna Management Plan and the Fisheries Regulations are currently under review. The annual internal review for the WCFPC annual reports means there is regular internal review, but in the absence of any external review, SG80 could not be met for SIb.		

7 Recommendations and Scoping

This section is provided to highlight to the client fishery what may be necessary prior to, or during the full assessment, which has not been covered by this pre-assessment. It seeks to prepare the client for further information requests and full assessment site visit activities.

Firstly, the documentation and fishery progress page, must be updated to reflect the new scope of Chinese vessels and the updated scoring. It will also be necessary to continue to ask the flag states' management authorities to request aggregated observer data for the fleets. This provides the third-party data on bycatch and ETP species' interactions which are necessary to score PIs in Principle 2. Ideally this information would be split by area of operation to make for a more accurate P2 assessment. Other data that may be requested include instructions to captains, particularly in reference to marine pollution policies and ETP species handling, VMS data for the fleet, (via management authorities), fleet records of ETP species interactions, and traceability information.

With regard to stakeholder involvement in the full assessment, it will be necessary to further engage with the national management bodies in the coastal states in which the fisheries operate. This is necessary for a full understanding of the management structures and implementation of relevant IATTC Resolutions and national management regulations. Also expect a certain amount of interest from NGO groups. This is not necessarily a negative, as they may have research/studies that may be useful for the assessment, but also, they may have concerns regarding the assessment. Sometimes this is due to further public pressure but also due to unfamiliarity with the MSC assessment process. Where possible the client fisheries should look to engage with these groups prior to announcement, during the preparation of the Announcement Comment Draft Report (ACDR). Further details of the full assessment process can be found on the MSC website.

It is also necessary prior to full assessment to conduct a review of the traceability systems in operation in these fisheries. Information was not provided in this pre-assessment and it will be necessary to understand how catch from different UoAs are handled. A crucial part of the traceability assessment is that there is a system in place to demonstrate appropriate records are available tracing the path of the fishery products back to the UoAs. Particular points to consider are the point of intended change of ownership for the product, separation systems in place, potential for mixing of certified and non-certified product and whether separate chain of custody certification will be needed prior to the change of ownership (CoC will always be required following the first change of ownership).

Full assessment typically takes around 12 months from start to finish, so the more comprehensive the data collection, the more streamlined the assessment timeline. Please note that delays may occur to the assessment timeline if significant stakeholder comments or objections to the certification of the fishery are received.

High priority PIs (those that scored <60) are as follows:

2.3.1	ETP Species Outcome		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	It should firstly be noted that there are no national or international formal catch limits, which would trigger management actions for the ETP species identified in this assessment. This PI relates to direct and indirect effects of the longline UoAs' activities and whether direct effects are likely or high likely not to hinder recovery of ETP species. It is difficult to score due to lack of fishery-specific information from the fishery, but none-the-less, scoring elements are discussed below. Silky sharks: The only stock assessment for this species estimates that it is overfished (Rice and Harley, 2013), but was based on poor and now out-of-date data. According to Peatman et al., 2019 80% of elasmobranchs caught in tropical shallow longline fisheries are silky sharks. Given its vulnerable status and life history, the lack of observer data, it cannot be evidenced that known direct effects of the UoA are likely to not hinder recovery. Based on this argument, SG60 is not met. No indirect effects were thought to be attributed to longline operations. Oceanic whitetip sharks: The most recent stock assessment (Tremblay-Boyer et al., 2019) assesses the stock as overfished and predicts population extinction in the long-term under current rates of fishing mortality. Given its vulnerable status and life history, the lack of observer data, it cannot be evidenced that known direct effects of the UoA are likely to not hinder recovery. SG60 is not met. Blue sharks: According to Peatman et al., 2019, blue sharks are the most commonly caught elasmobranch on longlines. Their presence varied according to the fisheries, and were particularly prevalent in shallow-set longline, accounting for 70-90% in the south and north temperate fisheries respectively. Blue sharks are thought to be most likely discarded in longline fisheries (Peatman et al., 2019), but their condition upon release is often not recorded, but still appears to be better survival than other shark species, for example hammerheads which survive poorly when caught and predominantly dead when released. The latest stock assessment for north Pacific blue sharks was conducted in 2016 (WCPFC SC, 2017b). Stock status is reported in relation to maximum sustainable yield (MSY). Female spawning biomass in 2015 (SB_{2015}) was 71% higher than at MSY and estimated to be 308,286 mt. The recent annual fishing mortality ($F_{2012\text{-}2014}$) was estimated to be well below F_{MSY} at approximately 37% of F_{MSY}. The conclusion of the stock assessment is that the blue shark stocks are not overfished and that overfishing is not		

	occurring. For the north Pacific, given that $B>>B_{MSY}$ and $F<<F_{MSY}$, the fishery cannot be thought to be hindering recovery. SG80 is likely met. The most recent stock assessment for the south Pacific stock however estimates that the stock is depleted and does not attempt to include discards or post-release mortality. Given the lack of data and potentially low observer coverage, it can only be said that known effects are likely not to hinder recovery. Only SG60 is met. Mako sharks: Recently listed as 'endangered' on the IUCN Red List, these species (shortfin and longfin) are very vulnerable to fishing pressure in pelagic fisheries. The study by Peatman et al., 2019 shows that there has been a reduction in mako over the data set (2003 – 2017), with around 20,000 tonnes caught in that time in the region across the longline fisheries (~38,600 tonnes in 2017). Mako sharks are more associated with the temperate water sets than the tropical sets, so there may well be different impacts depending on whether the UoA a tropical species (bigeye and yellowfin) or albacore. It was estimated that ~20% of the longfin mako shark were retained. As with other shark species here, the lack of data, especially fishery-specific data, makes estimating the direct impact of the fisheries on mako sharks difficult. Given its new IUCN status and lack of stock assessment, it could not be established whether the known direct effects are likely to hinder the recovery of mako sharks. SG60 is not met. Thresher sharks: Peatman et al., 2019 report a reduction in the catch estimates of thresher sharks over the time period of data (2003 – 2017), with around 21,000 individuals being caught in the region in 2017 (~711 tonnes). Fins only were retained for ~25% of the thresher sharks. Given the species' concern status, lack of species information, decreasing population trend and the low level of observer data for this fishery, a high likelihood of known direct effects of the UoA cannot be awarded. SG80 is not met. Porbeagle sharks: More commonly caught in southern temperate water shallow sets, this species is not a common species caught in longline operations in the Pacific and is generally discarded (although more than 25% were dead on release) when encountered (Peatman et al., 2019). The first stock assessment of porbeagle sharks in the southern hemisphere (includes WCPO and EPO) was conducted in November 2017. Estimated values of fishing mortality were compared to a MIST (F_{crash}) which indicates a level of fishing expected to lead to population extinction in the long-term. Given the likely areas of fishing effort of this

	fishery it is likely not to hinder recovery, but without better information, only SG60 is met. Hammerhead sharks: The stock statuses are unknown but given the life characteristics of these species, it is likely to be declining. To date there have not been any stock assessment or analysis conducted on any of the hammerhead species form. They are relatively uncommonly caught on longlines, except in shallow tropical sets, with 18.3% of sets encountering a species of hammerhead. Survival of hammerheads on longlines is known to be poor and according to Peatman et al., 2019 there is a high level (nearly 75%) of retention in longline fisheries in the region. Without more information, it is not possible to ascertain whether direct effects are likely to hinder recovery of hammerhead sharks. SG60 is not met. Manta and mobula rays: Interactions with longline fisheries do occur. Peatman et al., 2019 present information that 10 – 35% of manta rays are released alive/healthy or injured. Given the relatively low proportion of these rays compared to other elasmobranchs (between 0.3% and 5.2% of sets record catches of mobulid rays according to Peatman et al., 2019) and the assumption the UoAs will adhere to the CMM and Resolutions of the WCPFC and IATTC (and therefore attempt to release manta and mobula rays); the author considered the UoAs unlikely to hinder recovery of this species. Therefore SG 60 is met. Given the lack of observer data, more information is needed for SG80 to be met. No indirect effects were thought to be attributed to longline operations for elasmobranch species. Marine turtles: Six out of the seven marine sea turtle species are threatened with extinction. Fisheries bycatch has been ranked as the most significant threat to sea turtle populations globally, followed by climate change. A global comparison of calculated impact scores between three classes of gear types (longlines, nets and trawls) was conducted. Incidental catch of marine turtles in longline fisheries is one of the most serious threats to marine turtle populations (Gilman and Huang, 2017). Gilman and Huang (2017) summarised the following in the case of longline fisheries, “fish bait also reduced hard-shelled turtle deep hooking. Wider circle hooks reduced both leatherback and hard-shelled turtle catch rates relative to narrower J and tuna hooks and reduced the proportion of caught hard-shelled turtles that were deeply hooked.” It is not necessarily possible to interpret low numbers of interactions with low impact. Turtle populations in some areas are small

	and localised and even minimal mortalities can have an impact either directly or indirectly (Gascoigne et al., 2015). Indirect effects for turtles were perceived to be surrounding disturbance around inshore nesting areas, given these are deep water fisheries, this is unlikely to be impacted. Additionally, plastic disposal and waste management issues are increasing problems in fisheries. Clukey et al., 2017 noted 100% olive ridley, 90% green and 80% of loggerhead turtles captured as bycatch in longline operations in the Pacific had ingested plastic. Whilst this particular study didn't note any adverse health impacts directly relating to plastic ingestion, the indirect effects at this stage are unclear and need further study. Given there is no fishery-specific data on the fleets operating in this fishery, including whether there are waste management protocols; there is uncertainty around both the direct and indirect effects of the fishery. On a precautionary basis, SG80 cannot be awarded for turtle populations. Cetaceans: There are two main types of interaction between cetaceans and longlines: depredation and entanglement, the latter often following on from the former (Anderson, 2014). The study by Gilman et al. (2006a) found only one interaction with a toothed whale in the Palau longline fishery. On this basis, the team considered it highly likely that the UoA is not hindering recovery of cetacean species. For indirect effects, noise disturbance is likely to be minimal because the number of vessels is limited in a number of cases. It is known that marine mammals have changed their foraging behaviour in response to the availability of fish on longlines – individual fishers will try to mitigate this by avoiding setting or hauling in the presence of mammals if possible. Aside from the risk of bycatch (considered above), it has been shown in other fisheries (e.g. orcas in toothfish fisheries) that the impact on the mammals themselves is positive, as one would expect. However, as per the rationale of marine turtles, the issue of marine plastics cannot be ruled out as an indirect effect. Without further information on fleet waste management, SG80 cannot be awarded on a precautionary basis. Seabirds: The category of ETP species is unlikely to be an issue, given the tropical nature of the fishery. Given that the distributions of albatrosses and large petrels, which are main at-risk species susceptible to capture in pelagic longline fisheries, occur poleward of 20 degrees latitude in both hemispheres, it is highly unlikely that this fishery overlaps with these species. Indirect effects were thought to be disturbance around nesting and roosting areas and marine waste. As these are in more poleward latitudes, effects were considered to be unlikely not to create unacceptable impacts. As with marine turtles and

	cetaceans, the issue of waste management in the fishery needs to be clarified before awarding a score of SG80 or above for seabirds. No MSC fishery in the regions have failed on ETP but without fishery independent data, it was not possible to give an accurate score. Problems with under or misreporting, especially with low observer for a number of flag states coverage and poor stock status of some ETP species (silky and oceanic whitetip sharks for example), a condition is highly likely. At this stage, this PI scores <60.
Improvement Recommendations	Due to the constraints of the FIP, no fishery specific data was provided. This will be the first step to give an accurate score for ETP PIs. Understanding the species encountered will then enable the FIP to build a ETP management plan to ensure best practices are being used. This plan could include delivering skipper training etc.
Priority	High

Medium priority issues (those that passed with conditions, SG60-79) are as follows:

1.1.1	Stock status – EPO bigeye and EPO yellowfin		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	EPO bigeye: For SIa, to achieve SG60 it has to be likely (≥ 70th %ile), for SG80 is has to be highly likely (≥ 80th %ile) and for SG100 there has to be a high degree of certainty (≥ 95th %ile) that current stock status is above the PRI; i.e. above 50%S_{MSY} or 20%$S_{0.}$ The most recent formal stock assessment (Xu et al., 2018) suggests that the 5%/95% confidence intervals for spawning stock sit at approximately 50% MSY, which means that there is approximately a 5% probability that the stock is below the MSC default for the PRI. The 2019 assessment uses indicators rather than a formal assessment model, because the model was not considered robust. These indicators (catch, average weight per fish, closure-adjusted capacity and three FAD-related indicators) (Figure 7) are all at levels set as the outer safe limit, except for catch. Since these limits are well before the point at which recruitment should be impaired, SG80 is met for SIa. The management goal of the Commission is to maintain stocks at MSY. In order to score SG80, the stock must be fluctuating at or around a level consistent with MSY. The 2018 stock assessment was not considered robust and pending re-evaluation there was no estimate of S/S_{MSY} in 2019. Overall given the conclusions of the 2019 indicator analysis, there is not sufficient evidence that the stock is fluctuating around a level consistent with MSY. SG80 is not met for SIb. EPO yellowfin: An updated assessment was conducted in 2019. The limit reference points for EPO yellowfin is set at 0.28*SMSY. As with bigeye, the IATTC LRP for yellowfin is below the MSC default level for PRI (50%BMSY / 20%B0), so these defaults are used for scoring instead. Since 20%S0 is close to the level of SMSY estimated analytically (27%S0); this was not considered a suitable proxy for the PRI, so 50% of SMSY is used. To achieve SG60 for SIa, it has to be likely (≥ 70th %ile), for SG80 is has to be highly likely (≥ 80th %ile) and for SG100 there has to be a high degree of certainty (≥ 95th %ile) that current stock status is above the PRI; i.e. above 50%SMSY or 14%S0). According to the approximate 5%/95% CIs (Error! Reference source not found.) the lower bound estimate of S is well above this level. This means that there is <5% probability that the stock is below the PRI. Since 2011, when the SBR fell as a result of the series of low recruitments that coincided with a series of strong La Niña events, it has been estimated to be at, or slightly below, the MSY level. At the start of 2019 it was estimated to be 0.21, below the MSY level (0.27). Fishing mortality rates for yellowfin tuna are		

	now above maximum sustainable yield (MSY) levels (F multiplier = 0.89), a substantial change from the last assessment. Yellowfin tuna in the eastern Pacific Ocean are now overfished and undergoing overfishing (Minte-Vera et al. 2019). Current stock status relative to the MSY reference point (SMSY=3,638 t) is Srecent /SMSY = 0.76 (base case model). For SIb, the stock is no longer at or fluctuating around a level consistent with MSY. Given uncertainty on the stock status, it is probable that fishing mortality needs to be reduced to achieve MSY and therefore SG80 is not met. A condition would not be raised for this PI, instead dealt with under PI 1.1.2 – stock rebuilding.
Improvement Recommendations	The management goal of the Commission is to maintain stocks at MSY. In order to score SG80, the stocks must be fluctuating at or around a level consistent with MSY. The stock assessments were not considered robust. The FIP will have to make sure the commissions are working to remove these issues and produce well rounded stock assessments.
Priority	Medium

1.1.2	**Stock rebuilding – EPO bigeye and EPO Yellowfin**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	As the score for PI 1.1.1 for bigeye and yellowfin was less than SG80, PI 1.1.2 “stock rebuilding” must be addressed, in lieu of a condition, which is required for all other PIs failing to meet SG80. The decline in stock status to below MSY level is not well understood due to various uncertainties. As a precautionary measure, the Commission should ensure that catches are reduced to end overfishing and allow the SSB to recover to SSB_{MSY} levels. At this stage, no catch limits are specified for the bigeye stock. The current management measure for bigeye, yellowfin and the other target species in this assessment is C-17-02 (conservation measures for tropical tunas in the eastern Pacific Ocean during 2018 – 2020 and amendment to Resolution C-17-01. A workplan has been developed to address the issues identified in the assessment review, aimed at increasing the Committee’s ability to provide more concrete and robust advice by the 2019 meeting of the Scientific Committee. An external review was part of the workplan and that was done in March 2019 and is available online, and there is evidence that the work is on schedule. Therefore, monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe. SG60 is met. As yet, there is no evidence the rebuilding strategies are rebuilding stocks. SG80 is not met.		
Improvement Recommendations	Current fishing mortality needs to be reduced to 89% of 2015 – 2017 average levels (F-multiplier = 0.89) to achieve MSY to enable the PI to meet SG80.		

	The fishery must work to advocate authorities and RFMO to reduce this.
Priority	Medium

1.2.1	**Harvest Strategy**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	The harvest strategy objective is to maintain stocks at a level that can support MSY. The status of the stock relative to MSY is monitored by the scientific staff of IATTC and is reported to the Commission. The Commission then can respond to the scientific information by developing resolutions for management actions to be implemented by the member states. While formal targets and limits have not been adopted by the IATTC, the MSY criterion is effectively used as the target. In 2016, IATTC adopted a HCR for tropical tunas based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02). If the estimated fishing mortality is higher than F_{MSY} for either stock then fishing mortality should be reduced to F_{MSY}. To achieve this there are currently two management tools used by the IATTC that are agreed among fishing nations and passed as IATTC Resolutions. The first is in the form of season closures, while the second is limits on fishing capacity. Currently, this harvest strategy is set out in C-17-02, which is due to operate for 2018-2020, with a review of the strategy due before 2021. C-17-02 stipulates that the Commission scientists should review stock status (the F-mult) each year for yellowfin (and bigeye) and adjust the length of the closure according to the stock with the lowest F-mult (see under 1.2.2). The harvest strategy is however simple, if fishing mortality is higher than the level producing MSY, reduce F to F_{MSY} and therefore would be expected to achieve stock management objectives, i.e. MSY and SG60 is met for SIa. On the basis that the most recent stock assessment shows the yellowfin stock biomass to be below MSY and fishing mortality to be above MSY, it cannot be said that the strategy is responsive to the state of the stock and so SG80 is not met. The harvest strategy is implemented by restricting effort of the entire fishery for yellowfin, bigeye and skipjack, and in theory would be likely to work. SG60 is met for SIb. SG80 is not met because the state of the stock means there is no evidence that the harvest strategy is achieving its objectives. Resolution C-17-02 requires monitoring of a number of activities, including landings and transhipments, national compliance on measures through MCS and IATTC analyses the effects on stocks of the implementation of measures. SG60 is met.		

	Resolution C-16-02 provides a comprehensive road map for the evaluation of harvest control rule for the tropical tunas (yellowfin, bigeye and skipjack). It has been reviewed and improved as necessary. For example, IATTC recognised that that target reference points (TRPs) should also include the level of biomass as well as F if the long-term sustainable exploitation of the fish stocks, therefore during its 87th annual meeting interim LRP and TRPs were adopted for yellowfin (and bigeye). SG80 is met. This fishery targets yellowfin specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Discarding rates for yellowfin are minimal. Hence there is no 'unwanted catch'[40] of yellowfin in this fishery. C-17-02, paragraph 24 states all bigeye, skipjack and yellowfin brought on board is required to be landed, except that unfit for human consumption.
Improvement Recommendations	Harvest strategies are currently limited and need to be developed further by the IATTC. The fishery should help the RFMO develop this strategy and engage in any consultation processes.
Priority	Medium

1.2.2	**HCR and Tools**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	The HCR for EPO tropical tunas is set out in Res. C-16-02 (see bigeye above). It can be expected to keep the biomass above the limit reference point, and most likely above the PRI (given the relatively precautionary probability of $B<B_{lim}$ set as a trigger for management action). SG60 for SIa is met. The HCR until the most recent stock assessment has kept the stock fluctuating at or around a level consistent with MSY. The HCR is explicit (that *if $F>F_{MSY}$ it will be returned to F_{MSY}),* quantitative, and measurable, and is therefore considered well-defined, in place and 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. SG80 is met for SIa. The IATTC has operated for many years for bigeye and yellowfin under an operational HCR of fishing at F_{MSY} and has adopted interim target (TRP) and limit (LRP) reference points. Although the strategy has not been evaluated for yellowfin Maunder et al. (2015) used management		

[40] * SA3.1.6: The term 'unwanted catch' shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid and did not want or chose not to use.

	strategy evaluation (MSE) to evaluate the robustness of the HCR to the main uncertainties using bigeye tuna as an example. Since the HCR sets the lower of the two estimated F for bigeye and yellowfin, this is a useful exercise for yellowfin. The analysis included misspecification of the steepness of the stock-recruitment relationship and natural mortality. The 2018 stock assessment is highly uncertain, with IATTC scientists noting that estimates of stock status in relation to reference points are not robust enough to be used by management. Steepness is a key uncertainty and remains a problem for the assessment. A wider range of uncertainties need to be considered and MSE needs to be run for yellowfin. Based on the results of the preliminary MSE for BET and the performance of the stock in the past, SG80 is met for SIb. The tools to implement the HCR are set out in Res. C-17-02; the key tool is the seasonal closure. They were selected by IATTC because they have been used in the past and/or can be used over periods longer than a year (see C-16-02); IATTC have taken a pragmatic approach to the selection of appropriate tools. The seasonal closure is likely to be sufficient to control the exploitation rate to ensure that the PRI is not crossed, meeting SG60. However, it cannot be argued to be likely to achieve the exploitation rates set out in the HCR (i.e. the reference points), so SG80 is not met.
Improvement Recommendations	HCRs are currently limited and need to be developed further by the IATTC and WCPFC. The fishery should help the RFMO develop this strategy and engage in any consultation processes. Current actions engage with the RFMOs to achieve these recommendations.
Priority	Medium

2.3.2	**ETP Species Management**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	Sharks: There are various CMMs in place at regional level which relate to shark bycatch. CMM 2010-07 is the overarching measure on sharks which stipulates *inter alia* that fins on board vessels should total no more than 5% of the weight of sharks on board up to the first point of landing and that CCMs should develop a national NPOA in line with the FAO's IPOA. At best, this constitutes measures in place which are expected not to hinder the recovery of ETP shark species. Assumed low observer coverage prevents any score higher than SG60 being met. It should be noted also that more shark species are receiving protected statuses, so the need for stronger measures for shark species generally within the fishery should look to be adopted.		

	Silky sharks: CMM 2013-08 is in place for this species specifically. It requires the prohibition of retaining the shark or its products on-board. Number must be recorded by the fishery itself and if accidentally captured, best efforts made for their safe release. There are therefore measures in place to ensure the UoAs do not hinder the recovery of the stock. The lack of fishery-specific data and assumed low observer coverage precludes a higher score than SG60 here, as there is no evidence that the measures are being implemented or reviewed. Oceanic whitetip sharks: As with silky sharks, CMM 2011-04 has be enacted for this species. Otherwise rationale as per silky sharks. There are therefore measures in place to ensure the UoAs do not hinder the recovery of the stock. The lack of fishery-specific data ad assumed low observer coverage precludes a higher score than SG60 here, as there is no evidence that the measures are being implemented or reviewed. Giant manta and mobula rays: There are no specific management measures for manta and mobula rays in the WCPO. WCPFC 13 adopted that manta and mobula rays shall be considered WCPFC key shark species for assessment and thus listed under the Shark Research Plan, noting that data gaps may preclude a traditional stock assessment approach. CMM 2019-03 covering non-target species requires those species not retained should be promptly released to the water unharmed. SC12 also recommended that the WCPFC considers adopting guidelines for safe release of mobulid rays caught incidentally in WCPFC fisheries, and a good practice guide has been produced and distributed to inform fishers of the best techniques for releasing sharks and rays. This constitutes measures enough to meet SG60. SG80 cannot be awarded due to the lack of formalised, directed management for mobulids. Cetaceans: There are no management requirements regarding cetaceans for longline fisheries (only purse seine). Despite specific longline management, the Pacific Islands where the fishery operates (Australia, **Cook Islands**, **FSM**, **Fiji**, **French Polynesia**, Marshall Islands, Nauru, New Zealand, Niue, Palau, PNG, Samoa, Tokelau, Tonga, **Vanuatu**, UK, USA, Solomon Islands, Kiribati and Tuvalu) are however signatories to the Memorandum of Understanding (MoU) for the Conservation of Cetaceans and their Habitats in the Pacific Island Region. On the basis that cetaceans are unlikely to be a problem for the fishery under assessment, the team considered this requirement to constitute a strategy and sufficient for SG80 to be met.

	Seabirds: Based on the analysis by Filippi et al. (2010), like cetaceans, ETP seabirds are not deemed to be an issue in these fisheries given the areas of operation. SG80 is met. Marine turtles: All tuna RFMOs have been working to eliminate and mitigate interactions with sea turtles over many decades. WCPFC have adopted CMM 2008-03 – Conservation Management Measure of Sea Turtles which covers both longline and purse seine operations. The WCPFC has also developed several guidelines for handling sea turtles when captured by purse seine operations and vessels are required to ensure their safe release wherever practicable. Longline vessels must also carry and use dip-nets in accordance with these WCPFC guidelines; only use large circle hooks and whole finish for bait. The measures are considered likely to work based on research on turtle interactions/bycatch issues in longline fisheries (Gilman and Huang, 2017 for example). SG60 is at least awarded.
Improvement Recommendations	The lack of fishery-specific data and assumed low observer coverage precludes a higher score than SG60 here, as there is no evidence that the measures are being implemented or reviewed. The fishery must collate fishery independent data to be able to score the PI effectively and improve human observer coverage through engaging with authority's observer programmes. Advocation to increase observer coverage requirements at a RFMO level is also required. Current actions with EM and engaging with Vanuatu are in place, the action plan needs to reflect the Chinese flagged vessels.
Priority	Medium

2.3.3	**ETP Species Information**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	For all scoring elements, there is some quantitative information adequate to assess whether the UoA is a threat to the recovery of ETP species and to support a strategy. This data comes in the form of observer reports and electronic monitoring. This records volume and fate. Further work needs to be done on condition on release and continuing to engage to get human observers on board. This is supported by robust processes and training delivered to skippers on ETP species identification and accurate reporting to improve the quality and quantity of data. This information means it will score SI(a)80. An ecological risk assessment is currently being planned for 2020 and this alongside more data will help us be able to assess with a high degree of certainty the magnitude of the UoAs impact on ETP species and increase this score to SI(b)80.		

	Regarding SI(b) information is adequate to support measures but not strategies to manage impacts on ETP species. An ecological risk assessment is currently being planned for 2020 and this alongside more data will help us be able to assess with a high degree of certainty the magnitude of the UoAs impact on ETP species and increase this score to SI(b)80. Overall the score would be SG60-79 and current actions will ensure the score increases in the FIPs lifetime.
Improvement Recommendations	An ecological risk assessment is currently being planned for 2020 and this alongside more data will help us be able to assess with a high degree of certainty the magnitude of the UoAs impact on ETP species and increase this score to SI(b)80.
Priority	Medium

3.1.1	**Legal and Customary Framework – China**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	China: With regard to dispute resolution (SIb), Chapter 5 – Legal Liability of the Chinese Fisheries Law, Article 33 states: "The administrative sanctions stipulated in this Law shall be decided by departments of fishery administration or their subordinate fishery superintendency agencies. Any party who refuses to accept the decision on an administrative sanction may file a suit in a people's court within 30 days after receiving notification of the decision. If the party neither files a suit nor complies with the decision within the time limit, the agency that made the decision shall request the people's court to compel execution of the decision. However, a party which is engaged in maritime operations must comply with the sanction before filing a suit." This demonstrates that there is at least a mechanism for the resolution of legal disputes. It's transparency nor effectiveness can be commented on, as no evidence could be found. For now, SG60 is at least met.		
Improvement Recommendations	No evidence could be found on its transparency nor effectiveness so an initial fact finding is required to understand this, if not, advocacy must take place.		
Priority	Medium		

3.1.2	**Consultation, Roles and Responsibilities – China**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	China: This report uses the scorings from Morgan et al., 2018, who had on-site meetings for the full assessment. For China, it was "not clear		

	how particular stakeholders are contacted or why by the competent authority, or *for what matters* or *how often (regularity)*, nor are generalised minutes or transparent records of consulted participants available. It is not clear whether these arrangements are formalised in policy or legislation. It is also unclear if they can be initiated at any time, rather than just in the lead up to the WCPFC annual meeting". On this basis SG80 was not met, as only evidence could be found of the management system obtaining information for stakeholders, not that it regularly sought the relevant information. SG60 only is met for SIb.
Improvement Recommendations	No evidence could be found on consultation, Roles and Responsibilities so an initial fact finding is required to understand this, if not, advocacy must take place.
Priority	Medium

3.2.2	**Decision Making Process – China**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	China: According to FCRv2.0 "The focus for this PI is on the decision-making processes themselves, and if they actually produce measures and strategies within the fishery-specific management system. It is not an evaluation of the quality of those measures and strategies as this is covered elsewhere in the tree structure under P1 and P2 (GSA 4.8)"… "Established" decision-making processes should be understood to mean that there is a process that can be immediately triggered for fisheries-related issues, the process has been triggered in the past and has led to decisions about sustainability in the fishery". The management system of relevance to this SI is at the RFMO level, either WCPFC or IATTC depending on the UoA, as the fishery is not taking place in Chinese waters. Please see the rationales for either WCPFC (Table 19) or IATTC (Table 20) for SIa. According to Morgan et al., 2018, it is not clear as to whether China has well-developed and responsive (transparent, adaptive, timely) processes nor that national measures routinely apply to serious and other important (flag State) issues. This rationale was based on a lack of evidence during the full assessment process. "The assessment team received evidence of Chinese pre-meeting arrangements that provide one process for consultation on WCPFC issues prior to decisions being made at the regional level to develop a national position on proposed CMMs" (Morgan et al., 2018). In line with the WPSTA assessment, SG80 is not met for SIb. With regard to the precautionary approach (SIc), information being available to stakeholders on request (SId) and the management		

	system's approach to disputes (SIe), the RFMO management level is deemed most relevant and should be focussed on for this PI, rather than the national level management. Please see the rationales for either WCPFC (Table 19) or IATTC (Table 20) for these scoring issues (all awarded at least SG80).
Improvement Recommendations	It is not clear as to whether China has well-developed and responsive (transparent, adaptive, timely) processes nor that national measures routinely apply to serious and other important (flag State) issues. This rationale was based on a lack of evidence during the full assessment process. "The assessment team received evidence of Chinese pre-meeting arrangements that provide one process for consultation on WCPFC issues prior to decisions being made at the regional level to develop a national position on proposed CMMs" (Morgan et al., 2018). In line with the WPSTA assessment, SG80 is not met for SIb. The FIP will have to work to find the evidence if this is in place, if not, the FIP will have to work to produce these processes and measures.
Priority	Medium

3.2.3	**Compliance and Enforcement – China and Vanuatu**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	China: Currently, licensing is the main approach to manage Chinese vessels conducting fishery activities, where there is a gap to evaluate post-licensing activities conducted by fishing vessels. Liabilities are defined in the 'Fisheries Law of the People's Republic of China' where the most serious scenario is to confiscate the vessel. Though some laws and regulations were set to manage Chinese fishing vessels, IUU fishing is well-known worldwide by Chinese fishing vessels. Poor regulation and weak global enforcement are some of the key factors behind it and is not well-controlled by Chinese flagged vessels and legal authorities. Based on the information available, sanctions to deal with non-compliance exist and there is some evidence that they are applied, SG60 requirements are therefore met. However, there is not sufficient evidence to conclude they are consistently applied and provide an effective deterrence, meaning SG80 requirements are not met for SIb. Vanuatu: The Fisheries Division's MCS programme adheres to national management measures and regionally adopted management measures formulated by the WCPFC. The MCS programme is responsible for the management of VMS system, monitoring catch log sheets, licensing of fishing vessels, managing the national observer programme and conducting at-sea inspections with two patrol vessels. The Fisheries Act 2014 Part 19 outlines the requirements and responsibilities for the		

	maintenance of the MCS system. SG80 is met for SIa as there is a MCS in place, which demonstrable ability to enforce relevant CMMs. Part 19 of the Fisheries Act (2014) also details the sanctions applied for non-compliance to regulations concerning VMS, Port State Measures and catch documentation. In most cases this is monetary fines (for example someone who falsifies catch certification for an import of seafood into Vanuatu can face fines of up to VT5000,000,000 (US$ 4,281,551)) but prison terms are also possibilities depending on the severity of the crime. “A person who divulges information from a vessel monitoring system, to any other person not authorised to receive the information, commits an offence punishable on conviction by a fine not exceeding VT100,000,000 (US$855,809), or by a term of imprisonment of not more than two years, or both”. Property seizure is also another possible sanction for non-compliance. These are therefore expected to provide effective deterrence and so SG80 is met for SIb. The lack of violations from the fleet reported by the Fisheries Division (only 20 minor infractions with 100% being resolved since 2014) leads to the conclusion that the sanctions are either effective and provide effective deterrence or insufficient to identify offenders. Observer reports from 2014 were the most recent that the Fisheries Division had available. The observer coverage was only 2.7% which is well below the 5% regional requirement. SG80 could not be awarded on this basis for SIc. There is no evidence of systematic non-compliance. SId meets SG80 on this basis.
Improvement Recommendations	Based on the information available, sanctions to deal with non-compliance exist and there is some evidence that they are applied, SG60 requirements are therefore met. However, there is not sufficient evidence to conclude they are consistently applied and provide an effective deterrence. The FIP will need to provide this evidence and if lacking work with authorities to improve enforcement.
Priority	Medium

3.2.4	**Management Performance Evaluation – China and Vanuatu**		
Scoring Guidepost	SG 60	SG 80	SG 100
Scoring Rationale	The management system has internal processes to evaluate management performance. These include evaluations of policy, research, operations, compliance and enforcement. These are carried out on a regular basis. SG80 is therefore met for SIa.		

	There is no evidence of any external reviews, which is not to say that there haven't been any. In the absence of information SG80 cannot be met for SIb.
Improvement Recommendations	It is recommended to first engage with flag states to see if external reviews have taken place. If not, the FIP must advocate the authorities to conduct one.
Priority	Medium

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9 Appendices

9.1 Assessment information

9.1.1 Small-scale fisheries

No small-scale fisheries were identified for any of the UoAs listed in this pre-assessment.

9.2 Evaluation processes and techniques

9.2.1 Site visits

A site visit was not conducted for this pre-assessment.

9.2.2 Recommendations for stakeholder participation in full assessment

Stakeholders were not conducted for this site visit. However, for the full assessment it will be important to engage with the following groups of stakeholders:

- Overlapping fisheries (certified and in assessment);
- Overlapping Fishery Improvement Projects (FIPs);
- NGOs with an interest in the fishery;
- Secretariat to the Pacific Community (SPC);
- Inter American Tropical Tuna Commission (IATTC);
- Western and Central Pacific Fisheries Commission (WCPFC);
- National management authorities for which the fisheries may operate.

9.3 Harmonised fishery assessments

Harmonisation will be required in the case of this fishery. It should be noted that by the time this fishery is ready for MSC full certification, more fisheries may well have become MSC-certified. Table 25 below lists the overlapping fisheries at the time of this report being written.

Table 25 – Overlapping fisheries with this assessment

Fishery name	Certification status and date	PIs to harmonise
WPSTA Western and Central Pacific skipjack and yellowfin free school purse seine	Certified June 2018	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Walker Seafood Australia albacore, yellowfin tuna and swordfish	Certified August 2015	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Tri Marine Western and Central Pacific skipjack and yellowfin tuna	Certified June 2016	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
North-eastern tropical Pacific purse seine yellowfin and skipjack tuna fishery	Certified September 2017	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific albacore & yellowfin and bigeye longline	Certified June 2015 (with bigeye in assessment)	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
French Polynesia albacore and yellowfin longline fishery	Certified June 2018	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Solomon Islands skipjack and yellowfin tuna purse seine and pole & line	Certified with components in assessment July 2016	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
PT Citraraja Ampat, Sorong pole and line skipjack and yellowfin tuna	Certified November 2018	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
PNA Western and Central Pacific skipjack and yellowfin tuna	Certified December 2011	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
American Samoa EEZ albacore and yellowfin longline	Certified November 2017	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Japanese Pole and Line skipjack and albacore tuna fishery	Certified October 2016	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4

Fiji albacore and yellowfin LL	Certified December 2012	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
SZLC CSFC & FZLC FSM EEZ longline yellowfin tuna	Certified October 2018	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
SZLC CSFC & FZLC FSM EEZ longline bigeye tuna	Certified March 2019	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Tropical Pacific yellowfin and skipjack free-school PS fishery	Certified October 2019	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Pan Pacific bigeye, albacore and yellowfin longline fishery	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Solomon Islands longline albacore and yellowfin tuna	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
MIFV RMI EEZ longline yellowfin and bigeye tuna fishery	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Kiribati albacore, bigeye and yellowfin longline fishery	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
PNG Fishing Industry Association's purse seine skipjack and yellowfin tuna	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Ishihara Marine Products albacore and skipjack pole and line fishery	Certified March 2019	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
North Buru and Maluku Fair Trade Fishing Associations, Indonesian handline yellowfin tuna	In assessment	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Japanese pole and line skipjack and albacore tuna fishery	Certified October 2016	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
New Zealand albacore tuna troll	Certified May 2011	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
Canada Highly Migratory Species Foundation (CHMSF) British Columbia albacore tuna north Pacific	Certified March 2010	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
AAFA and WFOA north Pacific albacore tuna	Certified August 2007	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4
AAFA and WFOA south Pacific albacore tuna	Certified September 2007	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4

9.4 Table of Scores for each MSC PI

Table 26. Principle 1 list of scoring for WCPO and EPO longline fisheries for albacore, bigeye and yellowfin tuna

Component	PI	Performance Indicator	WCPO BET	WCPO YFT	EPO BET	EPO YFT	SP ALB	NP ALB
Outcome	1.1.1	Stock Status						
	1.1.2	Stock Rebuilding	N/A	N/A			N/A	N/A
Management	1.2.1	Harvest Strategy						
	1.2.2	HCR and Tools						
	1.2.3	Information and Monitoring						
	1.2.4	Assessment of Stock Status						

Key

Pass without conditions	
Pass with conditions	
Fail	

N/A – Not Applicable

Table 27. Principle 2 list of scoring WCPO and EPO longline fisheries

Principle 2 – Minimising Environmental Impacts			WCPO	EPO
Primary Species	2.1.1	Outcome		
	2.1.2	Management		
	2.1.3	Information		
Secondary Species	2.2.1	Outcome		
	2.2.2	Management		
	2.2.3	Information		
ETP Species	2.3.1	Outcome		
	2.3.2	Management		
	2.3.3	Information		
Habitats	2.4.1	Outcome		
	2.4.2	Management		
	2.4.3	Information		
Ecosystem	2.5.1	Outcome		
	2.5.2	Management		
	2.5.3	Information		

Table 28. Principle 3 list of scoring flag states involved in the fishery

Principle 3 – Effective Management						
			WCPFC	IATTC	China	Vanuatu
Governance and Policy	3.1.1	Legal and Customary Framework				
	3.1.2	Consultation, Roles & Responsibilities				
	3.1.3	Long Term Objectives				
Fishery Specific Management System	3.2.1	Fishery Specific Objectives			N/A	
	3.2.2	Decision Making Process				
	3.2.3	Compliance and Enforcement				
	3.2.4	Management Performance Evaluation				