WCPO purse seine tuna Fishery Improvement Project

Confidential MSC Pre-assessment for

Thai Union

by **Key Traceability Ltd.**

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Reviewed by - Dr. Jo Gascoigne

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Contents

1 Executive summary

This document presents the results of the pre-assessment against the Marine Stewardship Council (MSC) Fisheries Standard for sustainable fishing (version 2.0). The fishery being assessed is the WCPO purse seine tuna fishery (FCF- and Silla-operated vessels). The fishery targets skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*T. obesus*) through free-school and FAD-associated purse seine sets in the western and central Pacific Ocean (national EEZs and high seas). The vessels are predominately flagged to Taiwan, but other coastal state flags may also be included in this project. The fishery is managed regionally by the Western and Central Pacific Fisheries Commission (WCPFC).

The aim of the document is to give guidance on gaps against the MSC Fisheries Standard that could be improved by a Fisheries Improvement Project (FIP).

The following Units of Assessment (UoAs) were considered in this report:

- Western and Central Pacific Ocean (WCPO) stocks of skipjack, bigeye and yellowfin, caught by purse seine on FAD associated sets and managed regionally by relevant national management and regionally by WCPFC (three UoAs);
- Western and Central Pacific Ocean (WCPO) stocks of skipjack, bigeye and yellowfin, caught by purse seine on non-associated sets (free-school) and managed regionally by relevant national management and regionally by WCPFC (three UoAs).

This pre-assessment only considered publicly-available data and no site visits or consultations with stakeholders were carried out. Data was collected from the WCPFC website and other publicly-available studies. Additional information was obtained from existing MSC fishery assessments.

Overall, all stocks 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.

For Principle 2, the fishery predominantly catches the target species, with very small percentages of other bycatch species. The free-school UoAs overall scored well, as have other MSC-certified purse seine fisheries in the region. Two important issues have been identified in relation to FAD use in the fishery. One surrounds the unobserved mortality of ETP species caused by entanglement with FADs, and the other, the lack of information on ecosystem impacts of FADs. The former only applies if entangling FADs are used, but it is thought that this may be the case in this fishery. Entanglement in FADs is an issue for a range of species, but principally, it is thought, silky sharks (Filmalter et al., 2013) and turtles.

For Principle 3, the pre-assessments, which considered the WCPFC management system, predicted scores of 80 or above for all PIs. This agrees with recent MSC assessments of WCPFC-managed stocks. National management has not been investigated in this pre-assessment. It should however be noted that as of 1st January 2020, CCMs shall ensure that the design and construction of any FAD to be deployed in or that drifts into, the WCPFC Convention Area shall comply with the non-entangling design currently specified in CMM 2018-01. The purpose of which is to reduce the risk of entanglement of sharks, marine turtles or any other species. Failure to comply with this would raise compliance issues and would at least lead to a condition at full assessment.

In general, the key strengths of the fishery are:

- 100% observer coverage, which would give verified, accurate and comprehensive data for all species interacting with the fishery, not just the target or commercially valuable species at full assessment;

- Selective fishery, with ≥95 %of catch attributed to the target species of bigeye, yellowfin and skipjack;
- The regional governance and management of the fisheries is well documented and well implemented.

The key weaknesses in the fishery are:

- Lack of a formal harvest strategy and harvest control rules for the target stocks (bigeye, yellowfin and skipjack tuna);
- Lack of management and information for manta and mobula ray species;
- Risk of use of entangling FADs leading to unobserved mortality of ETP species;
- Lack of information on the ETP and ecosystem impacts of FADs.

In conclusion, one Performance Indicator in this assessment scored <60, which was for ETP species outcome (PI 2.3.1) for the FAD associated part of the fishery. This would cause the FAD fishery assessment to fail against the MSC Fisheries Standard. Other areas of Principle 2 also did not meet SG80 (secondary species management, PI 2.2.2; ETP species for free-school, PI 2.3.1, and ETP species information, PI 2.3.3, ecosystem outcome, PI 2.5.1 and ecosystem management, PI 2.5.2 for FAD-associated UoAs).

2 Glossary

Acronym	Definition
B_0	equilibrium unexploited total biomass
$B_{Fcurrent}$	equilibrium total biomass at Fcurrent
B_{init}	Initial biomass at the start of the stock assessment model (for the albacore assessment, B1960)
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
dFAD	Drifting Fish Aggregation Device
DWFN	Distant Water Fishing Nations
EAFM	Ecosystem Approach to Fisheries Management
EEZ	Exclusive Economic Zone
ENSO	El Niño–Southern Oscillation Index
ETP	Endangered, threatened or protected species
FAD	Fish Aggregation Device
FAO	Food and Agricultural Organisation
FCP	Fisheries Certification Process
FFA	Pacific Islands Forum Fisheries Agency
FFC	Forum Fisheries Committee
FIP	Fishery Improvement Programme
FMS	Fisheries Monitoring System
F_{MSY}	Fishing mortality at age resulting in MSY
HCR	Harvest Control Rule
ISSF	International Seafood Sustainability Foundation
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated (fishing)
LRP	Limit Reference Point
MCS	Monitoring, Control and Surveillance
MSC	Marine Stewardship Council

Acronym	Definition
MSY	Maximum Sustainable Yield
MSY, YFMSY	equilibrium yield at F_{MSY}
OFP	Oceanic Fisheries Programme (OFP) within the SPC Division of Fisheries, Aquaculture and Marine Ecosystems
PICTs	Pacific Island Countries and Territories
PNA	Parties to the Nauru Agreement
PRI	Point of Recruitment Impairment
RFMO	Regional Fisheries Management Organisation
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, SB1960)
SC	Scientific Committee
SEAPODYM	Spatial Ecosystem and Population Dynamics Model
SIDS	Small Island Developing States
SIDST	Small Island Developing States and Territories
SPC	Secretariat of the Pacific Community
TAC	Total Allowable Catch
TAE	Total Allowable Effort
TCC	Technical Compliance Committee of the WCPFC
TRP	Target Reference Point
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UoC	Unit of Certification
VDS	Vessel Day Scheme
VMS	Vessel Monitoring System
WCP-CA	Western Central Pacific (WCPFC) Convention Area
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean

3 Report details

This report serves as an update from the 2015 pre-assessment completed by FishListic. It has been written by Key Traceability and reviewed by Dr Jo Gascoigne, who is a registered technical consultant on the MSC website. It has been updated to follow the new MSC process (Fisheries Certification Process (FCP) v2.1), which is mandatory for all fisheries entering assessment. Since the 2015 pre-assessment, updates in stock assessments for all target species have also occurred and these are captured in this report. Additionally, the CAB-wide harmonisation for WCPO yellowfin and skipjack Principle 1 scoring has taken place and this is also reflected in the P1 scoring.

3.1 Aims and constraints of the pre-assessment

This report presents the results of a pre-assessment study for the Western and Central Pacific Ocean (WCPO) purse seine fishery for the following stocks: WCPO bigeye tuna (*Thunnus obesus*), WCPO skipjack tuna (*Katsuwonus pelamis*) and WCPO yellowfin tuna (*T. albacares*).

The purpose of this pre-assessment is to evaluate 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.

The following key constraints were identified which may influence the outcome of an eventual full assessment:

- No site visit was held for this pre-assessment because of the travel involved. Stakeholders were therefore not consulted.
- No data directly relating to the fishery was collected, this means that scoring has been by extrapolation, especially in relation to bycatch and ETP species under Principle 2.
- This pre-assessment only looks at the regional and sub-regional management. National management within EEZs has not been included in the analysis. This would need to be considered prior to commencing a full assessment for this fishery.
- Traceability systems in place in the fisheries were not analysed, and it is recommended this is investigated prior to full assessment to ensure compliance with fishery assessment traceability requirements and ascertain whether separate Chain of Custody (CoC) certification at the vessel level will be needed.

3.2 Version details

The report uses the MSC Fisheries Standard v2.0, the Fisheries Certification Process v2.01 and MSC pre-assessment reporting template v3.1.

4 Units of Assessment

4.1 Units of Assessment

Six Units of Assessment (UoA) were identified for this pre-assessment. These are listed in Table 1 to Table 6.

Table 1 – UoA 1

UoA 1	Description
Species	Bigeye tuna (*Thunnus obesus*)
Stock	Western and central Pacific Ocean bigeye tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – FAD associated
Justification for choosing UoA	Chosen by species and gear operation

Table 2 – UoA 2

UoA 2	Description
Species	Bigeye tuna (*Thunnus obesus*)
Stock	Western and central Pacific Ocean bigeye tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – free school (unassociated)
Justification for choosing UoA	Chosen by species and gear operation

Table 3 – UoA 3

UoA 3	Description
Species	Skipjack tuna (*Katsuwonus pelamis*)
Stock	Western and central Pacific Ocean skipjack tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – FAD associated
Justification for choosing UoA	Chosen by species and gear operation

Table 4 – UoA 4

UoA 4	Description

Species	Skipjack tuna (*Katsuwonus pelamis*)
Stock	Western and central Pacific Ocean skipjack tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – free school (unassociated)
Justification for choosing UoA	Chosen by species and gear operation

Table 5 – UoA 5

UoA 5	Description
Species	Yellowfin tuna (*Thunnus albacares*)
Stock	Western and central Pacific Ocean yellowfin tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – FAD associated
Justification for choosing UoA	Chosen by species and gear operation

Table 6 - UoA 6

UoA 6	Description
Species	Yellowfin tuna (*Thunnus albacares*)
Stock	Western and central Pacific Ocean yellowfin tuna
Geographical area	Western and central Pacific Ocean
Harvest method / gear	Purse seine – free school (unassociated)
Justification for choosing UoA	Chosen by species and gear operation

It should also be noted that the FAD component UoAs for this fishery (Table 1, Table 3, Table 5) are classified as enhanced fisheries, as FADs are classified by MSC scope criteria as habitat modified (see FCP v2.1 G7.4): “Habitat modifications in enhanced fisheries can include both physical changes to the sea bed or river course and the use of a range of man-made structures associated with the rearing or capture of fish that are not strictly ‘fishing gear’. In the first case, modifications can range from the construction of simple ponds in intertidal areas or river floodplains through to watercourse management measures aimed

at improving spawning habitats. Examples of the second case are fish attracting and/or aggregating devices (e.g. FADs), lobster casitas and mussel culture ropes (in CAG systems). Such artificial habitat modifications either enhance the productivity of the fishery or facilitate the capture or production of commercial marine species".

4.2 Description of the fishery

The fishery which is targeted for a FIP is made up of a fleet of 40-45 tuna purse seine vessels, flagged either to Taiwan or to a range of Pacific Island states. The vessels fish in the WCPO for the three tropical tuna species (with most of the catch being made up of skipjack). They deploy FADs, and fish on FADs and other floating objects, as well as setting on free schools.

Gillett (2007) outlined some major events affecting purse-seining in the Pacific Islands region during the two decades of expansion, including:

- Strong El Niño events, especially that of 1982 – 83, resulted in good purse seine fishing in the Pacific Islands and the opposite in the eastern Pacific. This is because in general, during El Niño years the purse seine fishery moves to the east of its normal location between Papua New Guinea and the Federated States of Micronesia;
- The South Pacific Tuna Treaty, signed in 1987 and coming into force in 1988 allowed the US purse seine fleet access to most of the region, especially the PICTS EEZs, except for closed areas in some EEZs and high seas pockets;
- There has been a general increase in the proportion of tuna caught by purse-seining relative to that by longline or pole-and-line. About 80 per cent of the WCPFC catch area tuna has been caught by this gear over at least the last decade (see Figure 1).

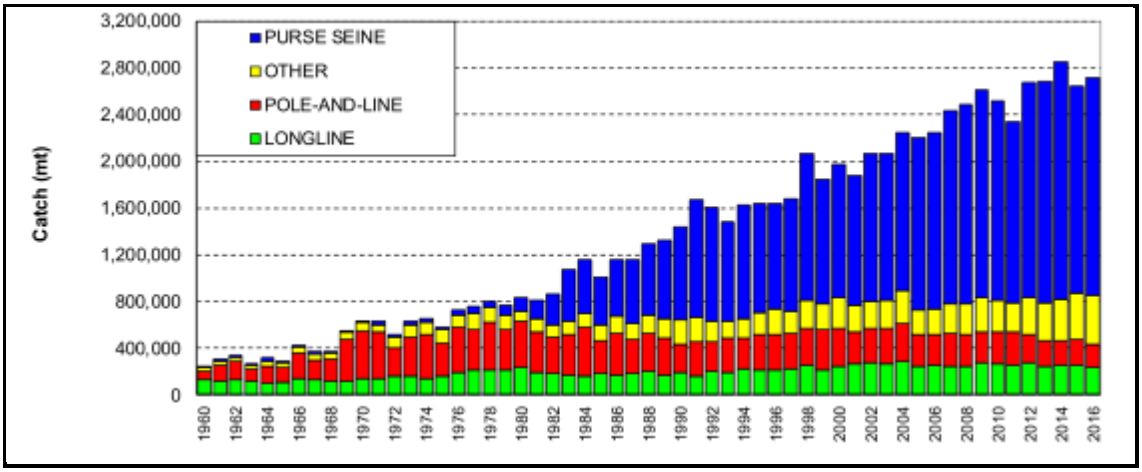

Figure 1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types (from Williams et al. 2017).

4.2.1 Gear type

Purse seine fishing involves enclosing a school of fish, in this case skipjack and yellowfin tuna, with a curtain of netting. Although specifications can vary, nets are typically made of nylon mesh (knotted or smooth) around 1,500 to 2,000 metres long and 120 to 250 metres in depth. Mesh sizes range from not less than 90 mm to around 120 mm when stretched in the centre (bunt) and at least 240 mm in 70% of the body or wings (Figure 2).

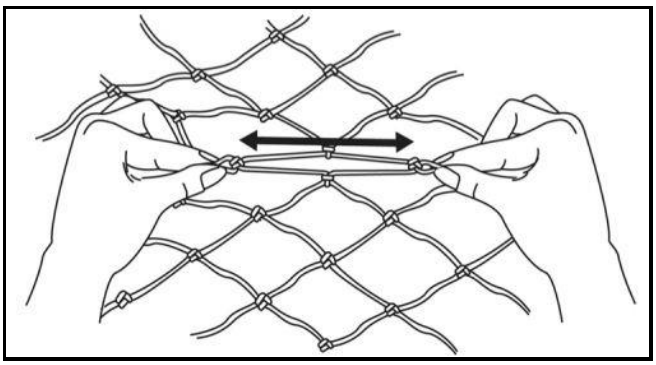

Figure 2. Illustration of a stretched diamond mesh (source: SPC illustration in ISSF Guidebook 2016).

The net lengths are divided into separate panels (strips), which can be replaced when the nets are damaged (Figure 3).

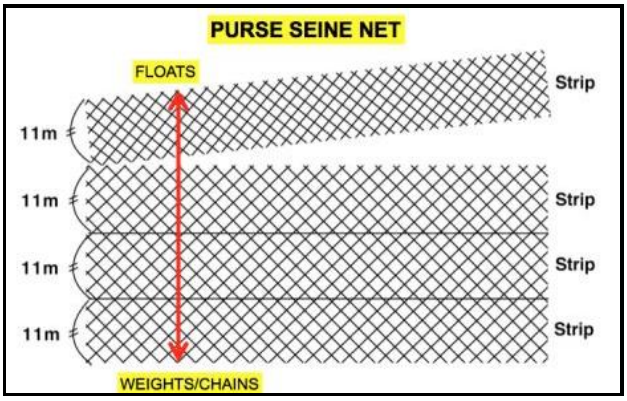

Figure 3. Net panel schematic (source: SPC illustration in ISSF Guidebook 2016).

The top of the net is mounted on a float line and the bottom on a lead line. The lead line generally consists of a steel chain with steel "purse" rings attached below the chain. The purse line running through the purse rings is also made of steel and allows the pursing of the net.

Once the vessel has identified a fish aggregation, the skipper will evaluate the species composition, school size, and chances of capturing the school. Often electronic devices like the echo-sounder and sonar are used to make these determinations. If the aggregation is at a Fish Aggregation Device (FAD), these tools are critical because most FAD fishing is initiated before daylight so other visual cues, such as fish on the surface or birdlife, cannot be used to evaluate the aggregation as would be the case for a free school. If the decision is made to make a set, the vessel is positioned by the skipper and then the skiff is released, towing the end of the net. The purse seine vessel tows the purse seine net around the aggregation to encircle them within the net. When the skiff and the seiner come together, cables and towlines are exchanged between the two vessels. The skiff then starts towing the purse seine vessel in order to manoeuvre it away from the net so that the net can be closed underneath the school by hauling the purse line running through the rings at the bottom of the net. This is "pursing" (see Figure 4). Once pursing complete, hauling the net onto the deck begins ("net rolling"). It is stacked on the back deck of the vessel with the aid of a power block and the crew.

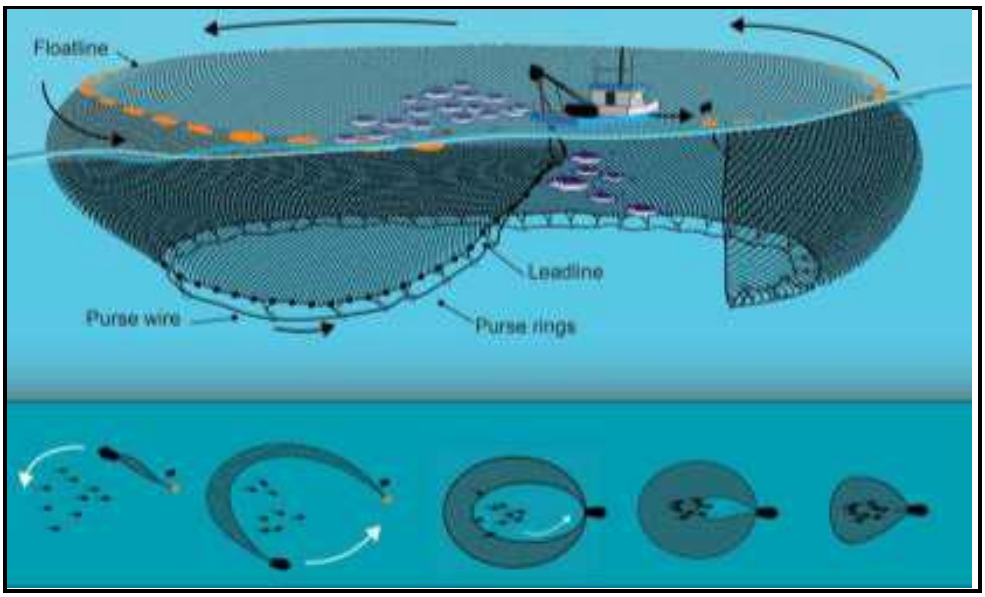

Figure 4. Illustration - a free school tuna purse seine set (Source: http://www.afma.gov.au/portfolio-item/purse-seine/).

As the volume of the net becomes smaller, the fish become more concentrated until the "sacking up" point is reached, where the final slack in the net is removed. The catch is concentrated and scooped out using a brailer (a smaller scoop). If favourable conditions present themselves on could have as many as three sets in one day.

A Fish Aggregation Device (FAD) was, at one point, defined by WCPFC Conservation and Management Measure CMM 2009-02 (recalling CMM 2008-01 footnote 1) as "any object or group of objects, of any size, that has or has not been deployed, that is living or non-living, including but not limited to buoys, floats, netting, webbing, plastics, bamboo, logs, and whale sharks floating on or near the surface of the water that fish may associate with." Schools of tuna may be found associated with such man-made and natural structures or organisms or be completely unassociated with any such structures or organisms by WCPFC definition. CMM 2018-01 has replaced the above CMM 2008-01, without carrying forward the general FAD description, which is now very widely understood in the fishery world (CMM 2009-02 is still in force) and has instead briefly defined an "instrumented buoy" also as a FAD.

4.2.2 Fleet size and operational area

Modern purse seiners are large industrial vessels that are capable of making extended trips of several weeks before returning to port to land or tranship the catch and resupply (Davies, 2014). In 2017 there were 325 active purse seiners operating in the WCP-CA (WCPFC, 2018a). In 2017, the combined total of bigeye, skipjack and yellowfin tuna landed in the WCP-CA was 2,438,129 metric tonnes. Table 7 provides a breakdown of the catch in 2017[1].

[1] Note that albacore has not been included in the species list as it is not a target of this fishery. The only gear consideration here has been purse seine, again as the subject of this assessment. The '% by purse seine' column in Table 7 represents the percentage of catch of target species taken by that gear type in 2017. The remaining percentage not displayed is the total taken by other fishing gears (longline, pole and line, troll and 'other').

Table 7. 2017 target species catch breakdown

Species	Metric tonnes	% of total	% by purse seine
Bigeye tuna	129,066	67	45
Skipjack tuna	1,627,672	28	79
Yellowfin tuna	681,391	5	70
TOTAL	2,438,129	100	-

The Western and Central Pacific Commission (WCPFC) convention area (WCP-CA)(**Error! Reference s ource not found.**) is defined in Article 3 of the Convention. WCPFC is responsible for the management of tuna fisheries in this area. In additional to WCPFC, the Parties to the Nauru Agreement (PNA) are eight Pacific Island countries that control the world's largest tuna purse seine fishery. The countries of Federated states of Micronesia (FSM), Kiribati, Republic of the Marshall Islands, Nauru, Palau, Papua New Guinea (PNG), Solomon Islands, and Tuvalu act as a sub-regional management body, managing the shared resource of tropical tuna stocks which inhabit their waters.

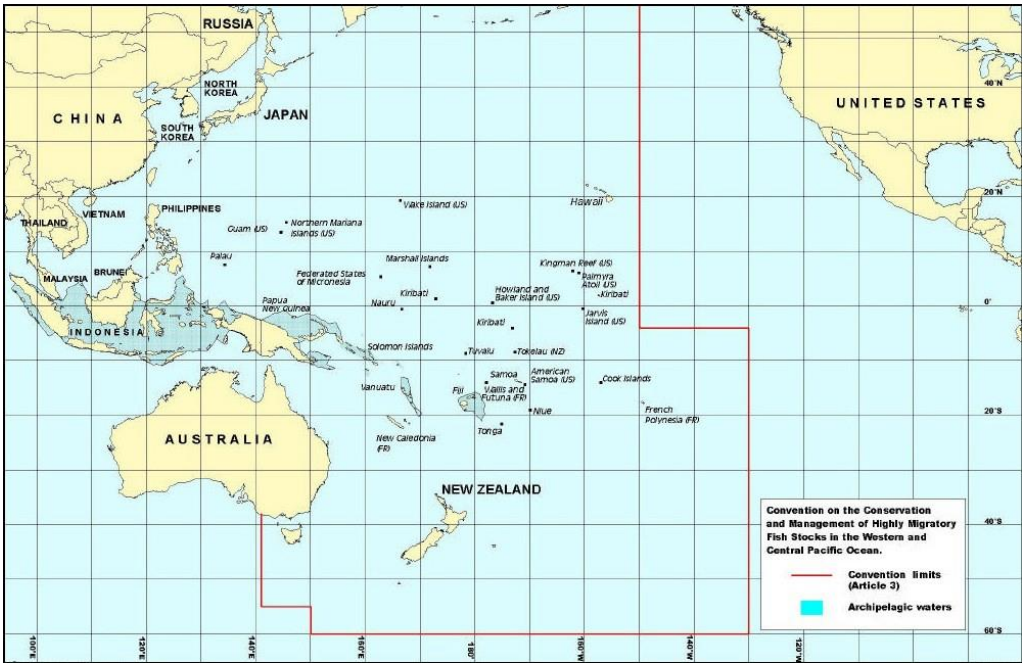

Figure 5. Map of the Western and Central Pacific Fisheries Commission convention area (source: http://www.wcpfc.int/doc/convention-area-map).

4.2.3 Management of target stocks

Bigeye, skipjack and yellowfin tuna are each managed as two separate stocks in the Pacific Ocean: The Western and Central Pacific (WCPO) stock and the Eastern Pacific (EPO) stock. This aligns with the Convention Areas of the two Pacific RFMOs – i.e. WCPFC and IATTC. In this assessment, we are concerned with the WCPO stocks of yellowfin, skipjack and bigeye and their management is the responsibility of WCPFC.

4.3 Principle 1

4.3.1 Principle 1 – Low Trophic Level (LTL) species

All target species for this assessment are not 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 WCPO yellowfin and skipjack 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. Further to this, it is not one of the species types listed in Box SA1, nor do they feed predominantly on plankton.

4.3.2 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, west and central and eastern. Bigeye grow 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. **Error! Reference source not found.** gives the stock assessment output from the Scientific C ommittee (SC)14 uncertainty grid (WCPFC, 2018c). 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 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, 2018c). Figure 6**Error! Reference source not found.** presents a Majuro plot comparing new and old growth models in relation to F and SB.

Table 8. 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, 2018c).

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

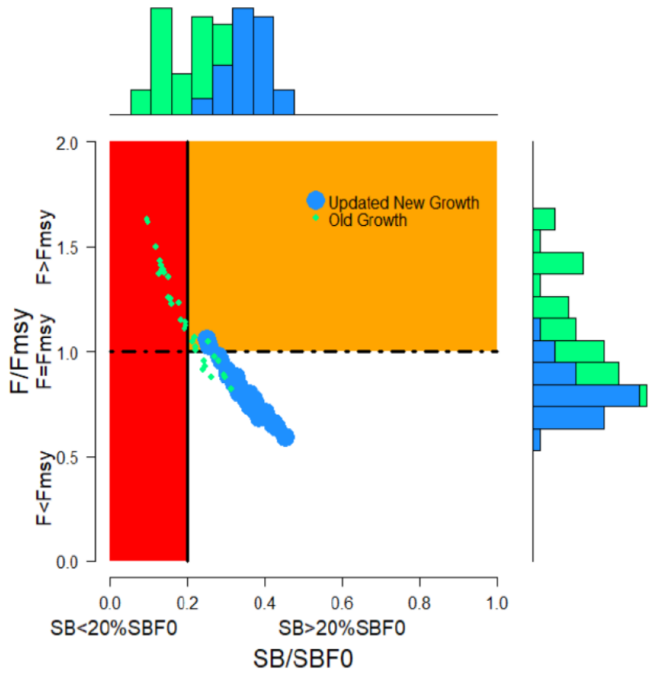

Figure 6. Majuro plot showing the outcome of each of the 72 models in the grid from the assessment update in 2018, with the updated new growth model in blue and the old growth model in green (these results discarded by the Scientific Committee). The red area shows SB below the LRP, while the orange area shows F higher than F_{MSY} (Figure 7 in Vincent et al. (2018)).

Reference points: WCPFC has agreed an explicit limit reference point for bigeye (and other stocks) of 20%$SB_{current,F=0}$, 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 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.

Harvest strategy: CMM 2014-06 commits WCPFC to developing a formal harvest strategy for key stocks, including those considered here. The Commission agreed a workplan to implement the CMM, which was revised in 2017 after a failure to meet key targets at WCPFC13 (2016). 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 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 2018a)(see Table 7). 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 9). Longline fisheries catching bigeye are also subject to restrict on catch limits (see Table 10).

Table 9. 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 10. 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.

PNA harvest strategy and the VDS: The PNA purse seine vessel day scheme, although it does not cover all of the stock, is important because more than half the total catch is taken in PNA waters and is where the majority of this assessment's effort takes place. The VDS restricts effort in the purse seine fishery by allocating a total pool of effort in terms of 'vessel days' in the PNA zones. The objective of the purse seine VDS (from a stock management perspective) is to constrain purse seine effort to 2010 levels in the EEZs of PNA member countries (plus Tokelau); following the requirements of CMM 2016-01 and its previous iterations. The Total Allowable Effort (TAE) is allocated between PNA members based on a pre-agreed key but can be traded if necessary. Fishing companies apply at the beginning of the year for the number of days they think they will require from each country and pay accordingly. They may also buy more days during the year as required, as long as they remain available (so far, days have reportedly not been limiting)(**Error! Reference source not found.**).

Determining the TAE (days)					
	TAE 2016	**TAE 2017**	**Provisional TAE 2018**	**Proposed Revised TAE 2018**	**Provisional TAE for 2019 & 2020**
Estimated 2010 Logsheet effort	44,033	44,033	44,033	44,033	44,033
Length Adjustment factor	1.95%	1.30%	1.30%	0.0%	0.0%
PNA TAE	***44,890***	***44,605***	***44,605***	***44,033***	***44,033***
Tokelau TAE	*991*	*985*	*985*	*972*	*972*
Total VDS TAE (PNA + Tokelau)	***45,881***	***45,590***	***45,590***	***45,005***	***45,005***

Figure 7. Determining the TAE (in days). Source: PNA, 2016.

Information and stock assessment: the most recent stock assessment (McKechnie et al., 2017) 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.

4.3.3 Skipjack tuna background

Stock: The 2016 stock assessment (McKechnie et al, 2016) report skipjack to be the smallest yet fastest growing of the main commercial tuna species. Maturity is reached at ~40 cm and maximum age of ~4.5 (based on tag recapture studies). In the Pacific, it appears that growth varies spatially, being apparently quicker close to the equator than in peripheral areas, although the stock assessment assumes a single Von Bertelanfy (VB) growth curve across all regions. As with bigeye (and yellowfin), for management purposes the Pacific stock of skipjack is separated into two, the western and central stock and the eastern stock. A new stock assessment was released in August 2019 (Vincent et al., 2019), but has not been used for an in-depth analysis as this assessment is not used or referenced by any other MSC certified fishery (but will be references in their subsequent surveillances). The 2016 assessment summarises that current catch are slightly below the estimated MSY but approaching that level. Biomass is estimated to be approximately at the target reference level (50%$SB_{F=0}$) and well above the limit reference point (20%$SB_{F=0}$)(Table 11) as well as SB_{MSY}; F is estimated to be ~half the MSY level (**Error! Reference source not found.**).

Table 11. Estimated stock status in relation to reference points from the most recent skipjack stock assessment, from the reference case model (median), and the range over the one-off sensitivities and the entire structural uncertainty grid. Recent=2011-2014 and latest=2015; however, the authors warn against the use of latest, except for catch, because it is highly dependent on recent recruitment which is known to be variable and poorly estimated. Source: Tables 8 and 9 in McKechnie et al., 2016.

Ratio	Ref. case model	Range over all one-off sensitivities	Median from structural uncertainty grid	5% CI from structural uncertainty grid	95% CI from structural uncertainty grid
C_{latest}/MSY	0.89	0.81-1.06	0.89	1.04	0.76
F_{recent}/F_{MSY}	0.45	0.40-0.62	0.48	0.38	0.64

$SB_{recent}/SB_{F=0}$	0.52	0.41-0.56	0.49	0.40	0.57
SB_{recent}/SB_{MSY}	2.31	1.80-2.63	2.04	1.58	2.65

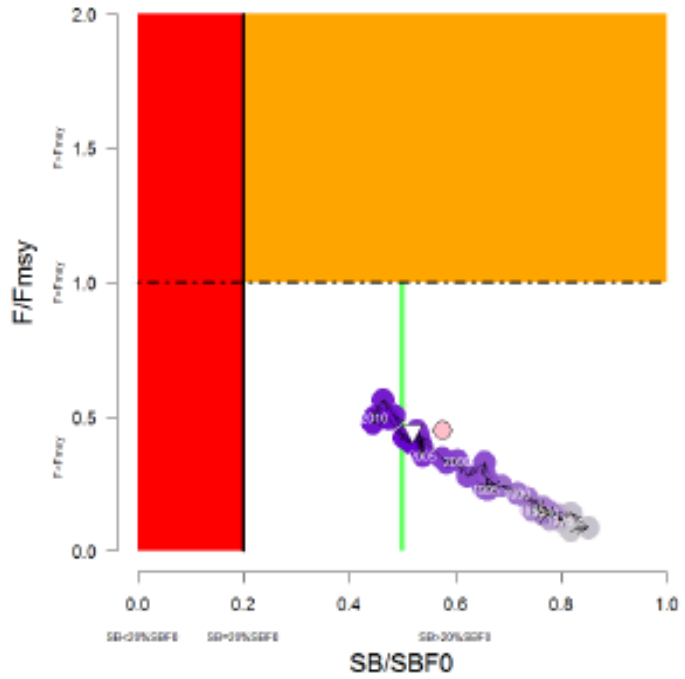

Figure 8. Majuro plot for WCPO skipjack, showing stock trajectory in relation to unfished biomass (x-axis) and fishing mortality (y-axis) with reference point indicated (SB<limit reference point is red area, target is green line, orange area delineates $F>F_{MSY}$); white triangle = $SB_{recent}/SB_{F=0}$; pink circle = $SB_{latest}/SB_{F=0}$ (McKechnie et al, 2016).

Reference points: As with yellowfin (and bigeye), WCPFC has agreed an explicit limit reference point for bigeye (and other stocks) of $20\%_{SBcurrent,F=0}$. The current CMM for the skipjack (CMM 2018-01) also states an agreed interim target reference point (TRP) of 50% of the recent spawning biomass in the absence of fishing (see CMM 2015-06).

Harvest strategy: As per bigeye in Section **Error! Reference source not found.**.

Information and stock assessment: As with the assessments for all the main WCPFC stocks, the assessment model is run in Multifan-CL (MFCL), which provides a Bayesian framework. MFCL requires that 'fisheries' are defined with as near as possible constant selectivity and catchability. Purse seine data was amalgamated across flags but stratified by region and set type (unassociated, log, FAD, whale, dolphin, unknown); pole-and-line fisheries were likewise grouped by region; there were some 'miscellaneous' fisheries (gillnets, ring nets, handlines) in the western equatorial area, from which only catch data were used; and a 'longline' fishery was created to include research and observer length-frequency data.

4.3.4 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: With regard to 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 F in relation to F_{MSY}. The stock assessment further summarises 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 run and for most of the regions. Table 12 presents the summary of the uncertainty grid in the assessment. **Error! Reference source not found.** presents the Majuro plots for t he full grid and key sensitivities.

Table 12. 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
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

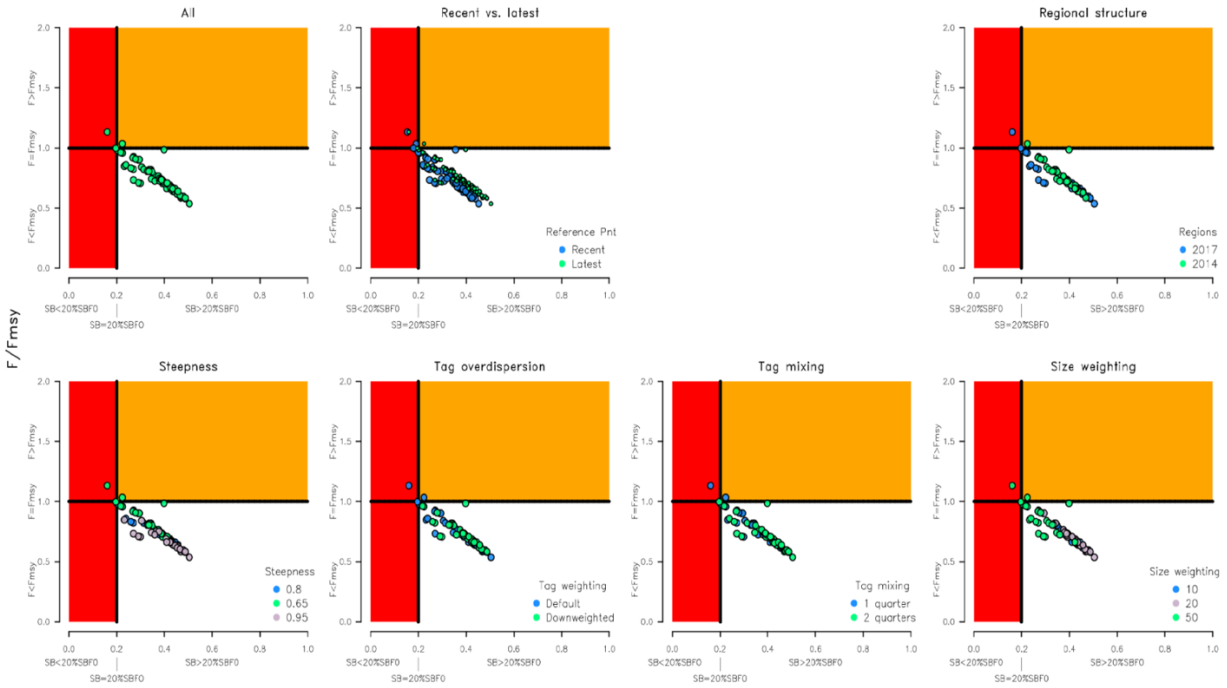

Figure 9. Majuro plots summarising the results for each of the models in the structural uncertainty grid individually; y-axis = F/F_{MSY}; orange zone = F>F_{MSY}; x-axis = SB/$SB_{F=0}$ (contrary to how it is labelled in the original figure); red zone = SB<20%$SB_{F=0}$, i.e. LRP agreed by WCPFC. All 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 (details of sensitivities given in Section Error! Reference source not found. **below). Figure A41 in Tremblay-Boyer et al., 2017.**

Reference points: See bigeye above in Section **Error! Reference source not found.**.

Harvest strategy: As per bigeye in Section **Error! Reference source not found.**. There is also some management of yellowfin 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: 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. However, they do note various sources of uncertainty in the reference case model and use sensitivity analyses to address these.

4.3.5 Total Allowable Catch (TAC) and catch data

This purse seine fishery is not conducted under a TAC, or catch limit, system but rather by an effort limitation system, called the Vessel Day Scheme (VDS) which applies to EEZs of countries which are Parties to the Nauru Agreement (PNA). PNA sets the yearly Total Allowable Effort (TAE) in fishing days for Pacific Island Countries and Territories (PICTs) which are members of PNA. Each member country is allocated a share of the total days for use in its own EEZ and vessel days can be freely traded among countries. Under the VDS everyone who wants to fish in the waters of PNA members (plus provision for inclusion of the New Zealand territory of Tokelau) must compete and pay for the available fishing days.

Under the Tuna Treaty 22 PICTs are directly and/or indirectly involved, many of them at various levels of both fishery and national development. It is important to acknowledge Pacific solidarity through the sacrifice made by Pacific nations with large EEZs (see Table 13), many of them members of the PNA, by compromising on a strategic element of their revenue-generating Vessel Day Scheme (VDS). As noted above, fishing in the waters of PNA members involves competition for the available fishing days (Table 14

Table 13. Pacific island countries and territories; comparison of land areas versus area of EEZs (Source: Gillett and Tauati, 2018).

The 22 Pacific Island countries and territories*

	Country/territory	Land area (km²)	Area of 200-mile zone (km²)	Estimated population (mid-2016)
Independent Pacific Island Countries	Cook Islands	180	1 830 000	15 200
	The Federated States of Micronesia	702	2 978 000	104 600
	Fiji	18 376	1 290 000	880 400
	Kiribati	726	3 550 000	117 194
	The Marshall Islands	720	2 131 000	55 000
	Nauru	21	320 000	10 800
	Niue	258	390 000	1 600
	Palau	500	629 000	17 800
	Papua New Guinea	461 690	3 120 000	8 151 300
	Samoa	2 934	120 000	194 000
	Solomon Islands	29 785	1 340 000	651 700
	Tonga	696	700 000	100 600
	Tuvalu	26	900 000	10 100
	Vanuatu	12 189	680 000	289 700
Pacific Island Territories	American Samoa	197	390 000	56 400
	French Polynesia	3 521	5 030 000	273 800
	Guam	549	218 000	169 500
	New Caledonia	19 103	1 740 000	277 000
	Northern Marianas Islands	475	1 823 000	55 700
	Pitcairn Islands	5	800 000	50
	Tokelau	12	290 000	1 400
	Wallis and Futuna Islands	124	300 000	11 800

Table 14. PNA TAE for 2018 and Provisional TAE for 2019 and 2020 (Source: PA22/WP.4; VDS-T&SC6/WP.1, April 2017).

Determining the TAE (days)					
	TAE 2016	TAE 2017	Provisional TAE 2018	Proposed Revised TAE 2018	Provisional TAE for 2019 & 2020
Estimated 2010 Logsheet effort	44,033	44,033	44,033	44,033	44,033
Length Adjustment factor	1.95%	1.30%	1.30%	0.0%	0.0%
PNA TAE	***44,890***	***44,605***	***44,605***	***44,033***	***44,033***
Tokelau TAE	*991*	*985*	*985*	*972*	*972*
Total VDS TAE (PNA + Tokelau)	***45,881***	***45,590***	***45,590***	***45,005***	***45,005***

Under WCPFC CMM 2018-01 in addition to the 45,005 PNA VDS days, there are further catch limits to purse seine fishing in EEZs, which may be pertinent to this assessment. The following countries EEZs are limited by effort: Cook Islands, Fiji, Niue, Samoa, Tonga and Vanuatu. These Members, Cooperating Non-Members and Participating Territories (CCMs) are developing joint arrangements which may incorporate measures such as pooling and transferability of limits between EEZs. Australia, Japan, New Zealand, New Caledonia and the United States have also got effort limitations but not part of the joint arrangement. Purse seine effort control is further applied for certain Distant Water Fishing Nations (DWFNs), operating on the high seas. Taiwan is currently limited to 95 days. The following CCMs are also limited: China, Ecuador, El Salvador, European Union, Japan, New Zealand, Philippines, Republic of Korea and USA.

Table 15. Purse seine effort (logsheet days) in PNA waters (Source: SPC data as of 6 June 2018).

Effort (days)	2010	2011	2012	2013	2014	2015	2016	2017
PNA EEZs	44,248	48,140	42,609	43,959	43,305	32,225	35,427	37,848
PNA AWS	6,266	8,671	8,822	7,631	6,785	3,829	3,677	5,034
Total	**50,514**	**56,811**	**51,431**	**51,591**	**50,090**	**36,054**	**39,104**	**42,882**

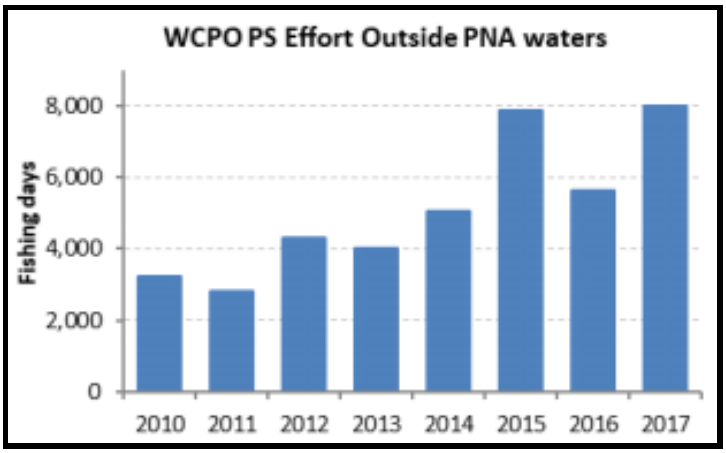

Figure 10. Estimated purse seine fishing effort in the WCPO outside PNA waters since 2010 (Effort excludes fishing in waters of Indonesia and Philippines, and by Philippine vessels under the Special Arrangement in High Seas Pocket (HSP-1). Source: SPC data as at 6 June 2018).

Based on SPC data in Table 15 and **Error! Reference source not found.** above, purse seine effort on the WCPO high seas represents at most only around 20% of the total fishing effort determined in the TAE, even in 2017, when high seas activity seemed to peak. Note that actual days fished may be less than the TAE in summary data tables.
Specific UoA catch information was not provided for this pre-assessment.

4.4 Principle 2

4.4.1 Designation of species under Principle 2

The fisheries' impact of non-target species is analysed differently if the species is from a "managed" stock or not, or considered Endangered, Threatened or Protected (ETP). These are defined as follows:

Primary species (MSC Component 2.1):

- Species in the catch that are not covered under P1;
- Species that are within scope of the MSC programme, i.e. no amphibians, reptiles, birds or mammals;
- Species where management tools and measures are in place, intended to achieve stock management objectives reflected in either limit (LRP) or target reference points (TRP). Primary species can therefore also be referred to as 'managed species'.

Secondary species (MSC Component 2.2):

- Species in the catch that are not covered under P1;
- Species that are not managed in accordance with limit or target reference points, i.e. do not meet the primary species criteria;
- Species that are out of scope of the programme, but where the definition of ETP species is not applicable (see below).

ETP (Endangered, Threatened or Protected) species (MSC Component 2.3) are assigned as follows:

- Species that are recognised by national ETP legislation;
- Species listed in binding international agreements (e.g. CITES, Convention on Migratory Species (CMS), ACAP, etc.);
- Species classified as 'out of scope' (amphibians, reptiles, birds and mammals) that are listed in the IUCN Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE).

Both **primary** and **secondary** species are defined as 'main' if they meet the following criteria:

The catch comprises 5 % or more by weight of the total catch of all species by the UoC;

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.

4.4.2 Data availability

Data directly from the fisheries under assessment were not provided for this pre-assessment. Information for analysis therefore comes from publicly available literature and other similar MSC certified fisheries, which has been references. This means that scoring is precautionary but enough to guide scoping and FIP

workplan documents. At full assessment fishery specific data will be required, as will aggregated SPC observer data covering the fleet.

There have been several key studies that have provided good insights into the catch composition of purse seine fisheries within the Pacific Ocean, and a break down between free-school and FAD operations (Lawson and Williams, 2005; Nicol et al. 2009; Harley et al. 2010; Dagorn et al. 2012; Hare et al. 2015, Brouwer et al., 2018). As the UoAs cover such a wide area, and in the absence of more specific fishery information, it was deemed prudent to find sources that spanned the WCPO region rather than a specific fishery where possible. A study by Peatman et al., 2018 presents the total number of reported sets between 2003 and 2017 by school association type (**Error! Reference source not found.**). REF _Ref18406291 \h * MERGEFORMAT **Error! Reference source not found.** shows that free-school/unassociated sets are the most common type in the WCPO region, with a peak number of sets in 2014.

Year	aFAD	dFAD	log	FS	whale	whale.shk	Total
2003	2,644	3,576	7,051	17,043	29	18	30,361
2004	2,899	4,776	13,289	11,162	33	2	32,161
2005	3,223	3,982	9,842	19,494	39	4	36,584
2006	2,067	4,931	11,118	15,309	28	9	33,462
2007	2,117	5,539	8,971	19,648	64	11	36,350
2008	3,084	10,423	4,887	22,718	70	10	41,192
2009	3,058	11,370	6,779	22,803	88	9	44,107
2010	2,355	6,848	3,797	38,191	260	18	51,469
2011	2,925	15,243	3,641	30,305	155	1	52,270
2012	2,765	13,405	4,438	36,609	136	9	57,362
2013	2,178	12,110	3,498	38,014	99	5	55,904
2014	1,701	13,932	2,780	38,802	81	4	57,300
2015	1,260	10,264	2,074	33,710	132	9	47,449
2016	1,205	10,676	2,192	31,811	160	13	46,057
2017	609	13,841	1,703	33,315	228	54	49,750

Figure 11. Total reported sets by year and association type for large scale purse seine fleets operating in the WCPFC-CA, from 2003 to 2016. Cell colours: red = highest number of sets, green = lowest number of sets, for all years and set types combined within a table (source: Peatman et al., 2018).

Catch composition from the last five years for the region are presented from a study by SPC (Brouwer et al, 2018).

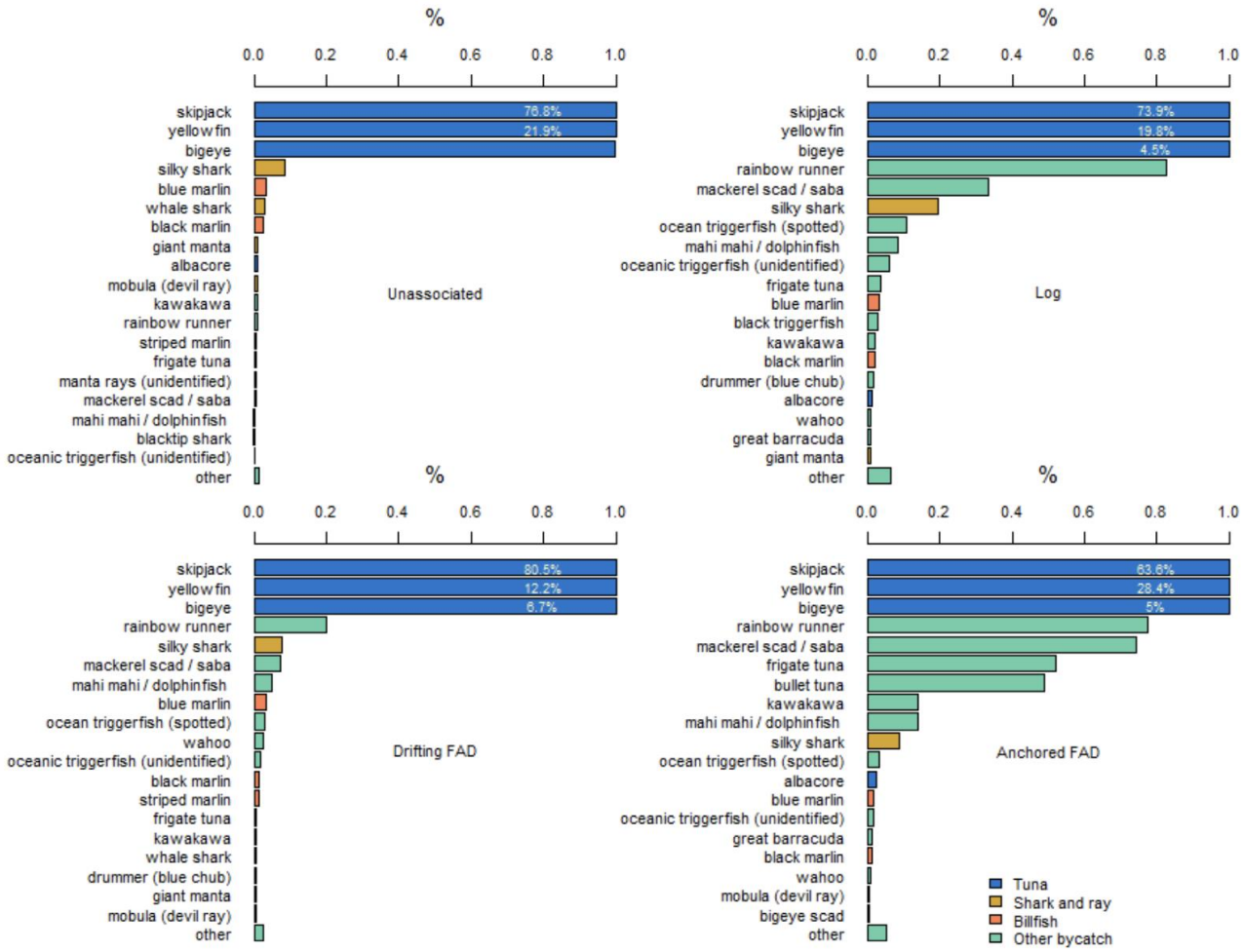

Figure 12. Catch composition of the various categories of purse seine fisheries operating in the WCPO based on observer data from the last five years' data. Note: the y-axis stops at 1% and bars exceeding 1% have the value displayed in the bar (source: Bouwer et al., 2018).

Based on the catch compositions of Figure 12, scoring elements have been identified (Table 30). As presented in **Error! Reference source not found.**, catch compositions are clearly different between u nassociated and FAD fisheries in the WCPO. However, from a scoring element (Table 16) perspective in this pre-assessment, the profile for scoring elements is similar for FAD and free-school fisheries. In all cases shown in Figure 12 the target species comprise 97% or more of the catch (98.7% YFT and SKJ in free-school, 99.4% SKJ, YFT and BET in drifting FAD, 98.2% SKJ, YFT and BET in log-associated and 97% SKJ, YFT and BET in anchored fisheries). This means there are no 'main' species that are not target species in either the primary or secondary species categories and minor secondary species have not been analysed in this report.

The target species considered under Principle 1 for these UoAs include bigeye, yellowfin and skipjack tuna. SA 3.1.3.1 (MSC Fisheries Standard version 2.0) requires that if there are multiple P1 species, i.e. multiple UoAs, then when not the topic of the UoA (under Principle 1), then the species must be considered under Principle 2, primary species. For example, in this fishery, where yellowfin UoAs are being evaluated, skipjack and bigeye is designated as a primary species under Principle 2 etc. Information on the stocks and their management for bigeye, yellowfin and skipjack will not be repeated here in Principle 2.

Table 16. Scoring elements

Component	Scoring elements	Designation	Data-deficient
P1	WCPO bigeye (UoAs 1,2)	Target	No
P1	WCPO skipjack (UoAs 3,4)	Target	No
P1	WCPO yellowfin (UoAs 5,6)	Target	No
Primary	WCPO skipjack (UoAs 1,2,5,6)	Main	No
Primary	WCPO bigeye (UoAs 3,4,5,6)	Main	No
Primary	WCPO yellowfin (UoAs 1,2,3,4)	Main	No
Primary	Striped marlin (all UoAs)	Minor	No
Secondary	Not listed in the pre-assessment as there are no 'main' species	N/A	N/A
ETP	Whale shark	N/A	No
ETP	Silky shark	N/A	No
ETP	Oceanic whitetip shark	N/A	No
ETP	Giant manta ray	N/A	No
ETP	Mobula ray	N/A	No
Habitats	N/A – pelagic environment	N/A	N/A

4.4.3 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.
- See Table 17**Error! Reference source not found.** below as for the cumulative impact assessment for this assessment.

Table 17. Cumulative impacts summary for scoring elements in this pre-assessment

Outcome Performance Indicator	Species	Cumulative impact?	Rationale
Primary species (main)	WCPO bigeye tuna (for WCPO skipjack and yellowfin UoAs)	No	Not below PRI
	WCPO skipjack tuna (for WCPO bigeye and yellowfin UoAs)	No	Not below PRI
	WCPO yellowfin tuna (for WCPO bigeye and skipjack UoAs)	No	Not below PRI
Secondary species	No main secondary species	No	No main secondary species
ETP species	Silky shark	No	There are currently no national and/or international requirements setting catch limits for silky sharks in the WCPO. No retention policy doesn't not constitute a 'limit'.
	Oceanic whitetip shark	No	There are currently no national and/or international requirements setting catch limits for oceanic whitetip sharks in the WCPO. No retention policy doesn't not constitute a 'limit'.
	Whale shark	No	There are currently no national and/or international requirements setting catch limits for whale sharks in the WCPO. No retention policy doesn't not constitute a 'limit'.

	Giant manta ray	No	There are currently no national and/or international requirements setting catch limits for giant manta ray in either the WCPO.
	Mobula/devil ray	No	There are currently no national and/or international requirements setting catch limits for mobula/devil rays in either the WCPO.
	Cetaceans	No	There are currently no national and/or international requirements setting catch limits for cetaceans in the WCPO.
	Sea turtles	No	There are currently no national and/or international requirements setting catch limits for sea turtles in the WCPO. No retention policy doesn't not constitute a 'limit'.
Habitats	N/A	N/A	This fishery does not interact with any benthic habitats

4.4.4 Primary species

The only 'main' primary species for both free-school and FAD fisheries are skipjack, yellowfin and bigeye tuna. Background to these stocks are provided in Section 4.3.

One other primary species is presented in Figure 12, which is striped marlin. This however is a minor species, which are not discussed in this report.

4.4.5 Secondary species

There are no 'main' secondary species in this assessment, given no species meets the 5% total catch threshold nor 2% in the case of vulnerable species. 'Minor' species are not discussed in this report, as they are only discussed at the SG100 level scoring and therefore do not affect whether a condition for a particular PI is issued.

4.4.6 ETP species

Non-target species interactions are unfortunately unavoidable in commercial fishing activities and is well-documented. Impacts include but may not be limited to (Gilman et al., 2012):

- Ghost fishing, where gear has been abandoned or lost;
- Losses when catch is not brought aboard but dies due to the operations, either by being injured or direct mortality;
- Post-release mortality, where animals are released alive but die through stress caused by operations, either through singular or repeated interactions.

Cryptic mortality, even in data-rich fisheries such as WCPO purse seine operations is difficult to estimate and the full effects and impacts are not yet known with accuracy (Gilman et al., 2012). Intrinsic life history attributes of ETP species make them particularly susceptible to fishing, both directly and indirectly. Species here are characterised by any or all of the following: slow growth rates, low fecundity, sensitivity to stress caused by interactions with fishing gear.

FADs add an additional risk to the health of ETP populations. Although their presence is monitored by a GPS buoy, drifting FADs (dFADs) (making them traceable unless the GPS malfunctions), have an accompanying net, with a mesh size or 10-20 cm and whose depth varies from ten to 100 metres (ISSF, 2017) which entangles animals accidentally. There have been some studies into release rates of species, for example 75% of turtles are reportedly released alive when found entangled on the surface (Hall and Roman, 2013), unobserved mortality of species, in particular sharks, is hard to quantify. The precise number of dFADs is not known as presently there are no unique FAD identification management schemes implemented by RFMOs, but some estimate 90,000–120,000 FADs per year globally (Scott and Lopez, 2014; Gersham et al., 2015 from ISSF, 2017) and more work is needed to fully understand the effects that FADs play in tropical pelagic ecosystems and better management is needed to mitigate impacts.

Since 2010, the UoAs have had 100% observer coverage between 20°N and 20°S (CMM 2008-01 superseded by CMM 2014-01), and more than 80% of purse seine operations that take the target tuna species operate in PNA waters. Without information directly from the fishery, it is difficult to accurately assess this component. Using **Error! Reference source not found.** as a starting point, five species are identified as ETP species and occurring in f ree-school and FAD tuna purse seine operations. These are whale sharks (*Rhinocodon typus*), silky sharks (*Carcharhinus falciformis*), oceanic whitetip sharks (*C. longimanus*), giant manta rays (*Manta birostris*) and mobula rays (*Mobula* spp.). It is likely that other ETP species such as cetaceans and turtles will feature in these fisheries' bycatch profile, as they do in other MSC overlapping purse seine fisheries and have been identified in recent SPC publications (Peatman et al., 2018). These are considered below in this section.

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.

For elasmobranchs in general, shark bycatch has fluctuated over the years. Silky shark accounted for 88 % of estimated shark bycatch from 2003 to 2017, with mantas and mobulid rays, and oceanic whitetip accounting for 5 and 1.6 % respectively (Peatman et al., 2018; Table 18).

Table 18. Median shark bycatch estimates (individuals) by species/species group for large-scale purse seine fleets. Species/species group accounting for less than < 2% of total shark bycatch have been grouped in to 'others' (source Peatman et al., 2018).

Year	Silky shark	Mantas & mobulids	Oceanic whitetip shark	Elasmobranchs nei	Others	Total
2003	43,892	2,196	2,123	10,150	1,642	**60,122**
2004	60,886	2,520	2,503	4,077	1,101	**71,209**
2005	56,242	2,196	1,481	1,769	733	**62,502**
2006	55,466	1,857	642	1,088	678	**59,821**
2007	52,708	2,208	967	822	761	**57,553**
2008	50,378	2,663	1,233	1,367	1,168	**56,987**
2009	43,758	2,068	428	768	830	**47,959**
2010	31,578	2,599	676	654	870	**36,390**
2011	52,639	2,790	520	1,159	704	**57,828**
2012	36,985	4,948	479	663	1,326	**44,414**
2013	41,887	3,617	414	806	810	**47,543**
2014	52,432	3,576	677	940	967	**58,611**
2015	39,634	2,991	520	1,978	713	**45,848**
2016	60,899	4,006	498	1,508	546	**67,475**
2017	72,261	3,440	721	2,036	438	**79,019**
Species totals	**751,645**	**43,676**	**13,882**	**29,787**	**13,287**	**853,282**

An earlier study by Peatman et al. (2017) recorded the main species of elasmobranchs and their respective fates attributed to interactions with purse seine operations in the region between 2003 and 2016 (**Error! Reference source n ot found.**).

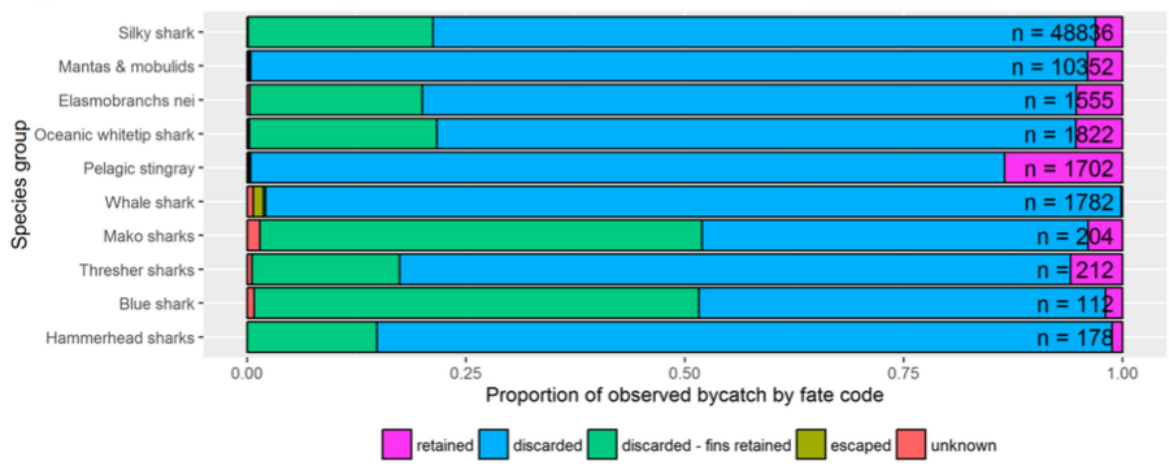

Figure 13. Recorded fate of observed sharks and rays' bycatch (individuals) by species/species group, as a proportion of total observed bycatch for the species/species group in the purse seine fisheries. The number of records is provided (n = ...). (source: Peatman et al. 2017).

Whale shark: Whale shark (*Rhinocodon typus*) was first listed as a CITES Appendix II species in 2003[2], and listed as a CMS Appendix I species in 2018[3]. Whale sharks can inhabit waters ranging from the surface down to depths of around 2000 metres. Focusing on where these UoAs operate, it has been estimated that the whale shark population has undergone around a 63% population reduction in the Indo-Pacific Ocean over the past three generations (75 years) (Pierce & Norman, 2016). It is considered that whale sharks have a very low population growth and highly susceptible to fishing mortality (Stacey et al. 2008).

With regard to the WCPO, Harley et.al. (2013) investigated the spatial and temporal distribution of whale sharks in the WCPO using predominantly observer data, and other data sources, from the equatorial purse seine fishery. The authors of the report stressed that this data and investigation did not consider data from the domestic purse seine fisheries in the EEZs of Indonesia, Philippines or the Japanese purse seine fleet operating in the North. The study found that since 2003, 1% of all sets recorded some form of interaction. Furthermore, they concluded that there has been a 50% decline in whale shark occurrences in free school sets over the past ten years, with a mean of 1% for the first six years and the dropping down to 0.5% for the last four years.

In 2010, SPC provided summary information regarding whale shark interactions with purse seine sector in the WCPO between 2007 – 2009. This summary informed that there was approximately 11 whale shark interactions per 1,000 sets made and resulted in an estimated 0.06 whale shark mortalities per 1,000 sets (12%)(SPC 2010). It is important to keep in mind that this data summary was for a period prior to 100% observer coverage in the fishery. However, Clarke (2015), found that between 2010 – 2014, when observer coverage was 100%, that the interaction rate was much lower (2.6 – 5.8 per 1,000 sets) with mortality at around 7.2% as recorded by observers in the WCPO. Clarke (2015) further reported that observers consistently reported that 5 – 10% of whale sharks encircled result in mortality. This figure excludes the numbers released in an unknown state.

The WCPFC, including the PNA countries where the UoAs operate, have implemented a number of management measures to reduce interactions with whale sharks. In 2010, the Parties to the Nauru Agreement (PNA), through the

[2] https://www.speciesplus.net/#/taxon_concepts/6257/legal

[3] https://www.speciesplus.net/#/taxon_concepts/11544/legal

Third Implementing Arrangement[4], introduced measures that prohibited purse seine vessels engaging in fishing or related activity in order to catch tuna associated with whale sharks. On 1 January 2014, the WCPFC, at its ninth regular session, included whale shark as the 14th species on its list of key shark species (Harley et.al. 2013). The WCPFC also adopted a Conservation and Management Measure CMM 2012-04[5] for protection of whale sharks from purse seine fishing operations.

CMM 2012-04 applies to the high seas and EEZs of the Convention Area and prohibits any members flagged vessels from setting a purse seine on a school of tuna associated with a whale shark if the animal is sighted prior to the commencement of the set. The CMM further states that:

> 1. For fishing activities in exclusive economic zones of CCMs north of 30 N, CCMs shall implement either this measure or compatible measures consistent with the obligations under this measure and report the measures taken in the Part 2 report.
>
> 2. CCMs shall require that, in the event that a whale shark is not deliberately encircled in the purse seine net, the master of the vessel shall:
>
> (a) ensure that all reasonable steps are taken to ensure its safe release.; and
>
> (b) report the incident to the relevant authority of the flag State, including the number of individuals, details of how and why the encirclement happened, where it occurred, steps taken to ensure safe release, and an assessment of the life status of the whale shark on release (including whether the animal was released alive but subsequently died).
>
> 3. In taking steps to ensure the safe release of the whale shark as required under paragraph 4(a), CCMs shall require the master of the vessel to follow any guidelines adopted by the Commission for the purpose of this measure.
>
> 4. In applying steps under paragraphs 1, 4(a) and 5, the safety of the crew shall remain paramount.
>
> 5. CCMs shall advise in their Part 1 Annual Report of any instances in which whale sharks have been encircled by the purse seine nets of their flagged vessels, including the details required under paragraph 4(b).
>
> 6. The Secretariat shall report on the implementation of this conservation and management measure on the basis of observer reports, as part of the Annual Report on the Regional Observer Programme.

CMM 2012-04 is reviewed every two years by WCPFC. The review considers the measures contained within the CMM as well as the effectiveness, compliance and enforcement of the overall CMM by the member countries. The latest compliance management report for this CMM was reported on at WCPFC 14 (WCPFC14 2017a) for activities conducted in 2016. The WCPFC 14 summary report indicated that out of 19 countries assessed, there had been a 21% non-compliance with reporting in countries Part 1 annual report (Japan, Kiribati, Solomon Islands, and Vanuatu) and a further 16% non-compliance with meeting reporting deadlines (Ecuador, PNG and El Salvador) to the Commission.

In addition to the CMM, the WCPFC adopted guidelines for the safe release of encircled whale sharks (WCPFC 2015).

[4] https://www.pnatuna.com/content/3rd-pna-implementing-arrangement

[5] https://www.wcpfc.int/conservation-and-management-measures

Silky shark: Silky sharks were listed on CITES as an Appendix II species in 2017[6], are listed on CMS as an Appendix II species in 2015[7] 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[8], 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).

Silky sharks are found in the oceanic and coastal pelagic habitats of tropical waters, often associated with seamounts, and juveniles with floating objects. Juveniles are often caught by pelagic purse seine vessels fishing FADs, while longline fishing operations catches older and larger silky shark compared to that taken by purse seine operations. Silky shark often inhabits continental shelves and slopes from the surface to 500 metres (CoP 2016).

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 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) (**Error! Reference source not found.**).

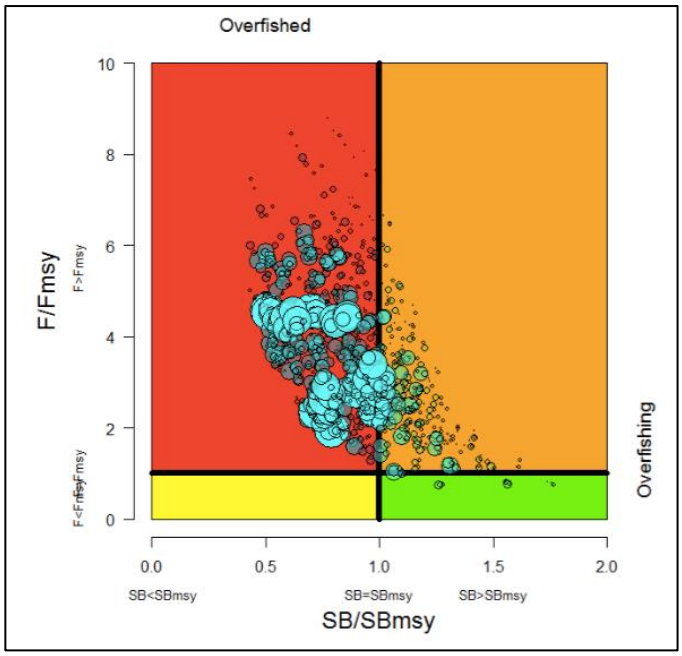

Figure 14. Kobe plot from the grid based only on the SPC Longline and Japanese Research and Training Vessel CPUEs.

Silky sharks in the WCPO are caught as bycatch by tuna purse seine operations, with increasing bycatch now being taken by the purse seine sectors using FADs. 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

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

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 haulback 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[9].

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 19) (WCPFC 2017b).

Table 19. 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

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

Focusing on the purse seine operations, 32,643 silky sharks were observed with a total of around 53.8% 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).

This species is well known for association with FADs (Filmalter et al., 2013; Peatman et al., 2017). A previous study completed by Filmalter et al. (2013), estimated mortality through FAD entanglement in the Indian Ocean to be five to ten times that of the known mortality from the region's purse seine fishery (480,000 – 960,000 individuals). There is no reason why those kinds of figures couldn't apply to other oceans such as the western and central Pacific. Filmalter et al (2013) further went on to estimate a figure of 400,000 to two million silky sharks when all world fisheries are combined. This makes the need for improvements in the FAD component of this fishery assessment particularly necessary.

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 $F/F_{MS}Y$ 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/Fcrash 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[10]. 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.

[10] 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 haulback 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 20). Any alleged infringements are notified by the Secretariat in the WCPFC online compliance case file system (WCPFC 2017b).

Table 20. 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

Giant manta ray: The giant manta ray (*Manta birostris*), was first listed on Appendix II of CITES in 2013[11]. 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 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[12]. 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[13].

[11] https://www.speciesplus.net/#/taxon_concepts/11277/legal
[12] http://www.iucnredlist.org/details/198921/0
[13] http://www.iucnredlist.org/details/198921/0

Currently, WCPFC do not have any management or requirements regarding giant manta rays by their respective fisheries. However, data is collected under the observer programme (the number of discards and releases of manta and mobula rays with indication of species (to the best extent possible), length, sex, status (dead or alive) and location caught) (WCPFC, 2016) and there have been identification guides developed and implemented (WCPFC SC 2016). Furthermore, WCPFC13 requested that SC13 and TCC13, with support from the Secretariat, work towards the development of a comprehensive approach to shark and ray conservation and management with a view to adopting a new CMM at the Commission's annual meeting in 2018. This new CMM should include:

- Policies on full utilisation;
- Prohibition on finning;
- No retention policies;
- Safe release and handling practices;
- Gear mitigation;
- Size limits or closures;
- Management plans/catch limits;
- Key species and their assessment schedules;
- Species-specific limit reference points; and
- Any data reporting requirements beyond those contained in "Scientific Data to be Provided to the Commission." (WCPFC 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., 2018), all mobulas/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[14]
- *Mobula eregoodootenkee* (longhorned pygmy devil ray) - CITES and CMS Appendix II[15][16], IUCN Redlist Near Threatened[17].
- *Mobula japanica* (spinetail devil ray) - CITES and CMS Appendix II[18][19], Near Threatened[20]

[14] http://www.iucnredlist.org/details/195459/0
[15] https://www.speciesplus.net/#/taxon_concepts/66515/legal
[16] https://www.speciesplus.net/#/taxon_concepts/68411/legal
[17] http://www.iucnredlist.org/details/41832/0
[18] https://www.speciesplus.net/#/taxon_concepts/68408/legal
[19] https://www.speciesplus.net/#/taxon_concepts/66512/legal
[20] http://www.iucnredlist.org/details/41833/0

- *Mobula tarapacana* (sicklefin devil ray) – CITES Appendix II[21], CMS Appendix I[22], Vulnerable[23] on IUCN Redlist.
- *Mobula thurstoni* (bentfin devil ray) - CITES and CMS Appendix II[24][25], IUCN Redlist Near Threatened[26]

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 mobulas 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.

Sea 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. 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). However, incidental catch of marine turtles in purse seine gear is very low in comparison and considered to be inconsequential compared to longline. Incidental catch of marine turtles in purse seine gear occurs mainly during setting the net around a FAD, but also in free school sets to a much lesser extent.

Turtles caught in purse seine usually have a very high survival rate due to the fact that they can be dip netted or scooped out of the net and released prior to the net being fully pursed or fish brought on board. However, turtle deaths are also present in purse seine gear, mainly through drowning if they get entangled in the net or FAD or crushed under the weight of the catch (Williams et al. 2009, Peatman et al. 2018, WCPFC SC 2017).

The estimated total turtle bycatch for large-scale purse seine fleets peaked in 2011 at 378 individuals, decreasing to approximately 209 individuals from 2014 onwards. Across the years (2003 – 2017) the percentage species breakdowns were thus: green turtle (23 %), olive ridley (22.5%), loggerhead (20 %) and hawksbill turtles (15.5 %) accounted for the majority of turtle bycatch (Table 21). Unassociated sets accounted for the highest proportion of turtle bycatch (87.6%) in 2017 (

Table 22) (Peatman et al. 2018).

[21] https://www.speciesplus.net/#/taxon_concepts/68410/legal
[22] https://www.speciesplus.net/#/taxon_concepts/66514/legal
[23] http://www.iucnredlist.org/details/60199/0
[24] https://www.speciesplus.net/#/taxon_concepts/66513/legal
[25] https://www.speciesplus.net/#/taxon_concepts/68409/legal
[26] http://www.iucnredlist.org/details/60200/0

Table 21. Median turtle bycatch estimates (individuals) by species/species group for large-scale purse seine fleets (Source: Peatman et al. 2018).

Year	Green turtle	Olive ridley turtle	Loggerhead turtle	Hawksbill turtle	Leatherback turtle	Marine turtles nei	Total
2003	38	37	0	25	0	217	**323**
2004	0	16	0	15	12	84	**129**
2005	37	7	30	17	0	94	**190**
2006	20	63	26	30	13	14	**171**
2007	98	64	55	29	5	18	**275**
2008	41	36	100	32	8	7	**227**
2009	52	62	85	45	6	5	**260**
2010	58	40	56	43	7	9	**214**
2011	76	130	81	75	7	9	**378**
2012	73	78	57	50	6	17	**282**
2013	94	67	69	63	8	12	**314**
2014	63	51	29	44	9	13	**209**
2015	84	48	49	25	4	5	**216**
2016	41	44	35	19	14	5	**160**
2017	27	42	34	32	5	3	**148**
Species totals	**803**	**784**	**706**	**543**	**104**	**513**	**3,495**

Table 22. (left) Total estimated turtle bycatch in individuals (median, and lower and upper 95 % confidence intervals) for large-scale purse seine fleets. Average annual bycatch rates by set and '000 metric tonnes of target catch are also included. (right) Proportion of annual estimated turtle bycatch (individuals) by association type (Source: Peatman et al. 2018).

	Estimated bycatch			Bycatch rate per	
Year	Low	Median	High	set	'000 mt
2003	218	323	443	0.011	0.32
2004	77	129	199	0.004	0.12
2005	129	190	264	0.005	0.16
2006	119	171	234	0.005	0.14
2007	194	275	383	0.008	0.20
2008	160	227	305	0.006	0.16
2009	196	260	337	0.006	0.17
2010	198	214	230	0.004	0.14
2011	356	378	403	0.007	0.27
2012	264	282	301	0.005	0.17
2013	300	314	330	0.006	0.20
2014	195	209	224	0.004	0.12
2015	203	216	229	0.005	0.14
2016	148	160	172	0.003	0.10
2017	97	148	219	0.003	0.10

Year	aFAD	dFAD	log	FS	whale	whale.shk
2003	7.1%	16.4%	23.0%	53.5%	0.0%	0.0%
2004	18.4%	0.0%	49.0%	32.6%	0.0%	0.0%
2005	9.5%	5.4%	54.2%	30.3%	0.5%	0.0%
2006	6.9%	19.7%	41.9%	31.5%	0.0%	0.0%
2007	5.0%	12.4%	22.6%	59.6%	0.4%	0.0%
2008	6.7%	14.5%	4.7%	73.8%	0.4%	0.0%
2009	3.4%	23.7%	34.9%	37.5%	0.4%	0.0%
2010	2.2%	11.5%	9.9%	76.4%	0.0%	0.0%
2011	3.1%	33.3%	7.1%	55.9%	0.5%	0.0%
2012	5.2%	22.3%	18.6%	53.5%	0.4%	0.0%
2013	3.3%	18.2%	11.6%	66.6%	0.3%	0.0%
2014	1.9%	22.3%	12.7%	63.1%	0.0%	0.0%
2015	3.7%	24.5%	9.7%	62.1%	0.0%	0.0%
2016	3.5%	21.3%	5.9%	68.7%	0.6%	0.0%
2017	0.0%	7.6%	3.8%	87.6%	1.0%	0.0%

In the WCPO, all but one species of sea turtle (Kemp's ridley) inhabit these waters. The South Pacific loggerhead has the highest conservation concern within the region with leatherback and hawksbill also having a high risk.

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 2008-03 –

Conservation Management Measure of Sea Turtles[27] which covers both longline and purse seine operations. Relevant to the purse seine fishery, this CMM requires members to:

- Members will implement, as appropriate the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations and to ensure the safe handling of all captured sea turtles, in order to improve their survival;
- Report to the Commission in Part 2 of their annual reports the progress of implementation of the FAO Guidelines and this measure, including information collected on interactions with sea turtles in fisheries managed under the Convention;
- All data collected by the WCPFC Regional Observer Programme (ROP), shall be reported to the Commission as provided in paragraph 2 above or as agreed to under other Commission data collection provisions;
- Require fishers to bring aboard any captured sea turtle that is comatose or inactive as soon as possible and foster its recovery, including giving it resuscitation, before returning it to the water. CCMs shall ensure that fishermen are aware of and use proper mitigation and handling techniques, as described in WCPFC guidelines.
- Promptly release sea turtles entangled, and that they do so in accordance with WCPFC guidelines;
- Carry and use dip-nets in accordance with these WCPFC guidelines;
- Purse seine vessels ensure that operators, to the extent practicable:
    - Avoid encirclement of sea turtles, and if a sea turtle is encircled or entangled, take practicable measures to safely release the turtle.
    - Release all sea turtles observed entangled in fish aggregating devices (FADs) or other fishing gear.
    - If a sea turtle is entangled in the net, stop net roll as soon as the turtle comes out of the water; disentangle the turtle without injuring it before resuming the net roll; and to the extent practicable, assist the recovery of the turtle before returning it to the water.
    - Carry and employ dip nets, when appropriate, to handle turtles.
- Require purse seine operators to record all incidents involving sea turtles during fishing operations and report such incidents to the appropriate authorities of the CCM;
- Provide the results of the reporting to the Commission as part of the reporting requirement;
- Provide to the Commission the results of any research related to the development of modified FAD designs to reduce sea turtle entanglement and take measures to encourage the use of designs found to be successful at such reduction;
- Provide the results of the reporting to the Commission as part of the reporting requirement;
- The SC and TCC will annually review the information reported by members pursuant to this measure. Where necessary an updated suite of mitigation measures, specifications for mitigation measures, or recommendations for their application will be developed by these committees and provided to the Commission for its consideration and review;
- This measure authorises the Secretariat to obligate resources available to the Special Requirements Fund to be used to assist developing State Members and Territories in implementing the FAO Guidelines to Reduce Sea Turtle Mortality. These funds can be used to train and encourage fishers to adopt appropriate methods and technologies to reduce interactions with sea turtles and to mitigate their adverse effects;
- The Commission will regularly consider additional or new mitigation measures for other longline and purse seine fisheries, based on advice from the SC and TCC and on information provided by CCMs pursuant to this measure.

[27] https://www.wcpfc.int/system/files/CMM%202008-03%20%5BSea%20turtles%5D.pdf

The WCPFC has also developed several guidelines for handling sea turtles when captured by longline and purse seine operations[2829].

Marine mammals: This assessment has no direct data on marine mammals (primarily to cetaceans). Peatman et al. (2018) has again been used to make inferences on cetacean interactions in the fisheries under assessment. The study showed variability across the years (2003 – 2017). In general, a reduction in marine mammal bycatch has been observed. The highest interactions are associated with drifting FADs. Marine mammal bycatch estimates had 95 % confidence intervals of 54 % for 2003 to 2009, and 17 % for 2010 to 2016 (Table 23).

Table 23. (left) Total estimated marine mammal bycatch in individuals (median, and lower and upper 95 % confidence intervals) for large-scale purse seine fleets. Average annual bycatch rates by set and '000 metric tonnes of target catch are also included. (right) Proportion of annual estimated marine mammal bycatch (individuals) by association type.

	Estimated bycatch			Bycatch rate per	
Year	Low	Median	High	set	'000 mt
2003	415	819	1,505	0.027	0.82
2004	1,035	1,620	2,405	0.050	1.52
2005	438	779	1,364	0.021	0.65
2006	946	1,458	2,129	0.044	1.19
2007	653	1,212	2,174	0.033	0.89
2008	627	1,258	2,273	0.031	0.90
2009	1,114	1,631	2,369	0.037	1.07
2010	392	472	575	0.009	0.32
2011	504	585	694	0.011	0.42
2012	546	639	756	0.011	0.39
2013	756	825	912	0.015	0.52
2014	326	381	456	0.007	0.21
2015	377	435	513	0.009	0.28
2016	273	334	421	0.007	0.21
2017	257	427	722	0.009	0.30

Year	aFAD	dFAD	log	FS	whale	whale.shk
2003	31.1%	2.3%	58.7%	7.6%	0.3%	0.0%
2004	8.3%	18.1%	62.5%	8.9%	2.3%	0.0%
2005	17.0%	5.4%	71.9%	5.6%	0.0%	0.0%
2006	8.1%	18.0%	57.0%	16.9%	0.0%	0.0%
2007	12.9%	20.3%	44.1%	21.8%	0.9%	0.0%
2008	16.9%	32.7%	46.0%	4.0%	0.4%	0.0%
2009	10.8%	38.6%	35.7%	14.8%	0.1%	0.0%
2010	22.0%	37.3%	16.3%	20.9%	3.5%	0.0%
2011	14.4%	57.5%	9.3%	17.3%	1.6%	0.0%
2012	6.4%	44.6%	31.5%	16.5%	1.0%	0.0%
2013	5.9%	60.7%	23.2%	9.8%	0.4%	0.0%
2014	10.6%	33.3%	27.0%	28.1%	1.1%	0.0%
2015	5.1%	58.9%	21.0%	13.9%	1.2%	0.0%
2016	13.9%	45.1%	20.1%	19.4%	1.5%	0.0%
2017	12.0%	32.3%	16.9%	26.9%	12.0%	0.0%

On 1 January 2013, the WCPFC adopted a Conservation and Management Measure CMM 2011-03[30] to address the impact from purse seine activity on cetaceans. CMM 2011-03 aims to implement a range of measures for the protection of cetaceans from purse seine fishing operations. The CMM applies to the high seas and EEZs of the Convention Area and prohibits any members flagged vessels from setting a purse seine net on a school of tuna associated with a cetacean if the animal is sighted prior to the commencement of the set. The CMM further states that:

> 1. CCMs shall require that, in the event that a cetacean is unintentionally encircled in the purse seine net, the master of the vessel shall:
>
> (a) ensure that all reasonable steps are taken to ensure its safe release. This shall include stopping the net roll and not recommencing fishing operation until the animal has been released and is no longer at risk of recapture; and
>
> (b) report the incident to the relevant authority of the flag State, including details of the species (if known) and number of individuals, location and date of such encirclement, steps taken to ensure safe release, and an assessment of the life status of the animal on release (including, if possible, whether the animal was released alive but subsequently died).

[28]https://www.wcpfc.int/system/files/WCPFC%20Guidelines%20for%20the%20Handling%20of%20Sea%20Turtles%20-%201Apr2010_0.pdf
[29]https://www.wcpfc.int/system/files/WCPFC%20Guidelines%20for%20the%20Handling%20of%20Sea%20Turtles%20%28Graphics%29%20-%2030June2009_0.pdf
[30] https://www.wcpfc.int/doc/cmm-2011-03/conservation-and-management-measure-address-impact-purse-seine-activity-cetaceans

2. In taking steps to ensure the safe release of the cetacean as required under paragraph 2(a), CCMs shall require the master of the vessel to follow any guidelines adopted by the Commission for the purpose of this measure.

3. In applying steps under paragraphs 2(a) and 3, the safety of the crew shall remain paramount.

4. CCMs shall include in their Part 1 Annual Report any instances in which cetaceans have been encircled by the purse seine nets of their flagged vessels, reported under paragraph 2(b).

5. The Secretariat shall report on the implementation of this conservation and management measure on the basis of observer reports, as part of the Annual Report on the Regional Observer Programme.

This CMM is reviewed every three years. The latest compliance management report for this CMM was reported on at WCPFC 14 for activities conducted in 2016. The WCPFC 14 summary report indicated that out of 19 countries assessed, there had been a 16% non-compliance with reporting in countries Part 1 annual report (Japan, Solomon Islands, and Vanuatu) and a further 16% non-compliance with meeting reporting deadlines (Ecuador, PNG and European Union) to the Commission.

4.4.7 Habitats

This fishery is strictly a pelagic fishery and does not interact with benthic habitats. Although the pelagic realm constitutes a 'habitat' this is dealt with under ecosystems below.

The ability for the fishery to 'ghost fish' was also considered but found to highly unlikely. Purse seine nets, due to their operational nature, size, and value, are rarely, if ever, lost at sea. There are no records of industrial scale purse seine nets being lost. However, if a net of such size where to be lost, hypothetically, then due to its nature, design and construction materials, it would be expected to be passive with no, or extremely limited, ongoing interactions.

4.4.8 Ecosystem

In the Pacific Ocean, exploited tuna populations have declined steadily to levels near the equilibrium biomass that is likely to produce the MSY for each stock. The impacts of the fishery on bycatch and ETP species, as well as habitats have all been considered and described in previous sections. Other risks however 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 under the ecosystem component of Principle 2.

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 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 (e.g., Myer and Worm 2003; Polovina et al. 2009).

In the WCPO, purse seine fisheries (both FAD and free-school) have reported another record catch, and since the 1960s tuna fisheries have harvested approximately 70 million metric-tonnes of tuna (**Error! Reference source not found.**).

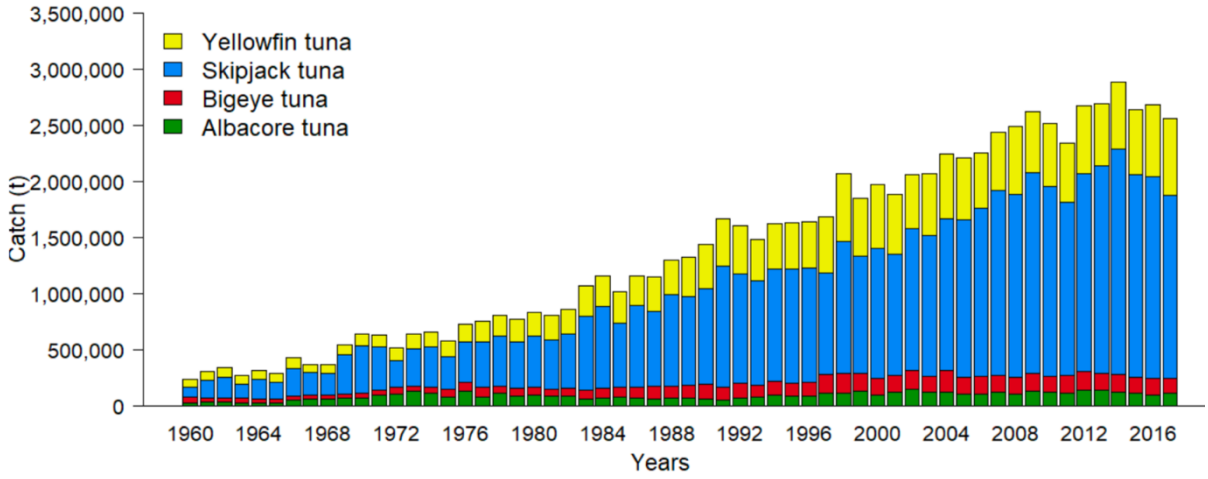

Figure 15. Catch (metric tonnes) by gear (top) and species (bottom) for the western and central Pacific region, 1960-2017. Note: data for 2017 are preliminary (source: Brouwer et al., 2018).

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[31] but they still require further testing and ground-truthing before being fully applied to WCPFC fisheries as a tool[32]. Some of these earlier model outputs are provided in **Error! Reference source not found.**.

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 (**Error! Reference source not found.**).

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

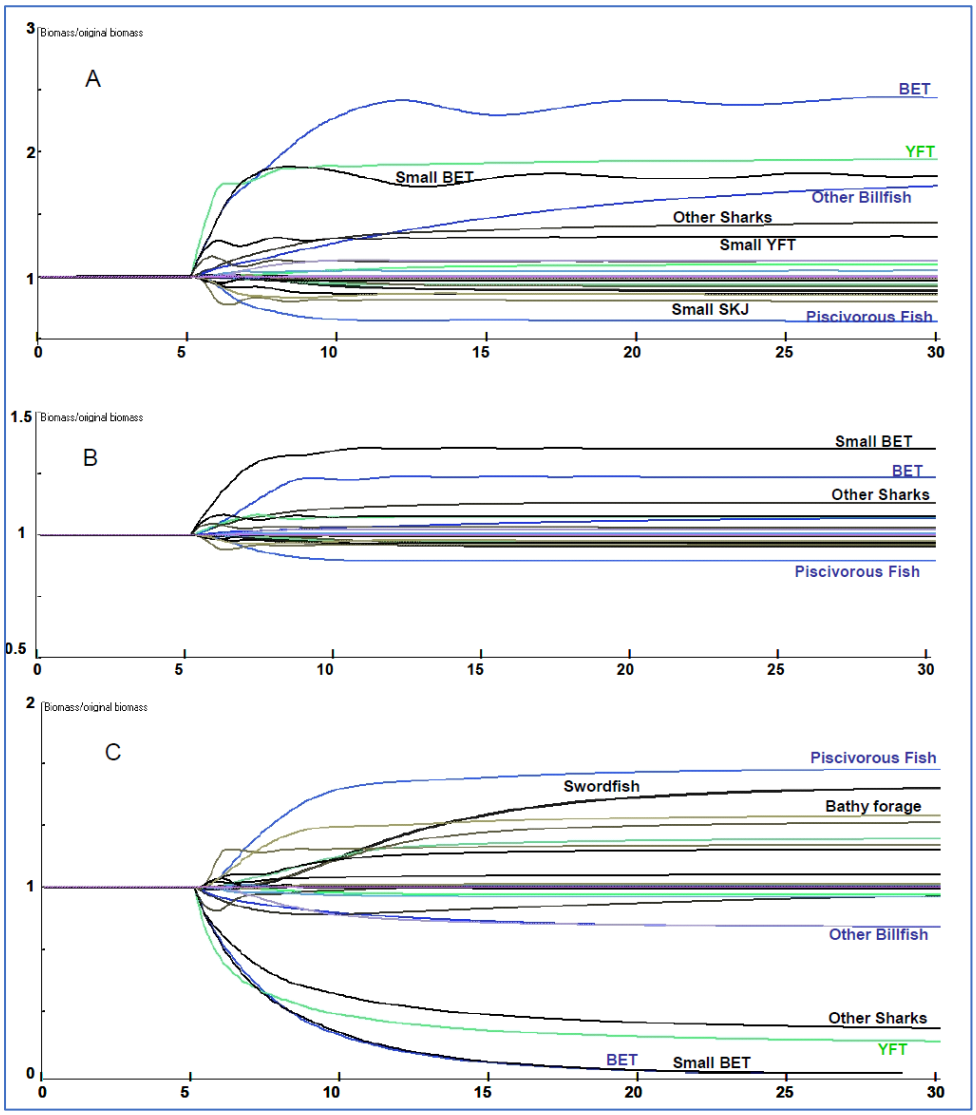

Figure 16. Biomass/Original Biomass ratio trajectories of the ecosystem components over 30 years with three different Ecosim scenarios: A) complete removal of all fisheries after five years, B) removal of FAD purse seine after five years, other fisheries maintained at current level, C) all fisheries doubled after five years and maintained at that level (Source: Allain et al., 2007).

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, at least for free-schools.

What is not clear for 'associated' UoAs, is the ecosystem impacts of the deployment of FADs in the region, i.e. whether species (not just target species) have changed their behaviours (Hallier and Gaertner, 2008), changing capturability and predator-prey interactions, whether certain species are more prone to entanglement, reducing biomass and impacting trophic structures. Some studies have been published (Hallier and Gaernter, 2008; Dagorn et al., 2012; Forget et al., 2015), which have shown possible behavioural shifts in target tuna species as well as non-target species

in association with FADs. As an example, Forget et al. (2015) found that skipjack, bigeye and yellowfin tuna and silky sharks have shown to be more closely associated with FADs during the day and less during the night, whilst other bycatch species such as rainbow runner and oceanic triggerfish, the opposite for true. This type of behavioural shift, when taken into account with fisher behaviours could see a higher amount of these species being captured in FAD fishing operations, as purse seine fishing is a day activity. In summary, not enough information is known about ecosystem dynamics in relation to industrial FAD fishing and management is yet to address this issue sufficiently.

4.5 Principle 3

4.5.1 Legal and customary framework

The Western and Central Pacific Fisheries Commission (WCPFC) is the Regional Fisheries Management Organisation (RFMO) responsible for the management and governance of tuna and tuna like species in the Western and Central Pacific Ocean (WCPO) as outlined in Annex I of the 1982 Convention[33]. The WCPFC was first created and open to countries signature in Honolulu on 5 September 2000. The WCPFC is one of the first regional fisheries agreements to be adopted since the conclusion in 1995 of the UN Fish Stocks Agreement (UNFSA). The WCPFC came into effect and was ratified by the forming countries in 2004. The objective of the Convention is '*to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 United Nations Convention on the Law of the Sea and the 1995 UN Fish Stocks Agreement (Article 2 of the Convention*)'. For this purpose, the Convention establishes a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean[34].

Th WCPFC and associated arrangements are consistent with the principles and provisions of UNCLOS, UNFSA & CBD. The WCPFC has incorporated the precautionary approach into the Commission through its various Conservation Management Measures (CMMs), Technical and Compliance Committee, Scientific Committee and various other instruments and working groups. All WCPFC Members are legally bound to apply the precautionary approach as parties to the WCPFC Convention under Article 5 Paragraph C and Article 6 of the WCPFC Convention[35].

The WCPFC dispute settlement mechanism is set out in Article 31 (Procedures for the settlement of disputes)[36] of the Convention. The system includes specific provision for dispute settlement at the WCPFC that are considered to be effective and transparent in dealing with most issues and appropriate to the context of the fishery, albeit untested. There is no available evidence on any failure to comply with binding judicial decisions. Processes are in place to allow such challenges to take place, but the system has a record of acting appropriately to avoid legal disputes.

The WCPFC Convention provides for recognition of the interests of all small Island developing States, territories, and artisanal fishers within the overall framework for sustainability in the WCPFC Convention and specifically under Articles 5, 7, 10, 30[37]. The WCPFC Convention and measures, strategies and plans have mechanisms to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

The WCPFC management and governance system is consistent with and aims to achieve sustainable fisheries in accordance with MSC Principles 1 and 2.

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[33] http://www.fao.org/fishery/rfb/wcpfc/en

[34] https://www.wcpfc.int/convention-text

[35] https://www.wcpfc.int/system/files/text.pdf

[36] https://www.wcpfc.int/system/files/text.pdf

[37] https://www.wcpfc.int/system/files/text.pdf

4.5.2 Consultation roles and responsibilities

This assessment is relatively broad (i.e., bigeye, skipjack and yellowfin tuna caught in the western and central Pacific Ocean by purse seine gear associating with FADs and unassociated (free-schools)) and therefore falls entirely under WCPFC governance, rather than a specific nation's fishing operation.

WCPFC, under Articles 9–16 and 23–24, have set out clearly explicitly defined functions, roles and responsibilities of member states and the committees formed under Commission control (i.e., Scientific Committee and Technical Compliance Committee), and has identified all organisations and individuals involved in the management processes.

The Commission and the associated committees have clear operating procedures and terms of reference. The roles and responsibilities of members and non-members are clearly defined in the Convention, in the Rules of Procedure and in relevant CMMs [38]. A handbook is produced each year and the 2019 handbook is available online at: https://www.wcpfc.int/doc/observer-guide-wcpfc-cmms-booklet-2019/observer-guide-wcpfc-cmms-booklet-2019.

Under the Convention, there are several Articles that make specific mention of the consultation requirements and processes. Furthermore, WCPFC, throughout its operations and numerous Committees, there are broad, regular formal and informal consultation processes that are undertaken with various parties, including consultation with bilateral partners and domestic stakeholders. These processes seek and accept information, and WCPFC has demonstrated to consider such information received. These various consultation processes provides opportunity for involvement. WCPFC allows observers to attend all meetings and Committees and working groups, which allows them access to all the main management bodies and information provided within. Observers are permitted to make oral submissions to the Commission and its subsidiary bodies. Written documents prepared by observers can also be tabled at meetings as information documents in line with the Rules of Procedure.

WCPFC is active in assisting and facilitating the regular and timely provision of fisheries data and information in order to be assessed by the Commission secretariat and scientific providers such as SPC. The Commission actively uses information from the fishery and its member states in order to inform fisheries management decisions and the formulation of CMMs. This is demonstrated through reports and outcomes of WCPFC meetings, which detail the decision-making process and are readily accessible online.

In summary, the WCPFC facilitates effective engagement with stakeholders and furthermore provides logistical and financial support to cooperating non-members to ensure attendance and meaningful involvement and interaction in the cooperative management of fisheries in the WCPO.

4.5.3 Long-term objectives

WCPFC has clear long-term objectives that guide decision-making. These objectives are consistent with MSC Principles and the precautionary approach. These are explicit within applicable WCPFC CMMs and the WCPFC Convention text[39]. Article 2 specifies that the Commission have the objective to "*ensure through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the WCPO in accordance with the 1982 Convention and Agreement [UNCLOS and FSA respectively]*". Article 5 of the Convention provides principles and measures for achieving this conservation and management objective; more specifically Article 5(c) requires the Commission to apply the precautionary approach in decision-making and Article 6 outlines the means by which this will be given effect. Article 10 of the Convention is consistent with MSC principles and

[38] https://www.wcpfc.int/system/files/Rules_of_Procedure.pdf

[39] https://www.wcpfc.int/system/files/text.pdf

objectives in specifying long-term objectives of *"maintaining or restoring populations…above levels at which their preproduction may become seriously threatened"*[40].

However, it should be noted that while there is a requirement for the WCPFC to apply the precautionary principle during decision-making it has historically struggled to do so for some stocks (e.g., bigeye tuna).

4.5.4 Fishery-specific objectives

The WCPFC have objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2 and are explicit within the fishery-specific management system.

Additional to the high-level overarching umbrella objective of the WCPFC, the long-term objectives are identified in relevant CMMs and through default reference points for target stocks. There are numerous Conservation Management Measures developed and implemented at the WCPFC that address and include objectives relating to P1 and P2 outcomes of the MSC (Table 24), including many that pertain to *'Species of Special Interest'*.

While these include short- and long-term objectives and are consistent with the MSC's Principles 1 and 2, the objectives are not all well-defined in terms of measurable targets or outcomes, especially for the CMMs related to P2 outcomes.

Table 24. Example of WCPFC CMMs that include objectives to maintain the stock at a prescribed level or mitigate interactions with unwanted species.

CMM	Species
2005-03	North Pacific albacore
2006-04	Southwest Pacific striped marlin
2008-03 (effective until 31 December 2019, then replaced by CMM 2018-04)	Sea turtles
2009-03	Swordfish
2010-01	North Pacific striped marlin
2015-02	South Pacific albacore
2010-07 2014-05	Sharks
2011-03	Cetaceans
2011-04	Oceanic whitetip sharks
2012-04	Whale sharks

[40] https://www.wcpfc.int/system/files/text.pdf

2013-08	Silky sharks
2018-01 2015-06 2014-06	Bigeye, skipjack and yellowfin tuna
2018-03	Seabirds

4.5.5 Decision-making processes

The WCPFC has established clear and explicit decision-making processes within the Convention and include processes of the SC and the TCC[41]. Decision-making at the Commission is by consensus and if consensus cannot be reached, voting grounds for appealing decisions, conciliation and review are all part of the established decision-making process, as described in *Article 20* of the WCPFC Convention.

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 to ensure that the Commission obtains the best scientific information available for its consideration and decision-making.

Such decision-making processes have resulted in a comprehensive set of CMMs and strategies to achieve the specific objectives for the UoAs under assessment.

In summary, WCPFC decision-making processes are open, use the precautionary approach and best available information and are well-documented. The WCPFC decision making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. However, they do not clearly respond to all issues, nor provide formal reporting.

4.5.6 Compliance and enforcement

The WCPFC aims to ensure compliance through the use of VMS, IUU vessel listing, port state controls, observers, logbooks and transhipment monitoring which are covered under CMMs[29]. The combination of monitoring, control and surveillance (MCS) at WCPFC creates a system that has demonstrated to be comprehensive and effective in the WCPO fisheries. The WCPFC has a considerable combination of MCS and compliance mechanisms/ tools to creates a system that has been demonstrated to be comprehensive and effective for the UoA.

The WCPFC have clear penalties and sanctions to deal with non-compliance that are appropriate and consistently applied and are an effective deterrent. For example, the 100% observer scheme has proven to have worked effectively, with a number of safeguards in place to ensure that non-compliance and inaccurate reporting are identified. There are some issues relating a small number of parties to WCPFC reporting weaknesses, however, these have been identified and are continually being addressed by the Commission and its members.

A comprehensive MCS system has been implemented in the fishery and justified by a strong human and asset base and has demonstrate an ability to enforce relevant management measures, strategies and/or rules.

[41] https://www.wcpfc.int/system/files/text.pdf

Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery. There is no evidence of systematic non-compliance.

4.5.7 Monitoring and management performance evaluation

In 2011, the WCPFC undertook an expert external performance review panel that consisted of four external experts as well as representatives from Small Island Developing States[30]. A schedule of responses and actions were developed in response to the recommendations of the review; these were considered by the WCPFC in 2012. An Independent Review of the Commission's Transitional Science Structure and Functions recommended periodic external review of the stock assessments, which has been adopted by the WCPFC. All stock assessments undertaken by SPC are subject to peer-review and occasional external review.

The WCPFC develops regional reports that detail compliance of members with the reporting provisions of the Commission. Progress with implementation of CMMs is monitored through the reporting provisions within the CMMs themselves or the annual report by members to the Commission. This allows Commission meetings to provide an overall review of key processes and outcomes.

5 Traceability

5.1 Traceability within the fishery

No information related to traceability within the fishery was supplied for this pre-assessment, so an analysis is therefore not provided.

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7 Pre-assessment results

7.1 Pre-assessment results overview

7.1.1 Overview

There are currently multiple MSC-certified fisheries for the target species of this fishery.

For WCPO bigeye, yellowfin and skipjack, the most recent stock assessments conclude that the stocks are at or above the MSY levels, and above the PRI with a high degree of certainty, resulting in good overall scores for Principle 1. The core regional management measure for the stocks is WCPFC CMM 2018-01, which provides for a series of management measures aimed at constraining effort on tropical tunas and is intended to be a 'bridging measure' while work continues towards a formal harvest strategy.

Principle 2 generally scored well, especially for the free-school UoAs. The main issues for Principle 2 are in the FAD-associated fisheries; unobserved mortality of ETP species (such as silky sharks and turtles) due to FAD entanglement and the possible ecosystem impact of FADs. The former only applies if entangling FADs are used, which might be the case in this fishery.

Principle 3 has strong management implemented through the RFMO, the Western Central Pacific Fisheries Commission (WCPFC) and as mentioned there are several MSC-certified fisheries in the WCPO at the time of writing this report. A consideration before entering into full assessment will be the management of national authorities in their EEZs, which has not been covered by this pre-assessment.

7.1.2 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, and most importantly, it will be necessary for the client fishery to provide full catch data (all species), firstly directly from the fishery itself, but also via a request to the relevant national management authorities who process fishery logbooks. This provides the full assessment team with third-party, verifiable data to cross-check against the fisheries. It will also be necessary to ask the flag states' management authorities to request aggregated observer data from SPC. 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.

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 has not been covered by this pre-assessment due to the lack of fishery-specific data.

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 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.

7.2 Summary of potential pre-conditions by Principle

Table 25 – Summary of Performance Indicators which are predicted to lead to a fail (score <60)

Principle of the Fisheries Standard	Number of PIs with draft scoring ranges <60
Principle 1 – Stock status	**0**
Principle 2 – Minimising environmental impacts	**1**
Principle 3 – Effective management	**0**

7.3 Summary of Performance Indicator level scores

Table 26 to Table 31 present summarised scoring rationales for this fishery for each PI across the three Principles.

Table 26. Summary of Principle 1 Performance Indicator level scores for WCPO bigeye

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status – bigeye tuna	**≥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). Further to this, 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 WCPFC15 (WCPFC, 2019). 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.		
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. Further to this it has been both internally and externally peer reviewed.		

Table 27. Summary of Principle 1 Performance Indicator level scores for WCPO skipjack

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status – skipjack tuna	**≥80**	**No**
Rationale or key points		
The PRI has been taken to be the agreed limit reference point (20% $SB_{F=0}$). Considering the full range of the structural uncertainty grid (5% and 95% CIs); SB ranges from ~40-57% of $SB_{F=0}$, with the reference case SB_{recent} at 52% according to the 2016 stock assessment (McKechnie et al., 2016) (considered here as the 2019 revision (Vincent et al., 2019) has not been used by any other MSC-certified fishery). The 2019 stock assessment also puts the stock above PRI in either the 5 (like 2016 assessment) or 8 region model. Median SB_{recent} = 43%$SB_{F=0}$; SB_{latest} = 41%$SB_{F=0}$; i.e. the stock is		

also considered to be fluctuating at a level consistent with MSY. Estimates of SB_{recent}/SB_{MSY}: reference case model: 2.31; median of structural uncertainty grid: 2.04; lower 5% confidence interval of uncertainty grid: 1.58. In other words, there is a probability <5% that the stock is below SB_{MSY}. Vincent et al., 2019 reports median SB_{recent}/SB_{MSY} estimates of 2.5, and 10% confidence interval of uncertainty grid: 1.6 – 1.7 depending on the region model (note 2019 doesn't present 5% confidence intervals). In summary, the 2019 stock assessment does not indicate any negative scoring changes to those fisheries scored using the 2016 stock assessment.		
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		
The current management framework can be expected to ensure that F and SB remain at appropriate levels; this is supported by the current stock status and status quo projections. As with bigeye and yellowfin, there is not a formal strategy in place although there is a workplan in place to work towards one, which means only SG60 can be met for this stock.		
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 WCPO skipjack (see CMM 2014-06 and associated workplans). Meanwhile, a HCR can be considered to be 'available' under MSC definitions (see under WCPO bigeye above), allowing a score of 60 but no higher.		
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 with bigeye, 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, and accounts for major features of the biology of the species (e.g. estimates		

of age/growth, natural mortality at age, recruitment etc.). The stock assessment has been tested and shown to be robust. The assessment is also subject to peer review through the WCPFC Scientific Committee (SC).

Table 28. Summary of Principle 1 Performance Indicator level scores for WCPO yellowfin

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status – yellowfin tuna	**≥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). In relation to the stock 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 and skipjack, yellowfin is part of the WCPFC workplan (WCPFC 2017a) 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. 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 29. Summary of Principle 2 Performance Indicator level scores for FAD fisheries

* **Note: Fishery specific information was not available to score this Principle.**

2.1.1 – Primary Bycatch Species Outcome	**≥80**	**No**
Rationale or key points		
Likely main primary bycatch species have been identified as bigeye, skipjack and yellowfin (those species which are not the target (P1) species of the UoA in question). All these main primary species are above the PRI with a high degree of certainty (see P1 above). They are also considered to be fluctuating around a level consistent with MSY. All three species have recent and robust stock assessments that indicate that overfishing is not occurring and that the stocks are not overfished. These are assessed and reviewed by SPC and WCPFC regularly. Therefore, at least SG80 is met, but likely higher.		
2.1.2 – Primary Bycatch Species Management	**≥80**	**No**
Rationale or key points		
There is a strategy in place for the main primary species (bigeye, yellowfin, skipjack) (CMM 2014-06, 2018-01) and given that stocks are above the PRI and fluctuating around a level consistent with MSY (see Table 26 - Table 28 above), there is an objective basis for concluding that the strategy in place has been implemented successfully. There is no unwanted catch of these species which are retained unless damaged beyond use. On this basis, at least SG80 is met.		
2.1.3 – Primary Bycatch Species Information	**≥80**	**No**
Rationale or key points		
There is quantitative information for the catch of main and minor primary species (landings and discards) from a range of fishery dependent (logbooks) and independent (port sampling and 100% observer coverage on all purse seine trips in the WCPO) sources which are reviewed by research and government agencies. Each of the main primary species has a detailed stock assessment that provides quantitative information on total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting		

recruitment. Quantitative information is therefore adequate to support at least a partial strategy to manage 'main' primary species. At least SG80 is met.		
2.2.1 – Secondary Bycatch Species Outcome	**≥80**	**No**
Rationale or key points		
It is assumed that there are no main secondary species (species making up >5% of the catch). This assumption is based on published literature on tuna purse seine fisheries such as Peatman et al. (2017 and 2018) and Herrera & García Horcajuelo (2018). As there are no 'main' secondary species this scoring issue is not applicable[42]. FCR SA3.2.1 applies here as there are no components for the UoAs to impact. In order to score higher, minor secondary species would have to be scored to ascertain whether any are below biologically based limits and for those species that the UoAs can evidence their operations do not hinder the recovery and rebuilding of those species. This has not been attempted in this pre-assessment.		
2.2.2 – Secondary Bycatch Species Management	**60-79**	**No**
Rationale or key points		
Given that there are no 'main' secondary species considered under this assessment and that the other minor secondary species are likely taken in extremely small quantities, the term "if necessary" applies for having a partial strategy in place. Evidence for implementation for a partial strategy would include licences, VMS and observer data, landings data (port sampling), logbooks and the MCS system as described under Principle 3. With respect to shark finning, this is dependent on whether all sharks are placed under ETP or whether some fit into the secondary species category at full assessment (see comment in Section 4.4.6 above for further explanation on division of P2 data). If some are placed under secondary species, compliance records/incidences of shark finning from observer reports or sanctions/penalties imposed on client vessels will need to be considered here. It is not considered likely that there is significant shark-finning taking place on board, but since it is not clear that there is a strictly enforced policy against shark finning for all vessel in the UoAs, a precautionary score of 60-79 has been proposed.		
2.2.3 – Secondary Bycatch Species Information	**≥80**	**No**
Rationale or key points		
As previously mentioned, there are not thought to be any 'main' secondary species in this assessment. This PI scored SG80 by default. To achieve higher, information would need to be adequate to estimate the impact of the UoAs and support a strategy to manage all secondary species. Information collection for purse seine fisheries in the WCPO is good with 100% observer coverage on all trips, however despite the thorough information available, there are not stock assessments, or even stock descriptions identifying individual stocks for all secondary species.		
2.3.1 – ETP Species Outcome	**<60**	**No**

[42]https://mscportal.force.com/interpret/s/article/P2-species-outcome-PIs-scoring-when-no-main-or-no-minor-or-both-PI-2-1-1-1527262009344

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 FAD UoAs' activities. It is difficult to score due to lack of fishery-specific information from the fishery. Extrapolation of FAD UoAs is not possible and therefore overall this PI fails given all the uncertainties about types of FADs used, associated mortality etc. and therefore whether direct effects are likely or high likely not to hinder recovery of ETP species. Scoring elements and the relevant scoring are discussed below. Whale sharks: Bycatch of whale shark may be a significant issue for both free-school and associated sets. Although setting on whale sharks has been banned by WCPFC since 2014, whale sharks may act as the FADs, rather than being associated with drifting FADs deployed by the fishery. The PNA assessment provides a mortality estimate of 11.3% mortality (based on an average of 61 interactions for the 2011-2015 for the fishery and SPC mortality estimate of seven) for the free-school component of the fishery (Blythe-Skyrme et al., 2018). Therefore, the assessment team concluded that the UoAs direct effects are known but given the numbers recorded by observers and the fate of all animals (all released with majority alive and some unknown), SG80 cannot be awarded. A precautionary score of 60 – 79 is given due to lack of fishery-specific information. 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. Hall and Roman (2013) reported 75-90% of sharks found in FADs to be silky sharks. Survival from entanglement is considered negligible. As a ram-ventilating species, this shark need to actively swim through the water to keep oxygenating its body (Hutchinson et al, 2015). Unless the dFAD is lifted out of the water or the shark entanglement occurs close enough to the sea surface to be seen, the incident may go undetected (ISSF, 2017). A previous study completed by Filmalter et al. (2013), estimates mortality through FAD entanglement in the Indian Ocean to be five to ten times that of the known mortality from the region's purse seine fishery (480,000 – 960,000 individuals). There is no reason why those kinds of figures couldn't apply to other oceans such as the western and central Pacific. Filmalter et al (2013) further went on to estimate a figure of 400,000 to two million silky sharks when all world fisheries are combined. Further information is lacking about the potential for causing behavioural changes and making them more susceptible to capture in purse seine fisheries (Forget et al., 2015). Based on this argument, SG60 is not met. Oceanic whitetip sharks: As with silky sharks, oceanic whitetips are heavily associated with dFADs (ISSF, 2017). Again, as ram-ventilators, drowning once entangled in a FAD is inevitable. 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. Indirect effects caused by association with FADs is not addressed, especially as it is possible that the fishery is still using 'entangling' FADs. SG80 cannot be met. Giant manta and mobula rays: 5% of elasmobranch bycatch in WCPO purse seine fisheries between 2003-17 is attributed to these species (Peatman et al., 2018), peaking with an estimate of 68,000 individuals in 2016 (Peatman et al., 2018). Given the probable scale of the fishery compared to all purse seine operations in the WCPO and 100% observer coverage provides good information on the fate and therefore direct effects of the UoAs on manta and mobula species. There is no evidence of entanglement issues with dFADs or associative behaviours. SG80 is likely met. Marine turtles: There have been some studies into release rates of species, for example 75% of turtles are reportedly released alive when found entangled on the surface (Hall and Roman, 2013). The number of turtles observed entangled in 'ISSF, 2017). 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). Whilst turtles are perceived to be more heavily impacted by longline fisheries,

observed mortality is associated with entanglement with FADs and subsequent drowning (Williams et al., 2009). Given that there is no fishery-specific data creating uncertainty around direct effects of FADs in this portion of the fishery and the potential knock-on effects on turtle populations, the precautionary course of action is not to award SG60 for this scoring group.

Cetaceans: According to the PNA free-school purse-seine PCR (Blythe-Skyrme et al., 2018), free-school sets have a low bycatch and FAD sets a negligible bycatch; >90% are observed to be alive on release. Without direct fishery data is ascertain the affected species and their subsequent population status but given 100% observer coverage ensuring compliance with CMM 2011-03 and direct effects are known via number and fate recording, SG 80 is likely to be met.

2.3.2 – ETP Species Management	**60 – 79**	**No**

Rationale or key points

Whale sharks: Have their own CMM to manage interactions with purse seine gear and are listed as a 'key shark species' (Harley et al., 2013). WCPFC banned the setting of purse seine gear deliberately on whale sharks in 2014 with the enactment of CMM 2012-04 and applies to EEZs of the Convention Area and on the high seas. Further details of the CMM are provided in Section 4.4.6.**Error! Reference source not found.** but essentially vessels are required to take all reasonable steps to release the individuals safely. The CMM is reviewed every two years, which considers the CMM's effectiveness, as well as the compliance of CCMs. This PI is likely to meet SG80 for this species.

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. Although high observer coverage provides confidence that vessels are compiling with these measures, there is not a company policy in place to ban the use of entangling FADs, as there is not a strategy in place for managing the impact of the UoA (i.e. use of FADs), which would minimise the mortality of this species. This precludes SG80 not being met.

Oceanic whitetip sharks: As with silky sharks, CMM 2011-04 has be enacted for this species. Otherwise rationale as per silky sharks. SG80 is met.

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 2005-03 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.

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. As with silky sharks, the lack of company policy to ban entangling FAD use in the fishery to minimise FAD-associated mortality, this PI does not meet SG80 for marine turtles.

Cetaceans: The incidental capture of cetaceans in purse seine gear is addressed under CMM 2011-03 (enforceable from 2013), prohibits CMM-flagged vessels from setting a purse seine net on a school of tuna associated with a cetacean in the high seas and exclusive economic zones of the WCPO. If unintentionally encircled, all reasonable steps

should be employed to ensure its safe release. The CMM is reviewed every three years, including CCM's compliance. Whilst there are some CCMs under investigation for not complying including Taiwan (WCPFC, 2018b), there is no evidence to suggest that this is the client fleet. SG80 is likely to be met for this scoring element.		
2.3.3 – ETP Species Information	**60 - 79**	**No**
Rationale or key points		
For the analysis possible for this pre-assessment, it appears that there should be good information generally about the ETP species and there is arguably quantitative information about ETP stocks/populations (i.e., turtles, some shark species) that interact with this type of fishery at a regional level. Additionally, interactions with the species listed, except for manta and mobula rays, are required by to be recorded directly by the fishery so that data can be supplied by the national management bodies in CCM Part 2 annual reports to the Commission. Based on this argument, information would therefore be adequate to support a strategy to manage impacts on ETP species. The pre-assessment cannot however comment on the degree logbooks are completed by the fleet or whether species-level identification is evidenced in observer records, unobserved mortality of ETP species with FADs (particularly silky sharks and turtles), SG80 cannot be met.		
2.4.1 – Habitats Outcome	**≥80**	**Yes / No**
Rationale or key points		
Highly unlikely the gear interacts with benthos. The fishery takes place in deep water. Lost gear may consist of the fishing gear itself as the fishery does not use bait or leave gear to soak in the water unaccompanied (like longlines or gillnets), but in this fishery, purse seine gear are rarely lost, since they are highly expensive, attached to the vessel and will always be retrieved.		
2.4.2 – Habitats Management	**≥80**	**Yes / 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.		
2.4.3 – Habitats Information	**≥80**	**Yes / 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.		
2.5.1 – Ecosystems Outcome	**60 – 79**	**Yes / 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.

What is not clear for 'associated' UoAs, is the ecosystem impacts of the deployment of FADs in the region, i.e. whether species (not just target species) have changed their behaviours (Hallier and Gartner, 2008), changing capturability and predator-prey interactions, whether certain species are more prone to entanglement, reducing biomass and impacting trophic structures. The ecological impact of a network of thousands of artificial drifting and anchored FADs aggregate tunas and other pelagic species from surrounding waters has not been assessed. As described by MRAG (2014), although it is unlikely that the UoAs disrupt the key elements underlying ecosystem structure, the lack of direct information on the role of FADs in the ecosystem is needed to secure a score of SG80.

2.5.2 – Ecosystems Management	**60 – 79**	**Yes / 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 WCPFC have introduced binding CMMs for all key tuna stocks taken within the WCPO that limit and control harvest to acceptable levels, as well as several key CMMs which aim to mitigate, reduce, eliminate fishery interactions with ETPs and key shark species. There is continued data collection and monitoring through the likes of VDS, 100% observer coverage, logbooks, VMS and ongoing ecosystem and trophic

research. Taking into account these information sources, the efforts of WCPFC 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. However, in relation to FADs specifically, restrictions regarding the use of FADs have been implemented in the WCPO region (e.g. FAD fishing control in the Pacific, see CMM 2018-01); however the extent to which this will work in terms of controlling the impact of FADs on the ecosystem depends to some extent on what these impacts are (which is not yet very clear). Since the outcome PI for ecosystem does not meet SG80, it is not possible to award SG80 here either.		
2.5.3 – Ecosystems Information	**60 – 79**	**Yes / No**
Rationale or key points		
Given the explanations provided in PIs 2.5.1 and 2.5.2, highlighting the lack of information available and uncertainties surrounding the impacts of FAD on the WCPO ecosystem, it cannot be said that there is adequate information to score this PI higher. The difference between free-school and associated sets activities (target species, fishing gear, CMMs, management structures etc. are the same) are the presence of FADs, so arguably in these UoAs, they are main impact. Although the WCPFC manage the use of FADs and collect catch information from the purse seine fisheries, there are other areas which require more detailed investigation. For example, the unseen impacts of entangling FADs. On this SG80 cannot be awarded.		

Table 30. Summary of Principle 2 Performance Indicator level scores for free-school fisheries

* **Note: Fishery specific information was not available to score this Principle**

2.1.1 – Primary Outcome	**≥80**	**Yes / No**
Rationale or key points		
See PI 2.1.1 for FAD fisheries (Table 29). No material differences.		
2.1.2 – Primary Management	**≥80**	**Yes / No**
Rationale or key points		
See PI 2.1.2 for FAD fisheries (Table 29). No material differences.		
2.1.3 – Primary Information	**≥80**	**Yes / No**
Rationale or key points		
See PI 2.1.3 for FAD fisheries (Table 29). No material differences.		
2.2.1 – Secondary Outcome	**≥80**	**Yes / No**

Rationale or key points		
See PI 2.2.1 for FAD fisheries (Table 29). No material differences.		
2.2.2 – Secondary Management	**60-79**	**No**
Rationale or key points		
See PI 2.2.2 for FAD fisheries (Table 29). No material differences.		
2.2.3 – Secondary Information	**≥80**	**No**
Rationale or key points		
See PI 2.2.3 for FAD fisheries (Table 29). No material differences.		
2.3.1 – ETP Outcome	**60 - 79**	**No**
Rationale or key points		

It should firstly be noted that there are no national or international set formal 'limits, which would trigger management actions for the ETP species identified in this assessment. This PI relates to direct and indirect effects of the free-school UoAs' activities. It is difficult to score due to lack of fishery-specific information from the fishery.

Whale sharks: Bycatch of whale shark may be a significant issue for both free-school and associated sets. Although setting on whale sharks has been banned by WCPFC since 2014, whale sharks may act as the FADs, rather than being associated with drifting FADs deployed by the fishery. The PNA assessment provides a mortality estimate of 11.3% mortality (based on an average of 61 interactions for the 2011-2015 for the fishery and SPC mortality estimate of seven) for the free-school component of the fishery (Blythe-Skyrme et al., 2018). Therefore, the assessment team concluded that the UoAs direct effects are known but given the numbers recorded by observers and the fate of all animals (all released with majority alive and some unknown), SG80 cannot be awarded. A precautionary score of 60 – 79 is given due to lack of fishery-specific information.

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. The best and most reliable data is sourced from observer programmes held by SPC. The total recorded bycatch of silky shark from all purse seine operations between 2003 – 2016 was 669,476 individuals (Peatman et al., 2017). Given associations with purse seine fisheries are predominantly attributed to FADs (Hall and Roman, 2013), it is plausible that the free-school UoAs are highly likely not to hinder recovery of this species. Indirect effects are considered negligible, not creating unacceptable impacts. SG80 is met.

Oceanic whitetip sharks: The most recent stock assessment for oceanic whitetip was conducted in 2019. The commercial catches of this species have been low, and survivability of discarded sharks is poor. The best and most reliable data is sourced from observer programmes held by SPC. The total recorded bycatch of oceanic whitetips from all purse seine operations between 2003 – 2016 was 12,642 individuals (Peatman et al. 2017). Using the same argument as for silky sharks, it is likely the free-school UoAs would meet SG80.

Giant manta and mobula rays: These species have attributed 5% of elasmobranch bycatch in WCPO purse seine fisheries between 2003-17, peaking with an estimate of 68,000 individuals in 2016 (Peatman et al., 2018). Given the probable scale of the fishery compared to all purse seine operations in the WCPO and 100% observer coverage

provides good information on the fate and therefore direct effects of the UoAs on manta and mobula species. SG80 is likely to be met.

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 purse seine gear is very low in comparison and considered to be inconsequential compared to longline. Turtles caught in purse seine usually have a very high survival rate due to the fact that they can be dip netted or scooped out of the net and released prior to the net being fully pursed or fish brought on board. Mortality is associated in purse seine fisheries with the FAD component (drowning through FAD entanglement). Without direct fishery data it is not possible to ascertain the affected species and their subsequent population status but given 100% observer coverage ensuring compliance with CMM 2008-03, SG 80 is likely to be met.

Cetaceans: According to the PNA free-school purse-seine PCR (Blythe-Skyrme et al., 2018), free-school sets have a low bycatch and FAD sets a negligible bycatch; >90% are observed to be alive on release. Without direct fishery data is ascertain the affected species and their subsequent population status but given 100% observer coverage ensuring compliance with CMM 2011-03 and direct effects are known via number and fate recording, SG 80 is likely to be met.

2.3.2 – ETP Management	**60 – 79**	**Yes / No**

Rationale or key points

Whale sharks: Have their own CMM to manage interactions with purse seine gear and are listed as a 'key shark species' (Harley et al., 2013). WCPFC banned the setting of purse seine gear deliberately on whale sharks in 2014 with the enactment of CMM 2012-04 and applies to EEZs of the Convention Area and on the high seas. Further details of the CMM are provided in Section **Error! Reference source not found.** but essentially vessels are required to take all r easonable steps to release the individuals safely. The CMM is reviewed every two years, which considers the CMM's effectiveness, as well as the compliance of CCMs. This PI is likely to meet SG80 for this species.

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. 100% observer coverage provides confidence that vessels are compiling with these measures. SG80 is likely met.

Oceanic whitetip sharks: As with silky sharks, CMM 2011-04 has be enacted for this species. Otherwise rationale as per silky sharks. SG80 is met.

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 2005-03 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 Manta and Mobula rays caught incidentally in WCPFC fisheries, and a good practice guide has been produced and distributed to inform fishermen 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.

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. 100% observer coverage allows verification that measures, and safe release are followed. SG80 is likely met for turtle species. Cetaceans: The incidental capture of cetaceans in purse seine gear is addressed under CMM 2011-03 (enforceable from 2013), prohibits CMM-flagged vessels from setting a purse seine net on a school of tuna associated with a cetacean in the high seas and exclusive economic zones of the WCPO. If unintentionally encircled, all reasonable steps should be employed to ensure its safe release. The CMM is reviewed every three years, including CCM's compliance. Whilst there are some CCMs under investigation for not complying including Taiwan (WCPFC, 2018b), there is no evidence to suggest that this is the client fleet. SG80 is likely to be met for this scoring element.		
2.3.3 – ETP Information	**60 - 79**	**No**
Rationale or key points		
See PI 2.3.3 for FAD fisheries (Table 29). No material differences.		
2.4.1 – Habitats Outcome	**≥80**	**No**
Rationale or key points		
See PI 2.4.1 for FAD fisheries (Table 29). No material differences.		
2.4.2 – Habitats Management	**≥80**	**No**
Rationale or key points		
See PI 2.4.2 for FAD fisheries (Table 29). No material differences.		
2.4.3 – Habitats Information	**≥80**	**No**
Rationale or key points		
See PI 2.4.3 for FAD fisheries (Table 29). No material differences.		
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 2018-01 on the management of bigeye, yellowfin and skipjack tuna, 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.

Table 31 - Summary of Principle 3 Performance Indicator level scores

3.1.1 – Legal and customary framework	**≥80**	**No**

Rationale or key points

The WCPFC provides the regional framework which enables effective cooperation for the management of the shared resource of tunas and tuna-like species in the western and central Pacific Ocean. This is achieved through a number of provisions for highly migratory and straddling fish stocks. Articles 63 and 64, 118 and 119 of UNCLOS (1984) are of particular importance: requiring "states cooperate directly or through appropriate international organisations with a view to ensuring conservation and promoting the objective of optimal utilisation..." of these stocks. This extends to resources on the high seas. WCPFC also incorporates all key provisions of the UNFSA, which further "ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention". The framework for the delivery management outcomes consistent with MSC Principles 1 and 2 are provided through Conservation Management Measures (CMMs), which all CCMs are legally bound to implement under the Convention.

Further cooperation in the management of fisheries resources of common interest is afforded through the Nauru Agreement. This is another regional, treaty-level fisheries management structure, established in the 1980s, to manage tuna stocks *within national waters* of the Parties to the Nauru Agreement (PNA): Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu. The Agreement primarily focuses on:

- Developing strategic fisheries conservation and management initiatives to improve the sustainability of tuna stocks in their waters;
- Developing initiatives to maximise sustained direct and indirect economic benefits to the Parties; and
- Maximising profitability of the fishery and ancillary industries within the PNA member countries.

These elements are supported by other organisations such as FFA, and SPC, which provide scientific and analyses to compliment the management.

There are three mechanisms for dealing with legal disputes at the regional/international level: at annual meetings, a review panel and lastly through the International Court of Justice (ICJ)/International Tribunal for the Law of the Sea. The WCPFC is required to promote transparency in its decision-making processes, which are on a consensus-basis and other activities under Article 21 of the Convention, such that independent observers, including IGOs and NGO can participate in committee and commission meetings and are able to observe discussions. Article 21 specifically states that: "Such intergovernmental organisations and non-governmental organisations shall be given timely access to pertinent information subject to the rules and procedures which the Commission may adopt". Dispute mechanisms are considered to be transparent and effective.

At the sub-regional level, PNA has a transparent dispute mechanism in place to manage the Vessel Day Scheme, for example how the VDS days are allocated. Article 8.2 of the Palau Agreement provides a mechanism to address disagreements arising from the Arrangement and are resolved through negotiations between parties, which is considered effective in dealing with most issues.

The legal rights of people dependent on subsistence fishing are also observed at the regional and sub regional level. The WCP-Convention recognises and formally commits to the legal rights of small-scale and artisanal fishers dependent on fishing for their livelihoods. Further to this, the presence of the PNA creates an additional level of protection of subsistence fishers, whose basis for the development was to promote economic control and participatory rights over the tuna resources in PNA waters, including the promotion of the development of the Parties' indigenous fishery sector, whilst developing fishing conservation and management initiatives. On this basis, SG80 is met.

3.1.2 – Consultation, roles and responsibilities	**≥80**	**No**
Rationale or key points		

Functions, roles and responsibilities are explicitly defined and understood for the WCPFC and its CCMs and the committees formed under Commission control (e.g. Scientific Committee and Technical Compliance Committee) within the Convention itself. How each component of the management is to work is facilitated through clear operating procedures. Specifically relating to PNA, functions, roles and responsibilities are defined within the Nauru Agreement, including how PNA must interact and cooperate with other relevant management bodies such as FFA and WCPFC and other integral organisations such as, SPC.

Both PNA and WCPFC have processes of consultation that regularly seek and accept relevant information necessary for the management of the resources. WCPFC for example uses the scientific advice provided through SPC work and information directly from the fisheries themselves to update and implement CMMs. Observers are allowed at PNA and WCPFC meetings, and meeting outcomes are available on request in the case of PNA and publicly available for WCPFC (Blythe-Skyrme et al., 2018).

Engagement with stakeholders allowing their participation is provided for by both WCPFC and PNA. As mentioned above, observers such as NGOs or industry members are permitted to observe meeting at the regional and sub-regional level. Attendance at Commission and related meetings is comprehensive with logistic and limited financial support provided to Pacific Island Countries and Territories (PICTs) to ensure attendance, meaningful involvement and interaction in the cooperative management of fisheries in the WCPO.

SG80 is met for this PI.

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

Rationale or key points

The WCPFC is the Regional Fisheries Management Organisation (RFMO) for the target stocks of this assessment. It is responsible for decision-making for key management measures, which affect target stocks, non-target species and their ecosystems. Long-term objectives are explicit within the WCPFC Convention. WCPFC sets clear objectives, which are explicit with management policy, which are consistent with the MSC Fisheries Standard. There are a number of Articles specified in the WCPFC Convention which is of particular relevance for MSC fisheries assessments.

- Article 2 - specifies that the Commission has the objective to “ensure through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the WCPO in accordance with the 1982 Convention and Agreement (UNCLOS and UNFSA respectively).
- Article 5 provides principles and measures for achieving this conservation and management objective. More specifically Article 5(c) requires the Commission to apply the precautionary approach in decision-making.
- Article 10 of the Convention is consistent with MSC P1 and P2 in specifying long term objectives of “maintaining or restoring populations…above levels at which their reproduction may become seriously threatened”.

The intent of the PNA is consistent with the MSC Fisheries Standard in that objectives are concerned with, amongst others, fisheries conservation development along with its management initiatives and therefore plays a part in decision-making, i.e. with the determination of annual TAE. The VDS, as outlined in the Palau Agreement is the key strategy within PNA fishery specific management system. Article 2 of the “Purse Seine VDS Text” states the objectives of the management scheme, including “the sustainable use of tuna resources by purse seine vessels”. A specific example where this is seen is in the Palau Agreement, which restricts the total number of vessel licences (and therefore effort) awarded in the fishery. This is further bolstered by the national laws and management policies of

the individual PNA fishing nations. The precautionary approach is followed by default as all PNA parties must comply to all CMMs set by the RFMO, where this approach is explicitly required. SG80 is met.

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

Rationale or key points

Fishery-specific objectives are set out in CMMs, which are regularly reviewed, updated/revised and new ones added. In addition to target species management measures (CMM 2018-01; 2015-02; CMM 2015-06), WCPFC also proscribes CMMs for P2 elements, such as non-target/ETP species (CMM 2008-03; CMM 2017-06; CMM 2014-05; CMM 2013-08; CMM 2011-4; CMM 2010-07). Those CMMs seek to utilise non-target species resources sustainably and minimise bycatch of ETP species, aiming to release bycatch alive wherever possible. In summary, because current CMMs in force contain reasonably explicit and specific intentions and objectives and also allow for evaluation of the performance against these objectives.

Sub-regionally, the PNA TAE are now devised with the most recent stock assessments taken into account, with the current target to keep effort at 2010 levels. Article 12 of the "Purse Seine VDS text" denotes that TAE is set "having regard to the best available, scientific, economic, management and other relevant advice and information". The PNA effort approximates 60% of purse seine effort in the WCPO (Blythe-Skyrme et al., 2018), both implicitly and explicitly ratifying the CMMs in place in the fishery (and those outside PNA waters). PNA is inextricably connected to the development of HCRs at WCPFC level. With regard to the argument presented for WCPFC, the same is true for PNA. SG80 is met.

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

Rationale or key points

The WCPFC decision-making processes are transparent and clearly defined in Article 20 of the Convention and Rules of Procedure and allows consideration of serious and important issues through its committees (Scientific Committee (SC) and Technical Compliance Committee (TCC)). Both the precautionary approach and best available scientific information is used to shape and achieve fishery-specific objectives. All resulting CMMs apply equally inside EEZs and on the high seas. Flag states enforce management measures on their own vessels and coastal States within their own EEZ. At both the WCPFC and PNA levels, decisions are made by consensus. For PNA, fishery-specific measures are facilitated through the FSMA and Palau Agreement. The decision-making processes are activated through the processes of the Scientific Committee, the Technical and Compliance Committee and the WCPFC. Serious and other issues are addressed via the implemented of CMMs, including those which specifically encompass the purse seine fisheries and have been shown that they deal with serious and important issues in a transparent and adaptive manner. At the sub-regional level, catch and monitoring information at the national level of CCMs feeds into PNA member meetings but the overall management process is delivered by WCPFC. Information such as meeting minutes, scientific reports etc and available via the WCPFC website, but not all is made public (Part 2 country reports covering topics such as compliance are not however available). For PNA, some documents are freely available such as the TAE Advisory and TAE Decision documents, which elaborate on discussions and management adoptions/actions by Parties and recommendations made by the VDS Technical and Scientific Committee. With regard to dispute resolution, WCPFC's consensus decision-making demonstrates to a degree a proactive nature to avoiding legal disputes. Sub-regionally, Article 8.2 of the Palau Agreement provides a mechanism to address disagreements arising from the Arrangement and are resolved through negotiations between parties, which is considered effective in dealing with most issues. SG80 is met.

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

Rationale or key points

WCPFC has implemented a MCS system which can demonstrably enforce its CMMs. This is enacted through mandatory logbooks, VMS, port state controls, 100% observer coverage for purse seine vessels to name a few. The MCS system is further supported by some countries aerial and naval forces, such as provided via France, Australia and New Zealand. For PNA, member parties themselves provide MCS through national instruments monitoring fishing activity in their areas of jurisdiction, i.e. their own EEZs, cooperation among parties being promoted through the PNA Agreement. Further to this, the Niue Treaty is an agreement on cooperation between FFA members about monitoring, control and surveillance of fishing - it includes provisions on exchange of information (about where the position and speed of vessels at sea, which vessels are without licences) plus procedures for cooperation in monitoring, prosecuting and penalising illegal fishing vessels.

Compliance to CMMs is somewhat reliant on a disincentive to end up on the IUU vessel list, which is publicly available. Sanctions are applied to fishing entities and WCPFC notifies Flag States of non-compliant vessels, which the Flag States should order to withdraw from the Commission Area. Sanctions are also issued by the national level by PNA member parties through individual fishery acts. Penalties include seizure of vessels, catches and fines depending on the gravity of the infraction.

All WCPFC members must submit confidential reports to the TCC relating to compliance with all active CMMs. MRAG (2016) reported on IUU in the purse seine sector and found that “the largest contributor to the total estimated IUU volume and value are reporting violations, accounting for 56% the estimated IUU volume”. There is evidence that fishers comply with the management system, provided by 100% observer coverage for trips, transhipment and port state inspections, all of which are supported by annual operations provided by participating FFA member nations to run Pacific patrol boats to boost surveillance and monitoring presence. A very low 3.5% non-compliance rate detected in the 2017 operation provides some evidence that the vast majority of fishers comply with WCPFC management systems.

Overall there is no strong evidence of systematic non-compliance. Offences when they do occur can range from incorrect boat marking to not adhering to the FAD closure. Overall however, there is no evidence of systematic non-compliance with CMMs.

Of importance however is the new regulation regarding non-entangling FAD construction and deployment, the specifications of which are defined in CMM 2018-01. As of 1st January 2020, if entangling FADs are used in the fishery, they will no longer be compliant with CMM 2018-01, which will lead to a condition at full assessment. To be precautionary, a <80 has been awarded here to ensure this potential issue is addressed in the FIP.

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

Rationale or key points

Review mechanisms are available at both the regional and sub-regional level. These tend to interrogate the degree and success to which CMMs have been implemented and how well they have performed, as well as compliance of CCMs with reporting back to the WCPFC through mandatory reporting. Stock assessments undertaken by SPC are also subject to peer-review and external review to ensure that the scientific processes remain robust. The PNA VDS is managed and reviewed by an Inter-Party VDS Committee. Internal reviews by member countries on their own management systems also take place and allows further scrutiny of the fishery-specific management system. Although the WCPFC does not have a regular programme of external reviews, independent performance reviews

were undertaken in 2011 and in 2014, consistent with the Kobe Course of Actions. Sub-regionally, in addition to internal reviews by the Committee and member countries, as a recommendation of PNA's first MSC certification, an independent external review in 2015 compared the effort based VDS to a quota limit system. According to Blythe-Skyrme et al. (2018), PNA has now developed a work plan to consider and address key issues identified. SG80 is therefore met.

8 Appendices

8.1 Evaluation processes and techniques

8.1.1 Site visits

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

8.1.2 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);
- NGOs with an interest in the fishery;
- Secretariat to the Pacific Community (SPC);
- Western and Central Pacific Fisheries Commission (WCPFC);
- National management authorities for which the fisheries may operate.

8.2 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 32 below lists the overlapping fisheries at the time of this report being written.

Table 32 – Overlapping fisheries with this assessment

Fishery name	Certification status and date	Performance Indicators 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
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific albacore & yellowfin longline	Certified June 2015	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 tuna longline	Certified December 2012	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4 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	

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 purse seine fishery	In assessment	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 fishery	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
Talley's New Zealand skipjack tuna purse seine	Certified August 2017	PI 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4

Appendix A: Table of Scores for each MSC PI

Table 33. Principle 1 list of scoring for WCPO purse seine fishery

Component	PI	Performance Indicator	WCPO BET	WCPO SKJ	WCPO YFT
Outcome	1.1.1	Stock Status			
	1.1.2	Stock Rebuilding	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 34. Principle 2 list of scoring WCPO purse seine fishery

Principle 2 – Minimising Environmental Impacts			FAD	Free-school
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 35. Principle 3 list of scoring WCPO purse seine fishery

Principle 3 – Effective Management			
			WCPFC
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	
	3.2.2	Decision Making Process	
	3.2.3	Compliance and Enforcement	
	3.2.4	Management Performance Evaluation	