

**Marine Stewardship Council (MSC) Public Comment
Draft Report**

**SZLC CSFC & FZLC FSM EEZ Longline Yellowfin and
Bigeye Tuna Fishery (Bigeye UoA)**

On behalf of

SZLC CSFC and FZLC

Prepared by

Control Union Pesca Ltd

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Glossary

Term / acronym	Definition
B_0	equilibrium unexploited total biomass
$B_{F_{current}}$	equilibrium total biomass at $F_{current}$
B_{init}	Initial biomass at the start of the stock assessment model (for the albacore assessment, B_{1960})
B_{MSY}	equilibrium total biomass at MSY
CAB	Conformity Assessment Body
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
CSFC	China Southern Fishery Shenzhen Co. Ltd
CU Pesca	Control Union Pesca Ltd.
DEA	Department of External Affairs
EAFM	Ecosystem Approach to Fisheries Management
EEZ	Exclusive Economic Zone
eNGO	Environmental Non-Governmental Organisation
EMS	Electronic Monitoring System
ERA	Ecological Risk Assessment
ETP	Endangered, threatened or protected species
FAME	SPC Division of Fisheries, Aquaculture and Marine Ecosystems
FAO	Food and Agricultural Organization
FFA	Pacific Islands Forum Fisheries Agency
FFC	Forum Fisheries Committee
FIP	Fishery Improvement Programme
F_{MSY}	Fishing mortality at age resulting in MSY
FSM	Federated States of Micronesia
FZLC	Liancheng Overseas Fishery (FSM) Co. Ltd.

Term / acronym	Definition
MEC	ME Certification Ltd. As of 1 st June 2018 MEC changed its name to Control Union Pesca (CU Pesca).
HCR	Harvest Control Rule
iFIMS	integrated Fisheries Information Management Systems
IGO	Intergovernmental Organisation
IPOA	International Plan of Action
ISC	International Scientific Committee for Tuna and Tuna like Species in the N. Pacific Ocean
ISSF	International Seafood Sustainability Foundation
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated (fishing)
LRP	Limit Reference Point
MCS	Monitoring, Control and Surveillance
MEY	Maximum Economic Yield
MERIP	Marine Environment Research Institute of Pohnpei
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
MSY, Y_{FMSY}	equilibrium yield at F_{MSY}
Nm	Nautical mile
NORMA	National Oceanic Resource Management Authority
NPOA	National Plan of Action
NTADS	Non-target and dependent species
PAE	Party Allowable Effort
OFP	Oceanic Fisheries Programme (OFP) within the SPC Division of Fisheries, Aquaculture and Marine Ecosystems
PCDR	Public Comment Draft Report
PICI	Pacific Islands Conservation Initiative
PICs	Pacific island countries
PITIA	Pacific Islands Tuna Industry Association
PNA	Parties to the Nauru Agreement
PRC	People's Republic of China

Term / acronym	Definition
RFMO	Regional Fisheries Management Organization
SB ₀	Equilibrium unexploited spawning potential
SB _{Fcurrent}	Average current spawning potential in the absence of fishing
SB _{init}	Initial spawning potential at the start of the stock assessment model (for the albacore assessment, SB ₁₉₆₀)
SC	Scientific Committee
SEAPODYM	Spatial Ecosystem and Population Dynamics Model
SIDS	Small Island Developing States
SP	Spawning potential - equivalent measure to spawning stock biomass under the assumption that reproductive output is proportional to biomass over the size at maturity – but can take account of other patterns of reproductive output
SPC	Pacific Community (formerly Secretariat of the Pacific Community, and before that the South Pacific Commission; the organization has retained the acronym SPC despite the new name)
SPREP	Secretariat of the Pacific Regional Environment Programme
SRP	WCPFC Strategic Research Plan
SZLC	Liancheng Overseas Fishery (Shenzhen) Co. Ltd
TAC	Total Allowable Catch
TAE	Total Allowable Effort
TCC	Technical Compliance Committee of the WCPFC
TMP	Management Plan on Tuna Fisheries for the Federated States of Micronesia
TRP	Target Reference Point
TVM	Te Vaka Moana
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
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WWF	World Wildlife Fund

Term / acronym	Definition
$Y_{F_{current}}$	Equilibrium yield at $F_{current}$

1 Executive Summary

This report covers the MSC full assessment of the SZLC CSFC & FZLC FSM EEZ longline yellowfin (*Thunnus albacares*) and bigeye (*T. obesus*) tuna fishery (bigeye Unit of Assessment). The assessment team consisted of Chrissie Sieben (Team Leader, Principle 2), Jo Gascoigne (Principle 1) and Peter Watt (Principle 3). A site visit was held on the 14th – 16th February 2018 in Pohnpei, in the Federated States of Micronesia (FSM). The assessment was undertaken in accordance with the MSC Fisheries Certification Requirements (FCR) version 2.0 for assessment procedure and scoring. The Risk-Based Framework (RBF) was not used.

Note: this fishery was initially announced to include both WCPO yellowfin and bigeye in its scope. However, due to ongoing harmonisation with other WCPO tuna fisheries in the MSC programme, the scoring for the bigeye Unit of Assessment (UoA) was delayed and the decision made to split the assessment into two: this report therefore only covers the bigeye UoA. The yellowfin UoA was certified on the 5th October 2018 (F-CUP-058).

The fishery under assessment operates in the Exclusive Economic Zone of FSM. The client fishery covers the vessels that are owned and/or managed by Liancheng Overseas Fishery (Shenzhen) Co. Ltd (SZLC), China Southern Fishery Shenzhen Co. Ltd (CSFC) and Liancheng Overseas Fishery (FSM) Co. Ltd. (FZLC). The vessels are licensed by the National Oceanic Resource Management Authority (NORMA), subject to a bilateral agreement and charter arrangement. All vessels in the client fleet are freezer vessels and are flagged to either China, Taiwan or FSM. Some also fish on the High Seas or in other EEZs – none of these areas are included in the UoC. Currently, vessels land in either Kosrae or Pohnpei or occasionally Apia, Samoa or Papeete, French Polynesia.

This fishery is managed at two levels; internationally through the Western and Central Pacific Fisheries Commission (WCPFC) and its associated bodies, and nationally within FSM. The FSM federal government is based in Pohnpei with control over waters beyond 12 miles to the outer boundary of the EEZ, with NORMA being responsible for the development and management of the marine resources within FSM. NORMA operates under Title 24. (Marine Resources) of the FSM Code, together with the Management Plan on Tuna Fisheries for FSM (2015). The Monitoring Control and Surveillance Section, under NORMA's Statistics, Compliance and Technical Projects Division, is responsible for the collection and entry of fishing vessel logsheet data, catch validation, transshipment reports, zone notifications and vessel control reports. Much of the compliance work within NORMA is done in tandem with the Maritime Police and the Maritime Surveillance Wing under the Department of Justice which is given power to penalize parties in breach of compliance to regulations stipulated in Title 24. Overall, the robust management and regulatory framework with clearly defined roles and responsibilities at national and regional level was regarded a key strength in the assessment of this fishery.

For WCPO bigeye, the MSC assessment considered the most recent stock assessment published in 2017, which incorporates a new growth curve and an adjusted regional structure. Both these changes resulted in a stock assessment which is significantly more optimistic than the previous assessment in 2014, with spawning biomass estimated to be above the limit reference point ($20\%SB_{current,F=0}$) with 84% probability, and fishing mortality (F) estimated to be below F_{MSY} with 77% probability. The uncertainty around the conclusions is higher, however,

and this was considered to be the main weakness in the assessment of this stock. The core regional management measure is WCPFC CMM 2017-01, 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. The latter is covered by CMM 2014-06 which commits WCPFC to putting in place a formal harvest strategy for its key stocks (including bigeye), with an associated workplan. Progress towards a harvest strategy has been slow, however, with the workplan having been revised twice already.

Key data sources on interactions with other species were logbooks and observer reports. Main primary species were WCPO yellowfin, blue marlin and North Pacific albacore. The bait used is the Indian oil sardine and was considered as a main secondary species. None of these stocks were considered to be below the point of recruitment impairment. Elasmobranchs (sharks and rays) were by far the most dominant group of ETP species captured in this fishery, with silky sharks, pelagic stingrays and blue sharks being most abundant in the observer data. Some interactions with sea turtles were also recorded. Impacts on seabirds and cetaceans were also considered but not thought to be significant. To mitigate bycatch of ETP species such as sharks and sea turtles, the client fleet uses circle hooks and has a policy in place which bans the use of shark lines and wire leaders and bans the retention of any elasmobranchs. The bait consists of fish and no squid has been used in recent years. The fishery was generally thought to comply with national and regional management measures on bycatch and ecosystem impacts; however its main weakness in relation to Principle 2 is the low observer coverage and the fact that FSM are currently not complying with the 5% minimum required human observer coverage of longline fishing effort in their EEZ (required under WCPFC CMM 2007-01). While five of the UoA vessels have had electronic monitoring since early 2017, currently observer data derived from electronic monitoring do not qualify as counting towards the WCPFC regional observer programme coverage rate requirement.

The **team's provisional** determination is that the fishery meets the criteria for MSC certification. Aggregate scores for each Principle are as shown in the following table:

Principle	Score
Principle 1 – Target Species	86.7
Principle 2 – Ecosystem	83.0
Principle 3 – Management System	90.0

Five conditions have been proposed; two on Principle 1 and three on Principle 2. The proposed conditions are as follows:

Condition number	Condition	Performance Indicator
1	WCPO bigeye needs a harvest strategy that is responsive to the state of the stock, with and the elements of the harvest strategy (monitoring, stock assessment, harvest control rules and management actions) working together to achieve stock management objectives.	1.2.1
2	WCPO bigeye needs a harvest control rule that ensures that the exploitation rate is reduced as the PRI is approached and is expected to keep the stock fluctuating around the target level and robust to the main uncertainties. The tools used to implement the HCR should be effective in achieving the required exploitation levels.	1.2.2

Condition number	Condition	Performance Indicator
3	The evidence base for determining interaction rates with ETP species, in particular sea turtles, should be improved so that trends in interactions can be measured and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.	2.3.1
4	The client should provide evidence that all relevant national and regional regulations on fishery interactions with ETP species are adhered to by the UoA so that it can be demonstrated that the fishery does not hinder recovery of ETP species.	2.3.2
5	The evidence base for determining interaction rates with all ETP species should be improved so that UoA related mortality on sea turtles can be assessed and so that trends in interactions with all ETP species can be measured over time and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.	2.3.3

The following recommendations were also issued by the team:

1. Although the client fleet has in place a waste management plan which prohibits discarding of non-biodegradable waste at sea, during site visit interviews with NORMA, the audit team was made aware of anecdotal reports of dumping at sea. However, the exact frequency of these types of incidents is unknown and therefore the impact cannot be estimated. It should be noted that from January 2019, CMM 2017-04 on Marine Pollution will enter into force. To ensure compliance with this CMM, it is recommended that incidents of dumping at sea are demonstrably reduced. This will be verified during surveillance audits by consulting observer reports for the UoA.
2. The fishery uses Indian oil sardine (*Sardinella longiceps*), sourced from China. By far the largest fishery is in India, which is the most likely source of the bait for this fishery although this is an assumption made by the team. It is therefore recommended that the client company reviews its bait sourcing policy to ensure the necessary information is collected so that all bait can be traced to its source; be it at stock level, country of capture or ideally, in the case of the Indian oil sardine, at Indian state level.
3. Unobserved mortality of ETP species is most likely to occur through ghost fishing. Gear loss in the UoA is reportedly minimal; however records of the number of terminal tackle or branchlines that are lost per set/trip/year per vessel are not recorded, although under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Although lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks, ETP species may be more vulnerable to ghost fishing through entanglement than for example primary or secondary species. Although there is some monitoring of gear loss in the UoA through the observer programme, the lack of better, UoA-specific data means there can be no high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species. A recommendation has therefore been issued for UoA vessels to systematically report on the extent of gear loss per trip (for example by recording the number of hooks lost).

2 Authorship and Peer Reviewers

The authors of this report (MEC assessment team) are:

Chrissie Sieben (Team Leader, Principle 2) has a Master's Degree in Marine Environmental Protection which she obtained at the University of Wales, Bangor. She is the MSC fisheries scheme manager at MEC and specialises in marine and fisheries ecology, marine environmental impact assessment and sustainable fisheries. She has over seven years' expertise with the MSC certification requirements and has completed numerous MSC pre-assessments, full assessments and surveillance audits. She regularly participates in MSC training sessions and workshops and has acted as team leader and P2 assessor on a range of pre-assessments and full assessments of demersal and pelagic fisheries in the Atlantic, Mediterranean, Indian Ocean and Western Central Pacific. Chrissie is a fully qualified team leader and conforms to the team leader requirements specified in Table PC1 (MSc in Marine Environmental Protection, - Completed MSC Team Leader training v2.0). With over 10 years' experience in marine fisheries ecology and 4 years' experience working with Western Central Pacific tuna fisheries, she meets the following criterion in Table PC3: Fishing impacts on aquatic ecosystems. Chrissie has completed the MSC online Traceability training and previously worked as a Chain of Custody auditor for MEP. She therefore meets the Table PC3 criterion: Understanding of the CoC Standard and CoC Certification Requirements. Chrissie has no conflict of interest for this assessment.

Dr Jo Gascoigne (Principle 1) is a former research lecturer in marine biology at Bangor University, Wales and a shellfisheries and tuna fisheries expert, with over 25 years' experience working in the fisheries sector. In addition to numerous pre-assessments, Jo's experience with tuna fisheries includes the SZLC, HNSFC & CFA Cook Islands EEZ south Pacific albacore longline fishery, the Walker Seafood's Australian Eastern tuna and billfish tuna fishery, and the French Polynesia albacore and yellowfin longline fishery. She was also invited to participate in the Hong Kong Harmonisation meeting in 2016. On 20 May 2016 a variation request was granted by MSC, qualifying Dr Gascoigne as Principle 1 (P1) assessor for tuna fisheries. Dr Gascoigne is a fully qualified MSC Team Leader and has been involved as expert and lead auditor in over 15 MSC pre- and full assessments. She also completed the pre-assessment report for this fishery. Dr Gascoigne has recently completed the required Fishery Team Leader MSC training modules for the new V2.0 Fisheries Certification Requirements. In addition, she has also completed the fisheries traceability version 2.0 MSC online training module in 2015. Jo has no conflict of interest for this assessment.

Peter Watt (Principle 3) has over 20 years' fisheries management and development work experience with national governments, regional organizations and private consultancy companies in Samoa, Papua New Guinea, Solomon Islands, Palau, Tokelau, Tonga, New Caledonia, Vanuatu, Kiribati, Federated States of Micronesia, Commonwealth of the Mariana Islands, Marshall Islands, Fiji, New Zealand, Canada, and United States. Peter has authored or co-authored over 30 publications in his field and worked on more than 50 projects and assignments in technical research, marine management and development, technical training and project administration. He developed and established community-based fisheries management arrangements for the Coastal Fisheries Development and Management Project in Papua New Guinea, establishing over twenty fisheries management plans and developing legislation to empower communities to manage their fisheries resources. Prior to this he was the Commercial Fisheries Advisor in Samoa for four years, providing management advice and

expertise for the development and management of the tuna longline and other fisheries. This included working with the government and stakeholders to develop and implement a tuna management plan, with related legislation and policies. Other experience also includes rapid resource assessments in the Philippines, Papua New Guinea and Samoa, and conducting stock assessments for the tuna longline fishery and outer reef slope assessments for the deep water snapper fishery. Peter has completed the v2.0 online training, meeting the competency requirements in Table PC2, as well as the following team competency criteria in Table PC3: Fishery management and operations and Current knowledge of the country, language and local fishery context (the local language spoken in Pohnpei is English). Peter has no conflict of interest for this assessment

Peer Reviewers:

The MSC Peer Review College compiled a shortlist of potential peer reviewers to undertake the peer review for this fishery. Two peer reviewers were selected from the following list:

- Carola Kirchner
- Geoff Tingley
- Jo Akroyd
- Joel Rice
- Sandra Diamond-Tissue
- Tim Emery

A summary of their experience and qualifications is available via this link: <https://fisheries.msc.org/en/fisheries/szlc-csfc-fzlc-fsm-eez-longline-yellowfin-and-bigeye-tuna/@@assessments> .

The Risk-Based Framework was not used.

3 Description of the Fishery

3.1 Unit(s) of Assessment (UoA) and Scope of Certification Sought

3.1.1 UoA and Proposed Unit of Certification (UoC)

MEC confirms that the fishery under assessment is within the scope of the MSC Fisheries Standard (7.4 of the MSC Certification Requirements v2.0):

- The target species is not an amphibian, reptile, bird or mammal;
- The fishery does not use poisons or explosives;
- The fishery is not conducted under a controversial unilateral exemption to an international agreement;
- The client or client group does not include an entity that has been successfully prosecuted for a forced labour violation in the last 2 years;
- The fishery has in place a mechanism for resolving disputes, and disputes do not overwhelm the fishery;
- The fishery is not an enhanced fishery as per the MSC FCR 7.4.3; and
- The fishery is not an introduced species-based fishery as per the MSC FCR 7.4.4.

There are no other eligible fishers. Therefore, the UoC is the same as the UoA described below.

Note: this fishery was initially announced to include both WCPO yellowfin and bigeye in its scope. However, due to ongoing harmonisation with other WCPO tuna fisheries in the MSC programme, the scoring for the bigeye Unit of Assessment (UoA) was delayed and the decision made to split the assessment into two: this report therefore only covers the bigeye UoA. The yellowfin UoA was certified on the 5th October 2018 (F-CUP-058).

UoA:

Species / stock	WCPO Bigeye tuna (<i>Thunnus obesus</i>)
Geographical range	FSM EEZ
Method of capture	Pelagic longline
Client Group	Vessels owned and/or managed by SZLC CSFC & FZLC
Other eligible fishers	None (UoA is same as UoC)

3.1.2 Final UoC(s)

(PCR ONLY)

The PCR shall describe:

- a. The UoC(s) at the time of certification.
- b. A rationale for any changes to the proposed UoC(s) in section 3.1(c).
- c. Description of final other eligible fishers at the time of certification.

(References: FCR 7.4.8-7.4.10)

3.1.3 Total Allowable Catch (TAC) and Catch Data

The TAC and catch data for the UoA are shown in Table 1. There is no TAC or quota in place.

Table 1. Bigeye catch data (data provided by NORMA)

Bigeye	
Year	Volume (tonnes)
2016	862
2015	2,145

3.1.4 Scope of Assessment in Relation to Enhanced Fisheries

The MSC defines enhanced fisheries as: Any activity aimed at supplementing or sustaining the recruitment, or improving the survival and growth of one or more aquatic organisms, or at raising the total production or the production of selected elements of the fishery beyond a level that is sustainable by natural processes. It may involve stocking, habitat modification, elimination of unwanted species, fertilisation or combinations of any of these practices.

The fishery under assessment is a wild capture fishery and does not meet the criteria for enhanced fisheries (see FCR v2.0 7.4).

3.1.5 Scope of Assessment in Relation to Introduced Species Based Fisheries (ISBF)

The MSC defines Introduced Species Based Fisheries (ISBF) as: Any fishery which prosecutes a target fin or shellfish species that was intentionally or accidentally transported and released by human activity into an aquatic environment beyond its natural distribution range. This does not include species that are “introduced” into a location due to an expansion in their natural geographic range. The fishery is not an ISBF (see FCR v2.0 7.4).

3.2 Overview of the fishery

3.2.1 The Client fishery

The client fishery covers the vessels that are owned and/or managed by Liancheng Overseas Fishery (Shenzhen) Co. Ltd (SZLC), China Southern Fishery Shenzhen Co. Ltd (CSFC) and Liancheng Overseas Fishery (FSM) Co. Ltd. (FZLC). Both CSFC and SZLC ultimately report to FZLC for the management of their FSM tuna longline operations. Liancheng Overseas Fishery (FSM) Co. Ltd. is a significant contributor to the FSM economy, employing between 100 to 200 staff in Pohnpei and Kosrae in various secondary processing and ancillary activities.

The vessels are licensed by the National Oceanic Resource Management Authority (NORMA) to fish for yellowfin with pelagic longline in the EEZ of the Federated States of Micronesia, subject to a bilateral agreement and charter arrangement between NORMA and the FSM-based company Liancheng Overseas Fishery (FSM) Co. Ltd., a subsidiary of Liancheng Overseas Fishery (Shenzhen) Co. Ltd.

The agreement *inter alia* details the access fees and licensing conditions and sets out the provisions for vessel day allocations under the Vessel Day Scheme (VDS). A detailed description of the fishing agreement and VDS is provided under Principle 3.

The vessels in the UoC are shown in Table 2. All are freezer vessels and are flagged to either China, Taiwan or FSM. In 2017, 33 licenses were issued to the client fleet. Currently, vessels land in either Kosrae or Pohnpei and occasionally in Apia, Samoa or Papeete, French Polynesia.

Table 2. Vessels in the UoC (note: not all will be licensed to fish in the FSM EEZ at the same time)

Vessel Name	FFA VID	IRCS	Flag State	Registration Number	Agent / management company name
SHEN LIAN CHENG 760	36212	BZXC32	China	(YUE)CHUANDENG(JI) (2016)FT-100051	SZLC
SHEN LIAN CHENG 761	36208	BZXC33	China	(YUE)CHUANDENG(JI) (2016)FT-100053	SZLC
SHEN LIAN CHENG 881	36498	BZXD92	China	(YUE)CHUANDENG(JI) (2017)FT-200004	SZLC
SHEN LIAN CHENG 882	36499	BZXD93	China	(YUE)CHUANDENG(JI) (2017)FT-200005	SZLC
SHEN LIAN CHENG 883	36512	BZXD94	China	(YUE)CHUANDENG(JI) (2017)FT-200006	SZLC
SHEN LIAN CHENG 884	36513	BZXD95	China	(YUE)CHUANDENG(JI) (2017)FT-200003	SZLC
SHEN LIAN CHENG 885	36514	BZXD96	China	(YUE)CHUANDENG(JI) (2017)FT-200002	SZLC
HUA NAN YU 711	36073	BZXD22	China	(YUE)CHUANDENG(JI) (2016) FT-100050	CSFC
HUA NAN YU 712	36074	BZXD23	China	(YUE)CHUANDENG(JI) (2016) FT-100048	CSFC
HUA NAN YU 716	36238	BZXD24	China	(YUE)CHUANDENG(JI) (2016) FT-100034	CSFC
HUA NAN YU 718	36246	BZXD26	China	(YUE)CHUANDENG(JI) (2016) FT-100032	CSFC
HUA NAN YU 719	36247	BZXD27	China	(YUE)CHUANDENG(JI) (2016) FT-100030	CSFC
HUA NAN YU 721	36259	BZXD28	China	(YUE)CHUANDENG(JI) (2016) FT-100031	CSFC
HUA NAN YU 722	36260	BZXD29	China	(YUE)CHUANDENG(JI) (2016) FT-100029	CSFC
HUA NAN YU 723	36261	BZXD32	China	(YUE)CHUANDENG(JI) (2016) FT-100028	CSFC
HUA NAN YU 731	36435	BZXD33	China	(YUE)CHUANDENG(JI) (2017) FT-200084	CSFC
HUA NAN YU 732	36436	BZXD34	China	(YUE)CHUANDENG(JI) (2017) FT-200085	CSFC
HUA NAN YU 736	36437	BZXD35	China	(YUE)CHUANDENG(JI) (2017) FT-200086	CSFC
HUA NAN YU 737	36481	BZXD36	China	(YUE)CHUANDENG(JI) (2017) FT-200087	CSFC
HUA NAN YU 738	36480	BZXD37	China	(YUE)CHUANDENG(JI) (2017) FT-200088	CSFC
HUA NAN YU 739	36479	BZXD38	China	(YUE)CHUANDENG(JI) (2017) FT-200089	CSFC
GUANG YUAN YU 338	36598	BZXY47	China	(YUE)CHUANDENG(JI)(2017)FT-200043	CSFC

Vessel Name	FFA VID	IRCS	Flag State	Registration Number	Agent / management company name
GUANG YUAN YU 339	36599	BZXY48	China	(YUE)CHUANDENG(JI)(2017)FT-200044	CSFC
SHEN GANG FA 15	36493	BZXD52	China	(YUE)CHUANDENG(JI)(2013)FT-200026	FZLC
SHEN GANG FA 16	36494	BZXD53	China	(YUE)CHUANDENG(JI)(2013)FT-200027	FZLC
SHEN GANG FA 17	36495	BZXD54	China	(YUE)CHUANDENG(JI)(2013)FT-200028	FZLC
SHEN GANG FA 18	36496	BZXD55	China	(YUE)CHUANDENG(JI)(2013)FT-200029	FZLC
SHEN GANG FA 19	36506	BZXD56	China	(YUE)CHUANDENG(JI)(2013)FT-200034	FZLC
SHEN GANG FA 715	36507	BZXD62	China	(YUE)CHUANDENG(JI)(2013)FT-200035	FZLC
SHEN GANG FA 716	36502	BZXD63	China	(YUE)CHUANDENG(JI)(2013)FT-200036	FZLC
SHEN GANG FA 718	36504	BZXD65	China	(YUE)CHUANDENG(JI)(2013)FT-200038	FZLC
SHEN GANG FA 719	36505	BZXD66	China	(YUE)CHUANDENG(JI)(2013)FT-200039	FZLC
SHEN GANG FA 720	36685	BZXD69	China	(YUE)CHUANDENG(JI)(2015)FT-200027	FZLC
CFA22	36214	V6P22	FSM	VR0120	FZLC
CFA23	36242	V6P23	FSM	VR0122	FZLC
CFA25	36244	V6P25	FSM	VR0121	FZLC
CFA26	35939	V6P26	FSM	VR0153	FZLC
CFA27	35940	V6P27	FSM	VR0154	FZLC
SUNSTAR 6	36038	BZTH9	China	(LIAO)CHUANDENG(JI)(2017)FT200005	FZLC
SUNSTAR 7	36040	BZTY2	China	(LIAO)CHUANDENG(JI)(2017)FT200006	FZLC
SHUN DA 8	36765	BZTM7	China	(LIAO)CHUANDENG(JI)(2016)FT-200021	FZLC
SHUN DA 9	36766	BZTM8	China	(LIAO)CHUANDENG(JI)(2016)FT-200023	FZLC
HONG YANG 2	35987	BBLV1	China	(LU)CHUANDENG(JI)(2016)FT-100017	FZLC
LU RONG YUAN YU 211	36771	BCLN8	China	(LU)CHUANDENG(JI)(2016)FT-200164	FZLC
LU RONG YUAN YU 212	36628	BBLM6	China	(LU)CHUANDENG(JI)(2017)FT-200038	FZLC
HONG YANG 8	36235	BBIW8	China	(LU)CHUANDENG(JI)(2016)FT-200044	FZLC
HONG YANG 9	36236	BBIW9	China	(LU)CHUANDENG(JI)(2016)FT-200046	FZLC

Vessel Name	FFA VID	IRCS	Flag State	Registration Number	Agent / management company name
HONG YANG 88	36307	BBIO8	China	(LU)CHUANDENG(JI)(2017)FT-200009	FZLC
LU RONG YUAN YU 888	36456	BBIV8	China	(LU)CHUANDENG(JI)(2018)FT-200031	FZLC
LU RONG YUAN YU 889	36457	BBIV9	China	(LU)CHUANDENG(JI)(2018)FT-200030	FZLC
WEN DAR No.666	36693	BJ4975	Chinese Taipei	CT4-2975	FZLC
JINXIANG 11	36624	BZYB2	China	(LIAO)CHUANDENG(JI)(2014)FT200119	FZLC
JINXIANG 12	36652	BZYB3	China	(LIAO)CHUANDENG(JI)(2015)FT200001	FZLC
(HONGYANG 8)	36816	BZU5C	China	(ZHE)CHUANDENG(JI)(2018)FT200117	FZLC
(HONGYANG88)	36817	BZU6C	China	(ZHE)CHUANDENG(JI)(2018)FT200115	FZLC
CHAOYEUNG No.5	35409	BJ3600	Chinese Taipei	CT4-1600	FZLC
HWA GWO No.68	36805	BK6740	Chinese Taipei	CT3-4740	FZLC
HWA GWO No.58	34902	BJ4220	Chinese Taipei	CT4-2220	FZLC

3.2.2 Introduction to FSM

The Federated States of Micronesia (FSM) is an independent sovereign island state associated with the USA in a Compact of Free Association in effect since 1986. The country consists of over 600 islands in four states (Yap, Chuuk, Kosrae, and Pohnpei) and occupies a major part of the group of Micronesian Islands called the Carolines, a chain stretching over 2,500 km. Its EEZ, located between 13°26'N and 1°10'S covers ~2,939,000 km² and borders the EEZs of Palau, Guam, Papua New Guinea and the Marshall Islands and four High Seas areas and is the 14th largest in the world.



Figure 1. EEZ of the Federates States of Micronesia

The FSM federal government is based on Pohnpei. The four state governments have a high degree of autonomy. The states have jurisdiction over waters within 12 nautical miles from islands, while the national government has control over waters beyond 12 nautical miles to the outer boundary of the EEZ. Each state has its own administrative organisations, with control over coastal fisheries development and management. However, tuna longline activities in the EEZ outside of 12nm fall under the remit of federal government.

Marine resource use consists of inshore fisheries in mangroves, reef areas, and lagoons, nearshore and bottom fisheries, and offshore fisheries (mainly for tuna). Subsistence fishers make the greatest use of inshore resources, while coastal commercial fishers concentrate on nearshore and bottom resources, and offshore resources are exploited by local and foreign-based tuna vessels (FAO, 2002).

FSM's EEZ contains substantial tuna stocks that are fished primarily by foreign longline, purse seine and pole-and-line vessels under access arrangements. Purse seine catches consisting mainly of skipjack dwarf those of the longline and pole and line fisheries which target bigeye and yellowfin (see Figure 2 and Figure 3).

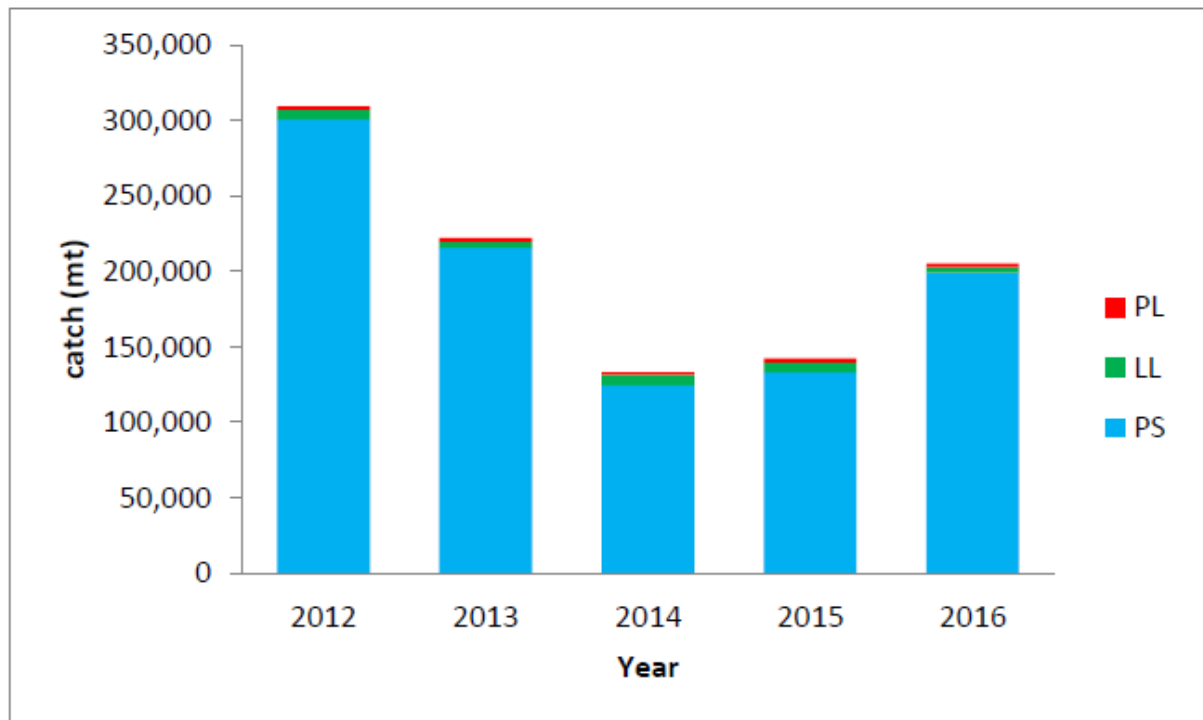
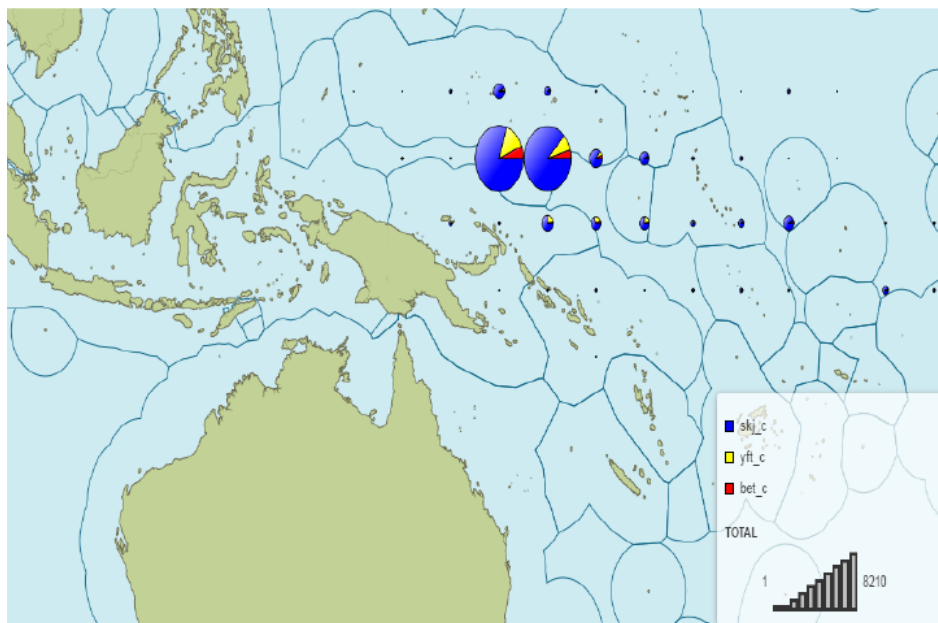


Figure 2. Total annual catch from 2012-2016 by different gear types operating in FSM EEZ.
Source: (NORMA, 2017).



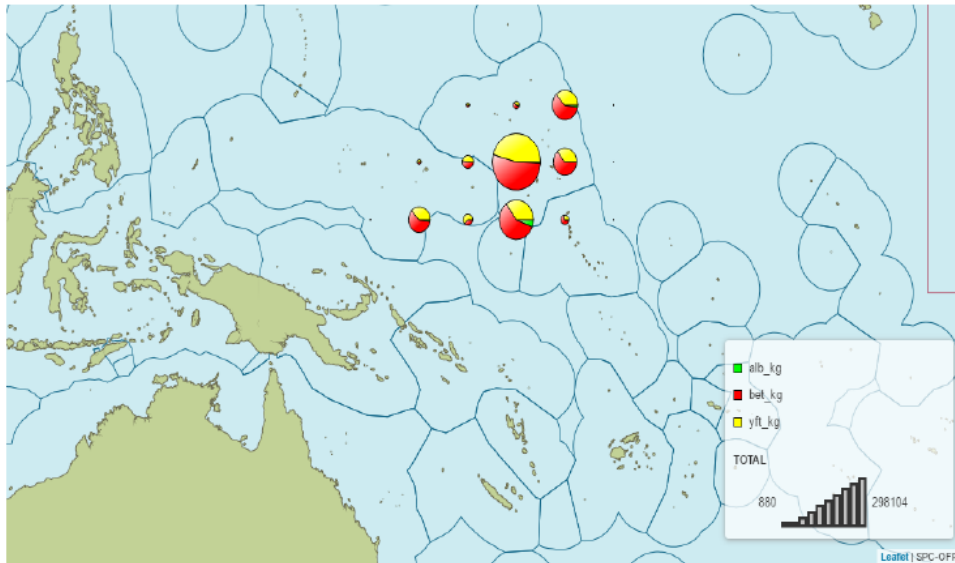


Figure 3. Distribution of FSM purse seine (top) and longline (bottom) catch in the WCPFC Convention Area, 2016. Source: (NORMA, 2017).

The longline fishery in the FSM began in the early 1950s by the Japanese, who targeted yellowfin tuna. By the late 1960s, they had been joined by Taiwan and Korea (Diplock, 1993). Purse seine fishing is currently permitted in FSM by vessels registered *inter alia* in Japan, Taiwan, Korea and China while longline fishing is carried out by the UoA fleet, as well as by Japanese flagged vessels. The number of vessels fluctuates from year to year, and even within years, depending on fishing conditions in FSM and elsewhere. The number of purse seine and longline licenses over the last three years is shown in Table 3. In relation to IUU fishing, there are ongoing concerns over illegal fishing of reef fish by Vietnamese ‘blue boats’. However, these incidences do not involve the FSM longline fishery and are now occurring less frequently with heavy penalties appearing to act as effective deterrents – this is further discussed in Section 3.5.6.

Table 3. Number of longline and purse seine licenses active in the FSM EEZ during 2015 – 17. Source: NORMA.

Fishery type	2015	2016	2017
Longline	71	39	50
Purse seine	119	114	124

3.2.3 Management of the fishery

This fishery is managed at two levels; internationally through the Western and Central Pacific Fisheries Commission (WCPFC), the tuna RFMO for the Western and Central Pacific Ocean, and its associated bodies, and nationally within FSM. A detailed description of the management system is provided under Principle 3 (Section 3.5); however, an introduction to the FSM management system is provided below.

Within FSM, the National Oceanic Resource Management Authority (NORMA) is responsible for the development and management of the marine resources within FSM. Title 18 of the FSM Code establishes the jurisdiction of NORMA as the territorial sea from 12nm from the island baselines within its EEZ while the Marine Resources Department in each state,

Pohnpei, Kosrae, Chuuk and Yap, has jurisdiction over the territorial sea from the high-water mark to 12nm.

To manage the tuna resources within the EEZ, NORMA operates under Title 24. Marine Resources of the FSM Code, a comprehensive framework for fisheries management, which stipulates the rights and authority regarding fishery resources. Additionally, the Management Plan on Tuna Fisheries for FSM (2015) acts as a guide to NORMA to ensure the sustainable development, conservation and use of tuna resources in FSM's EEZ. NORMA is responsible for administering the Vessel Day Scheme (VDS) implemented by PNA to limit purse seine and longline fishing effort within FSM's EEZ and those of the other eight PNA member countries. FSM has agreed to a range of binding and non-binding international treaties, concerning fisheries, which influence the domestic management framework. These include the binding UNCLOS, FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas and the signed but not ratified FAO Agreement of Port State Measures. Other non-binding treaties include the FAO Code of Conduct for Responsible Fisheries and International Plans of Action. Operations of NORMA are carried out by the Management and Development, Research and Statistics, Compliance and Technical Projects Divisions.

The national management system's decision-making body is the Board of Directors of NORMA comprised of representatives from each state and one-at large member appointed by the President. The Board is responsible for adopting fisheries regulations, concluding domestic and foreign fishing agreements and issuing fishing permits. Management measures by the Board are based on the best scientific information available and from relevant information gathered from various sources including WCPFC, SPC, FFA and PNA. Consultations with State representatives, NGOs, industry and other stakeholders when developing and implementing management measures are conducted through the Fisheries Management Surveillance Working Group meetings, annual Fisheries Symposium workshops and informal meetings.

The MCS Section, under NORMA's Statistics, Compliance and Technical Projects Division, is responsible for the collection and entry of fishing vessel logsheet data, catch validation, transshipment reports, zone notifications and vessel control reports. Much of the compliance work within NORMA is done in tandem with the Maritime Police and the Maritime Surveillance Wing under the Department of Justice which is given power to penalize parties in breach of compliance to regulations stipulated in Title 24. The responsibilities of the Maritime Police and the Maritime Surveillance Wing include maritime surveillance of FSM's EEZ and enforcement of fisheries and maritime laws. Regular dockside inspections are conducted on commercial fishing vessels entering into ports to determine whether the vessels are compliant with the regulations.

Periodic internal and external evaluations and reviews have been conducted for key parts of the management system. Many of the provisions of Title 24 have been repealed and re-enacted since it was published in 1982, the National Tuna Management Plan has been reviewed and revised since it was implemented in 2000, the Office of the National Public Auditor has conducted audits of NORMA's management systems and the World Bank has assessed effectiveness of the fisheries enforcement and seafood safety systems.

3.2.4 Gear and operation of the fishery

Pelagic longline gear is used throughout the world's oceans to capture tuna and tuna-like species. Longline gear is typically deployed from a single vessel across many miles of ocean. The vessel deploys a single mainline that is periodically buoyed with floatation devices and thinner branchlines (with baited hooks) are then attached to the mainline between the floats (Beverly et al., 2003; Curran, 2014). Within this simple framework, a variety of configurations and operational practices can be employed to specifically target different depths and species of fish. A single set by vessels in the client fleet usually consists of a mainline that is up to 50km in length with ca. 20m-long branchlines attached at intervals along the length of the line. The distance between floats is about 1km, with about 25 hooks between floats. The depth of the shallowest hook is at approx. 50m. Wider circle hooks rather than J-hooks (Figure 5) are consistently used in the fishery, as verified by the team during the site visit, and shark lines and wire leaders are banned. Note that the client has a policy in place banning the retention of sharks and rays and banning the use of fishing gear and methods to target sharks.

The bait used consists of fish (the Indian oil sardine – see Section 3.4.4) and no squid has been used in recent years.

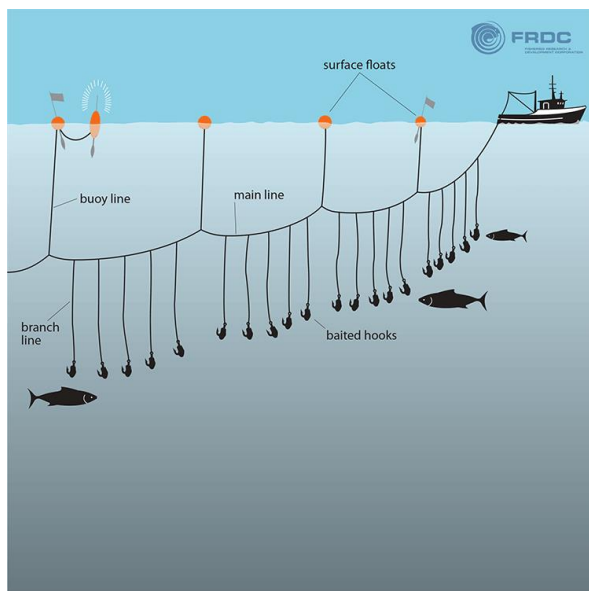


Figure 4. Illustration of longline set (Source: danasartandscienceblog.wordpress.com).

For the moment, the client fleet consists of freezer vessels only, with trips generally taking up to 50 days for the smaller vessels and up to 80 for the larger ones. Vessels typically carry up to 14 crew. None of the yellowfin product goes to the domestic market but is instead shipped to processors in China, Japan, Vietnam and Thailand.



Figure 5. Hooks used by vessels in the UoA.

3.2.5 Fishing areas and seasons

The client fleet operates on a year-round basis. Some of the client vessels also fish on the High Seas or in other EEZs – none of these areas are included in the UoC. An example of VMS tracks for a subset of the client fleet, aggregated for 2017 is shown in Figure 6 (note that straight lines indicate steaming rather than fishing). Commercial longlining for tuna is not permitted in waters up to 24nm from any FSM islands – these waters are instead reserved for domestic resource exploitation.

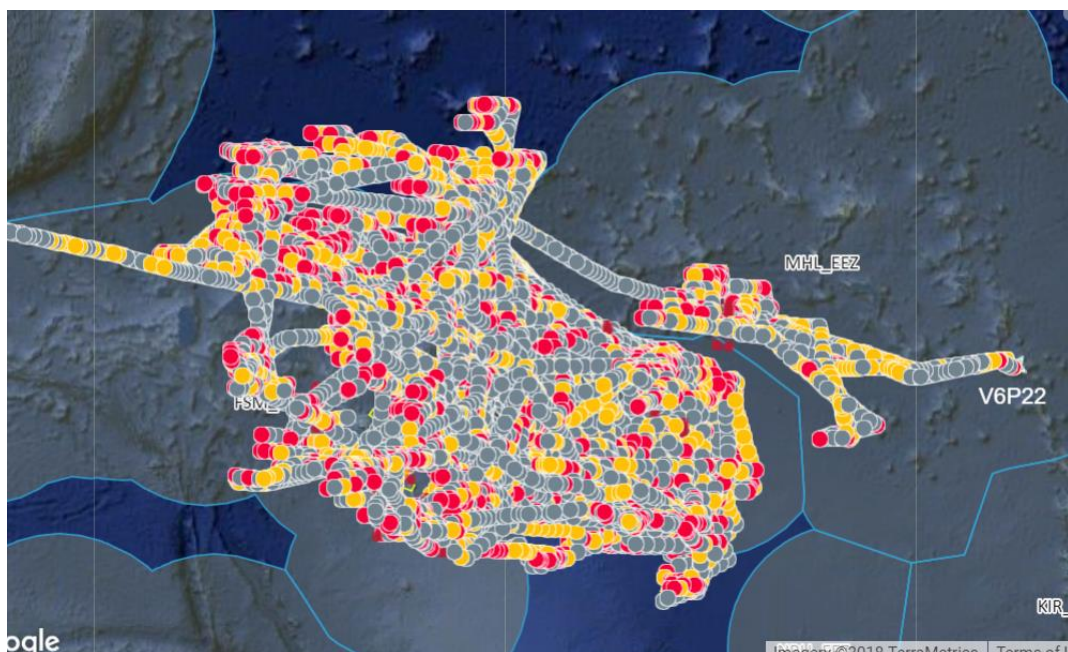


Figure 6. CFA 21,22,23,25,26,27 VMS tracks from Jan 01 to Dec 31 2017. Source: NORMA.

3.3 Principle One: Bigeye Background

3.3.1 Bigeye stock definition

Bigeye are distributed throughout the tropical and sub-tropical Pacific, so the question arises as to whether it is appropriate to treat the WCPO as a stock separate from the EPO. Genetic analysis does not suggest significant population differentiation (Grewe and Hampton, 1998). Tagging suggests that while some individuals may move very large distances (up to 4000 nautical miles over one or more years), most were recaptured much closer to the tagging point. Tagging also suggests that east-west (or in particular west to east movement) is more significant than north-south movement (which is one reason why the regional structure of the stock assessment has been adjusted; see Section 3.3.9). The working hypothesis is that bigeye in the far east and far west Pacific have little exchange, but there is likely to be mixing in the central Pacific and there is certainly extensive movement over the nominal WCPO/EPO boundary at 150°W (Figure 7). The consequences of this mixing for stock assessment has been evaluated via a Pacific-wide stock assessment (McKechnie et al., 2015b), the results of which suggest that the current approach is robust to this mixing.

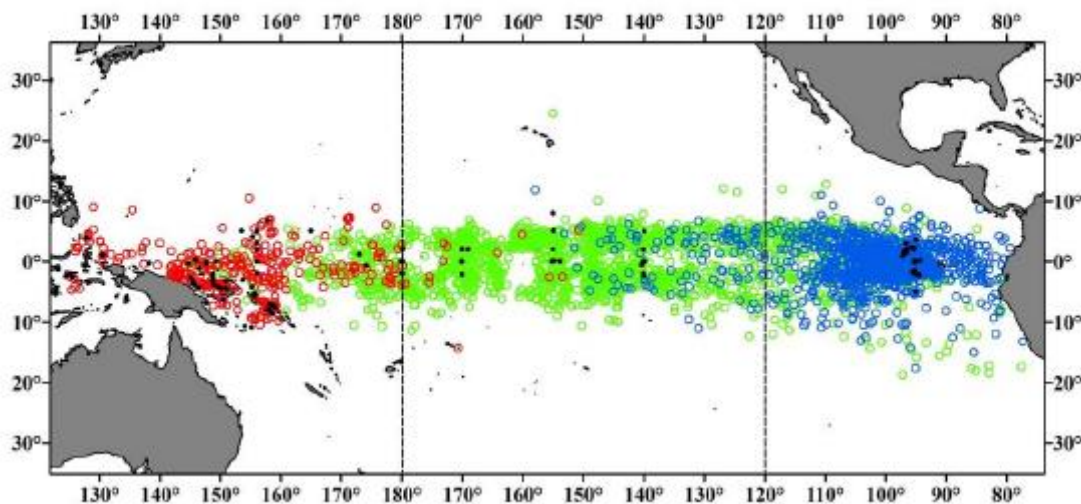


Figure 7. Movements of tagged bigeye, divided into three regions. Black points are release locations; red are recapture locations for fish released in the western region; green for recaptures of fish released in the central region; blue for recaptures of fish released in the eastern region. Figure taken from McKechnie, Pilling, et al. (2017a) who in turn took it from Schaefer et al. (2015).

3.3.2 Bigeye biology

Growth and maturity: Bigeye tuna are relatively fast-growing, with a maximum length of ~200 cm. Individuals reach maturity in the length range 80-120 cm. It appears that bigeye growth is faster in the EPO than the WCPO, for reasons unknown; maturity is reached at a similar age but at a larger size. Growth does not seem to vary significantly by sex (changes in sex ratio after maturity are therefore presumed to be related to differential natural mortality), but growth may vary spatially in the WCPO, although more data are required to map this in detail.

Bigeye age and growth in the WCPO have been revisited and revised in recent years ('Project 35'; Farley et al. (2017b), followed by 'Project 81'; Farley, Eveson, et al. (2018)). Initially, the

authors sectioned otoliths from 1039 fish caught from 2013-16, in the age range 0.25-13.7 years, mainly from the equatorial regions, and for the 2018 update included a further 237 age estimates, including 188 from fish >130cm FL, to address concerns expressed at SC13 regarding the accuracy of the revised growth curve at larger sizes, as well as 11 for small fish (31-39cm).

This work has allowed a new growth curve for bigeye to be estimated, which had a significantly lower asymptotic length than the curve previously used in the stock assessment model (e.g. from 2014), which was more similar to the EPO growth curve (see McKechnie, Pilling, et al. (2017a); Figure 8). The new growth curve from Project 35 was used in the 2017 stock assessment (alongside the old one; see Sections 3.3.1 and 3.3.9) and considerably affected the conclusions of the assessment (see Section 3.3.3). The updated 2018 stock assessment incorporated the results of Project 81 as well, but this made very little difference to the 2017 growth curve (Figure 8).

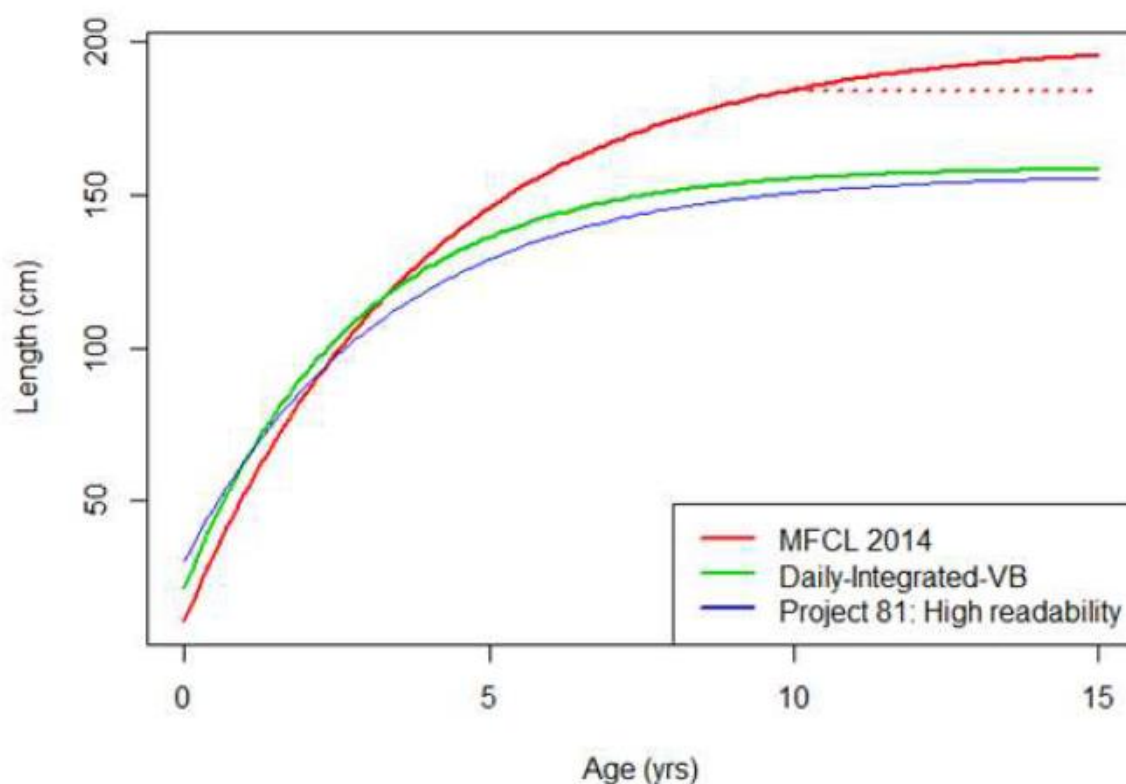


Figure 8. Bigeye growth curves used in the current and previous stock assessments: red – used in previous stock assessments up to 2014; green – used for 2017 assessment (McKechnie, Tremblay-Boyer, et al., 2017) based on the work presented in Farley et al. (2017b); blue – as green, incorporating additional work as set out in Farley, Eveson, et al. (2018); used in the 2018 update assessment.

Natural mortality: M is assumed to be high for the smallest size classes before declining to ~0.5/yr for fish >~40cm. Tagging data suggest that significant numbers of fish reach at least 8 years; the longest period at liberty for a recaptured bigeye in the WCPO was ~14 years, for a fish released aged 1-2 years. For females, M may increase after maturity because of the physiological stress of spawning; sex ratios of larger size classes tend to be male biased (McKechnie, Pilling, et al., 2017a). M curves in the stock assessment are sex-specific (see below).

3.3.3 WCPO bigeye stock status

The most recent full stock assessment for WCPO bigeye was in 2017 (McKechie, Pilling, et al., 2017b). The assessment incorporated a growth curve which has been updated by the results of 'Project 35' on age, growth and reproduction of bigeye, which has been going on since 2009 (Farley et al., 2017a) (see Section 3.3.2 above). The 2017 assessment also adjusted the regional structure; shifting the boundary between the northern temperate regions (regions 1 and 2) and tropical/equatorial regions (regions 3 and 4) from 20°N to 10°N (see Section 3.3.9 'stock assessment' below for details). The new (2017) vs old (2014) growth models and regional structures were used as sensitivities in the stock assessment mode, along with some others (discussed in Section 3.3.9). The 2017 assessment was updated in 2018 to incorporate the updated growth curve from 'Project 81' as described above, as well as to evaluate the impact of regional structure (Vincent et al., 2018). Both these changes, but particularly the new growth curve, resulted in the assessments from 2017 and 2018 being significantly more optimistic than the previous assessment in 2014.

SPC do not designate a 'reference case model' as the basis for management advice, but instead provide the range of model outputs over the whole sensitivity grid, including old vs 'updated new' (i.e. 2018) growth curves and old vs new regional structure. It was left to the Scientific Committee (SC14) to evaluate the various models and grids and decide how to provide management advice to the Commission. 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. They did include both regional structures, as well as a range of other uncertainty axes having less overall impact on the assessment conclusions (described in Section 3.3.9 below). This resulted in a grid of 36 models. Table 4 gives the stock assessment output from the SC14 uncertainty grid (WCPFC, 2018).

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

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_0	0.26	0.26	0.28	0.30	0.30

The basic conclusions of the stock assessment itself are summarised by the authors as follows (McKechie, Pilling, et al., 2017a; Vincent et al., 2018):

- All models with the updated new growth function put the SB above the limit reference point.
- All models with the new growth function estimate that recent recruitment has increased spawning potential in the last few years; with the old-growth model it was expected that this recruitment would increase SB in due course.

- Taking the four key sets of models (updated new/old growth, 2014/17 regions), only the old/2014 set of models put SB below the limit reference point for all models; this assessment was slightly more pessimistic than the 2014 analysis.
- All models estimated a substantial decline in bigeye abundance over 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, 2018).

3.3.4 Stock projections

SC14 also present some stock projections under different scenarios of fishing pressure and recruitment (WCPFC, 2018). The recruitment scenarios were based on either long-term average recruitment or recent levels of recruitment, as estimated from the 2018 updated stock assessment; recent recruitment levels being higher than the long-term average. Fishing scenarios were either 'status quo' (2013-15, reflecting 'recent' in the stock assessment), 'optimistic' (scalar multiples 1.11 for purse seine effort and 0.98 for longline effort) or 'pessimistic' (scalar multiples 1.12 for purse seine and 1.35 for longline). The results of the projections depend mainly on assumptions about recruitment. Based on recent (high) recruitment levels, the risk of SB declining to below the LRP by 2045 is minimal, although F is increasingly likely to exceed F_{MSY} as fishing effort increases. Conversely, assuming long-term recruitment levels, SB has a 17-32% chance of being below the LRP by 2045, while F is very likely to be above F_{MSY} under all fishing scenarios including the status quo (Table 5).

Table 5. Projections of future stock status from SC14, based on updated 2018 stock assessment; scenario definitions given in the text (WCPFC, 2018).

Recruitment scenario	Fishing scenario	Risk $SB_{2045} < LRP$	Risk $F > F_{MSY}$
Recent (high)	Status quo	0	11
	Optimistic	0	13
	Pessimistic	0	30
Long-term (lower)	Status quo	17	93
	Optimistic	18	94
	Pessimistic	32	98

3.3.5 WCPO bigeye harvest strategy

A limit reference point has been agreed for WCPO bigeye of $20\%SB_{\text{current},F=0}$, where 'current' is defined as the most recent 10-year period for which data are available for the stock assessment. The current CMM for tropical tuna stocks in the WCPFC zone is CMM 2017-01, which is intended to be a 'bridging measure' while work continues towards a formal harvest strategy (see below). CMM 2017-01 is currently in force and runs to February 2021, unless replaced before.

The objective of the current harvest strategy for bigeye is set out in paragraph 12 of CMM 2017-01:

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.

This objective is essentially maintenance of the status quo, because the final year of the stock assessment is 2015, so the objective equates to 'current' biomass, as defined by the SC.

CMM 2017-01 provides for a series of management measures aimed at constraining effort on tropical tunas (including bigeye), focusing particularly on the purse seine fishery which accounts for ~40% of the catch of bigeye (2014-16; WCPFC Tuna Fishery Yearbook) and has an impact on SB as well as SB_{MSY} disproportionate to its percentage of the catch because it takes mainly juveniles.

Measures for the purse seine fishery are as follows:

- For 2018, 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 (see below). Also a further two-month ban on FAD setting in the high seas in April-May or November-December; to be decided by the CCM; except for Kiribati and Cook Islands vessels in high seas areas adjacent to their EEZs and Philippines vessels in High Seas Pocket 1 (HSP1), for which a set of special measures are established.
- A maximum of 350 instrumented FADs to be in use, per vessel, at any one time.
- Purse seine catch or effort limits to be set for each relevant EEZ (see Table 6; remaining countries have till the end of 2018 to set limits).
- Non-SIDS (except Philippines) to set high-seas effort limits for their flag vessels for the area 20°N-20°S (see Table 7). The CMM also notes (para. 27): *CCMs shall ensure that the effectiveness of these effort limits for the purse seine fishery are not undermined by a transfer of effort in days fished into areas within the Convention Area south of 20°S. In order not to undermine the effectiveness of these effort limits, CCMs shall not transfer fishing effort in days fished in the purse seine fishery to areas within the Convention Area north of 20°N.* (Some exemptions are in place for the US to transfer days between EEZs and the high seas in support of the American Samoa cannery, for 2018 only.)
- Any overshoot of catch or effort limits to be deducted from the following year.

CMM 2017-01 also sets longline bigeye catch limits by flag (including charter vessels) for the distant water nations (Table 7). It also requires that member countries which caught less than 2,000 t in 2004 should ensure that their annual catch does not exceed 2,000 t. This does not apply to FSM, however, for two reasons: their 2004 catch was 2,618 t (WCPFC Tuna Fishery Yearbook), plus SIDS have an exemption (under paragraph 5 of the CMM). There are

therefore no catch limits for FSM-flagged vessels, or FSM-chartered vessels under this CMM; i.e. no bigeye catch limits apply to this UoA.

Table 6. Purse seine EEZ effort or catch limits under CMM 2017-01 (Table 1 in CMM 2017-01).
Note: PNA and Tokelau manage their effort together through the VDS; the Cook Islands, Fiji, Niue, Samoa, Tonga and Vanuatu are also reportedly developing a joint management arrangement. (FSM is a member of PNA.)

Coastal CCM or group of CCMs	Maximum effort in vessel days, or catch limit in tonnes
PNA	44,033 days (see further details below)
Tokelau	1,000 days
Cook Islands	1,250 days
Fiji	300 days
Niue	200 days
Samoa	150 days
Tonga	250 days
Vanuatu	200 days
Australia	30,000 t skipjack, 600 t each of yellowfin and bigeye
French Polynesia	0 (purse seine ban in FP EEZ)
Indonesia	not yet decided
Japan	1,500 days
Korea	not yet decided
New Zealand	40,000 t skipjack; nothing specified for other species
New Caledonia	20,000 t skipjack; nothing specified for other species
Philippines	not yet decided
Taiwan	not yet decided
USA	558 days
Wallis and Futuna	not yet decided

Table 7. High seas purse seine effort limits and longline catch limits for relevant fishing nations under CMM 2017-01 (Table 2 and Table 3 in CMM 2017-01). * provisional

CCM	Purse seine effort limit (days)	Longline bigeye catch limit (t)
China	26	8,224
EU	403	-
Japan	121	18,265
New Zealand	160	-
Korea	207	13,942
Taiwan	95	10,481
USA	1270	3,554
Indonesia	-	5,889 *

Other measures in CMM 2017-01 are as follows:

- Capacity of freezer purse seiners >24m operating between 20°N and 20°S is limited to the level set out in 2013-01 (and subsequent iterations), except SIDS and Indonesia; likewise freezer longliners and freshfish longliners targeting bigeye (with additional exemption for countries with a domestic quota system).
- Any replacement of purse seine vessels should not increase overall capacity.
- Other fisheries (i.e. not purse seine or longline) are limited to the catch level of 2004 or the average catch 2001-4, except for those taking <2,000 t who may take up to this level.

The provisions relevant to bigeye in CMM 2017-01 are compared with the previous tropical tuna CMM (2016-01) in Table 8, in order to evaluate whether WCPFC has followed the advice of the Scientific Committee not to increase fishing effort on bigeye. Although a quantitative analysis is difficult, it seems as if the FAD closure provisions have been somewhat weakened, and the longline bigeye catch limits for 2018 have also been increased slightly over 2017. Conversely, a limit has been put on (instrumented) FAD deployments for the first time.

Table 8. Comparison of CMM 2017-01 with the previous tropical tuna CMM (2016-01) in terms of its likely impact on fishing mortality of bigeye

Measure	CMM 2016-01 (provisions for 2017)	CMM 2017-01
Bigeye target	$F < F_{MSY}$	Status quo biomass
Annual FAD closure in zones	3 months, plus an additional 2 months closure or FAD set limits	3 months
Annual FAD closure high seas	12 months	5 months
Instrumented FAD limits	None	Maximum 350 FADs with instrumented buoys per vessel at any given time
FAD set limits	Limits by flag state as an alternative to 2 months in-zone closure	None
EEZ purse seine effort control	Effort (days) limited to 2010 levels, with some exceptions	Coastal-state purse seine effort limits (days)
High seas purse seine effort control	Flag-state effort limits for non-SIDS CCMs	Same limits
Longline catch limits	Flag-state catch limits; countries with catch <2,000 t in 2004 may take up to 2,000 t; SIDS exempt	Same except flag-state limits increased back to 2016 levels
Purse seine capacity limits	'current levels'	As CMM 2013-01, so presumably the same
Longline capacity limits	'current levels'	As CMM 2013-01, so presumably the same
Other fisheries	Catch of those 'other fisheries' exceeding 2,000 t/yr not to exceed the level of 2004 or 2001-4	Same

3.3.6 WCPO bigeye harvest strategy – progress towards a formal harvest strategy

CMM 2014-06 commits WCPFC to putting in place a formal harvest strategy for its key stocks (WCPO skipjack, yellowfin and bigeye, and South Pacific albacore), with an associated workplan, although the workplan has been revised twice (at WCPFC13 and WCPFC14).

The current workplan (agreed at WCPFC14 (WCPFC (2017a); Attachment L) has no targets for progress with the bigeye harvest strategy for 2018, but commits WCPFC to agreeing a TRP for bigeye in 2019 (WCPFC16) and adopting a HCR for bigeye in 2021 (WCPFC18). This does not represent a delay of target dates from the previous workplan (as revised at WCPFC13), which had the same target date for a TRP and did not go any further. The workplan has been reframed to reflect the changed perception of stock status – i.e. it focuses on developing a HCR rather than on rebuilding the stock.

According to CMM 2017-01 (paragraphs 28 and 44), the Commission intends to implement the harvest strategy in part via hard catch or effort limits in the high seas Convention Area, with a framework for their allocation among CCMs, with this due to be agreed by 2020, according to the CMM (paragraph 44).

3.3.7 PNA harvest strategy and the VDS

FSM is a member of PNA and is signed up to the purse seine vessel day scheme (VDS). 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 number of days for 2017-18 under the VDS is 45,590, and for 2019-20 provisionally 45,005 across all the EEZs¹. The number of days is calculated as follows: 44,033 days are taken as baseline (2010) effort for PNA countries (from SPC); a percentage multiplier is added based on how the days are sold across different vessel length classes (for 2017-18 this increases the number of days by 1.3% relative to the baseline, for 2019-20 it is set to zero); the same calculation is carried out separately for Tokelau based on a baseline of 1,000 days – these are summed together to give a Total Allowable Effort (TAE) as set out above (PNA, 2016a). Note that the length adjustment factor is not aimed at addressing purse seine effort creep (referenced in the bigeye stock assessment), as is made clear by PNA; but they express a willingness to address the issue, if more evidence can be provided as to the existence and scale of the issue.

This effort is allocated between countries 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).

In 2016, the Palau Arrangement set up a similar VDS for longline vessels in PNA waters (except Kiribati) (PNA, 2016b). The scheme allows a total of 123,000 longline days, which is significantly more than currently takes place. Of these, FSM has an allocation of ~30,928, which does not limit the existing fishery (in 2017, ~15% were used, partly because the Japanese longline fleet had chosen not to participate). There is the possibility in the Palau

¹ FSM, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands, Tuvalu, Tokelau

Arrangement to transfer days between members, although since all have sufficient allocation at present, there has been no need for this.

Reportedly, the 123,000 longline days were calculated based on the PNA proportion of total longline days in the WCPO (230,000) after the application of a 30% high seas cut for bigeye (bearing in mind it was established when the 2014 stock assessment was current, and the bigeye stock considered depleted) (E. Pangelinan, Executive Director NORMA, pers. comm.). (NB: Unlike the purse seine VDS, every day at sea is considered a fishing day under the longline scheme.) The scheme is due to be reviewed in 2021. For now, it is not considered to have a management purpose, but this could change in the future.

3.3.8 Bigeye information

The 2017 stock assessment report (McKechnie, Pilling, et al., 2017a) provides a full description of the data sources used, from which the summary in this section is taken unless otherwise indicated.

Fisheries: The stock assessment defines 32 'fisheries' according to fishing gear and method (longline, purse seine by set type², pole-and-line, various miscellaneous small-scale fisheries in Indonesia and the Philippines), as well as by region and for those with most (Japan, Australia, US) or least (Philippines, Indonesia) data, by vessel flag or fleet. (The previous assessment had 33 fisheries; the change was a consequence of the small change in regional boundaries, noted above and described in Section 3.3.9)

The information provided from each fishery is summarised in the graphic below (from (McKechnie, Pilling, et al., 2017a); this fishery is part of L-ALL-3 which is the fourth up from the bottom). It is clear that with a few exceptions, recent and historical (back to ~1980 at least) catch data are available from all the fisheries. Standardised CPUE is only evaluated for longline fisheries because of problems in defining a suitable measure of effort for the other gear types (see under 'effort' below). Size data are available as weight for the longline fisheries and length (from port sampling) for the other gear types; it is concerning that longline size data collection (or provision) seems to have slightly deteriorated in recent years.

² unassociated, or associated with FAD, natural log, dolphin, whale, whale shark or other, or unspecified

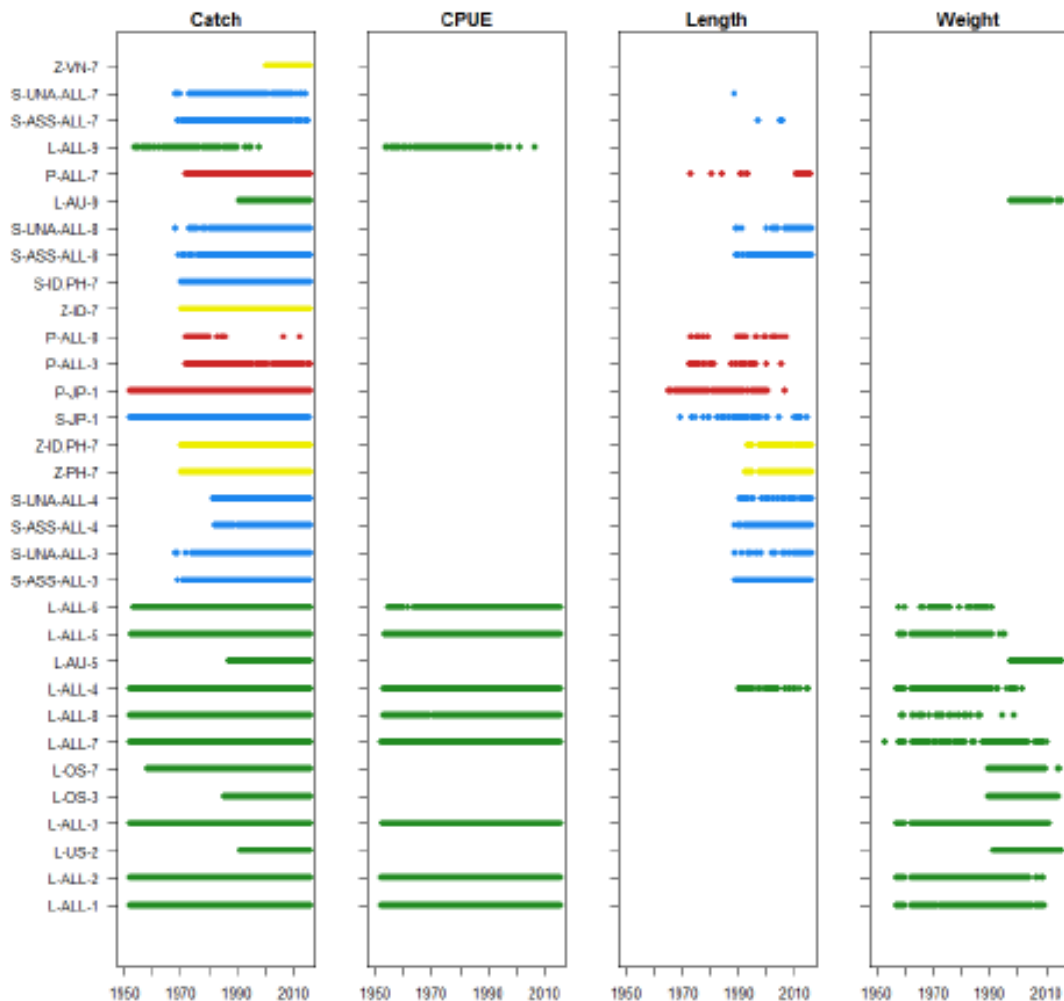


Figure 9. Graphic representing the input data to the bigeye stock assessment from each ‘fishery’ (as defined as described above). Left to right: catch, CPUE, catch length sampling and catch weight sampling; top to bottom: the 32 fisheries defined by the stock assessment; x-axis of each column 1950-2015 (Figure 5 in (McKechnie, Pilling, et al., 2017a)).

Catch data: Catch is recorded by number for longline and by weight for other gears. Discards are considered minor and are not included in the stock assessment. For the purse seine catch, a method has been defined (‘Method 3’ – see Hampton and Williams (2017)) for dividing the catch by species (this after a process of analysis and review; see references in stock assessment report).

Effort: Effort is not included in the stock assessment for all fisheries; e.g. if the data are not considered robust or if the fishery aggregates several gear types (small-scale fisheries). Purse seine effort is defined as days fishing / searching and allocated to set type according to the proportion of each set type in the total sets for the trip (from the logbook). The authors of the stock assessment report note a concern that there has been a change in reporting practice such that days previously considered ‘searching’ days may now be reported as ‘transiting’ days, leading to effort creep (because the trip catch is allocated to a lower proportion of the trip days); this is dealt with in the model by allowing periodic changes in catchability.

CPUE: The key datasets for the assessment are standardised longline CPUE time series from a range of fisheries; the historical data are mainly Japanese but in more recent years data are

available from all the main distant-water fleets as well as from Pacific island domestic fleets. An improvement since the 2014 assessment is that SPC has managed to compile an extensive database of operational (as opposed to aggregated) catch and effort data from the main distant water fleets.

Other fisheries: There has been gradual improvement in the data from Indonesia and the Philippines over the last decade or so; since the last assessment, catch data from Vietnam have also been available. Effort for these fisheries is included as days fished where possible, but usually not included (five fisheries).

IUU: A stock assessment model run was done to evaluate the possible impact of systematic underreporting of bigeye (see Pacific (2016)); the outcome was slightly more positive as you might expect (i.e. same CPUE trends but a higher catch); but this was not included in the list of 'key' sensitivities (see below).

Length / weight frequency: These data come from observers, port sampling or on-board collection by the crew and are converted to live weight. For purse seine fisheries, observer samples are corrected for grab-sample bias, and the long time-series of port sampling from Pago Pago has been included since the 2014 assessment. If both length and weight are available, weight is used for preference. The data are weighted by catch size to avoid over-weighting small sample sizes in the model.

Tagging: In total 17,886 releases and 6,344 returns are incorporated into the stock assessment model. These data come from the Regional Tuna Tagging Project (1989–92), the Coral Sea Tagging Programme (1995, 1999–2001) and the Pacific Tuna Tagging Programme (2006–2014). Since 2014, new tagging data are available from the Japanese Tagging Programme (2000–2014), which were included as a sensitivity because their structure made them cumbersome for MFCL to process. Releases later than the 3rd quarter of 2014 are excluded because of delays in reporting of recaptures.

3.3.9 Bigeye stock assessment

The most recent full stock assessment for WCPO bigeye is described in McKechnie, Pilling, et al. (2017a). It was updated in 2018, primarily to include new growth data, as described above (Vincent et al., 2018). The summary here is taken from these two documents unless otherwise indicated. The 2017 assessment uses data from 1952 to 2015, in quarterly timesteps, and the 2018 assessment does not update that time series, except to use in re-evaluating the spatial structure. Data from 2016 were not used based on the advice of SC12 that these data are often still preliminary and subject to revision, even after the SC meeting – in particular longline data which are the key dataset for the 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. The details of how these fisheries are defined are given in McKechnie, Tremblay-Boyer, et al. (2017). For each fishery, the assessment uses catch data, effort data (in the form of standardised CPUE time series; see McKechnie, Tremblay-Boyer, et al. (2017) and Tremblay-Boyer et al. (2017a)). The model also uses tagging data. Age and growth parameters are estimated externally and used as fixed parameter (the new growth work is described in Section 3.3.2).

Age and spatial structure: The stock assessment model is divided into 40 quarterly age-classes and stratified by area (region), with 9 regions defined. The regions cover the WCPFC

Convention area, but the assessment stops at 150°W and so excludes the IATTC overlap area. The 2017 model slightly adjusted the region boundaries from the 2014 assessment, putting the boundary between equatorial and tropical regions at 10° N and S rather than 20°. This was done because tagging data indicate limited movement between equatorial and more temperate regions, and because Regions 3 and 4 then better reflect the distribution of purse seine fishing (mainly from 10°N to 10°S). This regional structure was re-evaluated in the 2018 update, which considered an intermediate boundary at 15° (output more similar to the 10° model than the 20° model) and concluded that the 10° model was the most appropriate. SC14, however, decided to rank the models with the two regional structures as equally likely, as previously did SC13. The 2017 regions are as follows (see also Figure 10):

- Regions 1 and 2 (west and east) north of 20°N;
- Regions 3-4 in the equatorial Pacific;
- Regions 5-6 south of 10°N;
- Region 7 in the equatorial archipelagic region (Philippines, E. Indonesia); this region was defined to reduce the uncertainty associated with the fisheries from the Philippines, Indonesia and Vietnam;
- Region 8 separates the part of region 3 in the archipelagic waters of PNG and the Solomon islands, where tagging data show high residence times;
- Region 9 separates the Coral Sea from the rest of Region 5, to accommodate tagging data.

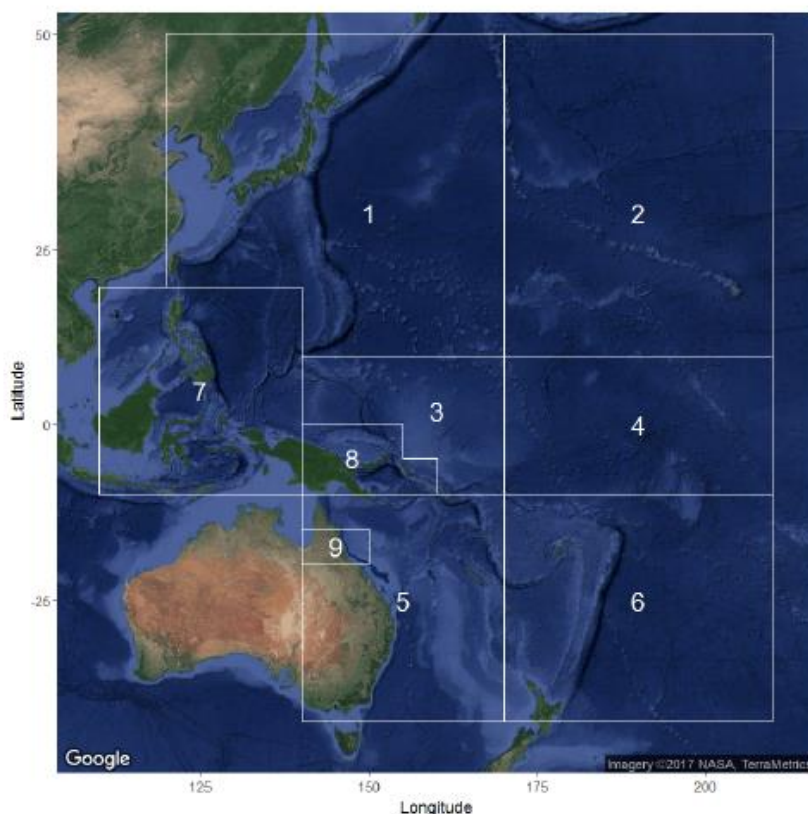


Figure 10. The regions used to stratify the model, as adjusted in the 2017 assessment and reaffirmed in the 2018 update (McKechnie, Pilling, et al., 2017a)

Growth: The details of the new work on age and growth (Project 36 and Project 81) are given in Section 3.3.2 above. For the purposes of the assessment, two alternative approaches to modelling growth were considered (all assuming a VB curve):

- the same growth curve and methodology as in the 2014 assessment;
- the growth curve estimated externally to the model, as used in the 2017 assessment but updated based on new data from Project 81 (see Figure 8 above);

Steepness: The reference case model assumes $h=0.8$; 0.65 and 0.95 are tested as sensitivities (standard practice across all SPC tuna assessments).

Recruitment: The stock-recruit relationship is considered weak (i.e. weak penalty for deviating from it); the six terminal quarterly recruitments are set at the mean of assessment period; the distribution of recruitment is allowed to vary across regions.

Natural mortality: M assumed to vary between males and females (because there is a larger proportion of males in the largest size classes); M is calculated externally by length and then converted to M -at-age using the growth curve; this M vector is put into the model as fixed values.

Selectivity: Modelled using a variety of functions and methods (cubic spline smoothing, logistic function), depending on the fishery. Fisheries can 'share' selectivity if their characteristics are similar, to reduce the number of model parameters

Catchability: Constant catchability is assumed for fisheries where there is standardised CPUE (i.e. the model assumes that standardised CPUE is an index of abundance); otherwise catchability is allowed to vary over time (every 2 years); this deals for example with the issue of purse seine effort creep noted in Section 3.3.8 above.

Model runs: The model was run initially exactly as for 2014, and changes were made one at a time, so that the consequences of each change for the outcome of the assessment could be evaluated. The sequence went as follows: 2014 model → new MFCL executable → 2014-15 data added → new approach to longline CPUE standardisation (Tremblay-Boyer et al., 2017a) → new regional structure → new growth and maturity schedule based on Farley et al. (2017b) → some modification to recruitment estimation → longline length-frequency data removed to avoid conflict with weight-frequency. This last provides the 2017 diagnostic model for the purposes of the analysis of fits etc.; but the authors note that the full range of the uncertainty grid should be considered as the basis for management advice; see Section 3.3.3 (stock status) above. The model was then updated in 2018 with the revised growth curve.

Sensitivities: Several hundred sensitivity runs were done but not all are presented in the report; they focus on those which are '*considered to represent the plausible bounds of model uncertainty*'. The sensitivities presented here are those retained by SC14 for their structural uncertainty grid of 36 models (Table 9).

Table 9. Key sensitivity runs selected by SC14 to represent the range of uncertainties in the stock assessment (McKechnie, Pilling, et al., 2017a; WCPFC, 2018)

Sensitivity	Description	Tested values (diagnostic model in bold)
Steepness (h)	Shape of stock-recruit curve (proportion of full recruitment at 20%SB ₀)	0.65, 0.8, 0.95

Tag overdispersion	Variance of tag-recapture probability distribution; to test the effect of downweighing the tagging data to account for various kinds of process error in tagging	default (1) or fixed (moderate)
Size-frequency weighting	Testing the impact of different assumptions about effective sample size for the size-frequency data	sample size divided by 10, 20, 50
Regional structure	See above	2017 vs. 2014 structure

3.3.10 LTL considerations

Bigeye has a trophic level of 4.5 and is not considered a low trophic level (LTL) species (Fishbase.org).

3.4 Principle Two: Ecosystem Background

3.4.1 Data availability

The Principle 2 analysis is based on two key sources of information: logbook and observer programme datasets. For each licensed vessel, the paper logbooks are the standard form through which data are collected. The logbooks detail estimated volume (tonnes) and number of individuals of retained catch per species, as well as time and coordinates of the sets. In addition to retained catches, information on discards and interactions with Endangered, Threatened or Protected (ETP) species such as sharks may also be recorded although less consistently. All logbook data should be provided to NORMA within 10 days from the end of the trip although they are usually submitted straight after landing, either in physical form or scanned. The data are then entered by NORMA into the SPC database Tufman, enabling SPC to carry out cross-checks between the catch data (logbooks), unloading records and VMS data. For this assessment, logbook data for 2015 and 2016 were obtained for the entire UoA, as summarised in Table 10. The reason why only two years' data are presented in the report is related to the implementation of the shark regulations at the start of 2015. In addition to a ban on shark finning, longline vessels were no longer permitted to target or land sharks as a result of these regulations. Only sharks that were dead upon hauling are now permitted to be landed, with fins naturally attached. This is discussed in detail in Section 3.4.5.1. This regulation has affected both at-sea fishing behaviour and the overall catch composition of landed fish. The team therefore determined that logbook and observer data prior to 2015 were not representative of the current UoA. It should be noted that the catch composition in the logbook and observer data will be reviewed on an annual basis at surveillance audits

As a WCPFC CCM, FSM participates in the Regional Observer Programme (ROP) which at a regional level aims to collect verified catch data, other scientific data, and additional information related to the fishery, including on the implementation of CMMs. CMM 2007-01 entered into force on 15 February 2008, and provides the basis of the rules and development of the WCPFC ROP. FSM are currently not complying with the 5% minimum required observer coverage of longline fishing effort in their EEZ (CMM 2007-01), with observers placed on only 6 longline trips aboard FSM-flagged vessels in 2016 (NORMA, 2017). The lack of observer coverage is reportedly related to the fact that a significant number of longline vessels are based in the neighbouring Marshall Islands (RMI), which makes it difficult to place FSM observers on board. During the site visit, NORMA staff indicated that collaboration was underway with RMI to address this issue, and subsequently NORMA has confirmed that an agreement is now in place between FSM and RMI so that in 2019 Marshall Islands nationals will be placed on longline vessels operating in the FSM EEZ. Another contributing factor appears to be capacity. With only 57 trained observers available for both the longline and purse seine fleet (the latter requiring 100% observer coverage according to CMM 2007-01) no observers have been placed on non-FSM flagged longline boats in recent years. For this assessment, NORMA provided observer data for 2015 and 2016, corresponding to 3 and 6 trips for those years respectively.

In addition to the ROP, which uses on-board observers, an electronic monitoring system (EMS) is being trialled on five of the UoA boats in collaboration with The Nature Conservancy (TNC) and Spanish EM service provider Satlink. Under the trial, all trips and sets are currently being monitored with the aim of improving detection capabilities in the software. During a next phase it is planned to carry out the trials with observers on board for ground truthing. With

assistance from TNC, work is also underway to adapt the legal FSM framework to Emonitoring. Currently, however, this process is still very much under development and is not considered a formal component of the FSM management system.

3.4.2 Designation of species under Principle 2

The designation of species as Primary, Secondary or Endangered, Threatened or Protected (ETP) species is based on the following criteria.

Primary species (MSC Component 2.1):

- Species in the catch that are not covered under P1
- Species that are within scope of the MSC program, 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.

A summary of the 2015/16 SPC logbook and observer data for the UoA fleet is provided in Table 10 and Table 11. The most reliable source of data for non-discarded species is the logbooks. Observer data are available to evaluate discards, but while accurate are less comprehensive. Note that shark discards are also recorded on the logbooks and that no sharks were landed in 2015 or 2016 according to NORMA.

The observer data for 2015 and 2016 (average) were scaled up to fleet level based on the total landings of bigeye (BET) and yellowfin (YFT) from the logbook data and the average percentage of BET and YFT retained (i.e. landed as indicated in the observer data – this is 99 %).

The scaling factor (SF) was calculated as follows:

1. BET + YFT landings (2015; 2016) raised to total catch (BET+YFT_{total}):

$$BET + YFT_{total} = \frac{\text{logbook data (BET + YFT; 2015 + 2016)}}{\% \text{ BET + YFT retained (99\%)}}$$

2. Scaling factor (SF):

$$SF = \frac{BET + YFT_{total}}{\text{observed catch (BET + YFT; 2015 + 2016)}}$$

The observer data for each species were then raised as follows:

$$Species_{total} = SF \times (\text{average observed catch Species (2015; 2016)})$$

Table 10. Summary of 2015 / 2016 SPC logbook data for the UoA fleet. Data provided by NORMA. P1 species is marked in red; Primary species are in bold; ETP species are shaded blue; all others are secondary species. Note that shark discards are also recorded on logbooks although not systematically.

Species		Catch volume (tonnes)		% Composition		Main?
		2015	2016	2015	2016	
BIGEYE	<i>Thunnus obesus</i>	2,281.75	875.00	38.83%	34.23%	Yes
YELLOWFIN	<i>Thunnus albacares</i>	1,664.90	756.01	28.33%	29.58%	Yes
ALBACORE	<i>Thunnus alalunga</i>	1,369.95	597.58	23.31%	23.38%	Yes
BLUE MARLIN	<i>Makaira nigricans</i>	284.78	196.47	4.85%	7.69%	Yes
WAHOO	<i>Acanthocybium solandri</i>	78.85	40.59	1.34%	1.59%	No
WORDFISH	<i>Xiphias gladius</i>	41.59	24.27	0.71%	0.95%	No
SKIPJACK	<i>Katsuwonus pelamis</i>	47.65	12.58	0.81%	0.49%	No

Species		Catch volume (tonnes)		% Composition		Main?
		2015	2016	2015	2016	
MAHI MAHI	<i>Coryphaena hippurus</i>	29.30	16.47	0.50%	0.64%	No
SAILFISH (INDO-PACIFIC)	<i>Istiophorus platypterus</i>	28.08	16.35	0.48%	0.64%	No
OILFISH	<i>Ruvettus pretiosus</i>	15.00	9.95	0.26%	0.39%	No
OPAH / MOONFISH	<i>Lampris guttatus</i>	10.56	7.02	0.18%	0.28%	No
PACIFIC BLUEFIN TUNA	<i>Thunnus orientalis</i>	3.09	1.32	0.05%	0.05%	No
OTHER	N/a	19.50	2.24	0.33%	0.09%	No
STRIPED MARLIN	<i>Kajikia audax</i>	0.77	0.17	0.01%	0.01%	No
MILKFISH	<i>Chanos chanos</i>		0.17	0.00%	0.01%	No
BLACK MARLIN	<i>Istiompax indica</i>	0.08	0.03	0.00%	0.00%	No
BLUE SHARK	<i>Prionace glauca</i>	0.08	0.00	0.00%	0.00%	N/a
SILKY SHARK	<i>Carcharhinus falciformis</i>	0.05	0.00	0.00%	0.00%	N/a
OCEANIC WHITETIP SHARK	<i>Carcharhinus longimanus</i>	0.02	0.00	0.00%	0.00%	N/a
THRESHER SHARKS	<i>Alopias</i> spp.	0.00	0.01	0.00%	0.00%	N/a
Total		5,876	2,556	100%	100%	

Table 11. Summary of 2015/16 observer data for the UoA fleet. Data provided by NORMA. P1 species is marked in red; Primary species are in bold; ETP species in blue; all others are secondary species.

Species		Total observed catch (tonnes)		Average annual catch (scaled up, in tonnes)	Average % composition (based on scaled up volume)	% Discarded	% Retained	Main?
		2015	2016					
BIGEYE	<i>Thunnus obesus</i>	49.55	58.46	1,636.37	50.44%	0.67%	99.33%	Yes
YELLOWFIN	<i>Thunnus albacares</i>	22.76	55.13	1,180.09	36.38%	2.11%	97.89%	Yes
BLUE MARLIN	<i>Makaira nigricans</i>	0.67	11.12	178.74	5.51%	0.93%	99.07%	Yes
PELAGIC STING-RAY	<i>Pteroplatytrygon violacea</i>	0.90	3.06	60.04	1.85%	100.00%	0.00%	N/a
STRIPED MARLIN	<i>Kajikia audax</i>	0.82	2.33	47.68	1.47%	0.00%	100.00%	No
ALBACORE	<i>Thunnus alalunga</i>	1.30	1.09	36.19	1.12%	0.00%	100.00%	Yes
SAILFISH (INDO-PACIFIC)	<i>Istiophorus platypterus</i>	0.06	1.60	25.16	0.78%	0.00%	100.00%	No
WAHOO	<i>Acanthocybium solandri</i>	0.26	0.97	18.67	0.58%	0.00%	100.00%	No
SILKY SHARK	<i>Carcharhinus falciformis</i>	0.07	0.76	12.50	0.39%	100.00%	0.00%	N/a
BLACK MARLIN	<i>Istiompax indica</i>	0.11	0.40	7.78	0.24%	0.00%	100.00%	No
MAHI MAHI	<i>Coryphaena hippurus</i>	0.09	0.41	7.64	0.24%	0.00%	100.00%	No
OPAH / MOONFISH	<i>Lampris guttatus</i>		0.41	12.28	0.19%	0.00%	100.00%	No
BLUE SHARK	<i>Prionace glauca</i>	0.04	0.32	5.43	0.17%	100.00%	0.00%	N/a
SKIPJACK	<i>Katsuwonus pelamis</i>	0.18	0.17	5.33	0.16%	7.45%	92.55%	No
SNAKE MACKEREL	<i>Gempylus serpens</i>	0.02	0.25	4.16	0.13%	92.86%	7.14%	No

Species		Total observed catch (tonnes)		Average annual catch (scaled up, in tonnes)	Average % composition (based on scaled up volume)	% Discarded	% Retained	Main?
		2015	2016					
ESCOLAR	<i>Lepidocybium flavobrunneum</i>	0.03	0.14	2.60	0.08%	18.32%	81.68%	No
SWORDFISH	<i>Xiphias gladius</i>	0.03	0.10	2.08	0.06%	25.22%	74.78%	No
RAZORBACK SCABBARD FISH	<i>Assurger anzac</i>		0.14	4.09	0.06%	100.00%	0.00%	No
SICKLE POMFRET	<i>Taractichthys steindachneri</i>	0.01	0.06	1.07	0.03%	100.00%	0.00%	No
GREAT BARRACUDA	<i>Sphyræna barracuda</i>	0.01	0.05	0.89	0.03%	100.00%	0.00%	No
SHORT-BILLED SPEARFISH	<i>Tetrapturus angustirostris</i>		0.05	1.45	0.02%	0.00%	100.00%	No
OILFISH	<i>Ruvettus pretiosus</i>		0.03	0.84	0.01%	100.00%	0.00%	No
PELAGIC THRESHER SHARK	<i>Alopias pelagicus</i>		0.03	0.83	0.01%	100.00%	0.00%	N/a
LONG FINNED MAKO SHARK	<i>Isurus paucus</i>		0.03	0.76	0.01%	100.00%	0.00%	N/a
OMOSUDID	<i>Omosudis lowii</i>	0.01	0.01	0.36	0.01%	100.00%	0.00%	No
LOGGERHEAD TURTLE	<i>Caretta caretta</i>		0.02	0.61	0.01%	100.00%	0.00%	N/a
COOKIE CUTTER SHARK	<i>Isistius brasiliensis</i>		0.01	0.42	0.01%	100.00%	0.00%	N/a
RED SEA CATFISH	<i>Bagre pinnimaculatus</i>	0.01	0.01	0.18	0.01%	0.00%	100.00%	No
SAND LANCES NEI	<i>Ammodytes americanus</i>	0.01		0.36	0.01%	0.00%	100.00%	No
SHORTSNOUTED LANCETFISH	<i>Alepisaurus brevirostris</i>	0.00	0.01	0.11	0.00%	100.00%	0.00%	No
CROCODILE SHARK	<i>Pseudocarcharias kamoharai</i>	0.01		0.16	0.00%	100.00%	0.00%	N/a

Species		Total observed catch (tonnes)		Average annual catch (scaled up, in tonnes)	Average % composition (based on scaled up volume)	% Discarded	% Retained	Main?
		2015	2016					
LONGSNOUTED LANCETFISH	<i>Alepisaurus ferox</i>	0.00		0.08	0.00%	100.00%	0.00%	No
Grand Total		76.97	137.15	3,158.37	100.00%			

3.4.3 Primary and secondary species

Based on the observer and logbook data, yellowfin and blue marlin are the only species meeting the requirements for 'main' primary species according to the criteria explained in Section 3.4.2. Although albacore showed up in only a small portion of the observed catch, it was a significant component of the catch recorded in the logbooks at over 23% for both 2015 and 2016. This species is only considered a bycatch in this fishery; however, changes in environmental conditions (e.g. during the 2014/16 El Nino event) may lead to an atypical increase in catch levels (Lehodey et al., 1997). Therefore, the assessment team took the precautionary view and assessed albacore as a 'main' primary species. No other species reached the threshold of 5% (or 2% in the case of vulnerable species); the remainder was therefore assessed as either minor primary or secondary (see Table 10 and Table 11).

Yellowfin, blue marlin and albacore are discussed further in the following sections.

3.4.3.1 WCPO yellowfin

The most recent stock assessment for WCPO yellowfin was carried out in 2017 (Tremblay-Boyer et al., 2017b). SPC themselves summarise the results of the stock assessment as follows (Tremblay-Boyer et al., 2017b):

- Spawner biomass is estimated to have declined across the whole model period for all models, and for most of the model regions.
- The median estimate of spawner depletion is similar to the previous assessment, and the probability of spawner biomass being below the LRP is estimated to be <5%; the same is true for F/F_{MSY} .
- F has increased continuously since the start of industrial fishing; F has in the past increased most rapidly on juveniles, but is also increasing on adults. A significant proportion of juvenile fishing mortality comes from surface fisheries in the Philippines, Indonesia and Vietnam, from which data are uncertain.

Recent recruitment is estimated to be relatively high; it is not known why this is, but good recruitment also estimated for skipjack and WCPO and EPO bigeye suggests it might be environmentally driven.

Although no stock assessment was conducted in 2018, the latest stock indicators were presented at SC14 (WCPFC, 2018). Total yellowfin catch in 2017 was a record 670,890 tonnes, a 4% increase from 2016 and a 12% increase from the average 2012-2016. SC14 noted that under recent fishery conditions, the yellowfin stock was initially projected to increase as recent estimated relatively high recruitments support adult stock biomass, then decline slightly. Median $F_{2019}/F_{MSY} = 0.63$; median $SB_{2019}/SB_{MSY} = 1.51$. The risk that $SB_{2019} < LRP = 6\%$ (WCPFC, 2018).

A limit reference point has been agreed for WCPO yellowfin of $20\%SB_{current, F=0}$, where 'current' is defined as the most recent 10-year period for which data are available for the stock assessment.

The current regional management measures for WCPO yellowfin are set out in CMM 2017-01 which aims to create a bridge to the adoption of a harvest strategy (...) 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. For yellowfin, until a TRP has been agreed, 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. Measures covered by the CMM relate to the purse seine fishery mainly which accounts for almost 60% of the catch of yellowfin (2014-16; WCPFC Tuna Fishery Yearbook); these include temporal restrictions on FAD use, a limit on the maximum number of FADs used per vessel, and catch and effort limits although the former do not apply to FSM.

3.4.3.2 Blue marlin

The most recent assessment for blue marlin, based on a single Pacific Ocean stock, was conducted by the ISC BILLWG in 2016 using a Stock Synthesis (SS3) model (ISC, 2016a). The findings of the assessment can be summarised as follows:

- Estimates of total stock biomass show a long-term decline. Population biomass (age-1 and older) averaged roughly 130,965 mt in 1971-1975, the first 5 years of the assessment time frame, and has declined by approximately 40% to 78,082 mt in 2014;
- Female spawning biomass in 2014 was estimated to about 25% above SSB_{MSY} ;
- Fishing mortality on the stock averaged roughly $F = 0.28$ during 2012-2014, or about 12% below F_{MSY} ;
- No long-term trend in recruitment was apparent;
- The lack of sex-specific size data and the simplified treatment of the spatial structure of Pacific blue marlin population dynamics were important sources of uncertainty in the 2016 stock assessment update.
- The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model (Figure 11) and shows that spawning stock biomass decreased to roughly the MSY level in the mid-2000's, and has increased slightly in recent years. Results from the base case assessment model indicate that the Pacific blue marlin stock is currently not overfished and is not experiencing overfishing relative to either MSY-based or $F_{20\%}$ -based biological reference points.

The stock assessment indicated that to avoid overfishing of this nearly fully exploited stock ($F/F_{MSY} = 0.88$) fishing mortality should not be increased from the current (2012-2014) level.

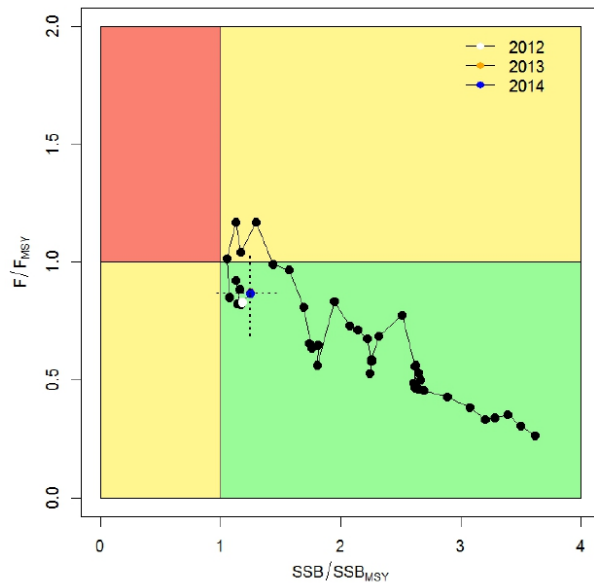


Figure 11. Kobe plot of the time series of estimates of relative fishing mortality (average of age 2+) and relative spawning stock biomass of Pacific blue marlin during 1971-2014. The dashed lines denote the 95% confidence intervals for the estimates in the year 2014 (ISC, 2016a).

3.4.3.3 Albacore

Albacore in the Pacific consists of two discrete stocks in the North and South Pacific. This fishery interacts principally with the North Pacific stock.

Stock assessments for NP albacore are carried out by ISC; the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. The ISC Albacore Working Group conducted a stock assessment of NP albacore in 2017 (ISC, 2017a). The conclusions of the stock assessment can be summarised as follows:

- SB (measured as female biomass) is estimated to be approximately 2.5 times higher than the LRP agreed by WCPFC (20%SB_{F=0});
- The model estimates 1-SPR ('fishing intensity') as a proxy for F. Fishing intensity is estimated to be below the level which would result in SB_{MSY}. A range of alternative proxies for F_{MSY} were evaluated (F_{0.1}, F_{10%} - F_{50%}, all expressed as fishing intensity) and F was estimated to be below them all except F_{50%} (the fishing intensity resulting in spawner-per-recruit at 50% of the unfished level; biomass ~50%SB₀).
- Status quo projections over 10 years (to 2025) based on the base case model predict declining catches and a low (<0.1%) probability of the biomass falling below the LRP, when constant effort is assumed. Assuming constant catch, however, the projections predict a decline in SB such that there is a ~30% probability of SB<LRP by 2025.

Figure 12 gives Kobe plots showing i) the trajectory of SSB and F (1-SPR) over the duration of the time series (1993-2015) for the base case model and ii) the final (2015) point estimate for the base case and the two key sensitivities. For 2015, the lower 5% CI for SSB is below the LRP in all cases, mainly because uncertainty around the estimate is high. The trajectory shows that there has likely not been a great deal of change in the stock biomass over the course of the fishery.

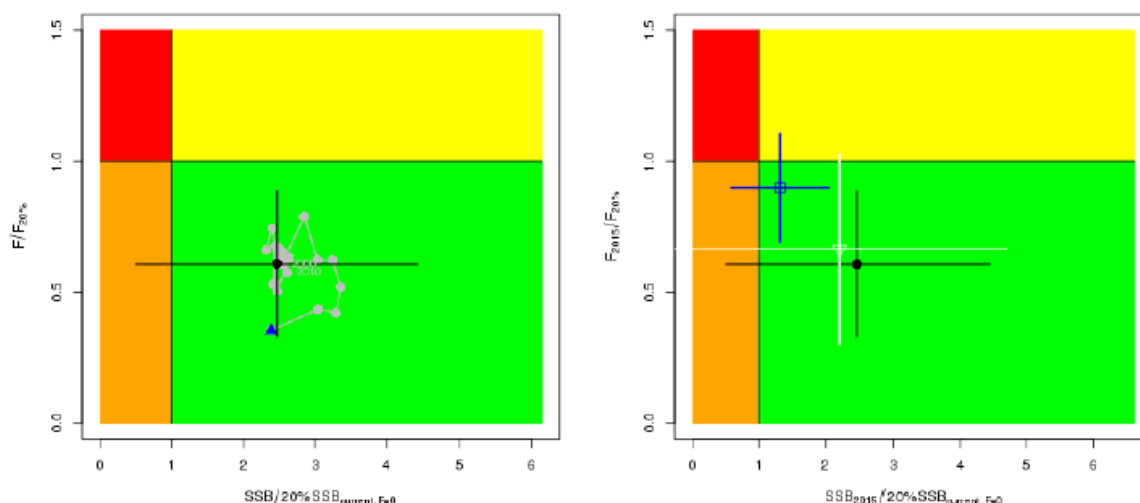


Figure 12. Kobe plots showing the status of North Pacific albacore relative to the limit reference point (LRP) (x-axis), and equivalent fishing intensity ($F_{20\%}$; i.e. $1-SPR_{20\%}$) (y-axis). Left: Trajectory over time series (1993-2015) for the base case model; blue triangle=start year, black circle with 5% and 95% CIs= 2015. Right: 2015 point estimate and CIs for the base case model (black), $M = 0.3$ /yr (blue), $CV = 0.06$ for Linf (white). From ISC (2017a).

3.4.4 Bait

Information on bait use is provided in Table 12 below. The fishery only uses Indian oil sardine (*Sardinella longiceps*), sourced from China. For 2015 and 2016 on average, bait use corresponded to ca. 45 % of the average total catch for those years (including landings, discards and bait).

Table 12. Bait use in the UoA (data provided by Client)

Year	Species	Source	Weight of bait used (tonnes)
2015	Indian oil sardine	China	2503
2016	Indian oil sardine	China	2766

The Indian oil sardine is a highly migratory small pelagic fish distributed on the entire west coast of India from Gujarat to Kerala, and also on Tamil Nadu, Pondichery, Andhra Pradesh and Orisha in the Indian east coast, but the highest abundance is observed off Kerala and Karnataka coasts (FishSource.org). The client reports that the bait is sourced from China but this is not the catch area as the species does not occur in Chinese waters. As per Figure 13 below, the most likely sources are either Indian, Pakistani or Omani coastal waters where commercial fisheries for this species exist. A stock assessment was carried out for *S. longiceps* in Oman in 2013 (Zaki et al., 2013), reporting an average annual yield at 2,732 tonnes with MSY at 2,886 t. Considering the UoA uses on average 2,500 tonnes annually, the team considered it highly unlikely that this predominantly artisanal fishery with such low yield was the source of the bait. For the Pakistani stock, a stock appraisal was carried out in 2016 (Baset et al., 2017). The average annual landings of *S. longiceps* stocks were 38,353 t while the highest and lowest 65,050 t in 1994 and 26,937 t in 2009 was recorded correspondingly, below the estimated MSY values.



Figure 13. *Sardinella longiceps* distribution. (Munroe and Priede, 2010)

By far the largest fishery is in India, which is the most likely ultimate source of the bait for this fishery. In India, populations of oil sardine are normally assessed separately for each State. Major catches (>13000 tons/year; representing >98.5% of the total catches in India including all gears) in the last years occurred off Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh, whereas catches off Gujarat, Pondichery, Odisha and West Bengal were much less important (<4000 tons/year; representing <1.5% of the total catches in India including all gears) (analysis presented on FishSource.org, based on CMFRI annual reports). Trends in catches for each major state are shown in Table 13.

The species grows rapidly, matures early, and is highly fecund. Population size for *S. longiceps* is highly erratic and susceptible to environmental fluctuations, with FAO catch statistics indicating large-scale annual fluctuations in the landings of this species. Fishery output and population parameters are being monitored by the Central Marine Fisheries Research Institute (CMFRI) and used as a proxy for stock survey (Andrews et al., 2008). According to these statistics the fishery thrived in the 1920s, with landings of over 57,000 tonnes in the 1923-24 season, followed by a decline over the following 22 years to a minimum of less than 500 tonnes in the mid-1940s. The fishery revived in the 1950s, with landings of around 10,000 tonnes per annum, and has grown considerably since, to a fishery landing over 400,000 tonnes in 2003 (Andrews et al., 2008). Recent landings, according to CMFRI are: 2015 – 265,667 t, 2014 – 544,684 t, 2013 – 595,392 t. MSY is estimated to be ~226,000 t (2007 estimate given in Andrews et al. (2008)), but is no doubt highly variable.

At state level, rapid stock assessments are conducted frequently for all coastal states by the CMFRI (FishSource.org). The latest stock status results for each state are shown in Table 13. With the exception of Karnataka, considered 'Less abundant' as of 2016, all are either abundant or underexploited - see CMFR Annual Reports, the most recent of which is CMFRI (2017).

Based on the above information and the volumes used in this fishery, *S. longiceps* was considered as a 'main' secondary species. Note that due to the uncertainty surrounding the source stock of the bait, a recommendation has been issued.

Table 13. 2013 – 2016 catch trends of the Indian oil sardine in key Indian states, from FishSource.org. Also see (CMFRI, 2017).

Year	Kerala	Tamil Nadu	Maharashtra	Goa	Andhra Pradesh	Karnataka
2013	246,841	182,427	13,100	40,631	5,849	98,453
2014	155,087	78,570	27,035	115,902	11,957	143,588
2015	68,431	87,553	15,325	16,212	23,622	43,489
2016	45,958	80,957	11,451	24,951	12,950	62,609
Stock condition as per most recent assessment	Abundant (2013)	Abundant (2015)	Underexploited (2014)	Abundant (2016)	Underexploited (2016)	Less abundant (2016)

3.4.5 ETP species

The criteria for designating ETP species are set out in Section 3.4.2. For this assessment, the team considered species protected under the following national legislation and/or international treaties to be ETP:

- FSM Code Title 24 (Marine Resources);
- FSM Code Title 23 (Resource Conservation);
- CITES Appendix I;
- Convention on Highly Migratory Species Appendices I and II;
- WCPFC CMM, which provides protection (i.e. a ban on landing), rather than management.

The key source of information to identify the ETP species that interact with this fishery were the observer data (Table 11). Although some interactions with sharks are recorded in the logbook data (see Table 10), this does not happen consistently and interactions with turtles and other ETP species do not tend to get reported. The team therefore decided to consider both datasets together, as summarized in Table 14.

Table 14. ETP species interacting with the UoA and interaction rates from logbook and observer data

Species	Total catch reported in logbook data (2015+2016) in tonnes	Av. annual catch (2015_2016) – scaled up in tonnes	Av. annual catch (2015_2016) – scaled up in nb. Ind.	Actual observed catch (2015+2016) in nb. Ind.	Fate
BLUE SHARK	0.08	5.43	258	17	Discarded (line cut)

Species	Total catch reported in logbook data (2015+2016) in tonnes	Av. annual catch (2015_2016) – scaled up in tonnes	Av. annual catch (2015_2016) – scaled up in nb. Ind.	Actual observed catch (2015+2016) in nb. Ind.	Fate
SILKY SHARK	0.05	12.5	1667	110	Discarded (6 alive, 3 dead, remained line cut)
OCEANIC WHITETIP SHARK	0.02	-	-	-	-
THRESHER SHARKS	0.01	0.83 (pelagic thresher)	61 (pelagic thresher)	2 (pelagic thresher)	Discarded (unknown)
PELAGIC STING-RAY	-	60.04	894	59	Discarded (line cut)
LONG FINNED MAKO SHARK	-	0.76	61	2	Discarded (unknown)
LOGGERHEAD TURTLE	-	Not scaled up	Not scaled up	2	Discarded (dead)
COOKIE CUTTER SHARK	-	0.42	61	2	Discarded (line cut)
CROCODILE SHARK	-	0.16	61	2	Discarded (line cut)

3.4.5.1 Elasmobranchs

Elasmobranchs (sharks and rays) are by far the most dominant group of ETP species interacting with this fishery. In total, eight species were recorded in the 2015/16 observer data and logbook data combined. Among these, silky shark accounted for the highest numbers, with 110 individuals recorded by observers. Scaling up the observer data as per the method described in Section 3.4.2, the team estimated the average annual catch at 1,667 individuals. Note that for 2015 and 2016 combined only a total of 0.05 tonnes were recorded in the logbooks for this species, demonstrating the lack of reliability of the logbooks on shark interactions. Pelagic stingrays came in second, with 59 observed interactions and an estimated annual catch of 894 ind.; none were recorded in the logbooks. The estimated total catch for the other elasmobranch species was relatively low with only a small number of individuals recorded in the observer data. Interactions with blue shark were at intermediate level with an estimated annual catch of 258 ind. and 17 observed interactions.

For the vast majority of interactions in Table 14, the observer data indicate that the elasmobranchs concerned were discarded by cutting the line. For sharks, survivability depends on a range of factors associated with capture including gear type, soak time and handling practices as well as biological attributes (species, size, sex and mode of gill ventilation) (Ellis et al., 2016). For longline fisheries in particular, post-release mortality

depends on a myriad of factors including where the shark was hooked and whether the line was cut off or bitten off. Figure 14 extracted from Patterson et al. (2014) depicts the range of variables involved. Curran (2014) and references therein reported post-release mortality rates for blue shark ranging from 15 to 19%. For thresher sharks this was 26% although this came from a study on recreational gear. More information on at-vessel mortality is available with blue sharks having the highest chance of survival (3 – 14% mortality) and thresher and silky sharks the lowest (up to 56% mortality). A post-release shark tagging study for silky and shortfin mako sharks is currently being undertaken in the New Zealand and Fiji longline fisheries as part of the 'Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction Project (ABNJ Tuna Project in short). Data from these tagging studies will eventually lead to a better understanding of the survival of discarded/released sharks and a final mitigation workshop, scheduled for 2018, will interpret shark tagging results from this and similar studies and propose pragmatic mitigation practices. In the meantime, however, the assessment team based the analysis on existing information. Based on this, and taking into account the prevalence of silky sharks in the dataset and the fact that most individuals are cut off the line, the assessment team assumed 50% mortality for all sharks concerned.

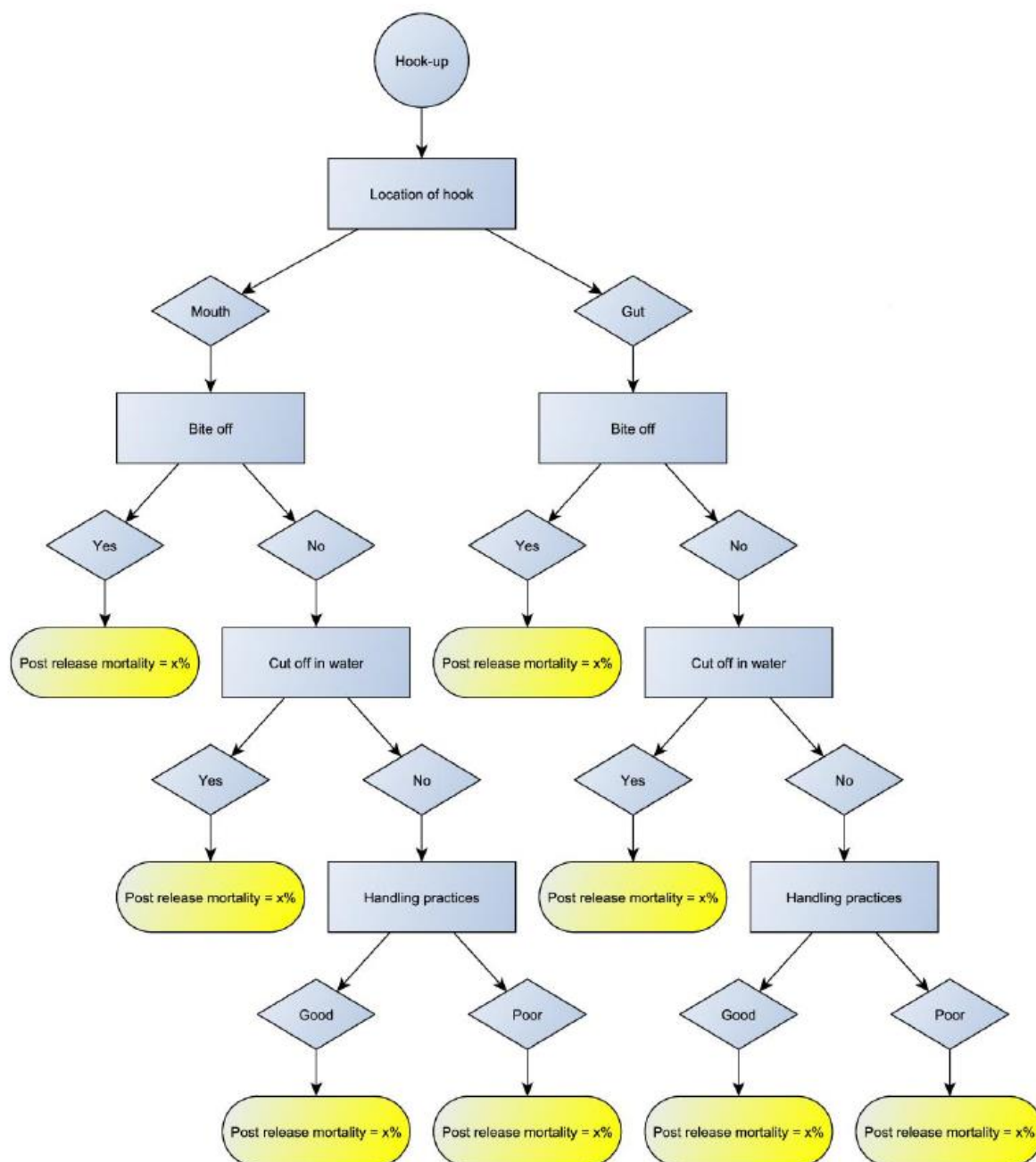


Figure 14. Flowchart depicting the mortality associated with the hooking and release of sharks in a longline fishery and factors that influence that mortality (Patterson et al., 2014).

For the purposes of scoring, the assessment team focused on the most frequently caught elasmobranchs according to the observer data; this concerns silky shark, blue shark and pelagic stingray.

Blue shark

This species is one of the most prolific shark species and was categorized as being at “medium” ecological risk for deep longline sets (Kirby and Hobday, 2007) although Kirby (2006) concluded that the species is relatively low risk as it is one of the most fecund shark species. Blue shark are widely distributed throughout temperate and tropical waters of the

Pacific Ocean. The ISC SHARKWG recognizes two stocks in the North and South Pacific, respectively, based on biological and fishery evidence.

For North Pacific blue shark, a stock assessment was conducted by ISC in 2014 using Stock Synthesis (Rice and Kai, 2014) and updated in 2017 (ISC, 2017b). Results of the reference case model showed that the spawning stock biomass was near a time-series high in the late 1970s, declined to its lowest level between 1990 to 1995, subsequently increased gradually to reach the time-series high again in 2005, and has since shown small fluctuations close to the time-series high. Recruitment has fluctuated around 37,000,000 age-0 sharks annually with no apparent trend. Female spawning biomass in 2015 (SB_{2015}) was 71% higher than at MSY and estimated to be 308,286 mt. The recent annual fishing mortality ($F_{2012-2014}$) was estimated to be well below F_{MSY} at approximately 37% of F_{MSY} . The reference run produced terminal conditions that were predominately in the green quadrant (not overfished and overfishing not occurring) of the Kobe plot.

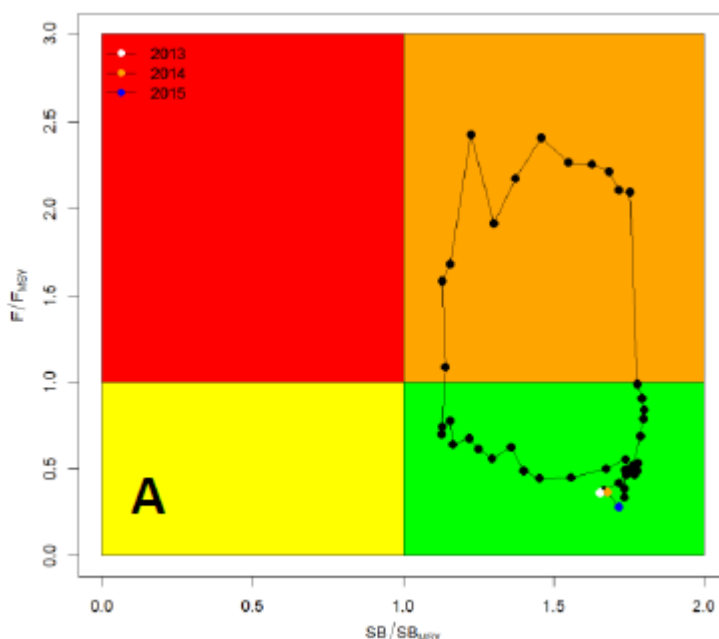


Figure 15. Kobe plot of the trends in estimates of relative fishing mortality and biomass of North Pacific blue shark between 1971-2015 for the reference case of the Stock Synthesis stock assessment model. From ISC (2017b).

Silky shark

Silky shark are a circumtropical species found in tropical waters of the Pacific Ocean and were categorized as being at “medium” ecological risk for both deep and shallow longline sets (Kirby and Hobday, 2007). The greatest impact on the stock is attributed to bycatch from the longline fishery, but there are also significant impacts from the associated purse seine fishery which catches predominantly juvenile individuals. Silky sharks that inhabit the coastal and oceanic waters of the WCPO are considered a single stock and have been assessed as such in the latest stock assessment by Rice and Harley (2013). The key conclusions are the following:

- The size composition data shows consistent declines over the period of the model (1995-2009) which is coupled with increasing fishing mortality, and a recently declining CPUE trend.

- This is a low productivity species and this is reflected in the low estimated value for F_{MSY} (0.08) and high estimated value for SB_{MSY} / SB_0 (0.39). These directly impact on conclusions about overfishing and the overfished status of the stock.
- Based on the reference case the estimated spawning biomass, total biomass and recruitment all decline consistently throughout the period of the model.
- 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} . Based on these results the stock assessment concludes that overfishing is occurring.
- Estimated spawning biomass has declined to levels below SB_{MSY} ($SB_{CURRENT}/SB_{MSY} = 0.70$) and for the majority of the model runs undertaken, $SB_{CURRENT}$ is less than SB_{MSY} . Based on the distribution of these results it is highly likely that the stock is in an overfished state.

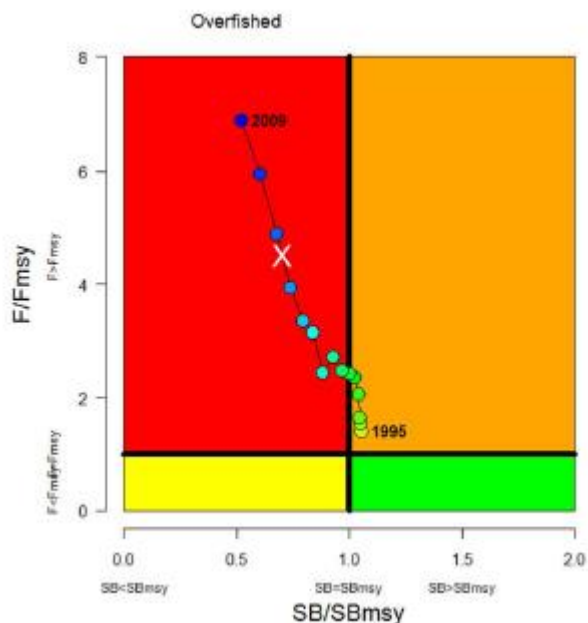


Figure 16. Kobe plot for reference case model indicating annual stock status, relative to SB_{MSY} (x-axis) and F_{MSY} (y-axis) the period 1995–2009. From Rice and Harley (2013).

Pelagic stingray

The pelagic stingray is widespread, with an almost circumglobal distribution, throughout tropical and subtropical areas of the Pacific, Atlantic and Indian Oceans (Baum et al., 2009). It is listed as of 'Least Concern' on the IUCN Red List. In the northeast and eastern central Pacific there appear to be two discrete populations: one migrating from eastern Pacific equatorial waters to off the California coast, and a second central Pacific population that migrates northwards, sometimes as far as Japanese and British Columbia waters (Ebert, 2003 in Baum et al. (2009)). This suggests that the species may have a fairly complicated population structure; however very little is currently known about either population structure or abundance and no stock assessment of Pacific Ocean pelagic stingrays has been conducted.

Pelagic longlines for tuna and billfish constitute one of the major threats to this species, which is mostly caught as bycatch. Post-discard survival rates are thought to be low in some areas because the rays are often discarded with serious mouth and jaw damage (Baum et al., 2009).

Again, however, there is very little information about the exact extent of this. Ferrari and Kotas (2013) examined hook selectivity of the pelagic stingray in southwestern Atlantic pelagic longline fisheries and found higher catches with 'J' hooks (9/0, 10 degrees offset) than with circle hooks (18/0, 10 degrees offset) circle hooks. It was therefore concluded that circle hooks could reduce the longline bycatch of this species.

Management

In terms of management, there are various CMMs in place at regional level which relate to shark bycatch. CMM 2010-07 is the overarching measure on sharks and in summary requires CCMs to:

- Implement, as appropriate, the FAO International Plan of Action for the Conservation and Management of Sharks (IPOA Sharks);
- Advise the Commission (in Part 2 of the annual report) on their implementation of the IPOA Sharks, including on the status of their National Plans of Action (NPOA) for the Conservation and Management of Sharks;
- NPOA or other relevant policies for sharks should include measures to minimize waste and discards from shark catches and encourage the live release of incidental catches of sharks;
- Report on annual retained and discarded catches in Part 2 of their annual report to the Commission;
- Take measures necessary to require that their fishers fully utilize any retained catches of sharks. Full utilization is defined as retention by the fishing vessel of all parts of the shark excepting head, guts, and skins, to the point of first landing or transshipment;
- Require their vessels to have on board fins that total no more than 5% of the weight of sharks on board up to the first point of landing
- In fisheries for tunas and tuna-like species that are not directed at sharks, CCMs shall take measures to encourage the release of live sharks that are caught incidentally and are not used for food or other purposes

Species-specific CMMs are in place for silky sharks (CMM 2013-08) and oceanic whitetip sharks (CMM 2011-04), both of which prohibit CCMs from retaining on board, transshipping, storing on a fishing vessel, or landing any oceanic whitetip or silky shark, in whole or in part, in the fisheries covered by the Convention. CCMs are further required to release any individuals as soon as possible after being brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible.

At national FSM level, all elasmobranchs (sharks and rays) are protected under Section 913 of its FSM Code Title 24. The regulation does not ban the landing of sharks, but stipulates that all sharks caught alive must be released and that any shark dead upon hauling may be landed with its fins naturally attached. In summary, the regulation contains the following key points:

- It shall be unlawful for fishing vessels to remove shark fins from sharks on board fishing vessels, and to retain on board, transship or land sharks or shark fins;
- It shall be unlawful for fishing vessels to possess wire leaders, steel trace, or wire trace;

- All sharks caught by a fishing vessel shall be either: (a) if still alive, immediately released back into the ocean. Fishing vessels must ensure that sharks are released whole, and that sharks are not unnecessarily harmed during the release process; or (b) if dead, may either be landed at a transshipment port in FSM, recorded in the daily catch report form for the vessel and discarded. Fishing vessels must ensure that sharks are landed whole with all shark fins attached to the carcass. Any sharks caught as by-catch should be handled in the above manner;
- It shall be a rebuttable presumption that any sharks caught or shark fins possessed by a fishing vessel fishing in the EEZ of the Federated States of Micronesia, originated from the EEZ of the Federated States of Micronesia;
- Any person who intentionally and knowingly commits an act in violation of this section shall be subject to a civil penalty of not less than \$50,000 and not more than \$250,000;
- All shark or shark fins seized and forfeited shall be destroyed by incineration.

Note that at state level (Chuuk, Pohnpei, Kosrei and Yaap), shark sanctuaries are in place and sharks are only allowed to be targeted for traditional use. This does not affect the UoA however as this fishery takes place outside the 24nm limit.

Since the regulations were adopted in 2015, NORMA reports a good level of compliance by all longline fleets, including the UoA. Although the regulations do not prohibit the landing of sharks, the ban on shark finning is crucial in that it acts as a disincentive for retention (volume taken up by the carcass of a shark is disproportionate to its value). One side-effect, however, has been that sharks that were previously retained and therefore reported in logbook data, are now more frequently cut off at the line (see Table 14) which has likely resulted in under-reporting.

FSM currently has no NPOA on sharks in place but NORMA confirmed that this is in its final stages of being drafted.

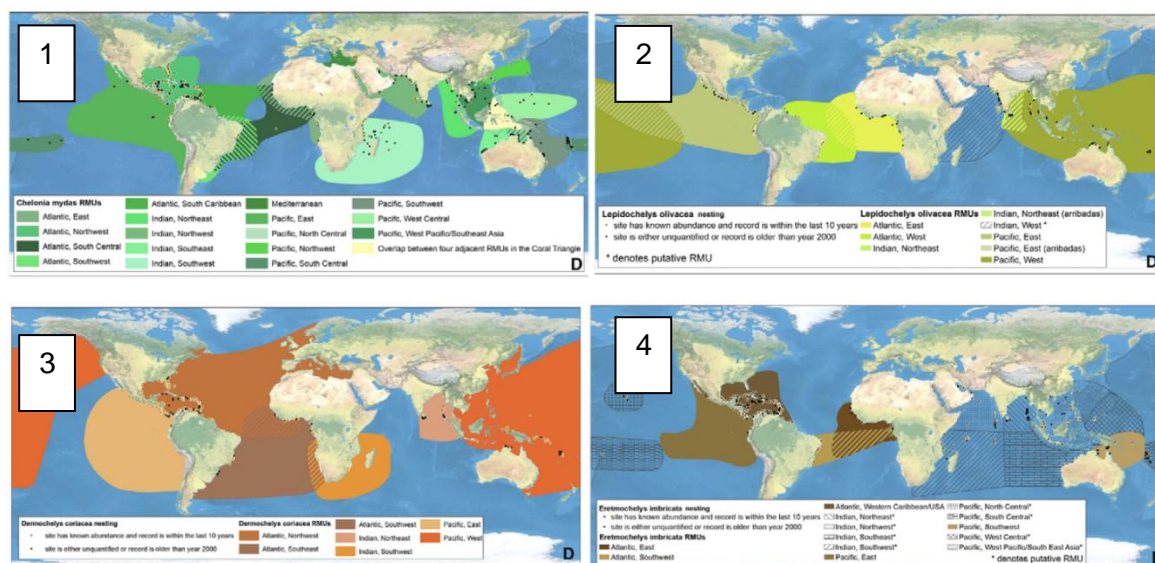
NORMA further provides shark identification materials to crew in addition to quarterly training for observers. The client vessels have also translated the SPC's ID guide and have instructed captains to keep a copy onboard. Based on observations during the site visit however this is not consistently happening. It is further planned that all agent boats will be getting training on the identification and safe release and handling techniques for sharks with yearly refreshers for captains, engineers and some crew.

Finally, at UoA level, all captains and crew of pelagic longline vessels owned and/or managed by the companies in the Client Group must abide by the following:

- No use of gear designs designed to catch sharks: (i) no attaching branchlines directly to floats; (ii) only monofilament used for leaders (no use of more durable material such as wire or multifilament nylon).
- No retention of any species of sharks or rays (including shark fins or other parts of sharks and rays), including no transshipping, landing or trading any sharks or rays.
- Record all required information in logbooks, including the number of each species of sharks and rays caught, and their haul back disposition (alive or dead upon retrieved to the vessel) for each haul, as accurately as possible and safely obtainable.

- #### 3.4.5.2 Sea turtles

Wallace et al. (2010) defined 58 sea turtle Regional Management Units (RMUs) globally, comprising multiple nesting sites, nesting populations and breeding populations, defining core distribution areas that are considered optimal for assessing the conservation status of marine turtles and for management applications. The fishery under assessment overlaps with the four RMUs shown in Figure 17 (note that the RMUs are continually updated as new stock information becomes available - for the latest map, see this link: <http://seamap.env.duke.edu/swot>). Note that there is no overlap with any of the RMUs for the loggerhead.



All of the species concerned are listed under Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and Appendices I and II of the CMS (Convention on the Conservation of Migratory Species of Wild Animals, or the Bonn Convention).

An assessment of the conservation status of marine turtle RMUs by Wallace et al. (2011) evaluated the risk level of each RMU based on a range of population parameters (e.g.,

population size, recent and long-term population trends, rookery distribution and vulnerability, genetic diversity) and the degree of threats (e.g. bycatch, coastal development, pollution and pathogens, climate change) impacting each RMU (Wallace et al., 2011, 2013). Wallace et al. (2013) further evaluated the relative bycatch impacts across different fishing gears across sea turtle RMUs globally. The study found that longlines were most frequently found to have the highest bycatch impact scores for individual RMUs, but this result was likely due to the higher availability of longline records than for other gear types and in general, mortality rates in longlines, with the exception of bottom-set longlines, were significantly lower than mortality rates in most nets and trawls.

The relative impacts of bycatch to marine turtle populations depend on the magnitude (i.e., the quantity that are captured), mortality rates, and reproductive values of individuals affected relative to amounts of fishing effort (Wallace et al., 2013); therefore, a threat that incurs high mortality and occurs in areas of high density of reproductively valuable individuals will have a negative population-level impact. In this context, fisheries operating in near-shore areas overlapping with high-use areas for turtles are more likely to negatively affect turtle populations than offshore fisheries operating in low-use areas. The resulting risk and threat levels for each RMU considered here are shown in Table 15. The *L. olivacea* (olive ridley) RMU was ranked at the highest risk of longline bycatch; the other three species were considered at the lowest risk. Wallace et al. (2013) however, did acknowledge the imbalanced distribution of available marine turtle bycatch data among gear categories and geographic regions, which directly affects the ability to adequately and quantitatively assess relative bycatch impacts across gear types and populations.

Table 15. Sea turtle Regional Management Units that overlap with the fishery under assessment (from Wallace et al. (2010)). RMU risk and threat level (from Wallace et al. (2011)), longline bycatch impact (from Wallace et al. (2013)), IUCN and conservation instruments are also shown.

Species	Common name	RMU	RMU risk and threat level (from Wallace et al., 2011)	IUCN status	Conservation instruments
<i>Chelonia mydas</i>	Green turtle	Pacific West central	Low risk Low threat Low bycatch impact	Endangered	CITES Appendix I CMS Appendix I & II
<i>Dermochelys coriacea</i>	Leatherback	Western Pacific	High risk Low threat Low bycatch impact	Critically endangered (West Pacific Ocean subpopulation)	CITES Appendix I CMS Appendix I & II
<i>Eretmochelys imbricata</i>	Hawksbill	Pacific west central	High risk High threat Low bycatch impact	Critically endangered	CITES Appendix I CMS Appendix I & II

Species	Common name	RMU	RMU risk and threat level (from Wallace et al., 2011)	IUCN status	Conservation instruments
<i>Lepidochelys olivacea</i>	Olive Ridley	Pacific west	Low risk High threat High bycatch impact	Vulnerable	CITES Appendix I CMS Appendix I & II

Management

At regional level, CMM-2008-03 on the conservation and management of sea turtles is in force, requiring the implementation of the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations. These guidelines include the use of wide circle hooks; using fish rather than squid for bait; and setting hooks deeper than turtle abundant depths (40–100 m). The CMM also details reporting requirements for CCMs and best practice guidelines to ensure the survival of captured sea turtles. For longline vessels, the CMM specifically requires that operators carry and use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled and, where appropriate, carry and use dip-nets. CCMs with longline fisheries other than shallow-set swordfish fisheries are furthermore urged to:

- Undertake research trials of circle hooks and other mitigation methods in those longline fisheries;
- Report the results of these trials to the Scientific Committee and Technical and Compliance Committee.

In the Hawaii longline shallowest swordfish fishery, Gilman et al. (2007b) found that combined turtle species capture rates declined significantly by ~ 90% from the period before the national US sea turtle regulations came into effect to the period after the regulations came into effect. While changes in the timing of setting and gear retrieval between the two time periods (as a result of seabird regulations) may be another cause of the observed changes in turtle catch rates, this provides some evidence on the effectiveness of this regulation. With support from the ABNJ Tuna Project, two workshops on the effectiveness of sea turtle mitigation were held in 2016. The workshops developed recommendations for observer data collection, sea turtle habitat studies, further quantitative analysis and cooperation with other sea turtle conservation and management initiatives. As a result of the workshops, the United States further recommended that the existing WCPFC sea turtle CMM be revised at the 13th Regular Session of the Technical and Compliance Committee Meeting of WCPFC in September 2017. This has not yet, however, resulted in a replacement sea turtle CMM.

At national FSM level, there is no NPOA on sea turtles as of yet. As far as the team is aware, this is also not yet in the drafting phase. Legislation is however in place under the Marine Preservation Act which sets limitations on the taking of sea turtles for traditional consumption and which does not apply to this fishery. At national level, management of sea turtle bycatch in longline fisheries therefore defaults to CMM-2008-03.

3.4.5.3 Seabirds

Although none of the observer reports cite interactions with seabirds (Table 14), the observer coverage in this fishery is low (Section 3.4.1). Given that the distributions of albatrosses and large petrels, which are main at-risk species susceptible to capture in pelagic longline fisheries, occur poleward of 20 degrees latitude in both hemispheres, it is highly unlikely that the FSM longline fishery overlaps with these species. However, the team considered potential impacts of this fishery on vulnerable seabird species on a precautionary basis.

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

Filippi et al. (2010) compared the distribution of seabirds and their likelihood of capture in relation to longline fishing effort in the WCPFC area. The study used a Productivity-Susceptibility Analysis (PSA) to identify the areas of greatest risk of occurrence and impacts of bycatch, the species of greatest concern for population level impacts and the fisheries which contributed the greatest risk. The resulting areas of likely species-level effects of fishing in the WCPFC Convention Area are shown in Figure 18. As can be seen from the map, the FSM EEZ is located in a low-risk area for seabird interactions.

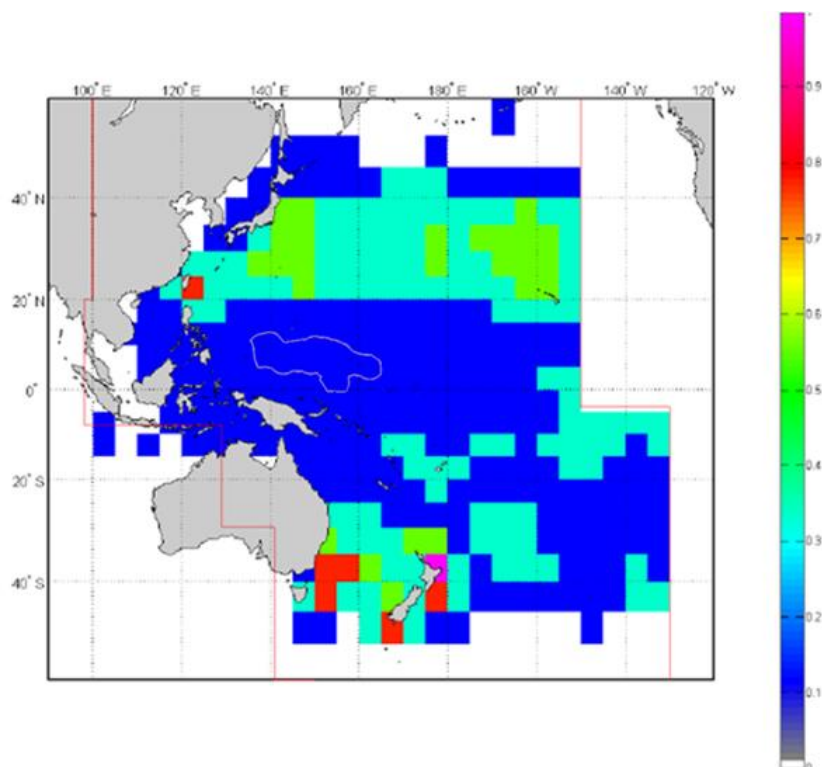


Figure 18. Areas of likely species-level effects of fishing in the WCPFC Convention Area. Highest risk areas - pink, Medium-high - orange; Medium – green; Medium-low – pale blue; Low – dark blue; Negligible risk – White. The FSM EEZ is marked with a pale outline. Map adapted from Filippi et al. (2010).

Management

In December 2017 (WCPFC14), CMM 2017-06 was agreed on mitigating the impact of fishing for highly migratory fish stocks on seabirds. The CMM stipulates the following:

- CCMs shall, to the greatest extent practical, implement the International Plan of Action for Reducing Incidental Catches of Seabirds in Longline Fisheries (IPOA-Seabirds);
- CCMs shall report to the Commission on their implementation of the IPOA-Seabirds, including, as appropriate, the status of their National Plans of Action for Reducing Incidental Catches of Seabirds in Longline Fisheries;
- For longline fisheries operating south of 30°S to use at least two of these three measures: weighted branch lines, night setting and tori lines;
- For longline fisheries operating north of 23°N with vessels of 24 meters or more in overall length to use at least two of the mitigation measures in Table 16, including at least one from Column A;
- For longline fisheries operating north of 23°N with vessels of less than 24 meters in overall length to use at least one of the mitigation measures from Column A in Table 16.

Table 16. Seabird bycatch mitigation measures listed in CMM 2017-06

Column A	Column B
Side setting with a bird curtain and weighted branch lines	Tori line
Night setting with minimum deck lighting	Blue-dyed bait
Tori line	Deep setting line shooter
Weighted branch lines	Management of offal discharge

The FSM EEZ is located between 13°26'N and 1°10'S. The mitigation measures listed in CMM 2017-06 therefore do not apply. Note that FSM has no explicit national protection status for seabirds or an NPOA in place.

3.4.5.4 Cetaceans

No interactions with cetaceans were cited in the UoA observer data. There are two main types of interaction between cetaceans and longlines: depredation and capture via hooking and entanglement, the latter often following on from the former (Gilman et al., 2007a; Anderson, 2014). Although relative to other fishing gear such as gillnets, longline fishing generally does not pose as much of a threat, many individuals suffer mortality and serious injury as a result of the interactions (Gilman et al., 2006; Garrison, 2007 cited in Werner et al. (2015)).

At regional level, there is no CMM relating to cetacean bycatch in WCPO longline fisheries. The Federated States of Micronesia are however a signatory to the Memorandum of Understanding (MoU) for the Conservation of Cetaceans and their Habitats in the Pacific Island Region (15 September 2006) which is a Multilateral Environmental MoU concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) and protects all populations of cetaceans (whales and dolphins) in the Pacific Island Region (area between the Tropic of Cancer and 60° South latitude and between 130° east longitude and 120° West longitude).

Although interactions with cetaceans were not perceived to be a problem based on observer data, considering the low level of observer coverage (Section 3.4.1) the team considered this group in the ETP analysis on a precautionary basis.

3.4.6 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.

Another issue which needs to be considered is the issue of unobserved mortality due to ghost fishing by discarded or lost fishing gear which may consist of monofilament and/or hooks. Currently, information on the proportion of hooks that are lost at sea (via bite-offs of terminal tackle or loss of complete branch lines) is not routinely collected on logbook or observer forms. However gear loss is reportedly minimal and the Client Group routinely collects and replaces old and worn branchlines (about 10,000 to 12,000 meters per trip) and as well as mainline (20,000 – 30,000 meters per year). Furthermore, tuna longline vessels deploy the longline gear with radio beacons placed at varying intervals along the mainline. These radio beacons enable the captain of the vessel to not only locate the drifting longline but also if the mainline breaks anywhere when hauling or otherwise, the captain is able to locate the separated section with the radio beacons that are placed along this section. Also, longline sets are marked and recorded on GPS so if for some reason the radio beacons are not functioning, the captain can return to the coordinates marked on the GPS, estimate the direction and speed of the current and search for the longline, probably with a 90% or more recovery rate. If a longline is lost or a portion of the line is lost captains will spend not only hours but sometimes days to locate it as the cost of replacement is very high (USD50,000 or more). If the longline is not found the fishing trip is usually terminated as the vessel would be required to return to port to replace the fishing gear (depending on the size of the vessel as smaller vessels do not have the capacity to carry replacement gear for an entire longline set). Therefore, the incidence of gear loss is very rare. In any case, lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the ghost fishing mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009).

3.4.7 Ecosystem

The vast majority of the FSM EEZ lies within the Western Pacific Warm Pool (Warm Pool). This body of water is characterised by high sea surface temperatures and low levels of primary production compared to the adjacent equatorial upwelling known as the cold tongue. The Warm Pool represents the western boundary of the South Pacific Subtropical Gyre, containing some of the warmest open ocean temperatures in the world (reaching up to 27°C at the edges, and 30°C in the centre) (Kawahata et al., 2000). The expanse of the Warm Pool is constantly in flux. On an annual basis, warm water will migrate south of its average position during the Northern Hemisphere's winter, and vice versa. During a La Niña or El Niño year, the eastern boundary of the warm pool will often advance or pull back for several months (Lehodey, 2001). Here, annual variations are overlaid upon slower oscillation periods, occurring over 10 to 20 years. While the yearly oscillations affect the position of the Warm Pool within the Pacific, the long-term patterns of oscillation affect its expanse (Lindegren et al., 2018). The underpinning mechanism for these long-term patterns is thought to be fluctuating subsurface currents, though this has yet to be proven (Hu et al., 2015). Front systems, where fish tend to aggregate,

are thus subject to unpredictable distortion and displacement. The result of this variability is that the FSM waters are undergoing complex temperature oscillations, with implications for the distribution and abundance of primary production, large pelagics biomass and as would be expected, fisheries.

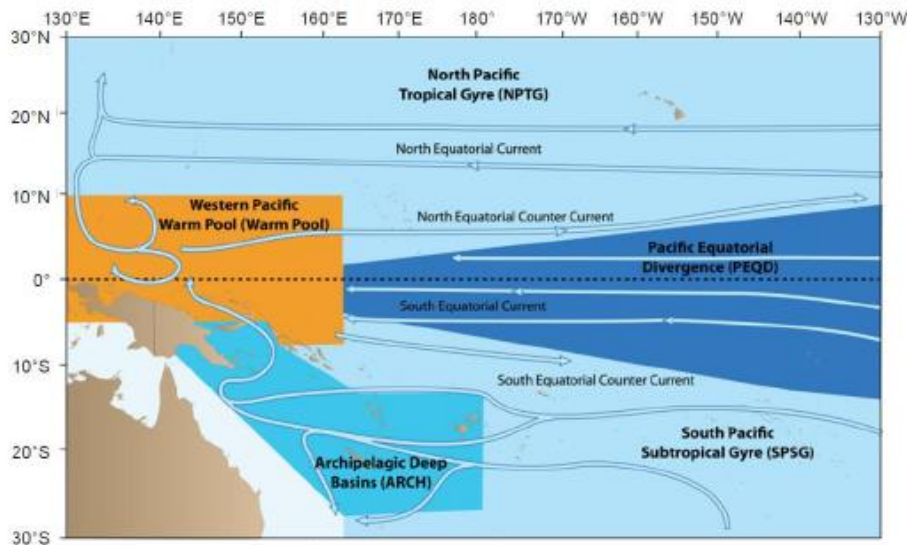


Figure 19. The five ecological provinces of the tropical Pacific Ocean. The FSM EEZ is located in the Warm Pool (from Le Borgne et al. (2011)).

Yellowfin and bigeye are high-trophic level species and considered second-tier apex predators below sharks, swordfish, marlin and billfish. Tunas are perceived as very effective generalists as they are opportunistic carnivores with high degrees of trophic interaction and diet overlap (Kitchell et al., 1999). There is, however, a growing body of evidence that exploitation by tuna fisheries creates substantial and sustained changes in both the target populations and a diversity of other species in the affected ecosystems (Botsford et al. 1997, Fogarty and Murawski 1998, Jennings et al. 1999, Stevens et al. 2000, Jackson et al. 2001 - all cited in Schindler et al. (2002)). Amongst these changes, trophic cascades are among the best-known examples, involving strong predator effects propagating downwards through food webs resulting in inverse patterns in abundance across two or more trophic links and potential simplification of oceanic systems through the removal of functional groups (Baum and Worm, 2009). Empirical evidence for top-down control in oceanic ecosystems such as the WCPO has been sparse (Baum and Worm, 2009) and research into the ecosystem-level impacts of Pacific tuna fisheries remains ongoing.

An analysis by Sibert et al. (2006) of Pacific fisheries data using integrated stock-assessment models to provide estimates of fishery impacts on population biomass, size structure, and trophic status of major top-level predator stocks showed that although the trophic level of the catch was found to have decreased slightly, there was no detectable decrease in the trophic level of the population. The authors concluded that while fisheries impacts on top-level predators have been substantial, they have not been catastrophic and the overall impacts on the Pacific Ocean ecosystem were considered to be minor. It is important to note, though, that this study was entirely based on fisheries-dependent data which undoubtedly introduces some bias into the analysis.

Baum and Worm (2009) focused on predator–prey relationships and top-down control of prey abundance or biomass by conducting a systematic literature review in ISI Web of Science for

1998 to 2008. Recent research where top-down control has been identified included three studies focusing on the Central North Pacific using Ecosym dynamic models (Kitchell et al., 2006) as well as comparative analyses of 1950s survey data and more recent catch data (Ward and Myers, 2005). All studies identified a decrease in predator abundance triggered by exploitation, resulting in an increase in medium-sized vertebrate predator populations following removal of their predators (mesopredator release). Food web responses to simulated removals of single apex predators depended on their overall predation rates and degree of dietary overlap with other predators - for example, the removal of blue shark was found to have minimal effect since reduced predation by this species could be compensated for by highly productive yellowfin tuna (Schindler et al., 2002). In addition, simultaneous exploitation of predator and prey species could override this mesopredator release (Shepherd & Myers 2005, cited in Baum and Worm (2009)).

In the North Pacific, a more recent analysis of catch rates for the 13 most abundant species caught in the deep-set Hawaii-based longline fishery over the past decade (1996–2006) provided evidence of a top-down response (Polovina et al., 2009). Catch rates for apex predators such as blue shark, bigeye and albacore tunas, shortbill spearfish and striped marlin declined from 3 to 9% per year while catch rates for 4 mid-trophic species, mahi mahi, sickle pomfret, escolar, and snake mackerel increased by 6 to 18% per year (Polovina et al., 2009; Polovina and Woodworth-Jefcoats, 2013). Polovina and Woodworth-Jefcoats (2013) suggest that size-based predation is the dominant mechanism in structuring the subtropical pelagic ecosystem, or at least the upper trophic levels caught in the deep-set fishery. As such, a reduction of fishes above the size that is fully exploited by the fishery increases the abundance of organisms from about the size of full entry to the fishery down to about 2 orders of magnitude in size - it was found however that this cascading effect did not go beyond a certain size level and that smaller micronekton and plankton were not affected.

For the Warm Pool pelagic ecosystem specifically (which concerns the fishery under assessment – see Figure 19), Allain et al. (2012) constructed a trophic mass-balance ecosystem model using Ecopath with Ecosim software. The authors demonstrated that the ecosystem responds to both top-down and bottom-up processes, and has the characteristics of a complex form of ‘wasp-waist’ structure where the majority of the system’s biomass is comprised of mid-trophic level groups. Significant complexity was further added through the effects of climate change, including increased sea surface temperature leading to changes in ocean stratification dynamics and changes in the depth of the thermocline. On their own and not taking into account fisheries pressure, these drivers have the ability to cause large and unpredictable changes to the biomasses of groups in both higher and lower trophic levels, and thus change the overall integrity of the ecosystem structure.

The picture that emerges is complex and made even more complex through the ongoing effects of climate change which in itself can act as a driver in trophic control (Baum and Worm, 2009). It is likely that the tuna longline fishery is having some degree of impact on ecosystem structure and functioning. It is therefore important to determine how much predator abundance can be altered before cascading effects occur, and whether there are clear thresholds for large-scale ecosystem transformation (Baum and Worm, 2009). The size-based model developed by Polovina and Woodworth-Jefcoats (2013) did not suggest any obvious threshold in changes to an ecosystem size structure that could serve as a management target. The team therefore considered biomass at the point of recruitment impairment (PRI) to be a suitable trigger, below which irreversible ecosystem impacts might be expected. At the scale of the

UoA, it is therefore highly unlikely that the fishery under assessment would lead to irreversible ecosystem impacts (see Section 3.3 under Principle 1). On this basis, it is considered highly unlikely that the UoA fishery will disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

3.4.8 Other issues of concern

During site visit interviews with NORMA, the audit team was made aware of anecdotal reports of dumping at sea of non-biodegradable materials. The exact frequency of these types of incidents is unknown and therefore the impact cannot be estimated. It should be noted that from January 2019, CMM 2017-04 on Marine Pollution will enter into force. To ensure compliance with this CMM, and with MARPOL Annex V, it is recommended that steps be taken to ensure that dumping at sea of prohibited materials does not occur. This will be verified during surveillance audits by consulting observer reports for the UoA.

3.5 Principle Three: Management System Background

3.5.1 Jurisdiction

The fishery under assessment operates within the EEZ of the Federated States of Micronesia (FSM). The UoA targets bigeye, a highly migratory stock, covering the WCPO.

The stock falls under the jurisdiction of WCPFC while the development and management of the marine resources within FSM falls under the jurisdiction of the National Oceanic Resources Management Authority (NORMA). Title 18 of the FSM Code establishes NORMA's jurisdiction over the territorial sea from 12nm from the island baselines and the FSM 200nm EEZ, the outer limit of which is measured from the same baselines. The Marine Resources Department of each state has jurisdiction over the territorial sea from the high water mark to 12nm in the States of Pohnpei, Kosrae, Chuuk and Yap. Each state has its own administrative organizations, agencies involved in fisheries and its own plans for fisheries development and management.

3.5.2 Legal basis and management set-up

3.5.2.1 International level

FSM has agreed to abide by a range of international legally binding and non-binding treaties concerning fisheries, which influence the domestic management framework. These include the binding United Nations Convention on the Law of the Sea, 1982 (UNCLOS); Food and Agriculture Organization (FAO) Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas 1993 (FAO Compliance Agreement); the United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 1995 (Fish Stocks Agreement); and the signed but not ratified FAO Agreement of Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing 2009. Other non-binding treaties include the FAO Code of Conduct for Responsible Fisheries and International Plans of Action to: prevent, deter and eliminate illegal, unreported and unregulated fishing; reduce fishing over capacity; reduce the incidental catch of seabirds, and conserve and manage sharks.

Consistent with its obligations under Article 118 of the UNCLOS and Part III of the Fish Stocks Agreement, the FSM cooperates in the management of highly migratory species through RFMOs which have allowed the development and implementation of sustainable management arrangements for some species as required under the obligations of UNCLOS Article 63(2), 64, 118, 119 and the Fish Stock Agreement Article 5.

WCPFC

The WCPFC is the relevant Regional Fisheries Management Organization (RFMO) responsible for the management of albacore, yellowfin, bigeye and skipjack as well as addressing the impacts of fishing on the wider ecosystem of the WCPO.

The WCPFC Convention (WCPFC 2000) is consistent with the principles of the UNCLOS, Highly Migratory Species, and Fish Stock Agreement; specifically:

- The objective of ensuring the long-term conservation and sustainable use of highly migratory stocks (Article 2);
- The general principles in Article 2 of the Fish Stocks Agreement, including the application of the precautionary approach, incorporating the UNSFA Annex II Guidelines for the Application of Precautionary Reference Points (Article 5);
- The application of these principles by Parties in their cooperation under the Convention, including the application of these principles in areas under national jurisdiction. (Article 8);
- Application of the dispute settlement provisions of the Fish Stocks Agreement to disputes between WCPFC members (Article 31);
- Recognition of the interests of small scale and artisanal fishers, and of communities and Small Island states dependent on their food and livelihoods on tuna resources (Article 30).

FSM has signed the WCPFC Convention and was present at the 1995 FAO Conference, during which the FAO Code was unanimously adopted, including the Compliance Agreement. These treaties/ agreements are consistent with the current international fisheries law and standards for the management of highly migratory species and ecosystems.

The Commission seeks input from recognised international law experts to ensure that decision making is informal in relation to compliance with international law and protocols. As a member of WCPFC and party to the Convention, FSM is legally bound to apply the precautionary approach for the sustainable management of highly migratory fish stocks and biodiversity conservation. Additionally, national legislation must take into account regulations set by WCPFC.

WCPFC takes input and advice from a number of subsidiary bodies (e.g. Scientific Committee), before making decisions, including the adoption of conservation and management measures (CMMs). The Commission also seeks input from recognized international law experts to ensure that decision-making is informed in relation to compliance with international law and protocols. All WCPFC members, including the FSM, are legally bound to apply the precautionary approach and relevant CMMs as parties to the WCPFC Convention. The FSM has adopted the WCPFC Conservation and Management Measure for bigeye, yellowfin, and skipjack tuna (CMM 2017-01). The FSM also cooperates in the development and recommendations for management of highly migratory stocks with regional and international fisheries organizations including the Secretariat of the Pacific Community (SPC) and WCPFC through the collection and sharing of catch and effort data, provision of scientific and compliance advice, and monitoring, control and surveillance initiatives (regional monitoring system (VMS), record of fishing vessels and high seas boarding and inspection register).

As mentioned above, Commission decision-making processes are based heavily on Scientific Committee reports on the status of target and non-target species and respond to serious issues, such as overfishing, and suspected overfished (i.e. bigeye). Based on recent stock status assessments for bigeye and yellowfin (2017), the main target species of the FSM longline fishery, the Scientific Committee (SC) concluded that the bigeye and yellowfin stocks are likely not to be experiencing overfishing.

Based on the results of the assessments for bigeye, yellowfin and skipjack and the recommendations of the SC, CMM 2017-01 was adopted by WCPFC at the plenary in December 2017.

Decision-making at the WCPFC is open and by consensus, with a provision for a two-chambered voting process requiring a 75% majority in both chambers if all efforts to reach a decision by consensus have been exhausted. To date no decisions have been made by vote. There are also provisions under Article 31 and Annex II of the Convention for a decision by the Commission to be reconsidered by a review panel at the request of a member. The WCPFC Convention also recognizes the interests of small-scale and artisanal fishers under Article 5 (h), which specifies that the Commission shall “take into account the interests of artisanal and subsistence fishers”. Under Article 30, which states that “the Commission shall give full recognition to the special requirements of developing State parties to this Convention, in particular (b) the need to avoid adverse impacts on and ensure access to fisheries by, subsistence, small-scale and artisanal fishers and fish workers as well as indigenous people.

Article 31 of the WCPFC Convention provides for adoption of procedures for the peaceful settlement of disputes laid out in Part VIII of the UNSFA and Part XV of UNCLOS. Annex II of the Convention establishes the authority to form a panel to review decisions made by the Commission and to settle disputes among members of the Commission. The dispute settlement mechanism outlined in the Convention allows for a transparent process to occur. To date there have not been any sanctions imposed by WCPFC, therefore there has not been a need for a panel to be convened to resolve disputes.

Longline Vessel Day Scheme

FSM is one of the eight members of the Parties to the Nauru Agreement (PNA) that developed the Palau Arrangement to manage tuna fishing effort in the Western and Central Pacific. Pursuant of the Palau Arrangement, the PNA implemented a zone-based arrangement to limit longline fishing effort based on a Vessel Day Scheme (VDS) in January 2017.

The Longline Vessel Day Scheme outlines the terms and conditions for the management of tuna longline vessels operating within the waters of the Parties to the Palau Arrangement. The objective of the scheme is to enhance the management of longline fishing vessel effort in the waters of the Parties by encouraging collaboration between all Parties. Through the VDS Management Scheme, the Parties are required to limit the level of fishing by longline vessels in their waters to the levels of total allowable effort (TAE) agreed by the Parties. The Parties meet annually to set the TAE for the VDS Management Year and may set the TAE for up to three years in advance. The TAE is set using the best scientific, economic, management and other relevant advice and information. The TAE is allocated amongst the Parties as their Party Allowable Effort (PAE) in a manner agreed to by the Parties. Each Party is required to ensure the number of fishing days by longline vessels in its waters does not exceed the Parties’ PAE or adjusted PAE in any Management Year. A Party may transfer unused days to another Party as long as it is less than 100% of its PAE. All necessary measures must be taken by the Parties to ensure that every longline vessel licensed to fish in its waters, and every longline vessel that is entitled to fly its flag, comply with the requirements of the Management Scheme and that if a Party exceeds its PAE for a Management Year, the Party’s PAE for the following Management Year will be adjusted by deducting:

- If the excess is less than 10% of the PAE – the amount of the excess:

- If the excess is 10% of the PAE or more – 120% of the excess.

In FSM, the Longline VDS Management Scheme is administered by NORMA's VDS Administrator who is responsible for monitoring and tracking the use of FSM's vessel days allocated from its PAE.

3.5.2.2 National level

The national development and management of the marine resources within the FSM falls under the jurisdiction of NORMA. NORMA works under Title 24. Marine Resources of the Code of FSM (revised 2014), which establishes a comprehensive framework for fisheries management. NORMA's rights and authority regarding fish and fishery resources in Title 24 relevant to the pelagic longline fishery are outlined in Sections 101-124, 201-211, 301-303, 401-407, 501-504, 601-611 and 901-920.

The functions, roles and responsibilities of NORMA and its staff are well defined under Title 24, Chapter 2 Management Authority. The duties and functions of NORMA include providing technical assistance in the delimitation of the EEZ and to negotiate domestic-based and foreign fishing agreements. Activities undertaken by NORMA are reported on an annual basis to the President of the FSM, the Speaker of Congress of the FSM and each State governor, maintaining transparency with regard to the number of permits and licenses issued, fines, forfeitures and estimates on current fishing effort in the EEZ. Operations of NORMA are carried out by the Management and Development, Research and Statistics, Compliance and Technical Projects Divisions. The National Fisheries Corporation works with NORMA in promoting the development of pelagic fisheries and related industries.

The Board of Directors of NORMA with members of each State appointed by the President, is the management system's decision-making body and its primary roles are to adopt regulations for the conservation, management and exploitation of fish in the EEZ, conclude fishing agreements, issue fishing permits, and participate in the planning and execution of programmes relating to fisheries.

Title 24 contains 11 Chapters that NORMA must follow when developing and implementing management measures. The chapters and subsections' management measures that are most relevant to the tuna longline fishery include:

- Chapter 1. General Provisions: commercial and non-commercial fishing permits, access agreements required, fisheries management agreements, multilateral access agreements, application for permits,
- Chapter 2. Management Authority: authority, regulations, duties and functions, executive director, Fisheries Management and Surveillance Working Group.
- Chapter 3. Permits for Fishing on the High Seas or in an Area Designated by a Fisheries Management Agreement by Flag Vessels: permits for flagged vessels, registration fee for flag fishing vessel and fishing by flag fishing vessels on the high seas or in an area designated by a fisheries management agreement.
- Chapter 4. Access Agreements for Foreign Fishing and related activities: negotiation of access agreements, foreign fishing agreements, fees.
- Chapter 5. Conservation, Management and Sustainable Use of Fisheries Resources: conservation, management and sustainable use of the fishery resources, allocation of

allowable fishing between domestic fishing vessels, allowable fishing between foreign fishing vessels

- Chapter 6. Enforcement: enforcement responsibility, appointment of authorized officers, powers of authorized officers, appointment of authorized observers, access granted to authorized observers, duties owed to authorized officers and observers.
- Chapter 9. Violations and Penalties for Prohibited Acts: prohibited acts, civil penalties, criminal penalties, liability of operators, fishing without a valid permit, unauthorized fishing in waters under national jurisdiction of a foreign state, fishing on or near submerged reefs or fish aggregating devices, possession, handling and sale of fish unlawfully taken, contamination of the exclusive economic zone

Other sections of the FSM Code (revised 2014) that are relevant to the management system include the following:

Title 19. Admiralty and Maritime outlines the obligations and qualifications for vessel registration and penalties for non-compliance. Sub-section 301 Obligation to Register stipulates that:

- (1) All vessels 12 meters and over which are wholly owned by Qualified Persons, if not registered under the laws of nation, shall be registered in the Federated States of Micronesia.
- (2) All vessels 12 meters and over entering or operating within the waters of FSM shall be duly registered either in accordance with the laws of FSM or another nation.
- (3) An owner or master of any vessel who knowingly allows the vessel to enter the waters of FSM or operate in such waters, unless the vessel is duly registered in accordance with the laws of the FSM or another nation, commits a civil offense and shall be liable to a fine not exceeding \$50,000. The burden of proof shall lie on the owner or master of the vessel to demonstrate that the vessel is duly registered.

Sub-section 302. Qualifications for vessel registration stipulates that:

- (1) For the purposes of this Title, a Qualified Person is:
 - (a) A person(s) who is a citizen of FSM, or a corporation which is established in accordance with the laws of FSM or any States, wholly owned by citizens, whose principal place of business is FSM;
 - (b) A person holding a current and valid foreign investment permit duly issued by the National Government to operate a vessel in interstate or international commerce who or which has its principal place of business in FSM;
 - (c) The National and State Governments of FSM and their instrumentalities.
- (2) Every vessel which is owned by a Qualified Person as defined under subsection (1)(b) of this section shall only be registered in FSM if it operates from and the majority of its voyages begin or end in FSM.

Title 23. Resource Conservation Chapter 1 Sub-section 101 prohibits the use of explosives, poisons, chemicals etc. to catch any fish or other marine life. Subsection 115 stipulates that no marine mammal shall be taken or killed by a commercial fishing party or for commercial

purposes but may be killed for traditional purposes. Chapter 2. Endangered Species Act Subsection 306 states that it is prohibited for any person to take, engage in a commercial activity with, hold possession of, or export any threatened or endangered species of plant or animal.

Title 24. Chapter 5 Sub-section 502 stipulates that the Board of Directors is required to apply the precautionary approach in the adoption of management measures that are consistent with and no less stringent than the criteria set forth in the United Nations Agreement or any other relevant agreement or fisheries management agreement to which FSM is a party. Also, it is required that management measures are based on the best scientific information available to ensure stocks are maintained at levels capable of producing maximum sustainable yield. This approach is reflected in Paragraph 7 of Fishing Access Agreements for Domestic Based Foreign Fishing Fleets, that provides powers to NORMA in the event it determines, through consultations with competent regional scientific authorities, that there is a serious threat to a stock, it can take precautionary measures to preserve the stocks by limiting or closing access to the FSM EEZ or portions thereof.

Decision-making by the Board of Directors with support from NORMA is made through the gathering of information from various sources including the vessel day scheme (VDS), vessel monitoring system (VMS), components of the integrated Fisheries Information Management Systems (iFIMS) and by analyzing catch and effort data from the fishery. Attendance at WCPFC meetings (including the SC and TCC) and through regional cooperation at FFC has expanded FSM's understanding of the functions, roles and responsibilities of national jurisdictions and the WCPFC and the components of the management structure.

There is a mechanism in place in the FSM Code to resolve disputes concerning infractions and penalties awarded for non-compliance to regulations concerning the fishery. Title 6. Judicial Procedure Chapter 9. Section 902 stipulates that *"any appeal authorized by law may be taken by filing a notice of appeal with the presiding judge of the Supreme Court of FSM from which the appeal is taken, or with the clerk of the court for the District in which the court was held, within 30 days after the imposition of the sentence or entry of the judgment, order, or decree appealed from, or within such longer time as may be prescribed by rules of procedure adopted by the Chief Justice."* Any infractions beyond administrative penalties are the responsibility of the Department of Justice. Most infractions are settled out of court for efficiency reasons as court cases tend to be lengthy.

The customary right for people to fish for food and livelihood is explicit in the FSM Bill of Rights Chapter 1. Sub-section 114 that states *"due recognition shall be given to local customs in providing a system of law and nothing in this chapter shall be construed to limit or invalidate any part of the existing customary law, except as otherwise provided by law."* The FSM Code also provides for small-scale fishers and domestic fishers. Title 24. specifically states that the State Government has powers *"to establish and support programmes to promote, support and guide fishing cooperative associations"*. Chapter 5 Subsection 503 of Title 24 stipulates that NORMA required to take into account the extent to which each vessel or vessel operator has historically fished in a particular area, has historically fished a particular regulated species and has traditional rights to fishing in the area when determining the portion of the total allowable catch allocated to domestic vessels if it determines that unrestricted fishing by domestic fishing vessels results in a catch level exceeding the optimum sustainable yield. Also, the 24nm contiguous zone was implemented to safeguard indigenous livelihoods and subsistence fishers.

Information about FSM fishery licensing, key documents, and projects is publically available on the NORMA website: www.norma.fm. New regulations and amendments to regulations are gazetted in local newspapers and public notices. NORMA's Youth Ambassador visits the States regularly to promote fisheries issues and the World Tuna Day and Fisheries Symposium provide information to raise public awareness of the tuna fishery. Also, the FSM Office of the National Public Auditor provides information concerning FSM fishery performance from its reports on its publically available website: www.fsmopa.fm. The FSM Supreme Court website contains information concerning decisions, rules, calendar and other information of the Court at www.fsmsupremecourt.org. FSM is required to submit annual reports to WCPFC concerning research, statistics and the status of their fisheries. Information submitted in these reports includes fleet composition, effort, interactions with ETP species and independent data from observer coverage or port sampling programmes. This information is publically available on the WCPFC website.

Tuna Management Plan

The Management Plan on Tuna Fisheries for the Federated States of Micronesia (TMP) 2015 serves as a guide to NORMA and tuna stakeholders to ensure the sustainable development, conservation and use of tuna resources in the FSM EEZ. For the FSM purse seine and longline fisheries the focus under the TMP is to achieve long-term ecosystem based fisheries and rights-based management outcomes through sustainable fishing to ensure economic efficiency and minimize fishing impacts on bycatch in the marine environment. The TMP outlines management measures that will deliver the most efficient and cost-effective results for the FSM tuna fishery. It includes specific responsibilities for implementation of contingency strategies, performance measures and monitoring for the tuna fishery. Some of the management measures include:

- FSM purse seine and longline fisheries are managed under the PNA vessel day scheme (VDS) and administered by NORMA in conjunction with the PNA office. The VDS provides FSM with an annual PAE that changes every year. This PAE is subject to future changes as a result of discussions for the setting and determination of TAE by PNA.
- Under the VDS, NORMA will ensure no fishing vessel is licensed to fish or issued with participatory rights unless they have been allocated with fishing days.
- If a scientific based TAE or TAC is established which may exceed current self-imposed limits (including effort limits through VDS) then quota or allocation will be re-considered and advice made available for the Executive Director to grant a license to a new entrant
- FSM will implement technical limits for the purposes of managing tuna fisheries which include, *inter alia*: commercial fishing will be prohibited in territorial areas unless the States indicate otherwise and other prohibited areas declared by the States and Federal governments
- Licensed fishing vessels must comply and implement WCPFC conservation and management measures and resolutions on sharks, sea turtles and seabirds in FSM's EEZ.

3.5.3 Objectives

3.5.3.1 Long-term objectives

The long-term objectives at the national level, consistent with the MSC fisheries standard, are clearly specified in Title 24. Chapter 1 Sub-section 101. The key objective is *to ensure the sustainable development, conservation and use of the marine resources in the exclusive economic zone by promoting the development of, and investment in, fishing and related activities in the context of effective stewardship*. Decision-making in the development of the Tuna Management Plan 2015, the adoption of the Longline Vessel Day Scheme and WCPFC CMMs is guided by this long-term objective.

At the regional level, the WCPFC is responsible for decision-making for key management measures, which affect the albacore, bigeye, yellowfin and skipjack stocks, bycatch species and ecosystem. Long-term objectives are explicit within the WCPFC Convention. For example, 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 FSA respectively)”*. Article 5 of the Convention then 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 through the application of the guidelines set out in Annex II of the FSA. Article 10 of the Convention is consistent with MSC principles and objectives in specifying long-term objectives of “maintaining or restoring populations...above levels at which their reproduction may become seriously threatened”. Evidence that these objectives are guiding, or are starting to guide decision-making is provided in various Commission reports and in CMMs.

3.5.3.2 Fishery-specific objectives

The FSM Tuna Management Plan (2015) includes the following short and long term objectives consistent with the MSC Principles 1 and 2 :

- To ensure that the nation’s tuna resources are used in a sustainable way;
- To obtain maximum sustainable economic benefits from the nation’s tuna resources;
- To promote economic security for the nation through the use of tuna resources.

The plan focuses on areas where NORMA has direct control, which primarily concerns the use of FSM’s EEZ by commercial fishing for tuna and tuna-like species, and how it will pursue its legislative objectives and requirements to deliver services with regard to the effective and sustainable management of tuna resources under an ecosystem approach to fisheries management. The main indicators and objectives for NORMA to deliver these services are outlined in Table 17.

Table 17. FSM Tuna Management Plan effective indicators and objectives

Indicator	Objectives
Species sustainability	FSM EEZ’s contribution to: (i) keeping biomass levels above limit reference points throughout range of stocks; (ii) continue to promote

Indicator	Objectives
	sustainable fishing in FSM EEZ; (iii) collect accurate/ timely data from all tuna fisheries in FSM (incl. bycatch); and, (iv) fewer fish species/ stocks are assessed as being subject to overfishing
Species viability	To avoid extinction for a species (i.e. $B_{CURRENT} < B_{MSY} > B_{EXTINCT}$)
Ecosystem & general environment	Ecosystem & biodiversity maintenance; waste minimization; reduction in the quantity of bycatch; collect accurate data from all tuna fisheries in FSM (incl. bycatch, etc.)
Economic benefits	To optimize economic benefits to the community; promote private sector/ domestic development; provide export-oriented income; promote domestic development aspirations (including gradual reduction of foreign fishing access); positive contribution by NORMA to productivity trends in FSM tuna fisheries
Social benefits	To optimize social benefits to the community; employment & income generating opportunities; ensure consistency/ compatibility of all fisheries developments with local legislations/ international agreements
Administration/ governance	Cost-effective regulation of the fishing industry; control of IUU fishing in FSM national waters
Food security	To maintain access to sufficient resources to enable survival; ensure sufficient food consumption

The objectives of the Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme (of which FSM is a Party) are to enhance the management of longline vessel effort in the waters of the Parties by encouraging the collaboration between all Parties and:

- Promote optimal utilization, conservation and management of tuna resources;
- Maximize economic returns, employment generation and export earnings from sustainable harvesting of tuna resources;
- Support the development of domestic locally based longline fishing industries;
- Secure an equitable share of fishing opportunities and equitable participation in the tropical longline fisheries for the Parties;
- Increase control of the tropical longline fisheries for the Parties;
- Enhance data collection and monitoring for the fishery; and
- Provide effective and efficient administration, management and compliance.

As noted in Section 3.3.7, however, the longline VDS does not currently play any role in the management of the stocks, since day allocations are 'aspirational'; hence only some of the above objectives are being addressed by the scheme at present.

At the WCPFC level, there are clear objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach in the WCPF Convention (Art. 2). The Commission's CMM 2017-01 for bigeye, yellowfin and skipjack has the objective to ensure that the fishing mortality rate is no greater than F_{MSY} . To meet this objective the

Commission's members, cooperating non-members and participating territories (CCMs) have agreed to take measures to not increase catches of yellowfin taken by their longline vessels.

The Commission has also adopted a number of measures to protect the unintentional catch of marine mammals and other non-target species that include the CMM for Mitigating Impacts of Fishing on Seabirds (CMM 2017-06), CMM on Sea Turtles (2008-03), CMM for Sharks (CMM 2014-05), CMM for Oceanic Whitetip Sharks (2011-04) and CMM for Silky Sharks (CMM 2013-08). These regional level objectives and the requirements of the CMMs are incorporated into the FSM fishery management system.

Commission reports indicate that explicit action is being undertaken through CMMs to support the achievement of objectives, however, this is yet to result in target reference points being formulated for all managed stocks. 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.

3.5.4 Stakeholders

A summary of key stakeholders involved in the fishery is provided in Table 18.

Table 18. Summary of key stakeholders involved in the FSM yellowfin and bigeye tuna longline fishery

Organisation	Roles and responsibilities
Regional and sub-regional bodies	
Western and Central Pacific Fisheries Commission (WCPFC)	Established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC Convention), which draws on the provisions of the UNFSA while reflecting the special political, socio-economic, geographical and environmental characteristics of the region. Convention Articles 9-11 and 23-24 provide information on the functions of, roles and responsibilities of the 26 member states and committees formed under Commission control. The Commission and its associated committees have clear operating procedures and terms of reference and the roles and responsibilities of members and non-members are clearly defined in the Convention, in the Rules of Procedure and in relevant CMMs
Parties to the Nauru Agreement (PNA)	<p>PNA is an alliance of Pacific Island states whose national waters collectively account for a significant proportion of the WCPO tuna catch and about half of the purse seine catch. The Nauru Agreement is a sub-regional agreement made to facilitate cooperation in the management of fisheries resources of common interest.</p> <p>The Nauru Agreement is a binding Treaty-level instrument considered to be a sub-regional or regional fisheries management arrangement for the purpose of the UNFSA and the WCPFC Convention. The PNA countries (FSM, Solomon Islands, Tuvalu, Kiribati, Marshall Islands, Papua New Guinea, Nauru and Palau; also Tokelau since 2012), have worked collaboratively since 1982 to manage the tuna stocks within their national waters through the Agreement. The PNA operates its secretariat from Majuro in the Marshall Islands. Its objectives are to enhance regional solidarity and to promote economic control and participatory rights over the tuna resources in PNA waters. The primary focus of the PNA is to:</p> <p>Develop strategic fisheries conservation and management initiatives;</p> <ul style="list-style-type: none"> • Develop initiatives to maximize the sustained direct and indirect economic benefits to the Parties; and • Maximize the profitability of the fishery and ancillary industries within the PNA. <p>The PNA coordinate the implementation of management measures with a view to enhancing economic benefits from the fishery, including harmonizing the terms and conditions of access for distant water fishing vessels/fleets and granting preferential access to vessels of the Parties in order to encourage domestic participation in the fishing industry. This includes operating an access and management regime, which optimizes revenue collection for the parties, as well as promoting the development of the Parties' indigenous fishery sector.</p> <p>The Nauru Agreement is implemented through binding Implementing Arrangements and associated Arrangements, which include:</p> <ul style="list-style-type: none"> • The 1st Implementing Arrangement, 1983, setting minimum licensing standards, including reporting, inspection and on-board observation, vessel identification and "good standing" on the FFA regional register

Organisation	Roles and responsibilities
	<ul style="list-style-type: none"> • The 2nd Implementing Arrangement, 1990, adding additional conditions relating to VMS, high seas reporting and a prohibition on transshipment at sea • The Palau Arrangement, 1995, limiting the purse seine fishery, initially by limiting vessel numbers, but now through the Vessel Day Scheme (VDS) • The FSM Arrangement: 1994, establishing arrangements for preferential access among the parties for vessels meeting certain standards for the provision of domestic economic benefits • The 3rd Implementing Arrangement (3IA) 2008, applying a FAD closure, 100% observer coverage and catch retention/no tuna discards in PNA EEZs, and prohibition of fishing in high seas pockets for licensed vessels <p>All PNA members have legal, institutional and policy frameworks, including tuna management plans, in place to manage the purse seine and longline fisheries in PNA waters and to implement the requirements of WCPFC, the PNA Agreement and the Vessel Day Scheme (VDS).</p> <p>The PNA has driven much of the management reform in the purse seine and longline fisheries, including the introduction of an input control system based on vessel day limits (the Vessel Day Scheme, VDS), closures of high seas pockets, seasonal bans on use of Fish Aggregating Devices (FADs), satellite tracking of boats, in port trans-shipment, 100 percent observer coverage of purse seine vessels, closed areas for conservation, mesh size regulations, tuna catch retention requirements, hard limits on fishing effort, prohibitions against targeting whale sharks, shark action plans, and other conservation measures to protect the marine ecosystem.</p>
Pacific Community (SPC)	<p>Based in Noumea, New Caledonia, the SPC is an intergovernmental organisation that provides technical and policy advice to its members. SPC has 26 member countries and territories, including American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna.</p> <p>The Oceanic Fisheries Programme (OFP) within the SPC Division of Fisheries, Aquaculture and Marine Ecosystems (FAME) provides FSM and the other Pacific Island members of SPC with scientific information and advice necessary to rationally manage fisheries exploiting the region's resources of tuna, billfish and related species. The OFP also is, under contract, the scientific service provider to the Commission, as allowed for under Article 13 of the Convention. The OFP has three sections:</p> <ul style="list-style-type: none"> • Statistics and Monitoring: including compilation of catch and effort data, data processing and technical support for port sampling programmes and observer programmes in member countries and territories, training in fisheries statistics and database management, statistical analyses and the provision of statistical support to the WCPFC;

Organisation	Roles and responsibilities
	<ul style="list-style-type: none"> • Tuna Ecology and Biology: including analysis of the biological parameters and environmental processes that influence the productivity of tuna and billfish populations, focusing on age and growth, movement and behaviour as observed from classical or electronic data archiving tags, and diet in a more general study devoted to the food web of the pelagic ecosystem; and development of mathematical models to understand environmental determinants of tuna fishery production, including impacts of climate fluctuation; • Stock Assessment and Modelling: including regional stock assessments for the WCPFC, development of tuna movement and simulation models, bio economic modelling, and scientific input to national tuna management plans and support for national EAFM analyses, tag-recapture database management. Confidential (to SPC and national governments) National Tuna Fisheries Status Reports are also produced.
Pacific Islands Forum Fisheries Agency (FFA)	<p>Based in Honiara, Solomon Islands, FFA has 18 members, including FSM. Other members are: Australia, Cook Islands, Fiji, French Polynesia (PIF membership granted September 2016), Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. FFA was established to help countries sustainably manage and develop the fishery resources that fall within their 200 mile EEZs. FFA is an advisory body providing expertise, technical assistance and other support to its members who make sovereign decisions about their tuna resources and participate in regional decision-making on tuna management through agencies such as the WCPFC and has two major programmes of relevance to the management framework under consideration:</p> <ul style="list-style-type: none"> • Fisheries management – providing policy and legal frameworks for the sustainable management of tuna; • Fisheries operations – supporting monitoring, control and surveillance of fisheries as well as treaty administration, information technology and vessel registration and monitoring. <p>These programmes provide advice on:</p> <ol style="list-style-type: none"> i) Appropriate legal frameworks for national tuna management, including members' ii) Obligations under various treaties and arrangements; iii) Appropriate fisheries management frameworks including the incorporation of the principles of ecosystem based fisheries management; iv) Effective fisheries administration, including access arrangements, licensing of foreign and domestic fishing vessels, governance of fisheries administrations, economic implications of different management systems, and the use of new systems and technologies; v) Development and implementation of monitoring, control and surveillance systems and effective compliance regimes including the provision of support services including a vessel regional register, VMS and observer programmes; and vi) The development of regional co-operation in fisheries management;

Organisation	Roles and responsibilities
	<p>FFA also services regional fisheries treaties and arrangements and provides capacity building in the area of fisheries management. The governing body of FFA, the Forum Fisheries Committee (FFC) provides a valuable forum for the discussion of matters of common interest. FFC (and FFC sub-group) outcomes and subsequent inputs into WCPFC have been instrumental in many of the key conservation and management initiatives agreed in that forum.</p> <p>There are significant FFA member country EEZ longline fisheries for albacore, bigeye and yellowfin tuna, with well over half of the catch taken from within these zones in the western Pacific. Despite a number of attempts, there has been no agreement reached on an overall catch cap (or allocation) for in-zone catches of albacore (at the moment) by FFA member countries, as has occurred for the PNA purse seine skipjack fishery. The majority of catch of yellowfin and bigeye is taken in the equatorial region, particularly within the EEZs of PNA member countries. In addition, increasing catches of albacore have been taken north of 20°S, including within the EEZs of other FFA member countries.</p>
National government stakeholders	
Department of Resources and Development	<p>Responsible for supporting and managing the development of the nation's economy and utilization of its natural resources in a sustainable manner. It is also responsible for assisting/coordinating with the States of Chuuk, Kosrae, Pohnpei and Yap to develop their economics by focusing on the four priority sectors of Agriculture, Energy, Fisheries and Tourism. The duties and functions that are relevant to the fisheries sector are:</p> <ul style="list-style-type: none"> • Develop national fisheries, aquaculture, and mariculture development and conservation policies, plan institutional structure and coordinate the roles of the private, public and fisheries agencies, including maintaining a close working relationship with the State and National fisheries agencies, and private sector fishing activities; • Coordinate the implementation of FSM's fisheries development plans; • Provide technical, advisory, and support services to the States and National Government on request in their inshore fisheries related development programs; • In coordination with the Department of Foreign Affairs and fisheries agencies, maintain liaison with foreign and international fisheries bodies, public and private, with a view to exchanging information and cooperation in training, research and marketing. • Conduct and/or license inshore fisheries research and development projects: • In coordination with NORMA monitor the exploitation of the Nation's marine resources, propose policies for effective management of resources, maintain a database of fishing statistics within the EEZ and coordinate the implementation of fisheries policies, program assistance and data assessments with the States.

Organisation	Roles and responsibilities
Department of Justice	<p>Responsible for the enforcement of law and administration of justice in FSM. It is the highest legal office of the executive branch of the FSM National Government mandated to enforce all national laws of the nation. It is divided into five divisions: Division of Law, Litigation, Immigration, National Police and Registrar of Corporation. The functions and duties of Divisions relevant to fisheries include:</p> <ul style="list-style-type: none"> • Division of Litigation: prosecute violation of national law • Division of National Police: investigate violation of national laws and regulations; maritime surveillance of FSM EEZ and marine jurisdiction, enforce fisheries and maritime laws and coordinate and conduct search and rescue operations.
Department of Transport, Communications and Infrastructure	<p>Responsible for interstate and international sea transportation and for the operation of vessels belonging to or controlled by FSM. It is tasked with enforcement of transport regulations and providing inter-state domestic shipping services using national vessels. The Division also provides technical support to state port authorities or agencies responsible for managing the ports and other maritime affairs and regulates tariffs under its concession agreement with the Pohnpei Stevedoring Company.</p>
States Port Authorities (Pohnpei, Kosrae, Chuuk, Yap)	<p>Responsible for the development, management, operation and maintenance of the States ports and facilities. As mandated by State Law, the Port Authority is responsible for regulating seaports. The Seaport regulations most relevant for fishing operations include: Chapter 2 Section 230: Discharge of Refuse, Chapter 6 Section 607 (b) Vessel Identity, Ownership and Contact Information, Chapter 7 Section 702. Removal of Garbage, Section 703. Pollution from Vessel and Section 704. Pollutants Other Than Oil.</p>
National Office of the Public Auditor (NOPA)	<p>Responsible for ensuring the effective administration and management of public funds and programs. The office endeavours to provide independent, accurate, and timely assessments of the Government of FSM's financial and operating activities in accordance with generally accepted government auditing standards.</p>
Department of Foreign Affairs	<p>Responsible for the conduct of relations of FSM with foreign governments, governmental regional and international organizations and quasi-governmental organizations in accordance with applicable laws, treaties, regulations and orders; and for advertising policies to be observed towards such governments and organizations.</p>
Non-Governmental Organizations (NGOs)	
<p>There is an active environmental NGO community within the Western and Central Pacific Region that includes World Wildlife Fund for Nature (WWF), Greenpeace, Birdlife international, TRAFFIC, The Nature Conservancy, International Seafood Sustainability Foundation (ISSF) and Pew Charitable Trusts. FSM has a number of local NGOs that have implemented marine conservation initiatives. These NGOs include Conservation Society of Pohnpei, Chuuk Conservation Society, Kosrae Conservation and Safety Organization, Micronesia Island Nature Alliance, Micronesia Shark Foundation and Marine Environment Research Institute of Pohnpei (MERIP) and The Micronesia Challenge.</p>	

3.5.5 Consultation processes

NORMA attends annual regional meetings held by the WCPFC and Scientific Committee and sub-regional meetings held by PNA. NGOs, International Governmental Organisations (IGOs) and industry are integral to these consultative discussions and provide contracting parties with information on coastal and distant water fishing states as well as scientific information. Both NORMA and the national fisheries section of the Department of External Affairs (DEA) maintain direct contact on technical issues with regional and international bodies relating to fisheries (FAO, 2002).

The Board of Directors of NORMA consult with relevant stakeholders such as Congress, Department of Justice, Department of Resources and Development, and State representatives (as required) when adopting regulations for the conservation, management and exploitation of fish in the EEZ and when negotiating foreign and domestic-based fishing agreements (E. Pangelinan, pers. comm. 16th February, 2018). NORMA also consults with the States and NGOs at annual Fisheries Symposium workshops about fisheries management regulations and agreements.

The FSM Tuna Management Plan (TMP) 2015 was developed through multiple consultations with stakeholders and workshops based on the EAFM framework. NORMA established a Fisheries Management and Surveillance Working Group to formulate and implement national fisheries management and surveillance strategies. The working group consists of appropriate representatives from NORMA and the Department of Justice as well as representatives from relevant National and State departments and divisions. The working group meets every quarter to discuss the management of the tuna fishery resources and Monitoring, Control and Surveillance (MCS) issues.

The Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme requires the Parties to consult with distant water fishing nations, fishing parties, fishing organisations, and other relevant organizations at annual meetings.

At the regional level, the WCPFC Convention provides information on the function, roles and responsibilities of the member states and committees formed under the Commission control (SC and TCC) in relation to consultative processes. There are extensive formal and informal consultation processes at the WCPFC that regularly seek and accept information from members and cooperating non-members. The Commission is active in assisting and facilitating the regular and timely provision of fisheries data and information for assessment by the Commission secretariat and scientific providers, such as SPC. The Commission actively uses information from the fishery and its member states in order to inform fisheries management decisions and assist in 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.

Attendance at Commission and related meetings is comprehensive. Logistic and financial support is provided to cooperating non-members to ensure attendance and meaningful involvement and interaction in the cooperative management of fisheries in the Western and Central Pacific Ocean (WCPO). Attendance at these meetings has facilitated a greater understanding of WCPFC and member states responsibilities, and has provided opportunities for consultation between FSM and other Pacific Island countries in the management of bigeye and yellowfin.

3.5.6 Enforcement and compliance

A monitoring control and surveillance (MCS) mechanism is in place in FSM. As a Member State of the WCPFC Convention, FSM is required to comply with regulations set by the WCPFC. The MCS Section under NORMA's Statistics, Compliance and Technical Projects Division, is comprised of 5 officers, that are responsible for the collection and entry of fishing vessel logsheet data as required under FSM Code Title 24 that sets out the conditions and terms of the fishing permits and foreign fishing agreements.

The reporting requirements of fishing licenses include daily vessel positions, details on sets and gear specifications, information on species retained and discarded. The MCS Division is also responsible for ensuring that licensed fishing vessels are listed on the WCPFC Record of Fishing Vessels and the FFA Regional Register of Good Standing and that licensed vessels have been fitted with VMS as required by the Commission. A summary of this information is presented to the WCPFC on an annual basis in a two-part report.

NORMA established a Fisheries Management and Surveillance Working Group to formulate and implement national fisheries management and surveillance strategies. The working group meets every quarter to discuss areas requiring improvement and strategies to address issues concerning the fisheries management and MCS system for the tuna fishery.

A person who is found by the Supreme Court of FSM to have committed an act prohibited in Title 24 Chapter 9 Violations and Penalties for Prohibited Acts is subject to a civil penalty. In determining the amount of the penalty, the Supreme Court of FSM takes into account the nature, circumstances, extent and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior offenses, whether there are multiple violations which together constitute a serious disregard of conservation and management measures.

Prohibited acts under Chapter 9 of Title 24 include:

- Violations of any provision, condition or requirement of a fishing permit or license or access agreement, serious misreporting of catch, fishing in a closed area, fishing after attaining quota, directed fishing for a prohibited stock, using prohibited fishing gear or falsifying or concealing markings, identity, or registration of a fishing vessel is subject to a civil penalty of not less than \$100,000 and not more than \$500,000.
- Fishing without a valid fishing permit is subject to a civil penalty of not less than \$100,000 and not more than \$1,000,000.
- Unauthorized fishing in waters under the national jurisdiction of a foreign state is subject to a civil penalty of not less than \$50,000 and not more than \$1,000,000.
- Violation of marine space is subject to a civil penalty of not less than \$50,000 and not more than \$500,000.
- Fishing on or near submerged reefs or fish aggregating devices is subject to a civil penalty of not less than \$50,000 and not more than \$250,000.
- Possession, handling and sale of fish unlawfully taken is subject to a civil penalty of not less than \$50,000 and not more than \$250,000.
- Contamination of the exclusive economic zone is subject to a civil penalty of not less than \$50,000 and not more than \$500,000.

- The severity of the penalties has proven to be a sufficient deterrent for vessel operators to comply with the regulations.

Enforcement responsibilities sit primarily with the Maritime Police, under the Department of Justice and the Office of the Attorney General, which is given power to penalize parties in breach of compliance to regulations stipulated in Title 24 of the FSM Code. The Maritime Police's responsibilities include maritime surveillance of FSM's EEZ and enforcement of fisheries and maritime laws. Regular dockside inspections are conducted on commercial fishing vessels entering into ports to determine whether the vessels are compliant with the regulations. Four patrol boats conduct surveillance activities in areas of fishing operations. In 2017, the Maritime Police Enforcement Wing reported that a total of 6 Law Enforcement Patrols (75 days) were conducted in areas of fishing activity that resulted in a total of 80 boardings. From 2014-2016 a total of seven tuna longline vessels committed 15 minor infractions that mostly were failure to monitor international distress and call frequencies and failure to mark the vessel in accordance with FAO Standard space. The fines for these infractions ranged from \$1,000 to \$15,000 and were settled out of court.

Since 2014 Maritime Police has arrested nine fishing vessels with 135 fishermen for illegal entry and fishing activity in FSM waters. FSM has implemented measures to restrict port entry and access to port services of vessels included in IUU lists and worked with other nations to strengthen enforcement and data programmes aimed at curtailing IUU fishing. In December 2017, FSM with other CCMs at the Fourteenth Session of WCPFC adopted the Conservation and Management Measure on Minimum Standards for Port State Measures (CMM 2017-02) to establish processes and procedures for port inspections of fishing vessels suspected of engaging in IUU fishing or fishing related activities in support of IUU fishing. A National Plan of Action to Prevent, Deter and Eliminate IUU Fishing was developed with assistance from FFA and approved in 2013. The Plan outlines actions that can be taken to enhance the objective of eradicating IUU fishing through fishing vessel licensing restriction, monitoring, control and surveillance, sanctions, and reporting activities.

NORMA conducts regular compliance workshops with fishing industry representatives and fishing vessel captains to discuss new regulations and fishing vessel licensing and registration requirements. NORMA reported that there has been a decline in non-compliance infractions as the vessel operators and owners has become more aware of the rules and regulations through these workshops (J. Helgen per comm., 15 February 2018).

The FSM National Fisheries Observer Program (NFOP) has been operating since 1979 with over 50 observers contracted from the FSM states. The NFOP was reviewed and authorized by the WCPFC Regional Observer Program (ROP) in May 2009. The WCPFC CMM for the Regional Observer Programme (CMM 2007-01) requires a minimum observer coverage of 5% for longline vessels; however, FSM observer coverage has been operating at about 2-3% since the measure was implemented. In 2014, only 2.6% of the longline trips carried observers (Status of Observer Data, P. Williams, WCPFC-TCC 2016 Table 3). To offset this figure, compliance with catch regulations is verified at vessel unloading, where a member of NORMA is always present as a witness. The percentage of observer coverage is expected to increase with the introduction of fresh tuna longline fishing later in 2018. With the shorter 10-15 day fresh tuna longline trips compared to the 60-80 day frozen tuna longline trips it is foreseen that there will be less difficulty in recruiting observers. Pohnpei is also the transshipment port for FSM, and this is permitted under strict Commission regulations (CMM 2009-06). NORMA

organizes quarterly training workshops for observers to keep them informed of new regulations, reporting requirements etc. The Client Group has provided 5 longline vessels to be equipped with Electronic Monitoring Systems (EMS) that were donated by The Nature Conservancy. It is hoped that the EMS units will prove to be a useful tool to monitor the fishing activities and catches of longline vessels and assist in identifying non-compliance infractions as well as record catch information.

At the international level, WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transshipment monitoring. A wide range of CMMs have been agreed to, and implemented at the national level that include:

- Specifications for the Marking and Identification of Fishing Vessels (CMM 2004-03);
- Centralized Vessel Monitoring System (Commission VMS) (CMM 2011-02);
- Regional Observer Program (ROP) CMM (2007-01);
- WCPFC IUU List (CMM 2010-06);
- Compliance Monitoring Scheme (CMM 2013-02);
- Standards, Specifications and Procedures for the Record of Fishing Vessels (CMM 2013-03) and,
- CMM for WVPFC implementation of a Unique Vessel Identifier (CMM 2013-04)
- CMM for Minimum Standards for Port State Measures (CMM 2017-02)

WCPFC builds capacity in the CCMs through the training of observers and enforcement officers and provides funds when needed to promote and support MSC activities.

3.5.7 Review of the management system

At the national level, there are mechanisms in place to evaluate key parts of the management system. The FSM Code (revised 2014) Title 24. Marine Resources is the main document for managing fisheries resources. Many of the provisions of Title 24 have been repealed and re-enacted since it was published in 1982 and currently there are amendments and inclusions being considered by NORMA to submit to Congress for approval. The National Tuna Management Plan 2015 states that “the plan will be reviewed at least every two years, if necessary, to factor in priority policy changes on tuna fisheries in consideration of new information and decisions taken by the Board of Directors, including decisions emerging from sub-regional and international agreements where FSM is a signatory.” A review of the original TMP 2000 was conducted in 2011 and identified gaps in the management system. A revised TMP was published in 2015 that addresses issues raised in the 2011 review concerning the lack of guidelines for NORMA to manage the tuna resources.

The Fisheries Management and Surveillance Working Group meets quarterly to review and evaluate the effectiveness the fisheries management and surveillance systems. Recommendations from the working group for improving these systems are given to the Board of Directors for consideration.

As of 2012, NORMA has been subject to periodic audits by the Office of the National Public Auditor (ONPA, 2012). Although a governmental body completed the audit, the auditors were external to the fishery specific management system and so the audit acts as an external review

of the performance and effectiveness of many aspects of the management system. An audit in 2012 covered operational duties of the Board of Directors, implementation and effectiveness of the current tuna management plan, vessel licence fees, data and reporting and NORMA's internal policy framework (ONPA, 2012). Results of the audit report indicated that the official by-laws for NORMA had not been adopted by Title 24 of the FSM Code 2002 and that written internal policies and procedures were lacking. In response to the findings of the ONPA, the Tuna Management Plan (TMP) 2015 was adopted as a living document that is regularly reviewed. The TMP 2015 is a policy document of NORMA that implements principles such as sustainability and maximizing the economic returns of the tuna fishery. NORMA has also developed a set of operational procedures and policies to provide guidance to carry out its duties and responsibilities efficiently and effectively. ONPA also noted that fisheries data were unreliable due to inaccurate and untimely reporting and a lack of cross-checking for data validation. To address this issue an Information Management System (IMS) will be developed to integrate relevant sets of information related to fishing including catch and observer reports. Also, NORMA has taken steps to ensure that a compliance officer is always present at vessel unloading to collect logsheet data and cross-check for data validation.

In 2017, ONPA conducted an independent audit on applying agreed upon procedures for NORMA's Fisheries Access Agreements. The audit covered several matters that included fishing revenue, donated goods and services, sold and non-sold fishing days and traded fishing days. The audit report noted that there were some problems with the accounting of the collections and determining the delayed collections of revenues. Information concerning the results for sold and non-sold fishing days was redacted for sensitivity and confidentiality purposes.

The Pacific Islands Regional Oceanscape Program (PROP) of the World Bank in 2015 conducted a review of the NORMA fisheries management system to assess the need to improve and strengthen enforcement, enhance safety of seafood exports through the establishment of a seafood hygiene competent authority, build capacity through the training of observers and enforcement officers and update monitoring equipment, strengthen fisheries management through capacity building of NORMA systems, institution and staff, and assess coastal fisheries that may be viable for further development in partnership with local communities. A review of the FSM fisheries legislation and seafood safety management system was conducted in February 2018 by the European Union to identify gaps in the sanitary controls for seafood products to be exported to the European Union countries.

At the sub-regional level, the Palau Arrangement for the Management of the Western Pacific Tuna Fishery - Longline Vessel Day Scheme annual meetings, commencing in 2018, will consider matters relating to the administration and operation of the Longline VDS. The Parties will meet at the end of each Management Year to set the TAE for the subsequent Management Year and calculate the Parties' PAEs and to investigate whether each Party has taken all necessary measures to ensure that the number of fishing days by longline vessels in its waters do not exceed the Party's PAE or Adjusted PAE during the Management Year.

At the regional level, there is a regional annual report developed by the WCPFC Secretariat, which details compliance of members with the reporting provisions of the Commission. An internal review is also conducted by the WCPFC through assessing the implementation and performance of the CMMs through reports of member countries to the Commission and stock assessments. Stock assessments undertaken by SPC are also subject to peer-review and external review to ensure that the scientific processes remain robust.

WCPFC does not have a regular programme of external reviews. However, an independent performance review was undertaken in 2008 and completed in 2011. In response to recommendations of the review a schedule of responses and actions were developed and considered by WCPFC in 2012. Also, an Independent Review of the Commission's Transitional Science Structure and Functions was conducted and there was a recommendation for periodic external reviews of the stock assessments, which has been adopted by WCPFC9. In 2017, there was an Independent Review of the Compliance Monitoring Scheme. The review assessed CCM's compliance with their obligations; identified areas that required capacity building and technical assistance; identified aspects of CMMs that need to be amended or refined and responded to non-compliance through remedial options.

4 Evaluation Procedure

4.1 Harmonised Fishery Assessment

For WCPO bigeye, the fishery overlaps with the Pan Pacific yellowfin, bigeye and albacore longline fishery which is also managed by CU Pesca. No provisional scores were available at the time of writing however. Therefore, unlike for other WCPFC stocks, there has been no MSC harmonisation process for bigeye. It is worth considering, however, the consistency of scoring across WCPFC stocks which have similar monitoring and stock assessment processes and this is considered where relevant in the scoring and rationales for Principle 1.

4.2 Previous assessments

This fishery has not been previously assessed.

4.3 Assessment Methodologies

This assessment was conducted in accordance with the MSC Fisheries Standard v2.0 and MSC Full Assessment Reporting Template version 2.0.

The default assessment tree was used without adjustments. The Risk-Based Framework was not used.

4.4 Evaluation Processes and Techniques

4.4.1 Site Visits and Consultations

The site visit was held in Pohnpei, FSM on the 14th to 16th February 2018. The individuals met during the site visit and their roles in the fishery are listed in Table 19. The site visit included a visit to the port where the team visited the vessel CFA21. The captain and key crew were briefly interviewed and the unloading process was observed from vessel to storage.

Table 19. List of attendees at the on-site meetings.

Name	Organisation	Type of consultation
Feleti TEO	Executive Director - WCPFC	Provision of information during the site visit
Tony BEECHING	Assistant Science Manager - WCPFC	Provision of information during the site visit
Karl STAISCH	Regional Observer Coordinator - WCPFC	Provision of information during the site visit
Eugene PANGELINAN	Executive Director - NORMA	Provision of information during the site visit
Matthew CHIGIYAL	Deputy Director - NORMA	Provision of information during the site visit
Bradley PHILLIPS	Chief of Research - NORMA	Provision of information during the site visit
Justino HELGEN	VMS Compliance Manager - NORMA	Provision of information during the site visit

Name	Organisation	Type of consultation
Hilo HSUEH	Island Relation Director of Frozen Group	Provision of information during the site visit
Benson DENG	Pohnpei Base Manager, Liancheng Overseas Fishery (FSM) Co	Provision of information during the site visit
Contesa J. FACTURA	FSM Base Quality Control Head, Liancheng Overseas Fishery (FSM) Co	Provision of information during the site visit
Camille INATIO	Fisheries Economic & VDS Administrator - NORMA	Provision of information during the site visit
Eric GILMAN	Consultant representing Client	Provision of information during the site visit
Peter WATT	MEC	Assessor
Jo GASCOIGNE	MEC	Assessor
Chrissie SIEBEN	MEC	Assessor, Team leader

The information obtained during the site visit has been incorporated throughout the main report; however key points are summarised below:

- **NORMA**: Information about the functioning and management of the fishery (operations, data gathering and analysis, management structures and responsibilities, management plans, regulations, enforcement etc.);
- **WCPFC**: Information about regional management, tropical tuna harvest strategy and management objectives, bigeye stock assessment, regional observer programme and longline observer coverage, ongoing work on ETP (sharks, rays, turtles) and marine pollution management measures, decision-making processes.
- **Liancheng Overseas Fishery (FSM) Co. Ltd.**: Information about traceability from capture to 1st point of sale, details on fishing operations, gear use, bait use, bycatch avoidance tactics, ETP interactions, waste disposal, gear loss, trends in bycatch.

4.4.2 Evaluation Techniques

a) Media announcements: MEC selected the MSC as media outlet. The MSC press release targeted a wide range of stakeholders within the sustainable seafood industry, ensuring that key stakeholders were notified of this fishery's announcement.

b) Methodology for information gathering: Review of data and documentation, interview of stakeholders.

c) Scoring process: Scoring was agreed by the team via email correspondence. Consensus was reached for all scores.

The scores were decided as follows:

How many scoring issues met?	SG60	SG80	SG100
All	60	80	100
Half	FAIL	70	90
Less than half	FAIL	65	85
More than half	FAIL	75	95

Note that where there is only one scoring issue in the SG, the issue can be partially scored – in this case the team used their judgement to determine what proportion of it was met, e.g. at the 100 level, a small part met = 85, about half met = 90, nearly all met = 95.

d) Decision rule for reaching the final recommendation: The decision rule for MSC certification is as follows:

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

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

e) Scoring elements: The set of scoring elements considered in the assessment is listed in Table 20.

Table 20. Scoring elements

Component	Scoring elements	Main/Not main	Data-deficient or not
Target species	WCPO bigeye	No	No
Primary species	WCPO yellowfin, blue marlin, North Pacific albacore	main	No
	See Table 10 and Table 11	minor	No
Secondary species	Indian oil sardine	main	No
	See Table 10 and Table 11	minor	No
ETP species	Elasmobranchs, sea turtles and seabirds, cetaceans	N/a	no
Habitats	None	N/a	N/a

5 Traceability

5.1 Eligibility Date

The eligibility date shall be the date of publication of the PCDR. Any product caught after the **3rd January 2019**, by the vessels listed in Table 2 and conforming to the UoA detailed in Section 3.1.1 shall thus be eligible to bear the MSC ecolabel, subject to the traceability conditions given in Section 5.3 as well as Clause 5.6 of the MSC CoC Default Standard v4.0 for under-assessment product.

5.2 Traceability within the Fishery

All vessels in the UoA require a fishing license issued by NORMA. Fishing takes place mainly in the FSM EEZ although vessels may also operate in other EEZs or in the High Seas. 72 hours prior to entering the FSM EEZ all vessels are required to notify NORMA with the coordinates and time of entry. Although the client fleet is not the only commercial longline fleet operating in the FSM EEZ, all other vessels are part of distant-water fleets and do not land at FSM ports. FSM-flagged vessels that operate in the neighbouring Marshall Islands EEZ would also be landing in Majuro, not FSM. Note that port clearance is required every time a vessel leaves an FSM port, even if staying within the EEZ.

Aboard all vessels, the SPC logbook is completed in terms of estimated volume (tonnes) and number of individuals of retained catch per species, as well as time and coordinates of the set. The retained catch is processed on board (removal of gills, guts, tails and fins) after which each bigeye and yellowfin tuna (the key target species) is equipped with a RFID (Radio Frequency Identification) tag inside its cavity. The tags electronically record the following information: vessel name, date of capture, estimated weight, species, and coordinates of the set. The fish are then blast-frozen and stored. Yellowfin and bigeye tunas are stored together, apart from all other retained species in a separate hold.

No at-sea transshipment takes place in this fishery. National licensing conditions state that transshipment, if required, must be conducted in port, not at sea. Evidence of illegal transshipping results in a fine and the placement of the particular vessel on an IUU list. Pohnpei, Kosrae and Yap are registered transshipment ports. Any vessel wishing to land or transship is required to provide 72 hours' notice of its intention to do so.

Landings take place in Pohnpei and Kosrae. Although the ports are managed at state level, the port authority comes under the remit of the Department of Justice (i.e. at national level). Prior to landing, the relevant state and national departments are notified 72 hours in advance and an inspection team is sent in order to verify the vessel's catch (number of pieces per species) and records. Offloading cannot take place without authorization from NORMA.

Some of the vessels that seasonally relocate from FSM to the Cook Islands will land catch from their final trip in FSM in Apia, Samoa or Papeete, French Polynesia. Note however that the catch from these trips would only qualify for MSC for vessels with MSC CoC certification.

Vessels are unloaded one at a time. During unloading the fish are sorted by size and species. The Client have their own weighing scale that feeds directly into a server and links the recorded weights to the information contained on the RFID tags. A report is generated per unloading for each vessel's trip. Here VMS data, departure and unloading dates, operation days, bait consumption, fuel consumption, and daily and total tuna catches are recorded. A

random sample of 60 pieces of retained catch per vessel is also graded on site for quality checking purposes. The fish are then loaded into a stainless steel tub and brought to a container for loading. Client personnel will supervise the unloading on-board the vessel as well as the loading of the fish into freezer containers, destined for shipping by reefer to processors in China, Thailand and Vietnam. At this point, a reefer bill of lading is produced which links the container's unique number back to the vessel name, time and date of loading and catch composition by number of pieces and weights. Note that the catch of one vessel may be split into different reefers and vice versa. In those instances, the catch from different vessels is separated by a net and identified by a label. When a reefer is filled, the containers are sealed. Ownership changes when the reefer reaches its destination.

The team considered that the procedures described above, in conjunction with the FSM MCS system described in Section 3.5.6, constitutes a robust traceability management system, enabling certified product to be traced up to the point of landing.

Table 21. Traceability Factors within the Fishery

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
Potential for non-certified gear/s to be used within the fishery	This risk is minimal – all vessels in the UoA are longliners.
Potential for vessels from the UoC to fish outside the UoC or in different geographical areas (on the same trips or different trips)	There is an identified risk of mixing between High Seas and in-zone (EEZ) sets during a trip. Therefore, any trips which include sets in the high seas area (or other areas outside the FSM EEZ) shall be classed as non-MSC certified unless vessels are MSC CoC certified.
Potential for vessels outside of the UoC or client group fishing the same stock	Vessels from outside the UoC are likely to fish for the same stock but will not be covered by this assessment. To avoid the risk of vessels landing yellowfin or bigeye from outside the UoC as MSC (i.e. vessels not associated with this assessment) an up to date list of vessels will be published with the certificate, pending the successful outcome of this evaluation . This list can then be used by companies with MSC CoC to ensure product is originating from a vessel covered by this assessment.
Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	Vessels are unloaded one at a time. After unloading, the fish are loaded into containers. In most cases each fishing vessel will use one container, in order to minimise mixing of catches. In the event that more than one vessel uses a container there are two measures in place to identify catches: 1) the catch from different vessels is separated by a net and identified by a label, and 2) RFID tags are attached inside the cavity of the fish prior to blast-freezing. Loss of tags is therefore highly unlikely. Once loaded, the container is sealed and its unique number will link back to the name of the vessel(s), time and date of loading and catch composition by number of pieces and weights.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	There is minimal risk of mixing during processing. Bigeye and yellowfin are two morphologically very distinct species and are unlikely to be substituted with each other or with other species. As previously discussed, there is a risk of mixing in-zone catches with high seas catches and any trips which include sets in the high seas area (or other areas outside the FSM EEZ) shall be classed as non-MSC certified.
Risks of mixing between certified and non-certified catch during transshipment	No at-sea transshipment takes place in this fishery. National licensing conditions state that transshipment, if required, must be conducted in port, not at sea. Evidence of illegal transshipping results in a fine and the placement of the particular vessel on an IUU list. Pohnpei, Kosrae and Yap are registered transshipment ports. Any vessel

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
	wishing to land or transship is required to provide 72 hours' notice of its intention to do so.
Any other risks of substitution between fish from the UoC (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	None

5.3 Eligibility to Enter Further Chains of Custody

Western Central Pacific Ocean bigeye caught by the vessels listed in Table 2 within the FSM EEZ and after the eligibility date will be eligible to enter further chains of custody, subject to the requirements for under-assessment product detailed in Clause 5.6 of the MSC CoC Default Standard and **pending the successful outcome of this evaluation**. However, any trips which include sets in the high seas area (or other areas outside the FSM EEZ) shall be classed as non-MSC certified and will not be eligible to enter further chains of custody unless vessels have separate CoC certification.

Separate chain of custody certification will be required after the point of landing which includes in-port transshipment. There are three eligible points of landing in FSM: Pohnpei, Kosrae and Yap although some vessels may also land in Apia, Samoa or Papeete, French Polynesia. The client has stated that the catch from trips landing in Apia and Papeete would only qualify for MSC for vessels with MSC CoC certification. Transport by reefers after landing is not covered by the fishery certificate.

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

No IPI stocks were identified in this assessment.

6 Evaluation Results

6.1 Principle Level Scores

The final principal scores are provided in Table 22.

Table 22. Final Principle Scores

Principle	Score
Principle 1 – Target Species	86.7
Principle 2 – Ecosystem	83.0
Principle 3 – Management System	90.0

6.2 Summary of PI Level Scores

Principle	Component	Wt	Performance Indicator (PI)		Wt	Score
One	Outcome	0.33	1.1.1	Stock status	0.5	100
			1.1.2	Stock rebuilding	0.5	N/a
	Management	0.67	1.2.1	Harvest strategy	0.25	70
			1.2.2	Harvest control rules & tools	0.25	60
			1.2.3	Information & monitoring	0.25	90
			1.2.4	Assessment of stock status	0.25	100
Two	Primary species	0.2	2.1.1	Outcome	0.33	90
			2.1.2	Management strategy	0.33	80
			2.1.3	Information/Monitoring	0.33	95
	Secondary species	0.2	2.2.1	Outcome	0.33	80
			2.2.2	Management strategy	0.33	80
			2.2.3	Information/Monitoring	0.33	80
	ETP species	0.2	2.3.1	Outcome	0.33	75
			2.3.2	Management strategy	0.33	75
			2.3.3	Information strategy	0.33	65
	Habitats	0.2	2.4.1	Outcome	0.33	100
			2.4.2	Management strategy	0.33	95
			2.4.3	Information	0.33	85
	Eco-system	0.2	2.5.1	Outcome	0.33	80
			2.5.2	Management	0.33	80
			2.5.3	Information	0.33	85
Three	Governance and policy	0.5	3.1.1	Legal &/or customary framework	0.33	95
			3.1.2	Consultation, roles & responsibilities	0.33	85
			3.1.3	Long term objectives	0.33	90

Principle	Component	Wt	Performance Indicator (PI)		Wt	Score
	Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.25	90
			3.2.2	Decision making processes	0.25	95
			3.2.3	Compliance & enforcement	0.25	85
			3.2.4	Monitoring & management performance evaluation	0.25	90

6.3 Summary of Conditions

See Appendix 2 for full detail. The fishery (bigeye UoA) is **provisionally proposed to be certified** with 5 conditions.

Table 23. Summary of Conditions

Condition number	Condition	Performance Indicator
1	WCPO bigeye needs a harvest strategy that is responsive to the state of the stock, with and the elements of the harvest strategy (monitoring, stock assessment, harvest control rules and management actions) working together to achieve stock management objectives.	1.2.1
2	WCPO bigeye needs a harvest control rule that ensures that the exploitation rate is reduced as the PRI is approached and is expected to keep the stock fluctuating around the target level and robust to the main uncertainties. The tools used to implement the HCR should be effective in achieving the required exploitation levels.	1.2.2
3	The evidence base for determining interaction rates with ETP species, in particular sea turtles, should be improved so that trends in interactions can be measured and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.	2.3.1
4	The client should provide evidence that all relevant national and regional regulations on fishery interactions with ETP species are adhered to by the UoA so that it can be demonstrated that the fishery does not hinder recovery of ETP species.	2.3.2
5	The evidence base for determining interaction rates with all ETP species should be improved so that UoA related mortality on sea turtles can be assessed and so that trends in interactions with all ETP species can be measured over time and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.	2.3.3

6.4 Recommendations

The team have raised three recommendations:

1. Although the client fleet has in place a waste management plan which prohibits discarding of non-biodegradable waste at sea, during site visit interviews with NORMA, the audit team was made aware of anecdotal reports of dumping at sea. However, the exact frequency of these types of incidents is unknown and therefore the impact cannot be estimated. It should be noted that from January 2019, CMM 2017-04 on Marine Pollution will enter into force. To

ensure compliance with this CMM, it is recommended that incidents of dumping at sea are demonstrably reduced. This will be verified during surveillance audits by consulting observer reports for the UoA.

2. The fishery uses Indian oil sardine (*Sardinella longiceps*), sourced from China. By far the largest fishery is in India, which is the most likely source of the bait for this fishery although this is an assumption made by the team. It is therefore recommended that the client company reviews its bait sourcing policy to ensure the necessary information is collected so that all bait can be traced to its source; be it at stock level, country of capture or ideally, in the case of the Indian oil sardine, at Indian state level.

3. Unobserved mortality of ETP species is most likely to occur through ghost fishing. Gear loss in the UoA is reportedly minimal; however records of the number of terminal tackle or branchlines that are lost per set/trip/year per vessel are not recorded, although under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Although lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks, ETP species may be more vulnerable to ghost fishing through entanglement than for example primary or secondary species. Although there is some monitoring of gear loss in the UoA through the observer programme, the lack of better, UoA-specific data means there can be no high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species. A recommendation has therefore been issued for UoA vessels to systematically report on the extent of gear loss per trip (for example by recording the number of hooks lost). .

6.5 Determination, Formal Conclusion and Agreement

(REQUIRED FOR FR AND PCR)

1. The report shall include a formal statement as to the certification determination recommendation reached by the Assessment Team about whether or not the fishery should be certified.

(Reference: FCR 7.16)

(REQUIRED FOR PCR)

2. The report shall include a formal statement as to the certification action taken by the CAB's official decision-makers in response to the Determination recommendation.

6.6 Changes in the fishery prior to and since Pre-Assessment

The following is a description of activities to improve the FSM locally-based longline fishery since an initial MSC pre-assessment was conducted in 2010 and since inception of a Fishery Improvement Project (FIP) in 2012. For more information, see the FIP website at <https://sites.google.com/site/fsmlonglinefip/home> and the FisheryProgress.org record for the FIP at <https://fisheryprogress.org/fip-profile/federated-states-micronesia-yellowfin-and-bigeye-tuna-longline>.

2010: A draft pre-assessment against the Marine Stewardship Council (MSC) standard was prepared in 2010.

2012: FIP is launched by Anova USA, Luen Thai Fishing Venture and the FSM National Oceanic Resource Management Authority (NORMA).

2012: Western and Central Pacific Fisheries Commission adopts a formal limit reference point for bigeye and yellowfin tuna stocks (This is documented in the meeting report for the WCPFC 9th commission meeting available at <http://www.wcpfc.int/system/files/WCPFC9-Summary-Report-final.pdf>, refer to paragraph 269, WCPFC9 adopted SC8 para 298 recommendation to adopt 20%unfishedSB for WCPO tropical tuna stocks).

March 2013: Luen Thai Fishing Venture adopted a company policy banning the retention of sharks or fishing gear and methods to target sharks (available online at https://sites.google.com/site/fsmlonglinefip/home/LTFV_shark_policy_Bilingual_R2.pdf?attredirects=0&d=1).

2013: Luen Thai Fishing Venture removed all J-shaped tuna hooks and replaced these with wider circle hooks in order to mitigate sea turtle bycatch rates.

May 2014: FIP participants adopted an initial FIP Workplan.

May 2014: FIP participants agree to participate in the WCPO Tuna MSC Alignment Group (see Group website at https://sites.google.com/site/seafoodcompaniestunamanagement/home/wcpo_tuna-p1_alignment) and attended the inaugural in-person meeting.

Dec. 2014: Training materials for captains and crew (handling and release guidance, species ID booklet, domestic regulations) are developed.

January 2015: LTFV begins using radio frequency identification (RFID) tags on frozen tuna, to provide full traceability from the vessel to the end of the supply chain.

July 2015: A new MSC pre-assessment is completed (MEC, 2015) and is posted on the FIP websites (available online at https://sites.google.com/site/fsmlonglinefip/home/FSM_MSC_PA_July2015.PDF?attredirects=0&d=1). The two units of certification covered by the pre- assessment were western and central Pacific Ocean (WCPO) stocks of bigeye and yellowfin tunas caught by vessels owned and managed by Luen Thai Fishing Venture (LTFV).

Sept. 2015: A Draft 2016-2018 FIP workplan is distributed to stakeholders for comment.

October 2015: Fishery improves precautionary approach by planning implementation in 2016 of the PNA longline vessel day scheme, providing a new input control mechanism.

December 2015: Sources of information on best practices for mitigation of bycatch by pelagic longline tuna fisheries are posted to the FIP website and distributed to FIP participants (see Gilman, 2011; Gilman et al., 2014, 2016; Gilman and Huang, 2017; Hall et al., 2017³). Best

³ Gilman, E. 2011. Bycatch governance and best practice mitigation technology in global tuna fisheries. Marine Policy 35: 590-609.

Gilman, E., Passfield, K., Nakamura, K. 2014. Performance of regional fisheries management organizations: ecosystem-based governance of bycatch and discards. Fish and Fisheries 15:327-351.

practices were also distributed to captains and crew through capacity building training workshops (see downloads section, below).

January 2016: Participants prepare updated training materials for train-the-trainer workshops, and plan for a refresher workshop to be held in April 2016.

April 2016: A train-the-trainer workshop was convened. The purpose of the workshop was to train Luen Thai Fishing Venture (LTFV) staff who in turn will train fishing base managers to instruct longline captains on methods to handle and release at-risk species, government longline rules, LTFV policy banning the use of gear designs and methods to target sharks and banning the retention of sharks including shark fins, proper use of the Pacific Community/Pacific Islands Forum Fisheries Agency logbook form for pelagic longline fishers, and training in species identification to improve logbook entries. See the DOWNLOADS section of the FIP website for more information.

May 2016: FIP participants contribute to development of a WCPO Tuna MSC Alignment Group workplan and development of a 2016 annual short-term position statement to push for improvements with sub-regional (PNA, FFA) and regional (WCPFC) management systems.

Oct. 2016: FIP participants contribute to the WCPO Tuna MSC Alignment Group's development of a list of highest priority achievements at the thirteenth regular session of the Western and Central Pacific Fisheries Commission (WCPFC13) related to addressing deficits in harvest strategies – which individual participants of the Alignment Group are to raise to the attention of delegations to WCPFC (see Alignment Group website https://sites.google.com/site/seafoodcompaniestunamanagement/home/WCPO_Tuna_Alignment_Group for the harvest strategy priority actions).

Dec. 2016: FIP participants attend meetings with coordinators of the WCPO Tuna MSC Alignment Group to discuss 2016 activities and plan 2017 activities, focusing on addressing harvest strategy deficits for WCPO tuna stocks. See https://sites.google.com/site/seafoodcompaniestunamanagement/home/WCPO_Tuna_Alignment_Group/links/21-may-2014-meeting-FIP-MSC-Aligning-P1 for the 2017 Alignment Group action plan.

Dec. 2016: During the 2016 annual session convened in December, WCPFC13 made some progress in implementing elements of the initial WCPFC harvest strategy workplan, and adopted a revised workplan. The WCPFC13 summary report is available at https://www.wcpfc.int/system/files/draft%20summary%20report%20WCPFC13_clean%20circulated%20for%20CCMs%20and%20observers%20comments_complete%20V2_0.pdf and the updated WCPFC harvest strategy workplan is available at <https://www.wcpfc.int/doc/supplcmm-2015-04/updated-workplan-harvest-strategies-2016-2019-and-record-outcomes-wcpfc13>

Gilman, E., Chaloupka, M., Swimmer, Y., Piovano, S. 2016. A cross-taxa assessment of pelagic longline bycatch mitigation measures: conflicts and mutual benefits to elasmobranchs. *Fish and Fisheries* 17: 748-784.

Gilman, E., Huang, H. 2017. Review of effects of pelagic longline hook and bait type on sea turtle catch rate, anatomical hooking position and at-vessel mortality rate. *Reviews in Fish Biology and Fisheries* 27: 43-52.

Hall, M., Gilman, E., Minami, H., Mituhasi, T., Carruthers, E. 2017. Mitigating bycatch in tuna fisheries. *Rev Fish Biol Fisheries* DOI 10.1007/s11160-017-9478-x

Jan. 2017: The domestic management authority (NORMA), TNC and LTFV begin an electronic monitoring (EM) pilot project. Satlink EM systems are installed on 6 LTFV vessels, and NORMA staff is trained and begin to analyze EM data and enter the data into the national longline observer program database.

Feb. 2017: FIP participants contributed to developing an Alignment Group 2017 position statement, and co-signed the statement, which the WCPFC secretariat distributed to WCPFC parties on 14 Feb. – see <http://tinyurl.com/Align-group-2017>.

July 2017: progress report on electronic monitoring project
https://sites.google.com/site/fsmlonglinefip/home/July2017_FSM_EM_prog_report.pdf?attredirects=0&d=1

Aug. 2017: New stock assessment report for WCPO bigeye tuna is published (see <https://www.wcpfc.int/system/files/SC13-SA-WP-05%20%5Bbet-assessment%5D%20REV1.pdf>) indicating that, based on new understanding on the stock structure, life history parameters, and recent recruitment, the stock is determined to not be overfished and overfishing not occurring.

August 2017: The 13th meeting of the WCPFC scientific committee met all milestones set out in the current WCPFC harvest strategy workplan (updated at WCPFC13, Dec. 2016). See <https://sites.google.com/site/wcpobetfip/home/Harvest%20strategy%202017%20SC%20milestone.pdf?attredirects=0&d=1> for a summary of how each harvest strategy workplan milestone for bigeye and yellowfin tuna have been met at SC13, and see https://sites.google.com/site/wcpobetfip/home/WCPFC_2016_updated_harvest_strategy_workplan.pdf?attredirects=0&d=1 for the current WCPFC harvest strategy workplan

November 2017: The fishery enters full assessment against the MSC fisheries standard for WCPO bigeye and yellowfin tuna stocks.

Dec. 2017: WCPFC at their 14th regular session adopted a new tropical tuna measure, which increased bigeye tuna catch limits, established an intersessional working group to develop a consolidated shark measure for adoption in 2018, directed their Scientific Committee to consider options for expanding the sea turtle measure to include all pelagic longline fisheries, adopted a replacement seabird bycatch measure, adopted a measure on marine pollution basically emphasizing existing prohibitions under MARPOL Annex V, and other measures. See <https://tinyurl.com/WCPFC14-outcomes> and download at https://sites.google.com/site/wcpobetfip/home/WCPFC-press-release_Dec2017.png?attredirects=0&d=1 for a press release issued by the WCPFC secretariat's Executive Director and the WCPFC Chair summarizing the key outcomes of WCPFC14. And see the WCPFC14 meeting report at <https://www.wcpfc.int/meetings/wcpfc14>. And see <https://www.wcpfc.int/conservation-and-management-measures> for the new measures adopted in 2017 at WCPFC14.

As part of ecological risk assessment activities, an assessment of the effect of 3 hook sizes was conducted on a vessel that primarily fishes in the Marshall Islands longline fishery, where the conventional hook size (14/0 circle hook) is the same hook used by vessels in the UoA of the FSM fishery. The results are available in the journal article: Gilman, E., Chaloupka, M., Musyl, M. 2018. Effects of pelagic longline hook size on species- and size-selectivity and survival. Reviews in Fish Biology and Fisheries 28: 417-433. Briefly, a controlled experiment was conducted comparing catch rates and mean lengths from use of a control small circle hook to 2 wider circle hooks. Catch rates of both retained and discarded species were

significantly higher on the medium hook. To minimize discarded catch, including of at-risk shark species, and maintain economically viability, it depends how the mgmt. system is designed. If input controls are limiting – such as under the FSM’s longline vessel day scheme, then, relative to medium hooks, continued use of the smallest hook would maintain current economic viability, and avoid increasing discards, including of sharks. However, if market species output controls were limiting, because the ratio of retained to discarded catch on medium hooks was greater than on narrowest hooks, medium hooks would generate lower discard levels. The fishery is subject to input but not output controls and vessels have continued to use the conventional smallest hook in order to meet objectives of management.

SFP/TNC Longline Bycatch Workshop: A 27 May 2018 workshop co-hosted by The Nature Conservancy and the Sustainable Fisheries Partnership included (a) a presentation providing a case study bycatch assessment and management activities in the FSM FIP, including the skipper training program, compliance with a ban on shark retention and the use of shark lines and wire leaders, use of circle hooks and the electronic monitoring program; and (b) a presentation on moving from unintended cross-taxa conflicts to intentional tradeoffs by moving from piecemeal to integrated fisheries bycatch management. See the workshop agenda at <https://www.dropbox.com/s/bp7htb47v3r27x0/Workshop%20Program%20longline%20bycatch%20assmt%20mgmt%2027May2018.pdf?dl=0>.

Additional ongoing activities conducted since the initial pre-assessment include:

Captain training: Captains receive annual training in protected species handling and release methods, in completing logbooks, in species identification, in garbage management, and national longline rules and regulations.

Electronic monitoring: LTFV, The Nature Conservancy and NORMA are conducting an electronic monitoring (EM) pilot project. The project aims to develop the institutional capacity of NORMA, the domestic management authority, to manage an EM system. Satlink EM systems were installed on 5 LTFV vessels in 2016 and FSM government office-based staff was trained, began analyzing the EM data, and began to have EM data contribute to the national observer program. See the FIP website for a progress report on the EM project.

References

- Ahser, E., 2002. Marine biodiversity of the Federated States of Micronesia. FSM National Biodiversity Strategy and Action Plan Project.
- Allain, V., Fernandez, E., Hoyle, S.D., Caillot, S., Jurado-Molina, J., Andrefouet, S., Nicol, S.J., 2012. Interaction between coastal and oceanic ecosystems of the Western and Central Pacific Ocean through predator-prey relationship studies. PloS one 7, e36701.
- Allain, V., Nicol, S., Polovina, J., Coll, M., Olson, R., Griffiths, S., Dambacher, J., Young, J., Molina, J.J., Hoyle, S., Lawson, T., Bell, J., 2011. Report of the international workshop on opportunities for ecosystem approaches to fisheries management in the Pacific Ocean tuna fisheries. WCPFC.
- Anderson, R.C., 2014. Cetaceans and Tuna Fisheries in the Western and Central Indian Ocean. IPNLF Technical Report No. 2. International Pole and Line Foundation, London.
- Andrews, J., Appukuttan, K.K., Medley, P., 2008. Certification Report for Indian Oil Sardine Gillnet Fishery Ref. 82033v1. Moody Marine Ltd.
- Baset, A., Liu, Q., Hanif, M.T., Liao, B., Memon, A.M., Mohsin, M., 2017. Estimation of Maximum Sustainable Yield Using Production Modeling: A Stock Appraisal of Indian Oil Sardine (*Sardinella longiceps*) from Pakistani Waters. Pakistan Journal of Zoology 49, 521–528.
- Baum, J., Bianchi, I., Domingo, A., Ebert, D.A., Grubbs, R.D., Mancusi, C., Piercy, A., Serena, F., Snelson, F.F., 2009. *Pteroplatytrygon violacea*. The IUCN Red List of Threatened Species 2009: e.T161731A5490530. IUCN.
- Baum, J.K., Worm, B., 2009. Cascading top-down effects of changing oceanic predator abundances. Journal of Animal Ecology 78, 699–714.
- Beverly, S., Chapman, L., Sokimi, W., others, 2003. Horizontal longline fishing methods and techniques: a manual for fishermen. Secretariat of the Pacific Community Nouméa, New Caledonia.
- CMFRI, 2012. Annual Report 2011-12. Central Marine Fisheries Research Institute.
- CMFRI, 2017. Annual Report 2016-17. Central Marine Fisheries Research Institute, Kochi. 292 p. CMFRI.
- Curran, D., 2014. Shark Catch in Pelagic Longline Fisheries: A Review of Mitigation Measures. WCPFC-SC10-2014/ EB-IP-11. PIFSC Working Paper WP-14-006. Issued 16 July 2014.
- Davies, N., Harley, S., Hampton, J., McKechnie, S., 2014. Stock assessment of yellowfin tuna in the Western and Central Pacific Ocean. WCPFC-SC10-2014/SA-WP-0.
- Diplock, J.H., 1993. Tuna fisheries in the Federated States of Micronesia, 1979-90. Marine Fisheries Review 55, 1–9.
- Ellis, J.R., Phillips, S.R.M., Poisson, F., 2016. A review of capture and post-release mortality of elasmobranchs. Journal of Fish Biology.

FAO, 2002. FAO Fishery Country Profile - Micronesia. FAO.

Farley, J., Eveson, P., Krusic-Golub, K., Clear, N., Sanchez, C., Roupsard, F., Satoh, K., Smith, N., Hampton, J., 2018. Update on age and growth of bigeye tuna in the WCPO: WCPFC Project 81. CSIRO Oceans and Atmosphere; WCPFC-SC14-2018/ SA-WP-01.

Farley, J., Eveson, P., Krusic-Golub, K., Sanchez, C., Roupsard, F., McKechnie, S., Nicol, S., Leroy, B., Smith, N., Chang, S.-K., 2017a. Project 35: Age, growth and maturity of bigeye tuna in the western and central Pacific Ocean. Scientific Committee, 13th regular session, Rarotonga, Cook Islands, 9-17 August 2017, WCPFC-SC13-2017/SA-WP-01.

Farley, J., Eveson, P., Krusic-Golub, K., Sanchez, K., Roupsard, C., McKechnie, F., Nicol, S., Leroy, S., Smith, B., Chang, N., 2017b. Project 35: Age, growth and maturity of bigeye tuna in the western and central Pacific Ocean. Scientific Committee, 13th regular session, Rarotonga, Cook Islands, 9-17 August 2017, WCPFC-SC13-2017/SA-WP-01.

Farley, J., Krusic-Golub, K., Clear, N., Eveson, P., Smith, N., 2018. Progress on yellowfin tuna age and growth in the WCPO WCPFC: Project 82. WCPFC Scientific Committee, Fourteenth Regular Session, Busan, Republic of Korea, 8-16 August 2018.

Federated States of Micronesia Code
<http://fmsupremecourt.org/WebSite/fsm/code/index.htm>

Federated States of Micronesia Bill of Rights
<http://fmsupremecourt.org/WebSite/fsm/constitution/article4.htm>

Filippi, D., Waugh, S., Nicol, S., 2010. Revised spatial risk indicators for seabird interactions with longline fisheries in the western and central Pacific. Scientific Committee. WCPFC-SC6-2010/EB- IP 01. WCPFC.

Fitzsimmons, 2011. Bycatch mitigation information system. WCPFC-SC7-2011/EB-IP-03. WCPFC.

Gilman, E., 2006. Incidental Capture of Seabirds in Pelagic Longline Fisheries of the Tropical and Subtropical Pacific Islands Region and Draft Pacific Islands Regional Plan of Action for Reducing the Incidental Catch of Seabirds in Pelagic Longline Fisheries. Pacific Islands Forum Fisheries Agency.

Gilman, E., Brothers, N., McPherson, G., Dalzell, P., 2007a. A review of cetacean interactions with longline gear. Journal of Cetacean Research and Management 8, 215.

Gilman, E., Kobayashi, D., Swenarton, T., Brothers, N., Dalzell, P., Kinan-Kelly, I., 2007b. Reducing sea turtle interactions in the Hawaii-based longline swordfish fishery. Biological Conservation 139, 19–28.

Gilman, E., 2015. Status of international monitoring and management of abandoned, lost and discarded fishing gear and ghost fishing. Marine Policy 60, 225–239.

Gilman, E., Chaloupka, M., Merrifield, M., Malsol, N.D., Cook, C., 2015. Standardized catch and survival rates, and effect of a ban on shark retention, Palau pelagic longline fishery. Aquatic Conservation: Marine and Freshwater Ecosystems 26, 1031–1062.

- Grewe, P.M., Feutry, P., Hill, P.L., Gunasekera, R.M., Schaefer, K.M., Itano, D.G., Fuller, D.W., Foster, S.D., Davies, C.R., 2016. Evidence of discrete yellowfin tuna (*Thunnus albacares*) populations demands rethink of management for this globally important resource. WCPFC Scientific Committee, 12th Regular Session, Bali, Indonesia, 3-11 August 2016. WCPFC-SC12-2016/ SA-IP-02.
- Grewe, P., Hampton, J., 1998. An assessment of bigeye (*Thunnus obesus*) population structure in the Pacific Ocean based on mitochondrial DNA and DNA microsatellite analysis. Technical Report, JIMAR Contribution 98-330.
- Hampton, J., Williams, P., 2017. Annual estimates of purse seine catches by species based on alternative data sources. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/SA-IP-03.
- Hoyle, S., Nichol, S., 2008. Sensitivity of bigeye stock assessment to alternative biological and reproductive assumptions. Scientific Committee, 4th Regular Session, Port Moresby, Papua New Guinea, 11-22 August 2008. WCPFC-SC4-2008/ME-WP-01.
- Hu, D., Wu, L., Cai, W., Gupta, A.S., Ganachaud, A., Qiu, B., Gordon, A.L., Lin, X., Chen, Z., Hu, S., others, 2015. Pacific western boundary currents and their roles in climate. *Nature* 522, 299.
- Ianelli, J., Maunder, M.N., Punt, A.E., 2012. Independent review of the 2011 WCPO bigeye assessment. Scientific Committee, 8th Regular Session, Busan, Korea, 7-15 August 2012. WCPFC-SC8-2012/SA-WP-01.
- ISC, 2014. North Pacific Swordfish (*Xiphus gladius*) Stock Assessment in 2014. WCPFC-SC10-2014/ SA-WP-13. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean.
- ISC, 2015. Stock assessment update for striped marlin in the Western and Central North Pacific Ocean through 2013. International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean - Billfish working Group.
- ISC, 2016a. Stock Assessment Update for Blue Marlin (*Makaira nigricans*) in the Pacific Ocean through 2014. WCPFC-SC12-2016/ SA WP-12. International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean - Billfish Working Group.
- ISC, 2016b. 2016 Pacific Bluefin Tuna Stock Assessment. WCPFC-SC12-2016/ SA WP-07. International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean - ISC Pacific Bluefin Tuna Working Group.
- ISC, 2017a. Stock Assessment of Albacore in the North Pacific Ocean in 2017. WCPFC-SC13-2017/ SA-WP-09 Rev 2 (15 August 2017). International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean.
- ISC, 2017b. Stock assessment and future projections of blue shark in the North Pacific Ocean through 2015. Report to the Shark Working Group. International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean.

- Kawahata, H., Suzuki, A., Ohta, H., 2000. Export fluxes in the western Pacific warm pool. Deep Sea Research Part I: Oceanographic Research Papers 47, 2061–2091.
- Kirby, D., 2006. Ecological Risk Assessment for species caught in WCPO tuna fisheries: Inherent risk as determined by Productivity-Susceptibility Analysis. Second Scientific Committee Meeting of the Western and Central Pacific Fisheries Commission, Manila, Philippines. WCPFC–SC2–2006/EB WP–1. WCPFC.
- Kirby, D.S., Hobday, A., 2007. Ecological Risk Assessment for the Effects of Fishing in the Western and Central Pacific Ocean: Productivity-Susceptibility Analysis. Third Scientific Committee Meeting of the Western and Central Pacific Fisheries Commission, Honolulu, USA, 13-24 August 2007. WCPFC-SC3-2007/EB-WP-01. WCPFC.
- Kitchell, J.F., Boggs, C.H., He, X., Walters, C.J., 1999. Keystone predators in the central Pacific. Ecosystem approaches for fisheries management 665–683.
- Kitchell, J.F., Martell, S.J., Walters, C.J., Jensen, O.P., Kaplan, I.C., Watters, J., Essington, T.E., Boggs, C.H., 2006. Billfishes in an ecosystem context. Bulletin of Marine Science 79, 669–682.
- Lawson, T., 2013. Update on the estimation of the species composition of the catch by purse seiners in the Western and Central Pacific Ocean, with responses to recent independent reviews. WCPFC Scientific Committee. WCPFC-SC9-2013/ST-WP-03, Pohnpei, Federated States of Micronesia, 6–14 August 2013.
- Le Borgne, R., Allain, V., Griffiths, S.P., Matear, R.J., McKinnon, A.D., Richardson, A.J., Young, J.W., 2011. Vulnerability of open ocean food webs in the tropical Pacific to climate change. Vulnerability of tropical Pacific fisheries and aquaculture to climate change 189–250.
- Lehodey, P., 2001. The pelagic ecosystem of the tropical Pacific Ocean: dynamic spatial modelling and biological consequences of ENSO. Progress in Oceanography 49, 439–468.
- Lehodey, P., Bertignac, M., Hampton, J., Lewis, A., Picaut, J., 1997. El Niño Southern Oscillation and tuna in the western Pacific. Nature 389, 715.
- Lehodey, P., Nicol, S., Hampton, J., Caillot, S., Williams, P.G., 2013. Project 62: SEAPODYM applications in WCPO [EB WP 03]. [Pohnpei, Federated States of Micronesia]: Western and Central Pacific Fisheries Commission (WCPFC). WCPFC.
- Lindgren, M., Checkley, D.M., Koslow, J.A., Goericke, R., Ohman, M.D., 2018. Climate-mediated changes in marine ecosystem regulation during El Niño. Global change biology 24, 796–809.
- Macfadyen, G., Huntington, T., Cappel, R., 2009. Abandoned, lost or otherwise discarded fishing gear. UNEP Regional Seas Reports and Studies No. 185. FAO Fisheries and Aquaculture Technical Paper No. 523. UNEP/FAO.
- McKechnie, S., Hampton, J., Abascal, F., Davies, N., Harley, S., 2015a. Sensitivity of WCPO stock assessment results to the inclusion of EPO dynamics within a Pacific-wide analysis.

- Scientific Committee, 11th Regular Session, Pohnpei, Federated States of Micronesia, 3-11 August 2015. WCPFC-SC11-2015/SA-WP-04.
- McKechnie, S., Hampton, J., Abascal, F., Davies, N., Harley, S.J., 2015b. Sensitivity of WCPO stock assessment results to the inclusion of EPO dynamics within a Pacific-wide analysis. WCPFC-SC11-2015/SA-WP-04.
- McKechnie, S., Hampton, J., Pilling, G.M., Davies, N., 2016. Stock assessment of skipjack tuna in the western and central Pacific Ocean. WCPFC-SC12-2016/SA-WP-04.
- McKechnie, S., Pilling, G., Hampton, J., 2017. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC13-2017/SA-WP-05, Rarotonga, Cook Islands, 9–17 August.
- McKechnie, S., Tremblay-Boyer, L., Pilling, G., 2017. Background analyses for the 2017 stock assessments of bigeye and yellowfin tuna in the western and central Pacific Ocean. WCPFC-SC13-2017/SA-IP-06.
- Munroe, Priede, 2010. *Sardinella longiceps*. The IUCN Red List of Threatened Species 2010: e.T154989A115258997. IUCN.
- NORMA, 2017. Annual Report to the Commission - Part 1: Information on Fisheries, Research and Statistics. WCPFC-SC13-AR/CCM-06 Rev 2 (4 November 2017). Scientific Committee 13th Regular Session. Rarotonga, Cook Islands 9 – 17 August 2017. WCPFC.
- Patterson, H., Hansen, S., Larcombe, J., 2014. A review of shark bycatch mitigation in tuna longline fisheries. WCPFC-SC10-2014/EB-WP-05. WCPFC.
- Peatman, T., Smith, N., Park, T., Caillot, S., 2017. Better purse seine catch composition estimates: recent progress and future workplan for Project 60. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/ST-WP-02.
- Pecoraro, C., Zudaire, I., Bodin, N., Murua, H., Taconet, P., Díaz-Jaimes, P., Cariani, A., Tinti, F., Chassot, E., 2016. Putting all the pieces together: integrating current knowledge of the biology, ecology, fisheries status, stock structure and management of yellowfin tuna (*Thunnus albacares*). Reviews in Fish Biology and Fisheries.
- Pilling, G., Brouwer, S., 2017. Report from the SPC pre-assessment workshop, Noumea, April 2017. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/IP-02.
- Pilling, G., Scott, R., Williams, P., Hampton, J., 2016. A compendium of fisheries indicators for tuna stocks not assessed in 2016 (bigeye and yellowfin tuna). Scientific Committee, 12th Regular Session, Bali, Indonesia, 3-11 August 2016. WCPFC-SC12-2016/SA-WP-03.
- PNA, 2016a. Parties to the Palau Arrangement, 21st Annual Meeting Tarawa, Kiribati, 31 March-1 April 2016. PNA.
- PNA, 2016b. Palau Arrangement of the Management of the Western Pacific Tuna Fishery - Management Scheme (longline vessel day scheme) (amended October 2016). PNA.

- PNA, 2017. FAD data to be provided by observers. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/ST-WP-06.
- Polovina, J.J., Abecassis, M., Howell, E.A., Woodworth, P., 2009. Increases in the relative abundance of mid-trophic level fishes concurrent with declines in apex predators in the subtropical North Pacific, 1996–2006. *Fishery Bulletin* 107, 523–531.
- Polovina, J.J., Woodworth-Jefcoats, P.A., 2013. Fishery-induced changes in the subtropical Pacific pelagic ecosystem size structure: observations and theory. *PLoS one* 8, e62341.
- Powers, J.E., 2013. Review of SPC estimation of species and size composition of the western and central Pacific purse seine fishery from observer-based sampling of the catch. WCPFC Scientific Committee. WCPFC-SC9-2013/ST-IP-03, Pohnpei, Federated States of Micronesia, 6–14 August 2013.
- Rice, J., Harley, S., 2013. Updated stock assessment of silky sharks in the Western and Central Pacific Ocean. WCPFC-SC9-2013/ SA-WP-03. WCPFC.
- Rice, J., Kai, M., 2014. Stock assessment of Blue Shark in the North Pacific Ocean using Stock Synthesis. WCPFC-SC10-2014/ SA-WP-08. ISC.
- Schaefer, K., Fuller, D., Hampton, J., Caillot, S., Leroy, B., Itano, D., 2015. Movements, dispersion and mixing of bigeye tuna (*Thunnus obesus*) tagged and released in the equatorial Central Pacific Ocean, with conventional and archival tags. *Fisheries Research* 161, 336–355.
- Schindler, D.E., Essington, T.E., Kitchell, J.F., Boggs, C., Hilborn, R., 2002. Sharks and tunas: fisheries impacts on predators with contrasting life histories. *Ecological Applications* 12, 735–748.
- Scott, R., Pilling, G.M., McKechnie, S., 2017. Stochastic status quo projections for bigeye tuna. WCPFC Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017.
- Sibert, J., Hampton, J., Kleiber, P., Maunder, M., 2006. Biomass, size, and trophic status of top predators in the Pacific Ocean. *science* 314, 1773–1776.
- Tremblay-Boyer, L., McKechnie, S., Pilling, G.M., Hampton, J., 2017a. Exploratory geo-statistical analyses for Pacific-wide operational longline CPUE data for WCPO tuna assessments. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/SA-WP-03.
- Tremblay-Boyer, S., McKechnie, S., Pilling, G., Hampton, J., 2017b. Stock assessment of yellowfin tuna in the Western and Central Pacific Ocean. WCPFC-SC13-2017/SA-WP-06.
- Vincent, M., Pilling, G., Hampton, J., 2018. Incorporation of updated growth information within the 2017 WCPO bigeye stock assessment grid, and examination of the sensitivity of estimates to alternative model spatial structures. WCPFC Scientific Committee Fourteenth Regular Session, Busan, Korea, 8-16 August 2018; WCPFC-SC14-2018/ SA-WP-03.

- Wallace, B.P., DiMatteo, A.D., Bolten, A.B., Chaloupka, M.Y., Hutchinson, B.J., Abreu-Grobois, F.A., Mortimer, J.A., Seminoff, J.A., Amorocho, D., Bjorndal, Karen, A., others, 2011. Global conservation priorities for marine turtles. *PloS one* 6, e24510.
- Wallace, B.P., DiMatteo, A.D., Hurley, B.J., Finkbeiner, E.M., Bolten, A.B., Chaloupka, M.Y., Hutchinson, B.J., Abreu-Grobois, F.A., Amorocho, D., Bjorndal, K.A., others, 2010. Regional management units for marine turtles: a novel framework for prioritizing conservation and research across multiple scales. *PloS one* 5, e15465.
- Wallace, B.P., Kot, C.Y., DiMatteo, A.D., Lee, T., Crowder, Larry, B., Lewison, R.L., 2013. Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. *Ecosphere* 4, 1–49.
- Ward, P., Myers, R.A., 2005. SHIFTS IN OPEN-OCEAN FISH COMMUNITIES COINCIDING WITH THE COMMENCEMENT OF COMMERCIAL FISHING. *Ecology* 86, 835–847.
- Watling, D., 2002. Interactions Between Seabirds and Pacific Island's Fisheries, Particularly the Tuna Fisheries. Secretariat of the Pacific Community, Noumea, New Caledonia.
- WCPFC, 2017a. Thirteenth Regular Session of the Scientific Committee, Rarotonga, Cook Islands, 9-17 August, 2017. Western and Central Pacific Fisheries Commission.
- WCPFC, 2017b. Fourteenth Regular Session of the Commission, Manila, Philippines, 3-7 December 2017: Draft Summary Report. Western and Central Pacific Fisheries Commission.
- WCPFC, 2018. Fourteenth Regular Session of the Scientific Committee, Busan, Republic of Korea, 8-16 August, 2018. Western and Central Pacific Fisheries Commission.
- Werner, T.B., Northridge, S., Press, McClellan, K., Young, N., 2015. Mitigating bycatch and depredation of marine mammals in longline fisheries. *ICES Journal of Marine Science* 72, 1576–1586.
- Williams, P., 2017. Scientific data available to the Western and Central Pacific Fisheries Commission. Scientific Committee, 13th Regular Session, Rarotonga, Cook Islands, 9-17 August 2017. WCPFC-SC13-2017/ST-WP-01.
- Zaki, S., Jayabalan, N., Al-Kiyumi, F., Al-Kharusi, L., Al-Habsi, S., Shejaibi, 2013. Length-based age, growth and stock assessment of the Indian oil sardine *Sardinella longiceps* Val. from the Salalah coast, Sultanate of Oman. *World Journal of Fish and Marine Sciences* 5 (2): 137-143.

Appendices

Appendix 1 Scoring and Rationales

Appendix 1.1 Principle 1 scoring rationales

Evaluation Table for PI 1.1.1 – Stock status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status relative to recruitment impairment			
	Guide post	It is likely that the stock is above the point where recruitment would be impaired (PRI).	It is highly likely that the stock is above the PRI.	There is a high degree of certainty that the stock is above the PRI.
	Met?	Y	Y	Y
	Justification	<p>The stock assessment does not provide a 'reference case' model. To evaluate stock status, the assessment team therefore based the scoring largely on the grid of 36 models constructed by the SC (SC14) as explained in Section 3.3.3; since this is what the SC considered most appropriate for providing management advice.</p> <p>For the purposes of scoring, the team considered the PRI to correspond to the agreed LRP (20%SB_{F=0}), although in practice this is likely to be a conservative estimate of the PRI, noting that it is ~70% of the median estimate of SB_{MSY} (28%SB₀ in the SC grid).</p> <p>Based on the SC14 grid (Table 4, (WCPFC, 2018)) there is high probability that the SB is above the LRP (36 out of 36 models). SC14 characterise the probability of SB<LRP as 0%, but in practice, it is clear that there is some uncertainty around stock status which is not quantified in this grid. The key uncertainty has been the growth model, but the additional work carried out in 2018 (Project 81), added to the existing 'new' growth model for 2017 provides additional confidence, such that SC14 decided to exclude the 'old' growth model as a sensitivity in the model output grid. This gives higher confidence than previously that the stock is above the LRP level.</p> <p>The stock-recruit relationship is plotted in Figure 1 below (stock-recruit pairs from 1964-2014 (Scott et al., 2017)), giving an opportunity to evaluate recruitment in relation to stock biomass directly. As can be seen from the figure, although biomass is reduced in the later part of the time series (crosses), recruitment does not appear to change.</p> <p>On balance, taking the conclusions of the SC grid as well as the sensitivities, and reviewing the stock-recruit information directly, the team concluded that there is a high degree of certainty that the stock is above the PRI; SG100 is met.</p>		

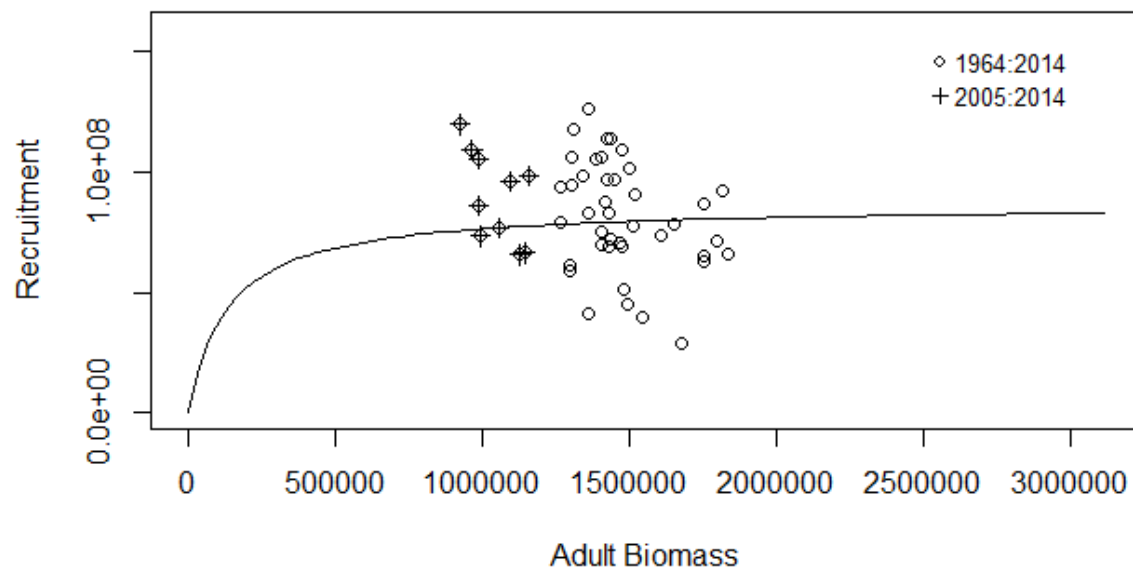


Figure 1. Stock-recruit pairs, 1964-2014 (circles), 2005 onwards marked with crosses (Scott et al., 2017)

b	Stock status in relation to achievement of MSY		
	Guide post	The stock is at or fluctuating around a level consistent with MSY.	There is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?	Y	Y
	Justification	<p>SB_{MSY} is estimated (median estimate) at 28%SB_0. MSC provide a default value for B_{MSY} in terms of B_0 of 40%, but the guidance notes that this is only used if B_{MSY} is not analytically determined (GSA 2.2.3.1). Therefore, for the purposes of scoring the team have used the analytically-determined median value of SB_{MSY} (i.e. 28%SB_0)</p> <p>According to the SC14 grid, SB_{recent}/SB_{MSY} is estimated as follows: 1.38 (median), 1.12 (10% CI), 0.96 (Min i.e. one out of 36 – 2.8%) (Table 4). In other words, the stock is estimated to be at a level consistent with SB_{MSY} with between 90% and 97% probability (the probability has not been directly quantified in either of the reports).</p>	

To consider F_{MSY} : The SC14 grid estimates F/F_{MSY} at 0.77 (median), 0.93 (90% CI), 1.06 (Min) (Table 4). SC14 provide a probability estimate of 6% (presumably two models out of 36) of $F > F_{MSY}$ (WCPFC, 2018). Trends in F from the 2017 diagnostic model (new/2017) are given in Figure 2 below; there is little evidence of a significant trend in recent years. Catch is \sim MSY or a little lower (median MSY estimate from SC14 grid 159 kt compared to 2015 catch of 152 kt).

In terms of biomass trajectory, as emphasised by both the stock assessment authors and the Scientific Committee (SC13 and SC14) the trajectory has been consistently downwards over the time series (see Figure 3 below). This means that over recent years, the stock has been in the current situation or better.

Scoring: The stock is at a level consistent with MSY (i.e. $SB > SB_{MSY}$, $F < F_{MSY}$, $C \sim MSY$). SG80 is met. In relation to SG100, taking the structural uncertainty grid as defined by SC14, there is a probability of approximately 95% that $SB > SB_{MSY}$ and $F < F_{MSY}$, and the stock has been at or above this level over the entire time series. Therefore SG100 is met.

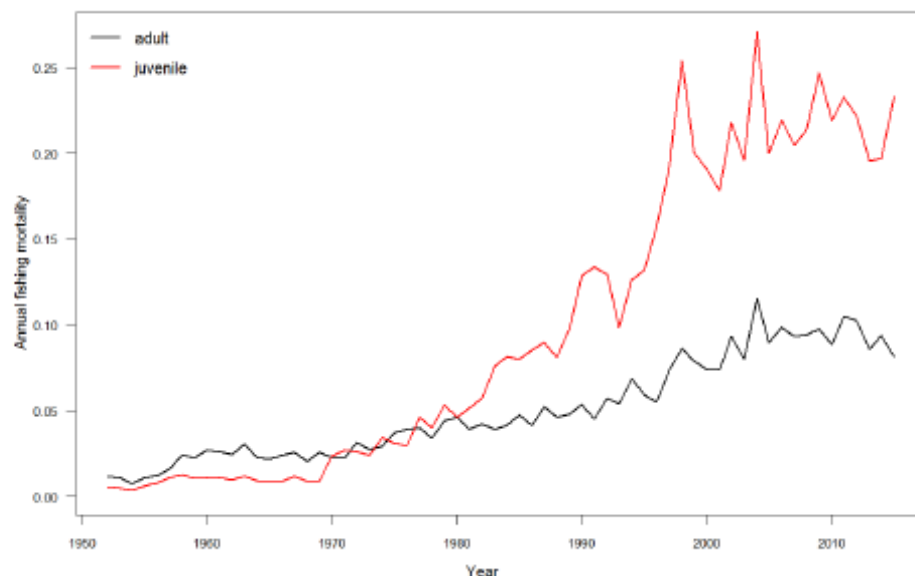


Figure 2: Time series of F (black: adult; red: juvenile) from the diagnostic case model (new/2017) (McKechnie, Pilling, et al., 2017a)

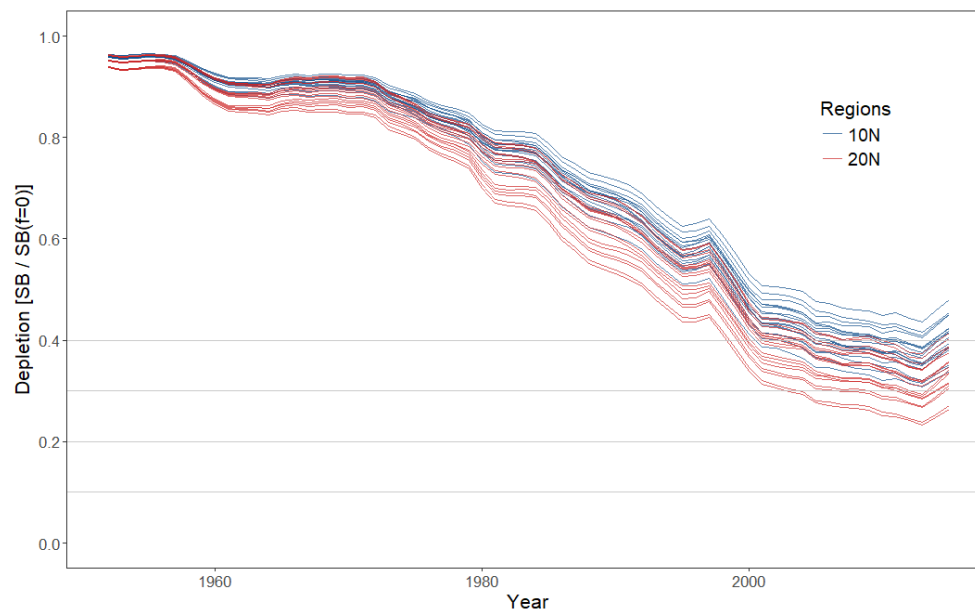


Figure 3. Trajectory of biomass depletion for the 36 models in the SC14 grid (blue: 2017 regional structure, red: 2014 regional structure)

References (Farley et al., 2017b; McKechnie, Pilling, et al., 2017a; Scott et al., 2017; WCPFC, 2017b, 2018; Farley, Eveson, et al., 2018; Vincent et al., 2018)

Stock Status relative to Reference Points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (S_{la})	Limit reference point	20%SB _{F=0}	SB _{recent} = 36%SB _{F=0} = 1.8LRP; SB _{latest} = 42%SB _{F=0} = 2.1LRP (median of SC uncertainty grid)
Reference point used in scoring stock relative to MSY (S_{lb})	MSY reference point	SB _{MSY}	SB _{recent} = 1.38SB _{MSY} ; SB _{latest} = 1.62 SB _{MSY} (median of SC uncertainty grid)

OVERALL PERFORMANCE INDICATOR SCORE:	100
CONDITION NUMBER (if relevant):	N/a

Evaluation Table for PI 1.1.2 – Stock rebuilding. Not applicable, not scored.
Evaluation Table for PI 1.2.1 – Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Harvest strategy design			
	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	Y	N	N
	Justification	<p>MSC defines a harvest strategy as ‘the combination of monitoring, stock assessment, harvest control rules and management actions, which may include an MP or an MP (implicit) and be tested by MSE’ (MSC – MSCI Vocabulary v1.1).</p> <p>The stated objective of the WCPFC harvest strategy as defined in CMM 2017-01 is to maintain status quo biomass, pending agreement on a formal target reference point, due in 2019 according to the latest version of the harvest strategy workplan (see Section 1.1.1).</p> <p>CMM 2014-06 commits WCPFC to developing a formal harvest strategy for yellowfin and the other key stocks; none of the key milestones for bigeye have yet been met however; at WCPFC14 the workplan was refocused from rebuilding to agreeing a long-term HCR, based on the results of the 2017 stock assessment (see harvest strategy workplan; Attachment L in the summary report from WCPFC14). For the moment, the elements of the WCPFC harvest strategy are the following:</p> <ul style="list-style-type: none"> • Data collection on the stock and fishery (considered in detail in PI 1.2.3 below) • Stock assessment process (considered in detail in PI 1.2.4 below) • Limit reference point (20%SB_{F=0}) and management target (SB₂₀₁₂₋₁₅; from CMM 2017-01) (see Section 3.3.3) • ‘Available’ HCR (see 1.2.2), with some management tools set out in 2017-01 (described in Section 1.1.1); • Monitoring of implementation of CMM 2017-01 via data gathering and Part 1 and 2 reports to the Commission. <p>This management strategy is reviewed annually during the Commission meeting.</p> <p>PNA harvest strategy:</p>		

	<p>PNA operate a purse seine vessel day scheme (VDS) which limits effort by setting an overall 'TAE' (total allowable effort) which is divided up for each of the parties to the agreement. The TAE is set annually based on objectives of 'optimal exploitation' as well as WCPFC provisions (which presumably means MSY). The days are set based on the objective of limiting purse seine effort to 2010 levels (which was a requirement of the previous tropical tuna CMMs, although not 2017-01). The purse seine VDS is relevant for bigeye because most of the F on juveniles comes from the purse seine fishery (see Figure 1 in 1.1.1b). A longline VDS has recently been established, but plays no role in management for the moment (see Section 3.3.7).</p> <p>Overall scoring:</p> <p>The objective of the current harvest strategy is to maintain the status quo (WCPFC: average SB/SB_{F=0} for 2012-2015; PNA: purse seine effort at a maximum of 2010 levels). The most recent stock assessment suggests that the status quo is an acceptable short-term biological target for bigeye (see 1.1.1 and projections in Table 5). The new tropical tuna bridging measure (2017-01) has overall somewhat weakened management provisions in relation to bigeye compared to the previous measure (2016-01) (see Section 3.3.6), which was aimed at rebuilding the stock. The measure did not particularly seem to be achieving this, but it should be noted that the stock assessment trajectory only runs to 2015.) It does not on this basis comply with the advice of the SC13 prior to the WCPFC 2017 plenary (SC13 report para. 241): <i>SC13 recommends as a precautionary approach that the fishing mortality on bigeye tuna stock should not be increased from current level to maintain current or increased spawning biomass until the Commission can agree on an appropriate target reference point (TRP).</i></p> <p>Status quo projections (Scott et al., 2017; WCPFC, 2018) provide a basis on which to evaluate the extent to which the harvest strategy is expected to achieve stock management objectives. The projections are summarised in Table 5, which gives the estimated probability of SB falling below the LRP by 2045 in the range 0-18% based on status quo and 'optimistic' fishery scenarios, which is acceptable given that the harvest strategy is intended to be revised significantly prior to 2045.</p> <p>Scoring: It is clear that the move by WCPFC14 to loosen bigeye management was not particularly precautionary, but given the ongoing work to put in place an improved management target and harvest strategy (2014-06 and workplan; see above and Section 3.3.6), assuming this progresses, the impact on the stock status from changes in the transition from 2016-01 to 2017-01 will probably not be significant; or at least will be lost in the much larger uncertainty about stock status derived from the choice of growth model and regional structure. Furthermore, the acceptance by SC14 of the 'updated new' growth model as the best scientific data on which to base stock assessments has considerably reduced the uncertainty around stock status. On this basis, SG60 can be considered to be met. SG80 is however not met.</p>			
b	Harvest strategy evaluation			
	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.

	Met?	Y	Y	N
	Justification	As noted above, stock status projections suggest that current management is precautionary in the short term. The stock assessment model based on the updated new growth curve, even with other sources of uncertainty remaining, suggests that the biomass will remain above the LRP with high probability. Management measures over the past few years (2013-01 – 2017-01) have been adjusted (strengthened from 2013-01 through 2016-01 and then weakened in 2017-01) but probably not in a way that has a significant impact on the stock (although stock status is only estimated to 2015; i.e. in the terminal year of the assessment, 2014-01 was in force). The team considered that the estimated low probability that $SB < LRP$ and $F > F_{MSY}$ constitutes ‘evidence’ that the harvest strategy is working. SG80 is therefore met. The current harvest strategy is a stop-gap and has not been fully evaluated, although projections suggest that in the longer term, depending on recruitment, it risks increasing F to unsustainable levels (Table 5). SG100 is not met.		
c	Harvest strategy monitoring			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	Monitoring of the fishery for the purposes of stock assessment is considered in PI 1.2.3 below, and the analysis of data is considered under PI 1.2.4. Monitoring of the implementation of the harvest strategy (notably CMM 2017-01) is carried out via self-assessment by CCMs, included in their Part 1 and 2 reports submitted to WCPFC annually. For FSM, NORMA monitors the fishery via logsheets, port inspections and VMS. Met.		
d	Harvest strategy review			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Not evaluated
	Justification	Since SG80a is not met, this has no impact on the scoring.		
	Shark finning			

e	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justifi cation	The target species is not a shark.		
f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a biannual review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	Not relevant	Not relevant	Not relevant
	Justifi cation	This fishery targets bigeye specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted. Overall discarding rates for bigeye are minimal, according to the stock assessment report. There is also negligible discarding of bigeye from the UoA, since it is a valuable target species (according to the UoA’s observer data, 99.5% of bigeye is retained). Hence there is no ‘unwanted catch’* of bigeye in this fishery. * SA3.1.6: The term ‘unwanted catch’ shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid, and did not want or chose not to use.		
References		(McKechnie, Pilling, et al., 2017a; Scott et al., 2017; WCPFC, 2017a, 2017b, 2018; Vincent et al., 2018) CMMs 2017-01, 2014-06, 2013-01, 2014-01, 2015-01, 2016-01		
OVERALL PERFORMANCE INDICATOR SCORE:				70
CONDITION NUMBER (if relevant):				Condition 1

Evaluation Table for PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	HCRs design and application			
	Guide post	Generally understood HCRs are in place or available that are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time.
	Met?	Y	N	N
	Justification	<p>SA2.5.2 In scoring issue (a) at the SG60 level, teams shall accept 'available' HCRs (instead of HCRs that are 'in place') in cases where: !!</p> <p>a. Stock biomass has not previously been reduced below the MSY level or has been maintained at that level for a recent period of time that is at least longer than 2 generation times of the species, and is not predicted to be reduced below BMSY within the next 5 years; or</p> <p>b. In UoAs where BMSY estimates are not available, the stock has been maintained to date by the measures in use at levels that have not declined significantly over time, nor shown any evidence of recruitment impairment.</p> <p>SA2.5.3 Teams shall recognise 'available' HCRs as 'expected to reduce the exploitation rate as the point of recruitment impairment is approached' only in cases where: !!</p> <p>a. HCRs are effectively used in some other UoAs, that are under the control of the same management body and of a similar size and scale as the UoA; or</p> <p>b. An agreement or framework is in place that requires the management body to adopt HCRs before the stock declines below BMSY.</p> <p>In the 2017 stock assessment, only the model set with the old growth model (now removed from the grid) plus the 2014 regional structure puts the stock biomass below SB_{MSY} at any point. According to the 2018 update (SC14 grid), stock biomass has been above the estimated MSY level throughout the time series for all models; only one model out of 36 (recent) or zero (latest) put $SB < SB_{MSY}$ in the current time period. Based on the SC grid, the probability that $F > F_{MSY}$ is estimated to be ~6%. $p(SB < SB_{MSY})$ is not quoted in the SC14 report, but from</p>		

		Table 4 can be seen to be <10% (see 1.1.1b); p(SB<LRP) is estimated to be ~0%. The biomass trajectory is stable or (possibly) increasing in the terminal year and F is ~stable (see 1.1.1). On this basis, SA2.5.2a is met. WCPFC have an agreed, legally-binding framework in place to establish formal harvest strategies and control rules for their main stocks, including WCPO bigeye (see CMM 2014-06 and associated workplans; Section 3.3.6). SA2.5.3b is therefore met. On this basis, a HCR can be considered to be 'available' for this stock. SG60 is met. Since the harvest strategy is not 'in place', SG80 is not met.		
b	HCRs robustness to uncertainty			
	Guide post	The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a wide range of uncertainties including the ecological role of the stock, and there is evidence that the HCRs are robust to the main uncertainties.	
	Met?	N	N	
	Justification	Since a HCR is 'available' rather than 'in place', it cannot be argued to be robust to the main uncertainties. Not met.		
c	HCRs evaluation			
	Guide post	There is some evidence that tools used or available to implement HCRs are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Y	N	N
	Justification	Under SA2.5.5, in order to conclude that 'available' HCRs are 'effective' (SG60), MSC requires evidence of i) the use of effective HCRs in other stocks or fisheries under the same management body; or ii) a formal agreement or framework with trigger levels which will require the development of a well-defined HCR. It also requires consideration of current exploitation rates in relation to biological reference points and the agreed trigger level (guidance for SA2.5.6: ' <i>evidence that current F is equal to or less than F_{MSY} should usually be taken as evidence that the HCR is effective</i> '). A formal framework is in place for the development of a harvest strategy for the stock (CMM 2014-06 and workplans; see above). F is estimated by SC14 to be below F_{MSY} with ~94% probability. The criteria for 'available' tools at SG60 are therefore met. SG80 is not met because the HCR does not include well-defined target exploitation levels.		
References		(McKechnie, Pilling, et al., 2017a; WCPFC, 2017a, 2017b, 2018; Vincent et al., 2018)		

	CMM 2014-06
OVERALL PERFORMANCE INDICATOR SCORE:	60
CONDITION NUMBER (if relevant):	Condition 2

Evaluation Table for PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Y	Y	Y
	Justification	<p>The following information is available, and is used as part of the harvest strategy – notably to inform the stock assessment model:</p> <p>1. Fishery-dependent information</p> <p><u>Catch, effort and CPUE</u>: It is a requirement for all CCM fisheries to provide catch and effort data to WCPFC/SPC, and unlike in the past, most key fleets now provide operational (logbook) rather than just aggregate data (Williams, 2017). Catch and effort data go back to 1950, although as expected, historical data are sparser and generally less reliable than more recent data. The logsheet data are raised to best estimates of total catch by SPC-OFP, to account for missing data. Purse seine catch is allocated to species via an agreed methodology ('method 3') (Hampton and Williams, 2017). Longline CPUE data are analysed and standardised as described in (McKechnie, Tremblay-Boyer, et al., 2017) and provide the key stock assessment input; purse seine CPUE is not used because of difficulty in measuring effort meaningfully.</p> <p><u>Length/weight-frequency data</u>: Size-frequency data come from various port sampling programmes and some observer reports, and go back to the 1960s. These data are weighted in the stock assessment according to spatial representation, to account for differences in length-frequency by geographic region.</p> <p><u>Fleet composition</u>: Each CCM provides information to WCPFC annually on their active fleet, in their Part 1 reports.</p> <p>2. Fishery-independent information</p> <p><u>Size and age data</u>: Age and growth has been a big issue for this assessment. The work done by CSIRO (Farley et al., 2017b; Farley, Eveson, et al., 2018) is considered to be very detailed compared to what is available for most stocks, and SC14 agreed to accept</p>		

		<p>their ‘updated new’ growth model as the best scientific data available for stock assessment.. Concerns expressed at SC13 is that it did not include enough very large and very small fish are addressed by ‘Project 81’ and the 2018 update assessment.</p> <p><u>Natural mortality</u>: Estimating natural mortality is always a big problem. For bigeye (and other WCPO stocks), the methodology set out in Hoyle and Nichol (2008) is used to estimate M-at-length by sex, based on the levels of M which give the observed divergence in sex ratio after maturity. This M-at-length vector is then used to calculate a M-at-age vector using the growth curve, which is the input to the stock assessment model. The new growth information has therefore resulted in a new M vector.</p> <p><u>Environmental data</u>: The Ocean Fisheries Programme of SPC undertaken environmental research as part of their ecosystem monitoring programme, focusing particularly on potential environmental drivers of tuna population dynamics.</p> <p>3. Stock structure The WCPO bigeye fishery is assessed and managed as a single stock in the WCPFC Convention Area, although there is strong evidence for mixing across the WCPFC/IATTC boundary (Section 3.3.1). Some work has been done to evaluate the usefulness of a combined management approach (McKechnie et al., 2015a), which concluded that the approach of separate assessments in the WCPO and the EPO was appropriate.</p> <p>4. Information inferred from the stock assessment A significant range of information relating to stock status comes as the output of the stock assessment (McKechnie, Pilling, et al., 2017a; WCPFC, 2017b), including estimates of spawner potential, recruitment, fishery impact etc.</p> <p>5. Data gaps Observer coverage (providing external verification of logbook data and information about discards) is low for the longline fishery. There is no external fishery-independent biomass indicator (such as a survey).</p> <p>Overall, given the size and complexity of the fishery, the range and comprehensiveness of the data available is impressive and improving all the time. Data gaps that previously constrained stock assessments, notably age-and-growth data, have been filled (Farley, Eveson, et al., 2018; Vincent et al., 2018; WCPFC, 2018). There remains bias and lack of precision in some of the datasets, particularly historical data; as well as uncertainty in others, but this is inevitable for any fishery.</p> <p>Overall, the major work that has gone into developing a growth curve, which has been agreed by the WCPFC Scientific Committee to represent the best available scientific information and accepted as appropriate for the stock assessment and provision of scientific advice, has removed a major source of uncertainty that remains for other stocks (e.g. similar work (‘Project 82’) is currently ongoing for yellowfin and due to be presented to SC15 (Farley, Krusic-Golub, et al., 2018). The key remaining source of uncertainty in the stock assessment relates not to any source of information but to the model structure, and is analysed in the 2018 stock assessment update (Vincent et al., 2018) based on detailed information about the spatial distribution of catch by gear. On this basis, the team concluded that SG100 is met.</p>
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b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule , and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N
	Justification	<p>Fishery removals are monitored by individual CCMs via logsheets and port sampling, and are required to be submitted to the Commission annually, in the form of estimates of total catch plus catch and effort data broken down by gear and either aggregated (5° squares by month) or (preferably) at operational level (individual logsheets). Despite some gaps in this dataset, coverage is good overall. This catch, effort and CPUE dataset is the key data set for the stock assessment. Other fisheries data which support management are size-frequency data (collected via port sampling and observer programmes) and tag returns. Biological data are also collected via research programmes (e.g. (Farley et al., 2017b; Farley, Eveson, et al., 2018)).</p> <p>Formal stock assessments have taken place every few years (2011, 2014, 2017 updated 2018). In between formal stock assessments, SPC provide some information on trends in fishery indicators (total catch, nominal CPUE, catch at length and at weight), to guide management (e.g. (Pilling et al., 2016; Brouwer et al., 2018)).</p> <p>On this basis, the team felt that SG80 was met. SG100 is not met, for the following reasons:</p> <ul style="list-style-type: none">• The characteristics of tuna longline CPUE are often poorly understood and it is unclear how successful most effort standardization analyses are or how to properly represent the uncertainties.• Purse seine catch and length-frequency data can be biased by grab-sampling techniques used to estimate species composition (although there is an agreed methodology used to avoid bias as far as possible; see Hampton and Williams (2017)).• Some data gaps remain in fishery-dependent data (see Figure 9).• The requirement to ‘raise’ logsheet data by estimates of total catch (to account for missing logsheets) results in some loss of precision.• Historical data are often lacking in precision.• Although the frequency of stock assessments is reasonable, they are not carried out with ‘high frequency’ (i.e. not annually). <p>Although uncertainty in the most recent stock assessment (2018 update) has been much reduced, it is not completely clear how robust the management is to uncertainty – the management system is still a work in progress.</p>		
Comprehensiveness of information				

c	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	<p>WCPFC and SPC work hard to quantify all sources of removals and include them in the stock assessment. Small-scale (but extensive) fisheries in Indonesia, the Philippines and Vietnam have in the past been a particular problem, and there has been ongoing work for quite a few years to quantify the catch (and where possible effort) from these fisheries (described in Tremblay-Boyer et al. (2017a)). According to the 2017 stock assessment report, there has been gradual improvement in the data from Indonesia and the Philippines over the last decade or so; since the last assessment, catch data from Vietnam has also been available and is included in the 2017/2018 assessment. At the 2017 pre-assessment workshop (PAW), it was noted that there is some potential for under-reporting of bigeye catch, and the workshop (Pilling and Brouwer, 2017) requested SPC to include a one-off sensitivity with this potential IUU fish added to the catch history (details of how this was done are given in McKechnie, Tremblay-Boyer, et al. (2017). It did not have a significant effect on the conclusions of the assessment, which were a little more positive (see McKechnie, Pilling, et al. (2017a); Appendix, Table 11).</p>		
References		(Hoyle and Nichol, 2008; McKechnie et al., 2015b; Pacific, 2016; Farley et al., 2017b; Pilling and Brouwer, 2017; Scott et al., 2017; Tremblay-Boyer et al., 2017a; WCPFC, 2017b, 2018; Hampton and Williams, 2017; McKechnie, Pilling, et al., 2017a; McKechnie, Tremblay-Boyer, et al., 2017; Brouwer et al., 2018; Vincent et al., 2018; Farley, Eveson, et al., 2018; Farley, Krusic-Golub, et al., 2018)		
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		Y	Y
	Justification	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, including (i) the dynamics of the fish population (growth, natural mortality, maturity and fecundity, recruitment); (ii) the fishery dynamics; (iii) the dynamics of tagged fish; (iv) the observation models for the data. The model partitions the population into 9 spatial regions and 28 quarterly age-classes and defines fisheries to consist of relatively homogeneous fishing units that have selectivity and catchability characteristics that do not vary greatly over time and space, although in the case of catchability some allowance can be made for time series variation. SPC have considerable experience in the development and application of MFCL. SG100 is met.		
b	Assessment approach			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	Y	Y	
	Justification	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; see Table 4 and PI 1.1.1. SG80 is met.		
c	Uncertainty in the assessment			
	Guide post	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.

	Met?	Y	Y	Y
	Justifi cation	<p>The assessment is a sophisticated statistical assessment which allows input parameters to vary stochastically within parameters defined by the assessors. The key means by which uncertainty in terms of the input values themselves is taken into account is via defining sensitivity runs (described in Section 3.3.9). SG80 is met.</p> <p>The probability of the stock being above or below a given reference level, as quoted in PI 1.1.1, is evaluated based on a model grid which is defined across an agreed set of these sensitivities (e.g. as per Table 4). The probabilities quoted in 1.1.1 are based on the SC14 grid, as explained in the rationale. In practice, the uncertainty around these estimates is greater than these probabilities suggest, because they do not incorporate the uncertainty about which grid to choose (which is basically unquantifiable) – this is emphasised in the 2017 stock assessment report. It should be noted that this is no different to any other stock assessment; it is just brought into relief here by the fact that two of the sensitivities in the 2017 assessment have a significant impact on the stock assessment conclusions. Probability is quantified to the extent possible; on this basis, SG100 is met.</p>		
d	Evaluation of assessment			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			Y
	Justifi cation	<p>Alternative hypotheses in terms of model input parameter values or estimation methods, or model structure, are explored based on sensitivities, as described above (see Table 9). The transition from the 2014 reference case to the 2017 diagnostic case model is explained in Section 3.3.9, and shows the new or changed inputs and how they have been carefully evaluated at each stage. Alternative hypotheses are also explored externally; for example, an alternative Pacific-wide stock structure is considered in McKechnie et al. (2015b) (although based on the new growth model, SC14 recommend revisiting this hypothesis). Tremblay-Boyer et al. (2017a) considers the use of geo-statistics as a new method of standardising CPUE; opportunities for improving the input data (e.g. Peatman et al. (2017)) or developing new sources of input data (e.g. PNA (2017)) are considered by the SC each year. The conclusions of the 2017 stock assessment are not particularly robust in terms of providing a definitive conclusion about the stock status but this is not the fault of the assessment, and in fact the uncertainty associated with the assessment outcome is in some ways a consequence of the effectiveness of the assessment in considering all possible hypotheses. In any case, uncertainty in the 2018 updated assessment is reduced by the decision of the Scientific Committee to exclude the old growth model from the structural uncertainty grid (nicely illustrating the point made in the rationale for SIc). Met.</p>		
e	Peer review of assessment			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.

	Met?		Y	Y
	Justification	The initial proposed approach from SPC is reviewed by external scientists in a pre-assessment workshop (Pilling and Brouwer, 2017). The final assessment is then evaluated by the Scientific Committee who make a decision on the composition of the uncertainty grid to be used for providing advice to the Commission. A previous bigeye assessment (2011) had a formal external review (Ianelli et al., 2012). SG100 is met.		
	References	(Ianelli et al., 2012; McKechnie et al., 2015b; Farley et al., 2017b; WCPFC, 2018; McKechnie, Pilling, et al., 2017a; McKechnie, Tremblay-Boyer, et al., 2017; Peatman et al., 2017; PNA, 2017; Tremblay-Boyer et al., 2017a; WCPFC, 2017b; Vincent et al., 2018)		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				N/a

Appendix 1.2 Principle 2 scoring rationales

Evaluation Table for PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guide post	<p>Main primary species are likely to be above the PRI</p> <p>OR</p> <p>If the species is below the PRI, the UoA has measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding.</p>	<p>Main primary species are highly likely to be above the PRI</p> <p>OR</p> <p>If the species is below the PRI, there is either evidence of recovery or a demonstrably effective strategy in place between all MSC UoAs which categorise this species as main, to ensure that they collectively do not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that main primary species are above the PRI and are fluctuating around a level consistent with MSY.</p>
	Met?	<p>WCPO yellowfin – Y</p> <p>Blue marlin – Y</p> <p>NP albacore - Y</p>	<p>WCPO yellowfin – Y</p> <p>Blue marlin – Y</p> <p>NP albacore - Y</p>	<p>WCPO yellowfin – N</p> <p>Blue marlin – Y</p> <p>NP albacore - Y</p>
Justification		<p>Based on the observer and logbook data, WCPO yellowfin and blue marlin are the only species meeting the requirements for 'main' primary species. North Pacific albacore was included as 'main' on a precautionary basis (see Section 3.4.2). The main primary species are as follows: WCPO yellowfin, blue marlin, North Pacific albacore</p> <p>WCPO yellowfin (also see Section 3.4.3.1): Although no stock assessment was conducted in 2018, the latest stock indicators were presented at SC14 (WCPFC, 2018). Total yellowfin catch in 2017 was a record 670,890 tonnes, a 4% increase from 2016 and a 12% increase from the average 2012-2016. SC14 noted that under recent fishery conditions, the yellowfin stock was initially projected to increase as recent estimated relatively high recruitments support adult stock biomass, then decline slightly. Median $F_{2019}/F_{MSY} = 0.63$; median $SB_{2019}/SB_{MSY} = 1.51$. The risk that $SB_{2019} < LRP$ was estimated at 6% (WCPFC, 2018). On the basis that a 95% probability is needed for SG100 to be met, only SG80 is met for yellowfin.</p> <p>Blue marlin (also see Section 3.4.3.2): the most recent stock assessment for this stock dates from 2016 (ISC, 2016a). The assessment found that although estimates of total stock biomass show a long-term decline from the start of the assessment timeframe (1971) to 2014, female spawning biomass was estimated to be 24,809 mt in 2014, or about 25% above SSB_{MSY}. Fishing mortality was about 12% below F_{MSY}. The 95% confidence intervals shown on the Kobe plot (Figure 11) indicate there is a high degree of certainty that this stock is above the PRI and is fluctuating around a level consistent with MSY. SG100 is met.</p>		

		North Pacific albacore (also see Section 3.4.3.3): the most recent stock assessment by the Albacore Working Group of ISC was in 2017 (ISC, 2017a). The assessment estimated SSB (in terms of female spawner biomass) to be ~2.5 times above the LRP. Projections at constant fishing intensity suggest a high degree of certainty (>99%) that the SSB will not fall below the LRP in 2020 and 2025. Current fishing intensity ($F_{2012-2014}$) is below F_{MSY} and all F_{MSY} proxy reference points except $F_{50\%}$. There is therefore a high degree of certainty that this stock is above the PRI and is fluctuating around a level consistent with MSY. SG100 is met. Unobserved mortality of primary species is most likely to occur through ghost fishing. Gear loss in the UoA is reportedly minimal; however records of the number of terminal tackle or branchlines that are lost per set/trip/year per vessel are not recorded, although under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). However, lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The team considered that unobserved mortality through ghost fishing was unlikely to be a significant factor in the fishery's interactions with primary species.		
b	Minor primary species stock status			
	Guide post			For minor species that are below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species
	Met?			N
	Justification	Minor primary species and stocks are WCNPO swordfish, WCPO skipjack, Pacific bluefin tuna and WCNPO striped marlin. The status for each stock is summarized in the table below. Bluefin and striped marlin are not likely to be above the PRI and rebuilding trends are not apparent. The team adopted an all or nothing approach for minor species; SG100 is therefore not met.		
		Stock	Below PRI?	Reference
Western and Central North Pacific swordfish		No. Exploitable biomass of WCNPO swordfish fluctuated at or above B_{MSY} throughout the assessment time horizon and has remained high in recent years. Results indicated it was very unlikely that the WCNPO swordfish population biomass was below B_{MSY} in 2012.	ISC (2014)	
Western Central North Pacific striped marlin		Overfishing is occurring relative to MSY-based reference points and the WCNPO striped marlin stock is overfished. No LRP estimated however team made assumption that this stock is not likely (70 th percentile) to be above PRI. No rebuilding trend apparent.	ISC (2015)	
	WCPO skipjack	No. Recent levels of spawning biomass are well above the level that will support the MSY, and are well above the limit reference point, 20% $SB_{F=0}$.	McKechnie et al. (2016)	

		Pacific bluefin	Overfishing is occurring and the stock is overfished. Team made assumption that this stock is not likely (70 th percentile) to be above PRI. No rebuilding trend apparent.	ISC (2016b)
References	ISC (2014); ISC (2015); McKechnie et al. (2016); ISC (2016b); ISC (2016a); ISC (2017a); WCPFC (2018) UoA logbook data (Table 10) UoA observer data (Table 11)			
Species/stock				Score
WCPO yellowfin				80
Blue marlin				100
NP albacore				100
Minor				80
OVERALL PERFORMANCE INDICATOR SCORE:				90
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are measures in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to above the point where recruitment would be impaired.	There is a partial strategy in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a strategy in place for the UoA for managing main and minor primary species.
	Met?	WCPO yellowfin – Y Blue marlin – Y NP albacore – Y Minor - Y	WCPO yellowfin – Y Blue marlin – Y NP albacore – Y Minor - Y	WCPO yellowfin – N Blue marlin – N NP albacore – N Minor - N
	Justification	<p>The main primary species are as follows: WCPO yellowfin, blue marlin, North Pacific albacore</p> <p>MSC definition of a strategy (Table SA8):</p> <p>A “strategy” represents a cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts.</p> <p>A “partial strategy” represents a cohesive arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and an awareness of the need to change the measures should they cease to be effective. It may not have been designed to manage the impact on that component specifically.</p> <p>WCPO yellowfin: CMM 2014-06 commits WCPFC to putting in place a formal harvest strategy for its key stocks (WCPO skipjack, yellowfin and bigeye, and South Pacific albacore), with an associated workplan, although the workplan has been revised twice (at WCPFC13 and WCPFC14). In the meantime, yellowfin is managed through CMM 2017-01 which is intended to be a ‘bridging measure’ while work continues towards a formal harvest strategy. The objectives of the CMM for yellowfin are as follows:</p> <p><i>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.</i></p> <p>The measures outlined in the CMM are explained in Section 3.3.6 and are not repeated here. It is worth noting however that FSM are a SIDS (Small Island Developing State) and are therefore exempt from certain measures included in the CMM.</p>		

		<p>Being a PNA member, FSM has in place a vessel day scheme for its longline fleet which operates in a similar fashion as the purse seine VDS. The scheme allows a total of 123,000 longline days, which is significantly more than currently takes place and should therefore be regarded as aspirational without limiting the longline fishery for yellowfin. The team therefore did not consider the VDS in the management of the stock.</p> <p>In the absence of a formal harvest strategy, the team considered the measures in CMM 2017-01 to be part of a partial strategy rather than a full strategy. As such, SG80 is met but not SG100.</p> <p>Blue marlin: this species received a score of 100 in PI 2.1.1(a) – as such, the term ‘if necessary’ applies here and management as described under SG60 and SG80 is not required. SG80 is therefore met by default for blue marlin. There is no specific strategy in place to manage bycatch of blue marlin in either this fishery or at regional WCPFC level; bycatch is instead covered under the more generic WCPFC Resolution 2005-03 on Non-Target Fish Species. On that basis, SG100 is not met.</p> <p>NP albacore: as for blue marlin, SG60 and SG80 is met by default as this stock scored 100 under 2.1.1(a). In 2017, the WCPFC Northern Committee passed an ‘interim harvest strategy’ for North Pacific albacore which incorporates the WCPFC LRP of 20%SB_{F=0} and puts in place a decision rule relating to the LRP, as follows:</p> <p><i>In the event that, based on information from ISC, the spawning stock size decreases below the LRP at any time, NC will, at its next regular session or intersessionally if warranted, adopt a reasonable timeline, but no longer than 10 years, for rebuilding the spawning stock to at least the LRP and recommend a CMM that can be expected to achieve such rebuilding within that timeline.</i></p> <p>Aside from this interim harvest strategy, WCPFC and IATTC still have harmonised management measures in place, which have applied since 2005: i.e. CMM 2005-03 (WCPFC) and Resolution C-05-02 (IATTC) which have the same requirements. However, until a more formal harvest strategy has been adopted for the stock, the team did not consider SG100 to be met.</p> <p>Minor species: SG60 and SG80 are met by default. Management of minor primary species is covered under the generic WCPFC Resolution 2005-03 on Non-Target Fish Species. On that basis, SG100 is not met.</p>		
b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	WCPO yellowfin – Y Blue marlin – Y NP albacore – Y Minor - Y	WCPO yellowfin – Y Blue marlin – Y NP albacore – Y Minor - Y	WCPO yellowfin – N Blue marlin – N NP albacore – N Minor - N
	Justification	As stated in scoring issue a above, WCPO yellowfin, blue marlin and NP albacore received a score of 100 in PI 2.1.1 and management as described under SG60 and SG80 is not required in this PI. SG80 is therefore met by default for these stocks. Note that management for none of these stocks has been tested and SG100 is therefore not met.		

		WCPO yellowfin: There have been no status quo projections based on the new stock assessment, although in previous years it has been tested. For now, SG100 is not met. Blue marlin: Not tested. SG100 is not met. NP albacore: Status quo projections are provided in the stock assessment report. For constant effort it is suggested that the biomass will remain above the LRP with >95% confidence; this is not the case however for constant catch projections. The team did not consider there was high confidence in the effectiveness of the partial strategy. SG100 is not met. Minor species: In the absence of any testing, SG100 is not met. SG60 and SG80 are met by default.		
c	Management strategy implementation			
	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully .	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		Y	N
	Justification	Evidence for implementation of the partial strategies for all species includes VMS and observer data, landings data (port sampling), logbooks and the MCS system as described under Principle 3. In the absence of systematic non-compliance by the UoA the team considered that SG80 should be met. However, considering the low observer coverage in this fishery (see Section 3.4.1) and taking into account the fact that much of CMM 2017-01 relies on factors that are outside the control of the UoA (e.g. other longline fisheries, the purse seine fishery), the team felt that clear evidence of its successful implementation is lacking. SG100 is not met.		
d	Shark finning			
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	No primary species are sharks: sharks are all protected in FSM and are therefore considered under ETP species below. Not relevant.		
e	Review of alternative measures			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	Y	Y	N

	Justification	All main primary species are retained for sale, as evidenced by the observer data. There is no unwanted catch of main primary species. SG60 and 80 are met by default. SG100 is not met as it is unclear to the assessment team whether there is a biennial review of alternative measures with respect to primary species in particular.
	References	CMM 2017-01; WCPFC Resolution 2005-03 UoA logbook data (Table 10) UoA observer data (Table 11)
Species/stock		Score
WCPO bigeye		80
Blue marlin		80
NP albacore		80
Minor		80
OVERALL PERFORMANCE INDICATOR SCORE:		80
CONDITION NUMBER (if relevant):		N/a

Evaluation Table for PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main species			
	Guide post	Qualitative information is adequate to estimate the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is adequate to assess the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status.
	Met?	Y	Y	Y
	Justification	There is quantitative information on the catch of main and minor primary species (landings and discards) from logbooks, port sampling and observers. Each of the main primary stocks has a stock assessment (see 2.1.1a), providing quantitative information on total landings and stock biomass. As most if not all primary species are retained for sale, logbooks (which provide 100% coverage) enable the impact of the UoA on these stocks to be evaluated with a high degree of certainty; SG100 is met.		
b	Information adequacy for assessment of impact on minor species			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			Y
	Justification	See above – met.		
c	Information adequacy for management strategy			
	Guide post	Information is adequate to support measures to manage main primary species.	Information is adequate to support a partial strategy to manage main Primary species.	Information is adequate to support a strategy to manage all primary species, and evaluate with a high degree of

				certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	A partial strategy is in place for main primary species where necessary (see 2.1.2) and the information required to support it (fishing effort via logbooks and VMS, landings, discards) is available as set out above. In the absence of a full strategy, SG100 is not met.		
	References	UoA logbook data (Table 10) UoA observer data (Table 11) See also Pls 2.1.1, 2.1.2 and references therein		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biological based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guide post	<p>Main Secondary species are likely to be within biologically based limits.</p> <p>OR</p> <p>If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.</p>	<p>Main secondary species are highly likely to be above biologically based limits</p> <p>OR</p> <p>If below biologically based limits, there is either evidence of recovery or a demonstrably effective partial strategy in place such that the UoA does not hinder recovery and rebuilding.</p> <p>AND</p> <p>Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that main secondary species are within biologically based limits.</p>
	Met?	Y	Y	N
	Justification	<p>With the exception of bait, there are no 'main' secondary species (see Section 3.4.3).</p> <p>Bait (see Section 3.4.4): The fishery only uses Indian oil sardine (<i>Sardinella longiceps</i>), which in 2015/16 accounted for ca. 45 % of the average total catch (including landings, discards and bait). The Indian oil sardine is a highly migratory small pelagic fish distributed on the entire west coast of India from Gujarat to Kerala, and also on Tamil Nadu, Pondichery, Andhra Pradesh and Orisha in the Indian east coast, but the highest abundance is observed off Kerala and Karnataka coasts (FishSource.org). The client reports that the bait is sourced from China but this is not the catch area as the species does not occur in Chinese waters (Figure 13). The most likely sources are either Indian, Pakistani or Omani coastal waters where commercial fisheries for this species exist. A stock assessment was carried out for <i>S. longiceps</i> in Oman in 2013 (Zaki et al., 2013), reporting an average annual yield at 2,732 tonnes with MSY at 2,886 t and therefore highly likely to be above biologically based limits. However, considering the UoA uses on average 2,500 tonnes annually, the team considered it highly unlikely that this predominantly artisanal fishery with such low yield was the source of the bait. For the Pakistan stock, a stock appraisal was carried out in 2016 (Baset et al., 2017). The average annual landings of <i>S. longiceps</i> stocks were 38,353 t while the highest</p>		

		<p>and lowest 65,050 t in 1994 and 26,937 t in 2009 was recorded correspondingly, below the estimated MSY values. This stock is therefore also considered to be above biologically-based limits. By far the largest fishery is in India, which is the most likely ultimate source of the bait for this fishery. In India, populations of oil sardine are normally assessed separately for each State and trends in catches for each major state are shown in Table 13.</p> <p>The species grows rapidly, matures early, and is highly fecund. Population size for <i>S. longiceps</i> is highly erratic and susceptible to environmental fluctuations, with FAO catch statistics indicating large-scale annual fluctuations in the landings of this species. Fishery output and population parameters are being monitored by the Central Marine Fisheries Research Institute (CMFRI) and used as a proxy for stock survey (Andrews et al., 2008). Rapid stock assessments are conducted frequently for all coastal states by the CMFRI (FishSource.org). The latest stock status results for each state are shown in Table 13. With the exception of Karnataka, considered 'Less abundant' as of 2016, all are either abundant or underexploited - see CMFR Annual Reports, the most recent of which is CMFRI (2017). Whilst there are no indications that the populations at state level, or indeed at stock level overall, are below biologically based limits, the team considered it more precautionary to also evaluate the second part of this scoring guidepost. Assuming the Indian fishery as the most likely source of bait, this fishery uses approximately 2,500 tonnes of bait per year, or approx. 1% of the total 2016 Indian landings from state-level populations estimated at 239,000 tonnes according to Table 13 (i.e. the best-case scenario). Under the worst-case scenario, which assumes that 100% of the bait come from the population with the lowest catch levels (Maharashtra in Table 13), this fishery uses 22% of the total catch. MSC Guidance GSA3.4.6 states that even if the total catch of a species is clearly hindering recovery, UoA catches of less than 30% of the total catch of a species may not normally be influential in hindering a recovery in a marginal sense. Although <i>S. longiceps</i> is a popular choice for bait in longline fisheries, the longline fisheries in the MSC programme combined that make use of this species are highly unlikely to exceed this 30% threshold. It is further noted that the two smallest populations (in terms of catches) Maharashtra and Andhra Pradesh are both considered underexploited by the CMFRI (see Table 13). Overall, the relatively low quantities of bait used in this fishery compared with total landings from the most likely stocks constitute a partial strategy which ensure that this fishery is having no overall impact on the stock. SG80 is met. However, the uncertainty surrounding the exact bait provenance means that either part of SG100 cannot be said to be met.</p> <p>Unobserved mortality of secondary species is most likely to occur through ghost fishing. Gear loss in the UoA is reportedly minimal; however records of the number of terminal tackle or branchlines that are lost per set/trip/year per vessel are not recorded, although under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). However, lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The team considered that unobserved mortality through ghost fishing was unlikely to be a significant factor in the fishery's interactions with secondary species.</p>		
b	Minor secondary species stock status			
	Guide post			For minor species that are below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species

	Met?			N
	Justification	There is a long list of minor secondary species (see Table 10 and Table 11) and they have not been evaluated individually. Using an all or nothing approach, this scoring issue is therefore not met.		
References		UoA logbook and observer data CMFRI (2012) and Andrews et al. (2008)		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a partial strategy in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a strategy in place for the UoA for managing main and minor secondary species.
	Met?	Y	Y	N
	Justification	With the exception of bait, there are no ‘main’ secondary species (see Section 3.4.3). Minor species were not evaluated in detail and were not considered to meet SG100. As set out in PI 2.2.1(a), the amount of bait used by this fishery is small in comparison to the total landings and biomass for the most likely source stock. This, together with the fact that the volume of bait use is monitored constitutes a partial strategy to ensure that the fishery has no impact on the stock. It does not, however, meet MSC’s definition of a strategy as given above, so SG100 is not met		
b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	Y	Y	N
	Justification	For the bait species, the amount of bait used by this fishery being small in comparison to the total landings and biomass for the most likely source stock, provides an objective basis for confidence that it is not having any impact on the stock. SG80 is met. Although the team had high confidence of a lack of impact, there is nothing in place that would constitute testing; either for the bait or for the minor species. SG100 is not met.		
	Management strategy implementation			

c	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully .	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).	
	Met?		Y	N	
	Justification	The quantity of bait used is known, as are total landings from the most likely source stocks. SG80 is met. In the absence of a strategy or a partial strategy which also covers minor species, the team did not consider SG100 to be met.			
d	Shark finning				
	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.	
	Met?	Not relevant	Not relevant	Not relevant	
	Justification	No secondary species are sharks: sharks are all protected in FSM and are therefore considered under ETP species below. Not relevant.			
e	Review of alternative measures to minimise mortality of unwanted catch				
	Justification	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all secondary species, and they are implemented, as appropriate.	
	Met?	Y	Y	N	
	Guide post	For the bait species, there is no unwanted catch as all of it is purchased and used. This scoring issue is therefore not relevant. Since there are no other main secondary species, SG60 and SG80 are met by default. Not all minor secondary species are desirable, and as far as the team is aware there is no biennial review of alternative measures to minimise these catches. SG100 is not met.			
References		UoA logbook and observer data; Site visit interviews			
OVERALL PERFORMANCE INDICATOR SCORE:					80
CONDITION NUMBER (if relevant):					N/a

Evaluation Table for PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guide post	Qualitative information is adequate to estimate the impact of the UoA on the main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and adequate to assess the impact of the UoA on main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and adequate to assess with a high degree of certainty the impact of the UoA on main secondary species with respect to status.
	Met?	Y	Y	N
	Justification	Other than the bait <i>S. longiceps</i> , there are no main secondary species. Bait species: There is quantitative information on the purchase of bait (based on client purchase data). The quantity of bait used is therefore known, as are the landings of the most likely source stocks. Some quantitative information is thus available and adequate to assess the impact of the UoA on the species. SG80 is met. SG100 is not met as more precise information is needed on which state-level population(s) the Indian oil sardine is/are sourced from.		
	b	Information adequacy for assessment of impacts on minor secondary species		
Guide post				Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
Met?				N
Justification		There is a long list of minor secondary species (see Table 10 and Table 11). The impact of the UoA on these stocks in terms of catch (landings, discards, mortality to point of discard) can be evaluated via the observer reports, but in some cases little is known about the stock structure and status, so SG100 is not met in full.		
	Information adequacy for management strategy			

c	Guide post	Information is adequate to support measures to manage main secondary species.	Information is adequate to support a partial strategy to manage main secondary species.	Information is adequate to support a strategy to manage all secondary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective .
	Met?	Y	Y	N
	Justification	For the bait species, the team concluded that there is a 'partial strategy' in place for bait rather than a strategy (see 2.2.2). The information available (purchase data, landings data) is sufficient to support this partial strategy and SG80 is met. In the absence of a formal strategy for all secondary species however SG100 is not met.		
References		UoA logbook and observer data Site visit interviews		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Effects of the UoA on population/stock within national or international limits, where applicable			
	Guide post	Where national and/or international requirements set limits for ETP species, the effects of the UoA on the population/stock are known and likely to be within these limits.	Where national and/or international requirements set limits for ETP species, the combined effects of the MSC UoAs on the population/stock are known and highly likely to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a high degree of certainty that the combined effects of the MSC UoAs are within these limits.
	Met?	Not scored – no limits	Not scored – no limits	Not scored – no limits
	Justification	ETP species are discussed in Section 3.4.5 Table 14 and include the following: - Elasmobranchs (sharks and rays) - Sea turtles - Seabirds - Cetaceans Formal 'limits' (national or international) which trigger management action are not in place for any of these species groups. This scoring issue was therefore not scored.		
	b	Direct effects		
Guide post		Known direct effects of the UoA are likely to not hinder recovery of ETP species.	Known direct effects of the UoA are highly likely to not hinder recovery of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
Met?		Y	Y – Elasmobranchs N – Sea turtles Y – Seabirds Y - Cetaceans	N – Elasmobranchs N – Sea turtles N – Seabirds N - Cetaceans
Justification		Elasmobranchs: For the purposes of scoring, the assessment team focused on the most frequently caught elasmobranchs according to the observer data (Table 11) this concerns silky shark, blue shark and pelagic stingray. The total direct effects of the fishery on elasmobranchs, including scaled up estimates of total fleet bycatch are estimated in Table 14. As explained in Section 3.4.5.1, the team assumed 50% mortality for all sharks concerned. On this basis, the following mortality estimates were derived for the three key species: - Blue shark: 129 ind./year		

	<p>- Silky shark: 834 ind./year</p> <p>- Pelagic stingray: 447 ind./year</p> <p>Note that these estimates should be considered at an order of magnitude rather than as absolute values.</p> <p>Blue shark: The most recent stock assessment for the North Pacific stock carried out by ISC (2017b) (see Section 3.4.5.1 for details) considers this stock not overfished with overfishing not occurring. The reference case model estimates current spawning biomass (SB₂₀₁₅) at 308,286 tonnes. The scaled up observer data estimates the average annual UoA catch of blue shark at 258 ind. or 5.43 tonnes (Table 14). Assuming 50% mortality, this corresponds to less than 0.01% of the estimated SB. On that basis, known direct effects of the UoA are highly likely to not hinder recovery of blue shark and SG80 is met.</p> <p>Silky shark: The most recent stock assessment (Rice and Harley, 2013) (see Section 3.4.5.1 for details) estimates 'current' catch (2005-8) at 5,331 t (although this estimate is highly uncertain). This fishery catches ~12.5 t/year, resulting in a mortality of ~6.25 t/year, or ~0.1 % of the total catch. On this basis, SG80 is met.</p> <p>Pelagic stingrays: the estimated average annual catch by the UoA is 894 ind. or 60 tonnes. Although there is some debate as to consistency of reporting of pelagic stingrays in fisheries statistics and data are lacking from several areas of the species' range, there are no data to suggest that significant declines have occurred in this species (Baum et al., 2009). Given increasing trends observed in some regions, this species' widespread distribution, and in the absence of evidence to suggest significant declines, it is currently assessed as of Least Concern globally (Baum et al., 2009). For this reason, the team considered that known direct effects of the UoA are highly likely to not hinder recovery of this species. SG80 is met.</p> <p>Overall, considering the levels of uncertainty in population estimates and the low level of observer coverage in this fishery, the team considered that SG100 was not met for elasmobranchs.</p> <p>Sea turtles: Only two interactions with sea turtles were recorded in the observer data (Table 14) both of which were loggerheads and were dead at point of discard. Considering the low level of observer coverage and low number of interactions, the team made no attempt to scale up these data. The FSM EEZ overlaps with 4 sea turtle Regional Management Units (RMUs), none of which concern the loggerhead but four other species: green turtle, hawksbill, leatherback and olive ridley (see Section 3.4.5.2). The olive ridley RMU is considered at high risk from bycatch in longlines (Wallace et al., 2013).</p> <p>The distribution of sea turtles in FSM waters is not well known, although the green turtle is thought to be the most abundant with moderate nesting colonies on some of the outer islands (Ahser, 2002). An overview of known nesting sites is also available here: http://seamap.env.duke.edu/swot. This suggests that interactions with adult nesting females may occur which would have a more severe impact at population level than interactions with only juveniles. Although observer coverage is limited and recorded interactions rates are low, a study on the bycatch profile of the pelagic tuna longline fishery in neighboring Palau which is a shallow-set fishery (the FSM fishery makes deep sets and therefore very likely has significantly lower catch rates of sea turtles and other epipelagic species) \ (Gilman et al., 2015), indicates a higher interaction rate is possible, with 106 sea turtles caught during 232 observed sets (or 60 trips) between 1999 and 2011 (excluding 2000 to 2003 and 2006). Although the known direct effects of the UoA are likely to not hinder recovery of ETP species, more information would be required to determine that this is highly likely to be the case. SG80 is not met.</p> <p>Seabirds: Although none of the observer reports cite interactions with seabirds, the observer coverage in this fishery is low (Section 3.4.1). As such, the team considered potential impacts of this fishery on vulnerable seabird species on a precautionary basis. Watling (2002), based on interviews with WCPO industry stakeholders and observer data, indicates that although seabird interactions with</p>
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		<p>longline vessels operating in tropical and subtropical areas of the WCPO are very rare (except in the Hawaii-based longline fisheries) this does not preclude the possibility of highly threatened seabird populations being impacted. Gilman (2006) equally concluded that existing observer data are currently insufficient to support a conclusion with any high level of certainty that no pelagic longline fisheries operating in the tropical Pacific Islands region could be contributing to existing or cause future seabird population declines.</p> <p>According to Filippi et al. (2010), the FSM EEZ is located in a low-risk area for seabird interactions (see Figure 18 in Section 3.4.5.3) and none of the mitigation measures listed in the recently updated CMM 2017-06 have to be applied by longline fisheries in FSM. Furthermore, the study by Gilman et al. (2015) found only 2 interactions with seabirds in a similar fishery in neighboring Palau. On this basis, the team considered it highly likely that the fishery is not hindering recovery of seabird species and SG80 is met. Without a more robust observer dataset, however, this cannot be said with a high degree of certainty and SG100 is not met.</p> <p>Cetaceans: As for seabirds, no interactions with cetaceans were cited in the UoA observer data; however this group was considered on a precautionary basis (Section 3.4.5.4). There are two main types of interaction between cetaceans and longlines: depredation and entanglement, the latter often following on from the former (Anderson, 2014). The study by Gilman et al. (2015) found only one interaction with a toothed whale in the Palau longline fishery. On this basis, the team considered it highly likely that the UoA is not hindering recovery of cetacean species and SG80 is met. Here also, however, without a more robust observer dataset, this cannot be said with a high degree of certainty and SG100 is not met.</p> <p>Unobserved mortality of ETP species is most likely to occur through ghost fishing. Gear loss in the UoA is reportedly minimal; however records of the number of terminal tackle or branchlines that are lost per set/trip/year per vessel are not recorded, although under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). However, lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). Nevertheless, ETP species may be more vulnerable to ghost fishing through entanglement than primary or secondary species. Although there is some monitoring of gear loss in the UoA through the observer programme, the lack of better, UoA-specific data means there can be no high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species. A recommendation has therefore been issued for UoA vessels to systematically report on the extent of gear loss per trip (for example by recording the number of hooks lost).</p>	
c	Indirect effects		
	Guide post	Indirect effects have been considered and are thought to be highly likely to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans

	Justification	<p>Note: Discard and post-release mortality is accounted for in the data cited above and is therefore not an indirect effect. The team considered possible indirect effects to be as follows:</p> <p>Elasmobranchs: None</p> <p>Sea turtles: Disturbance around nesting areas / inter-nesting foraging areas</p> <p>Seabirds: Disturbance around nesting / roosting areas</p> <p>Cetaceans: Noise disturbance, change in foraging behaviour</p> <p>For sea turtles and seabirds, disturbance around inshore nesting, foraging or roosting areas is highly unlikely as vessels are not permitted to operate within 24nm from any landmass with the EEZ (Section 3.2.5). As compliance with this measure is high according to NORMA, the team considered that SG100 should be met.</p> <p>Mammals: Noise disturbance is likely to be minimal because the number of vessels is limited relative to the size of the EEZ. It is known that marine mammals have changed their foraging behaviour in response to the availability of fish on longlines – individual fishers will try to mitigate this by avoiding setting or hauling in the presence of mammals if possible. Aside from the risk of bycatch (considered above), it has been shown in other fisheries (e.g. orcas in toothfish fisheries) that the impact on the mammals themselves is positive, as one would expect. Overall, the team concluded that SG100 is met.</p>
References	(Ahser, 2002; Watling, 2002; Gilman, 2006; Filippi et al., 2010; Rice and Harley, 2013; Wallace et al., 2013; Anderson, 2014; Gilman et al., 2015; ISC, 2017b)	
Element		Score
Elasmobranchs		90
Sea turtles		70
Seabirds		90
Cetaceans		90
OVERALL PERFORMANCE INDICATOR SCORE:		75 (sea turtles)
CONDITION NUMBER (if relevant):		3

Evaluation Table for PI 2.3.2 – ETP species management strategy

PI 2.3.2		The UoA has in place precautionary management strategies designed to: <ul style="list-style-type: none"> • meet national and international requirements; • ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place (national and international requirements)			
	Guide post	There are measures in place that minimise the UoA-related mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	N – Elasmobranchs N – Sea turtles N – Seabirds N - Cetaceans
	Justification	<p>MSC definitions:</p> <p>A “strategy” represents a cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts.</p> <p>A “comprehensive strategy” (applicable only for ETP component) is a complete and tested strategy made up of linked monitoring, analyses, and management measures and responses.</p> <p><u>All ETP species</u>: FSM participates in the Regional Observer Programme (ROP) which at a regional level aims to collect verified catch data, other scientific data, and additional information related to the fishery, including on the implementation of CMMs. CMM 2007-01 entered into force on 15 February 2008, and provides the basis of the rules and development of the WCPFC ROP and sets a minimum required national observer coverage of 5% for longline fisheries (see Section 3.4.1).</p> <p>Elasmobranchs: There are various CMMs in place at regional level which relate to shark bycatch. CMM 2010-07 is the overarching measure on sharks which stipulates <i>inter alia</i> that fins on board vessels should total no more than 5% of the weight of sharks on board up to the first point of landing (see Section 3.4.5.1 for further details) and that CCMs should develop a national NPOA in line with the FAO's IPOA.</p>		

	<p>Species-specific CMMs are further in place for silky sharks (CMM 2013-08) and oceanic whitetip sharks (CMM 2011-04), both of which prohibit CCMs from retaining on board, transshipping, storing on a fishing vessel, or landing any oceanic whitetip or silky shark, in whole or in part, in the fisheries covered by the Convention. CCMs are further required to release any individuals as soon as possible after being brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible.</p> <p>At national FSM level, all elasmobranchs (sharks and rays) are protected under Section 913 of its FSM Code Title 24. The regulation does not ban the landing of sharks, but stipulates that all sharks caught alive must be released and that any shark dead upon hauling may be landed with its fins naturally attached. At state level (Chuuk, Pohnpei, Kosrae and Yaap), shark sanctuaries are in place and sharks are only allowed to be targeted for traditional use. This does not affect the UoA however as this fishery takes place outside the 24nm limit. Since the regulations were adopted in 2015, NORMA reports a good level of compliance by all longline fleets, including the UoA. Although the regulations do not prohibit the landing of sharks, the ban on shark finning is crucial in that it acts as a disincentive for retention (volume taken up by the carcass of a shark is disproportionate to its value). One side-effect, however, has been that sharks that were previously retained and therefore reported in logbook data, are now more frequently cut off at the line which has likely resulted in under-reporting.</p> <p>The team considered that the above measures constitute a strategy, designed to minimise mortality on elasmobranchs and sharks specifically and that SG80 is met. Although the strategy goes above and beyond regional requirement (i.e. the ban on shark finning) the issues around underreporting of shark bycatch combined with the low observer coverage, prevent SG100 from being met.</p> <p>Sea turtles: At regional level, CMM-2008-03 on the conservation and management of sea turtles is in force, requiring the implementation of the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations, which include the use of wide circle hooks; using fish rather than squid for bait; and setting hooks deeper than turtle abundant depths (40–100 m). The CMM also details reporting requirements for CCMs and best practice guidelines to ensure the survival of captured sea turtles. For longline vessels, the CMM specifically requires that operators carry and use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled and, where appropriate, carry and use dip-nets. At national FSM level, there is no NPOA on sea turtles as of yet. As far as the team is aware, this is also not yet in the drafting phase. Legislation is however in place under the Marine Preservation Act which sets limitations on the taking of sea turtles for traditional consumption and which does not apply to this fishery. At national level, management of sea turtle bycatch in longline fisheries therefore defaults to CMM-2008-03.</p> <p>The team considered that the above measures constitute a strategy, designed to minimise mortality on sea turtles specifically and that SG80 is met. However, due to the issues around observer coverage, SG100 should not be met.</p> <p>Seabirds: In December 2017 (WCPFC14), CMM 2017-06 was agreed on mitigating the impact of fishing for highly migratory fish stocks on seabirds. The CMM sets out requirements for CCMs to develop NPOAs, as well as a series of mitigation measures for tuna longline fisheries operating south of 30°S and north of 23°N. The FSM EEZ being located between 13°26'N and 1°10'S is, however, exempt from these mitigation measures. As for the other species groups, the team considered that the above measures constitute a strategy, designed to minimise mortality on seabirds specifically and that SG80 is met. However, due to the issues around observer coverage, SG100 is not met.</p> <p>Cetaceans: For cetaceans, interactions are generally caused by depredation and are rare for the fishery under assessment. While cetaceans are not specifically addressed in any CMMs for WCPO longline fisheries, their protection is ensured through the Pacific Islands MoU which FSM is a signatory to (see Section 3.4.5.4). On the basis that cetaceans are unlikely to be a problem for the fishery under</p>
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		assessment, the team considered this requirement to constitute a strategy and sufficient for SG80 to be met. As for the other ETP groups, the low observer coverage precludes SG100 from being met. As explained in 2.3.1b unobserved mortality of ETP species is most likely to occur through ghost fishing which falls under the wider concept of waste management. NORMA adopted an ecosystem approach in the development of the Tuna Management Plan 2015. The objectives of the TMP relevant to Principle 2 include ecosystem & biodiversity maintenance and waste minimization. The Client further has in place a Waste Management Plan, which includes provisions on the correct disposal of fishing gear. Although gear loss is reportedly minimal, lost gear is currently not recorded by the client. However, under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Under CMM 2017-04, which enters into force from January 2019, CCMs shall also encourage their fishing vessels within the WCPFC Convention Area to retrieve abandoned, lost or discarded fishing gear and retain the material on board, separate from other waste for discharge to port reception facilities. Where retrieval is not possible or does not occur, CCMs shall encourage their fishing vessels to report the latitude, longitude, type, size and age of abandoned, lost or discarded fishing gear. The team was therefore satisfied that there is a management strategy in place to address the issue of lost fishing gear and associated ghost fishing. SG80 is met. In the absence of better, UoA specific monitoring of gear loss, however, it cannot be said that there is a comprehensive strategy. SG100 is not met.		
b	Management strategy in place (alternative)			
	Guide post	There are measures in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a strategy in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a comprehensive strategy in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species
	Met?	Not scored	Not scored	Not scored
	Justification	Only scored where there are no requirements for protection and rebuilding provided through national ETP legislation or international agreements.		
c	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the measures/strategy will work, based on information directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	N – Elasmobranchs N – Sea turtles N – Seabirds N - Cetaceans

	Justification	<p>Elasmobranchs: Since the FSM regulations were adopted in 2015, NORMA reports a good level of compliance by all longline fleets, as well as a decline in the number of sharks being landed. Although the regulations do not prohibit the landing of sharks, the ban on shark finning is crucial in that it acts as a disincentive for retention (volume taken up by the carcass of a shark is disproportionate to its value). One side-effect, however, has been that sharks that were previously retained and therefore reported in logbook data, are now more frequently cut off at the line which has likely resulted in under-reporting. This means that the observer data are now the only reliable source on interactions with sharks in this fishery. While the team agreed that the available observer data provides some objective basis for confidence that the strategy will work (SG80 is met), the evidence base was lacking to provide high confidence. SG100 is not met.</p> <p>Sea turtles: In the Hawaii longline fishery, combined turtle species capture rates declined by ~ 90% from the period before national sea turtle bycatch mitigation regulations came into effect to the period after the regulations came into effect (Gilman et al., 2007b) . While changes in the timing of setting and gear retrieval between the two time periods (as a result of the seabird CMM) may be another cause of the observed changes in turtle catch rates, this provides an objective basis for confidence that strategy is working. In the absence of more robust observer data, SG100 is not met.</p> <p>Seabirds: Based on the analysis by Filippi et al. (2010), described in Section 3.4.5.3, the team agreed that SG80 is met. Considering the low observer coverage however, SG100 is not met.</p> <p>Cetaceans: the fact that cetaceans are unlikely to be a problem for pelagic longline fisheries and the low level of reported interactions with this fishery provides an objective basis for confidence that the strategy will work. SG80 is therefore met. In the absence of more robust observer data, SG100 is not met.</p>		
d	Management strategy implementation			
	Guide post		There is some evidence that the measures/strategy is being implemented successfully.	There is clear evidence that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b).
	Met?		N	N
	Justification	All ETP species: during site visit interviews non-compliance by the UoA fleet was not a cause for concern in this fishery (Section on 3.5.6) and observations during the site visit indicated that some measures (e.g. turtle dehookers) were being implemented. Whilst there is no evidence that the measures described in SIa are not being implemented successfully, the observer coverage in this fishery is currently too low to provide evidence that this is indeed the case. The team therefore concluded that the current non-compliance with 5% observer rates required by CMM 2007-01 precludes SG80 from being met.		
e	Review of alternative measures to minimize mortality of ETP species			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.

Met?	Y	Y	Y
Justification	<p>UoA vessels participate in research activities on bycatch mitigation, including on hook size selectivity and ecological risk assessments. A study that included FSM waters was Gilman, E., Chaloupka, M., Musyl, M. 2018. Effects of pelagic longline hook size on species- and size-selectivity and survival. Reviews in Fish Biology and Fisheries 28: 417-433. https://doi.org/10.1007/s11160-017-9509-7. And although in neighbouring RMI waters, the following study was also carried out in cooperation with the client fleet: Gilman, E., Owens, M., Kraft, T. 2014. Ecological risk assessment of the Marshall Islands longline tuna fishery. Marine Policy 44: 239-255</p> <p>At the annual meeting of the WCPFC Scientific Committee, the Ecosystem and Bycatch Mitigation Theme exists to do precisely this. Working and information papers presented to SC12 (2016) include the following:</p> <ul style="list-style-type: none"> • EB-WP-05: Technical details on the development of shark management plans • EB-WP-06: Implications of the choice of mitigation measure on mortality of silky and oceanic white-tips • EB-WP-07: The outcome of different shark handling practices for post-release mortality • EB-WP-08: Review of available information on non-key sharks [including mantas and mobulids] and fisheries interactions • EB-WP-10: Improving tori line performance in small vessel longline fisheries • EB-WP-11: Report of a WCPFC workshop on the effectiveness of turtle bycatch mitigation measures • EB-WP-13: Effectiveness of seabird mitigation measures on small vessels north of 23° S • EB-IP-04: Cross-taxa comparison of the effectiveness of mitigation measures for elasmobranchs • EB-IP-05: Advice from ACAP on reducing longline impacts on birds • EB-IP-06: Development and testing of the 'hook pod' to reduce seabird impacts in New Zealand longline fisheries • EB-IP-11: Use of biodegradable twine <p>Likewise at SC11:</p> <ul style="list-style-type: none"> • EB-WP-02: Monte Carlo simulation modelling of measures to reduce impacts on silky and oceanic white-tip sharks • EB-WP-05: Analysis of the effectiveness of turtle mitigation measures in longline fisheries • EB-WP-10: At-sea experiments to develop mitigation measures for seabird bycatch in small boat longline fisheries in the North Pacific <p>Furthermore, as part of the ABNJ Tuna project, there have been a number of workshops on bycatch in longlines with particular emphasis on sharks, sea turtles and seabirds with several studies (shark post-release tagging studies, seabird mortality analysis) being carried out as a result.</p> <p>As a consequence of <i>inter alia</i> the above bycatch mitigation studies, WCPFC CMMs are regularly revised to include best practice. For example the Commission agreed to adopt CMM 2017-06 Conservation and Management Measure for Mitigating Impacts of Fishing on Seabirds, which will replaced CMM 2015-03. This revision was largely based on WCPFC14-2017-DP05 Proposed changes to CMM 2015-03 in regards the seabird mitigation requirements (Rev 1). CMM 2017-04 Conservation and Management Measure on Marine Pollution was also adopted following proposal WCPFC14- 2017-DP15 submitted by the Republic of the Marshall Islands to limit marine pollution from fishing vessels, including abandoned, lost or otherwise discarded fishing gear. At the annual WCPFC Commission</p>		

		meetings, the SC and TCC are further tasked to consider alternative bycatch management strategies with respect to improving existing CMMs. This is clearly evidenced in WCPFC Commission Regular Session reports, the latest of which is WCPFC14. The potential effectiveness and practicality of alternative measures to minimise UoA-related mortality on ETP species are implemented as appropriate. SG100 is met.
References		<p>(Filippi et al., 2010) (Gilman et al., 2007b) ;</p> <p>References given in scoring issue e are not listed again individually here, but can be located by going to the meeting page (https://www.wcpfc.int/meetings/sc12) and selecting the tab 'Ecosystem and Bycatch Mitigation Theme' (and likewise for SC11).</p> <p>CMM 2007-01 CMM 2010-07 CMM 2013-08 CMM 2011-04 CMM-2008-03 CMM 2017-06</p>
Elasmobranchs		75
Sea turtles		75
Seabirds		75
Cetaceans		75
OVERALL PERFORMANCE INDICATOR SCORE:		75
CONDITION NUMBER (if relevant):		4

Evaluation Table for PI 2.3.3 – ETP species information

PI 2.3.3		Relevant information is collected to support the management of UoA impacts on ETP species, including: <ul style="list-style-type: none">• Information for the development of the management strategy;• Information to assess the effectiveness of the management strategy; and• Information to determine the outcome status of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts			
	Guide post	Qualitative information is adequate to estimate the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for ETP species.	Some quantitative information is adequate to assess the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Y – Elasmobranchs Y – Sea turtles Y – Seabirds Y - Cetaceans	Y – Elasmobranchs N – Sea turtles Y – Seabirds Y - Cetaceans	N – Elasmobranchs N – Sea turtles N – Seabirds N - Cetaceans
	Justification	Elasmobranchs: Some quantitative information is available from observer reports, enabling UoA related mortality and the impact on the relevant populations to be estimated (see PI2.3.1). SG80 is met. Considering the low level of observer coverage, SG100 is not met. Sea turtles: as rare-event species, the observer coverage is currently too low to enable a quantitative estimation of mortality rates. SG80 is not met. Seabirds and cetaceans: considering the low likelihood of interactions (explained in PI 2.3.1), the observer data are sufficient for the UoA impact to be estimated. SG80 is met. The observer coverage is too low for SG100 to be met.		
b	Information adequacy for management strategy			
	Guide post	Information is adequate to support measures to manage the impacts on ETP species.	Information is adequate to measure trends and support a strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with

				high degree of certainty whether a strategy is achieving its objectives.
	Met?	Y	N	N
	Justification	All ETP species: much of the information used in the scoring of the ETP species component stems from studies on similar fisheries (e.g. Gilman et al. (2015)) or risk assessments (e.g. Filippi et al. (2010)), with the only fishery-specific information provided by a limited observer dataset. While the strategies in place are considered appropriate to manage the UoA's impact on ETP species (PI 2.3.2), the evidence base is lacking to detect increases in risk level and adapt management strategies on an ongoing basis. For this reason, SG80 is not met.		
References		(Filippi et al., 2010; Gilman et al., 2015)		
Elasmobranchs				70
Sea turtles				60
Seabirds				70
Cetaceans				70
OVERALL PERFORMANCE INDICATOR SCORE:				65
CONDITION NUMBER (if relevant):				5

Evaluation Table for PI 2.4.1 – Habitats outcome

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.		
Scoring Issue		SG 60	SG 80	SG 100
a	Commonly encountered habitat status			
	Guide post	The UoA is unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Y
	Justification	The longline fishery takes place in deep water and is highly unlikely to interact with benthic features. Gear loss is reportedly minimal in the UoA – if it does occur, lost gear may consist of monofilament and/or hooks and is only likely to continue to fish as long as bait remains on the hooks. Bait is stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is low (Macfadyen et al., 2009). SG100 is therefore met.		
b	VME habitat status			
	Guide post	The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Y
	Justification	See above. SG100 is met.		
c	Minor habitat status			
	Guide post			There is evidence that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where

				there would be serious or irreversible harm.
	Met?			Y
	Justification	As above. Met.		
References		Site visit interviews		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	Y	Y	N
	Justification	Considering that this fishery is extremely unlikely to impact benthic habitats, the term ‘if necessary’ applies here and management measures should not be required. SG 60 and 80 are therefore met by default. There is, however, no strategy in place which specifically aims to manage the impacts of the fishery on habitat types (either directly or through ghost fishing), as required by MSC for a score of 100. SG100 is therefore not met.		
b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or habitats involved.
	Met?	Y	Y	Y
	Justification	The ‘partial strategy’ is the nature of the fishery (pelagic only); there is therefore high confidence that it works, based on information directly about the gear type and deployment. SG100 is met.		
c	Management strategy implementation			
	Guide post		There is some quantitative evidence that the measures/partial strategy is being implemented successfully.	There is clear quantitative evidence that the partial strategy/strategy is being implemented successfully and is achieving

				its objective, as outlined in scoring issue (a).
	Met?		Y	Y
	Justification	Quantitative evidence such as VMS tracks will clearly demonstrate no impact on benthic habitats. SG100 is met.		
d	Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs			
	Guide post	There is qualitative evidence that the UoA complies with its management requirements to protect VMEs.	There is some quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is clear quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Y	Y	Y
	Justification	In the absence of interactions with VMEs (see 2.4.1), this issue is met by default. SG100 is met.		
References		Site visit interviews		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.4.3 – Habitats information

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	The types and distribution of the main habitats are broadly understood . OR If Consequence Spatial Analysis (CSA) is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and vulnerability of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Y	Y	N
	Justification	Knowledge of demersal habitats is not relevant to this fishery, so SG80 is met by default. SG100 is not met because it does not include a statement about 'relevant to the scale and intensity of the UoA'.		
b	Information adequacy for assessment of impacts			
	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA:	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA:	The physical impacts of the gear on all habitats have been quantified fully.

		Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	Met?	Y	Y	Y
	Justification	Since the gear does not interact with habitats, the (lack of) physical impacts are clear. SG100 is met.		
c	Monitoring			
	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in habitat distributions over time are measured.
	Met?		Y	N
	Justification	No information is required, so SG80 is met by default. SG100 is not met because such measurements are not necessary in this fishery.		
References		Site visit interviews		
OVERALL PERFORMANCE INDICATOR SCORE:				85
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.		
Scoring Issue		SG 60	SG 80	SG 100
a	Ecosystem status			
	Guide post	The UoA is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	N
	Justification	Based on the analysis presented in Section 3.4.7, it is likely that the tuna longline fishery is having some degree of impact on ecosystem structure and functioning. It is therefore important to determine how much predator abundance can be altered before cascading effects occur, and whether there are clear thresholds for large-scale ecosystem transformation (Baum and Worm, 2009). The size-based model developed by Polovina and Woodworth-Jefcoats (2013) did not suggest any obvious threshold in changes to an ecosystem size structure that could serve as a management target. The team therefore considered biomass at the point of recruitment impairment (PRI) to be a suitable trigger, below which irreversible ecosystem impacts might be expected. At the scale of the UoA, it is therefore highly unlikely that the fishery under assessment would lead to irreversible ecosystem impacts (see PI 1.1.1). On this basis, it is considered highly unlikely that the UoA fishery will disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. There is however limited formal evidence supporting this conclusion, in terms of direct information about the FSM EEZ pelagic ecosystem and the impact of longlining upon it. SG100 is thus not met.		
References		(Baum and Worm, 2009; Polovina and Woodworth-Jefcoats, 2013; McKechnie and Hampton, 2017; Tremblay-Boyer et al., 2017b)		
OVERALL PERFORMANCE INDICATOR SCORE:				80
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are measures in place, if necessary which take into account the potential impacts of the fishery on key elements of the ecosystem.	There is a partial strategy in place, if necessary, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a strategy that consists of a plan , in place which contains measures to address all main impacts of the UoA on the ecosystem, and at least some of these measures are in place.
	Met?	Y	Y	N
	Justifi cation	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., 2011). 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-2017-01 and the updated workplan for the adoption of Harvest strategies under CMM 2014-06 on the management of bigeye, yellowfin and skipjack, as well as to the management of non-target species (see rationales presented in PIs 2.1.2, 2.2.2 and 2.3.2). The team considered that all the CMMs in conjunction with the national legislation at FSM level (in particular in relation to sharks) constituted at least a partial strategy and that SG80 was therefore met. Management measures remain, however, species-specific with little consideration for an ecosystem-based approach that consists of a plan. Furthermore, at national level, work is ongoing on the drafting of various NPOAs on sharks, sea turtles and seabirds but these have yet to be put in place. SG100 is not met.		
b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).	There is some objective basis for confidence that the measures/partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or ecosystem involved
	Met?	Y	Y	N

	Justifi- cation	The WCPFC and national measures which form the partial strategy all take into account the available information with the expectation that impacts on the ecosystem are restrained (see discussions under Principle 1 and Principle 2). Furthermore, there is confidence that the partial strategy will work, based on the small footprint of the fishery in the ecosystem. SG80 is therefore met. Testing at UoA level has not been carried out however so SG100 is not met.			
c	Management strategy implementation				
	Guide post		There is some evidence that the measures/partial strategy is being implemented successfully .	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).	
	Met?		Y	N	
	Justifi- cation	At regional level, the partial strategy has so far succeeded in maintaining target species above B _{MSY} level (see Appendix 1.1 and 1.2 – PI 1.1.1), considered here as the main trigger point beyond which ecosystem structure and functioning may be affected (PI 2.5.1). There is therefore some evidence that the partial strategy is being implemented successfully. There is however insufficient evidence on key ecosystem indicators to inform on all measures with a high degree of certainty. SG80 is met but not SG100.			
References		(Allain et al., 2011)			
OVERALL PERFORMANCE INDICATOR SCORE:					80
CONDITION NUMBER (if relevant):					N/a

Evaluation Table for PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	Information is adequate to identify the key elements of the ecosystem.	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	There is ongoing work to collect detailed data on the structure of the Pacific Ocean pelagic ecosystem, e.g. through observer programmes (e.g. bycatch composition and quantities), trophic analyses (e.g. stomach contents, stable isotopes), mid-trophic level sampling (e.g. acoustics and net sampling of micronekton and zooplankton), behavioural analyses (tagging of a range of species), tagging studies (e.g. through the ABNJ Tuna Project). This information is thought to be adequate to broadly understand the key elements of the ecosystem. SG80 is met.		
b	Investigation of UoA impacts			
	Guide post	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and some have been investigated in detail .	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and have been investigated in detail .
	Met?	Y	Y	Y
	Justification	Trophic structure of pelagic ecosystems in the Pacific, including the WCPO, has been characterised using Ecopath and Ecosim models based on diet data. The dynamic system model SEAPODYM, is a model developed for investigating spatial tuna population dynamics, under the influence of both fishing and environmental effects (Lehodey et al., 2013). The continued development and application of the SEAPODYM model to the work of the WCPFC Scientific Committee, is facilitated through Project 62 which affiliates the independently funded work on SEAPODYM into the SC’s work programme (Lehodey et al., 2013). A list of current projects is given in Lehodey et al. (2013). Main interactions between the fishery and the ecosystem have been and are being investigated in detail. SG100 is met.		
	Understanding of component functions			

c	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are known .	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are understood .
	Met?		Y	N
	Justification	<p>Information on target and non-target species (bycatch and ETP species) is gathered by the SPC through logbook data and its regional observer programme. The available information is managed by the Bycatch mitigation information system (BMIS) which acts as a reference and educational tool that supports the WCPFC's responsibilities with regard to the sustainable management of non-target, or bycatch, species in WCPO fisheries targeting highly migratory species, including tuna and billfish (Fitzsimmons, 2011). Furthermore, the Kobe By-catch Technical Working Group (KBTWG) was established in 2009 with the aim of supporting, streamlining, and seeking to harmonize the by-catch related activities of Ecosystems/By-catch working groups across RFMOs and feeding its findings through to those RFMOs (in this framework, a Joint t-RFMOs FADs Working Group took place in April 2017). Furthermore, the ABNJ Tuna Project aims to achieve responsible, efficient and sustainable tuna production and biodiversity conservation through: (i) supporting the use of sustainable and efficient fishing practices by the stakeholders of the tuna resources; (ii) reducing illegal, unreported and unregulated fishing; and (iii) mitigating adverse impacts of bycatch on biodiversity. The project is partly funded by the Global Environment Facility (GEF) and has a total budget of about US\$178 million. In the WCPFC work on this project has focused on <i>inter alia</i> collecting integrated bycatch data on sharks from the WCPFC and IATTC regions, carrying out a t-RFMO shark data inventory and data improvement field studies, including tagging; preparing an assessment methods catalogue for sharks for one ocean basin with results made available globally, four additional species assessments (including species risk assessments) and promoting the use of results for priority setting and development of robust pan-Pacific Conservation and Management Measures; and collating and disseminate new information on mitigation of impacts to bycatch species, thereby reducing technical uncertainties across a range of stakeholders allowing t-RFMO discussions to focus on management issues such as cost and feasibility.</p> <p>The team considered that sufficient information is being gathered to understand the main functions of the ecosystem components. SG80 is therefore met. There remains, however, uncertainty as to the fishery's impacts on those components due to issues with low observer coverage. SG100 is thus not met.</p>		
d	Information relevance			
	Guide post		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N

	Justification	For the same reasons given is Slc, SG80 is met but not SG100.		
e	Monitoring			
	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N
	Justification	Logbook and observer data is sufficient to detect any changes which might have ecosystem impacts; e.g. changes in rates of bycatch. SG80 is met. Since there is not something that could be formally defined as an ecosystem management strategy (as yet), SG100 is not met.		
References		Lehodey et al., 2013; Fitzsimmons, 2011; for the status of individual stocks see references in 1.1.1, 2.1.1 and 2.3.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				85
CONDITION NUMBER (if relevant):				N/a

Appendix 1.3 Principle 3 scoring rationales

Evaluation Table for PI 3.1.1 – Legal and/or customary framework

PI 3.1.1	<p>The management system exists within an appropriate legal and/or customary framework which ensures that it:</p> <ul style="list-style-type: none"> Is capable of delivering sustainability in the UoA(s); and Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and Incorporates an appropriate dispute resolution framework. 		
Scoring Issue	SG 60	SG 80	SG 100
a	Compatibility of laws or standards with effective management		
	Guide post	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y
	Justification	<p>At the national level, the development and management of the marine resources within FSM falls under the jurisdiction of the National Oceanic Resources Management Authority (NORMA). NORMA works under Title 24. Marine Resources of the Code of FSM, - Fisheries Act 2002, which establishes a comprehensive framework for fisheries management. Title 18 of the FSM Code establishes the jurisdiction of NORMA as the territorial sea from 12nm from the island baselines and FSM 200nm EEZ, the outer limit of which is measured from the same baselines. The Marine Resources Department in each state, Chuuk, Pohnpei, Kosrae, and Yap, has jurisdiction over the territorial sea from the high water mark to 12nm. A 24nm zone from the islands and atolls of FSM is recognized as a contiguous zone. NORMA rights and authority regarding fish and fishery resources in Title 24 relevant to the pelagic longline fishery are outlined in Sections 101-124, 201-211, 301-303, 401-407, 501-504, 601-611 and 901-920. The National Fisheries Corporation works with NORMA in promoting the development of pelagic fisheries and related industries. The Board of Directors of NORMA, comprised of five members (one representative from each state appointed by the President and one at-large member appointed by the President of FSM), established under Title 24 is responsible for adopting fisheries regulations, concluding domestic and foreign fishing agreements and</p>	

		<p>issuing domestic, domestic-based and foreign fishing permits. FSM is a Party of the Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Fishery Vessel Day Scheme (VDS). It is also a member of the FFA, PNA, SPC and WCPFC and must therefore adopt WCPFC CMMs.</p> <p>FSM has agreed to abide by a range of international legally binding and non-binding treaties concerning fisheries, which influence the domestic management framework. These include the binding <i>United Nations Convention on the Law of the Sea, 1982 (UNCLOS)</i>, <i>Food and Agriculture Organization (FAO) Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas 1993 (FAO Compliance Agreement)</i>, <i>the United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 1995 (Fish Stocks Agreement)</i> and the signed but not ratified <i>FAO Agreement of Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing 2009</i>. Other non-binding treaties include the <i>FAO Code of Conduct for Responsible Fisheries</i> and <i>International Plans of Action to: prevent, deter and eliminate illegal, unreported and unregulated fishing; reduce fishing over capacity; reduce the incidental catch of seabirds, and conserve and manage sharks</i>.</p> <p>Consistent with its obligations under Article 118 of the UNCLOS and Part III of the Fish Stocks Agreement, FSM cooperates in the management of highly migratory species through regional fisheries management organizations (RFMOs) which have allowed the development and implementation of sustainable management arrangements for some species as required under the obligations of UNCLOS Article 63(2), 64, 118, 119 and the Fish Stock Agreement Article 5.</p> <p>On the basis of the above, SG100 is met.</p>		
b	Resolution of disputes			
	Guide post	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective .
	Met?	Y	Y	N
	Justification	At the national level, there is a mechanism in place in the FSM Code to resolve disputes concerning infractions and penalties awarded for non-compliance to regulations concerning the tuna fishery. Title 6. Judicial Procedure Chapter 9. Section 902 stipulates that “any appeal authorized by law may be taken by filing a notice of appeal with the presiding judge of the Supreme Court of FSM from which the		

		<p><i>appeal is taken, or with the clerk of the court for the District in which the court was held, within 30 days after the imposition of the sentence or entry of the judgment, order, or decree appealed from, or within such longer time as may be prescribed by rules of procedure adopted by the Chief Justice.” Any infractions beyond administrative penalties are the responsibility of the Department of Justice. Most fisheries infractions are settled out of court for efficiency reasons as court cases tend to be lengthy.</i></p> <p>At the regional level, the WCPFC dispute settlement mechanism is set out under Article 31 of the Convention. Annex II of the Convention establishes the authority to form a panel to review decisions made by the Commission and to settle disputes among members of the Commission. The dispute settlement mechanism outlined in the Convention allows for a transparent process to occur. To date there have not been any sanctions imposed by WCPFC, therefore there has not been a need for a panel to be convened to resolve disputes.</p> <p>While the mechanisms for dispute resolution are transparent and considered to be effective in dealing with most issues at both the national and regional level, they have only been tested and proven to be effective at a national level, so only SG 80 is considered met. SG 100 is not met in full.</p>		
c	Respect for rights			
	Guide post	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	<p>At the national level, the customary right for people to fish for food and livelihood is explicit in the FSM Bill of Rights Chapter 1. Sub-section 114 which states “<i>due recognition shall be given to local customs in providing a system of law and nothing in this chapter shall be construed to limit or invalidate any part of the existing customary law, except as otherwise provided by law.</i>” The FSM Code also provides for small-scale fishers and domestic fishers. Title 24 specifically states that the State Government has powers “<i>to establish and support programmes to promote, support and guide fishing cooperative associations</i>”. To support the livelihoods of local fishers NORMA allocates a portion of the optimum sustainable yield to domestic fishing vessels. Also, the 24nm contiguous zone was implemented to safeguard indigenous livelihoods and subsistence fishers.</p> <p>At the regional level, the WCPFC Convention provides for the recognition of the interests of small-scale and artisanal fishers with the overall framework for sustainability in the WCPFC Convention. For example, under Article 5 the Convention states that “in order to</p>		

		<p>conserve and manage highly migratory fish stocks in the Convention area.... the members of the Commission shall... (h) take into account the interests of artisanal and subsistence fishers". Under Article 10, paragraph 3, the Convention States that "in developing criteria for allocation of the total allowable catch or total allowable effort the Commission shall take into account.... (d) the needs of small island developing States and territories and possessions, in the Convention area whose economies, food supplies and livelihoods are overwhelmingly, dependent on the exploitation of marine living resources and (g) the needs of coastal communities which are dependent on the fishing stock". Furthermore, under Article 30, the Convention specifies that the Commission shall give all recognition to the special requirements of the developing State parties to this Convention, in particular small island developing States, territories and possessions, in particular (b) the need to avoid adverse impacts on and ensure access to fisheries by subsistence, small-scale and artisanal fishers and fish workers as well as indigenous people.</p> <p>On the basis of the above, SG 100 is met</p>
References		<p>Federated States of Micronesia Code Title 18, Title 24 Sections 103-120, 301-306, and 502-510</p> <p>Federated States of Micronesia Bill of Rights Chapter 1</p> <p>Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)</p> <p>Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993)</p> <p>Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC Convention)</p> <p>WCPFC CMM 2015-01 Conservation and Management Measure for big eye, yellowfin and skipjack tuna in the Western and Central Pacific Ocean.</p>
OVERALL PERFORMANCE INDICATOR SCORE:		95
CONDITION NUMBER (if relevant):		N/a

Evaluation Table for PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		<p>The management system has effective consultation processes that are open to interested and affected parties.</p> <p>The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties</p>		
Scoring Issue		SG 60	SG 80	SG 100
a	Roles and responsibilities			
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood .	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Y	Y	Y
	Justification	<p>At the national level, the development and management of the marine resources within the FSM falls under the jurisdiction of the National Oceanic Resources Management Authority (NORMA). NORMA works under Title 24. Marine Resources of the Code of FSM, - Fisheries Act 2002, which establishes a comprehensive framework for fisheries management. The functions, roles and responsibilities of NORMA and its staff are well defined under Title 24, Chapter 3 (Management Authority). The National Fisheries Corporation works with NORMA in promoting the development of pelagic fisheries and related industries. NORMA remains representative of the FSM as a whole, with members of each State, appointed by the President of the Federated States of Micronesia, holding a position on the Board of Directors. Duties and functions of NORMA are explicitly described in Chapter 3 of Title 24 and include providing technical assistance in the delimitation of the EEZ and to negotiate domestic-based and foreign fishing agreements. Activities undertaken by NORMA are reported on an annual basis to the President of FSM, the Speaker of Congress of the FSM and each State governor, maintaining transparency with regard to number of permits and licences issued, fines, forfeitures and estimates on current fishing effort in the EEZ. The Board of Directors of NORMA is the management system's decision-making body and its primary roles are to adopt regulations for the conservation, management and exploitation of fish in the EEZ conclude fishing agreements, issue fishing permits, and participate in the planning and execution of programs relating to fisheries.</p> <p>At the sub-regional level, the PNA coordinates the implementation of management measures for member countries to ensure the tuna resources are maintained at sustainable levels and to enhance the economic benefits from the tuna fisheries. The FSM tuna longline</p>		

		<p>fishery is managed under the PNA vessel day scheme (VDS) and administered by NORMA in conjunction with the PNA office. The VDS provides FSM with an annual PAE that changes every year. The PAE is subject to future changes as a result of discussions for the selling and determining of the TAE by PNA.</p> <p>The Oceanic Programme (OFP) of SPC provides FSM and other Pacific Island members with scientific information and advice to manage the region's tuna, billfish and other related species. SPC is the scientific service provider for WCPFC and is mainly responsible for the compilation of catch and effort data, statistical analysis, analysis of biological parameters and environmental processes that influence the productivity of tuna and billfish populations, regional stock assessments and bio-economic modelling.</p> <p>The FFA is an advisory body that provides expertise and technical assistance to FSM and Pacific Island members in the development of fisheries management policy and legal frameworks for the sustainable management of tuna resources and supports the monitoring, control and surveillance of fisheries as well as treaty administration, information technology and vessel registration and monitoring.</p> <p>At the regional level, the WCPF Convention in Articles 9-16 and 23-24 provide information on the functions, roles and responsibilities of member states and the committees formed under Commission control (e.g. Scientific Committee and Technical Compliance Committee). The Commission and its associated committees have clear operating procedures and terms of reference and the roles and responsibilities of members and non-members are clearly defined in the Convention, Rules of Procedure and relevant CMMs. The FSM is an active member of the WCPFC and its committees.</p> <p>The level of collaboration and cooperation and the roles and responsibilities of NORMA and WCPFC are well understood.</p> <p>On the basis of the above, SG100 is met.</p>		
b	Consultation processes			
	Guide post	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used .
	Met?	Y	Y	N
	Justification	At the national level, NORMA attends annual regional meetings held by the WCPFC and Scientific Committee and sub-regional meetings held by PNA. Non-Governmental Organisations (NGOs), International-Governmental Organisations (IGOs) and industry are integral to these consultative discussions and provide contracting parties with information on coastal and distant water fishing states as well as		

		<p>scientific information. Both NORMA and the national fisheries section of the Department of External Affairs (DEA) maintain direct contact on technical issues with regional and international bodies relating to fisheries (FAO, 2002). The Board of Directors and NORMA consult with relevant stakeholders such as Congress, Department of Justice, Department of Resources and Development, and State representatives (as required) when adopting regulations for the conservation, management and exploitation of fish in the EEZ and when negotiating foreign and domestic-based fishing agreements (E. Pangelinan, pers. comm. 16th February, 2018). NORMA also consults with the States and NGOs at annual Fisheries Symposium workshops about fisheries management regulations and agreements. The FSM Tuna Management Plan (TMP) developed in early 2011 was followed by stakeholder consultations in Pohnpei in October 2011. The objective of the consultations, following earlier workshops on the EAFM framework, was to update the FSM TMP adopted in 2000 and consider its associated amendments to the Marine Resources Act 2002. Further consultations were held with stakeholders the development of the amended TMP 2015. NORMA established a Fisheries Management and Surveillance Working Group to formulate and implement national fisheries management and surveillance strategies. The working group consists of appropriate representatives from NORMA and the Department of Justice as well as representatives from relevant National and State departments and divisions. The working group meets every quarter to discuss the management of the tuna fishery resources and Monitoring, Control and Surveillance (MCS) issues and provide recommendations to the Boad of Directors for consideration.</p> <p>The Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme requires the Parties (of which FSM is a Party) to consult with distant water fishing nations, fishing parties, fishing organisations, and other relevant organizations at annual meetings. As there is no formal consultation processes in place, SG80 is met but not SG 100</p> <p>At the regional level, there are extensive formal and informal consultation processes at the WCPFC that regularly seek and accept information from members and cooperating non-members. The Commission is active in assisting and facilitating the regular and timely provision of fisheries data and information for assessment by the Commission secretariat and scientific providers, such as SPC. The Commission actively uses information from the fishery and its member states to inform fisheries management decisions and assist in the formulation of CMMs. This is demonstrated through reports and outcomes of WCPFC meetings, which detail the decision-making process and are readily accessible online. At a regional level, SG100 is met.</p> <p>As only the regional management system includes consultation processes that regularly seek and accept relevant information, including local knowledge and demonstrates consideration of the information and explains how it is used or not used, SG80 is met but not SG100.</p>	
c	Participation		
	Guide post	The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.

	Met?		Y	N
	Justification	<p>At the national level, the consultation process provides opportunity for all interested and affected parties to be involved through the Fisheries Management and Surveillance Working Group and in the development of tuna fisheries management plans.(refer to 3.1.2b.</p> <p>The Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme requires the Parties (of which FSM is a Party) to consult with distant water fishing nations, fishing parties, fishing organisations, and other relevant organizations at annual meetings to determine fishing effort controls within the Parties waters and on the high seas.</p> <p>At the regional level, the WCPFC Secretariat facilitates effective engagement by stakeholders. Attendance at Commission and related meetings is comprehensive and logistic and financial support is provided to cooperating non-members to ensure attendance and meaningful involvement and interaction in the cooperative management of fisheries in the Western and Central Pacific Ocean (WCPO). Additional services are provided through the FFA and SPC. NGOs can attend meetings as observers and may make statements which are included in the official record.</p> <p>As there is an opportunity at the national level for affected parties to be involved in the consultation process SG80 is met, however as there is no formal consultation process that provides opportunity and encouragement for all interested parties to be involved and facilitates their active engagement, SG100 is not met.</p>		
	References	<p>Federated States of Micronesia Code Title 24 Chapters 1, 3 and 5</p> <p>Federated States of Micronesia Tuna Management Plan 2015</p> <p>Office of the National Public Auditor NORMA report 2012</p> <p>WCPFC, SC and TCC meeting records</p> <p>WCPFC Rules of Procedure</p> <p>WCPFC website http://www.wcpfc.int</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				85
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach.		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are implicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are explicit within and required by management policy.
	Met?	Y	Y	P
	Justification	<p>The long-term objectives at the national level, consistent with the MSC fisheries standard, are clearly specified in Title 24. Chapter 1 Sub-section 101. The key objective is <i>to ensure the sustainable development, conservation and use of the marine resources in the exclusive economic zone by promoting the development of, and investment in, fishing and related activities in the context of effective stewardship</i>. NORMA has developed and implemented Tuna Management Plan (TMP) 2015 to meet the key objective outlined in Title 24. The TMP provides a framework under which NORMA manages tuna fishery resources within its EEZ and specifies the integration and implementation of ecosystem approaches into the management system. The ecosystem approach of the TMP is consistent with the MSC Principles and Criteria and application of the precautionary approach. Since the FSM framework requires clear management plans to be developed with explicit objectives constituent with the legislation, SG 100 is met.</p> <p>The WCPFC is responsible for decision-making for key management measures which affect the bigeye and yellowfin stocks, the bycatch species and ecosystem (P2). Long-term objectives are explicit within the WCPFC Convention. For example, 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 FSA respectively]”. Article 5 of the Convention then 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, including through the application of the guidelines set out in Annex II of the FSA. Article 10 of the Convention is consistent with MSC principles and objectives in specifying long term objectives of “maintaining or restoring populations...above levels at which their reproduction may become seriously threatened”. Evidence that these objectives are guiding, or are starting to guide decision-making is provided in various Commission reports and in CMMs. 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. Additionally, the guidelines set out in Annex II of the SFA provide additional objectives to guide decision-making that include the use of target reference points to meet the</p>		

		<p>management objectives and the adoption of fisheries management strategies to ensure that target reference points are not exceeded. Evidence that the objectives are guiding decision-making is provided in various reports of the Commission and indicate that explicate action is being undertaken to develop and implement management arrangements that support achievement of the objectives. However, the long term objectives have yet to be explicitly defined.</p> <p>Based on the above, SG 80 is met for both the national and regional systems. SG 100 is met for the FSM system but not the regional (WCPFC) system. Based on partial scoring at the SG 100 level, the overall score is 90.</p>
References		<p>Federated States of Micronesia Code Title 24 Chapter 1</p> <p>Federated States of Micronesia Tuna Management Plan 2015</p> <p>United Nations Convention on the Law of the Sea, 1982</p> <p>Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC Convention)</p> <p>Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)</p> <p>Western and Central Pacific Fisheries Commission website</p>
OVERALL PERFORMANCE INDICATOR SCORE:		90
CONDITION NUMBER (if relevant):		N/a

Evaluation Table for PI 3.2.1 Fishery-specific objectives

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Objectives , which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery-specific management system.	Short and long-term objectives , which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.	Well defined and measurable short and long-term objectives , which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.
	Met?	Y	Y	P
	Justification	<p>National Principle 1 Objectives:</p> <p>NORMA has adopted a number of short and long-term objectives to improve its abilities to realize the goals of Title 24 and the TMP 2015 through the incorporation of ecosystem science and principles. The TMP 2015 objectives: FSM contribution to: (i) keeping biomass levels above limit reference points throughout range of stocks; (ii) continue to promote sustainable fishing in FSM EEZ; (iii) collect accurate/ timely data from all tuna fisheries in FSM (incl. bycatch); and, (iv) fewer fish species/ stocks are assessed as being subject to overfishing and to avoid extinction for a species (i.e. $B_{CURRENT} < B_{MSY} > B_{EXTINCT}$) are consistent with MSC's Principle 1. Under Title 24 and the TMP 2015 NORMA has taken a series of management actions to conserve pelagic species caught in the Western Pacific region. Evidence of management measures taken to meet these objectives include the purse seine and longline VDS schemes and closure of waters within 24 nm of FSM islands and atolls to commercial fishing by vessels. FSM has also adopted conservation and management measures agreed at the WCPF Commission for yellowfin and bigeye, specifically Conservation and Management Measure for bigeye, yellowfin and skipjack (CMM 2017-01).</p> <p>The Longline Vessel Day Scheme made pursuant to the Palau Arrangement for the Management of the Western Pacific Tuna Fishery's relevant objectives are to promote optimal utilization, conservation and management of tuna resources and maximize economic returns, employment generation and export earnings from sustainable harvesting of tuna resources.</p>		

	<p>These long-term and short term objectives are explicit and are considered to be clearly defined and measurable, and thus meet the requirements of SG 100.</p> <p>Regional Principle 1 Objectives:</p> <p>Regional fishery-specific objectives are set out in the CMMs of WCPFC. For Principle 1. The CMM 2017-01 for bigeye, yellowfin and skipjack has the following objectives: Bigeye: pending agreement on a target reference point the spawning biomass depletion ratio (SB/SBF=0) is to be maintained at or above the average SB/SBF=0 for 2013-2015; Skipjack: the spawning biomass of skipjack tuna is to be maintained on an average level consistent with the interim target reference point of 50% of the spawning biomass in the absence of fishing, adopted in accordance with CMM 2015-06; Yellowfin: pending agreement on a target reference point the spawning biomass depletion ratio (SB/SBF=0) is to be maintained at or above the average SB/SBF=0 for 2012-2015. To meet this objective the Commission's members, cooperating non-members and participating territories (CCMs) have agreed to take measures to not increase catches by their longline vessels of yellowfin and bigeye. Long-term objectives are given in the WCPF Convention (Article 2) ... <i>to ensure, through effective management the long-term conservation and sustainable use of highly migratory fish stocks in the WPFO in accordance with UNCLOS and the Fish Stocks Agreement.</i> These regional level objectives and the requirements of the CMMS are incorporated into the Federated States of Micronesia fishery management system. Based on the above SG100 is met.</p> <p>National Principle 2 Objectives</p> <p>NORMA adopted an ecosystem approach in the development of the Tuna Management Plan 2015. The objectives of the TMP relevant to Principle 2: ecosystem & biodiversity maintenance; waste minimisation; reduction in the quantity of bycatch; collect accurate data from all tuna fisheries in FSM (incl. bycatch, etc.) are consistent with MSC's Principle 2. The measures contained in FSM Code 2002 are consistent with the MSA's National Standards and other applicable laws. Measures that address issues concerning marine species preservation and protection of endangered species are outlined Title 23. Resource Conservation. Chapter 1 Marine-Species Preservation prohibits the use of explosives, poisons, chemicals etc., limitations are outlined on the taking of turtles, limitations are outlined on the taking of marine mammals and penalties are given for persons violating any of the Chapter provisions. Chapter 3. Endangered Species Act prohibits any person to take, engage in commercial activity with, hold, have possession of, or export any threatened or endangered species of plant or animal and penalties are given for persons violating any of the provisions of this Chapter. As the objectives are well defined but not measurable due to a lack of observer data the score of the SG is 80 but not 100.</p> <p>Regional Principle 2 Objectives:</p> <p>The regional long term objectives cited above for Principle 1 also apply for Principle 2 for this fishery. Regional short-term objectives for Principle 2 are set up in the CMMs of WCPFC, the CMM for Mitigating Impacts of Fishing on Seabirds (CMM 2017-06), CMM of Sea Turtles (2008-03), CMM for Sharks (CMM 2014-05), and CMM for Silky Sharks (CMM 2013-10). WCPFC also provides supplementary information on CMMs that include Guidelines for Handling Sea Turtles and Guidelines for the Safe Release of Encircled Animals including whale sharks. In most cases the objectives in these CMMs are not well defined or measurable. Based on the above SG 80 is met but not SG100.</p>
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		On the basis of the above this PI received a partial score of 90.
References	Federated States of Micronesia Code Title 23 and 24 Federated States of Micronesia Tuna Management Plan 2015 Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme WCPFC Convention WCPFC website http://www.wcpfc.int	
OVERALL PERFORMANCE INDICATOR SCORE:		90
CONDITION NUMBER (if relevant):		N/a

Evaluation Table for PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guide post	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	<p>The Board of Directors of NORMA, comprised of five members, established under FSM Code Title 24. Chapter 3, is the national management system's decision-making body and its primary roles are to adopt regulations for the conservation, management and exploitation of fish in the EEZ, conclude fishing agreements, issue fishing permits, and participate in the planning and execution of programs relating to fisheries. Under Title 24. Chapter 5 Sub-section 502 the Board of Directors is required to ensure that management measures are based on the best scientific evidence available and designed to maintain or restore stocks at levels capable of producing maximum sustainable yield. Decision-making by the Board of Directors with support from NORMA is made through the gathering of information from various sources including the vessel day scheme (VDS), vessel monitoring system (VMS), components of integrated Fisheries Information Management Systems (iFIMS) and by analysing catch and effort data from the fishery. Measures and strategies to sustainably manage the tuna resources of FSM were established through the development and implementation of the Tuna Management Plan 2015. FSM is a participating Party in the Palau Arrangement for the Management of the Western Pacific Tuna Fishery. FSM was an active Party in the development and implementation of the Purse Seine and Longline Vessel Day Schemes to control tuna fishing effort in the Parties of the Arrangement waters and ensure the sustainable harvesting of the tuna resources in these waters.</p> <p>The decision-making processes at the international level are well established and documented. 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.</p> <p>On the basis of the above SG 80 is met.</p>		
		Responsiveness of decision-making processes		

b	Guide post	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	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.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N
	Justification	<p>NORMA and its Board of Directors' primary roles are to prepare, monitor and amend regulations and management plans for the offshore fishery within FSM's EEZ. There is an adaptive management approach, which monitors and addresses changing conditions based on the best available information. This approach is reflected Paragraph 7 of the Fishing Access Agreement for a Domestic Based Foreign Fishing Fleets that provides powers to NORMA in the event it determines, through consultations with competent regional scientific authorities, that if there is a serious threat to a stock, it can take precautionary measures to preserve the stocks by limiting or closing access to the FSM EEZ or portions thereof. In developing management plans, NORMA consults with its stakeholders and provides a public forum for decision-making. The Tuna Management Plan originally developed in 2000 was reviewed by a stakeholder consultation in Pohnpei in October 2011. The objective of the consultation, following earlier workshops on the EAFM framework, was to update the TMP adopted in 2000 and consider its associated amendments to the Marine Resources Act 2002. Further consultations were held with stakeholders in the development of the TMP 2015 which provided guidelines for the management of the tuna resources to ensure sustainability. To enhance the management of tuna resources in the Western Pacific, FSM and the Parties to the Palau Arrangement developed and implemented a Vessel Day Scheme for the longline fisheries in the waters of the Parties in early 2017. Through the Management Scheme, the Parties limit the level of longline fishing effort to the levels of total allowable effort (TAE) agreed by the Parties. The TAE is set using the best scientific, economic, management and other relevant advice and information. The TAE is allocated amongst the Parties as their Party Allowable Effort (PAE) in the manner agreed to by the Parties. Each Party is required to ensure the number of fishing days by longline vessels in its waters does not exceed the Parties' PAE or adjusted PAE in any Management Year. Based on the above, SG 100 is met.</p> <p>Commission decision-making processes are based heavily on Scientific Committee reports on the status of target and non-target species and respond to serious issues, such as overfishing, and suspected overfished. (i.e. bigeye). Based on recent stock status assessments for bigeye and yellowfin (2017), the main target species of the FSM longline fishery, the Scientific Committee (SC) concluded that:</p> <p>the bigeye stock appears to not be experiencing overfishing (77% probability) and it appears the stock is not in an overfished condition (84% probability). It recommended as a precautionary approach the fishing mortality on the bigeye stock should not be increased from the current level to maintain current or increased spawning biomass until the Commission can agree on an appropriate target reference</p>		

		<p>point (TRP) and that future work is required to improve the assessment and reduce uncertainty. For the yellowfin stock the Scientific Committee concluded that it appears to not to be experiencing overfishing (96% probability) and it appears that the stock is not in an overfished condition (92% probability). It recommended that WCPFC could consider measures to reduce fishing mortality from fisheries that take juveniles and measures should be implemented to maintain current spawning biomass levels until the Commission can agree on an appropriate target reference point (TRP). Due to the recommendations of the Scientific Committee and based on the results of the assessments for bigeye, yellowfin and skipjack, CMM 2017-01 was adopted.</p> <p>However, WCPFC, has not responded effectively to all issues, including fishing effort issues concerning other tuna species (i.e. southern albacore) and implemented alternative management measures. Therefore, for the regional level decision-making processes, SG 80 is met, but SG 100 is not met.</p> <p>On the basis of the above SG 80 is met but not SG100.</p>	
c	Use of precautionary approach		
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.
	Met?		Y
	Justification	<p>Title 24. Chapter 5 Sub-section 502 stipulates that NORMA is required to apply the precautionary approach in the adoption of management measures that are consistent with and no less stringent than the criteria set forth in the United Nations Agreement or any other relevant agreement or fisheries management agreement to which FSM is a party. This approach is reflected in Paragraph 7 of the Fishing Access Agreement for a Domestic Based Foreign Fishing Fleets that provides powers to NORMA in the event it determines, through consultations with competent regional scientific authorities, that if there is a serious threat to a stock, it can take precautionary measures to preserve the stocks by limiting or closing access to the FSM EEZ or portions thereof. Under Title 24. Chapter 5 Sub-section 502 NORMA is also required to ensure that management measures are based on the best scientific evidence available and designed to maintain or restore stocks at levels capable of producing maximum sustainable yield. Decision-making by the Board of Directors with the support of NORMA is made through the gathering of information from various sources including the vessel day scheme (VDS), vessel monitoring system (VMS), components of integrated Fisheries Information Management Systems (iFIMS) and by analysing catch and effort data from the fishery. On the basis of the above, SG80 is met.</p> <p>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.</p>	

		On the basis of the above, SG 80 is met.		
d	Accountability and transparency of management system and decision-making process			
	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	Information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on the fishery's performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	Y
	Justification	Information concerning FSM fishery licensing, key documents and projects is publically available on the NORMA website: www.norma.fm . New regulations and amendments to regulations are gazetted in local newspapers and public notices. NORMA's Youth Ambassador visits the States regularly to promote fisheries issues and the World Tuna Day and Fisheries Symposium provide information to raise public awareness of the tuna fishery. FSM is required to submit annual reports to WCPFC concerning research, statistics and the status of their fisheries. Information submitted in these reports includes fleet composition, effort, interactions with ETP species and independent data from observer coverage or port sampling programmes. This information is publically available on the WCPFC website. Also, the Office of the National Public Auditor provides information concerning FSM fishery performance on its publically available website: www.fsmopa.fm . WCPFC also maintains a publically accessible website where meeting minutes, reports and scientific reports from the Commission and subsidiary bodies are posted and are freely available for download. The national and regional websites provide a high level of public access and transparency, showing how scientific information is used to inform management actions, which are then monitored for effectiveness and discussed. On the basis of the above, SG 100 is met.		
e	Approach to disputes			
	Guide post	Although the management authority or fishery may be subject to continuing court	The management system or fishery is attempting to comply in a timely fashion with	The management system or fishery acts proactively to avoid legal disputes or

		challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	judicial decisions arising from any legal challenges.	rapidly implements judicial decisions arising from legal challenges.
	Met?	Y	Y	Y
	Justification	<p>At the national level, there is no evidence available to suggest that NORMA or its Board of Directors are disrespectful to, or defiant of national laws, or legally binding agreements reached at the international level. As outlined in 3.1.1 NORMA and the Department of Justice have well-established mechanisms and frameworks for addressing legal disputes concerning the fishery. NORMA attempts to curtail disputes by consulting with the industry through stakeholder meetings and workshops to raise public awareness and provide input into amendments of management measures and/or policy. These consultative processes enable NORMA to minimize disputes and respond to judicial decisions in a timely fashion.</p> <p>At the regional level, WCPFC decision-making is based on consensus and therefore to a degree is proactive in avoiding legal disputes through this process. The Federated States of Micronesia has acted proactively at the regional level by incorporating WCPFC CMMS into national legislation.</p> <p>On the basis of the above, SG 100 is met.</p>		
	References	<p>Federated States of Micronesia Code Title 24 Chapter 3</p> <p>Federated States of Micronesia Tuna Management Plan</p> <p>Fishing Access Agreement for a Domestic Based Fishing Fleet Paragraph 7</p> <p>Plau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme</p> <p>NORMA website: www.norma.fm</p> <p>Office of the National Public Auditor website: www.fsmopa.fm</p> <p>CMM 2010-05</p> <p>WCPF Convention</p>		
OVERALL PERFORMANCE INDICATOR SCORE:				95
CONDITION NUMBER (if relevant):				N/a

Evaluation Table for PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guide post	Monitoring, control and surveillance mechanisms exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	Y	N
	Justification	<p>A monitoring control and surveillance (MCS) mechanism is in place in the FSM. As a Member State of the WCPFC Convention, it is required to comply with regulations set by the WCPFC. The MSC Division of NORMA, comprised of 5 officers, is responsible for the collection and entry of fishing vessel logsheet data as required the FSM Code Title 24 that sets out the conditions and terms of the fishing permits and foreign fishing agreements. The reporting requirements of fishing licenses include daily vessel positions, details on sets and gear specifications, information on species retained and discarded. The MSC Division is also responsible for ensuring that licensed fishing vessels are listed on the WCPFC Record of Fishing Vessels and the FFA Regional Register of Good Standing and that licensed vessels have been fitted with Vessel Monitoring System (VMS) as required by the Commission. A summary of this information is presented to the WCPFC on an annual basis in a two-part report. A Fisheries Management and Surveillance Working Group was established by NORMA to formulate and implement national fisheries management and surveillance strategies. The working group consists of appropriate representatives from NORMA and the Department of Justice as well as representatives from relevant National and State departments and divisions. The working group meets every quarter to discuss the management of the tuna fishery resources and Monitoring, Control and Surveillance (MCS) issues and provide recommendations to the Board of Directors.</p> <p>Enforcement responsibilities sit primarily with the Maritime Police under the Department of Justice and Office of the Attorney General, which are given power to penalise parties in breach of compliance regulations stipulated in Title 24 of the FSM Code. The Maritime Police responsibilities include maritime surveillance of FSM EEZ and enforcement of fisheries and maritime laws. Regular dockside inspections are conducted on commercial fishing vessels entering into ports to determine whether the vessels are compliant with the regulations. Four</p>		

	<p>patrol boats conduct surveillance activities in areas of fishing operations. In 2017 the Maritime Police Enforcement Wing reported that a total of 6 Law Enforcement Patrols (75 days) were conducted in areas of fishing activity concentration that resulted in a total of 80 boardings. A total of 15 minor infractions were identified during onboard inspections during fisheries surveillance operations from 2014-2016. Vessel operators were fined for the infractions and most were settled out of court.</p> <p>Since 2014 the Maritime Police has arrested nine fishing vessels with 135 fishermen for illegal entry and fishing activity in FSM waters. FSM has implemented measures to restrict port entry and access to port services of vessels included in IUU lists and worked with other nations to strengthen enforcement and data programs aimed at curtailing IUU fishing. In December 2017 FSM with other CCMs at the Fourteenth Session of WCPFC adopted the Conservation and Management Measure on Minimum Standards for Port State Measures (CMM 2017-02) to establish processes and procedures for port inspections of fishing vessels suspected of engaging in IUU fishing or fishing related activities in support of IUU fishing. A National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing was developed with assistance from FFA and approved in 2013. The Plan outlines actions that can be taken to enhance the objective of eradicating IUU fishing through fishing vessel licensing restriction, monitoring, control and surveillance, sanctions, and reporting activates. NORMA conducts regular compliance workshops with fishing industry representatives and fishing vessel captains to discuss new regulations and fishing vessel licensing and registration requirements. NORMA reported that there has been a decline in non-compliance infractions as the fleet has become more aware of the rules and regulations through these workshops (J. Helgen per comm. 15 February 2018). Although the MCS system has been effective in enforcing management measures and regulations there is a low level of observer coverage (2.6% in 2014) due to difficulties in recruiting observers, which is below the 5% WCPFC regional target.</p> <p>At the international level, WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transshipment monitoring. A wide range of CMMs have been agreed and implemented at the national level that include:</p> <ul style="list-style-type: none"> • Specifications for the Marking and Identification of Fishing Vessels (CMM 2004-03) • Centralized Vessel Monitoring System (Commission VMS) (CMM 2011-02) • Regional Observer Program (ROP) CMM (2007-01) • WCPFC IUU List (CMM 2010-06) • Compliance Monitoring Scheme (CMM 2013-02) • Standards, Specifications and Procedures for the Record of Fishing Vessels (CMM 2013-03) and • CMM for WVPFC implementation of a Unique Vessel Identifier (CMM 2013-04) <p>Although the MCS system for this UoA has demonstrated an ability to enforce relevant management measures, strategies and rules, it has not been able to meet the minimum 5% observer coverage as required for longline vessels (CMM for the ROP (CMM 2007-01). The MCS system has therefore not demonstrated a <u>consistent</u> ability to enforce relevant management measures for this fishery and only SG 80 is met.</p>
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b	Sanctions		
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.
	Met?	Y	Y
	Justification	<p>A person who is found by the Supreme Court of FSM to have committed an act prohibited in Title 24 Chapter 9 Violations and Penalties for Prohibited Acts is subject to a civil penalty. In determining the amount of the penalty, the Supreme Court of FSM takes into account the nature, circumstances, extent and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior offenses, whether there are multiple violations which together constitute a serious disregard of conservation and management measures.</p> <p>Prohibited acts under Chapter 9 of Title 24 include:</p> <ul style="list-style-type: none"> • Violations of any provision, condition or requirement of a fishing permit or license or access agreement, serious misreporting of catch, fishing in a closed area, fishing after attaining quota, directed fishing for a prohibited stock, using prohibited fishing gear or falsifying or concealing markings, identity, or registration of a fishing vessel is subject to a civil penalty of not less than \$100,000 and not more than \$500,000. • Fishing without a valid fishing permit is subject to a civil penalty of not less than \$100,000 and not more than \$1,000,000. • Unauthorized fishing in waters under the national jurisdiction of a foreign state is subject to a civil penalty of not less than \$50,000 and not more than \$1,000,000. • Violation of marine space is subject to a civil penalty of not less than \$50,000 and not more than \$500,000. • Fishing on or near submerged reefs or fish aggregating devices is subject to a civil penalty of not less than \$50,000 and not more than \$250,000. • Possession, handling and sale of fish unlawfully taken is subject to a civil penalty of not less than \$50,000 and not more than \$250,000. • Contamination of the exclusive economic zone is subject to a civil penalty of not less than \$50,000 and not more than \$500,000. <p>The severity of the penalties has proven to be a sufficient deterrent for vessel operators to comply with the regulations.</p>	

		<p>The majority of infractions committed by tuna longliners are minor. NORMA reported that there has been a decline in non-compliance infractions as the fleet has become more aware of the rules and regulations through these workshops (J. Helgen per comm. 15 February 2018).</p> <p>As FSM is a Party to the Palau Arrangement for the Management of Western Pacific Tuna Fishery – Longline Vessel Day Scheme it is required to ensure that every longline vessel that is licensed to fish in its waters, and every longline vessel that is entitled to fly its flag, comply with the requirements of the Management Scheme and that if a Party exceeds its PAE for a Management Year, the Party's PAE for the following Management Year will be adjusted by deducting:</p> <ul style="list-style-type: none">• If the excess is less than 10% of the PAE – the amount of the excess:• If the excess is 10% of the PAE or more – 120% of the excess. <p>As the Longline Vessel Day Scheme commenced in January 2018 it is too early to determine whether the above penalties are an effective deterrence.</p> <p>At the regional level, the WCPFC relies largely on the IUU vessel listing process (CMM 2010-06) as an incentive for compliance along with port state controls, observers, logbooks and transshipment monitoring. The current IUU vessel listing highlights the success of this form of sanctioning in deterring non-compliance as only three fishing vessels remain on the 2015 vessel list and none have been added in the last year or more.</p> <p>On the basis of the above, SG 100 is met.</p>		
c	Compliance			
	Guide post	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	N
	Justification	At the national level, there is evidence that the FSM pelagic longline fishers comply with the management system. Vessel operators provide information of importance to ensure the effective management of the fishery through vessel operator daily logbooks and catch unloading records. The Marine Police Enforcement Unit conducts regular dockside inspections on longline vessels to determine whether the vessels are compliant with FSM regulations (a total of 6 dockside inspections were conducted in 2017). Its four patrol boats conduct surveillance activities in areas of fishing operations. Patrols indicate that non-compliance of the vessel operators is low, in 2017, a total of		

		75 patrol days with 80 boardings resulted in only 15 minor violations evident for failure to monitor international distress and call frequencies and failure to display permit or permit number in the wheelhouse. Compliance with catch regulations is verified at vessel unloading, where a member of NORMA is always present as a witness. Pohnpei is also the transshipment port for the FSM, and this is only permitted under strict Commission regulations (see CMM 2009-06). However, the low level of observer coverage (2.6% in 2014), which is below the 5% WCPFC regional target, does not provide a high degree of certainty of compliance. At the regional level, WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transshipment monitoring. The lack of any significant breaches of regulation provides a reasonable level of confidence that the operators are complying with the management system, SG80 is met.		
d	Systematic non-compliance			
	Guide post		There is no evidence of systematic non-compliance.	
	Met?		Y	
	Justification	Records from the Marine Police patrols indicate that there is a low incidence of minor infractions committed by the tuna longline fleet. Also, the severity of the penalties for violations listed in Title 24 Chapter 9 is a major deterrent to non-compliance. There is no evidence of systematic non-compliance. SG80 is therefore met.		
References		Federated States of Micronesia Code Title 24 Chapter 5 Palau Arrangement for the Management of the Western Pacific Tuna Fishery – Longline Vessel Day Scheme Specifications for the Marking and Identification of Fishing Vessels (CMM 2004-03) Centralized Vessel Monitoring System (Commission VMS) (CMM 2011-02) Regional Observer Program (ROP) CMM (2007-01) WCPFC IUU List (CMM 2010-06) Compliance Monitoring Scheme (CMM 2013-02) Standards, Specifications and Procedures for the Record of Fishing Vessels (CMM 2013-03) and CMM for WVPFC implementation of a Unique Vessel Identifier (CMM 2013-04)		
OVERALL PERFORMANCE INDICATOR SCORE:				85

CONDITION NUMBER (if relevant):	N/a
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Evaluation Table for PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives. There is effective and timely review of the fishery-specific management system.		
Scoring Issue		SG 60	SG 80	SG 100
a	Evaluation coverage			
	Guide post	There are mechanisms in place to evaluate some parts of the fishery-specific management system.	There are mechanisms in place to evaluate key parts of the fishery-specific management system	There are mechanisms in place to evaluate all parts of the fishery-specific management system.
	Met?	Y	Y	Y
	Justification	<p>At the national level, there are mechanisms in place to evaluate key parts of the management system. The FSM Code Title 24. Marine Resources is the main document for managing fisheries resources. Many of the provisions of Title 24 have been repealed and reenacted since it was published in 1982 and currently there are amendments and inclusions being considered by NORMA to submit to Congress for approval. The National Tuna Management Plan 2015 states that <i>“the plan will be reviewed at least every two years, if necessary, to factor in priority policy changes on tuna fisheries in consideration of new information and decisions taken by the Board of Directors, including decisions emerging from sub-regional and international agreements where FSM is a signatory.”</i> A review of the original TMP 2000 was conducted in 2011 that identified downfalls in the management system that included the lack of guidelines for NORMA to manage the tuna resources. A revised TMP was published in 2015 that addressed issues raised in the 2011 review. As of 2012, NORMA has been subject to periodic audits by the Office of the National Public Auditor (ONPA, 2012). The audit in 2012 covered operational duties of the Board of Directors, implementation and effectiveness of the current tuna management plan, vessel licence fees, data and reporting and NORMA's internal policy framework (ONPA, 2012). The ONPA conducted an independent audit in 2017 on applying agreed upon procedures of NORMA's Fisheries Access Agreements. The audit covered several matters that include fishing revenue, donate goods and services, sold and non-sold fishing days and traded fishing days of the VDS scheme.</p> <p>At the regional level, there is a regional annual report developed by the WCPFC Secretariat, which details compliance of members with the reporting provisions of the Commission. An internal review is also conducted by the WCPFC through assessing the implementation and performance of the CMMS through reports of member countries to the Commission and stock assessments. This allows Commission meetings to provide an overall review of key processes and outcomes. Stock assessments undertaken by SPC are also subject to peer-review and external review to ensure that the scientific processes remain robust.</p>		

		On the basis of the above, SG 100 is met		
b	Internal and/or external review			
	Guide post	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Y	Y	N
	Justification	<p>As of 2012, NORMA has been subject to periodic audits by the Office of the National Public Auditor (ONPA, 2012). Although a governmental body completed the audit, the auditors were external to the fishery specific management system and so the audit acts as an external review of the performance and effectiveness of many aspects of the management system. The audit in 2012 covered operational duties of the Board of Directors, implementation and effectiveness of the current tuna management plan, vessel licence fees, data and reporting and NORMA's internal policy framework (ONPA, 2012). The ONPA recently conducted an independent audit on applying agreed upon procedures of NORMA's Fisheries Access Agreements in 2017. The audit covered several matters that include fishing revenue, donate goods and services, sold and non-sold fishing days and traded fishing days of the VDS scheme.</p> <p>The Pacific Islands Regional Oceanscape Program (PROP) of the World Bank in 2015 conducted a review of the NORMA fisheries management system to assess the need to improve and strengthen enforcement, enhance safety of seafood exports through the establishment of a seafood hygiene competent authority, build capacity through the training of observers and enforcement officers and update monitoring equipment, strengthen fisheries management through capacity building of NORMA systems, institution and staff, and assess coastal fisheries that may be viable for further development in partnership with local communities. Currently a review of the FSM fisheries legislation and seafood safety management system is being conducted by the European Union to identify gaps in the sanitary controls for seafood products to be exported to the European Union countries.</p> <p>At the regional level, WCPFC does not have a regular program of external reviews. However, an independent performance review was undertaken in 2011 resulting in the development of a schedule of responses and actions in response to recommendations of the review. Also, an Independent Review of the Commission's Transitional Science Structure and Functions was conducted and there was a recommendation for periodic external reviews of the stock assessments, which has been adopted by WCPFC. As specified in scoring element (a) an annual report is provided to the Commission by the Secretariat on compliance of members with the reporting provisions of the Commission. In 2017, there was an Independent Review of the Compliance Monitoring Scheme which assessed CCM's compliance with their obligations; identified areas that required capacity building and technical assistance; identified aspects of CMMs that need to be amended or refined and responded to non-compliance through remedial options. Also, stock assessments undertaken by SPC are subject to peer-review and occasional external review.</p>		

		As both the national and regional management systems have regular internal reviews but only occasional external reviews, only SG 80 is met.
References	Federated States of Micronesia Title 24 Office of the National Public Auditor NORMA reports 2012 and 2017 Pacific Islands Regional Oceanscape Program (PROP) NORMA review 2015 MSC pre-assessment of the Federated States of Micronesia Yellowfin and Bigeye Longline Fishery 2015 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC Convention).	
OVERALL PERFORMANCE INDICATOR SCORE:		90
CONDITION NUMBER (if relevant):		N/a

Appendix 2 Conditions

The fishery is **provisionally proposed to be certified with five conditions**, as follows:

Table 24. Condition 1

Performance Indicator	1.2.1a. The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80.
Score	70
Rationale	<p><u>Scoring issue a (SG80):</u> The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80.</p> <p>Extract:</p> <p>The objective of the current harvest strategy is to maintain the status quo (WCPFC: average SB/SB_{F=0} for 2012-2015; PNA: purse seine effort at a maximum of 2010 levels). The most recent stock assessment suggests that the status quo is an acceptable short-term biological target for bigeye (see 1.1.1 and projections in Table 5). The new tropical tuna bridging measure (2017-01) has overall somewhat weakened management provisions in relation to bigeye compared to the previous measure (2016-01) (see Section 3.3.6), which was aimed at rebuilding the stock. (It did not particularly seem to be achieving this, but bear in mind that the stock assessment trajectory only runs to 2015.) It does not on this basis comply with the advice of the SC13 prior to the WCPFC 2017 plenary (SC13 report para. 241):</p> <p>SC13 recommends as a precautionary approach that the fishing mortality on bigeye tuna stock should not be increased from current level to maintain current or increased spawning biomass until the Commission can agree on an appropriate target reference point (TRP).</p> <p>Status quo projections (Scott et al., 2017; WCPFC, 2018) provide a basis on which to evaluate the extent to which the harvest strategy is expected to achieve stock management objectives. The projections are summarised in Table 5, which gives the estimated probability of SB falling below the LRP by 2045 in the range 0-18% based on status quo and 'optimistic' fishery scenarios, which is acceptable given that the harvest strategy is intended to be revised significantly prior to 2045.</p> <p>Scoring: It is clear that the move by WCPFC14 to loosen bigeye management was not particularly precautionary, but given the ongoing work to put in place an improved management target and harvest strategy (2014-06 and workplan; see above and Section 3.3.6), assuming this progresses, the impact on the stock status from changes in the transition from 2016-01 to 2017-01 will probably not be significant; or at least will be lost in the much larger uncertainty about stock status derived from the choice of growth model and regional structure. Furthermore, the acceptance by SC14 of the 'updated new' growth model as the best scientific data on which to base stock assessments has considerably reduced the uncertainty around stock status. On this basis, SG60 can be considered to be met. SG80 is however not met.</p>
Condition	WCPO bigeye needs a harvest strategy that is responsive to the state of the stock, with and the elements of the harvest strategy (monitoring, stock assessment, harvest control rules and management actions) working together to achieve stock management objectives.
Milestones	The milestones have been aligned with the latest iteration of the WCPFC harvest strategy WCPFC (2017a)

	<p>Year 1 (2019) – Year 3 (2021): the client will provide evidence that it is actively working to ensure that the harvest strategy for WCPO bigeye tuna is responsive to the state of the stock and that the elements of the harvest strategy work together towards achieving the management objectives reflected in the target and limit reference points. This evidence will include a summary of the actions taken by the client and other relevant parties to achieve this outcome in alignment with the WCPFC 2017 agreed work plan. (Score: 70)</p> <p>Year 4 (2022): Harvest strategy is in place. (Score: 80)</p>
Client action plan	<p>The client will advocate for: (i) WCPFC to implement the Harvest Strategy Workplan and meet the workplan schedule as adapted in Dec. 2017; (ii) the adoption of a WCPO bigeye tuna TRP by WCPFC in December 2019; (iii) the development of a HCR for WCPO bigeye tuna by WCPFC in December 2020; and (iv) the WCPO bigeye tuna HCR and harvest strategy to be adopted by WCPFC, where the harvest strategy is responsive to the state of the stock and achieves WCPFC's management objectives for the stock.</p> <p>The client will implement harvest strategy advocacy activities by participating in WCPFC meetings as part of the FSM delegation, where the client will communicate the desired milestones. The client will request ISSF to allow the client to co-sign ISSF-organized joint letters to WCPFC that advocate for putting in place and implementing a robust harvest strategy for this stock. The client will also distribute the ISSF annual WCPFC joint letter to the heads of the FSM, China and Taiwan delegations to WCPFC and highlight to these delegates that implementation of the WCPFC Harvest Strategy Workplan is a condition of MSC certification of the FSM and other MSC certified fisheries in the WCPO region.</p> <p>The client will also meet during WCPFC annual sessions with MSC staff and with clients and CABs of other MSC fisheries with the same conditions of certification to discuss how we could align and coordinate our Client Action Plan activities to address these conditions.</p> <p>FSM NORMA will also support implementation of this client action plan through participation in PNA, FFA and WCPFC activities related to putting robust harvest strategies, including HCRs, in place.</p>
Consultation on condition	<p>No consultation is required since WCPFC have already expressed their intention of undertaking this process (see CMM 2014-06 and current harvest strategy workplan).</p>

Table 25. Condition 2

Performance Indicator	<p>1.2.2a. Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY.</p> <p>1.2.2b. The HCRs are likely to be robust to the main uncertainties.</p> <p>1.2.2c. Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.</p>
Score	60
Rationale	<p><u>Scoring issue a (SG80):</u> Well defined HCRs are in place that ensure that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.</p> <p>In the 2017 stock assessment, only the model set with the old growth model (now removed from the grid) plus the 2014 regional structure puts the stock biomass below SB_{MSY} at any point. According to the 2018 update (SC14 grid), stock biomass has been above the estimated MSY level throughout the time series for all models; only one model out of 36 (recent) or zero (latest) put $SB < SB_{MSY}$ in the current time period. Based on the SC grid, the probability that $F > F_{MSY}$ is estimated to be ~6%. $p(SB < SB_{MSY})$ is not quoted in the SC14 report, but from Table 4 can be seen to be <10% (see 1.1.1b); $p(SB < LRP)$ is estimated to be ~0%. The biomass trajectory is stable or (possibly) increasing in the terminal year and F is ~stable (see 1.1.1). On this basis, SA2.5.2a is met.</p> <p>WCPFC have an agreed, legally-binding framework in place to establish formal harvest strategies and control rules for their main stocks, including WCPO bigeye (see CMM 2014-06 and associated workplans; Section 3.3.6). SA2.5.3b is therefore met. On this basis, a HCR can be considered to be 'available' for this stock. SG60 is met. Since the harvest strategy is not 'in place', SG80 is not met.</p> <p><u>Scoring issue b (SG80):</u> The HCRs are likely to be robust to the main uncertainties.</p> <p>Since a HCR is 'available' rather than 'in place', it cannot be argued to be robust to the main uncertainties. Not met.</p> <p><u>Scoring issue c (SG80):</u> Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.</p> <p>Under SA2.5.5, in order to conclude that 'available' HCRs are 'effective' (SG60), MSC requires evidence of i) the use of effective HCRs in other stocks or fisheries under the same management body; or ii) a formal agreement or framework with trigger levels which will require the development of a well-defined HCR. It also requires consideration of current exploitation rates in relation to biological reference points and the agreed trigger level (guidance for SA2.5.6: 'evidence that current F is equal to or less than F_{MSY} should usually be taken as evidence that the HCR is effective').</p> <p>Taking this last point first, it is clear that $F < F_{MSY}$ (see 1.1.1). A formal agreement for the development of a well-defined HCR is provided by CMM 2014-06, with a framework provided by the associated workplan (updated after WCPFC13 and again after WCPFC14 to reflect the failure to move forward on some of the milestones). A trigger level is provided by the agreed limit reference point ($20\%SB_{F=0}$). The recent assessment provides some evidence that the tools in use are sufficiently effective at controlling exploitation rates.</p> <p>Overall, therefore, under the MSC requirements and guidance for 'available' HCRs, SG60 is met. SG80 is not met.</p>

Condition	WCPO bigeye needs a harvest control rule that ensures that the exploitation rate is reduced as the PRI is approached and is expected to keep the stock fluctuating around the target level and robust to the main uncertainties. The tools used to implement the HCR should be effective in achieving the required exploitation levels.
Milestones	<p>The milestones have been aligned with the latest iteration of the WCPFC harvest strategy WCPFC (2017a).</p> <p>Year 1 (2019) – Year 3 (2021): the client should provide evidence that it is actively working to ensure that well defined harvest control rules taking into account the main uncertainties are in place for WCPO bigeye and that these are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached. This evidence will include a summary of the actions taken by the client and other relevant parties to achieve this outcome in alignment with the WCPFC agreed work plan. (Score 60).</p> <p>Year 4 (2022): HCR adopted. (Score: 80)</p>
Client action plan	See the client action plan for condition 1, where advocacy for items (iii) and (iv) relate to having a well-defined harvest control rule (HCR) for WCPO bigeye tuna developed and adopted that takes into account the main uncertainties for the stock that are consistent with the harvest strategy, ensures that the exploitation rate is reduced as a limit reference point is approached, and is expected to keep the stock near its TRP.
Consultation on condition	No consultation is required since WCPFC have already expressed their intention of undertaking this process (see CMM 2014-06 and current harvest strategy workplan).

Table 26. Condition 3

Performance Indicator	2.3.1b The UoA meets national and international requirements for the protection of ETP species. The UoA does not hinder recovery of ETP species. Direct effects
Score	75
Rationale	<p>Scoring issue b (SG80): Known direct effects of the UoA are highly likely to not hinder recovery of ETP species</p> <p>Sea turtles: Only two interactions with sea turtles were recorded in the observer data, both of which were loggerheads and were dead at point of discard. Considering the low level of observer coverage and low number of interactions, the team made no attempt to scale up these data. The FSM EEZ overlaps with 4 sea turtle Regional Management Units (RMUs), none of which concern the loggerhead but four other species: green turtle, hawksbill, leatherback and olive ridley. The olive ridley RMU is considered at high risk from bycatch in longlines (Wallace et al., 2013).</p> <p>The distribution of sea turtles in FSM waters is not well known, although the green turtle is thought to be the most abundant with moderate nesting colonies on some of the outer islands (Ahser, 2002). An overview of known nesting sites is also available here: http://seamap.env.duke.edu/swot. This suggests that interactions with adult nesting females may occur which would have a more severe impact at population level than interactions with only juveniles. Although observer coverage is limited and recorded interactions rates are low, a study on the bycatch profile of the pelagic tuna longline fishery in neighboring Palau which is a shallow-set fishery (the FSM fishery makes deep sets and therefore very likely has significantly lower catch rates of sea turtles and other epipelagic species) \ (Gilman et al., 2015), indicates a higher interaction rate is possible, with 106 sea turtles caught during 232 observed sets (or 60 trips) between 1999 and 2011 (excluding 2000 to 2003 and 2006). Although the known direct effects of the UoA are likely to not hinder recovery of ETP species, more information would be required to determine that this is highly likely to be the case. SG80 is not met.</p>
Condition	The evidence base for determining interaction rates with ETP species, in particular sea turtles, should be improved so that trends in interactions can be measured and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.
Milestones	<p>Year 1 (2019): Evaluate current data collection strategy and identify areas of improvement. Develop improved data collection plan. Start with improved data collection (Score: 75).</p> <p>Year 2 (2020): Continue development of improved data collection plan. Continue with improved data collection (Score: 75).</p> <p>Year 3 (2021): Continue development of improved data collection plan. Continue with improved data collection (Score: 75).</p> <p>Year 4 (2022): Full implementation of improved data collection plan. Continued data collection. Demonstrate sufficient quantitative information is available to assess UoA related mortality on sea turtles and to measure trends in interactions with all ETP species. Data analysis results show that the known direct effects of the UoA are highly likely to not hinder recovery of ETP species, in particular sea turtles. (Score: 80).</p>
Client action plan	By Dec. 2019 (Year 1), the client will request that NORMA modify the SPC/FFA logsheet form to add a field for "turtle interactions" so that the captain has a

		<p>location on the form to record sea turtle capture events and NORMA can start inputting the logsheet turtle interaction data into the Tufman database.</p> <p>The client will request that FSM NORMA achieve a minimum observer coverage rate of 4% of trips made in 2020 (Year 2) in the FSM EEZ by the vessels covered by the MSC certificate, and 5% in subsequent years.</p> <p>By Feb 2022, demonstrate that a minimum 4% observer coverage rate was achieved during the previous calendar year (2020, Year 2), that during 2020 logsheets had a field for captains to record sea turtle captures, and that NORMA input into Tufman the turtle interactions recorded on logsheets in 2020.</p> <p>By Feb. 2022 demonstrate that a minimum 5% observer coverage rate was achieved during the previous calendar year (2021, Year 3), that during 2021 logsheets had a field for captains to record sea turtle captures, and that NORMA input into Tufman the turtle interactions recorded on logsheets in 2021.</p> <p>By Feb. 2023 demonstrate that a minimum 5% coverage rate was achieved during the previous calendar year (2022, Year 4).</p> <p>By Dec. 2022 (Year 4) NORMA will review annual species-specific ETP catch rates and raised levels by vessels in the UoC to determine whether catch rates or levels are experiencing a significant increasing trend. The client will request that FSM NORMA consult with relevant experts to obtain advice on whether the estimated fishing mortality levels are highly likely to not be hindering the recovery of sea turtles and other ETP species.</p>
Consultation condition	on	FSM NORMA (see Appendix 7)

Table 27. Condition 4

Performance Indicator	2.3.2d Management strategy implementation
Score	75
Rationale	<p>Scoring issue d (SG80): There is some evidence that the measures/strategy is being implemented successfully.</p> <p>All ETP species: during site visit interviews non-compliance by the UoA fleet was not a cause for concern in this fishery and observations during the site visit indicated that some measures (e.g. turtle dehookers) were being implemented. Whilst there is no evidence that the measures described in SIa are not being implemented successfully, the observer coverage in this fishery is currently too low to provide evidence that this is indeed the case. The team therefore concluded that the current non-compliance with 5% observer rates required by CMM 2007-01 precludes SG80 from being met.</p>
Condition	The client should provide evidence that all relevant national and regional regulations on fishery interactions with ETP species are adhered to by the UoA so that it can be demonstrated that the fishery does not hinder recovery of ETP species.
Milestones	<p>Year 1: Identify short-comings at fleet level in the implementation of relevant national and regional regulations in relation to ETP species. Identify short-comings at NORMA to ensure compliance with CMMs, particularly in relation to observer coverage (CMM 2007-01). (Score: 75)</p> <p>Year 2: Put in place measures to ensure implementation of relevant national and regional regulations in relation to ETP species at fleet and NORMA level. (Score: 75)</p> <p>Year 3: Continue to develop measures to ensure implementation of relevant national and regional regulations in relation to ETP species at fleet and NORMA level. (Score: 75)</p> <p>Year 4: Demonstrate that all relevant national and regional regulations on fishery interactions with ETP species are adhered to by the UoA. (Score: 80).</p>
Client action plan	<p>By Dec. 2019 (Year 1): The client, in coordination with FSM NORMA, will identify all FSM and WCPFC conservation and management measures related to ETP species, including observer coverage rate, implementation of sea turtle handling and release practices required under WCPFC CMM 2008-03, a ban on using wire leaders or shark lines required under WCPFC CMM 2014-05, and a ban on retaining any sharks under FSM rules, and determine which of these measures are not being met by NORMA or the UoA.</p> <p>By Dec. 2020 (Year 2), the client will support and advocate that FSM NORMA has corrected any deficits in implementing national or regional ETP measures.</p> <p>The client will achieve the annual observer coverage rates as described in the client action plan under condition 3.</p>
Consultation on condition	FSM NORMA (see Appendix 7)

Table 28. Condition 5

Performance Indicator	PI 2.3.3 Relevant information is collected to support the management of UoA impacts on ETP species, including: <ul style="list-style-type: none"> • Information for the development of the management strategy; • Information to assess the effectiveness of the management strategy; and • Information to determine the outcome status of ETP species.
Score	60
Rationale	<p><u>Scoring issue a (SG80):</u> Some quantitative information is adequate to assess the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species.</p> <p>Sea turtles: as rare-event species, the observer coverage is currently too low to enable a quantitative estimation of mortality rates. SG80 is not met.</p> <p>Scoring issue b (SG80): Information is adequate to measure trends and support a strategy to manage impacts on ETP species.</p> <p>All ETP species: much of the information used in the scoring of the ETP species component stems from studies on similar fisheries (e.g. Gilman et al. (2015)) or risk assessments (e.g. Filippi et al. (2010)), with the only fishery-specific information provided by a limited observer dataset. While the strategies in place are considered appropriate to manage the UoA's impact on ETP species (PI 2.3.2), the evidence base is lacking to detect increases in risk level and adapt management strategies on an ongoing basis. For this reason, SG80 is not met</p>
Condition	The evidence base for determining interaction rates with all ETP species should be improved so that UoA related mortality on sea turtles can be assessed and so that trends in interactions with all ETP species can be measured over time and so that it can be determined whether the UoA may be a threat to protection and recovery of the ETP species.
Milestones	<p>Year 1 (2019): Evaluate current data collection strategy and identify areas of improvement. Develop improved data collection plan. Start with improved data collection (Score: 60).</p> <p>Year 2 (2020): Continue development of improved data collection plan. Continue with improved data collection (Score: 60).</p> <p>Year 3 (2021): Continue development of improved data collection plan. Continue with improved data collection (Score: 60).</p> <p>Year 4 (2022): Full implementation of improved data collection plan. Continued data collection. Demonstrate sufficient quantitative information is available to assess UoA related mortality on sea turtles and to measure trends in interactions with all ETP species (Score: 80)</p>
Client action plan	See client action plan for Condition 3.
Consultation on condition	FSM NORMA (see Appendix 7)

Appendix 3 Peer Review Reports

Note: the Principle 2 and Principle 3 sections of this report were previously peer reviewed as part of the yellowfin UoA for this fishery. The yellowfin UoA was certified on the 5th October 2018 (F-CUP-058). The following peer reviews therefore focus on Principle 1 alone.

Appendix 3.1 Peer review 1

Summary of Peer Reviewer Opinion

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	Yes/No YES	CAB Response
<p><u>Justification:</u></p> <p>The PRDR used current and relevant data to support the findings for each of the performance indicators. For Principle One the stock assessment used state of the art population modeling techniques to determine the stock status. This stock assessment was recent (full assessment in 2017, updated in 2018) and adequately captured the uncertainty relating to stock status, which determined the stock is at a level which maintains high productivity and has a low probability of recruitment overfishing. The main stock status findings from the assessment (McKechnie, et al., 2017; Vincent et al., 2018) were based on the new growth curves for bigeye, which were an improvement from the estimates internal to the assessment program used in 2014.</p> <p>The harvest strategy needs additional work, and this is currently planned for BET by the WCPFC.</p>		Thank you, no comment required.

<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?</i> <i>[Reference: FCR 7.11.1 and sub-clauses]</i>	Yes/No yes	CAB Response
<u>Justification:</u> The conditions and specified outcomes over the subsequent years (Appendix 2) are appropriate for this assessment. Each PI that failed to meet the SG80 has its own distinct condition associated with it, cross-referencing as appropriate where common themes (i.e. lack of observer coverage) need to be addressed. Each condition explicitly states the rationale supporting the condition. There are verifiable milestones for achieving the SG80 for each condition. These milestones have specific timeframes which for the most part the first four years of certification (2019-2022). The score associated with the individual outcomes (milestones) to fulfill the condition was provided for all conditions. The first two conditions relate to the development of HCR and TRPs for the bigeye stock, and rest upon the caveat that WCPFC have already expressed their intention of undertaking this process (see WCPFC CMM 2014-06 and current harvest strategy workplan). As long as this workplan is achieved as written the SG80 should be met for these two conditions. Conditions 3,4 & 5 have been brought up because of a lack of data to support findings on ETP species, and due to non-compliance with minimum observer coverage (5%) and should be remedied by 1) an improved data collection plan (and updated logsheets) in place, along with 2) 5% coverage in the vessels covered in the MSC certificate. Of note is that the improvement of observer coverage to 4% and then 5% of trips may be a time consuming process as observer training and certification may take some time. Observer coverage of effective effort may be more readily measured by calculating the number of hooks observed to the number of fished.		No comment required. <

<i>Do you think the client action plan is sufficient to close the conditions raised?</i> <i>[Reference FCR 7.11.2-7.11.3 and sub-clauses]</i>	Yes/No YES	CAB Response
<u><i>Justification:</i></u> The client action plan is integrated into <i>Appendix 2, Conditions</i> with annual milestones for each of the conditions set out. The client action plan contains a time frame, which extends from 2019 to 2022 and indicates the parties responsible for the outcome of each component of the condition. Along with this information the expected score associated with the outcomes of		No comment required.

the conditions gives an indication of how the action is expected to improve the performance of the UoA.

The report does not explicitly state how any subsequent surveillance or assessment would assess any of the outcomes and milestones, presumably because they will all have been demonstrated as met as outcomes of the milestones, however this should be clarified in the final report. How the progress to meeting conditions would be demonstrated is largely self-evident and contained in the client action plan.

Several aspects of the client action plan rely upon the involvement of the WCPFC (see the milestones in Condition 1), and are necessary for this stock, and do not require consultation with the WCPFC, but do rely on the continued progress on developing a TRP and HCR for the stock. Given these comments the conditions are achievable and realistic in the allotted timeframe.

The milestones were drafted by the assessment team and explicitly state how progress against the conditions will be verified at surveillance audits. The milestones were not modified.

No comment required.

For reports using one of the default assessment trees:

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Yes	Yes	NA	The certifier correctly notes that, "there is high probability that the SB is above the LRP (36 out of 36 models in the latest assessment). The WCPFC SC14 characterize the probability of SB<LRP as 0%, but in practice, it is clear that there is some uncertainty around stock status which is not quantified in this grid. The key uncertainty has been the growth model, but the additional work carried out in 2018 (Project 81), added to the existing 'new' growth model for 2017 provides additional confidence, such that SC14 decided to exclude the 'old' growth model as a sensitivity in the model output grid. This gives higher confidence than previously that the stock is above the LRP level."	No comment required.
1.1.2	NA	NA	NA	The stock does not require rebuilding.	No comment required.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.2.1	Yes	Yes	Yes	The certifier notes that the "stock status projections suggest that current management is precautionary in the short term. The stock assessment model based on the updated new growth curve, even with other sources of uncertainty remaining, suggests that the biomass will remain above the LRP with high probability." The main concern is that overall the "current harvest strategy is a stop-gap and has not been fully evaluated." Though this is under consideration by the WCPFC	No comment required.
1.2.2	Yes	Yes	Yes	Basically the issue here is that "A formal framework is in place for the development of a harvest strategy for the stock" but these are no robust to the main uncertainties regarding the harvest and stock, given that they are not yet in place.	No comment required.
1.2.3	Yes	Yes	NA		No comment required.
1.2.4	Yes	Yes	NA		No comment required.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.1.1	Yes	Yes	NA		No comment required.
2.1.2	Yes	Yes	NA		No comment required.
2.1.3	Yes	Yes	NA		No comment required.
2.2.1	Yes	Yes	NA		No comment required.
2.2.2	Yes	Yes	NA		No comment required.
2.2.3	Yes	Yes	NA		No comment required.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.3.1	Yes	Yes	Yes	<p>The scoring of this SI is appropriate given the condition raised, ideally much higher levels of observer coverage would be put in place throughout the UOA. Significantly higher levels of observer coverage are needed to observe rare events.</p> <p>Although the FSM requirements are 5% of trips observed in practice this often leads to less than 5% of the effective effort being observed, coverage of hooks fished, rather than trips, is a better metric of the overall effort and observed effort.</p>	<p>The team used observer coverage in terms of 'trips' as this is the metric used in CMM 2007-01 as well as proposed in WCPFC-TCC9-2013-09. Demonstrated compliance with this CMM would enable the condition to be lifted, however it should be noted that FSM (in collaboration with the Client fleet) are in the process of piloting an electronic monitoring programme with the aim of eventually supplementing the 5% human observer coverage.</p>
2.3.2	Yes	Yes	Yes		No comment required.
2.3.3	Yes	Yes	Yes		No comment required.
2.4.1	Yes	Yes	NA		No comment required.
2.4.2	Yes	Yes	NA		No comment required.
2.4.3	Yes	Yes	NA		No comment required.

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
2.5.1	Yes	Yes	NA		No comment required.
2.5.2	Yes	Yes	NA		No comment required.
2.5.3	Yes	Yes	NA		No comment required.
3.1.1	Yes	Yes	NA		No comment required.
3.1.2	Yes	Yes	NA		No comment required.
3.1.3	Yes	Yes	NA		No comment required.
3.2.1	Yes	Yes	NA		No comment required.
3.2.2	Yes	Yes	NA		No comment required.
3.2.3	Yes	Yes	NA		No comment required.
3.2.4	Yes	Yes	NA		No comment required.

Appendix 3.2 Peer review 2

Summary of Peer Reviewer Opinion

<i>Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?</i>	No	CAB Response
<u>Justification:</u> There is a lack of evidence or justification to support a score of 80 for PI 1.2.1b.		Please see our response to your specific comment below
<i>Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?</i> <i>[Reference: FCR 7.11.1 and sub-clauses]</i>	Yes	CAB Response
<u>Justification:</u> The need for the WCPFC to finish developing the HS is clear and the wording appropriate for the Client to seek to drive that development within the Commission.		Thank you, no comment required.
<i>Do you think the client action plan is sufficient to close the conditions raised?</i> <i>[Reference FCR 7.11.2-7.11.3 and sub-clauses]</i>	Yes	CAB Response
<u>Justification:</u> Noting the difficulty experienced by individual fisheries in influencing RFMOs, the way the CAP addresses the conditions should be sufficient but the surveillance audits will need to be aware of any further slippage in the RFMO HS workplan.		No comment required.

For reports using one of the default assessment trees:

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
1.1.1	Yes	Yes	N/A	<p>Generally solid evidence drawn from the stock assessment provides appropriate justification for this PI.</p> <p>Element 1.1.1b: while the report discusses evidence that the stock is fluctuating about a level consistent with MSY, including a Kobe plot of the stock status history from the stock assessment would greatly assist the reader in interpreting this aspect of the evaluation.</p>	<p>No comment required.</p> <p>The team provided a summary of reference points over the 36 models in the structural uncertainty grid (section 3.3.3) which we considered more informative than a kobe plot.</p>
1.2.1	Yes	No	Yes	<p>The justification follows that of used in assessments of other tuna fisheries relating to the availability of components of the HS.</p> <p>Element 1.2.1b: The text indicates that the Assessment Team "considered that the estimated low probability that SB<LRP and F>FMSY constitutes 'evidence' that the harvest strategy is working. SG80 is therefore met." The stock assessment for</p>	<p>No comment required.</p> <p>This is correct (see Table 5) but this refers to projections through to 2045, while the rationale specifically states 'precautionary in the short term'. The harvest strategy workplan (as agreed at WCPFC14) states that a formal</p>

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				bigeye reported in the 2018 SC Summary report states on page 41 (para 180): "Under the scenario assuming long-term average recruitment continues into the future there was a high risk (18-32%) of breaching the LRPs and a zero probability of achieving the objective of CMM 2017-01, while under the scenario which assumes higher more recent recruitments continues into the future there was a low risk (0-5%) of breaching the LRPs and a 100% probability of achieving the objective of CMM 2017-01." There is thus some considerable uncertainty about whether the current HS is in fact achieving its objectives. Scoring of this at 80 appears to substantially overstate the effectiveness of the HS, without more justification, this element does not warrant a score of 80.	HCR should be agreed for bigeye by 2021. Even if this timetable slips somewhat, the time horizon over which it is appropriate to evaluate the current harvest strategy is therefore considerably shorter than 2045. The scoring was not amended.
1.2.1	No	No	N/A	Element 1.2.1f: the Assessment Team have used an observation in the stock assessment that refers to all of the WCPO bigeye fisheries that there	Principle 1 is concerned with the status and management of the target stock, for which discarding by other fisheries could be

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				minimal discards in this fishery. This UoA is a relatively small component of the overall WCPO bigeye fishery and even if there was substantive discarding, this would not be significant in terms of the stock assessment and would likely not be reported. This is, therefore, inappropriate: an evaluation of the level of discarding of bigeye in this UoA should be based on data gathered from this UoA.	relevant. It has, however, been noted in the rationale that there is negligible discarding of bigeye in the UoA.
1.2.2	Yes	Yes	Yes	It is clear that there is an available HCR but that it is not in place. The scoring flows from this understanding and is clearly explained.	No comment required
1.2.3	Yes	Yes	N/A	The data available are very similar to that for other tuna fisheries in this region and this PI has thus been scored similarly and appropriately.	No comment required
1.2.4	Yes	Yes	N/A	SPC is noted for the high quality of its assessments and this is no exception. There is also consultation on the stock assessment approach and a degree	No comment required

Performance Indicator	Has all available relevant information been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response
				of peer review of the assessment by the SC. This is clearly described and well justified.	

Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary) can be added below and on additional pages

Major comments

In recommendation 3 (pages 9 and 98), it is noted that “*Unobserved mortality of ETP species is most likely to occur through ghost fishing.*” Unobserved ETP mortality is much more likely to occur due to the low level (<5%) of observer coverage.

Team response: we understand the peer reviewer’s concerns about the low level of observer coverage, however this is being addressed through the condition as well as through the EM pilot that is currently being run in FSM in collaboration with the Client fleet. The team applied the MSC’s guidelines on ‘Unobserved mortality’ which explicitly refers to ghost fishing (GSA3.1.8); however we are in agreement that this is not a major problem in this fishery.

Minor/editorial comments

There is a problem with the placement of the degree symbol (for latitude) on page 35 (e.g. 15o).

Thank you, corrected.

Three approaches of how growth is considered in the model is referred to at the top of page 36 but only two are then described.

Thank you, corrected.

Reference to effort creep in the purse seine fishery is given on page 36 as Section 0. This should refer to Section 3.3.8 or 3.3.7.

Yes, 3.3.8 – corrected.

Erroneous carriage return at the bottom of page 36, just above Table 9.

Thank you, corrected.

Appendix 4 Stakeholder submissions

No stakeholder submissions were received prior to publication of the PCDR.

(REQUIRED FOR FR AND PCR)

1. The report shall include all written submissions made by stakeholders about the public comment draft report in full, together with the explicit responses of the team to points raised in comments on the public comment draft report that identify:

- a. Specifically what (if any) changes to scoring, rationales, or conditions have been made.
- b. A substantiated justification for not making changes where stakeholders suggest changes but the team makes no change.

(Reference: FCR 7.15.5-7.15.6)

Appendix 5 Surveillance Frequency

The surveillance level for this fishery is set at the default level (Level 6), requiring 4 annual on-site audits.

Surveillance Level	Year 1	Year 2	Year 3	Year 4
Level 6	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & re-certification site visit

Appendix 6 Objections Process

(REQUIRED FOR THE PCR IN ASSESSMENTS WHERE AN OBJECTION WAS RAISED
AND ACCEPTED BY AN INDEPENDENT ADJUDICATOR)

The report shall include all written decisions arising from an objection.

(Reference: FCR 7.19.1)

Appendix 7 NORMA Letter of Support



National Oceanic Resource Management Authority

FSM NATIONAL GOVERNMENT

P.O. Box PS122

PALIKIR, POHNPEI, FEDERATED STATES OF MICRONESIA 96941

Tel: (691) 320-5181/2700

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Email: norma@mail.fmWebsite: www.norma.fm

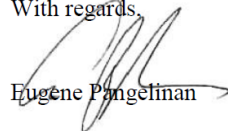
Chrissie Sieben, Lead Leader
MSC Assessment Team – FSM longline fishery
ME Certification
56 High Street
Lymington, UK

Re: Letter of commitment for MSC draft Client Action Plan – SZLC, CSFC and FZLC FSM
EEZ Longline Fishery

Dear Ms. Sieben,

The Federated States of Micronesia (FSM) National Oceanic Resource Management Authority (NORMA) fully supports efforts by the client group of companies (Liancheng Overseas Fishery (Shenzhen) Co. Ltd, China Southern Fishery Shenzhen Co. Ltd., and Liancheng Overseas Fishery (FSM) Co. Ltd.) to pursue certification of their vessels participating in the FSM pelagic longline fishery that operates in FSM's exclusive economic zone against the Marine Stewardship Council's fisheries standard. As stated in the enclosed Memorandum of Understanding which NORMA executed with the Liancheng Overseas Fishery (FSM) Co. of the client group in April 2017, NORMA remains committed to assist the client group, if the fishery passes the MSC assessment, in successfully addressing the conditions of certification. NORMA is therefore committed to assisting the client group to implement activities described in the draft Client Action Plan that require NORMA's support.

With regards,



Eugene Pangelinan

Enclosure