Marine Stewardship Council (MSC)

Announcement Comment Draft Report

DFC/HEC Western and Central Pacific longline bigeye, yellowfin and albacore tuna fishery

On behalf of

Dongwon Fisheries Co. Ltd and Hansung Enterprise Co.

Prepared by

Control Union (UK) Limited

May 2022

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ACDR

Role	Signature and date	Date
Originator:	Deirdre Duggan	11th April 2022
Reviewer:	B O'Kane	19th April 2022
Approver:	T Tsuzaki	17th May 2022

Executive Summary

Draft determination to be completed at Public Comment Draft Report stage

The assessment for DongWon Fisheries (DFC) Co. Ltd and Hansung Enterprise Co. (HEC) encompasses three species (yellowfin tuna, bigeye tuna and albacore tuna) caught using longline gear across the Western and Central Pacific Ocean and North and South Pacific Ocean. There are four Units of Assessment (UoAs). This report is the Announcement Comment Draft Report (ACDR) which provides details of the MSC assessment process for the DFC/HEC Western and central Pacific longline bigeye, yellowfin and albacore tuna fishery. The process begins with the publication of the ACDR on the 1st June 2022 and was concluded (to be determined at a later date).

A review of information presented by the client has been scored by the assessment team – please note this **does not** represent the final scoring outcome or a certification decision by CUUK. The scoring presented in this report has not yet been reviewed by stakeholders or peer reviewers – these reviews will be the next phase of the assessment process. The site visit for this fishery will take place starting 1st August 2022. Given the ongoing COVID-19 pandemic, a Variation Request will be submitted to allow the site visit to be conducted remotely via conference calls, as per the MSC Derogation 3. 29th March 2022.

Stakeholders are encouraged to review the scoring presented in this ACDR and make use of the Stakeholder Input Form to provide evidence to the team where scoring changes are necessary. All stakeholder comments received in the correct format (i.e., using MSC template) will be published on the MSC track a fishery page for this fishery prior to the site visit. Stakeholders are encouraged to discuss their written submissions with the assessment team during the remote site visit, commencing week 1st August 2022. Once CUUK receive input from a stakeholder, date and time will be arranged for the stakeholder discussion.

The target eligibility date for this assessment is the date of the publication of the Public Certification Report.

The assessment team for this fishery assessment is Deirdre Duggan (Team Leader), Kevin McLoughlin (Principle 1 expert), Tim Emery (Principle 2 expert) and Peter Watt (Principle 3 expert).

Client strengths:

Principle 1:

- Extensive data collection systems are in place at the WCPFC (and IATTC) and client fishery levels for all four P1 species. The available information supports regular robust stock assessments. All stocks have been assessed as being well above the PRI and at a level consistent with MSY. The activities of the client fishery vessels are well monitored. The WCPFC has a workplan for the development of harvest strategies for key tuna species.

Principle 2:

- All main primary species that are targeted (i.e. tunas) and all main secondary species are either highly likely to be above the PRI or there is a high degree of certainty that they are above the PRI and have a partial strategy or strategy in place to manage the impact of the UoA. All minor primary species are highly likely to be above the PRI.

- There is some objective basis for confidence that the measures, partial strategy or strategies in place for main primary and main secondary species will work and there is some evidence that they are being implemented successfully.
- Some quantitative information is available and adequate to assess the impact of the UoA on all main and minor primary species as well as main secondary and supports at least implementation of a partial strategy.
- Direct and indirect effects of the UoAs are highly likely to not hinder recovery of most ETP species. Overall, there is a low number of interactions for most ETP species in the UoAs relative to population estimates or catches within the WCPFC Convention Area.
- All ETP species have a strategy in place to manage the impact of the UoAs, including measures to minimise mortality that is designed to be highly likely to achieve national and international requirements for protection of ETP species. There is some objective basis for confidence that the measures/strategy will work for all ETP species and there is some evidence that they are being implemented successfully.
- The potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species are reviewed regularly and they are implemented as appropriate.
- At the regional level, there is sufficient information about ETP species and there is arguably quantitative information about some ETP stocks/populations that interact with the UoA.
- The UoA operates in deep water using pelagic longlines and is highly unlikely to interact with benthic features and reduce the structure and function of the epipelagic habitat. There is objective basis for confidence that the partial strategy will work, and there is quantitative evidence that demonstrates the fishing gear would have no impact on benthic habitats.
- The distribution of the pelagic habitat is known over the spatial range in which the UoA operates and the effect of pelagic longlines on this habitat (i.e., epipelagic) is negligible.
- Information is adequate to allow for identification of the main impacts of the UoA on the epipelagic habitat. There is reliable information on the spatial extent of interaction and on the timing and location of the fishing gear use through VMS and e-reporting among the UoA.
- 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 a partial strategy in place, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem.
- There is some objective basis for confidence that the partial strategy in place to manage UoA impacts on the ecosystem will work and there is some evidence that they are being implemented successfully.
- The information gathered is sufficient to identify species impacted and understand the main functions of the ecosystem components, while also adequate to ensure that the main consequences for the ecosystem of commercial fishing operations from the UoA can be estimated and any increase in risk level detected.

Principle 3:

- There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2 and the precautionary approach. Korea is a signatory to a range of international fisheries policy instruments and treaties, including UNCLOS and UNFSA, it is a participating and active member of the WCPFC and its coastal and offshore fisheries are managed under the Fisheries

Act and the Fishery Resources Management Act, while distant water fisheries are managed by the Distant Water Fisheries Development Act (DWFDA) which was amended in 2019.

- The functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction for the national management system.
- The regional and national management systems demonstrate consideration of information obtained and scientific reports and indicate what information is being used, how it is used, and justification is provided for information which is rejected. There are mechanisms in place to evaluate and review the fishery-specific management systems
- The regional level consultation processes provide opportunity and encouragement for all interested and affected parties to be involved and facilitate their effective engagement.
- At the regional level, the decision-making processes have resulted in a comprehensive set of CMMs and strategies to achieve specific objectives for the longline fishery. At the national level, the system of decision-making allows relevant stakeholders to be fully informed of the issues under consideration and ensure that decision-making results in measures and strategies to achieve fishery-specific objectives. The high seas fishery management systems of Korea are structured to respond to serious and other important issues that may be identified by national stakeholders and apply to national policy making relevant to the fishery specific management system.
- At the regional level, WCPFC seeks to ensure compliance through mandatory VMS, an IUU vessel list, port state controls, observers (and e-monitoring), logbooks (plus e-reporting), a record of fishing vessels and transhipment monitoring. Also, the regional MCS is supported by the QUAD Operational Working Group, comprised of the aerial and naval divisions of Australia, France, New Zealand and the U.S. At the national level, a comprehensive monitoring, control and surveillance system has been implemented, which has shown an ability to enforce relevant management measures, strategies and/or rules.
- For client longline vessels operating in high seas areas, there is some degree of confidence that fishers comply with the national and international management frameworks in place (no infractions were committed by the UoA vessels in 2019 and 2020).

Client weaknesses:

Principle 1:

- No harvest strategies of the form required by MSC are in place for P1 species at the WCPFC level and no agreed harvest control rules have been adopted to control fishing across the range of each stock. There have been several amendments to the WCPFC workplans to adopt formal harvest strategies which have resulted in delays to the adoption of elements of the strategies. The current timeline will make it difficult for harvest strategy conditions for WCPO yellowfin and bigeye tuna, and South Pacific albacore, to be met by June 2023 as required by the 2019 MSC CAB Variation and MSC derogation extensions due to Covid-19.

Principle 2:

- South American pilchard (Japanese Tsushima stock) is below the PRI and verified information on bait quantities is required to determine whether the cumulative impact of overlapping MSC UoAs hinders its recovery.

- It is not clear which stock of South American pilchard in Japan the UoA is sourcing bait from, and whether there is a cohesive arrangement in place that ensures bait is purchased from sustainable fisheries.
- According to bait purchase records, the majority of South American pilchard is being sourced by the UoA from China/Indonesia, where there is a lack of information on management measures in place.
- Further detail on UoA discarding practices is required and potential review of alternative measures to minimise mortality of unwanted catch of yellowfin and bigeye tuna.
- Precautionary scoring has been given to two bait species – Amberstripe scad and Indian oil sardine because of the need to apply the RBF at the site visit and seek stakeholder input.
- Further detail on UoA's compliance with shark finning regulations is required, as at-sea observer coverage in the UoA is low.
- Further detail on UoA's review of alternative measures to minimise mortality of unwanted catch of blue shark is required.
- In the absence of significant observer coverage or evidence of MCS activities and external validation of compliance with management measures, scores on ecosystem outcome PI, management strategy PIs and information PIs are affected.
- The low observer coverage in the fishery meant that it was not possible to determine that the UoA is highly likely to not hinder recovery of Olive Ridley turtles.
- The logbook data from the UoA had no recorded interactions with ETP species for the last five years. The logbook data and low level of observer coverage for the UoA represents a small basis of information to support a strategy to manage impacts on ETP species. There is not enough adequate information to measures trends in ETP bycatch for the UoA.

Principle 3:

- Dispute mechanisms have not been tested and proven to be effective at the regional and national levels. There is no evidence that proactive actions have been taken to limit disputes.
- National and regional management systems do not have formal mechanisms in place that formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood.
- The regional management system's functions, roles and responsibilities are not explicitly defined and well understood for all areas of responsibility and interaction. There is insufficient evidence to demonstrate how stakeholder information is used, or not, in decision-making at the national and regional levels. There is insufficient evidence to suggest meaningful facilitation at the national level to achieve effective engagement of all interested and affected parties. At the national and regional levels, formal reporting of comprehensive information on the fishery's performance and management actions is not always available to interested stakeholders.
- In most cases, CMMs objectives for sea turtles, sharks, seabirds, manta and mobulid rays are not well defined or measurable. 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. It is unclear how the precautionary approach and ecosystem approach to fisheries are used at the national and regional levels.

- At the regional level, decision-making is sometimes hampered by the operational particularities of cooperative regional fisheries management, especially with consensus decision-making. WCPFC has not been successful in establishing HCRs for BET and YFT.
- At the national level, it cannot be demonstrated that the monitoring, control and surveillance system has the consistent ability to enforce relevant management measures, strategies and/or rules due to the low observer coverage in the high seas during the COVID-19 pandemic.
- At the regional level, while some progress has been demonstrated towards transparency in reporting on Flag State compliance, the TCC reports still do not provide sufficient information on outcomes of investigations into non-compliance such that effective deterrence can be demonstrated.
- At the national and regional levels, there are only occasional external reviews of the fishery-specific management systems.

1. Report Details

1.1 Authorship and Peer Reviewers

Deirdre Duggan (Team Leader and Traceability)

Deirdre joined CU UK in March 2022 as Fisheries Assessment Manager. Before joining CU UK, Deirdre worked with LRQA, most recently as Fisheries Manager. With LRQA, Deirdre was responsible for the implementation of the MSC assessments as well as establishing LRQA activities related to the RFVS and Marin Trust. Prior to working on the CAB side of certifications, Deirdre gained experience on the client side while working with an Indonesian NGO (MDPI), whose focus was improvements and recognition for small-scale Indonesian fisheries (primarily handline yellowfin but also mud crab, pole and line and mini purse seine fisheries). As Program Director for MDPI, she led activities related to FIP implementation, traceability developments, Fair Trade certification and MSC certification of small-scale fisheries as well as being responsible for ensuring communication and collaboration with a variety of stakeholders. Deirdre was also a consultant to IPNLF, developing a prototype policy scorecard for handline and pole and line fisheries. Deirdre was on the Steering Committee for the Asia-Pacific FIP Community of Practice 2019 workshop, on the Fair Trade Fisheries Advisory Council as well as the MSC Fish For Good council in Indonesia.

Deirdre obtained a PhD from Queen's University Belfast in 2014 (Fisheries Management), an MSC from Plymouth University in 2010 (Applied Marine Science) and a BSC from NUI Galway in 2008 (Marine Science). Deirdre has completed the required MSC Fishery Team Leader modules for the new v2.2 Fisheries Certification Process, including the Traceability and the RBF modules, as well as ISO 19011 training. Deirdre has no conflict of interest in relation to this fishery.

Kevin McLoughlin (Principle 1)

Kevin McLoughlin is a specialist fisheries consultant based in Australia with more than 30 years' experience across a wide range of international and domestic fisheries science issues, with close links to government policy. He represented the Australian Government on many committees and groups such as fishery assessment groups, providing advice on a diverse range of fisheries and species (including tuna, shark, various finfish, scallop and prawn). Work in assessment groups involved assessment of target species, development of bycatch action plans and ecological risk assessments. Mr McLoughlin was responsible for the production of annual status reports for Australian government-managed fisheries for a number of years. Between 2005 and 2007, Mr. McLoughlin was Australia's delegate on scientific issues at the Indian Ocean Tuna Commission and was Chair of the IOTC Working Party on Bycatch for several years. Mr McLoughlin was also a delegate at meetings of the Commission for the Conservation of Southern Bluefin Tuna.

Mr McLoughlin has worked predominantly on Principle 1 aspects of MSC assessments but has also undertaken Principle 2 and 3 work, as well as peer review and surveillance audits for several fisheries. Kevin was a team member for the full assessment of the Fiji albacore longline fishery, the New Zealand Albacore Fishery, the New Zealand Skipjack Fishery, the Parties to the Nauru Agreement Western and Central Pacific Skipjack and Yellowfin unassociated purse seine fishery, the Tri Marine Western and Central Pacific Skipjack and Yellowfin Tuna Fishery, and Australia's blue grenadier fishery. He was also a member of teams assessing Australia's Northern Prawn Fishery, Western Australia's Exmouth Gulf and Shark Bay prawn trawl fisheries, and South Australia's Spencer Gulf prawn trawl fishery. He was a peer reviewer for the New Zealand albacore troll fishery and for the North and South Pacific American Albacore Fishing Association fisheries and has undertaken surveillance audits for a number of fisheries.

Kevin has passed the MSC online training for FCP v2.2 and has also completed the Risk-Based Framework module. Kevin has no conflict of interest in relation to this fishery.

Dr. Tim Emery (Principle 2)

Tim Emery has a Masters in Fisheries Policy from the University of Wollongong and a PhD in Fisheries Science from the University of Tasmania in Australia. He has over ten year's experience working in both domestic and international fisheries management, policy and science. During his PhD he investigated some of the untested assumptions behind individual transferable quota (ITQ) management and commercial fisher behaviour using experimental economics and discrete-choice modelling. Prior to commencing his PhD, Tim worked as a fisheries management officer for the Australian Fisheries Management Authority (AFMA). At AFMA, Tim gained a detailed understanding of fisheries governance and management frameworks through developing and implementing fisheries regulations and providing advice to stakeholders. Tim is currently employed as fisheries scientist, where he is responsible for undertaking ecological risk assessments, analysing electronic monitoring and logbook data, developing bycatch assessment reports and providing scientific advice to policy-makers. Tim has authored and co-authored over 20 peer-reviewed scientific publications on aspects of fisheries management, policy and science since commencing his PhD.

Tim has successfully completed the MSC online training on the FCP v2.2, the Risk Based Framework and Traceability modules and meets the MSC Team Member competency requirements for Principle 2. He has worked on several MSC pre-assessments and full assessments to date, including the Walker Seafood's Australian eastern tuna and billfish tuna fishery and the Korean Pan Pacific yellowfin, bigeye and albacore longline fishery. He is also a peer reviewer for the MSC Peer Review College and has reviewed several MSC full assessments. Tim has no conflict of interest in relation to this fishery.

Peter Watt (Principle 3)

Peter Watt has over 20 years' fisheries management and development work experience with national governments, regional organisations 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 MSC online training on FCP v2.2, meeting the competency requirements in Table PC2, as well as the Principle 3 competency criteria in Table PC3: Fishery management and operations. He also meets the Table PC3.5 Current knowledge of the country, language and local fishery context (the local language spoken in Pohnpei is English). Peter has no conflict of interest in relation to this fishery.

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:

Peer reviewer information to be completed at Public Comment Draft Report stage

A summary of their experience and qualifications is available via this link: **Enter link**

1.2 Version details

Table 1. Fisheries programme documents versions

Document	Version number
MSC Fisheries Certification Process	Version 2.2
MSC Fisheries Standard	Version 2.01*
MSC General Certification Requirements	Version 2.4.1
MSC Reporting Template	Version 1.2

* default assessment tree

2. Unit(s) of Assessment and Certification

2.1 Unit(s) of Assessment (UoA)

CU UK confirms that the fishery under assessment is within the scope of the MSC Fisheries Standard (7.4 and 7.5 of the MSC Fisheries Certification Process v2.2):

- The target species is not an amphibian, reptile, bird or mammal (FCP v2.2. 7.4.2.1);
- The fishery does not use poisons or explosives (FCP v2.2 7.4.2.2);
- The fishery is not conducted under a controversial unilateral exemption to an international agreement (FCP v2.2 7.4.2.3);
- The client or client group does not include an entity that has been successfully convicted for a forced or child labour violation in the last 2 years (FCP v2.2. 7.4.2.4);
- The client or client group has not been successfully convicted for shark finning in the last 2 years (FCP v2.2 7.4.2.10);[1]
- The fishery has in place a mechanism for resolving disputes, and disputes do not overwhelm the fishery (FCP v2.2 7.4.2.11 and 7.4.2.11iii);
- The fishery is not an enhanced fishery (MSC FCP v2.2 7.4.2.12); and
- The fishery is not an introduced species-based fishery (ISBF) (MSC FCP v2.2 7.4.2.13).

CU UK confirms that the client group has submitted the completed 'Certificate Holder Forced and Child Labour Policies, Practices and Measures Template' prior to the start of this assessment.

The provisional Units of Assessment (UoAs) are given in Table 2. Separate UoAs have been defined for each separate Principle 1 target stock, of which there are four in total.

Table 2. Provisional Unit(s) of Assessment (UoA) 1

Species and stock	UoA 1: WCPO yellowfin tuna (*Thunnus albacares*) UoA 2: WCPO bigeye tuna (*T. obesus*), UoA 3: South Pacific albacore (*T. alalunga*) UoA 4: North Pacific albacore (*T. alalunga*)
Geographical range of the fishery	FAO areas 81, 61, 71 and 77 WCPO high seas
Fishing Gear	Pelagic longline
Management System/s	WCPFC, flag state (Republic of Korea) management
Client group	Dongwon Fisheries Co. Ltd and Hansung Enterprise Co.
Other Eligible Fishers	None

[1] This will be further discussed with stakeholders during the site visit and updated if necessary in the CPRDR.

2.2 Unit(s) of Certification (UoC)

To be drafted at Client and Peer Review Draft Report stage

To be completed at Public Certification Report stage

If there are changes to the proposed Unit(s) of Certification (UoC), the CAB shall include in the report a justification.

Reference(s): FCP v2.2 Section 7.5

Table 3. Unit(s) of Certification (UoC)

Species	
Stock	
Geographical range of fishery	
Fishing gear type(s) and, if relevant, vessel type(s)	
Client group	

3. Assessment results overview

3.1 Determination, formal conclusion and agreement

To be drafted at Public Comment Draft Report stage

The report shall include a formal statement as to the certification determination recommendation reached by the assessment team on whether the fishery should be certified.

The report shall include a formal statement as to the certification action taken by the CAB's official decision maker in response to the determination recommendation.

Reference(s): FCP v2.2 7.20.3 h and 7.21

3.2 Principle level scores

To be drafted at Client and Peer Review Draft Report

The report shall include scores for each of the three MSC principles in the table below.

Reference(s): FCP v2.2 Section 7.17

Table 4. Principle level scores

Principle	Score	
	UoA 1	UoA 2
Principle 1 – Target Species		
Principle 2 – Ecosystem Impacts		
Principle 3 – Management System		

3.3 Summary of conditions

To be drafted at Client and Peer Review Draft Report stage

The report shall include a table summarising conditions raised in this assessment. Details of the conditions shall be provided in the appendices. If no conditions are required, the report shall include a statement confirming this.

Reference(s): FCP v2.2 Section 7.18

Table 5. Summary of conditions

Condition number	Condition	Performance Indicator (PI)	Deadline	Exceptional Circumstances?	Carried over from Pervious Certificate?	Related to previous condition?
				Yes/No	Yes / No / NA	Yes / No / NA

Condition number	Condition	Performance Indicator (PI)	Deadline	Exceptional Circumstances?	Carried over from Pervious Certificate?	Related to previous condition?
				Yes/No	Yes / No / NA	Yes / No / NA
				Yes/No	Yes / No / NA	Yes / No / NA

3.4 Recommendations

To be drafted at Client and Peer Review Draft Report stage

If the CAB or assessment team wishes to include any recommendations to the client or notes for future assessments, these may be included in this section.

4. Traceability and eligibility

4.1 Eligibility date

The eligibility date is the date of the publication of the Public Certification Report, pending the successful outcome of this assessment.

4.2 Traceability within the fishery

Multiple longline sets and hauls are recorded on logbooks, which are completed daily in Daily Catch Reports (DCRs). Information submitted on logbook entries include the coordinates for each set, the time of set and haul, the number of hooks deployed, the number of individuals and weight in kilogrammes by species, the port of departure and unloading, as well as vessel details. These include name of the vessel, the licence number, registration number and the name of the captain.

As fish are removed from the hooks upon hauling, they are brought onboard for gilling and gutting or left whole ("round") and remain identifiable to species level. Other species are processed to customer requirements. They are then moved to the blast freezing room and frozen for 48 to 72 hours depending on the size of the catch. Following freezing, the fish are held in the fish holds in bulk, loose. At this ACDR stage, it is not clear that there is on-board separation of catch according to geographic area (i.e., high seas versus in-zone catches; the latter are not part of the UoC).

During periods of good fishing, the client vessels also use reefer carriers to transport catches to port, to allow the fishing vessel to carry on operating. For at-sea transshipment, the client group tranship in the EEZ of Pacific nations, according to their licence conditions and domestic laws. They only tranship at the EEZs of nations that allow them to tranship. Transshipment is authorised from the Fisheries Monitoring Centre (FMC). For the fishery under assessment, which covers high seas activities only, transshipment occurs according to the WCPFC CMM 2009-06. During all client group transshipment activities, there is 100 % observer coverage. A 10 % allowance between species (rather than total catch) weight reported before and after transshipment is allowed (the transshipment procedures are to be discussed at the site visit).

At least 24 hours prior to the vessel (relevant to both fishing vessel and transshipment vessel) entering port in Busan, the NFPQMS (National Fishery Products Quality Management Service) and FMC are contacted. Information on the expected amount to be landed, catch documents, information on catch area, and personal information of the vessel captain are provided. An officer from NFPQMS is then dispatched to the port for the vessel unloading. During this time, the fishing licence is also checked and verified by NFPQMS, along with the various logbooks, marking, species, as well as any possible illegalities during the port inspection.

Vessel logbooks, VMS tracks and catch certifications (to be discussed further) are shared through e-reporting and the real-time e-monitoring system that Korea has implemented, and there is a data link between NIFS, NFPQMS and the Ministry of Oceans and Fisheries (MOF). A bill of lading and vessel hold plans are provided with each consignment. In addition, under the Distant Water Fisheries Development Act, a "Report of Port Entry for vessels loading foreign catches" must be submitted to the National Institute of Fisheries Science (NIFS). A report of distant water catches landing volume must also be provided to the NIFS. In case the actual landing volume does not match the reported amount, or there are any differences or changes from what was reported, a correction must be made and submitted as well. In the case of any corrections, the following documents must be submitted along with the landing report:

- Bill of lading;
- Packing list;
- Catch certification;
- Confirmation of catch, issued by the fishing vessel captain;
- Survey report.

The entire catch is sorted and graded upon landing. Landed catches must be verified and checked at the certified weigh-house and by a certified surveyor (to be discussed further). No auctions are involved in the fishery. After landing, the product is transferred to a processing facility in Busan. The point of first sale and point of intended change of ownership are to be discussed at the site visit.

Table 6. Traceability within the fishery

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)? If Yes, please describe: If this may occur on the same trip, on the same vessels, or during the same season; How any risks are mitigated.	When the South Korean government issues a Distant Water Fishing Licence, they require vessels to identify their fishing gears and they are only allowed to fish with that certified fishing gear; in this case, longline. This risk is minimal.
Will vessels in the UoC also fish outside the UoC geographic area? If Yes, please describe: If this may occur on the same trip; How any risks are mitigated.	The entire fleet has VMS and automatic electronic reporting back to the Korean Government. These systems monitor when a vessel is approaching an area for which it does not have a licence and the FMC is notified. Investigations and subsequent sanctions on vessels can then be imposed. Fishing trips will include a mix of operations in certified waters (high seas) and also non-certified (in-zone). There is therefore a risk of mixing fish from different UoCs, as at this ACDR stage, it is not clear that there is on-board separation of catch according to geographic area.
Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities. Transport Storage Processing Landing Auction If Yes, please describe how any risks are mitigated.	There is only minimal processing at sea. Fish are gutted, gilled and blast frozen aboard the vessel. Species are mixed in the hold (following de-hooking from the fishing gear) and not separated until unloading/landing. Due to the nature of the fishing operation, physical separation prior to landing is impractical. The species being caught are however visually easily distinguishable, making physical separation unnecessary until landing. the risk of substitution between UoC and non-UoC areas is discussed above. Transshipment procedures are to be discussed at the site visit.

Factor	Description
Does transshipment occur within the fishery? If Yes, please describe: If transhipment takes place at-sea, in port, or both; If the transhipment vessel may handle product from outside the UoC; How any risks are mitigated.	Transhipment is only allowed under strict guidelines and completed in port with management authority supervision (see above). Transshipment at sea also occurs under the guidelines set by CMM-2009-06. This is to be discussed further at the site visit.
Are there any other risks of mixing or substitution between certified and non-certified fish? If Yes, please describe how any risks are mitigated.	None

4.3 Eligibility to enter further chains of custody

To be drafted at Client and Peer Review Comment Draft Report stage

The report shall include a determination of whether the seafood product will be eligible to enter certified chains of custody, and whether the seafood product is eligible to be sold as MSC certified or carry the MSC ecolabel.

The report shall include a list of parties, or category of parties, eligible to use the fishery certificate, and sell product as MSC certified.

The report shall include the point of intended change of ownership of product, a list of eligible landing points, and the point from which subsequent Chain of Custody certification is required.

If the CAB makes a negative determination under FCP v2.2 Section 7.9, the CAB shall state that fish and fish products from the fishery are not eligible to be sold as MSC certified or carry the MSC ecolabel. If the client group includes other entities such as agents, unloaders, or other parties involved with landing or sale of certified fish, this needs to be clearly stated in the report including the point from which Chain of Custody is required.

Should the fishery be certified the CAB inform the client that they sell or label non-eligible (nonconforming) product as MSC certified, they must:

a. Notify any affected customers and the CAB of the issue within 4 days of detection.

b. Immediately cease to sell any non-conforming products in stock as MSC certified until their certified status has been verified by the CAB.

c. Cooperate with the CAB to determine the cause of the issue and to implement any corrective actions required.

Reference(s): FCP v2.2 Section 7.9

4.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to enter further chains of custody

There are no IPI catches in this fishery.

5. Scoring

5.1 Summary of Performance Indicator level scores

The following scores are preliminary scores derived from the information made available prior to the site visit. In accordance with MSC FCPv2.2 G7.10.2.e, where limited information was available to provide a draft scoring range for a Performance Indicator, a more precautionary score was awarded, in some cases resulting in a score of < 60. It is expected that, with the provision of information during the site visit, some scores will increase.

Table 7. Performance Indicator scores. *more information needed to complete scoring.

Princi-ple	Component	Wt	Performance Indicator (PI)		Wt	Score			
						WCPO YFT	WCPO BET	WCPO SPALB	WCPO NPALB
One	Outcome	0.33	1.1.1	Stock status	0.5	≥80	≥80	≥80	≥80
			1.1.2	Stock rebuilding	0.5	na	na	na	na
	Management	0.67	1.2.1	Harvest strategy	0.25	<60*	<60*	<60*	<60*
			1.2.2	Harvest control rules & tools	0.25	60-79	60-79	60-79	60-79
			1.2.3	Information & monitoring	0.25	≥80	≥80	≥80	≥80
			1.2.4	Assessment of stock status	0.25	≥80	≥80	≥80	≥80
Two	Primary species	0.2	2.1.1	Outcome	0.33	≥80			
			2.1.2	Management strategy	0.33	<60*			
			2.1.3	Information/ Monitoring	0.33	≥80			
	Secondary species	0.2	2.2.1	Outcome	0.33	60-79			
			2.2.2	Management strategy	0.33	<60*			
			2.2.3	Information/ Monitoring	0.33	≥80			
	ETP species	0.2	2.3.1	Outcome	0.33	60-79			
			2.3.2	Management strategy	0.33	≥80			
			2.3.3	Information strategy	0.33	60-79			
	Habitats	0.2	2.4.1	Outcome	0.33	≥80			
			2.4.2	Management strategy	0.33	≥80			
			2.4.3	Information	0.33	≥80			

Princi -ple	Component	Wt	Performance Indicator (PI)		Wt	Score			
						WCPO YFT	WCPO BET	WCPO SPALB	WCPO NPALB
	Ecosystem	0.2	2.5.1	Outcome	0.33	≥80			
			2.5.2	Management	0.33	≥80			
			2.5.3	Information	0.33	≥80			
Three	Governance and policy	0.5	3.1.1	Legal &/or customary framework	0.33	≥80			
			3.1.2	Consultation, roles & responsibilities	0.33	≥80			
			3.1.3	Long term objectives	0.33	≥80			
	Fishery specific manageme nt system	0.5	3.2.1	Fishery specific objectives	0.25	≥80			
			3.2.2	Decision making processes	0.25	≥80			
			3.2.3	Compliance & enforcement	0.25	≥80			
			3.2.4	Monitoring & management performance evaluation	0.25	≥80			

5.2 Fishery overview

5.2.1 The Client fishery

The client fishery covers fifteen vessels that are owned and/or managed by Dongwon Fisheries Co. Ltd (DFC) and Hansung Enterprise Co. Ltd (HEC). All are pelagic longline freezer vessels, based in Busan, Republic of Korea (Table 8). The vessels are licensed by the Distant Water Division of the Ministry of Oceans and Fisheries (MOF) to fish for yellowfin, bigeye and albacore tuna with pelagic longline in the Western Central Pacific Ocean (WCPO) high seas. The extent to which the client fishery is active in the Economic Exclusive Zones (EEZs) of individual states, or the Eastern Pacific high sea, is to be discussed further at the site visit. All vessels must land their catch in Busan.

Table 8. UoA vessel list from client

Vessel name	Call sign	Length (metres)	IMO number	Landing site/ Home Port
No. 617 Dong Won	HLJF	49.91m	8714023	Busan, South Korea
No. 618 Dong Won	6KWS	49.91m	8815669	Busan, South Korea
No. 619 Dong Won	6KWT	49.91m	8815671	Busan, South Korea
No. 620 Dong Won	6LCI	49.91m	8821498	Busan, South Korea
No. 621 Dong Won	6NLA	49.62m	8905567	Busan, South Korea
No. 623 Dong Won	DSDR7	49.91m	8905581	Busan, South Korea
No. 631 Dong Won	DTAM4	49.91m	8911310	Busan, South Korea
No. 633 Dong Won	DTAN8	49.91m	8911334	Busan, South Korea
No. 632 Dong Won	DSAQ4	49.62m	8911322	Busan, South Korea
Chilsung No. 1	HLJC	47.21m	8717855	Busan, South Korea
No. 38 Hansung	HLJB	47.21m	8717843	Busan, South Korea
No. 39 Hansung	6NET	47.21m	9046409	Busan, South Korea
No.36 Hansung	HLWD	47.21m	8619388	Busan, South Korea
No. 650 Dong Won	6KSD	49.91m	9036715	Busan, South Korea
No. 622 Dong Won	DTAA5	49.62m	8905579	Busan, South Korea

5.2.2 History of the fishery and its management

The South Korean distant-water fishery began on a small scale in the Indian Ocean. By the 1970s the fleet had grown to operate in the three major oceans. The maximum number of tuna vessels peaked in 1975 at around 600 vessels, and this had gradually decreased in the ensuing years (Moon et al., 2005). Longline is the predominant fishing gear, although some Korean purse seine vessels are also in operation in the WCPO. Both fishery types are managed under the Distant Water Fisheries Development Act (DWFDA) of the Republic of Korea.

In 2016 and 2017, there were 96 active longline vessels, with 97 vessels in 2018 (Kim et al., 2019). Bigeye tuna represents the highest volume in the longline fishery, followed by yellowfin, blue marlin and albacore (Kim et al., 2019). The Korean longline fishery occurs in the tropical area of the whole Pacific, between 20°N and 20°S and longliners move freely from one place to another within their traditional fishing grounds or to another ocean for efficient catch. The fishery depends on overseas markets, such as Japan, Europe and the United States. The domestic market for tuna in Korea is still growing for sashimi.

At the regional level, the Western and Central Pacific Fisheries Commission (WCPFC) is the Regional Fishery Management Organization (RFMO) within the WCPO responsible for, *inter alia*, the management of North Pacific albacore and South Pacific albacore, WCPO yellowfin, bigeye and skipjack as well as addressing the impacts of fishing on the wider ecosystem of the WCPO. At the national level, the Republic of Korea is a signatory to a range of international fisheries policy instruments and treaties, including UNCLOS and UNFSA, as well as a participating and active member of WCPFC. These treaties/agreements are consistent with the current international fisheries laws and standards for the management of highly migratory species and ecosystems (MSC P1 and P2). In Korea, coastal and offshore fisheries are managed under the Fisheries Act and the Fishery Resources Management Act, while distant water fisheries, including those operating on the high seas, are managed by the Distant Water Fisheries Development Act (DWFDA) through the Ministry of Oceans and Fisheries (MOF). In order to fish in the high seas each vessel must obtain a fishing license from the MOF, which is valid for five years. The approval of the fishing license takes into account the vessel's compliance record. Authorized fishing vessels are required to report their catches, species, landings, value and complete logbooks. To meet Monitoring, Control and Surveillance (MCS) requirements DWFVs are required to install VMS with a qualified crew member responsible for its operation. Observers may be placed onboard in accordance with international and regional requirements. Vessels violating the regulations will be sanctioned depending on the severity. Serious cases can result in the suspension or cancellation of the authorization for distant water fishing.

All relevant levels of jurisdiction are discussed in more detail in Section 5.9.

5.2.3 Gear and operation of the fishery

Pelagic longline gear is used throughout the world's oceans to capture large pelagic fishes, including tuna and billfish species. Longline gear is typically deployed from a single vessel across many miles of ocean. The vessel deploys a single mainline made of nylon monofilament that is periodically buoyed with floatation devices and to which are attached hundreds or thousands of branchlines, each with a leader attached to a single baited hook as shown in Figure 1. Within this simple framework, a variety of configurations and operational practices can be employed to specifically target different depths and species of fish. A combination of the number of hooks set per basket, setting speed, vessel speed, floatline length, branchline length, mainline material, bait type and other factors combine to influence the depth at which a longline will effectively "fish" or "target" most of its hooks. For example, longline gear can be set very shallow to concentrate on species that inhabit the upper mixed layer of the ocean (e.g. swordfish) or very deep to concentrate on deep-dwelling species (e.g. bigeye) (Beverly et al., 2003; Swenarton and Beverly, 2004).

Longline deployment is referred to as "setting," and the gear, once deployed, is referred to as a "set." Sets are normally left drifting for several hours before they are retrieved, along with any catch. In the case of this fishery, the mainline is stored on large hydraulic reels and baited branchlines are quickly snapped to the mainline as the boat moves forward interspersed with floats at regular intervals. At the end of the set, the mainline is cut allowed to drift free, attached to marker buoys and radio beacons so that the gear can be retrieved.

A single set by vessels in the client fleet usually consists of a mainline that is 90 to 110 km line in length, with *ca*. 20 - 50 m branchlines attached at intervals along the length of the line. The distance between floats is about 1km. The depth of the shallowest hook is at approx. 100m and deepest hook at about 300m. There are usually more than 20 hooks deployed between floats. Wider circle hooks rather than

J-hooks are consistently used in the fishery, with a total of 2,000 to 2,300 hooks used per set (information provided by client). The fishery carries out one set per day. Trip length is dependent on the size of the vessel's hold capacity, though transhipment is allowed, and the client fleet consists of freezer vessels only, which allows trips to last for several months up to two years (to be confirmed at the site visit).

The main bait species used by the fishery include *Decapterus muroadsi*, *Sardinella longiceps* and *Sardinops sagax* (Section 5.8.1.4).

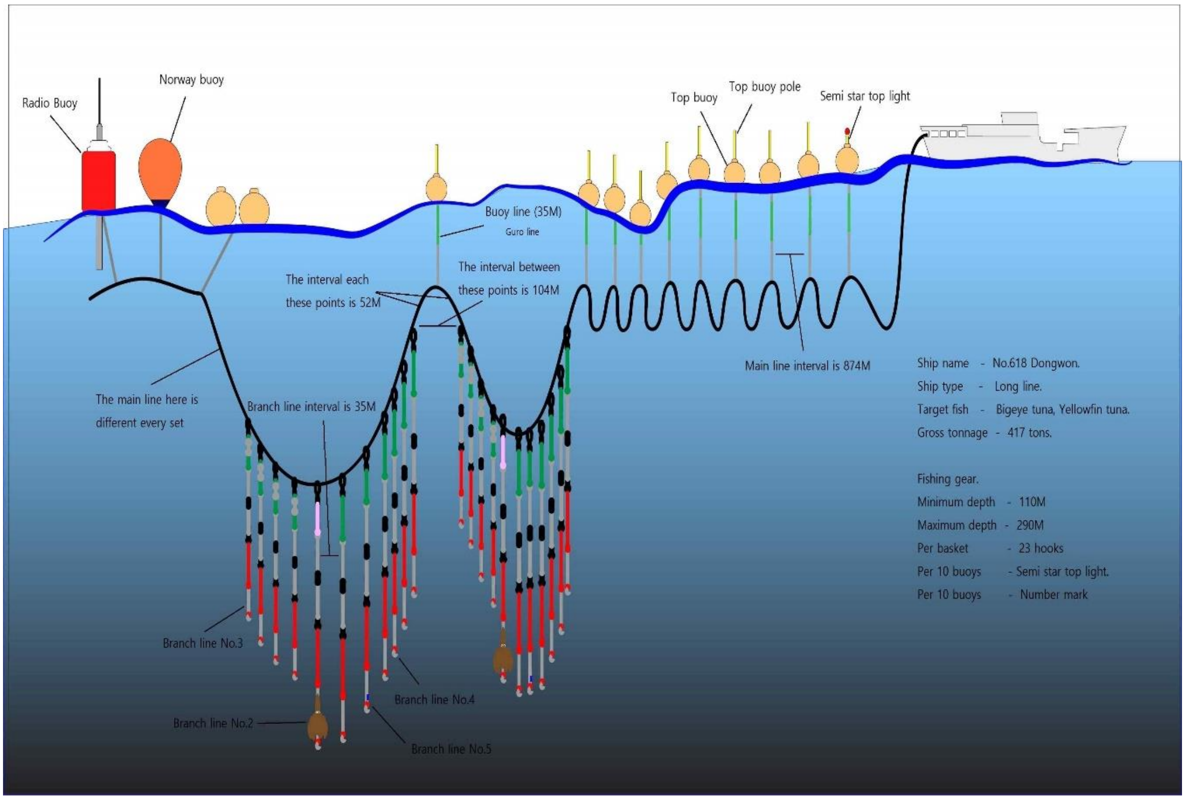


Figure 1. Illustration of the longline gear employed by the *No. 618 Dong Won*. Source: Doo-Won (2018)**.**

5.2.4 Fishing areas and seasons

Fishing occurs all year round, although predominately in the WCPO, as larger schools of fish are found there. The extent to which the client fishery is active in the Economic Exclusive Zones (EEZs) of individual states, or the Eastern Pacific high seas, is to be discussed further at the site visit.

5.3 Principle 1: general

5.3.1 Total Allowable Catch (TAC) and Landings Data

The TAC and landings data for all Principle 1 species and stocks are shown in Table 9 to Table 11. Note, none of these stocks are managed via TAC. Because North and South Pacific albacore cannot be separated in the catch data, a single table is presented for both stocks.

Table 9. TAC and Catch Data – WCPO yellowfin

TAC	Year	2020	Amount	N/a
UoA share of TAC	Year	2020	Amount	N/a
UoC share of total TAC	Year	2020	Amount	N/a
Total green weight landed catch	Year (most recent)	2020	Amount	1,864 t
	Year (second most recent)	2019	Amount	2,142 t

Table 10. TAC and Catch Data – WCPO bigeye

TAC	Year	2020	Amount	N/a
UoA share of TAC	Year	2020	Amount	N/a
UoC share of total TAC	Year	2020	Amount	N/a
Total green weight landed catch	Year (most recent)	2020	Amount	1,998 t
	Year (second most recent)	2019	Amount	1,569 t

Table 11. TAC and Catch Data – North and South Pacific albacore

TAC	Year	2020	Amount	N/a
UoA share of TAC	Year	2020	Amount	N/a
UoC share of total TAC	Year	2020	Amount	N/a
Total green weight landed catch	Year (most recent)	2020	Amount	178 t
	Year (second most recent)	2019	Amount	200 t

5.3.2 Overview

Fishing for tuna and billfish in the Pacific is diverse, ranging from small-scale artisanal operations in the coastal waters of Pacific states, to large-scale, industrial purse-seine, pole-and-line and longline operations in both the exclusive economic zones of Pacific states and on the high seas. The main tuna species targeted by these fisheries are skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*) and albacore tuna (*T. alalunga*). Artisanal and larger-scale commercial fisheries exploiting the same stocks of these species also occur in the Pacific Ocean waters of adjacent south-east Asian countries, particularly Indonesia, Philippines and Vietnam.

Annual total catches of the four main tuna species in the Convention Area of the Western and Central Pacific Fisheries Commission (WCP-CA) increased steadily during the 1980s as the purse seine fleet expanded, and remained relatively stable during most of the 1990s until a sharp increase in catch in 1998 (Hare et al., 2020). Since then there has been an upward trend in total tuna catch, primarily due to increases in purse seine catch with some stabilisation since 2009. The 2019 provisional total WCP-CA tuna catch was estimated at 2,997,309 t, a record catch. The 2019 purse seine fishery accounted for an estimated 2,108,012 t (70 % of the total catch), a record for the fishery. Pole-and-line fishing landed an estimated 191,135 t (6 % of the catch). The longline fishery in 2019 accounted for an estimated 279,015 t (9 % of the catch). The WCP-CA tuna catch for 2019 represented 81 % of the total Pacific Ocean catch (3,696,933 t) and 55 % of the global tuna catch (the provisional estimate for 2019 being 5,443,488 t) (Hare et al., 2020).

The WCP–CA yellowfin catch for 2019 (669,362 t) was the third highest recorded (44,000 t lower than the 2017 record catch). The WCP–CA bigeye catch for 2019 (135,680 t) was lower than the previous 10-year average and among the lowest of the past two decades (Williams and Ruaia, 2020). The WCP–CA South Pacific albacore catch for 2019 was 86,706 t, among the highest over the last 10 years. The 2019 WCP-CA North Pacific albacore catch was 61,644 t, slightly higher than in recent years but below the 10-year average.

In addition to the main tuna species, annual catch estimates for the WCPO in 2019 are available for the main species of billfish (swordfish, blue marlin, striped marlin and black marlin).

5.4 Principle 1: WCPO yellowfin tuna

5.4.1 Biology and ecology

Yellowfin tuna are found in tropical and subtropical waters of the Atlantic, Indian and Pacific Oceans. Yellowfin occur approximately within thermal boundaries of 18° to 31°C. Tagging with acoustic transmitters or ultrasonic tags indicates that yellowfin spend a majority of their time in the upper mixed layer of the ocean (less than 100 m) and typically in temperatures above 17–18°C (Molony, 2008). Yellowfin tuna feed on other fish, crustaceans and squid. Their trophic level has been estimated at 4.4 +/- 0.4 SE, hence they are not a low-trophic level species.

5.4.1.1 Growth and natural mortality

Yellowfin tuna grow rapidly, reaching 25 cm fork length at around three months, with juvenile yellowfin first recruiting to commercial fisheries (mainly surface fisheries in Philippines and eastern Indonesia) at a few months of age. They grow quickly to an estimated mean length for the final age-class of approximately 153 cm, with a maximum fork length close to 200 cm (Figure 2). However, growth rates are uncertain and may vary significantly by area in the Western Pacific.

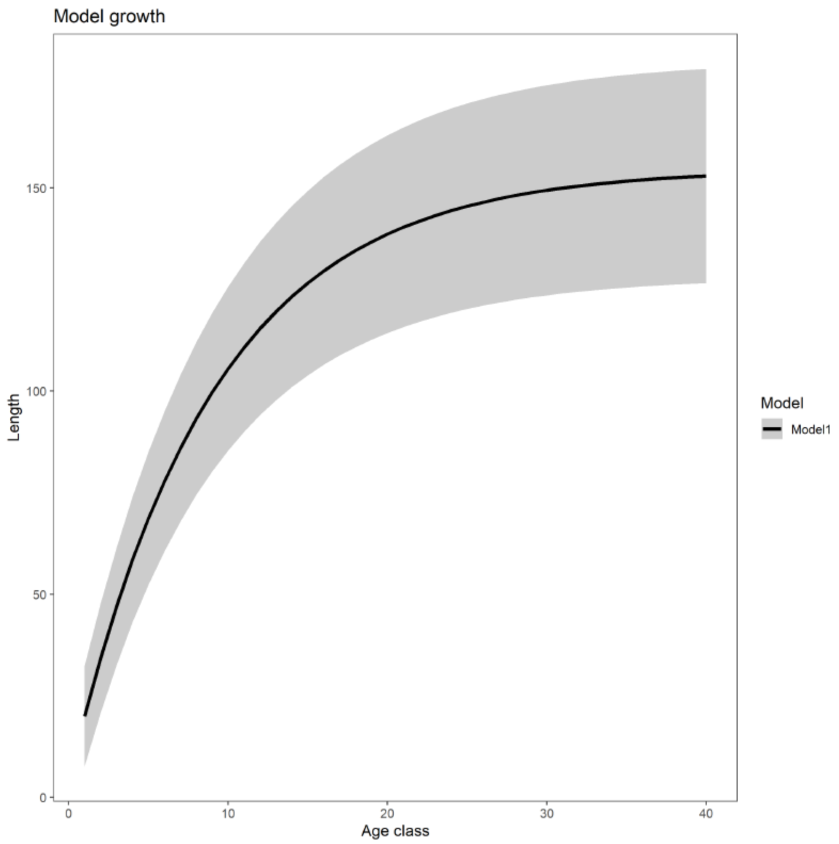


Figure 2. Yellowfin tuna estimated growth for the diagnostic case model. The black line represents the estimated mean fork length (cm) at-age and the shaded region represents the length-at-age within one standard deviation of the mean, for the diagnostic case model. Source: Vincent et al. (2020)**.**

Natural mortality (M) varies with size, being lowest for pre-mature individuals (50-80 cm) and increasing for younger and older fish. Tagging data suggest that it is commonplace for individuals to reach four years old. The longest period at liberty between tag and recapture for a WCPO yellowfin is currently six and a half years.

5.4.1.2 Reproduction and recruitment

Yellowfin mature at around 2-3 years of age, but when information on sex ratios, maturity at age, fecundity, and spawning fraction are included, the reproductive output peaks at between 10 and 15 years of age (Figure 3). Spawning occurs throughout the year in the core areas of distribution. Peaks are observed in the northern and southern summer months. Individuals may spawn every few days over the spawning period. Larval distribution in equatorial waters is trans-oceanic the year round, but there are seasonal changes in larval density in subtropical waters.

Small yellowfin tuna are found in surface waters for the most part (often associated with skipjack), but as they grow, they may change their behaviour to live somewhat deeper (although still usually above the thermocline and shallower than albacore in a given area). This change in behaviour may be associated with the development of the gas bladder, which greatly reduces the metabolic costs of swimming starting from ~50cm, but it will depend on, for instance, relative food availability in surface vs. deeper waters (Lehodey and Leroy, 1999).

Natural mortality is considered to be variable by size and gender, declining initially with size, then increasing at the onset of maturity (Davies et al., 2014). The generally increasing proportion of males in the catch with the increasing size is assumed to be due to an increase in the natural mortality of females, associated with sexual maturity and the onset of reproduction. The lowest rate is estimated at approximately 0.6-0.8 per year for pre-adult yellowfin of around 50-80 cm fork length. The stock assessment model uses fixed externally-estimated values for natural mortality-at-age but examines the sensitivity to mortality assumptions.

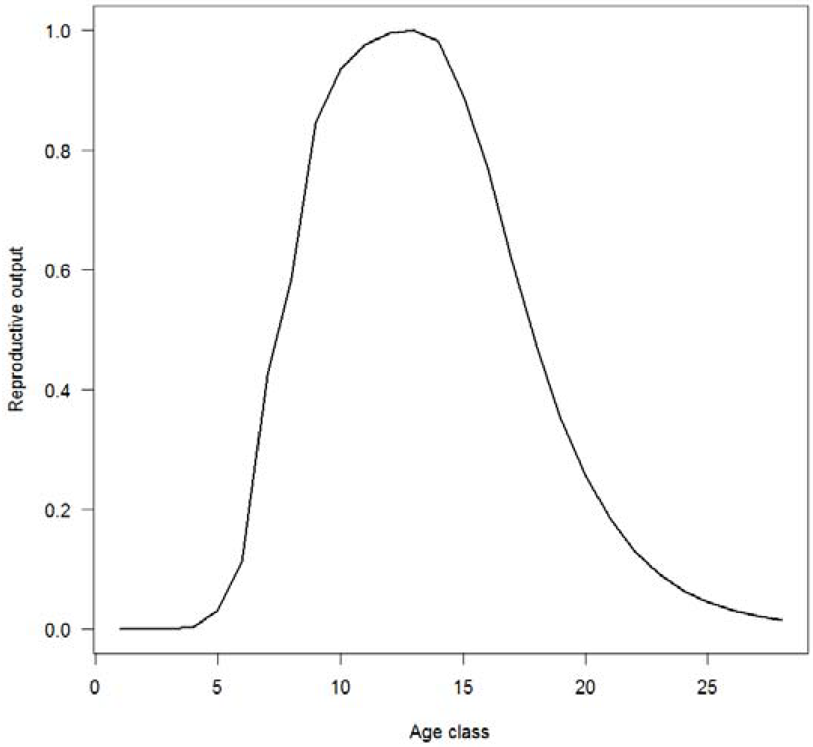


Figure 3. Yellowfin tuna: Index of spawning potential incorporating information on sex ratios, maturity at age, fecundity, and spawning fraction. Source: Davies et al. (2014)**.**

5.4.1.3 Stock structure

The current assessment and management arrangements in the Pacific treat yellowfin tuna as two single stocks associated with Inter-American Tropical Tuna Commission and Western and Central Pacific Fisheries Commission Convention Areas.

The distribution of yellowfin in the Pacific Ocean is nearly continuous. Tagging data (1989-2015) indicate extensive longitudinal movements among the equatorial regions but also a level of latitudinal movements to and from the sub-tropical latitudes (Figure 4) (Tremblay-Boyer et al., 2017). The tagging data suggest that yellowfin can follow the movement of convergence zones and other areas of higher productivity, and respond to events such as the El Niño Southern Oscillation, which change geographical patterns of productivity in the equatorial Pacific (Lehodey and Leroy, 1999). Genetic data suggest that there may be stocks or sub-stocks within the western Pacific; a genetic study was able to distinguish between fish from Tokelau and the Coral Sea with a high degree of accuracy (Grewe et al., 2016).

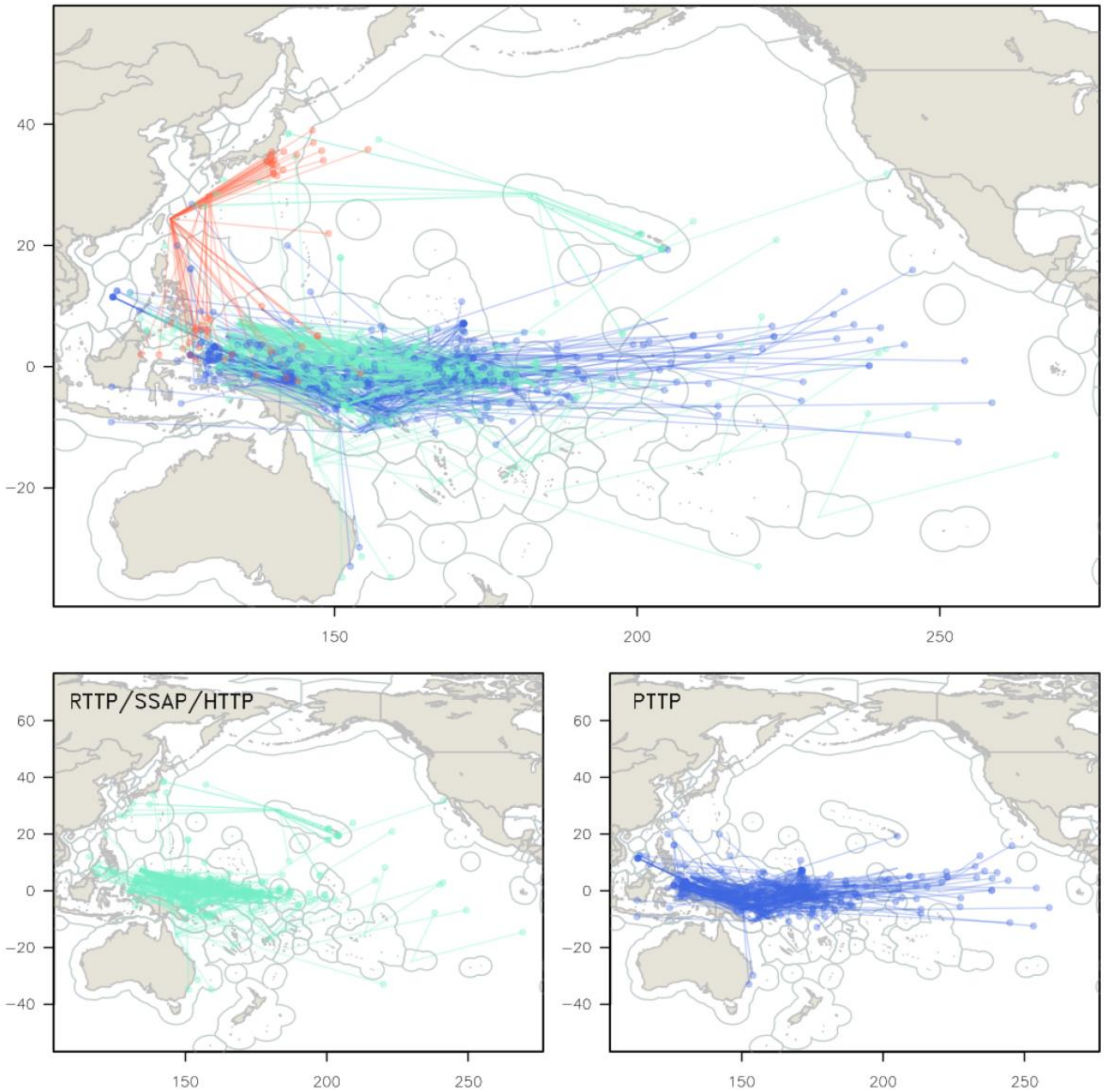


Figure 4. Map of the movements of tagged yellowfin released in the Pacific Ocean and subsequently recaptured more than 1,000 nautical miles from their release site. RTTP – Regional Tuna Tagging Program; SSAP – Skipjack Survey and Assessment Programme; HTTP – Hawaii Tuna Tagging Project; PTTP – Pacific Tuna Tagging Program. Source: Vincent et al. (2020)**.**

The yellowfin assessments have considered the stock within the domain of the model area (essentially the WCPO, west of 150°W) as a discrete stock unit. The model domain is disaggregated into 9 regions so as to describe to some extent spatial processes (such as recruitment and movement) and fishing mortality within regions (Figure 5) (Vincent et al., 2020).

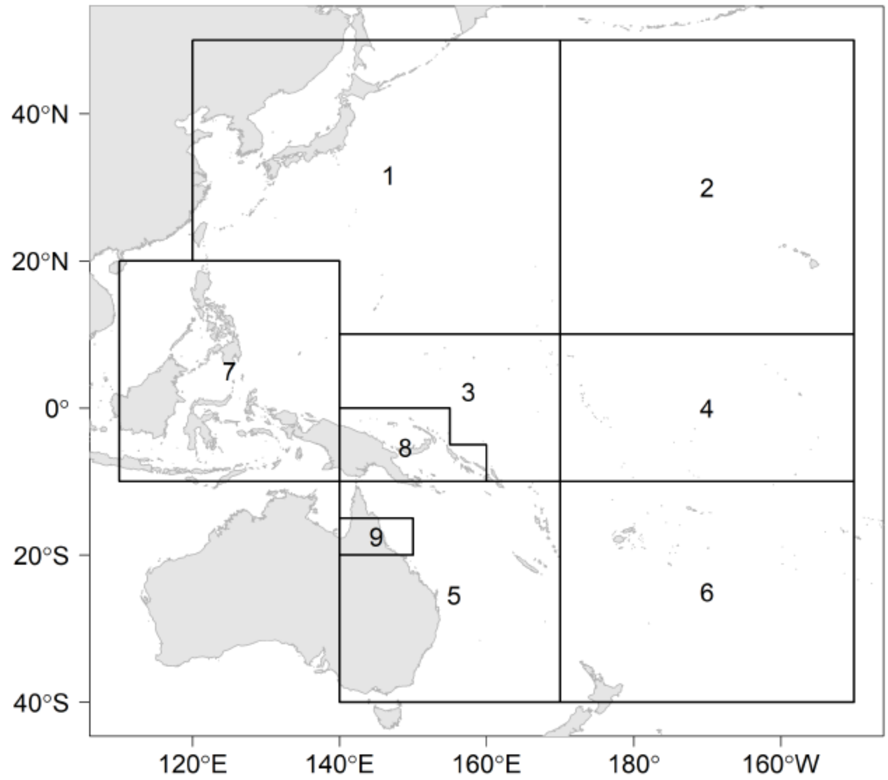


Figure 5. The geographical area covered by the stock assessment and the boundaries for the 9 regions defined in the 2020 assessment. Source: Vincent et al. (2020)**.**

5.4.2 Stock assessment and information

Yellowfin tuna stock assessments have been conducted frequently since 1999. Assessments are undertaken by the Oceanic Fisheries Program (OFP) of the Pacific Community (SPC). MULTIFAN-CL software is used, and draft results are submitted to the WCPFC Scientific Committee (SC) for discussion and review, with a final report presented to the WCPFC plenary. An independent review of the 2011 bigeye tuna assessment (Ianelli et al., 2012) made several recommendations for improvement that apply equally to the yellowfin tuna assessment, and these have been incorporated into subsequent assessments where possible.

The assessment model relies mainly on catch and effort data for the various fleets, size data and tagging data. The distribution of yellowfin catches for the most recent decade of the stock assessment (2009-2018) is shown in Figure 6 and the time series of total annual catch by fishing gear over the full assessment period is shown in Figure 7. The 2019 WCPFC Convention Area yellowfin tuna catch (669,362 t) was the third highest on record, at around 44,000 t less than the previous record in 2017, with a purse seine catch of 364,571 t. The longline catch for 2019 (104,440 t) was the highest since 1980. Pole-and-line fisheries took 37,563 t of yellowfin during 2019, the highest on record. Catches in the 'other' category are largely composed of yellowfin taken by various assorted gears (e.g. troll, ring net, bag net, gillnet, large-fish handline, small-fish hook-and-line and seine net) in the domestic fisheries of the Philippines and eastern Indonesia (Williams and Ruaia, 2020).

The latest yellowfin assessment was undertaken in 2020 (Vincent et al., 2020). This was an update of the 2017 assessment and addresses recommendations of the 2017 stock assessment report

(Tremblay-Boyer et al., 2017). As indicated in Vincent et al. (2020), key changes made in the progression from the 2017 to 2020 diagnostic models include:

- Updating all data up to the end of 2018;
- Implementation of updated models for tag data, purse seine catch estimates and size composition data;
- Implementation of the 'index fishery' approach, which used a geo-statistically standardized CPUE index;
- Utilizing updated biological parameters for the length-weight relationship and reproductive potential, and extension of the number of quarterly age classes in the model to 40;
- Changes to gear selectivity settings; and
- Implementation of growth using the conditional age-at-length otolith data.

Assumptions on parameters of the model (including age/spatial structure, growth, recruitment, mortality, maturity, selectivity and catchability) are detailed in Vincent et al. (2020). A structural uncertainty analysis (model grid) is used for consideration in developing management advice where all possible combinations of the most important axes of uncertainty from the one-off models were included. The 2020 assessment advice was based on a structural uncertainty grid comprised of 72 models.

The following summary of the yellowfin assessment results is from the SC16 Summary Report (WCPFC_SC, 2020a). General conclusions of the 2020 yellowfin assessment by SC16 include:

- That there has been a long-term decrease in spawning biomass from the 1970s for yellowfin tuna but that the depletion rates have been relatively stable over the last decade;
- The median value of relative recent (2015-2018) spawning biomass depletion ($SB_{2015\text{-}2018}/SB_{F=0}$) was 0.58 with a 10th to 90th percentile interval of 0.51 to 0.64;
- There was 0 % probability (0 out of 72 models) that the recent (2015-2018) spawning biomass had breached the adopted LRP;
- There has been a long-term increase in fishing mortality for both juvenile and adult yellowfin tuna which is consistent with previous assessments, but since 2010 there has been no directional trend;
- The median of relative recent fishing mortality ($F_{2014\text{-}2017}/F_{MSY}$) was 0.36 with a 10th to 90th percentile interval of 0.27 to 0.47;
- There was 0 % probability (0 out of 72 models) that the recent (2014-2017) fishing mortality was above F_{MSY}; and
- Stochastic projections examined the potential stock consequences of fishing at "status quo" conditions (2016–2018 average longline and other fishery catch and 2018 purse seine effort levels) and long-term recruitment scenario using the uncertainty framework approach endorsed by SC. Projections indicate that median $SB_{2025}/SB_{F=0}$ = 0.58; median $SB_{2035}/SB_{F=0}$ = 0.59 and median $SB_{2045}/SB_{F=0}$ = 0.58. The risk that $SB_{2048}/SB_{F=0}$ is less than the LRP is 0 %.

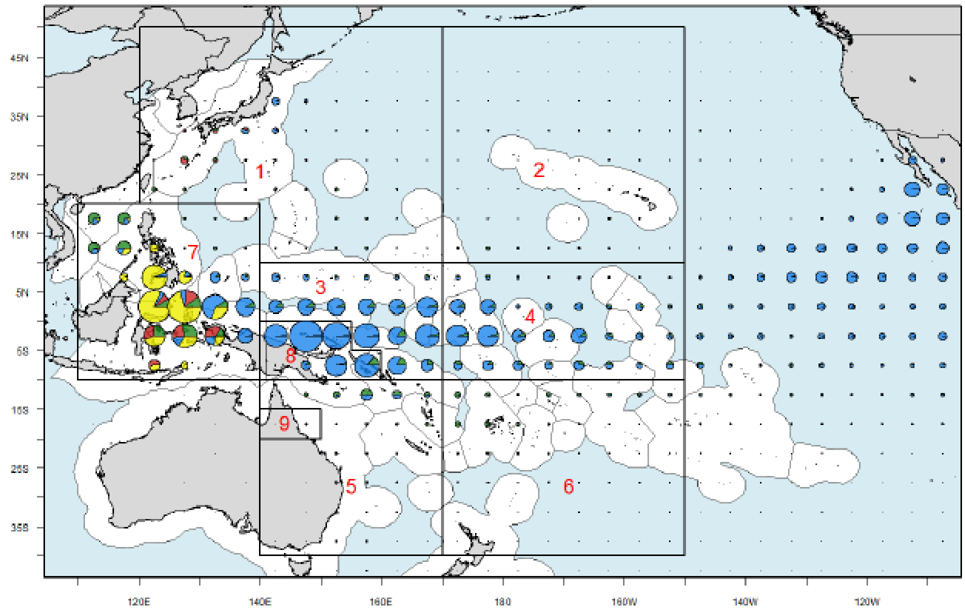


Figure 6. Yellowfin tuna catches for the most recent decade of the stock assessment (2009-2018) by 5o square and fishing gear: longline (green), pole-and-line (red), purse seine (blue) and miscellaneous (yellow), for the WCPO and part of the EPO. Overlayed are the regional boundaries for the stock assessment. Source: Vincent et al. (2020)**.**

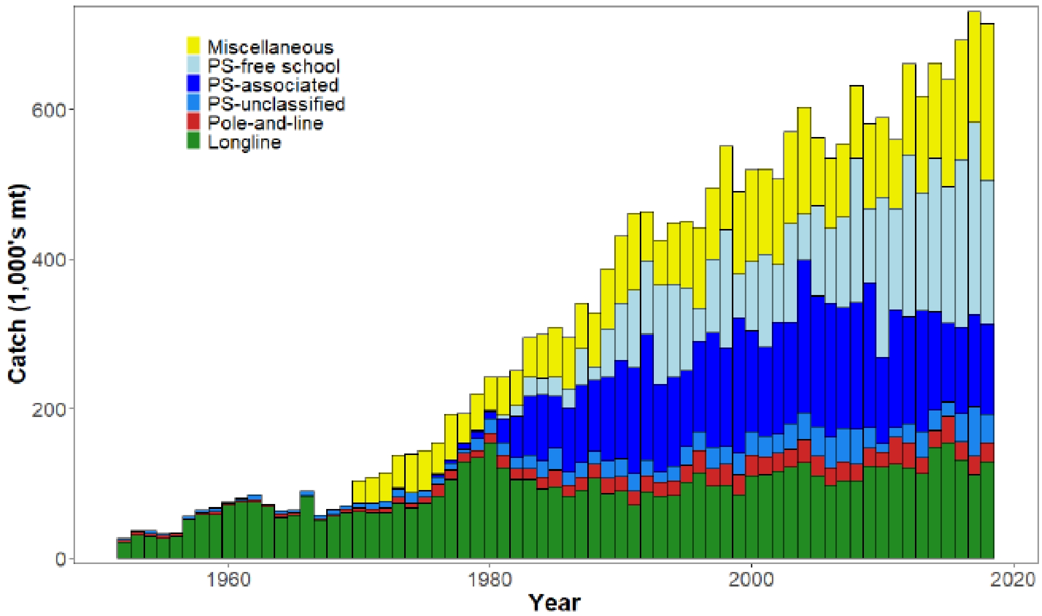


Figure 7. Time series of total annual catch (1000's mt) by fishing gear over the full assessment region and time period. The different colours denote longline (L) (green), pole-and-line (P) (red), purse seine (S) (blue), purse seine-associated (S) (dark blue), purse seine-unassociated (S) (lightblue), miscellaneous (yellow) Source: Vincent et al. (2020)**.**

Reference point values for the 2020 assessment are summarized in Table 12. Time-dynamic percentiles of depletion ($SB_t/SB_{t,F=0}$) for the 72 models are shown in Figure 7. A Kobe plot summarising the results for each of the 72 models in the structural uncertainty grid is shown in Figure 8.

SC16 concluded that the stock is not experiencing overfishing (100 % probability $F<F_{MSY}$) and is not in an overfished condition (0 % probability $SB/SB_{F=0}<LRP$). Additionally, stochastic projections predict there to be no risk of breaching the LRP (0 % probability $SB_{2048}/SB_{F=0}<LRP$). SC16 noted that although

the structural uncertainty grid presents a positive indication of stock status, the high level of unresolved conflict amongst the data inputs used in the assessment suggests additional caution may be appropriate when interpreting assessment outcomes to guide management decisions (WCPFC_SC, 2020a).

SC16 recommended a precautionary approach such that the fishing mortality on the yellowfin tuna stock should not be increased from the level that maintains spawning biomass at 2012-2015 levels until the Commission can agree on an appropriate target reference point.

Table 12. Summary of reference points over the 72 models in the structural uncertainty grid. Note that "recent" is the average over the period 2015-2018 for SB and 2014-2017 for fishing mortality, while "latest" is 2018. The values of the upper 90th and lower 10th percentiles of the empirical distributions are also shown. F_{mult} is the multiplier of recent (2014-2017) fishing mortality required to attain MSY. Source: WCPFC_SC (2020a)**.**

Reference point	Mean	Median	Minimum	10^{th} percentile	90^{th} percentile	Maximum
C_{latest}	709,389	711,072	700,358	702,279	712,761	714,073
$Y_{Frecent}$	779,872	784,200	661,600	707,720	877,040	908,000
f_{mult}	2.87	2.80	1.70	2.12	3.72	4.29
F_{MSY}	0.11	0.10	0.08	0.09	0.12	0.15
MSY	1,090,706	1,091,200	791,600	874,200	1,283,920	1,344,400
F_{recent}/F_{MSY}	0.37	0.36	0.23	0.27	0.47	0.59
$SB_{F=0}$	3,641,228	3,603,980	2,893,274	3,231,353	4,050,429	4,394,277
SB_{MSY}	860,326	858,700	349,100	590,090	1,114,400	1,322,000
$SB_{MSY}/SB_{F=0}$	0.23	0.24	0.12	0.18	0.28	0.30
$SB_{latest}/SB_{F=0}$	0.54	0.54	0.40	0.47	0.60	0.66
SB_{latest}/SB_{MSY}	2.43	2.28	1.47	1.67	3.29	4.89
$SB_{recent}/SB_{F=0}$	0.58	0.58	0.42	0.51	0.64	0.68
SB_{recent}/SB_{MSY}	2.59	2.43	1.54	1.77	3.57	5.27

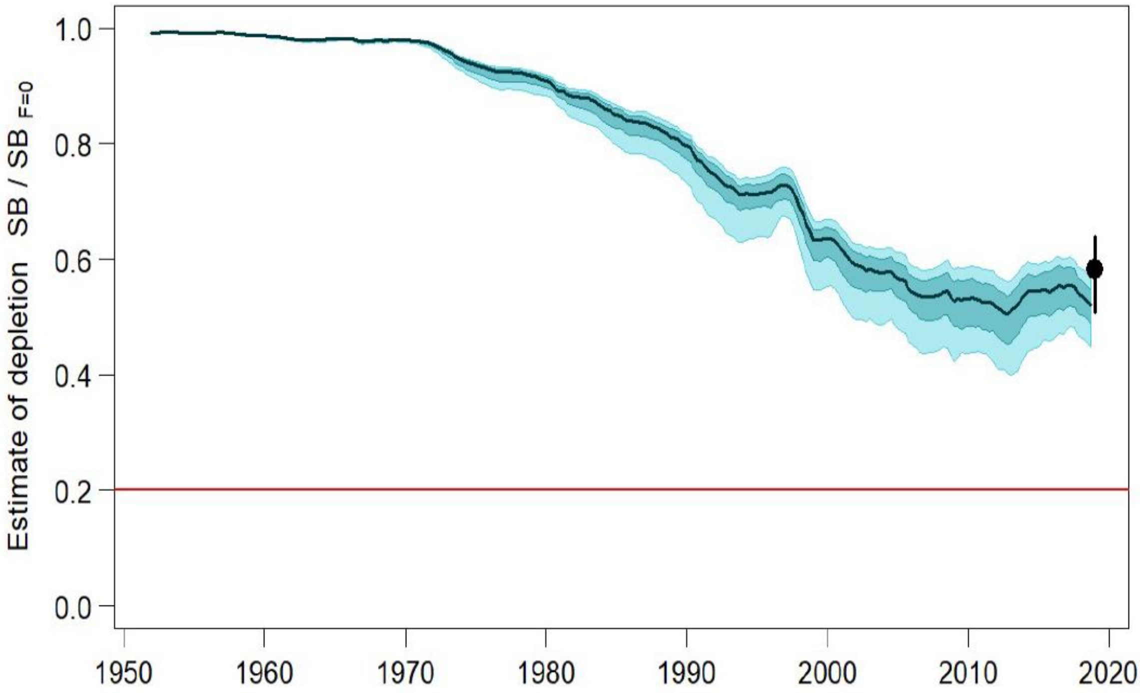


Figure 8. Plot showing the trajectories of fishing depletion of spawning potential for the models in the structural uncertainty grid for the median, 50 % quantile, and 80 % quantile of instantaneous depletion across the structural uncertainty grid and the point and error bars is the median and 10th and 90th percentile of estimates of $SB_{recent}/SB_{F=0}$. Source: WCPFC_SC (2020a)**.**

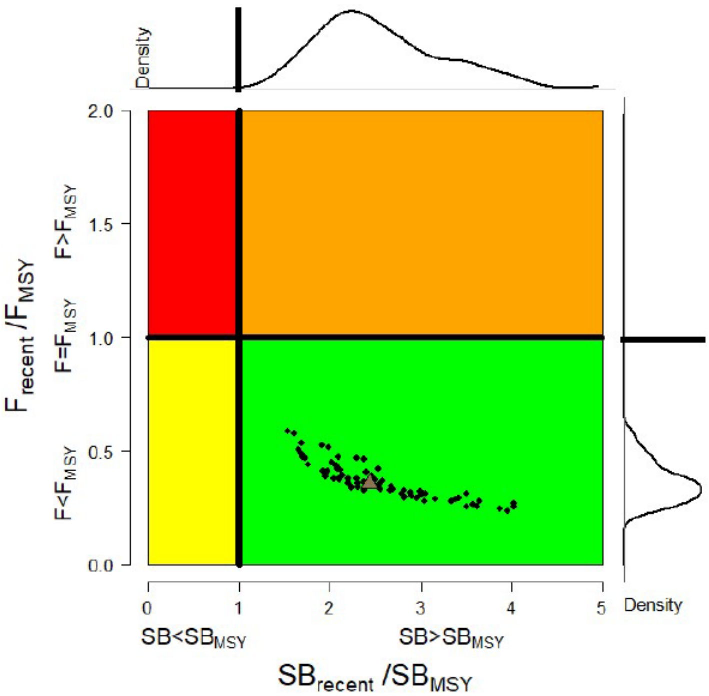


Figure 9. Kobe plot for the recent spawning potential (2015–2018) summarizing the results for each of the models in the structural uncertainty grid. The plots represent estimates of stock status in terms of spawning biomass depletion and fishing mortality relative to MSY quantities and marginal distributions of each are presented with the median of the structural uncertainty grid displayed as a brown triangle. Source: WCPFC_SC (2020a)**.**

5.4.3 Harvest strategy

The harvest strategy relies on annual decision-making processes founded on the core principles of the WCPFC as laid out in its Convention and in a growing body of CMMs (see https://www.wcpfc.int/conservation-and-management-measures). The WCPO yellowfin tuna harvest strategy has several components, with WCPFC, Parties to the Nauru Agreement (PNA) and national and archipelagic management actions. The harvest strategy is supported by a state-of-the-art stock assessment and extensive monitoring frameworks.

Bigeye, skipjack, and yellowfin tuna stocks are currently managed through CMM 2020-01 which replaced CMM 2018-01 and its predecessors, coming into effect In February 2021. This CMM is intended to provide for a robust transitional management regime pending the full establishment of harvest strategies. 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. CMM 2020-01 dictates a suite of purse seine management measures including temporal (3-month) and spatial closure periods/areas, development and adoption of non-entangling FADS, limits on the number of FADs actively fishing, catch retention measures for bigeye, yellowfin and skipjack tuna, and monitoring and control requirements.

WCPFC CMM 2014-06[2] was adopted to develop and implement a harvest strategy approach for key fish stocks in the WCPO. The CMM identifies the elements that harvest strategies are to contain (including defined operational objectives, TRPs and LRPs for each stock, acceptable levels of risk of not breaching limit reference points, a monitoring strategy, decision rules that aim to achieve the TRP and avoid the LRP, and management strategy evaluation). CMM 2014-06 required the development of a workplan for its implementation, first adopted at WCPFC12 (WCPFC (2016) - Attachment Y). There have been several revisions to the workplan in subsequent years. Elements of the workplan for WCPO yellowfin and bigeye tuna are being run in tandem. WCPFC has set a limit reference point for both species (20% $SB_{current,F=0}$). A range of harvest strategy-related research was presented for discussion by WCPFC16. Relevant research and technical documents are available on the WCPFC website (SC15 and WCPFC16 meeting reports). WCPFC16 agreed to changes which delay the implementation of elements of the harvest strategy. For yellowfin and bigeye, the changes and revised timeline reflect the substantial body of work required to develop the multispecies framework in advance of further harvest strategy development. Progress towards implementation the harvest strategy is summarised in Figure 10.

The workplan was further considered at WCPFC17, but discussion was limited due to Covid-19. There were no changes relative to yellowfin and bigeye. WCPFC17 (WCPFC (2021) - Attachment H).

[2] The updated CMM 2014-06 work plan uses the term “Management Procedure” in place of “Harvest Control Rule”. A management procedure is a formal specification of data collection and associated estimation model (e.g., the estimation of stock status through an analytical or empirical method) together with a HCR.

Harvest Strategy element	Yellowfin	Bigeye
Management Objectives	Noted	
Performance Indicaotrs	Identified	
Limit Reference Points	Adopted	Adopted
Target Reference Point	Interim	Interim
Harvest Control Rules		
Management Strategy Evaluation		
Monitoring Strategy		

Figure 10. Progress towards implementing the yellowfin and bigeye harvest strategies. Dark green shading indicates substantial progress has indicates work is currently underway; orange indicates work has not yet begun. Adapted from WCPFC-2019-09 (2019)**.**

WCPFC18 was held in December 2021. The summary report for the meeting discusses agreement on further change to the CMM 2014-06 workplan (WCPFC (2022) - Attachment I). The updated workplan indicates further delays to the timeline for adoption of CMM 2014-06 requirements for bigeye and yellowfin tuna. Management procedures for yellowfin and bigeye are now scheduled for adoption in 2024.

WCPFC18 also agreed on an updated CMM for bigeye, yellowfin and skipjack tuna, CMM 2021-01 (WCPFC (2022) - Attachment G). In terms of the harvest strategy, this CMM continues the requirements of CMM 2020-01. CMM 2021-01 came into effect on 16 February 2022 and will remain in effect until 15 February 2024 unless earlier replaced or amended by the Commission.

The latest activities for the workplan schedule for yellowfin and bigeye, are as follows:

Agree Target Reference Point

- Commission agree a TRP for yellowfin and bigeye.

Develop management procedures and Management strategy evaluation

- SC provide advice on performance of potential management procedures

2023: Develop management procedures and management strategy evaluation

- SC agree the operating models for MSE;
- SC provide advice on performance of potential management procedures;
- SC provides advice on relevant elements of the monitoring strategy;
- Technical and Compliance Committee (TCC) consider the implications of potential management procedures; and
- Commission consider advice on progress towards management procedures.

Develop and implement relevant elements of the monitoring strategy

2024: Develop management procedures and management strategy evaluation

- SC provide advice on performance of potential management procedures; SC provides advice on relevant elements of the monitoring strategy;
- TCC consider the implications of potential management procedures; and
- Commission consider and refine a candidate set of management procedures.

Commission ADOPT a management procedure.

In February 2019, MSC accepted a variation request submitted by all fisheries CABs to align harvest strategy condition timelines for Regional Fisheries Management Organisation (RFMO) managed highly migratory stocks in the MSC programme, including tuna and swordfish. The variation request proposed a 'hard deadline' approach to Principle 1 condition timelines. As a result of the variation request, the accepted deadline for closing harvest strategy conditions for WCPO skipjack, yellowfin and bigeye was 2021. Following a meeting in September 2020, the CABs agreed to follow the MSC's Covid-19 derogation[3] extension to timelines for existing fishery certificates by adding six months to the previous 'hard deadline' outcomes, with a new deadline of June 2022.

However, the MSC have now issued a further derogation[4] with the effective date of 28 March 2021, to extend condition timelines on management and information PIs for an additional year. The result is that the timelines for milestones on existing relevant conditions are required to be shifted one year forward, and there are no milestones effective for this current year. The March 2021 derogation means that the new deadline for the condition will be June 2023.

5.4.3.1 PNA Vessel Day Scheme (VDS)

An important component of the overall harvest strategy for WCPO purse seine fishing (predominantly aimed at skipjack) is the Vessel Day Scheme (VDS), established in 2006 under the Palau Arrangement and initially limiting effort levels of PNA countries to 2004 levels. The VDS limits total days fished by purse seiners fishing within the EEZs of PNA countries, where the majority of the purse seine fishery takes place within the WCPFC-CA. Fishing under the VDS is subject to strict PNA-wide rules, as well as to any national or WCPFC rules in force. Additionally, the 3rd Implementing Arrangement of the Nauru Agreement prescribed closures to purse seine fishing, by vessels licensed to fish in PNA waters, of areas of the high seas from 1 January 2011 that were surrounded by the EEZs of PNA countries (from 10°N to 20°S latitude and 170°E to 150°W longitude, equating to an area of 4,555,000 sq. km). Under the VDS, PNA manages fishing in its waters via an effort-based system using Total Allowable Effort (TAE). The major function of effort limits initiated by the PNA to date has been to improve economic returns rather than address the sustainability of skipjack tuna given the healthy status of the stock.

The VDS TAE is determined annually in advance, currently for the next two years, based on the best available scientific, economic and management information and advice. The TAE is limited by the decisions of the WCPFC on the level of purse seine effort in PNA EEZs. PNA also implemented a zone-based arrangement to limit longline fishing effort based on a VDS in January 2017. The longline VDS outlines the terms and conditions for the management of tuna longline vessels operating within the waters of the Parties to the Palau Arrangement, with a TAE also being set. However, the longline VDS does not currently play a role in the management of the stocks, since day allocations are 'aspirational'.

[3] https://www.msc.org/docs/default-source/default-document-library/stakeholders/covid-19-pandemic-derogation-march-2020.pdf.

[4] https://www.msc.org/docs/default-source/default-document-library/for-business/program-documents/chain-of-custody-supporting-documents/msc-derogation-6-covid-19-fishery-conditions-extension.pdf.

5.4.4 Principle 1 Performance Indicator scores and rationales: WCPO yellowfin

Scoring table 1. 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?	Yes	Yes	Yes

Rationale

WCPFC has adopted 20 % of the unfished spawning potential (20%$SB_{F=0}$) as the limit reference point (LRP) for yellowfin. Management advice on the 2020 yellowfin assessment (Vincent et al., 2020) is summarised in the conclusions of WCPFC SC16 (WCPFC_SC, 2020a). The structural uncertainty analysis used a crosswise grid of 72 alternative model formulations (Table 12). The WCPO yellowfin spawning biomass was characterised using the grid and the median $SB_{recent}/SB_{F=0}$ was estimated to be 0.58, with a range of 0.51 to 0.64 for the 10th and 90th percentiles; there is 0 % probability (none of the 72 models) that the recent spawning biomass had breached the adopted LRP.

MSC guidance (GSA2.2.3.1) provides that where B_{MSY} is analytically determined it should be used to calculate the PRI and that: *where B_{MSY} is analytically determined to be lower than 40%B_0 (as in some highly productive stocks), and there is no analytical determination of the PRI, the default PRI should be 20%B_0 unless B_{MSY}<27%B_0, in which case the default PRI should be 75%B_{MSY}.*

The 2020 assessment provides a median estimate of SB_{MSY} of 23.8%$SB_{F=0}$, hence a value of 17.9%$SB_{F=0}$ could be used as the PRI (i.e. 75 % of 23.8%$SB_{F=0}$). Given that all outcomes of the 2020 assessment indicate that SB_{recent} (and SBl_{atest}) are above this level and the more precautionary 20%$SB_{F=0}$, there is a high degree of certainty the stock is above the PRI.

SG60, SG80 and SG100 requirements are met.

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)

Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a **high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
Met?		Yes	Yes

Rationale

The median estimate of SB_{MSY} is at 23.8%$SB_{F=0}$ (WCPFC_SC, 2020a). The median estimate of SB_{latest}/SB_{MSY} is 2.28 (with range of 1.67 to 3.29 for the 10th and 90th percentiles) and SB_{recent}/SB_{MSY} is 2.43 (range 1.77 to 3.57). The minimum estimate from the grid of SB/SB_{MSY} is >1 for the SB_{latest} and SB_{recent} estimates (1.47 and 1.54), suggesting that spawning biomass is above SB_{MSY} with a high degree of certainty (Table 12). In addition, $F < F_{MSY}$ for all 72 models in the assessment grid. **SG80 and SG100 are met**.

References

Vincent et al. (2020) and WCPFC_SC (2020a)

Stock status relative to reference points			
	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	Limit reference point	75%SB_{MSY} = 17.9%$SB_{F=0}$	$SB_{latest}/SB_{F=0}$ = 0.54 (latest = 2018) $SB_{recent}/SB_{F=0}$ = 0.58 (recent = 2015 to 2018)
Reference point used in scoring stock relative to MSY (SIb)	MSY target reference point	SB_{MSY}	SB_{latest}/SB_{MSY} = 2.28 SB_{recent}/SB_{MSY} = 2.43

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

Draft scoring range	≥80

Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 2. PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	NA		NA

Rationale

The stock does not require rebuilding.

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, or it is **highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	NA	NA	NA

Rationale

The stock does not require rebuilding.

References

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

Draft scoring range	NA
Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 3. 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?	Yes	No	No

Rationale

MSC guidance defines a harvest strategy as the combination of monitoring, stock assessment, harvest control rules and management actions. It is intended that these elements work together towards achieving management objectives. The current harvest strategy is not formalised but consists of the elements considered at PIs 1.2.2, 1.2.3, and 1.2.4.

The operational harvest strategy for WCPO yellowfin has several contributing components, with WCPFC, PNA and national and archipelagic waters management actions being supported by a robust stock assessment and extensive monitoring frameworks. An explicit LRP for yellowfin tuna has been adopted for biomass (20%$SB_{F=0}$). A formal target reference point is under discussion by WCPFC and subject to development under the workplan established under CMM 2014-06.

There has been a development of WCPFC management measures (for skipjack, yellowfin and bigeye tuna) over time (currently CMM 2020-01). The stated objective of CMM 2020-01 is that "Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks." The status of yellowfin continues to be assessed as not overfished and not subject to overfishing. For yellowfin, pending agreement on a target reference point, CMM 2020-01 requires that the spawning biomass depletion ratio ($SB/SB_{F=0}$) is to be maintained at or above the average $SB/SB_{F=0}$ for 2012-2015. The most recent stock assessment suggests that the status quo is an acceptable biological target for yellowfin (see PI 1.1.1). The likely impact of CMM 2017-01 and 2018-01 (identical in relevant provisions to 2020-01) has been examined with 30-year projections (SPC, 2017, 2018, 2020; Pilling et al., 2019). In 2020, all scenarios resulted in a negligible risk of SB falling below the LRP or SB_{MSY}, or F increasing above F_{MSY}.

The range of measures applied fishing for yellowfin tuna are expected to achieve stock management objectives, **meeting the SG60 requirements**.

At this point, harvest control rules have not been adopted. There is an extensive information base from a wide range of biological studies and from a diverse range of fisheries. The information is sufficient to support a state-of-the-art stock assessment that provides probabilistic estimates of key parameters and their relationship to reference points. Advice from the stock assessment is provided by the SC and additional work is carried out by the scientific provider, SPC, to the Commission. Annual decision-making is articulated through CMMs and is supported by good scientific decision-support systems. CMM 2014-06 spells out the future direction for strengthening the harvest strategy, including the development of harvest control rules.

The current WCPFC harvest strategy is contained in CMM 2020-01 which has effectively been in place since 2013 with several revisions since CMM 2013-01. Efforts to put in place a formal and responsive harvest strategy and harvest control rules for the tropical tuna stocks, as per the requirements of CMM 2014-06, are ongoing. Management measures in place under CMM 2020-01 include limits on FAD sets and fishing days for purse seine; unlike bigeye there are no longline catch limits for yellowfin.

Under CMM 2014-06 requirements, WCPFC adopted a workplan to implement the required elements of a harvest strategy in 2015. The workplan has undergone several modifications since it was first developed. Elements of the workplan for yellowfin and bigeye tuna are being run in tandem. WCPFC has set a limit reference point for yellowfin (20%$SB_{current,\ F=0}$). A range of harvest strategy related research was presented for discussion by WCPFC16. Relevant research and technical documents are available on the WCPFC website. Progress towards implementation of the harvest strategy is summarised in Figure 10.

The workplan was further considered at WCPFC17, but discussion was limited due to Covid-19. WCPFC18 was held in December 2021. The summary report for the meeting discusses agreement on further change to the CMM 2014-06 workplan (WCPFC (2022) - Attachment I). The updated workplan indicates further delays to the timeline for adoption of CMM 2014-06 requirements for bigeye and yellowfin tuna. Management procedures for yellowfin and bigeye are now scheduled for adoption in 2024.

WCPFC18 also agreed on an updated CMM for bigeye, yellowfin and skipjack tuna, CMM 2021-01 (WCPFC (2022) - Attachment G). In terms of the harvest strategy, this CMM continues the requirements of CMM 2020-01. CMM 2021-01 came into effect on 16 February 2022 and will remain in effect until 15 February 2024 unless earlier replaced or amended by the Commission.

The latest activities for the workplan schedule for yellowfin and bigeye, are as follows:

2022: Agree Target Reference Point

- Commission agree a TRP for yellowfin and bigeye.

Develop management procedures and Management strategy evaluation

- SC provide advice on performance of potential management procedures

2023: Develop management procedures and management strategy evaluation

- SC agree the operating models for MSE;
- SC provide advice on performance of potential management procedures;
- SC provides advice on relevant elements of the monitoring strategy;
- Technical and Compliance Committee (TCC) consider the implications of potential management procedures; and
- Commission consider advice on progress towards management procedures.

Develop and implement relevant elements of the monitoring strategy

2024: Develop management procedures and management strategy evaluation

- SC provide advice on performance of potential management procedures; SC provides advice on relevant elements of the monitoring strategy;
- TCC consider the implications of potential management procedures; and
- Commission consider and refine a candidate set of management procedures.

Commission ADOPT a management procedure.

It has not been shown that the harvest strategy is responsive to the state of the stock and that the elements of the harvest strategy work together towards achieving those stock management objectives. **SG80 nor SG100 are met.**

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

Rationale

SC16 concluded that the stock is not experiencing overfishing (100 % probability $F<F_{MSY}$) and is not in an overfished condition (0 % probability $SB/SB_{F=0}$<LRP). Additionally, stochastic projections predict there to be no risk of breaching the LRP (0 % probability $SB_{2048}/SB_{F=0}$<LRP). This provides evidence that the harvest strategy is meeting sustainability objectives reflected in PI 1.1.1 SG80. As indicated at PI 1.1.1, the 2020 stock assessment also supports this position. **The SG60 and SG80 requirements are met for this scoring issue.** Although the information on stock status and stock projections indicate that the harvest strategy is maintaining the stock at appropriate levels, the

strategy has not been fully tested. Evaluation of the performance of the harvest strategy and harvest control rules against management objectives is an element of CMM 2014-06 and its workplan. **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?	Yes

Rationale

WCPFC has monitoring systems in place to record catch and effort for all vessels catching yellowfin tuna in the WCPO. Monitoring of the fishery includes mandatory logbooks with records of catch and effort for each fishing operation, a VMS, observer coverage of fishing operations including detailed recording of catch composition, tagging data, biological studies and port inspections. These monitoring systems support a sophisticated stock assessment process that regularly provides robust estimates of stock status that are sufficient to determine whether the harvest strategy is working. All data for the client fishery is submitted through Korean/WCPFC reporting requirements. Observer data is collected through the Regional Observer Programme (ROP) or national observer programmes. As indicated above, WCPFC has adopted numerous CMMs which form the basis of the harvest strategy. Progress on and compliance with these CMMs is regularly monitored at annual Commission and sub-committee meetings. **SG 60 requirements are met**.

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

Rationale

Although there is ongoing review of the elements of the harvest strategy and revisions are made as evidenced by the adoption of updated CMMs, the harvest strategy for yellowfin tuna has not been formalised and is not subject to a formal review process. **SG100 is not met on this basis**.

e	Shark finning

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

Rationale

Yellowfin tuna is not a shark; this scoring issue is **not relevant**.

f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	No (more information needed)	No (more information needed)	No (more information needed)

Rationale

For the yellowfin stock as a whole, available information indicates there is negligible unwanted* catch. CMM 2020-01 (and its predecessors) requires that "To create an incentive to reduce the non-intentional capture of juvenile fish, to discourage waste and to encourage an efficient utilization of fishery resources, CCMs shall require their purse seine vessels fishing in EEZs and on the high seas within the area bounded by 20°N and 20°S to retain on board and then land or tranship at port all bigeye, skipjack, and yellowfin tuna." Exceptions to this requirement are possible where the fish are unfit for human consumption for reasons other than size or when serious malfunction of equipment occurs. Reporting of discards is required (WCPFC web page on *Scientific data to be Provided to the Commission*, https://www.wcpfc.int/doc/data-01/scientific-data-be-provided-commission-revised-wcpfc4-6-7-and-9). Discarded catches of yellowfin across the whole fleet are estimated to be minor and are not considered in the stock assessment (Vincent et al., 2020). Estimates of discards based on observer data have been provided at recent SC meetings. The average discard rate for the three target tuna species caught by purse seiners (yellowfin, bigeye and skipjack) over the period 1995-2019 was 2.4 %, with an estimated 0.9 % discarded in 2019 (WCPFC-SC16-2020/ST IP-01).

For the UoA, at-sea observer data presented in Section 5.8.1.3 provides information on levels of discarding. The level of discarding indicated for the period 2018-2020 for yellowfin is 12.31 % (see Table 19). The client has indicated that these discard rates could be due to either: (i) depredation events with sharks and killer whales, which are subsequently damaged and discarded or, (ii) undersize and young fish (less than 6 kg) that have no market value, which are subsequently discarded. Additional information is required on the reason for this level of discarding, whether the discarded catch should be considered unwanted catch in the context of this scoring issue, and whether approaches to minimise the level of discarding have been explored. This scoring issue is provisionally not scored.

* 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

Vincent et al. (2020), WCPFC (2021), WCPFC_SC (2020a), Pilling et al. (2019), SPC (2017, 2018, 2020)

CMM 2014-06; CMM 2020-01 (and its predecessors).

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

Draft scoring range	<60 (more information needed)
Information gap indicator	More information required in relation to unwanted catch in the UoA.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 4. 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?	Yes	No	No

Rationale

Following the MSC Notice, "Scoring of 'available' Harvest Control Rules (HCRs) in CRv1.3 fisheries" of 24th November 2014, PI 1.2.2 si(a) has been scored using MSC Standard v2.0 provisions for SG60 (as above) scoring for a number of fisheries, including several tuna fisheries. MSC have also provided further comment on HCRs with their notice of 16 December 2015 "Interpretation on Harvest Control Rules (HCR)".

MSC Standard v2.01 lays out two conditions for acceptance of HCR being available sufficient to justify scoring at the SG60 level.

First, Standard v2.01 SA2.5.2a provides for HCR being recognised as available, "…if stock biomass has not previously been reduced below B_{MSY} or has been maintained at that level for a recent period of time".

The MULTIFAN-CL software used for yellowfin tuna stock assessment provides probabilistic estimates of parameters of interest, and uncertainty has been extensively explored using a crosswise grid of sensitivity tests. Previous yellowfin tuna assessments indicate that SB has not been reduced below SB_{MSY}. The 2020 assessment estimates of spawning biomass are also above the level that will support the MSY (SB_{recent}/SB_{MSY} = 2.43) (WCPFC_SC, 2020a). Additionally, stochastic projections predict there to be no risk of breaching the LRP (0 % probability $SB_{2048}/SB_{F=0}$<LRP). The Standard v2.0 SA2.5.2a requirement is therefore met and HCRs are considered to be 'available'.

Second, Standard v2.01 SA2.5.3b provides for HCR being recognised as available if, "…there is an agreement or framework in place that requires the management body to adopt HCRs before the stock declines below B_{MSY}".

CMM 2014-06 sets out the principles and elements for harvest strategies to be developed and implemented, including requirements for target and limit reference points and decision rules or ("harvest control rules"), with a clear intention that harvest control rules, tested using simulation approaches, will be part of the implemented harvest strategies. As indicated above, the progress on the CMM 2014-06 workplan has been slow. However, the current stock assessment and projections of future stock size indicate that the stock will remain above SSB_{MSY} over the period agreed in the CMM 2014-06 workplan. The Standard v2.01 SA2.5.3b requirement is therefore met.

Since both Standard v2.01 SA2.5.2a and SA2.5.3b requirements are met, **a score of SG60 is awarded**. CMM 2014-06 established a process for the adoption of harvest control rules; however, well-defined harvest control rules are not currently in place and **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?		No	No

Rationale

HCRs are still under development, The 'available' HCR does not allow evaluation of robustness to the main uncertainties.; **SG80 is therefore 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?	Yes	No	No

Rationale

Under MSC Standard v2.01 SA2.5.6, MSC requires that as part of the evaluation of the effectiveness of HCRs, "…teams shall include consideration of the current levels of exploitation in the UoA, such as measured by the fishing mortality rate or harvest rate, where available". SA2.5.6 guidance (GSA2.5.2-7) states that "Evidence that current F is equal to or less than F_{MSY} should usually be taken as evidence that the HCR is effective". Evidence to support this is provided by the 2017 and 2020 assessments indicating that overfishing is not occurring ($F_{current}$ /F_{MSY} < 1 across the grid of model runs) (WCPFC_SC, 2017, 2020a).

In relation to SIa above, SA2.5.5b, requires that where HCRs are recognised as 'available "A description of the formal agreement or legal framework that the management body has defined, and the indicators and trigger levels that will require the development of HCRs" shall be provided. CMM 2014-06 sets out elements of harvest strategies to be developed and implemented. As indicated at PI 1.2.1, a workplan has been adopted to progress these elements. Overall, therefore, under the MSC requirements and guidance for 'available' HCRs, **SG60 is met. SG80 is not met.**

References

Vincent et al. (2020), WCPFC_SC (2017, 2020b)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 5. 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 are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	No

Rationale

Monitoring systems in place provide an extensive range of information to support the current harvest strategy and inform the stock assessment. Available information includes mandatory logbooks, with records for each fishing operation, detailed VMS coverage, a requirement for 100 % observer coverage for the majority of the yellowfin purse seine catch, and port inspections. Information is available on key aspects of yellowfin tuna biology and extensive tagging provides information on stock structure. The tagging data and size composition sampling are key inputs to the MULTIFAN-CL model which provides for estimation of reference points against which stock status can be evaluated and management advice provided. Data on environmental conditions are collected and are known to be important for understanding shifts in the distribution of the stock and the fishery.

A review of the scientific data available to WCPFC tabled at SC16 notes the major recent developments with regard to filling gaps in the provision of scientific data to the Commission. For example, all CCMs with fleets active in the WCPFC Convention Area provided 2019 annual catch estimates by the deadline of the 30th April 2020. There are identified gaps in the provision of some operational data, notably from Indonesia and Vietnam (e.g. catch in number for longline and handline fisheries). However, the NZ-funded WPEA-Improved Tuna Monitoring (WPEA-ITM) Project contributes WCPFC technical assistance to the Philippines, Indonesia and Vietnam to, inter alia, improve monitoring and data management of their domestic fisheries. It is reported that there has been good progress in the collection and provision of data from each of these countries in recent years (WCPFC-SC16-2020/ST-WP-01).

Information available to inform the stock assessment and support the harvest strategy includes:

Fishery-dependent information

Catch, effort and catch per unit of effort (CPUE). All CCM fisheries are required to provide catch and effort data to WCPFC/ SPC (Williams et al., 2020a). The logsheet data are raised to best estimates of total catch by SPC-OFP, to account for missing data.

Length-frequency data: Length-frequency data are collected through various port sampling programmes and some observer reports. These data are weighted in the stock assessment according to spatial representation, to account for differences in length-frequency by geographic region.

Fleet composition: Each CCM provides information to WCPFC annually on their active fleet, in their Part 1 reports.

Fishery-independent information

Stock structure: Knowledge of the spatial distribution and seasonal migration for the WCPO yellowfin is fairly well understood. Yellowfin in the western Pacific are believed to comprise a single stock for management purposes, based on the extensive available tagging data, with the spatial extent of that stock approximating the WCPFC Convention Area.

Stock productivity: Overall, there is adequate knowledge of the life-history parameters for WCPO yellowfin to conduct robust assessments and develop appropriate LRPs and TRPs. Biological samples are routinely collected on an annual basis from both domestic and international yellowfin fisheries. Reliable data are available to estimate growth rates, maturity and fecundity. Length-weight relationships are established by the OFP to convert population numbers to biomass.

Environmental data: SPC-OFP has undertaken environmental research as part of their ecosystem monitoring programme, focusing particularly on potential environmental drivers of tuna population dynamics.

Information inferred from the stock assessment

Estimates of stock abundance are obtained through the MULTIFAN-CL stock assessment. Also, abundance indices analysed included CPUE for purse seine and longline fisheries. Effort data units for purse seine fisheries are defined as days fishing/or searching, and are allocated to set type (associated or unassociated) in logbook data.

There is an extensive range of information collected related to the fishery to support the harvest strategy. There is sufficient information collected to meet **SG60 and SG80 requirements**.

However, some data gaps do constrain stock assessments, for example, data gaps persist for some large fisheries in southeast Asia despite improvements in recent years. The stock assessment is reliant on commercial CPUE as an index of stock abundance, and although these data are carefully analysed and standardised as far as possible, there are no fishery-independent datasets with which they can be compared. Issues such as spatial and temporal changes in catchability remain problematic. On this basis **SG100 is not met.**

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No

Rationale

Stock abundance and removals are monitored at a level of accuracy and coverage that is sufficient to support the harvest control measures in place. Estimates of stock abundance are obtained through the MULTIFAN-CL stock assessment, with the assessments undertaken regularly. Abundance indices monitored include CPUE for the longline fisheries. WCPFC has systems in place for recording catch and effort for all vessels catching WCPO yellowfin tuna. Purse seine catch data are estimated by 1° latitude, 1° longitude, month, flag, and set type. The majority of the purse seine catches are taken under the PNA VDS arrangements. Purse seine vessels are subject to 100 % at sea observer coverage. The longline catch and effort and CPUE information is the key data for stock assessment. Other important 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.

Individual CCMs monitor fishery removals via logsheets and port sampling, and data 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, either in an aggregated form or (preferably) at the operational level (individual logsheets).

UoA removals are submitted via Korea's distant water fishing activity monitoring requirements. Data are collected by Korea's National Institute of Fisheries Science (NIFS), the research arm of the Korea's Ministry of Oceans and Fisheries (MOF). Data are stored electronically on the electronic reporting system (ERS) by the vessel and sent to the Korean Fisheries Monitoring Center (FMC) and NIFS at the same time. NIFS send the data to WCPFC for the annual report to the Commission. Operational data are sent to the SPC, as per WCPFC reporting requirements.

In between formal stock assessments, SPC provides information on trends in fishery indicators (total catch, nominal CPUE, catch at length and at weight) to guide management (e.g. Brouwer et al. (2018)).

This level of monitoring meets the **SG60 and SG80 levels**.

There continues to be gaps with some inputs (e.g. uncertainty in the CPUE data mentioned above; purse seine catch and length-frequency data can be biased by grab-sampling techniques used to estimate species composition). Other uncertainties include:

- Although there have been improvements, catch data from Indonesian fisheries remains subject to significant uncertainties;
- tuna longline CPUE data are often poorly understood and it is unclear how successful most effort standardization analyses are or how to properly represent the uncertainties;
- The requirement to 'raise' logsheet data by estimates of total catch (to account for missing logsheets) results in some loss of precision.

As a result, the high level of certainty required at **SG100 is not met**.

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

Rationale

Other removals from the stock across the WCPO include catches by other WCPFC members, including by fishing gears other than purse seine. Catches by members are required to be reported to the WCPFC. Article 5 of the Convention requires CCMs to "*collect and share, in a timely manner, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes*." In general, all CCMs submit aggregate catch data by the WCPFC deadline, though some of these datasets are of higher quality than others.

WCPFC and SPC have undertaken extensive work 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 problem, and there has been ongoing work for quite a few years to quantify the catch (and where possible effort) from these fisheries. There has been gradual improvement in the data from these sources over recent years, and catch data are included in the most recent stock assessment.

A report by Pew Charitable Trusts (Pew, 2019) highlights uncertainties in the declaration of transhipments and provides evidence that points to the possibility of significant levels of undeclared transhipments from longline vessels. However, stock assessments do not rely on transshipment data to quantify removals from the stock, since it is very challenging for transshipment observers to estimate quantities accurately. Instead, they rely on logbooks and reports from CCMs, and use VMS data to cross-check logbook data.

Overall, while there are some concerns around reporting of various types of data, these issues are being addressed by WCPFC and there is no evidence that they significantly compromise the robustness of stock assessments. **SG80 requirements are met**.

References

Tremblay-Boyer et al. (2017), Vincent et al. (2020), WCPFC (2020a, 2020b), WCPFC_SC (2020c), Williams et al. (2020a), Pew (2019), Brouwer et al. (2018)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 6. 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?		Yes	Yes

Rationale

The MULTIFAN-CL stock assessment software is a robust and internationally recognized stock assessment package with efficient function minimization, implemented in AD Model Builder. The most recent yellowfin stock assessment (Vincent et al., 2020), like other recent assessments, is an integrated, model-based assessment that is undertaken by an experienced and internationally recognised stock assessment program at the SPC. The model used has undergone continued development over the years, with frequent supporting analysis and research and workshops. The assessment takes into account major features relevant to the biology and the nature of the fishery, **meeting SG80 and SG100**.

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

Rationale

The assessment outputs provide a wide range of estimates of stock status and report spawner biomass and fishing mortality relative to a range of reference points which can be estimated, including MSY reference points (F_{MSY}, SB_{MSY}) and depletion-based reference levels ($SB_{F=0}$, SB_0). **SG60 and SG80 are met**.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Yes	Yes	Yes

Rationale

The assessment of yellowfin tuna has provided explicit commentary on the major sources of uncertainty, has assessed the sensitivity of the assessment to these uncertainties, and has evaluated current and future stock status relative to these in a probabilistic way. In the assessment, two approaches were used to describe the uncertainty in key model outputs. Firstly, statistical uncertainty is estimated within a given assessment model, while secondly structural uncertainty in the assessment is examined by considering the variation among a suite of models that encompassed combinations of alternative parameter values across several axes: steepness (3 settings), tagging data overdispersion (2), tag mixing (2), size data weighting (3) and regional structure (2). The structural uncertainty grid, including 72 runs considered to represent the 'plausible range' of stock uncertainty, was used to estimate median and 10 % and 90 % estimates of parameter values and stock status relative to various reference points (Vincent et al., 2020). The assessment thus takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way. **SG60, SG80 and SG100 requirements are met.**

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?			Yes

Rationale

There is an ongoing program of review of assessment assumptions and approaches by the staff in the SPC's Oceanic Fisheries Programme. Alternative hypotheses are continually being explored (within funding and time constraints) and assessments are updated and modified as required. Recommendations for further work to improve the assessment can be seen in Vincent et al. (2020).

The structure of the assessment has been regularly updated to reflect the availability of new data or new interpretations of existing data and a suite of sensitivity analyses have been undertaken to explore the impact of options such as changing assumptions for fixed parameters or different treatments of the data. Furthermore, retrospective analyses have been undertaken to explore any systematic biases in the model and the results used to adjust the reference case. The assessment for yellowfin tuna has been shown to be robust, **meeting the requirements of SG100.**

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

Rationale

Internal reviews of stock assessments are undertaken by SPC. There has been an external review of the assessment of bigeye tuna (Ianelli et al., 2012) which provided recommendations that were also applicable to other similar assessments such as for yellowfin tuna. Many of those recommendations have been addressed with subsequent yellowfin assessments.

There have also been external reviews commissioned of different aspects of the data analyses that feed into the assessments, e.g. external review of the purse seine fishery species and size composition estimation has been conducted by Cordue (2013). A level of internal review is also provided by submission to meetings of the WCPFC SC, at which experienced scientific staff from several countries attend.

There have been two earlier reviews of the previous yellowfin tuna assessment (Haddon, 2010; Maguire, 2010) which were commissioned by the U.S. through the Center for Independent Experts (CIE). There has, however, been no recent formal external review for yellowfin. **This scoring issue is met at the SG80 level but not at the SG100 level**.

References

Ianelli et al. (2012), Medley et al. (2020), Tremblay-Boyer et al. (2017), Vincent et al. (2020), WCPFC (2021), WCPFC_SC (2020a), Cordue (2013), Haddon (2010) and Maguire (2010)

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

Draft scoring range	≥80

Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

5.5 Principle 1: WCPO bigeye tuna

5.5.1 Biology and ecology

Bigeye tuna have a relatively broad distribution in the WCPO, both geographically between 40°N and 40°S, and vertically from the surface to depths of 500 m (occasionally to 1000 m) due to their tolerance of low oxygen levels and low temperatures (Figure 11). In the tropical and sub-tropical waters of the WCPO, adult bigeye tuna migrate from cooler deeper waters (beneath the thermocline) where they live during the day to shallower warmer waters (above the thermocline) at night. Juvenile bigeye tuna tend to inhabit shallower waters and can form mixed schools with skipjack and yellowfin, resulting in catches by surface fisheries, particularly in association with floating objects. In the WCPO, smaller bigeye (20 to 75 cm) are typically caught on the surface by a range of gears including handline, ringnet and purse seine and are used mainly for canning. The majority of larger/older fish (100 to 180 cm) are caught by longline fisheries. Bigeye tuna feed on a wide variety of fishes, cephalopods, and crustaceans during the day and at night. Bigeye tuna biomass is estimated to be significantly smaller than for skipjack or yellowfin tuna in the WCPO. Bigeye tuna (and the other target species for the client fishery) are not a key low trophic level species.

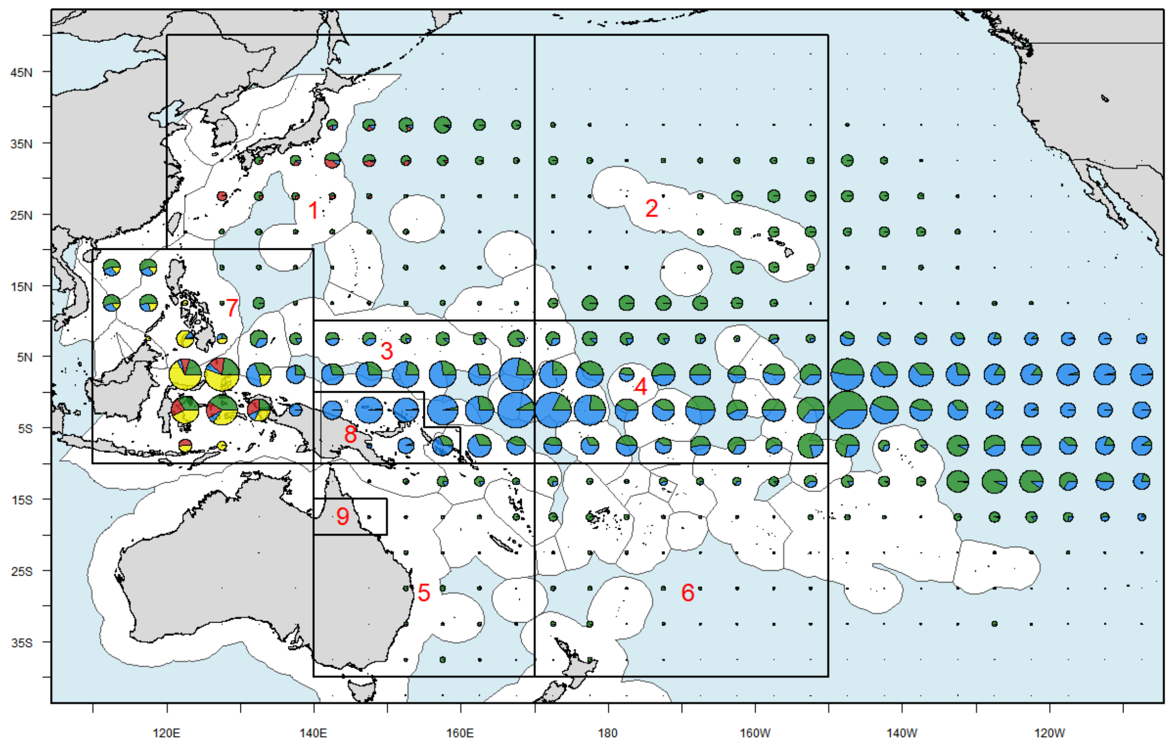


Figure 11. Distribution and magnitude of bigeye tuna catches for the most recent decade of the stock assessment (2009-2018) by 5 degree square and fishing gear: longline (green), pole-and-line (red), purse seine (blue) and miscellaneous (yellow), for the WCPO and part of the EPO. Overlayed are the regional boundaries for the stock assessment. Source: Ducharme-Barth et al. (2020)**.**

5.5.1.1 Growth and natural mortality

Bigeye tuna growth rates are slower than either yellowfin or skipjack, reaching around 40 cm after one year. They also live longer and mature later. Recent studies have updated bigeye age and growth estimates in the WCPO (Farley et al., 2017, 2018). 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 (see stock assessment section, below).

Natural mortality (M) is estimated to be relatively low compared with other tropical tuna species (M is assumed to be higher for the smallest size classes before declining to ~0.5/yr for fish >~40 cm). 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 (Ducharme-Barth et al., 2020). There is a generally increasing proportion of males in the catch with increasing size which is assumed to be due to an increase in M for females associated with sexual maturity and the onset of reproduction.

5.5.1.2 Reproduction and recruitment

In the WCPO, bigeye tuna become reproductively active from about 100 cm fork length and all individuals >120 cm fork length are reproductively mature (2-4 years old). Bigeye tuna are multiple spawners that may spawn every 1 or 2 days over several months over periods of the full moon throughout the year in tropical waters. Eggs and larvae are pelagic.

5.5.1.3 Stock definition

Bigeye tuna are distributed throughout tropical and sub-tropical waters of the Pacific Ocean (Figure 11). Genetic studies have failed to reveal significant evidence of widespread population subdivision in the Pacific Ocean (Grewe and Hampton, 1998). These results are not conclusive regarding the rate of mixing of bigeye tuna throughout the Pacific, however they are broadly consistent with the results of historic tagging experiments on bigeye tuna undertaken by the Pacific Community (SPC) and the Inter-American Tropical Tuna Commission (IATTC). The majority of the tagging of bigeye prior to 2008 occurred either in the eastern Pacific (east of about 120°W) or in the western Pacific (west of about 180°). These earlier tagging data did indicate some long-distance recaptures; however a large majority of the returns were relatively close to the release points. More recent tagging work, however, has suggested that while bigeye tuna in the far eastern and western Pacific may have relatively little exchange, those in the central part of the Pacific between about 180° and 120°W may mix more rapidly over distances of 1000–3000 nm (Schaefer et al., 2015). It is now accepted that there is extensive movement of bigeye across the nominal WCPO/EPO boundary of 150°W. Nevertheless, stock assessments of bigeye tuna are routinely undertaken separately for the WCPO and EPO.

5.5.2 Stock assessment and information

An updated stock assessment was carried out for bigeye in 2020 following assessments in 2017 (McKechnie et al., 2017a) and 2018 (Vincent et al., 2018). An additional three years of data were available for the 2020 assessment (Ducharme-Barth et al., 2020); the model extends through the end of 2018. New developments to the stock assessment include addressing the recommendations for improved growth modelling made in the 2017 stock assessment report, inclusion of spatio-temporal standardized CPUE implemented using "index" fisheries, updating the length-weight relationship, defining reproductive potential as a function of length, and updates to the preparation of the tagging data (WCPFC_SC, 2020a).

Changes made in the progression from the 2017 to 2020 diagnostic models include:

- Changes to the preparation and treatment of the tagging data;
- Improvements to the size frequency data preparation and the switch to the index fishery approach;
- Specifying reproductive potential as a function of length;

- Updating the growth curve to using the fixed values from the tag-integrated model; and
- Assuming non-decreasing selectivity for certain longline fisheries.

Assumptions on parameters of the model (including age/spatial structure, growth, recruitment, mortality, maturity, selectivity and catchability) are detailed in Ducharme-Barth et al. (2020). A structural uncertainty analysis (model grid) is used for consideration in developing management advice where all possible combinations of the most important axes of uncertainty from the one-off models were included. The 2020 assessment advice was based on a structural uncertainty grid comprised of 24 models.

The assessment model relies mainly on catch and effort data for the various fleets, size data and tagging data. The distribution of bigeye catches for the most recent decade of the stock assessment (2009-2018) is shown in Figure 11 and the time series of total annual catch by fishing gear over the full assessment period is shown in Figure 12. The 2019 WCPFC Convention Area bigeye tuna catch (135,680 t) was lower than the recent ten-year average and amongst the lowest over the past two decades. The purse seine catch of bigeye was estimated to be 50,819 t which was the lowest since 2003. The longline catch for 2019 (68,371 t) was slightly lower than the recent ten-year average, and well down on the bigeye catch levels experienced in the 2000s. The purse seine and longline fisheries accounted for 88 % of the total bigeye catch in 2019 (Williams and Ruaia, 2020).

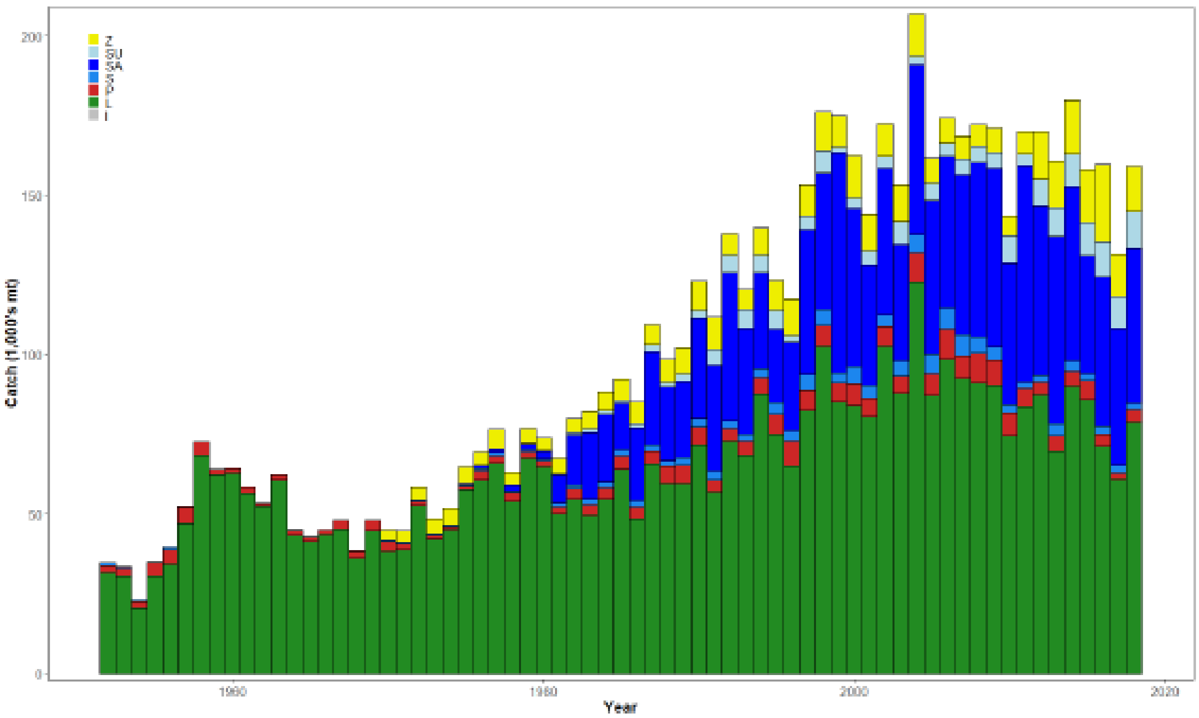


Figure 12. Time series of total annual catch (1000's mt) by fishing gear for the diagnostic case model over the full assessment period. The different colours refer to longline (green), pole-and-line (red), purse seine (blue), purse seine associated (dark blue), purse seine unassociated (light blue), miscellaneous (yellow), and index (grey). Source: Ducharme-Barth et al. (2020)**.**

The following summary of the bigeye assessment results is from the SC16 Summary Report (WCPFC_SC, 2020a). General conclusions of the 2020 bigeye assessment by SC16 include:

- The results from the uncertainty grid adopted by SC16 show that the stock has been continuously declining since the late 1950s, except for the recent small increase from 2015 to 2016, with biomass declining thereafter;
- The median value of relative recent (2015-2018) spawning biomass depletion ($SB_{2015\text{-}2018}$/ SBF=0) was 0.41 with 10th to 90th percentiles of 0.27 to 0.52;
- There was 0 % probability (0 out of 24 models) that the recent (2015-2018) spawning biomass had breached the adopted limit reference point (LRP);
- There has been a long-term increase in fishing mortality for both juvenile and adult bigeye tuna and while juvenile fishing mortality is higher than that of the adult fish, both adult and juvenile fishing mortality rates have stabilised somewhat since 2008 and have fluctuated without trend since that time;
- The median recent fishing mortality ($F_{2014\text{-}2017t}/F_{MSY}$) was 0.72 with a 10th to 90th percentile interval of 0.49 to 1.02;
- There was a roughly 12.5 % probability (3 out of 24 models) that the recent (2014-2017) fishing mortality was above F_{MSY}; and
- The results of stochastic projections from the 2020 assessment which indicated the potential stock consequences of fishing at "status quo" conditions (2016–2018 average longline and other fishery catch and 2018 purse seine effort levels) and short-term recruitment scenario using the uncertainty framework approach endorsed by SC. Projections indicate that median $SB_{2025}/SB_{F=0}$ = 0.47; median $SB_{2035}/SB_{F=0}$ = 0.49 and median $SB_{2045}/SB_{F=0}$ = 0.49. The risk that $SB_{2048}/SB_{F=0}$ is less than the LRP is 0 %.

Based on the uncertainty grid adopted, SC16 concluded the WCPO bigeye tuna spawning biomass is above the biomass LRP and recent F is very likely below F_{MSY}. The stock is not overfished (100 % probability $SB/SB_{F=0}$>LRP) and likely not experiencing overfishing (87.5 % probability $F<F_{MSY}$). SC16 noted that levels of fishing mortality and depletion differ among regions, and that fishery impact was higher in the tropical regions, with particularly high fishing mortality on juvenile bigeye tuna in these regions.

Reference point values for the 2020 assessment are summarized in Table 13. Time-dynamic percentiles of depletion ($SB_t/SB_{t,F=0}$) for the 24 models are shown in Figure 13. A Kobe plot summarising the results for each of the 24 models in the structural uncertainty grid is shown in Figure 14. SC16 recommended a precautionary approach such that the fishing mortality on the bigeye tuna stock should not be increased from the level that maintains spawning biomass at 2012-2015 levels until the Commission can agree on an appropriate target reference point.

Table 13. Summary of reference points over the 24 models in the structural uncertainty grid. Note that "recent" is the average over the period 2015-2018 for SB and 2014-2017 for fishing mortality, while "latest" is 2018. The values of the upper 90th and lower 10th percentiles of the empirical distributions are also shown. F_{mult} is the multiplier of recent (2014-2017) fishing mortality required to attain MSY. Source: WCPFC_SC (2020a)**.**

Reference point	Mean	Median	Minimum	10th percentile	90th percentile	Maximum
C_{latest}	159,738	159,288	157,297	157,722	162,033	162,271

Reference point	Mean	Median	Minimum	10^{th} percentile	90^{th} percentile	Maximum
$Y_{Frecent}$	136,568	134,940	117,800	124,668	149,424	161,520
f_{mult}	1.45	1.38	0.83	0.98	2.03	2.33
F_{MSY}	0.05	0.05	0.04	0.04	0.07	0.07
MSY	146,715	140,720	117,920	125,628	179,164	187,520
F_{recent}/F_{MSY}	0.74	0.72	0.43	0.49	1.02	1.21
$SB_{F=0}$	1,395,173	1,353,367	903,708	982,103	1,780,138	1,908,636
SB_{MSY}	320,162	321,550	192,500	219,810	443,730	482,700
$SB_{MSY}/SB_{F=0}$	0.23	0.23	0.19	0.2	0.26	0.26
$SB_{latest}/SB_{F=0}$	0.38	0.38	0.23	0.3	0.47	0.51
SB_{latest}/SB_{MSY}	1.7	1.67	0.95	1.23	2.15	2.6
$SB_{recent}/SB_{F=0}$	0.4	0.41	0.21	0.27	0.52	0.55
SB_{recent}/SB_{MSY}	1.78	1.83	0.87	1.18	2.32	2.84

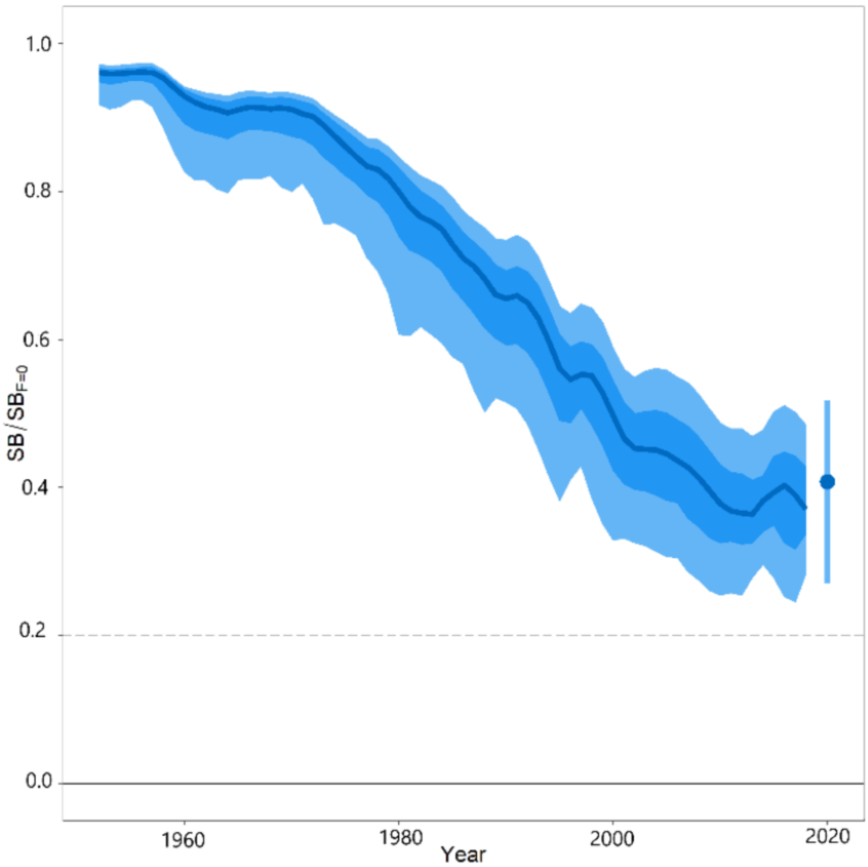


Figure 13. Time-dynamic percentiles of depletion ($SB_t/SB_{t;F=0}$) and median (dark line) across all 24 models in the structural uncertainty grid. The lighter band shows the 10th to 90th percentiles around the median, and the dark band shows the 50th percentile around the median. The median $SB_{recent}/SB_{F=0}$ and 80th percentile is shown on the right by the dot and line. Source: WCPFC_SC (2020a).

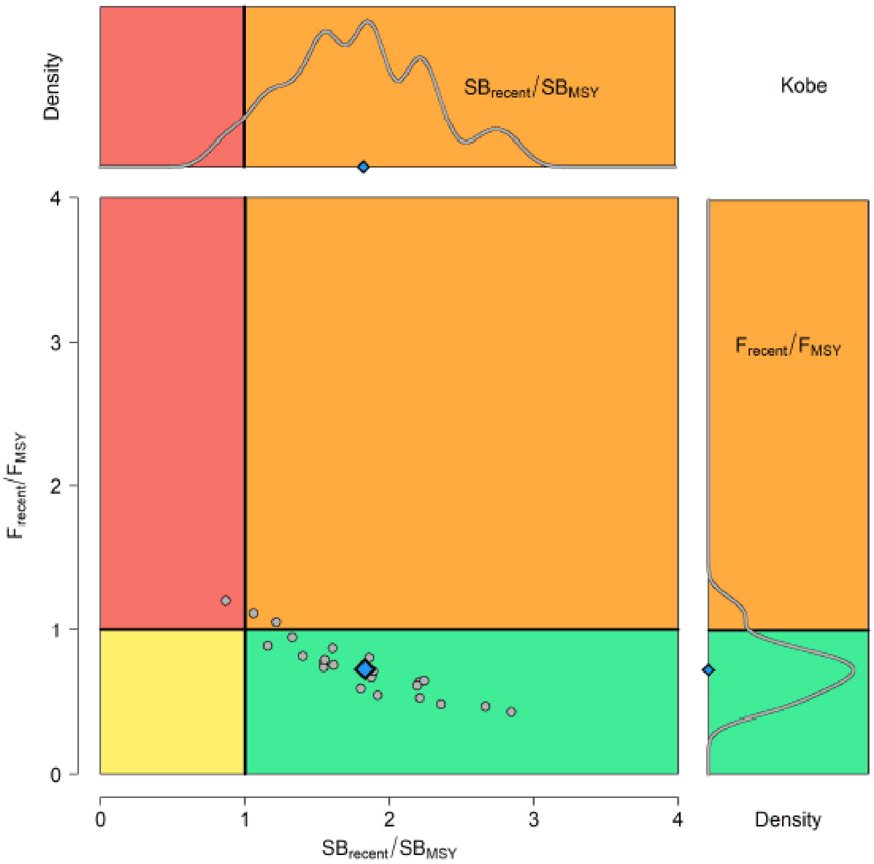


Figure 14. Kobe plot for the recent spawning potential (2015–2018) summarizing the results for each of the models in the structural uncertainty grid. The plots represent estimates of stock status in terms of spawning biomass depletion and fishing mortality. Marginal distributions of each are presented. The median is shown in blue. Source: WCPFC_SC (2020a)**.**

5.5.3 Harvest strategy

The harvest strategy measures described above for yellowfin (Section 5.4.3) also apply to bigeye. In addition, CMM 2020-01 sets longline bigeye catch limits by flag (including charter vessels) for the distant water nations.

5.5.4 Principle 1 Performance Indicator scores and rationales: WCPO bigeye

<u>Scoring table 7. PI 1.1.1 – Stock status</u>

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status relative to recruitment impairment			
	Guide post	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	Yes	Yes	Yes

Rationale

WCPFC has adopted 20 % of the unfished spawning potential (20%$SB_{F=0}$) as the limit reference point (LRP) for bigeye. Management advice on the 2020 bigeye assessment (Ducharme-Barth et al., 2020) is summarised in the conclusions of WCPFC SC16 (WCPFC_SC, 2020a). The structural uncertainty analysis used a crosswise grid of 24 alternative model formulations (Table 13). The WCPO bigeye spawning biomass was characterised using the grid and the median $SB_{recent}/SB_{F=0}$ was estimated to be 0.41, with a range of 0.27 to 0.52 for the 10th and 90th percentiles; there is 0 % probability (none of the 24 models) that the recent spawning biomass had breached the adopted LRP.

MSC guidance (GSA2.2.3.1) provides that where B_{MSY} is analytically determined it should be used to calculate the PRI and that: *where B_{MSY} is analytically determined to be lower than 40%B_0 (as in some highly productive stocks), and there is no analytical determination of the PRI, the default PRI should be 20%B_0 unless B_{MSY}<27%B_0, in which case the default PRI should be 75%B_{MSY}.*

The 2020 assessment provides a median estimate of SB_{MSY} of 23.8%$SB_{F=0}$, hence a value of 17.9%$SB_{F=0}$ could be used as the PRI (i.e. 75 % of 23.8%$SB_{F=0}$). Given that all outcomes of the 2020 assessment indicate that SB_{recent} (and SBl_{atest}) are above this level, as well as above the more precautionary 20%$SB_{F=0}$, there is a high degree of certainty the stock is above the PRI.

SG60, SG80 and SG100 requirements are met.

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)	

Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a **high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
Met?		Yes	No

Rationale

The median estimate of SB_{MSY} is at 23.8%$SB_{F=0}$ (WCPFC_SC, 2020a). The median estimate of SB_{latest}/SB_{MSY} is 1.67 (with range of 1.23 to 2.15 for the 10th and 90th percentiles) and SB_{recent}/SB_{MSY} is 1.83 (range 1.18 to 2.32). The minimum estimate from the grid of SB/SB_{MSY} is <1 for the SB_{latest} and SB_{recent} estimates (0.95 and 0.87), suggesting that spawning biomass is fluctuating around a level consistent with MSY but not above MSY with a high degree of certainty (Table 13). In addition, $F > F_{MSY}$ for 3 of the 24 models in the assessment grid. **SG80 is met but not SG100.**

References

Ducharme-Barth et al. (2020) and WCPFC_SC (2020a)

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	Limit reference point	75%B_{MSY} = 17.9%$SB_{F=0}$	$SB_{latest}/SB_{F=0}$ = 0.38 (latest = 2018) $SB_{recent}/SB_{F=0}$ = 0.41 (recent = 2015 to 2018)
Reference point used in scoring stock relative to MSY (SIb)	MSY reference point	SB_{MSY}	SB_{latest}/SB_{MSY} = 1.67 SB_{recent}/SB_{MSY} = 1.83

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

Draft scoring range	≥80

Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 8. PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	NA		NA

Rationale

The stock does not require rebuilding.

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, or it is **highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	NA	NA	NA

Rationale

The stock does not require rebuilding.

References

NA

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

Draft scoring range	NA
Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 9. 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?	Yes	No	No

Rationale

MSC guidance defines a harvest strategy as the combination of monitoring, stock assessment, harvest control rules and management actions. It is intended that these elements work together towards achieving management objectives. The current harvest strategy is not formalised but consists of the elements considered at PIs 1.2.2, 1.2.3, and 1.2.4.

The operational harvest strategy for WCPO bigeye has several contributing components, with WCPFC, national and archipelagic waters management actions being supported by a robust stock assessment and extensive monitoring frameworks. There has been a development of WCPFC management measures (for skipjack, yellowfin and bigeye tuna) over time (currently CMM 2020-01). The stated objective of CMM 2020-01 is that “Pending the establishment of harvest strategies, and any implementing CMM, the purpose of this measure is to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks.” The status of bigeye continues to be assessed as not overfished and not subject to overfishing. For bigeye, pending agreement on a target reference point, CMM 2020-01 requires that the spawning biomass depletion ratio ($SB/SB_{F=0}$) is to be maintained at or above the average $SB/SB_{F=0}$ for 2012-2015. The most recent stock assessment suggests that the status quo is an acceptable biological target for bigeye (see PI 1.1.1). The likely impact of CMM 2017-01 and 2018-01 (identical in relevant provisions to 2020-01) has been examined with 30-year projections (SPC, 2017, 2018, 2020; Pilling et al., 2019). Assuming that recent recruitment levels (high) continue, the risk of SB falling below the LRP remained negligible, while the risk of $F>F_{MSY}$ ranged from 0-13 % depending on assumptions about effort. Assuming long-term mean recruitment (lower), the risk of $F> F_{MSY}$ in 2048 was significant (37-58 % depending on assumed effort) while the risk of SB<LRP was not negligible but nevertheless remained low (5-19 %) (noting that the LRP is close to the estimated level of B_{MSY}).

The range of measures applied fishing for bigeye tuna are expected to achieve stock management objectives, **meeting the SG60 requirements**.

At this point, harvest control rules have not been adopted. There is an extensive information base from a wide range of biological studies and from a diverse range of fisheries. The information is sufficient to support a state-of-the-art stock assessment that provides probabilistic estimates of key parameters and their relationship to reference points. Advice from the stock assessment is provided by the SC and additional work is carried out by the scientific provider, SPC, to the Commission. Annual decision-making is articulated through CMMs and is supported by good scientific decision-support systems. CMM 2014-06 spells out the future direction for strengthening the harvest strategy, including the development of harvest control rules.

CMM 2014-06 commits WCPFC to developing a formal harvest strategy for bigeye and the other key stocks. Workplans developed under this CMM have been revised on several occasions and key milestones for bigeye have not been met to date. Elements of the workplan for yellowfin and bigeye tuna are being run in tandem. An explicit LRP for bigeye tuna has been adopted for biomass (20%$SB_{F=0}$). A formal target reference point is under discussion by WCPFC and subject to development under the workplan established under CMM 2014-06. In the absence of a formal target reference point, the default WCPFC target of B_{MSY} applies to bigeye tuna.

Under CMM 2014-06 requirements, WCPFC adopted a workplan to implement the required elements of a harvest strategy in 2015. The workplan has undergone several modifications since it was first developed. Elements of the workplan for yellowfin and bigeye tuna are being run in tandem. A range of harvest strategy-related research was presented for discussion by WCPFC16. Relevant research and technical documents are available on the WCPFC website. Progress towards implementation of the harvest strategy is summarised in Figure 10.

The workplan was further considered at WCPFC17, but discussion was limited due to Covid-19.

WCPFC18 also agreed on an updated CMM for bigeye, yellowfin and skipjack tuna, CMM 2021-01 (WCPFC (2022) - Attachment G). In terms of the harvest strategy, this CMM continues the requirements of CMM 2020-01. CMM 2021-01 came into effect on 16 February 2022 and will remain in effect until 15 February 2024 unless earlier replaced or amended by the Commission.

The latest activities for the workplan schedule for yellowfin and bigeye, are as follows:

2022: Agree Target Reference Point

- Commission agree a TRP for yellowfin and bigeye.

Develop management procedures and Management strategy evaluation

- SC provide advice on performance of potential management procedures

2023: Develop management procedures and management strategy evaluation

- SC agree the operating models for MSE;
- SC provide advice on performance of potential management procedures;
- SC provides advice on relevant elements of the monitoring strategy;

- Technical and Compliance Committee (TCC) consider the implications of potential management procedures; and
- Commission consider advice on progress towards management procedures.

Develop and implement relevant elements of the monitoring strategy

2024: Develop management procedures and management strategy evaluation

- SC provide advice on performance of potential management procedures; SC provides advice on relevant elements of the monitoring strategy;
- TCC consider the implications of potential management procedures; and
- Commission consider and refine a candidate set of management procedures.

Commission ADOPT a management procedure.

It has not been shown that the harvest strategy is responsive to the state of the stock and that the elements of the harvest strategy work together towards achieving those stock management objectives. **SG80 nor SG100 are met**.

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

Rationale

The latest stock assessment indicates that there is a high degree of certainty that the stock is above the LRP and that the stock is at or fluctuating around a level consistent with MSY. The estimated low probability that SB_{recent}<LRP and the estimated fishing mortality ($F_{recent}<F_{MSY}$) provides evidence that although the harvest strategy has not been fully tested it is achieving sustainability objectives reflected in PI 1.1.1 SG80. Management measures (CMM 2020-01 and its predecessors) have been amended in response to available information. **SG60 and SG80 requirements are met.** Although the information on stock status and stock projections indicate that the harvest strategy is maintaining the stock at appropriate levels, the strategy has not been fully tested. Evaluation of the performance of the harvest strategy and harvest control rules against management objectives is an element of CMM 2014-06 and its workplan. **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?	Yes		

Rationale

WCPFC has monitoring systems in place to record catch and effort for all vessels catching bigeye tuna in the WCPO. Monitoring of the fishery includes mandatory logbooks with records of catch and effort for each fishing operation, VMS, observer coverage of fishing operations including detailed recording of catch composition, tagging data, biological studies and port inspections. These monitoring systems support a sophisticated stock assessment process that regularly provides robust estimates of stock status that are sufficient to determine whether the harvest strategy is working. All data for the client fishery are submitted through Korean/WCPFC reporting requirements. Observer data are collected through the Regional Observer Programme (ROP) or national observer programmes. As indicated above, WCPFC has adopted numerous CMMs which form the basis of the harvest strategy. Progress on and compliance with these CMMs is regularly monitored at annual Commission and sub-committee meetings. **SG60 requirements are met.**

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

Rationale

There is ongoing review of the elements of the current operational harvest strategy, however the harvest strategy for bigeye has not been formalised and is not subject to a formal review process. **SG100 is not met**.

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

	Met?	NA	NA	NA

Rationale

Bigeye is not a shark; this scoring issue is **not relevant**.

f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	No (more information needed)	No (more information needed)	No (more information needed)

Rationale

Bigeye is a target species and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of the catch being unwanted*. The 2020 stock assessment indicates that discarding rates for bigeye are negligible. In addition, CMM 2020-01 (and its predecessors) requires that “To create an incentive to reduce the non-intentional capture of juvenile fish, to discourage waste and to encourage an efficient utilization of fishery resources, CCMs shall require their purse seine vessels fishing in EEZs and on the high seas within the area bounded by 20oN and 20oS to retain on board and then land or tranship at port all bigeye, skipjack, and yellowfin tuna.”

Estimates of discards based on observer data have been provided at recent SC meetings. The average discard rate for the three target tuna species caught by purse seiners (yellowfin, bigeye and skipjack) over the period 1995-2019 was 2.4 %, with an estimated 0.9 % discarded in 2019 (WCPFC-SC-ST-IP01 2020).

For the UoA, at-sea observer data presented in Section 5.8.1.3 provides information on levels of discarding. The level of discarding indicated for the period 2018-2020 for bigeye is 11.76 % (see Table 19). The client has indicated that these discard rates could be due to either: (i) depredation events with sharks and killer whales, which are subsequently damaged and discarded or, (ii) undersize and young fish (less than 6kg) that have no market value, which are subsequently discarded. Additional information is required on the reason for this level of discarding, whether the discarded catch should be considered unwanted catch in the context of this scoring issue, and whether approaches to minimise the level of discarding have been explored. This scoring issue is therefore provisionally not scored.

* 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

Ducharme-Barth et al. (2020), WCPFC (2021), WCPFC_SC (2020a), Pilling et al. (2019), SPC (2017, 2018, 2020)

CMM 2014-06; CMM 2020-01 (and its predecessors)

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

Draft scoring range	<60 (more information needed)
Information gap indicator	More information sought to confirm that unwanted catch is not a relevant issue for the client fishery: What is the reason for swordfish (and yellowfin and bigeye) being released? Are these released fish included in catch reporting to the RFMO?

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 10. 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	**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	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level

		exploitation rate as the point of recruitment impairment (PRI) is approached.	fluctuating around a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	taking into account the ecological role of the stock, most of the time.
	Met?	Yes	No	No

Rationale

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:

- 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 B_{MSY} within the next 5 years; or
- In UoAs where B_{MSY} 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.
- 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:
- 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
- An agreement or framework is in place that requires the management body to adopt HCRs before the stock declines below B_{MSY}.

The 2020 stock assessment update indicates that the median value of SB_{recent}/SB_{MSY} is 1.83 and the probability that SB_{recent}<LRP is estimated to be 0 %. The median F_{recent}/F_{MSY} is estimated to be 0.72, with a probability of approximately 12.5 % (3 out of 24 models) that recent F was above F_{MSY}. The risk that $SB_{2048}/SB_{F=0}$ is less than the LRP ranges is 0 %. On this basis, SA2.5.2a is met.

WCPFC have adopted CMM 2014-06 and related workplans to establish formal harvest strategies and control rules for the key stocks, including WCPO bigeye. SA2.5.3b is therefore met and an HCR can be considered ‘available’ for this stock. **SG60 is met**. Well defined harvest control rules have not yet been adopted, hence **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?		No	No

Rationale

There is an ‘available’ HCR rather than ‘in place’, hence this cannot be considered to be robust to the main uncertainties. **SG80 is 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?	Yes	No	No

Rationale

SA2.5.5 requires evidence of a) evidence that HCRs are being ‘effectively’ used in other named UoAs, also managed by the same management body, including the basis on which they are regarded as ‘effective’; or b) a description of the formal agreement or legal framework that the management body has defined, and the indicators and trigger levels that will require the development of HCRs.

MSC guidance for SA2.5.6 indicates that ‘evidence that current F is equal to or less than F_{MSY} should usually be taken as evidence that the HCR is effective’. Recent F is estimated by SC16 to be below F_{MSY} with ~87 % probability.

WCPFC has adopted a formal framework for the development of a harvest strategy for key tuna species (CMM 2014-06 and relevant workplans).

The criteria for ‘available’ tools at **SG60 are therefore met**.

SG80 is not met because there are no HCRs with tools to achieve required exploitation levels.

References

Ducharme-Barth et al. (2020) and WCPFC_SC (2020a)

CMM 2014-06

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 11. 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 are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	Yes

Rationale

Monitoring of the WCPO bigeye stock has been undertaken through the assessment work of the WCPFC Scientific Committee with the research being undertaken by the SPC-OFP since the WCPFC entered into force in 2004. Monitoring of the stock consists of collecting data on fishery removals, effort, size composition as well as from observer and tagging programmes. Available information includes mandatory logbooks, with records for each fishing operation, detailed VMS coverage, a requirement for 100 % observer coverage for the majority of the yellowfin purse seine catch, and port inspections. Additionally, the Scientific Committee coordinates biological research needs and disseminates research results and statistics to cooperating scientists and the management bodies.

The client fleet submits data in accordance with U.S. Federal requirements.

A review of the scientific data available to WCPFC tabled at SC16 notes the major recent developments with regard to filling gaps in the provision of scientific data to the Commission. For example, all CCMs with fleets active in the WCPFC Convention Area provided 2019 annual catch estimates by the deadline of the 30th April 2020. There are identified gaps in the provision of some operational data, notably from Indonesia and Vietnam (e.g. catch in number for longline and handline fisheries). However, the NZ-funded WPEA-Improved Tuna Monitoring (WPEA-ITM) Project contributes WCPFC technical assistance to the Philippines, Indonesia and Vietnam to, *inter alia*, improve monitoring and data management of their domestic fisheries. It is reported that there has been good progress in the collection and provision of data from each of these countries in recent years (WCPFC-SC16-2020/ST-WP-01).

Information available to inform the stock assessment and support the harvest strategy includes:

<u>Fishery-dependent information</u>

Catch, effort and catch per unit of effort (CPUE). All CCM fisheries are required to provide catch and effort data to WCPFC/SPC (Williams et al., 2020a). The logsheet data are raised to best estimates of total catch by SPC-OFP, to account for missing data.

Length-frequency data: Length-frequency data is collected through various port sampling programmes and some observer reports. These data are weighted in the stock assessment according to spatial representation, to account for differences in length-frequency by geographic region.

Fleet composition: Each CCM provides information to WCPFC annually on their active fleet, in their Part 1 reports.

<u>Fishery-independent information</u>

Size and age data: Age and growth has been an important issue in the bigeye stock assessment. Recent studies have updated bigeye age and growth estimates in the WCPO (Farley et al., 2017, 2018). 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. WCPFC SC14 agreed to accept the updated 'new growth' model as the best scientific data available for stock assessment and management advice.

Natural mortality: M-at-age is estimated externally to the stock assessment model using observed length-at-age, the observed proportion of males at length, and an assumed average rate of natural mortality. The updated new growth information has resulted in a new M-vector to be used in the assessment.

Environmental data: SPC-OFP has undertaken environmental research as part of their ecosystem monitoring programme, focusing particularly on potential environmental drivers of tuna population dynamics.

Stock structure: Bigeye tuna in the WCPO are assessed and managed as a single stock in the WCPFC Convention Area, although there is evidence from tagging for mixing across the WCPO/EPO boundary. The consequences of this mixing for stock assessment have been evaluated via a Pacific-wide stock assessment (McKechnie et al., 2015), the results of which suggest that the current approach is robust to this mixing.

<u>Information inferred from the stock assessment</u>

Estimates of stock abundance are obtained through the MULTIFAN-CL stock assessment. Also, abundance indices analysed included CPUE for purse seine and longline fisheries. Effort data units for purse seine fisheries are defined as days fishing/or searching and are allocated to set type (associated or unassociated) in logbook data.

In addition, the Ocean Fisheries Programme of SPC undertake environmental research as part of their ecosystem monitoring programme, focusing particularly on potential environmental drivers of tuna population dynamics. Ecosystem models have been developed to inform ecosystem-based fisheries management.

Overall, there is a comprehensive range of information collected related to the fishery including the elements required to **meet the SG60, SG80 and SG100 levels**.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No

Rationale

Individual CCMs monitor fishery removals via logsheets and port sampling, and data 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, either in an aggregated form or (preferably) at the operational level (individual logsheets). Despite some gaps in this dataset, coverage is considered to be good overall. This catch, effort and CPUE dataset is the major input for stock assessment. Other key fisheries data which support management are length-frequency data (collected via port sampling and observer programmes) and tag returns. Biological data are also collected via research programmes.

Stock assessments are undertaken regularly though not annually (2011, 2014, 2017, 2018 and 2020 update). In between formal stock assessments, SPC provides information on trends in fishery indicators (total catch, nominal CPUE, catch at length and at weight) to guide management (e.g. Brouwer et al. (2018)).

UoA removals are submitted via Korea's distant water fishing activity monitoring requirements. Data are collected by Korea's National Institute of Fisheries Science (NIFS), the research arm of the Korea's Ministry of Oceans and Fisheries (MOF). Data are stored electronically on the electronic reporting system (ERS) by the vessel and sent to the Korean Fisheries Monitoring Center (FMC) and NIFS at the same time. NIFS send the data to WCPFC for the annual report to the Commission. Operational data are sent to the SPC, as per WCPFC reporting requirements.

The available monitoring information **meets SG60 and SG80 requirements**. **SG100 is not considered to be met,** for the following reasons:

- Tuna longline CPUE is 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;
- The requirement to 'raise' logsheet data by estimates of total catch (to account for missing logsheets) results in some loss of precision;
- Some data gaps remain in the fishery-dependent data;

- Historical data are often lacking in precision; and
- Although the frequency of stock assessments is reasonable, they are not carried out with 'high frequency' (i.e. not always updated annually).

In addition, it is not completely clear how robust the management is to uncertainty – the management system is still a work in progress.

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

Rationale

Extensive work is undertaken by WCPFC and SPC to quantify all fishery removals from the stock for consideration in the stock assessment. There has been ongoing work to improve the extent and quality of data from small-scale fisheries (though with substantial catches) fisheries (notably Indonesia, Vietnam and the Philippines). The data coverage overall is extensive.

The 2017 pre-assessment workshop noted that there is some potential for underreporting of bigeye catch (Pilling and Brouwer, 2017). The workshop requested SPC to include a one-off sensitivity with this potential IUU fish added to the catch history; see McKechnie et al (2017b). It did not have a significant effect on the conclusions of the assessment, which were a little more positive (see McKechnie et al. (2017a)).

A report by Pew Charitable Trusts (Pew, 2019) highlights uncertainties in the declaration of transhipments and provides evidence that points to the possibility of significant levels of undeclared transhipments from longline vessels. However, stock assessments do not rely on transshipment data to quantify removals from the stock, since it is very challenging for transshipment observers to estimate quantities accurately. Instead, they rely on logbooks and reports from CCMs, and use VMS data to cross-check logbook data.

Overall, while there are some concerns around reporting of various types of data, these issues are being addressed by WCPFC and there is no evidence that they significantly compromise the robustness of stock assessments. **SG80 requirements are met**.

References

Farley et al. (2017 and 2018); Pilling and Brouwer (2017); Brouwer et al. (2018); McKechnie et al. (2015, 2017a and 2017b); Vincent et al. (2018); Ducharme-Barth et al. (2020) and Pew (2019)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 12. 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?		Yes	Yes

Rationale

The MULTIFAN-CL stock assessment software is a robust and internationally recognized stock assessment package with efficient function minimization, implemented in AD Model Builder. The model can incorporate a range of datasets and 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; and (iv) observation models for the data.

The assessment model defines a total of 41 fisheries and uses a regional structure which comprises nine regions identified, based on consideration of fishery characteristics and movement information from tagging studies. The model partitions the population into 40 quarterly age-classes and “monitors” the population at quarterly time steps through a time window of 1952-2018. The assessment is undertaken by an experienced and internationally recognised stock assessment programme at the SPC, the WCPFC science provider.

The SG80 and SG100 requirements are met.

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

Rationale

As described in the introductory sections of this document and in the scoring text for PI 1.1.1, the stock assessment reports provide a wide range of estimates of stock status relative to indicators of interest to management, including agreed/potential reference levels. The **SG60 and SG80 requirements are met**.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Yes	Yes	Yes

Rationale

As with other WCPFC tuna stock assessments, the assessment of bigeye tuna has provided explicit commentary on the major sources of uncertainty, assesses the sensitivity of the assessment to these uncertainties, and evaluates current and future stock status relative to these in a probabilistic way. The structural analysis of uncertainty involves applying the assessment method to a crosswise grid of many combinations of assumptions. Probabilities quoted in PI 1.1.1 rationale are based on the WCPFC SC16 structural uncertainty grid. A 2011 review of the bigeye assessment (Ianelli et al., 2012) found the structural analysis "to be a particularly successful way to convey uncertainty". Consideration of bigeye growth has been a major uncertainty in the assessment and the 2020 assessment has continued to incorporate enhanced growth information.

The updated 2020 stock assessment provides background on new or changed inputs and how they have been introduced and evaluated. However, SC16 comments that the authors of the 2020 assessment noted that there were a number of indications that the model was likely over-parametrized and overly complex. SC16 recommended an external peer review or WCPFC modelling workshop prior to the next WCPO bigeye tuna stock assessment (WCPFC_SC, 2020a).

Uncertainty is taken into account and probability is quantified to the extent possible. **SG60, SG80 and SG100 requirements are met**.

d	Evaluation of assessment

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

Rationale

There is an ongoing program of review of assessment assumptions and approaches by the staff in the SPC's OFP. Alternative hypotheses are continually being explored (within funding and time constraints) and assessments are updated and modified as required. The structure of the assessment has been regularly updated to reflect the availability of new data or new interpretations of existing data and a suite of sensitivity analyses have been undertaken to explore the impact of parameter assumptions. For example, the 2017 stock assessment was updated in 2018 to reflect research on bigeye growth. The assessment approach has been tested and shown to be robust.

This scoring issue has previously been scored as meeting SG100 for other MSC bigeye UoAs. However, SC16 commented that the authors of the stock assessment noted that there were a number of indications that the model was likely over-parametrized and overly complex. SC16 suggested that an external peer review or WCPFC modelling workshop would be appropriate prior to the next WCPO bigeye tuna stock assessment. **The SG100 requirement is not met**.

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

Rationale

There is an ongoing program of review of assessment assumptions and approaches by the staff in the SPC's OFP. Alternative hypotheses are continually being explored (within funding and time constraints) and assessments are updated and modified as required. The structure of the assessment has been regularly updated to reflect the availability of new data or new interpretations of existing data and a suite of sensitivity analyses have been undertaken to explore the impact of parameter assumptions. For example, the 2017 stock assessment was updated in 2018 to reflect research on bigeye growth. The assessment approach has generally been tested and shown to be robust. **SG80 requirements are met**. However, SC16 comments that the authors of the 2020 assessment noted that there were a number of indications that the model was likely over-parametrized and overly complex. SC16 recommended an external peer review or WCPFC modelling workshop prior to the next WCPO bigeye tuna stock assessment (WCPFC_SC, 2020b). As a result, the **SG100 requirement is not met**.

References

McKechnie et al. (2017a and b); Farley et al. (2017 and 2018); Vincent et al. (2018); Pilling and Brouwer (2017); WCPFC_SC (2018, 2020a); Ianelli et al. (2012); Ducharme-Barth et al. (2020)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

5.6 Principle 1: South Pacific albacore

5.6.1 Biology and ecology

South Pacific albacore (SP ALB) are a highly migratory species, exploiting widely-spaced feeding and spawning grounds, and stocks are thought to be strongly influenced by large oceanic phenomena such as El Niño. Albacore tuna tend to school by size, as well as with other tuna species. They are a pelagic species that can be found to depths of 200 m. The longline fishery typically takes adult albacore in the narrow size range of 90–105 cm and the troll fishery takes juvenile fish in the range of 45–80cm. Their trophic level has been estimated at 4.3 +/- 0.2 SE, hence they are not a low-trophic level species.

5.6.1.1 Growth and natural mortality

Initial growth is rapid, with albacore reaching 45-50 cm fork length (FL) in their 1st year. The fish begin to mature at ~80 cm FL (length at 50 % maturity ~85 cm; Farley et al. (2013)). Males grow to larger sizes than females, and their lengths-at-age start to diverge above about 85 cm when they reach maturity. Maximum recorded length is about 120 cm FL.

The instantaneous natural mortality rate for South Pacific albacore is believed to be between 0.2-0.5 per year, with significant numbers of fish reaching at least 10 years (Tremblay-Boyer et al., 2018). No information is available on possible changes in natural mortality with size and for the purposes of the stock assessment, natural mortality is assumed to be constant throughout life.

5.6.1.2 Reproduction and recruitment

Albacore mature at approximately 5 years (>80 cm) and spawn in tropical and sub-tropical waters between ~10^{o}S and 30^{o}S during the austral summer (Tremblay-Boyer et al., 2018). Females produce 2-3 million eggs per season depending on their body size. Juveniles in the south Pacific recruit to surface fisheries in New Zealand coastal waters and in the vicinity of the sub-tropical convergence zone (STCZ – around 40°S) in the central Pacific at 1 year of age, from where they appear to gradually disperse to the north. Subsequently, there are regular migrations between tropical and subtropical waters. Albacore migrate southwards during early summer and northwards during winter coinciding with the seasonal oscillation of the location of the 23−28°C isotherm of sea surface temperature.

5.6.1.3 Stock definition

Separate north and south Pacific albacore stocks are recognized in the Pacific Ocean based on location and seasons of spawning, low longline catch rates in equatorial waters and tag recovery information. There is some suggestion of gene flow between the north and south Pacific stocks based on an analysis of genetic population structure; however, migration between stocks is not thought significant enough to affect management (Nikolic and Bourjea, 2013).

The latest stock assessment for South Pacific albacore assumes the boundary of the stock extends from the east coast of Australia to 130°W (Tremblay-Boyer et al., 2018). This model structure assumes that SP ALB east of 130^{o}W are a separate stock. The eastern Pacific component of the stock has not been included in recent assessments, due to low catches and poor data quality. Moore et al. (2020) suggest that it is not clear whether the boundaries of the model domain reflect the underlying population structure of SP ALB.

5.6.2 Stock assessment and information

The latest stock assessment for SP ALB was undertaken in 2018 using MULTIFAN-CL software, incorporating data to the end of 2016 (Tremblay-Boyer et al., 2018). The previous stock assessment was undertaken in 2015. Catch estimates for all tuna and billfish species fished in the WCPFC statistical area are compiled annually by the SPC based on reports provided by CCMs. The most recent report provides catches up to and including 2019 (Williams and Ruaia, 2020).

The south Pacific albacore catch in 2019 (86,706 t), was amongst the highest for the fishery, with the record catch taken in 2017 (93,415 t) (Figure 15). The distribution of catches for the most recent decade of the stock assessment (2006-2015) by 5 degree square and fishing gear is shown in Figure 16. Longline accounts for more than 90 % of the catch and catches are taken over a large area of the south Pacific but concentrated in the west.

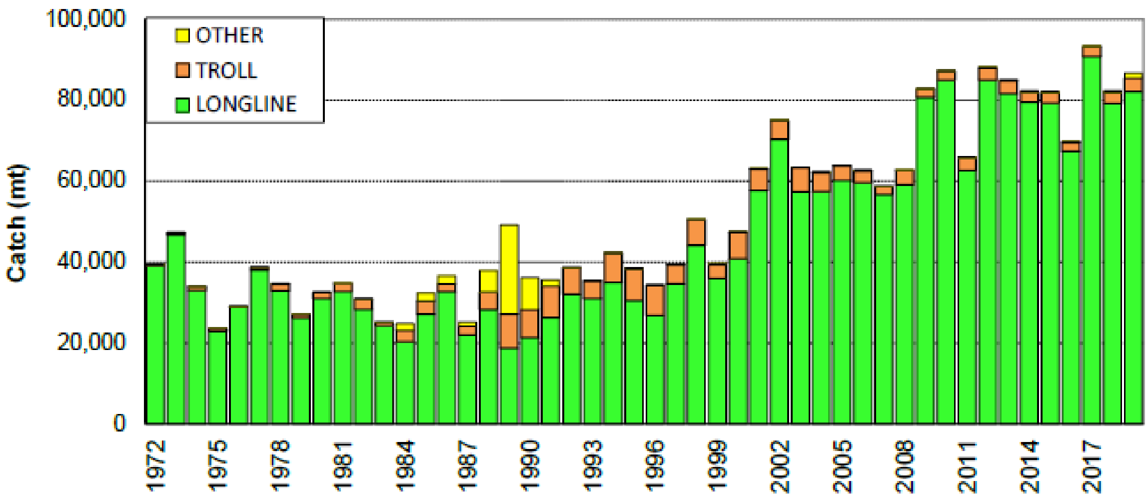


Figure 15. South Pacific albacore catch (t) by gear, 1972–2019; "other is primarily catch by the driftnet fleet. Source: Williams and Ruaia (2020)**.**

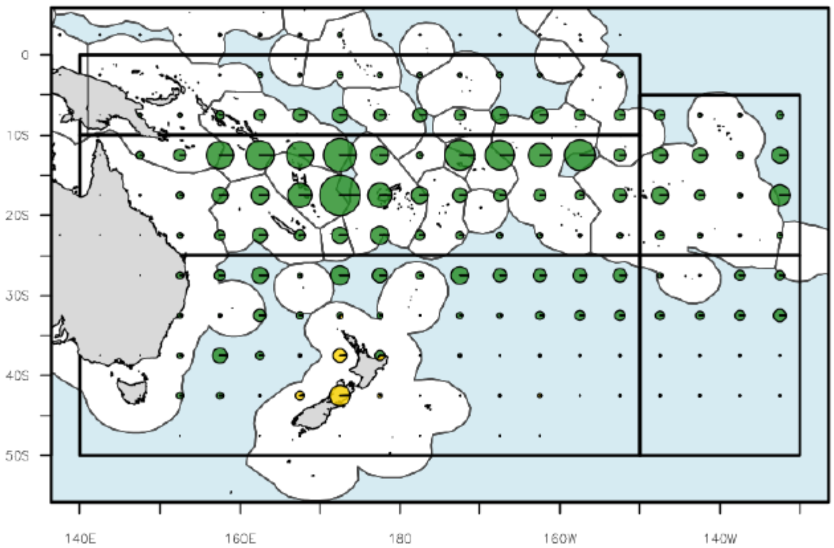


Figure 16. Distribution and magnitude of albacore tuna catches for the most recent decade of the stock assessment (2006-2015) by 5 degree square and fishing gear: longline (green), pole-and-line (red), purse seine (blue) and miscellaneous (yellow), for the WCPO and part of the EPO. Overlayed are the regional boundaries for the stock assessment (2018 regional structure). Source: Tremblay-Boyer et al. (2018)**.**

Catches are reported to WCPFC by vessel flag states that are responsible for the vessels fishing the stock. Catch and effort data for the stock assessment are compiled according to the defined fisheries. The catch data are thought to be reasonably accurate for the period of the assessment. All catches are expressed in numbers of fish, with the exception of the driftnet fishery, where catches were expressed in weight (metric tonnes). For longline fisheries, effort is expressed in hundreds of hooks, while for troll and driftnet fisheries, the number of vessel days of fishing activity are used.

The 2018 model partitions the population into five spatial regions (under the 2018 regional structure) and 48 quarterly age classes. In addition to the diagnostic case model, the 2018 assessment reports the results of one-off sensitivity models to explore the relative impacts of key data and model assumptions for the diagnostic case model on the stock assessment results and conclusions. A structural uncertainty analysis is used for consideration in developing management advice, where all possible combinations of the most important axes of uncertainty from the one-off models were included. As well as incorporating data to 2016, the 2018 SP ALB assessment changes include:

- Using standardised catch per unit effort (CPUE) indices calculated from the recently collated operational longline CPUE dataset, including historical Japanese longline data within the CPUE which were not available in 2015;
- Moving from the traditional CPUE standardized index to one based upon a geostatistical model;
- Applying the CPUE standardized index to an `index fishery' in each region.

Conclusions of the 2018 assessment (Tremblay-Boyer et al., 2018) include:

- While biomass is estimated to have declined initially, estimates of spawning potential, and biomass vulnerable to the various longline fisheries, have been stable or possibly increasing slightly over the past 20 years. This has been influenced mainly by the estimated recruitment, which has generally been somewhat higher since 2000 than in the two decades previous;
- Most models also estimate an increase in spawning and longline vulnerable biomass since about 2011, driven by some high estimated recruitments, particularly around 2009;
- A steady increase in fishing mortality of adult age-classes is estimated to have occurred over most of the assessment period, accelerating since the 1990s but declining following the decline in longline catch seen since 2010. Juvenile fishing mortality increased until around 1990, and has remained stable at a low level since that time;
- All models indicate that SP ALB is above the LRP (of $0.2SB_{F=0}$), with overall median spawning biomass depletion for 2016 ($SB_{latest}/SB_{F=0}$) estimated at 0.52 (80 percentile range 0.37-0.69) (Figure 17);
- Recent average fishing mortality is estimated to be well below F_{MSY} (median F_{recent}/F_{MSY} = 0.2, 80 percentile range 0.08-0.41).

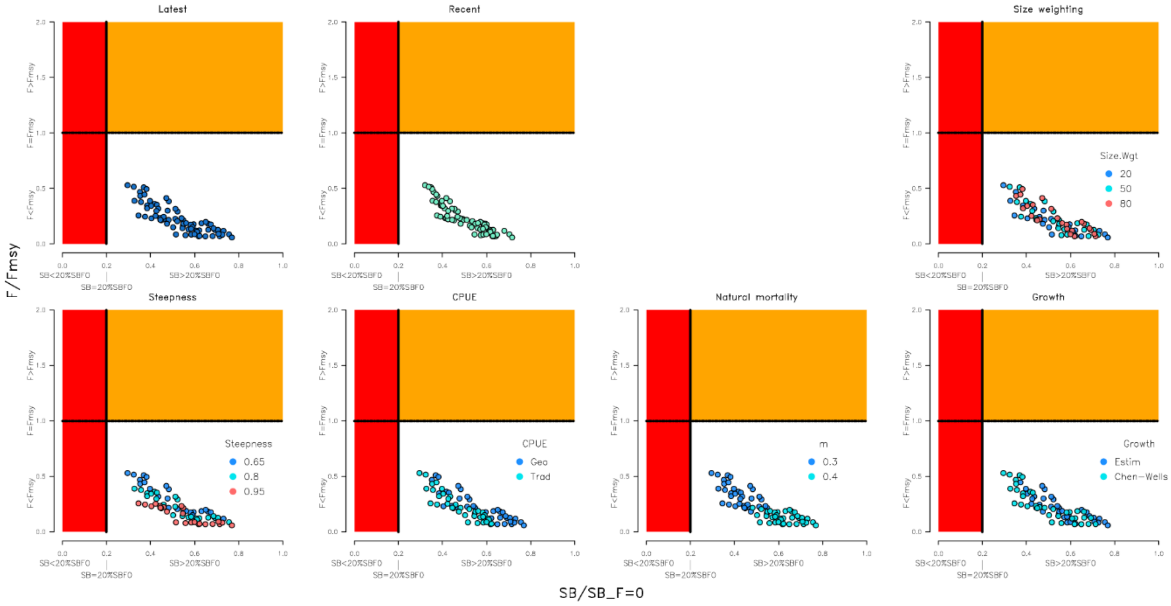


Figure 17. Majuro plots summarising the results for each of the models in the structural uncertainty grid under the *SB_{latest}=$SB_{F=0}$* and the *SB_{recent}=$SB_{F=0}$* reference points (top left) and each axis of uncertainty. Source: WCPFC_SC (2018)**.**

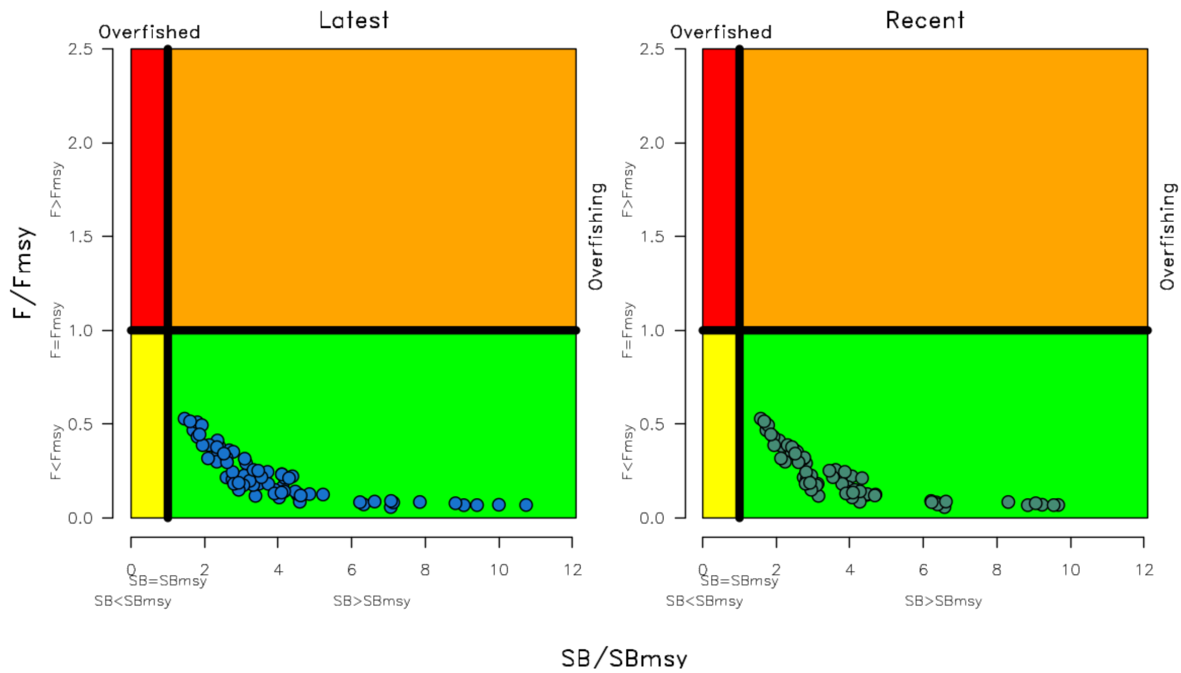


Figure 18. Kobe plots summarising the results for each of the models in the structural uncertainty grid under the SB_{latest}=$SB_{F=0}$ and the SB_{recent}=$SB_{F=0}$ reference points. Source: WCPFC_SC (2018)**.**

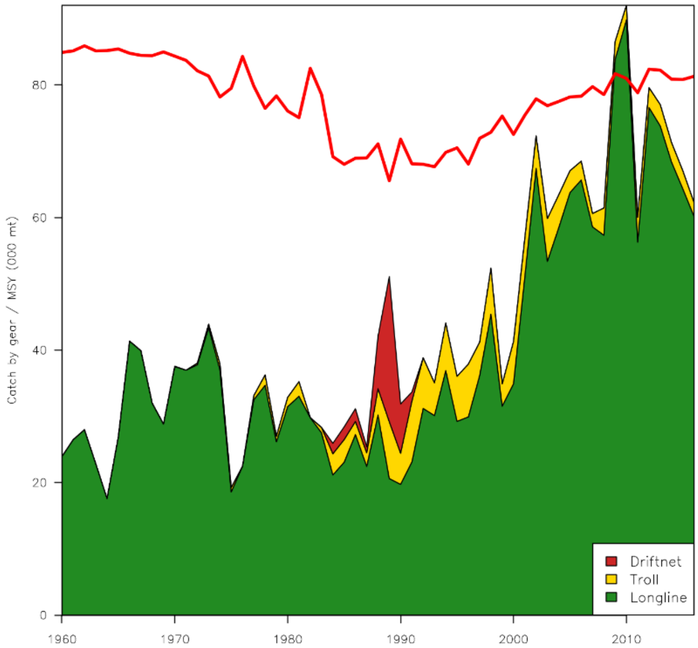


Figure 19. History of the annual estimates of MSY (red line) for the diagnostic case model compared with annual catch by the main gear types. Source: WCPFC_SC (2018)**.**

Figure 17 displays Majuro plots summarising the results for each of the models in the structural uncertainty grid, while Figure 18 shows equivalent Kobe plots for SB_{recent} and SB_{latest} across the structural uncertainty grid. Annual estimates of MSY for the diagnostic case model compared with annual catch by the main gear types is shown in Figure 19. The estimated median spawning biomass trajectory shows a consistent decline through to around 2010, followed by a period of stabilization through to 2016 (Figure 20).

Estimated values of the reference points over all 72 individual models in the structural uncertainty grid are shown in Source: **WCPFC_SC (2018)**.

Table 14. Based on the uncertainty grid adopted by the 14th session of the Scientific Committee, the SP ALB tuna spawning biomass is very likely to be above the biomass LRP and recent F is very likely below F_{MSY}, hence the stock is not experiencing overfishing (100 % probability $F < F_{MSY}$) and is not in an overfished condition (100 % probability SB_{recent} > LRP) (WCPFC_SC, 2018).

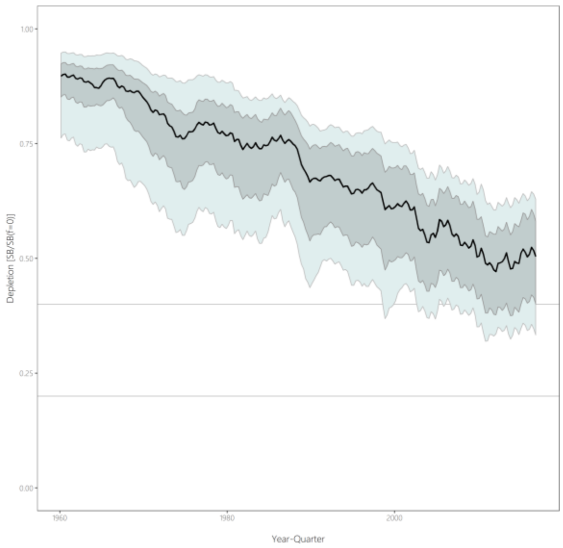


Figure 20. Time-series depletion estimates across the structural uncertainty grid. The black line represents the grid median trajectory, the dark grey region represents the 50 %ile range, the light grey the 90 %ile range; horizontal lines=LRP and 2*LRP. Source: WCPFC_SC (2018)**.**

Table 14. Summary of reference points over all 72 individual models in the structural uncertainty grid. Source: Tremblay-Boyer et al. (2018)**.**

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

5.6.3 Harvest strategy

The WCPO harvest strategy for tunas has several components, with WCPFC, national and archipelagic management actions, supported by a robust stock assessment and extensive monitoring frameworks. WCPFC CMM 2014-06 was adopted to develop and implement a harvest strategy approach for key fish stocks in the WCPO. The CMM identifies the elements that harvest strategies are to contain (including defined operational objectives, target reference points (TRPs) and limit reference points (LRPs) for each stock, acceptable levels of risk of not breaching limit reference points, a monitoring strategy, decision rules that aim to achieve the TRP and avoid the LRP, and management strategy evaluation). As with WCPO yellowfin and bigeye, a biomass LRP has been set at 20%$SB_{current,F=0}$. CMM 2014-06 required the development of a workplan for its implementation, first adopted at WCPFC12 (WCPFC (2015); Attachment Y). There have been several revisions to the workplan in subsequent years.

The major management actions currently in place for SP ALB are set out in CMM-2015-02. The CMM 2015-06 workplan was subject to a substantial review at WCPFC16 and contains some significant changes in recognition of the needs of WCPFC CCMs as well as recent scientific advice (WCPFC, 2019).

In 2017, WCPFC14 agreed on an inter-sessional process to develop a “roadmap” to implement the elements needed for the effective conservation and management of SP ALB, taking into account the updated 2018 stock assessment. The Commission accepted New Zealand’s offer to lead this intersessional working group. The terms of reference of this intersessional group included considering:

- The elements necessary for the implementation of harvest strategy approach to the management of the stock;
- an allocation process; and
- monitoring and reporting priorities, and addressing of gaps, for all fisheries taking SPALB within the WCPFC convention area.

In summary, progress on elements of the harvest strategy for SP ALB is that:

- In 2012, an LRP of 20%$SB_{current,\ F=0}$, was adopted;
- In 2018, an interim TRP of 56%$SB_{F=0}$ was adopted by WCPFC15 with the objective of achieving an 8 % increase in CPUE for the southern longline fishery as compared to 2013 levels (WCPFC, 2018). The interim TRP will be revised should a future stock assessment indicate that this interim TRP will not result in the desired longline CPUE. A managed catch reduction of around 25 % will be required to achieve the TRP and will occur over a period no longer than 20 years. WCPFC15 tasked the SC with examining a range of alternative catch pathways and timeframes that achieve the TRP.
- In 2018, at WCPFC15 the Commission agreed to amend/develop appropriate CMMs to implement a harvest control rule (HCR) with the objective of managing the SPALB spawning stock biomass towards the target level. The updated 2018 workplan under CMM 2014-06 required an HCR to be implemented by 2021 (WCPFC (2018), Attachment I). It remains for CCMs to agree on a set of HCRs for testing, using management strategy evaluation, and implementation by the Commission.
- The 2019 Commission meeting agreed further changes to the harvest strategy work plan to accommodate “the need for additional work and time to explore and develop the details and practical implementation aspects of the multispecies framework covering all four tuna stocks” (WCPFC, 2019). The workplan changes involve delays in the adoption of a management procedure for SP ALB by one year to 2022 (because of a clash in 2021 with an updated albacore assessment that may also necessitate an update to the MSE operating model), as well as a potential update of

the interim TRP in accordance with the approach adopted by WCPFC15 (WCPFC (2019); Attachment H).

A range of harvest strategy related research was presented at WCPFC16 for discussion. For example, as requested by WCPFC15, WCPFC16-2019-19 examines “a range of alternative catch pathways and timeframes that achieve [the interim TRP], for consideration in 2019. In undertaking [this work] information from all fisheries will be included while noting that any management measures must take account of the impact of different gear types.” The document presents results from stochastic stock projections across the grid of 72 assessment models under future fishery scenarios to examine their performance in recovering the stock to the TRP.

Harvest strategy element	South Pacific Albacore
Management Objectives	Noted
Performance Indicators	Identified
Limit Reference Points	Adopted
Target Reference Point	Interim
Harvest Control Rules	Example HCRs examined
Management Strategy Evaluation	Developing
Monitoring Strategy	Developing

Harvest strategy element	Skipjack
Management Objectives	Noted
Performance Indicators	Identified
Limit Reference Points	Adopted
Target Reference Point	Interim
Harvest Control Rules	Example HCRs examined
Management Strategy Evaluation	Developing
Monitoring Strategy	Developing

Figure 21. Progress towards implementing the SP ALB harvest strategy. Dark green shading indicates substantial progress has been made; light green indicates work indicates work is currently underway; orange indicates work has not yet begun. Adapted from WCPFC-2019-09 (2019)**.**

WCPFC16 agreed to reinvigorate the SP ALB Roadmap Intersessional Working Group in 2020, under the leadership of Fiji. The Group met virtually in November 2020, with the major agenda item being to examine progress on alternative catch pathways to achieve the interim TRP (WCPFC, 2020c). Fiji provided a summary of the outcomes of the November meeting to WCPFC17, indicating that discussions are ongoing in relation to possible amendments to CMM 2015-02 or introducing a new CMM, which will be a comprehensive measure to address all occurrence of the species (in EEZs and the high seas; and including the entire area south of the equator, including the IATTC Convention Area).

There were no changes in the CMM 2014-6 workplan at WCPFC17 relative to SP ALB.

WCPFC18 was held in December 2021. The CMM-2014 workplan was reviewed at the meeting, with the adoption of a management procedure still scheduled for 2022. The latest activities for the workplan schedule for SP ALB, are as follows:

2022: Develop management procedures and management strategy evaluation

- SC agree the operating models for MSE;
- SC provide advice on performance of candidate management procedures;
- SC provides advice on relevant elements of the monitoring strategy;
- Technical and Compliance Committee (TCC) consider the implications of candidate management procedures; and
- Commission consider advice on progress towards management procedures.

Commission review and ADOPT a management procedure.

5.6.4 Principle 1 Performance Indicator scores and rationales: SP albacore

Scoring table 13. 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?	Yes	Yes	Yes

Rationale

The PRI for this stock is not estimated. WCPFC has adopted $20\%SB_{F=0}$ as a limit reference point (LRP) for the stock, where $SB_{F=0}$ is calculated as the average over the period 2006–2015.

MSC guidance (GSA2.2.3.1) provides that where B_{MSY} is analytically determined it should be used to calculate the PRI and that: *where B_{MSY} is analytically determined to be lower than 40%B_0 (as in some highly productive stocks), and there is no analytical determination of the PRI, the default PRI should be 20%B_0 unless B_{MSY}<27%B_0, in which case the default PRI should be 75%B_{MSY}.*

The median value for B_{MSY} in the 2018 assessment is estimated as $15\%SB_{F=0}$. On this basis, since the PRI is not analytically determined and B_{MSY} is estimated to be <27%B0, the guidance suggests a proxy PRI of $75\%B_{MSY}$, i.e. 11.3 $\%SB_{F=0}$.

To achieve SG60 it has to be likely (≥ 70^{th} %ile), for SG80 to be highly likely (≥ 80^{th} %ile) and for SG100 there has to be a high degree of certainty (≥ 95^{th} %ile) that current stock status is above the PRI. For SG80 to be met, 12 or fewer of the model of the 48 model scenarios from the final grid should fall below the PRI, and for SG100, 2 or fewer scenarios should fall below the PRI.

Majuro plots (Figure 17) summarise the results for each of the models in the structural uncertainty grid with respect to $SB_{recent}/SB_{F=0}$. None of the runs fall below $11.3\%SB_{F=0}$, or the more conservative $20\%SB_{F=0}$. Source: **WCPFC_SC (2018)**.

Table 14 shows that the reference points and the minimum value of $SB_{recent}/SB_{F=0}$ and $SB_{latest}/SB_{F=0}$ are all above 0.20. Therefore, there is a high degree of certainty that the stock is above the PRI. **SG60, SG80 and SG100 are met**.

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is a **high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		Yes	Yes

Rationale

Stock status relative to SB_{MSY} is presented in Kobe phase plots for each of the models in the structural uncertainty grid (Figure 18). In no case, for either 'recent' or 'latest', is stock biomass estimated to be below SB_{MSY}. Figure 19 presents the history of the annual estimates of MSY for the diagnostic case model, compared with annual catch by the main gear types, suggesting that catch has only exceeded MSY in a very few years (2009 and 2010 in the time series from 1960). Stock assessment estimates of catch relative to MSY indicate that stock has been above a level consistent with MSY over recent years. **SG80 and SG100 are met.**

References

Tremblay-Boyer et al. (2018) and WCPFC_SC (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 (SIa)	Limit reference point/ SB_{MSY} as a proxy PRI	LRP = $20\%SB_{F=0}$ $75\%SB_{MSY}$=11.3 $\%SB_{F=0}$	The minimum value of $SB_{recent}/SB_{F=0}$ is 0.32 and so is above the proxy PRI and $20\%SB_{F=0}$
Reference point used in scoring stock relative to MSY (SIb)	SB_{MSY} Where the recent period is defined as 2013-2016.	SB_{MSY}=68,650t	The minimum value of SB_{recent}/SB_{MSY} is 1.58 and so SB_{recent} is greater than SB_{MSY}.

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 14. PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	NA		NA

Rationale

The stock does not require rebuilding.

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, or it is **highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	NA	NA	NA

Rationale

The stock does not require rebuilding.

References

NA

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

Draft scoring range	NA
Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 15. 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?	Yes	No	No

Rationale

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 v1.3).

Elements of a harvest strategy include the reference points used to set limits and targets, "current" and "available" HCRs (1.2.2), data collection procedures (P1 1.2.3), the stock assessment (P1 1.2.4), and the monitoring of implementation of management measures. Current management measures for South Pacific albacore are set out in CMM 2015-02 which requires that that CCMs do not increase the number of their vessels actively targeting SP ALB in the Convention area south of 20°S over 2005 or 2002-4 levels, and also includes data gathering and reporting requirements. Implementation of CMM 2015-02 is monitored via data gathering and Part 2 reports to the Commission.

CMM 2014-06 sets out the roadmap to establishing a harvest strategy for key stocks managed by WCPFC. Under CMM 2014-06 WCPFC have also agreed a workplan with indicative timeframes to adopt or refine harvest strategies for South Pacific albacore, which is reviewed annually. At WCPFC15 (December 2018), the Commission adopted an interim TRP for SP ALB with the objective of an 8 % increase in longline CPUE (estimated by SPC to be achieved at 56%$SB_{F=0}$).

As with other tuna species, there have been delays and amendments to the CMM 2014-06 workplan. The 2019 Commission meeting agreed further changes to the harvest strategy work plan to accommodate "the need for additional work and time to explore and develop the details and practical implementation aspects of the multispecies framework covering all four tuna stocks" (WCPFC, 2019). The workplan changes involve delays in the adoption of a management procedure for SP ALB by one year to 2022 (because of a clash in 2021 with an updated albacore assessment that may also necessitate an update to the MSE operating model), as well as a potential update of the interim TRP in accordance with the approach adopted by WCPFC15 (WCPFC (2019); Attachment H).

WCPFC16 agreed to reinvigorate the SP ALB Roadmap Intersessional Working Group in 2020. The Group met virtually in November 2020, with the major agenda item being to examine progress on alternative catch pathways to achieve the interim TRP (WCPFC, 2020c). A summary of the outcomes of the meeting provided to WCPFC17, indicated that discussions are ongoing in relation to possible amendments to CMM 2015-02 or introducing a new CMM, which will be a comprehensive measure to address all occurrence of the species (in EEZs and the high seas; and including the entire area south of the equator, including the IATTC Convention Area).

Progress towards implementation of the harvest strategy is summarised in Figure 21. There were no further changes in the CMM 2014-6 workplan at WCPFC17 relative to SP ALB. WCPFC (2021) (Attachment H) lists the activities for the latest workplan schedule for SPA as follows:

2021: Develop management procedures and Management strategy evaluation

- SC provide advice on performance of candidate management procedures;
- TCC consider the implications of candidate management procedures;
- Commission consider and refine a candidate set of management procedures.

- [Updated stock assessment considered by SC17]
- [Potential update of TRP following assessment and in accordance with WCPFC15 adopted approach]

2022: as for 2021; and Adopt a management procedure.

In relation to SG60, it is clear from the results of the stock assessment that the stock is well above MSY levels, and projections suggest that the current harvest strategy is likely to keep the stock above the LRP in the medium term (see 1.1.1). **SG60 is met**. In relation to SG80, the harvest strategy is required to be 'responsive to the state of the stock'. While some progress has been made (e.g. agreement of an interim TRP), the existing harvest strategy currently in place (i.e. CMM 2015-02) simply requires that effort is not increased above recent historical levels and makes no reference to the agreed reference points nor to changes to be made according to the stock status. Furthermore, it has a range of problems (SIDS exemption, nothing north of 20ºS, defining vessels 'actively targeting' SP ALB), which makes its impact on the stock difficult to predict (although in practice it seems to be working). On this basis, **SG80 is not met**.

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

Rationale

Currently the stock is above the PRI with a high degree of certainty and F is and has always been below F_{MSY}. Therefore it appears that the harvest strategy is working and is achieving its objectives. Its performance has not, however, been 'fully evaluated', nor is it clear that in the long run it will be able to maintain biomass at the target level, which is higher than the current biomass level. **SG60 and SG80 are met but not SG100**.

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

Rationale

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

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

Rationale

There is ongoing review of the elements of the current operational harvest strategy, however the harvest strategy for SP ALB has not been formalised and is not subject to a formal review process. **SG100 is not met**.

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

Rationale

This scoring Issue need not be scored because sharks are not a target species.

f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	No (more information needed)	No (more information needed)	No (more information needed)

Rationale

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

For the UoA, at-sea observer data presented in Section 5.8.1.3 provides information on levels of discarding. The level of discarding indicated for the period 2018-2020 for albacore is 5.43 % (see Table 19). Additional information is required on the reason for this level of discarding, whether the discarded catch should be considered unwanted catch in the context of this scoring issue, and whether approaches to minimise the level of discarding have been explored. This scoring issue is therefore not yet scored.

* 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

CMMs 2015-02, 2014-06

Tremblay-Boyer et al. (2018), WCPFC (2017, 2020c, 2021)

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

Draft scoring range	<60 (more information needed)
Information gap indicator	More information on unwanted catch to be discussed at site visit.

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

Overall Performance Indicator score	

Condition number (if relevant)	

Scoring table 16. 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?	Yes	No	No

Rationale

Under 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:

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 B_{MSY} within the next 5 years; or

Under 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:

b. An agreement or framework is in place that requires the management body to adopt HCRs before the stock declines below B_{MSY}. Note: See MSC advisories 'Scoring of 'available' Harvest Control Rules (HCRs) in CRv1.3 fisheries' (24 Nov. 2014) and 'Interpretation on Harvest Control Rules (HCR)' (16 Dec. 2015).

A HCR may be considered to be 'available' and 'expected to reduce the exploitation rate as the PRI is approached' at SG60 if i) 'stock biomass has not previously been reduced below B_{MSY} or has been maintained at that level for a recent period of time' (SA2.5.2a) and ii) 'there is an agreement or framework in place that requires the management body to adopt HCRs before the stock declines below B_{MSY}' (SA2.5.3b). The stock is above B_{MSY} with high probability and under CMM 2014-06 there is an established a workplan and agreed timetable for the adoption of well-defined harvest control rules, with an agreement to adopt a HCR. The process is therefore underway although some delays have been evident in the past. **SG60 requirements are met**.

Overall, at present although a generally understood HCR is in place, no well-defined HCRs are 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?		No	No

Rationale

There is no formal HCR so it cannot be robust to the main uncertainties. **The SG80 requirements are 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?	Yes	No	No

Rationale

Under SA2.5.5, in order to conclude that available HCRs are 'effective', 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').

Recent average fishing mortality is estimated to be well below F_{MSY} (median F_{recent} /F_{MSY} =0.20, 80 percentile range 0.08-0.41), which level is likely to maintain the stock above the LRP. Pilling et al. (2015) show that fishing the stock at MSY level would require a major increase in effort from current levels.

A well-defined HCR is being developed under CMM 2014-06. An interim limit and target reference point has been agreed, and HCRs will be evaluated for the main sources of uncertainty using Management Strategy Evaluation (MSE) (see WCPFC (2018)).

Overall, therefore, under the MSC requirements and guidance for 'available' HCRs, **SG60 is met**. **SG80 is not met**.

References

CMM 2014-06

Pilling et al. (2015), Tremblay-Boyer et al. (2018), WCPFC (2018, 2019), Brouwer et al. (2018)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 17. 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 are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	No

Rationale

The information used by SPC to inform the stock assessment, projections etc. (and hence support the harvest strategy) is described in the background information of this report. It is extensive, including fishery-specific catch and effort data, size-frequency data from port sampling, and biological information from various research projects. The client fleet submits data in accordance with WCPFC requirements. The data have been improved since the previous assessment; for example, operational-level historical Japanese data are now available. There is uncertainty around natural mortality growth rates, with more information on age and growth highlighted as a priority requirement. There are also no tagging data available for albacore. **SG80 is met but the information does not meet the SG100 requirement**.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No

Rationale

Fishery removals are monitored by individual CCMs via logsheets and port sampling, both of which 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 dataset for the stock assessment. Size-frequency data (collected via port sampling and observer programmes) are also used in the assessment, although estimation of growth curves remains problematic. Biological data are collected via research programmes (e.g. Farley et al. (2013)).

UoA removals are submitted via Korea's distant water fishing activity monitoring requirements. Data are collected by Korea's National Institute of Fisheries Science (NIFS), the research arm of the Korea's Ministry of Oceans and Fisheries (MOF). Data are stored electronically on the electronic reporting system (ERS) by the vessel and sent to the Korean Fisheries Monitoring Center (FMC) and NIFS at the same time. NIFS send the data to WCPFC for the annual report to the Commission. Operational data are sent to the SPC, as per WCPFC reporting requirements. This level of monitoring meets the **SG60 and SG80 levels**.

Formal stock assessments have taken place every few years (2012, 2015, 2018). In between formal stock assessments, SPC provide some information on trends in fishery indicators (total catch, nominal CPUE, catch at length and at weight), to guide management (e.g. Brouwer et al. (2018)).

On this basis, the team felt that **SG80 was met**. **SG100 is not met**, for the following reasons:

1) The characteristics of tuna longline CPUE are often poorly understood and it is unclear how successful most effort standardisation analyses are or how to properly represent the uncertainties (although this may be improved by the new geostatistical methods);
2) Some data gaps remain in fishery-dependent data;
3) The requirement to 'raise' logsheet data by estimates of total catch (to account for missing logsheets) results in some loss of precision;
4) Historical data are often lacking in precision;
5) Although the frequency of stock assessments is reasonable, they are not carried out with 'high frequency' (i.e., not annually).

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

Rationale

The assessment method used (MFCL) requires all catch and effort to be allocated to fisheries, where ideally the fisheries are defined to have selectivity and catchability characteristics that do not vary greatly over time. 16 fisheries (plus 5 'index fisheries') were defined according to gear type, fishing method and region or sub-region. Relative to the tropical species, there are fewer issues relating to large fisheries in Indonesia, the Philippines and Vietnam with poor catch and effort data (since in these areas there is not much albacore). The assessment does not include the albacore fishery (catch or CPUE) east of 130°W (considered under 1.2.4). **SG80 is met**.

References

Brouwer et al. (2018), Farley et al. (2013) and Tremblay-Boyer et al. (2018)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 18. 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?		Yes	No

Rationale

The assessment is conducted using the integrated assessment model Multifan-CL (MFCL) which can integrate several sources of information and uses the available data in a raw form as appropriate in a single analysis. MFCL is able to take into account features of the fisheries (catchability, selectivity) and the biology of the stock (in a population model). The 2018 model partitions the population into 5 spatial regions and 48 quarterly age-classes. In addition to the diagnostic case model, the 2018 assessment reports the results of one-off sensitivity models to explore the relative impacts of key data and model assumptions for the diagnostic case model on the stock assessment results and conclusions. A structural uncertainty analysis is used for consideration in developing management advice, where all possible combinations of the most important axes of uncertainty from the one-off models were included. When running an integrated assessment, it is important to correctly specify: i) the observation model process, e.g. the form of selectivity and discarding; ii) systems dynamics, e.g. values for steepness and natural mortality; and iii) appropriate data and data weightings. All of these were investigated using the uncertainty grid.

The assessment is appropriate for the stock and the generally understood harvest control rule. **SG80 is met**.

The assessment takes into account many of the features relevant to the biology of SP ALB. However, the latest stock assessment for SP ALB assumes the boundary of the stock extends from the east coast of Australia to 130°W (Tremblay-Boyer et al., 2018). This model structure assumes that SP ALB east of 130ºW are a separate stock. The eastern Pacific component of the stock has not been included in recent assessments, due to low catches and poor data quality. Moore et al. (2020) suggest that it is not clear whether the boundaries of the model domain reflect the underlying population structure of SP ALB. **SG100 is not met**.

b	Assessment approach

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

Rationale

An LRP and an interim TRP have been defined, with the TRP estimated in terms of SB directly from the stock assessment (based on an 8 % increase in CPUE). The stock assessment model is able to estimate stock status relative to a suite of appropriate reference points. **SG60 and SG80 are met**.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Yes	Yes	Yes

Rationale

The SP ALB assessment provides explicit commentary on the major sources of uncertainty, has assessed the sensitivity of the assessment to these uncertainties, and has evaluated current and future stock status relative to these in a probabilistic way. The structural uncertainty grid, including 72 runs considered to represent the 'plausible range' of stock uncertainty, was used to estimate median values and confidence intervals (Tremblay-Boyer et al., 2018). **SG60, SG80 and SG100 requirements are met**.

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?			Yes

Rationale

There is an ongoing program of review of assessment assumptions and approaches by the staff in the SPC's Oceanic Fisheries Programme. Alternative hypotheses are continually being explored (within funding and time constraints) and assessments are updated and modified as required. Recommendations for further work to improve the assessment can be seen in Tremblay-Boyer et al. (2018).

The assessment is updated to reflect the availability of new data or new interpretations of existing data and a suite of sensitivity analyses have been undertaken to explore the impact of options such as changing assumptions for fixed parameters or different treatments of the data. In addition, retrospective analyses are undertaken as a general test of the stability of the model, as a robust model should produce similar output when rerun with data for the terminal year/s sequentially (Tremblay-Boyer et al., 2018).

The assessment has been tested using a systematic exploration of the interactions among different sets of assumptions. Externally to the stock assessment, there is consideration each year of how to improve the input data (e.g. addition of new Japanese data in the most recent assessment; new methods of standardisation via geo-statistics). This confirms that alternative hypothesis and assessment approaches have been rigorously explored. **SG100 is met**.

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

Rationale

Although neither the 2015 nor the 2018 assessments have been formally externally peer reviewed, the assessment, as have other WCPFC assessments, have benefited from developments that addressed the recommendations made by the independent review of the 2011 bigeye assessment (Ianelli et al., 2012). Although the current assessment has not been externally peer reviewed it is regularly subject to internal scrutiny by SPC and the scientific committee of the WCPFC, during which scientists from a number of contracting parties are able to review the assessment. This scoring issue **is met at the SG80 level but not at the SG100 level**.

References

Ianelli et al. (2012), Moore et al. (2020) and Tremblay-Boyer et al. (2018)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

5.7 Principle 1: North Pacific albacore

5.7.1 Biology and ecology

The biology and ecology of North Pacific albacore (NP ALB) is as described for SP ALB above. The longline fishery typically takes adult albacore in the narrow size range of 90–105 cm and the troll fishery takes juvenile fish in the range of 45–80 cm. Their trophic level has been estimated at 4.3 +/- 0.2 SE, hence they are not a low-trophic level species.

The treatment of NP ALB as a separate stock is supported by several lines of evidence: lower catch rates in equatorial regions, tagging data (no recorded recoveries in the South Pacific of fish tagged in the North), larval samples (albacore larvae are rare in samples from equatorial waters) and genetic data showing differentiation between North and South Pacific albacore (Tremblay-Boyer et al., 2018).

NP ALB spawn from March through to July on grounds located in the WCPO in subtropical waters between about 10 to 25 degrees north at depths exceeding 90 m. Juveniles tend to migrate to higher latitudes. NP ALB appear to disperse gradually north- and southward from the Central Pacific but may also migrate seasonally between tropical and sub-tropical waters (Tremblay-Boyer et al., 2018).

5.7.2 Stock assessment and information

The NP ALB stock has been assessed regularly by the Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) since 2005. ISC works by convening working groups of scientists from member countries to address different issues.

Catch estimates for all tuna and billfish species fished in the WCPFC statistical area are compiled annually by the SPC based on reports provided by CCMs. The most recent report provides catches up to and including 2019 (Williams and Ruaia, 2020). In the North Pacific Ocean (NPO), albacore tuna are mainly taken by longline, pole-and-line and troll fishing gears, with minor catches by purse seine. Annual catches of NP ALB had peak periods in the 1970s and then again in the late 1990s into the early 2000s (Figure 22). Recent catches have been lower, due to declines in the pole-and-line and longline catches. NP ALB catch (61,644 t) for 2019 was slightly higher than catches in recent years, but clearly lower than the recent ten-year average (Williams and Ruaia, 2020). Albacore catches are taken by multiple fleets over a wide area.

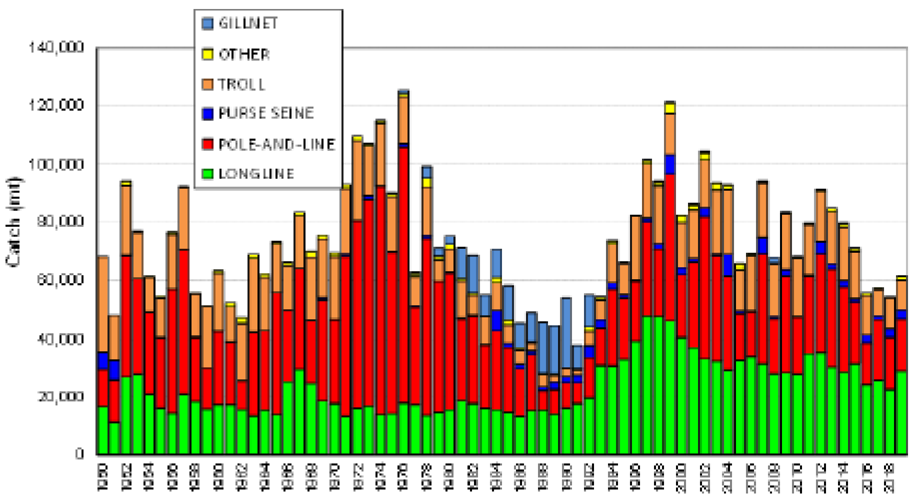


Figure 22. WCP–CA north Pacific albacore catch (mt) by gear. Source: Williams and Ruaia (2020).

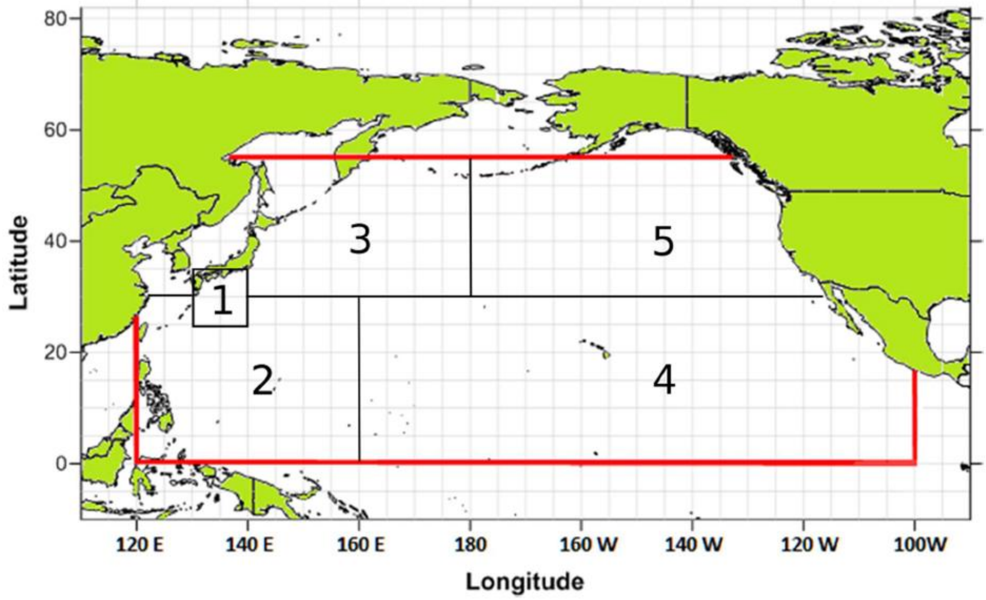


Figure 23. Spatial domain (red box) of the north Pacific albacore stock in the 2020 stock assessment. Fishery definitions were based on five fishing areas (black boxes and numbers) defined from cluster analyses of size composition data. Source: ISC_NC (2020)**.**

The latest stock assessment was provided by the ISC Albacore Working Group in 2020 (ISC_NC, 2020). In the assessment, the stock area consists of all waters in the Pacific Ocean north of the equator to 55°N (Figure 23). The previous assessment took place in 2017 (ISC, 2017). Important changes from the 2017 assessment were: i) Input sample sizes of the size composition data were allowed to vary between fisheries and over time, depending on the sampling that occurred, because of improvements in data preparation; ii) The primary Japan pole-and-line fisheries were subdivided into seasonal fisheries, and the selectivity of the two most important Japanese pole-and-line fisheries were allowed to vary annually, if data were available. This approach substantially improved the model fits to the size composition data of these important fisheries; and iii) The Japan longline fisheries that caught albacore in the main spawning area were also subdivided into seasonal fisheries with separate selectivity patterns, which improved fit to the size composition data (ISC_NC, 2020).

All available fishery data for north Pacific albacore for the 1994-2018 period were used in the stock assessment (WCPFC_SC, 2020a). Catch and size composition data were compiled and assigned to 35 fisheries defined for this assessment (based on flag, gear, area, and season). The same abundance index as the 2017 assessment was fitted in the base case model. The North Pacific albacore stock was assessed using a length-based, age-, and sex-structured Stock Synthesis (SS Version 3.30.14.08) model over the 1994-2018 period and it was assumed that there is instantaneous mixing of albacore on a quarterly basis. Biological parameters like growth, natural morality (M) and stock-recruitment steepness, were the same as for the 2017 assessment. All fisheries were assumed to have dome-shaped length selectivity curves, and age-based selectivity for ages 1-5 were also estimated for surface fisheries (troll and pole-and-line) to address age-based changes in juvenile albacore availability and movement. Selectivity curves were also assumed to vary over time for several fleets. Maximum likelihood estimates of model parameters, derived outputs, and their uncertainties from the base case model were used to characterize stock status (WCPFC_SC, 2020a).

The Northern Committee (NC) of the WCPFC adopted a biomass-based LRP in 2014 of 20 % of the current spawning stock biomass when F=0 (20%$SSB_{current, F=0}$). Stock status is depicted in relation to the adopted LRP for the stock and the equivalent fishing intensity ($F_{20\%}$; calculated as 1-$SPR_{20\%}$) (Table 15).

Fishing intensity (F, calculated as 1-SPR) is a measure of fishing mortality expressed as the decline in the proportion of the spawning biomass produced by each recruit relative to the unfished state. For example, a fishing intensity of 0.8 will result in a SSB of approximately 20 % of SSB_0 over the long run. Fishing intensity is considered a proxy of fishing mortality (WCPFC_SC, 2020a).

The Kobe plot shows that the estimated female SSB has never fallen below the LRP since 1994, albeit with large uncertainty in the terminal year (2018) estimates. Even when alternative hypotheses about key model uncertainties such as growth were evaluated, the point estimate of female SSB in 2018 (SSB_{2018}) did not fall below the LRP, although the risk increases with this more extreme assumption (Figure 24). The SSB_{2018} was estimated to be 58,858 t (95 % CI: 27,751 – 89,966 t) and 2.30 (95 % CI: 1.49 – 3.11) times greater than the estimated LRP threshold of 25,573 t (95 % CI: 19,150 – 31,997 t) (Table 15). Current fishing intensity, $F_{2015-2017}$ (0.50; 95 % CI: 0.36 – 0.64; calculated as 1- $SPR_{2015-2017}$), was at or lower than all seven potential F-based reference points identified for the North Pacific albacore stock (Table 15).

WCPFC-SC16 provides the following information on the status of the NP ALB stock based on these findings:

- The stock is likely not overfished relative to the limit reference point adopted by WCPFC (20%$SSB_{current,\ F=0}$), and
- No F-based reference points have been adopted to evaluate overfishing. Stock status was evaluated against seven potential reference points. Current fishing intensity ($F_{2015-2017}$) is likely at or below all seven potential reference points (Table 15).

WCPFC-SC16 also provides advice on stock projections based on the 2020 stock assessment (Figure 25):

1. If a constant fishing intensity ($F_{2015-2017}$) is applied to the stock, then median female spawning biomass is expected to increase to 62,873 t and there will be a low probability of falling below the limit reference point established by the WCPFC by 2028.
2. If a constant average catch ($C_{2013-2017}$ = 69,354 t) is removed from the stock in the future, then the median female spawning biomass is also expected to increase to 66,313 t and the probability that SSB falls below the LRP by 2028 will be slightly higher than the constant fishing intensity scenario.

Table 15. Estimates of maximum sustainable yield (MSY), female spawning biomass (SSB), and fishing intensity (F) based reference point ratios for north Pacific albacore tuna. Source: ISC_NC (2020)**.**

Estimate	Base Case	Growth CV = 0.06 for L_{inf}	Update of 2017 base case model to 2020 data
MSY (t) [A]	102,236	84,385	113,522
SSB_{MSY} (t) [B]	19,535	16,404	21,431
SSB_0 (t) [B]	136,833	113,331	152,301
SSB_{2018} (t) [B]	58,858	34,872	77,077
$SSB_{2018}/20\%_{SSBcurrent,\ F=0}$ [B]	2.30	1.63	2.63
$F_{2015-2017}$	0.50	0.64	0.43
$F_{2015-2017}/F_{MSY}$	0.60	0.77	0.52

Estimate	Base Case	Growth CV = 0.06 for L_{inf}	Update of 2017 base case model to 2020 data
$F_{2015-2017}/F_{0.1}$	0.57	0.75	0.49
$F_{2015-2017}/F_{10\%}$	0.55	0.71	0.48
$F_{2015-2017}/F_{20\%}$	0.62	0.80	0.54
$F_{2015-2017}/F_{30\%}$	0.71	0.91	0.62
$F_{2015-2017}/F^{40\%}$	0.83	1.06	0.72
$F_{2015-2017}/F_{50\%}$	1.00	1.27	0.86

A – MSY includes male and female juvenile and adult fish

B – Spawning stock biomass (SSB) in this assessment refers to mature female biomass only.

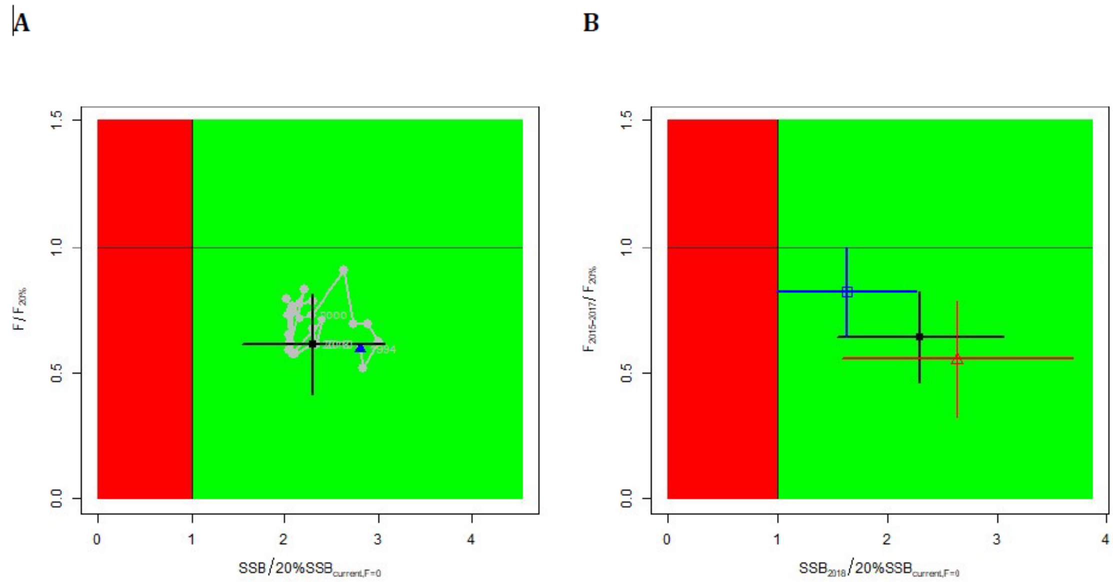


Figure 24. Kobe plot showing the status of north Pacific albacore. A -relative to the 20%$SSB_{current,\ F=0}$ biomass-based limit reference point, and equivalent fishing intensity ($F_{20\%}$; calculated as 1-$SPR_{20\%}$) over the base case modelling period (1994-2018). Blue triangle indicates the start year (1994) and black circle with 95 % confidence intervals indicates the terminal year (2018); B - Kobe plot showing current stock status and 95 % confidence intervals of the base case model (black; closed circle), an important sensitivity run of CV = 0.06 for L_{inf} in the growth model (blue; open square), and a model representing an update of the 2017 base case model to 2020 data (red; open triangle). Source: ISC_NC (2020)**.**

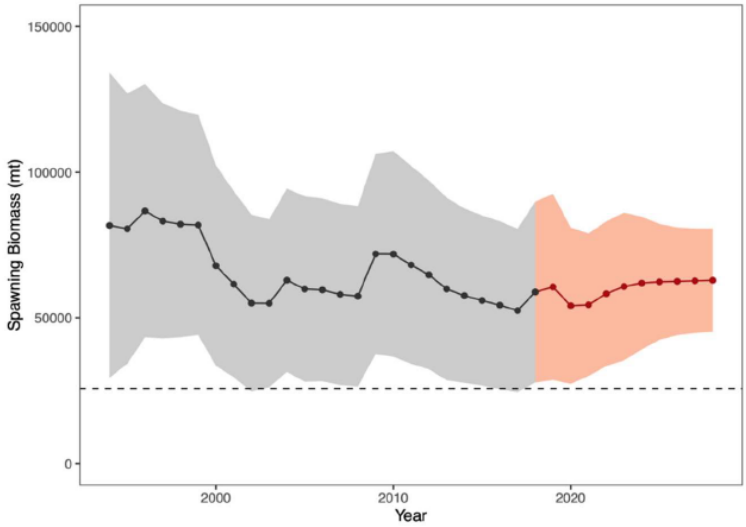


Figure 25. Historical and future trajectory of north Pacific albacore female (SSB) under a constant fishing intensity ($F_{2015\text{-}2017}$) harvest scenario. Shaded area shows 95 % confidence intervals; dashed black line indicates $20\%SSB_{current,F=0}$ LRP for 2018 (25,573 t). Source: ISC_NC (2020)**.**

5.7.3 Harvest strategy

North Pacific albacore is managed jointly under the auspices of both the WCPFC and IATTC. Prior to 2019, the key WCPFC CMMs were: i) CMM-05-03, which adopted a range of measures relating to effort control and reporting; and CMM 2014-06, which relates to plans to develop and implement harvest strategies, including TRPs and HCRs. The key adopted IATTC Resolution was C-05-02, relating to effort control and reporting, but also to coordination with WCPFC and to ensuring future consideration of actions related to North Pacific albacore. WCPFC adopted CMM 2019-03 in 2019 with measures essentially harmonised with those of C-05-02. The management objective of these measures is that fishing effort should not increase beyond 'current levels' (noting that 'current levels' vary in their definition).

CMM 2014-06 reveals a clear intention by the WCPFC to move towards well-defined harvest control rules which have not yet been adopted for North Pacific albacore. The WCPFC Northern Committee agreed an 'interim harvest strategy' for north Pacific albacore in 2019 (WCPFC (2017); Attachment I). This strategy indicates an objective to maintain the biomass, with reasonable variability, around its current level in order to allow recent exploitation levels to continue and with a low risk of breaching the LRP. The LRP is agreed as $20\%SSB_{current\ F=0}$. The strategy does not specify a TRP but notes that this should be determined as part of a Management Strategy Evaluation (MSE) included under the Northern Committee's future work. The ALBWG of ISC have held five MSE workshops since 2015; most recently in March 2019. The management objectives for the MSE are defined as 1) maintain historical spawning biomass; 2) maintain historical total biomass; 3) maintain historical harvest ratios of each fishery; 4) maintain catches above historical average; 5) minimize changes in management over time; and 6) maintain fishing impact around the target value. The latest workshop evaluated a series of five harvest strategies based on controlling catch (TAC) or controlling effort (TAE), with various TRPs, LRPs and HCRs, across the six performance metrices (Tommasi and Teo, 2019). The workplan for the Northern Committee indicates that work on the MSE will be ongoing until at least 2023 (WCPFC_NC, 2020).

Table 16. Work programme for the Northern Committee (north Pacific albacore elements). Source: WCPFC_NC (2020)**.**

Programme	**North Pacific albacore**
Objectives 2021-2023	(A) Review members' reports on their implementation of CMM 2019-03. (B) Implement the Interim Harvest Strategy, including: (1) monitor if LRP is breached; (2) continue to work to establish TRP and other elements of harvest strategies, if appropriate based on MSE; (3) recommend any changes to CMM.
Tasks **2021**	Continue to support ISC MSE work to complete Task (B)(2). Recommend any necessary changes to CMM. (Task (B) (3))
Tasks **2020**	Continue to support ISC MSE work to complete Task (B)(2). Recommend any necessary changes to CMM. (Task (B) (3)).
Tasks **2021**	Continue to support ISC MSE work to complete Task (B)(2). Obtain the new assessment results from ISC and recommend any necessary changes to CMM. (Task (B) (3)).

5.7.4 Principle 1 Performance Indicator scores and rationales: NP albacore

Scoring table 19. 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?	Yes	Yes	Yes

Rationale

The most recent stock assessment by the ISC Albacore Working Group (ALBWG) was undertaken in 2020 (ISC_NC, 2020). A summary of the findings is given in the 2020 WCPFC-SC summary report (WCPFC_SC, 2020a).

MSC guidance (GSA2.2.3.1) provides that where B_{MSY} is analytically determined it should be used to calculate the PRI and that: where B_{MSY} is analytically determined to be lower than 40%B_0 (as in some highly productive stocks), and there is no analytical determination of the PRI, the default PRI should be 20%B_0 unless B_{MSY}<27%B0, in which case the default PRI should be 75%B_{MSY}.

The PRI for this stock is not estimated. The 2020 base case assessment provides an analytical estimate of SB_{MSY} = 14.3%SSB_0 (19535/138833). A proxy PRI of 75 % of this suggests a low biomass level (10.7%SSB_0). The agreed LRP is 20%$SSB_{current,F=0.}$ The SSB_{2018} was estimated to be 58,858 t (95 % CI: 27,751 – 89,966 t), greater than the 75%B_{MSY} proxy and 2.30 (95 % CI: 1.49 – 3.11) times greater than the LRP threshold of 25,573 t (95 % CI: 19,150 – 31,997 t) (Table 15). There is a high degree of certainty that the stock is above the proxy PRI level**. SG60, SG80 and SG100 are met**.

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

Rationale

The 2020 stock assessment estimated current spawning stock biomass, SSB_{2018}, to be approximately 3 times the MSC default TRP of SSB_{MSY}. SSB_{MSY} is actually estimated to be lower than the MSC default LRP of $20\%SSB_0$. The stock is estimated to never have been reduced to SSB_{MSY}. **SG80 requirements are met**.

In addition, the 2020 stock assessment base case estimates SSB_{MSY} to be ~15 $\%SB_{2018,F=0}$. Two sensitivities are examined in the assessment, i.e. an alternative CV for Linf in the growth model, and an update of updated 2017 mode to 2020 data. For the base case model, SB_{2018} is estimated to be $46\%SB_{F=0}$; for the alternative growth model $33\%SB_{F=0}$ (or 2.1 times SSB_{MSY}) and for the 2017 model update, $53\%SB_{F=0}$ (or 3.6 times SSB_{MSY}). All estimates are above the B_{MSY} estimate.

However, the stock assessment outcome for SSB_{MSY} is lower than the estimated LRP. MSC guidance indicated does not provide commentary on this situation. The guidance does suggest a B_{MSY} reference point of $40\%B_0$ where no analytical estimate of B_{MSY} is available. For the 'base case' and the 'update of the 2017 base case' sensitivities, estimated SSB_{MSY} is above the estimated $40\%B_0$ level (base case: SSB_{2018}=58,858 t and $40\%B_0$=54733 t; update of 2017: SSB_{2018}=77,077 t and $40\%B_0$=60,920 t). For the 'growth' sensitivity, estimated SSB_{MSY} is below the estimated $40\%B_0$ level (SSB_{2018}=34,872 t and $40\%B_0$=45,332 t).

Overall, it is concluded that it is likely that the stock is around a level consistent with MSY. **SG80 is met**. However, **there is not the high degree of certainty to meet the SG100 requirements.**

References

ISC (2017, 2020), ISC_NC (2020), WCPFC_SC (2020a)

Stock status relative to reference points			
	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	SB_{MSY} as a proxy PRI	LRP = $20\%SSB_{current,F=0}$ $75\%SB_{MSY}$=11.3 $\%SB_{F=0}$	$SSB_{2018}/20\%SSB_{current,F=0}$ = 2.30
Reference point used in scoring stock relative to MSY (SIb)	SB_{MSY} The recent level of spawning biomass relative to MSY	SB_{MSY}=14.3%SSB_0 Proxy $40\%B_0$	SSB_{2018}/ SSB_{MSY} = 3.0 Below proxy for growth sensitivity

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

Draft scoring range	≥80

Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 20. PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is **the shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	NA		NA

Rationale

The stock does not require rebuilding.

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, or it is **highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	NA	NA	NA

Rationale

The stock does not require rebuilding.

References

NA

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

Draft scoring range	NA
Information gap indicator	Information sufficient to score PI

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 21. 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?	Yes	Yes	No

Rationale

MSC defines the elements of a harvest strategy as i) the control rules and tools in place; ii) the information base and monitoring; and iii) the assessment method. The intention is that these elements should work together effectively to ensure overall performance, measured in terms of achieving outcomes (i.e., meeting objectives).

The current harvest strategy comprises: i) the interim harvest strategy as proposed by the Northern Committee and accepted by WCPFC in 2017 (WCPFC, 2018) and ii) WCPFC CMM 2019-03 / IATTC Resolution C-05-02, which are both still in force. The focus of the interim harvest strategy is the development of management objectives, target reference points and harvest control rules and a work plan has been established. Given that CMM 2019-03 and C-05-02 are still in place and are effectively the operational harvest strategy, this PI is scored against them.

The elements of the NP albacore harvest strategy are as follows:

6) Limit reference point (20%$SB_{current,\ F=0}$);
7) Management target: status quo; avoiding LRP with high probability;
8) Data collection on the stock and fishery (considered in PI 1.2.3 below);
9) Stock assessment process (considered in PI 1.2.4 below);
10) ‘Available’ HCR (see 1.2.2); to date management tools have not been required;
11) Monitoring of implementation of CMM 2019-03/Resolution C-05-02 via data gathering and reporting to WCPFC / IATTC.

These management measures are reviewed annually during Northern Committee meetings.

The elements described above, and their implementation are expected to achieve stock management objectives, **meeting SG60 requirements**.

SG80 requires that the harvest strategy be responsive to the status of the stock. Given that the stock status has varied very little over the stock assessment time series, no response has been required. Nevertheless, while there are no formally agreed harvest control rules yet in place, the harvest strategy, utilising high quality science and compliance information, and founded on high quality scientific advice, is considered to be responsive to the state of the albacore stock. This is the harmonised position for the north Pacific albacore harvest strategy (see Table 40) and **SG80 requirements are considered to be met**.

The harvest strategy is not yet designed to achieve stock management objectives. A workplan is in place to strengthen the harvest strategy through the adoption of a TRP and HCRs and involves the use of management strategy evaluation. **The SG100 requirements are not currently met**.

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

Rationale

Fishing mortality rate remains well below F_{MSY} (WCPFC and IATTC implicit LRP) and the stock is well above SSB_{MSY} (the MSC default TRP) and $20\%SSB_{current,F=0}$ (WCPFC explicit LRP). Evidence of this is seen in PI 1.1.1. The harvest strategy has not been fully tested but evidence exists that it is achieving its objectives. **SG80 requirements are met.**

The harvest strategy is informal and not fully evaluated. **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?	Yes		

Rationale

Internationally, systems are in place for recording catch and effort for all fishing entities fishing on north Pacific albacore. ISC Members are required to annually report the following data for fishery monitoring: Category I: total annual catch (round weight by species) total annual effort (active vessels by fishery); Category II: catch-effort (summary of logbook data); Category III: biological data, (size composition, length or weight frequencies, sex information). Fishing entities fishing in the WCPO are required to report all data on standard WCPFC forms.

The ISC exchanges data with the IATTC and the WPFC (through the SPC) on an annual basis. Monitoring is in place that is expected to determine whether the harvest strategy is working. **SG60 requirements are met**.

d	Harvest strategy review			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Yes

Rationale

The harvest strategy is periodically reviewed and improved as necessary. Both the IATTC and the WCPFC receive advice and review management resolutions during their respective annual meetings. Evidence of this is in the form of adoption of WCPFC CMMs and IATTC Resolutions. Although it does not cover North Pacific albacore, the requirement for the implementation of formal harvest strategies and HCRs for WCPFC has been agreed in CMM 2014-06. The interim harvest strategy adopted by IATTC indicates a commitment to ongoing review of the harvest strategy. A process of Management Strategy Evaluation (MSE) has started for the stock. The workplan for the Northern Committee indicates that work on the MSE will be ongoing until at least 2023 (WCPFC_NC, 2020). **SG100 requirements are met**.

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

Rationale

Sharks are not a target species in the client fishery and so this SI is not applicable.

f	Review of alternative measures

	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	No (more information needed)	No (more information needed)	No (more information needed)

Rationale

This fishery targets albacore specifically, and there are no requirements such as minimum or maximum landing sizes or quotas which could lead to any of this catch being unwanted*.

For the UoA, at-sea observer data presented in Section 5.8.1.3 provides information on levels of discarding. The level of discarding indicated for the period 2018-2020 for albacore is 5.43 % (see Table 19). Additional information is required on the reason for this level of discarding, whether the discarded catch should be considered unwanted catch in the context of this scoring issue, and whether approaches to minimise the level of discarding have been explored. This scoring issue is therefore not yet scored.

* 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

ISC (2017, 2020), ISC_NC (2020), WCPFC (2018, 2020b), WCPFC_NC (2020)

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

Draft scoring range	<60 (more information needed)
Information gap indicator	More information sought on unwanted catch by UoA.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 22. 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?	Yes	No	No

Rationale

MSC certification requirements lay out two conditions for acceptance of HCR being available sufficient to justify scoring at the SG60 level.

First, MSC FS v2.01 SA2.5.2a provides for HCR being recognised as available "…if stock biomass has not previously been reduced below B_{MSY} or has been maintained at that level for a recent period of time".

The albacore stock assessment provides probabilistic estimates of parameters of interest, and uncertainty has been extensively explored through sensitivity tests (ISC, 2017, 2020). The stock has not been reduced below SSB_{MSY} over the time series and projections under the current fishing intensity ($F_{2015-2017}$) suggest female SSB will increase over the next 10 years (ISC, 2020). The SA2.5.2a requirement is therefore met.

Second, SA2.5.3b provides for HCR being recognised as available if "…there is an agreement or framework in place that requires the management body (WCPFC and IATTC) to adopt HCRs before the stock declines below B_{MSY}".

WCPFC CMM 2014-06 sets out definitions of harvest strategies to be developed and implemented. The definitions include target and limit reference points and decision rules or ("harvest control rules"), with a clear intention that harvest control rules, tested using simulation approaches, will be part of the implemented harvest strategies. The Commission agreed to adopt a work plan at the 2015 Commission meeting, with revision in subsequent years, with application to skipjack, bigeye, yellowfin, Pacific bluefin, and South and North Pacific albacore tunas, with the Northern Committee of the ISC responsible for developing and recommending the work plan for North Pacific albacore.

According to ISC (2020), projections at constant fishing mortality and average historical recruitment indicate the stock will remain above the LRP with a high probability.

The SA2.5.3b requirement is therefore met and **the fishery meets SG60**.

SG80 is not met because there are not yet well-defined harvest control rules in place through WCPFC and/or IATTC.

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?		No	No

Rationale

Given that there is no HCR in place it follows that **SG80 and SG100 are 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?	Yes	No	No

Rationale

Two MSC requirements need to be addressed for SG60 to be met.

First, MSC FS v2.01 SA2.5.6 requires that as part of the evidence that tools are working, "…teams should include current levels of exploitation in the UoA, as measured by fishing mortality rate where available". The best available information on the exploitation rate is in ISC (2020): the SS3 base case assessment estimates F/F_{MSY} as 0.6 and F is estimated never to have reached F_{MSY}. The MSC Fisheries Standard v2.01 GSA2.5.2-2.5. (relating to SA2.5.6), notes that current F being "equal to or less than F_{MSY} should be taken as evidence that the HCR is effective."

Second, The MSC Fisheries Standard v2.01 SA2.5.5 requires that in order to conclude that 'available' HCRs are 'effective', 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. A formal framework is in place for the development of a harvest strategy for the stock (CMM 2014-06 and workplans; ISC MSE process; see above).

The requirements for ‘available’ tools at **SG60 are therefore met. SG80 is not met** because there is not a well-defined HCR.

References

ISC (2017, 2020), ISC_NC (2020), WCPFC (2017, 2020b)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 23. 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 are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	Yes

Rationale

The ISC ALBWG coordinates biological research and disseminates research results and statistics to cooperating scientists and the management bodies in support of the harvest strategy. Available information includes:

- Stock structure: Data suggest distinct North and South Pacific Ocean albacore tuna stocks. The equator is considered the north-south boundary between the stocks. The distinction is supported by a range of fishery, tagging, genetic, and ecological data.
- Life-history parameters for North Pacific albacore are based on analyses of biological samples, collected routinely on an annual basis. Reliable data are available to estimate sex-specific growth rates, a maturity ogive and fecundity. Length-weight relationships are established by the ALBWG to convert population numbers to biomass.
- Detailed fleet information on the North Pacific albacore tuna fisheries is kept domestically by Japan and other nations and internationally by both the IATTC and WCPFC.
- Stock abundance is determined via stock assessment (see PI 1.2.4).
- Removals by all fisheries are reported to IATTC and WCPFC. ISC Members are required to annually report total annual catch, total annual effort and catch-effort data (summary of logbook data).

Overall, a comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information (such as environmental information), including some that may not be directly related to the current harvest strategy, is available. **SG60, SG80 and SG100 requirements are met**.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No

Rationale

The stock assessment estimates stock abundance using catch and effort data and size composition data. Standardized abundance indices are regularly monitored by the ALBWG. The ALBWG aggregated catch and effort data into monthly 1°x1° strata for the surface fishery, and 5°x5° strata for the longline for standardization using generalized linear models. Data for stock assessment are from all fisheries for the entire North Pacific albacore stock. Discarding is considered overall to be negligible and fishery removals are regularly monitored at a level of accuracy and coverage consistent with assessment requirements to enable management decision-making.

ISC Members are required to annually report the following data for fishery monitoring: Category I: total annual catch (round weight by species) total annual effort (active vessels by fishery); Category II: catch-effort (summary of logbook data); Category III: biological data, (size composition, length or weight frequencies, sex information). The frequency and certainty of monitoring is sufficient given the frequency of the assessment, and assessment time step (quarterly) and approaches taken to ensuring robust estimation and advice.

UoA removals are submitted via Korea's distant water fishing activity monitoring requirements. Data are collected by Korea's National Institute of Fisheries Science (NIFS), the research arm of the Korea's Ministry of Oceans and Fisheries (MOF). Data are stored electronically on the electronic reporting system (ERS) by the vessel and sent to the Korean Fisheries Monitoring Center (FMC) and NIFS at the same time.

The data are sufficient to **meet SG60 and SG80 requirements**. There are some sources of uncertainty such as lack of sex–specific size data and the simplified treatment of the spatial structure of North Pacific albacore population dynamics. **The fishery does not meet the SG100 requirements**.

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

Rationale

All catch and size composition data from ISC member (Canada, China, Chinese Taipei, Japan, Korea, Mexico, and USA) and non-member countries were compiled for 1994-2018 for the assessment. Catch and size composition data were compiled and assigned to 35 fisheries defined for the assessment (based on flag, gear, area, and season). The Northern Committee reviews fishery removal information from the stock and compliance with CMM 2019-03 during annual meetings. There is adequate information on all other fishery removals from the stock. Other fishery removals such as recreational fishery by the US are reported in the catch tables in the annual ISC Plenary report. **SG80 is met.**

References

ISC (2019, 2020)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 24. 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?		Yes	Yes

Rationale

The stock has been assessed regularly by the ISC ALBWG since 2005. Recent assessments use the Stock Synthesis v3.3 (SS3) framework. SS3 is a framework for exploring and implementing integrated length- and age-based forward-simulating statistical catch-at-age models. The method has generally been accepted as rigorous. The stock assessment model is a sex-specific, length-base, age-structured, forward-simulating, fully integrated, statistical model. The base case model representing the collective work of the ALBWG.

The assessment model approach employs maximum likelihood estimates to fit a range of parameters and is then used to evaluate stock status probabilistically with respect to reference points. The base case model is not spatially explicit, but fisheries were defined using multiple criteria, including fishing area, and therefore implicitly included spatial inferences. The latest assessment was conducted in 2020 (ISC, 2020). There were three important changes to the base case model compared to the previous assessment in 2017 (ISC, 2017).

The ongoing development of the assessment indicates that the major features relevant to the biology of the species and the nature of the UoA are taken into account. In the 2020 assessment, the primary Japan pole-and-line fisheries were subdivided into seasonal fisheries, and the selectivity of the two most important Japanese pole-and-line fisheries were allowed to vary annually, if data were available. This approach substantially improved the model fits to the size composition data of these important fisheries. Uncertainty is explored using sensitivity analysis to evaluate changes in data series, growth curve parameters, natural mortality, stock recruitment steepness, selectivity parameters and weighting of size composition data.

Overall, the assessment takes into account the major features relevant to the biology of the species **meeting SG80 and SG100 requirements**.

b	Assessment approach

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

Rationale

The model is developed using state-of-the art approaches to investigate model convergence, model structure, parameter mis-specification and data conflicts. Diagnostic tools include model convergence tests, profiles of estimated recruitment at unfished equilibrium, residual analysis, and retrospective analysis.

The stock assessment takes into account uncertainty within the base case model (from data and parameter estimates) and provides confidence intervals. The assessment also takes into account structural uncertainty, via a range of one-off sensitivity runs. The assessment also provides stochastic future projections (from the base case model), again providing confidence intervals. **SG60, SG80 and SG100 requirements are met**.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	Yes	Yes	Yes

Rationale

The model is developed using state-of-the art approaches to investigate model convergence, model structure, parameter mis-specification and data conflicts. Diagnostic tools include model convergence tests, profiles of estimated recruitment at unfished equilibrium, residual analysis, and retrospective analysis.

The stock assessment takes into account uncertainty within the base case model (from data and parameter estimates) and provides confidence intervals. The assessment also takes into account structural uncertainty, via a range of one-off sensitivity runs. The assessment also provides stochastic future projections (from the base case model), again providing confidence intervals. **SG60, SG80 and SG100 requirements are met**.

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?		Yes

Rationale

Alternative hypotheses and assessment approaches have been rigorously explored and the assessment model has been modified over time to reflect changes in understanding. To explore uncertainty, the ALBWG conducts sensitivity analyses to evaluate changes in data series, growth curve parameters, natural mortality, stock recruitment steepness, selectivity parameters and weighting of size composition data. Additional modelling approaches are also undertaken to provide a comparison of results (e.g. an age-structured production model, ASPM). **SG100 requirements are met**.

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

Rationale

The stock assessment report is reviewed by ISC in their plenary and through other WCPFC and IATTC internal processes. **SG80 is met**. The ISC had three independent reviewers from the Center of Independent Experts (University of Miami) conduct reviews of the assessment in 2011 and recommendations were incorporated into subsequent assessments (Chen, 2011; Cordue, 2011). However, there have been several changes to the assessment model since then, thus the assessment team conclude an updated external review is warranted. **SG100 is not met.**

References

Chen (2011), Cordue (2011), ISC (2017, 2020)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

5.8 Principle 2

5.8.1 Designation of species under Principle 2

5.8.1.1 General

The Principle 2 analysis is based on three key sources of information: logbook, bait records and observer program datasets. The assessment team was provided logbook catch, effort (number of hooks set) and bait data from the client (Dongwon Fisheries Co. Ltd and Hansung Enterprise Co.) and at-sea observer data from the National Institute of Fisheries Science (NIFS) for the period 2016 to 2020.

The fishery's impact of non-target species is analysed differently if the species is from a "managed" stock or not, or considered ETP. These are defined as follows:

Primary species (MSC Component 2.1):

- Species in the catch that are not covered under P1;
- Species that are within scope of the MSC 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):

- 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

5.8.1.2 Logbook data

The logbook catch data are detailed in Table 17. This dataset provides information on the target and economically-important (byproduct) species but provides no information on the discards and interactions with Endangered, Threatened, Protected (ETP) species. Total catches have averaged around 3,400 tonnes (t) across the time period but total catch in 2016 was substantially lower than subsequent years due to poor catches (A. Townley, pers. comm). Removing 2016, results in an average catch of around 3,700 t over the four years (2017-2020).

The species composition making up the total annual catch is also shown in Table 17. As mentioned above, the logbook catch data provide very little information on discards and interactions with ETP species. Furthermore, species in the “Others” category were not identified within the dataset and represent various taxa (as detailed in the accompanying table footnote). The incomplete nature of the logbook (in terms of discards and ETP), as well as issues with species identification prevented an accurate assessment of what species are interacting with the UoAs and whether those species are classified as “main” or “minor” under the MSC criteria. Consequently, the at-sea observer data (which are more accurate but less comprehensive), were utilised.

Table 17. Summary of annual catch[5] (in tonnes and as % of total catch) recorded in logbooks by the UoA fleet between 2016 and 2020 (Source: Dongwon Fisheries Co. Ltd and Hansung Enterprise Co).

Species	Scientific name	Annual catch (tonnes)					Annual species composition (% total)				
		2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Bigeye tuna	*Thunnus obesus*	937.97	1,572.86	1,757.51	1,568.68	1,998.04	53.69	48.54	56.26	36.88	46.02
Yellowfin tuna	*T. albacares*	477.95	1,131.62	945.29	2,142.35	1,863.74	27.36	34.92	30.26	50.37	42.93
Albacore tuna	*T. alalunga*	78.50	180.98	122.31	200.10	127.92	4.49	5.58	3.92	4.70	2.95
Swordfish	*Xiphias gladius*	48.10	48.18	63.25	51.46	59.15	2.75	1.49	2.02	1.21	1.36
Skipjack tuna	*Katsuwonus pelamis*	6.93	34.36	25.84	28.32	40.07	0.40	1.06	0.83	0.67	0.92
Blue marlin	*Makaira mazara*	146.93	210.98	166.45	226.46	193.96	8.41	6.51	5.33	5.32	4.47
Striped marlin	*Kajikia audax*	7.15	7.29	6.15	4.68	9.68	0.41	0.22	0.20	0.11	0.22
Others	-	43.49	54.24	36.98	31.06	49.05	2.49	1.67	1.18	0.73	1.13
Total	**-**	**1,747.02**	**3,240.53**	**3,123.78**	**4,253.11**	**4,341.60**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

[5] Important to note that catch here predominantly refers to retained target and by-product species with no information on discards or interactions with ETP species. "Others" refers to a combined total of various species including: Ocean sunfish, Marine fishes (mixed group), Wahoo, John Dory, Indo-Pacific Sailfish, Opah, Japanese Spanish mackerel and Marlins, sailfishes (mixed group)

5.8.1.3 At-sea observer data

At-sea observer data, which were provided by NIFS, indicated observers were deployed on two vessels in 2016, one vessel in 2017, five in 2018, four in 2019 and two in 2020. With the exception of 2016 and 2017, at-sea observers were onboard the vessels for the majority of the year, providing a clear representation of fishing operations across seasons. Effort data (number of hooks) provided by the client for the 15 vessels in the UoAs indicated that they deployed an average of 11.3 million hooks annually between 2016 and 2020 (Table 18). Observer coverage (as a proportion number of hooks set to number observed) in both 2016 and 2017 represented a small fraction (<1.5 %) of the total hooks deployed in the UoA (Table 18). In 2018 and 2019, coverage increased to 4.5 % and 7.2 % respectively, before declining again in 2020 to 2.6 % (Table 18). While there is no binding level of observer coverage at the vessel level, there is a binding 5 % observer coverage level set by the WCPFC for all longline operations in the western and central Pacific Ocean (WCPO) under CMM 2018-05. In 2018 and 2019, the national Republic of Korea longline fleet achieved observer coverage levels of 6.3 % and 10.4 % respectively (based on number of observed fishing days) (WCPFC_SC, 2020b, 2021a).

Table 18. Summary of observer coverage as a percentage of number of hooks observed between 2016 and 2020. Source: supplied NIFS data.

Year	No of vessels observed	Total no. of hooks deployed by UoA fleet	Total no. of hooks observed	Observer coverage
2016	2	11,242,845	101,812	0.91 %
2017	1	11,607,704	161,348	1.39 %
2018	5	11,142,523	505,291	4.53 %
2019	4	10,684,997	764,593	7.16 %
2020	2	11,892,275	307,787	2.59 %

While five years of at-sea observer data were provided by NIFS, the assessment team determined that the very low level of observer coverage in 2016 and 2017, coupled with the inability to review seasonality in the data (as the observers were not on the vessels throughout the year), meant that they would be less representative of fishing operations than more recent (2018-2020) years. The last three years have averaged around 4.7 % observer coverage, which approaches the observer coverage requirements of the WCPFC under CMM 2018-05. Therefore, in order to ensure the observer data are representative of the UoAs' longline operations and number of sets, data extrapolation and 'scaling up' to the logbook records was undertaken for the 2018 to 2020 data.

It is important to note that the at-sea observer data provided by NIFS only recorded numbers and not weights of individuals, so the assessment team used the average weights of each of the species as provided in Peatman et al. (2018) as proxies, which was similarly employed by Gascoigne et al. (2021) for the Kiribati tuna longline MSC assessment. This was considered appropriate as the UoAs target similar species (tuna), uses a similar fishing method (deep setting >10 hooks between floats) and operate in similar waters (tropical >=10°S and <10°N) to the data analysed in Peatman et al. (2018), thus, species are assumed to be of similar weights. However, it should be noted that average weightings rely on there being a normal distribution of weights for the animals caught, but in reality it is likely that larger-sized individuals will be targeted and therefore, an average-weight is not entirely accurate but was the best available option.

Once the numbers of individual species were converted to weights, the at-sea observer data for 2018 to 2020 (average) were scaled up to a fleet level based on the total landings of bigeye (BET), yellowfin (YFT) and albacore (ALB) tuna from the logbook data (i.e. the key target species) and the average percentage of BET, YFT and ALB recorded as retained (i.e. landed) which was 90 % (Table 19).

The scaling equation is based on the catch method (percentage of observed retained catch) with the calculation methodology as follows:

Step 1. BET + YFT + ALB landings (Year) raised to total catch (BET+YFT+ALB_{total}):

$$BET + YFT + ALBtotal = \frac{logbook\ data\ (BET + YFT + ALB;\ 2018 + 2019 + 2020)}{\%\ BET + YFT + ALB\ retained\ (90\ \%)}$$

Step 2. Scaling factor (SF):

$$SF = \frac{BET + YFT + ALBtotal}{observed\ catch\ (BET + YFT + ALB;\ 2018 + 2019 + 2020)}$$

Step 3. The observer data for each species were then raised as follows:

$$Species_{total} = SF\ (15.53)\ x\ (average\ observed\ catch\ Species\ (2018; 2019; 2020))$$

For the purposes of this assessment, the new scaled average observer values were considered as the base norm for the period. Table 19 presents the average annual scaled up catch and accompanying species composition of the catch observed between 2018 and 2020.

The majority (81 %) of the scaled up average catch comprised the three target species (yellowfin, bigeye and albacore tuna), with smaller recurring catches of blue marlin (4 %), swordfish (3 %) and blue shark (2 %). The UoAs normally employ more than 20 (~ 25) hooks between floats (A. Townley, pers. comm) indicative of deeper setting. According to Peatman et al. (2018) the most common species found in deep-setting (> 10 hooks between floats) in tropical areas in descending order of prevalence are bigeye, yellowfin, escolars and wahoo. While the tunas made up the majority of the catch in the UoAs, escolar and wahoo only made up 0.5 % and 0.4 % of the scaled up average catch respectively.

Table 19. Summary of at-sea observer catch data (retained and discarded) and scaled up average annual catch and composition of species taken by the UoA fleet. Source: supplied NIFS data.

Species		Observed catch (tonnes)			Average annual scaled up catch (tonnes)	Average % composition (based on scaled up volume)	Retained (%)	Discarded (%)
Common name	Scientific name	2018	2019	2020				
Bigeye tuna	*Thunnus obesus*	100.37	168.83	76.87	1,791.52	40.66 %	88.24 %	11.76 %
Yellowfin tuna	*Thunnus albacares*	72.48	207.74	18.54	1,546.60	35.10 %	87.69 %	12.31 %
Albacore tuna	*Thunnus. alalunga*	17.29	28.85	2.04	249.46	5.66 %	94.57 %	5.43 %
Blue marlin	*Makaira mazara*	10.68	21.36	3.98	186.51	4.23 %	93.13 %	6.87 %
Swordfish	*Xiphias gladius*	6.95	10.20	5.58	117.67	2.67 %	65.63 %	34.38 %
Blue shark	*Prionace glauca*	6.12	4.34	9.20	101.75	2.31 %	0.22 %	99.78 %
Crocodile shark	*Pseudocarcharias kamoharai*	5.96	1.30	4.11	58.89	1.34 %	0.19 %	99.81 %
Silky shark	*Carcharhinus falciformis*	5.41	3.41	0.28	47.07	1.07 %	0.00 %	100.00 %
Skipjack tuna	*Katsuwonus pelamis*	1.85	3.19	0.40	28.14	0.64 %	65.87 %	34.13 %
Escolar	*Lepidocybium flavobrunneum*	1.47	2.10	1.12	24.23	0.55 %	32.93 %	67.07 %
Indo-Pacific sailfish	*Istiophorus platypterus*	3.15	0.61	0.00	19.48	0.44 %	89.19 %	10.81 %
Striped marlin	*Kajikia audax*	1.43	1.49	0.66	18.53	0.42 %	90.77 %	9.23 %
Shortbill spearfish	*Tetrapturus angustirostris*	1.89	0.85	0.83	18.44	0.42 %	91.39 %	8.61 %
Wahoo	*Acanthocybium solandri*	0.95	1.40	0.91	16.86	0.38 %	89.15 %	10.85 %
Snake mackerel	*Gempylus serpens*	1.09	1.64	0.44	16.37	0.37 %	0.00 %	100.00 %
Pelagic Stingray	*Pteroplatytrygon violacea*	0.53	2.21	0.33	15.89	0.36 %	0.00 %	100.00 %
Velvet dogfish	*Zameus squamulosus*	1.30	0.33	1.39	15.67	0.36 %	0.00 %	100.00 %

Species		Observed catch (tonnes)			Average annual scaled up catch (tonnes)	Average % composition (based on scaled up volume)	Retained (%)	Discarded (%)
Common name	Scientific name	2018	2019	2020				
Oceanic whitetip shark	*Carcharhinus longimanus*	1.39	1.27	0.12	14.42	0.33 %	0.00 %	100.00 %
Giant manta ray	*Mobula birostris*	0.41	1.96	0.21	13.33	0.30 %	0.00 %	100.00 %
Opah	*Lampridae spp*	0.52	1.17	0.65	12.15	0.28 %	93.42 %	6.58 %
Long snouted lancetfish	*Alepisaurus ferox*	1.00	0.39	0.74	11.01	0.25 %	0.00 %	100.00 %
Manta rays	*Mobula spp.*	0.00	2.06	0.00	10.66	0.24 %	0.00 %	100.00 %
Bigeye thresher shark	*Alopias superciliosus*	1.02	0.13	0.38	7.92	0.18 %	0.00 %	100.00 %
Oilfish	*Ruvettus pretiosus*	0.78	0.25	0.04	5.57	0.13 %	37.12 %	62.88 %
Black marlin	*Istiompax indica*	0.39	0.50	0.06	4.90	0.11 %	100.00 %	0.00 %
Reef manta ray	*Mobula alfredi*	0.82	0.00	0.00	4.26	0.10 %	0.00 %	100.00 %
Sickle pomfret	*Taractichthys steindachneri*	0.32	0.18	0.28	4.10	0.09 %	1.28 %	98.72 %
Longfin mako	*Isurus paucus*	0.44	0.15	0.19	4.02	0.09 %	0.00 %	100.00 %
Sharks	*Elasmobranchii*	0.11	0.51	0.00	3.20	0.07 %	0.00 %	100.00 %
Shortfin mako	*Isurus oxyrinchus*	0.03	0.58	0.00	3.18	0.07 %	0.00 %	100.00 %
Sharptail mola	*Masturus lanceolatus*	0.20	0.40	0.00	3.14	0.07 %	0.00 %	100.00 %
Lancetfishes	*Alepisaurus spp.*	0.06	0.51	0.00	2.95	0.07 %	0.00 %	100.00 %
Common remora	*Remora remora*	0.10	0.47	0.00	2.95	0.07 %	0.00 %	100.00 %
Mako sharks	*Isurus spp.*	0.53	0.00	0.00	2.76	0.06 %	0.00 %	100.00 %
Dagger pomfret	*Taractes rubescens*	0.07	0.19	0.18	2.28	0.05 %	0.00 %	100.00 %
Sunfishes	*Molidae spp.*	0.40	0.00	0.00	2.09	0.05 %	0.00 %	100.00 %

Species		Observed catch (tonnes)			Average annual scaled up catch (tonnes)	Average % composition (based on scaled up volume)	Retained (%)	Discarded (%)
Common name	**Scientific name**	**2018**	**2019**	**2020**				
Roudi escolar	*Promethichthys prometheus*	0.05	0.31	0.00	1.87	0.04 %	0.00 %	100.00 %
Short snouted lancetfish	*Alepisaurus brevirostris*	0.28	0.05	0.03	1.72	0.04 %	0.00 %	100.00 %
Rays and skates	*Mobula spp. and Rajidae spp.*	0.10	0.21	0.00	1.60	0.04 %	0.00 %	100.00 %
Dolphinfishes	*Coryphaena spp.*	0.06	0.17	0.67	1.43	0.03 %	6.67 %	93.33 %
Smooth hammerhead	*Sphyrna zygaena*	0.05	0.05	2.24	1.24	0.03 %	0.00 %	100.00 %
Blacktip shark	*Carcharhinus limbatus*	0.22	0.00	0.00	1.14	0.03 %	0.00 %	100.00 %
Ocean sunfish	*Mola mola*	0.20	0.00	0.00	1.05	0.02 %	0.00 %	100.00 %
Slender sunfish	*Ranzania laevis*	0.00	0.20	0.00	1.05	0.02 %	0.00 %	100.00 %
Pelagic Thresher	*Alopias pelagicus*	0.06	0.02	0.12	1.02	0.02 %	0.00 %	100.00 %
Thresher sharks	*Alopiidae spp.*	0.13	0.07	0.00	1.02	0.02 %	2.86 %	97.14 %
Hammerhead sharks	*Sphyrnidae spp.*	0.10	0.10	0.00	1.00	0.02 %	0.00 %	100.00 %
Great barracuda	Sphyraena barracuda	0.09	0.07	0.00	0.83	0.02 %	0.00 %	100.00 %
Crested oarfish	*Lophotus lacepede*	0.00	0.13	0.00	0.69	0.02 %	0.00 %	100.00 %
Live sharksucker	*Echeneis naucrates*	0.00	0.10	0.01	0.59	0.01 %	0.00 %	100.00 %
Scalloped bonnethead	*Sphyrna corona*	0.00	0.00	0.10	0.50	0.01 %	0.00 %	100.00 %
Rough pomfret	*Taractes asper*	0.00	0.07	0.00	0.34	0.01 %	0.00 %	100.00 %
Rainbow runner	*Elagatis bipinnulata*	0.02	0.04	0.00	0.32	0.01 %	16.67 %	83.33 %
Razorback scabbardfish	*Assurger anzac*	0.00	0.03	0.00	0.16	0.00 %	0.00 %	100.00 %
Bignose shark	*Carcharhinus altimus*	0.02	0.00	0.00	0.11	0.00 %	0.00 %	100.00 %

Species		Observed catch (tonnes)			Average annual scaled up catch (tonnes)	Average % composition (based on scaled up volume)	Retained (%)	Discarded (%)
Common name	**Scientific name**	**2018**	**2019**	**2020**				
Dogfish sharks	*Squalidae spp.*	0.00	0.02	0.00	0.11	0.00 %	0.00 %	100.00 %
Megamouth shark	*Megachasma pelagios*	0.00	0.02	0.00	0.11	0.00 %	0.00 %	100.00 %
Tiger shark	*Galeocerdo cuvier*	0.00	0.02	0.00	0.11	0.00 %	0.00 %	100.00 %
Driftfish	*Nomeidae spp.*	0.00	0.02	0.00	0.11	0.00 %	0.00 %	100.00 %
Taper-tail ribbonfish	*Trachipterus fukuzakii*	0.00	0.00	0.02	0.11	0.00 %	0.00 %	100.00 %
Queen snapper	*Etelis oculatus*	0.00	0.01	0.00	0.05	0.00 %	0.00 %	100.00 %
Snappers, jobfishes	*Lutjanidae spp.*	0.00	0.01	0.00	0.05	0.00 %	0.00 %	100.00 %
Brilliant pomfret	*Eumegistus illustris*	0.00	0.00	0.00	0.03	0.00 %	0.00 %	100.00 %
Barracudas	*Sphyraena spp.*	0.00	0.00	0.00	0.02	0.00 %	0.00 %	100.00%
Violet stingray	*Pteroplatytrygon violacea*	0.02	0.00	0.00	0.01	0.00 %	0.00 %	100.00 %
Green sea turtle	*Chelonia mydas*	0.00	0.00	0.00	0.00	0.00 %	0.00 %	100.00 %
Marine turtles	*Chelonioidea spp.*	0.00	0.00	0.00	0.00	0.00 %	0.00 %	100.00 %
Olive ridley turtle	*Lepidochelys olivacea*	0.00	0.00	0.00	0.00	0.00 %	0.00 %	100.00 %
Sooty albatross	*Phoebetria fusca*	0.00	0.00	0.00	0.00	0.00 %	0.00 %	100.00 %
Grand Total	**-**	**248.92**	**472.33**	**129.95**	**4,406.38**	**100.00 %**	-	**-**

5.8.1.4 Bait use

Table 20 presents information on bait use by the UoA fleet through 2018-20, including source country and as a percentage of overall logbook reported catch (Table 17). Bait use averaged around 41 % of the average total retained catch between 2018 and 2020. The main bait species used by the fishery included *Decapterus muroadsi*, *Sardinella longiceps* and *Sardinops sagax. 0*

Table 20. Bait species used by the UoA fleet through 2018-20 and percentage of total overall logbook catch. Source: Dongwon Fisheries Co. Ltd and Hansung Enterprise Co.

Species	Fishery/country	Bait use (tonnes)				% of overall logbook catch			
		2018	2019	2020	Total	2018	2019	2020	Average 2018-20
Illex argentinus	Falklands, Argentina	109.5	98.6	105.0	313.1	3.5 %	2.3 %	2.4 %	2.7 %
Sardinops sagax	UAE	17.0	0.0	0.0	17	0.5 %	0.0 %	0.0 %	0.1 %
	China/ Indonesia	174.5	169.2	112.0	455.7	5.6 %	4.0 %	2.6 %	3.9 %
	Japan	184.0	30.0	0.0	214	5.9 %	0.7 %	0.0 %	1.8 %
	Mexico	0.0	54.0	81.3	135.3	0.0 %	1.3 %	1.9 %	1.2 %
	Spain	12.0	0.0	0.0	12	0.4 %	0.0 %	0.0 %	0.1 %
	Total	**387.5**	**253.2**	**193.3**	**834**	**12.4 %**	**6.0 %**	**4.5 %**	**7.1 %**
Sardinella longiceps	Oman	148.0	236.0	332.2	716.2	4.7 %	5.5 %	7.7 %	6.1 %
Trachurus japonicas	Korea	28.4	32.1	51.8	112.3	0.9 %	0.8 %	1.2 %	1.0 %
Scomber japonicus	Korea	61.6	38.2	56.4	156.2	2.0 %	0.9 %	1.3 %	1.3 %
Decapterus muroadsi	China	24.0	0.0	0.0	24	0.8 %	0.0 %	0.0 %	0.2 %
	Indonesia	532.7	739.5	876.8	2149	17.1 %	17.4 %	20.2 %	18.3 %
	Vietnam	136.3	0.0	0.0	136.3	4.4 %	0.0 %	0.0 %	1.2 %
	Total	**693**	**739.5**	**876.8**	**2309.3**	**22.2 %**	**17.4 %**	**20.2 %**	**19.7 %**
Clupea pallasii	Korea/Russia	9.1	20.3	18.3	47.7	0.3 %	0.5 %	0.4 %	0.4 %
	Canada	90.3	58.0	36.0	184.3	2.9 %	1.4 %	0.8 %	1.6 %
	Total	**99.4**	**78.3**	**54.3**	**232**	**3.2 %**	**1.8 %**	**1.3 %**	**2.0 %**
*Chanos chanos**	Indonesia	8.5	24.5	89.9	122.9	0.3 %	0.6 %	2.1 %	1.0 %
Total		**1,536**	**1,500**	**1,760**	**4,796**	**49.2 %**	**35.3 %**	**40.5 %**	**40.9 %**

*Note: Milk fish (*Chanos chanos*) source is from aquaculture operations and as per MSC interpretation are not considered further.

5.8.1.5 Summary

Based on the data analyses outlined in the preceding sections, the species that will be considered under P2 for assessment are presented in Table 21. Justification for assigning each species to either Primary (main, minor), Secondary (main, minor) or ETP was provided for under GSA3.1.1 – 3.1.4 *Designation of P2 species*.

Table 21. Species, assessment category and justification for consideration under P2 for assessment. Bait species have been written in blue.

Species		Country/RFMO	Category	Justification
Common name	**Scientific name**			
Bigeye tuna	*Thunnus obesus*	WCPFC	Primary Main	Managed, >5 %
Yellowfin tuna	*Thunnus albacares*	WCPFC	Primary Main	Managed, >5 %
Albacore tuna	*Thunnus alalunga*	WCPFC	Primary Main	Managed, >5 %
South American pilchard	*Sardinops sagax*	China, Indonesia, Japan	Primary Main	Managed, >5 %
Blue marlin	*Makaira nigricans*	WCPFC	Secondary Main	Not managed, 2-5 % Precautionary
Blue shark	*Prionace glauca*	WCPFC	Secondary Main	Not managed, 2-5 % Precautionary
Amberstripe scad	*Decapterus muroadsi*	Indonesia	Secondary Main	Not managed, >5 %
Indian oil sardine	*Sardinella longiceps*	Oman	Secondary Main	Not managed, >5 %
Swordfish	*Xiphias gladius*	WCPFC	Primary Minor	Managed, <5 %
Skipjack tuna	*Katsuwonus pelamis*	WCPFC	Primary Minor	Managed, <5 %
Argentine shortfin squid	*Illex argentines*	Falklands/Argentina	Primary Minor	Managed, <5 %
Milkfish	*Chanos chanos**	Indonesia	Secondary Minor	Not managed, <5 %
Pacific herring	*Clupea pallasii*	Korea, Russia, Canada	Secondary Minor	Not managed, <5 %
Chub mackerel	*Scomber japonicas*	Korea	Secondary Minor	Not managed, <5 %

Species		Country/RFMO	Category	Justification
Common name	**Scientific name**			
Japanese horse mackerel	*Trachurus japonicas*	Korea	Secondary Minor	Not managed, <5 %
Crocodile shark	*Pseudocarcharias kamoharai*	WCPFC	Secondary Minor	Not managed, <5 %
Escolar	*Lepidocybium flavobrunneum*	WCPFC	Secondary Minor	Not managed, <5 %
Indo-Pacific sailfish	*Istiophorus platypterus*	WCPFC	Secondary Minor	Not managed, <5 %
Striped marlin	*Kajikia audax*	WCPFC	Secondary Minor	Not managed, <5 %
Shortbill spearfish	*Tetrapturus angustirostris*	WCPFC	Secondary Minor	Not managed, <5 %
Wahoo	*Acanthocybium solandri*	WCPFC	Secondary Minor	Not managed, <5 %
Snake mackerel	*Gempylus serpens*	WCPFC	Secondary Minor	Not managed, <5 %
Pelagic stingray	*Pteroplatytrygon violacea*	WCPFC	Secondary Minor	Not managed, <5 %
Velvet dogfish	*Zameus squamulosus*	WCPFC	Secondary Minor	Not managed, <5 %
Opah	*Lampris spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Long snouted lancetfish	*Alepisaurus ferox*	WCPFC	Secondary Minor	Not managed, <5 %
Oilfish	*Ruvettus pretiosus*	WCPFC	Secondary Minor	Not managed, <5 %
Black marlin	*Istiompax indica*	WCPFC	Secondary Minor	Not managed, <5 %
Sickle pomfret	*Taractichthys steindachneri*	WCPFC	Secondary Minor	Not managed, <5 %
Sharptail mola	*Masturus lanceolatus*	WCPFC	Secondary Minor	Not managed, <5 %
Lancetfishes	*Alepisaurus spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Common remora	*Remora remora*	WCPFC	Secondary Minor	Not managed, <5%
Dagger pomfret	*Taractes rubescens*	WCPFC	Secondary Minor	Not managed, <5 %

Species		Country/RFMO	Category	Justification
Common name	**Scientific name**			
Sunfishes	*Molidae spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Roudi escolar	*Promethichthys prometheus*	WCPFC	Secondary Minor	Not managed, <5 %
Short snouted lancetfish	*Alepisaurus brevirostris*	WCPFC	Secondary Minor	Not managed, <5 %
Dolphinfishes	*Coryphaena spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Ocean sunfish	*Mola mola*	WCPFC	Secondary Minor	Not managed, <5 %
Slender sunfish	*Ranzania laevis*	WCPFC	Secondary Minor	Not managed, <5 %
Great barracuda	*Sphyraena barracuda*	WCPFC	Secondary Minor	Not managed, <5 %
Crested oarfish	*Lophotus lacepede*	WCPFC	Secondary Minor	Not managed, <5 %
Live sharksucker	*Echeneis naucrates*	WCPFC	Secondary Minor	Not managed, <5 %
Scalloped bonnethead	*Sphyrna corona*	WCPFC	Secondary Minor	Not managed, <5 %
Rough pomfret	*Taractes asper*	WCPFC	Secondary Minor	Not managed, <5 %
Rainbow runner	*Elagatis bipinnulata*	WCPFC	Secondary Minor	Not managed, <5 %
Razorback scabbardfish	*Assurger anzac*	WCPFC	Secondary Minor	Not managed, <5 %
Bignose shark	*Carcharhinus altimus*	WCPFC	Secondary Minor	Not managed, <5 %
Dogfish sharks	*Squalidae spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Megamouth shark	*Megachasma pelagios*	WCPFC	Secondary Minor	Not managed, <5 %
Tiger shark	*Galeocerdo cuvier*	WCPFC	Secondary Minor	Not managed, <5 %
Driftfish	*Nomeidae spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Taper-tail ribbonfish	*Trachipterus fukuzakii*	WCPFC	Secondary Minor	Not managed, <5 %

Species		Country/RFMO	Category	Justification
Common name	Scientific name			
Queen snapper	*Etelis oculatus*	WCPFC	Secondary Minor	Not managed, <5 %
Snappers, jobfishes	*Lutjanidae spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Brilliant pomfret	*Eumegistus illustris*	WCPFC	Secondary Minor	Not managed, <5 %
Barracudas	*Sphyraena spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Violet stingray	*Pteroplatytrygon violacea*	WCPFC	Secondary Minor	Not managed, <5 %
Blacktip shark	*Carcharhinus limbatus*	WCPFC	Secondary Minor	Not managed, <5 %
Longfin mako shark	*Isurus paucus*	WCPFC	Secondary Minor	Not managed, <5 %
Shortfin mako shark	*Isurus oxyrinchus*	WCPFC	Secondary Minor	Not managed, <5 %
Mako sharks	*Isurus spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Bigeye thresher shark	*Alopias superciliosus*	WCPFC	Secondary Minor	Not managed, <5 %
Pelagic thresher shark	*Alopias pelagicus*	WCPFC	Secondary Minor	Not managed, <5 %
Thresher sharks	*Alopiidae spp.*	WCPFC	Secondary Minor	Not managed, <5 %
Smooth hammerhead	*Sphyrna zygaena*	WCPFC	Secondary Minor	Not managed, <5 %
Hammerhead sharks	*Sphyrna* spp.	WCPFC	Secondary Minor	Not managed, <5 %
Green turtle	*Chelonia mydas*	WCPFC	ETP	CMM 2018-04; CMS Appendix I; CITES Appendix I; Endangered on IUCN Red List
Olive ridley turtle	*Lepidochelys olivacea*	WCPFC	ETP	CMM 2018-04; CMS Appendix I; CITES Appendix I; Vulnerable on IUCN Red List
Marine turtles	*Chelonioidea spp.*	WCPFC	ETP	CMM 2018-04; CMS Appendix I; CITES Appendix I; Either Vulnerable or Endangered on IUCN Red List

Species		Country/RFMO	Category	Justification
Common name	**Scientific name**			
Sooty albatross	*Phoebetria fusca*	WCPFC	ETP	CMM 2018-04; CMS Appendix II; Endangered on IUCN Red List
Silky shark	*Carcharhinus falciformis*	WCPFC	ETP	CMM 2019-04; CMS Appendix II; CITES Appendix II; Vulnerable on IUCN Red List
Oceanic whitetip shark	*Carcharhinus longimanus*	WCPFC	ETP	CMM 2019-04; CMS Appendix I; CITES Appendix II; Critically endangered on IUCN Red List
Reef manta ray	*Mobula alfredi*	WCPFC	ETP	CMM 2019-05; CMS Appendix I; CITES Appendix II; Vulnerable on IUCN Red List
Giant manta ray	*Mobula birostris*	WCPFC	ETP	CMM 2019-05; CMS Appendix I; CITES Appendix II; Endangered on IUCN Red List
Manta rays	*Mobula spp.*	WCPFC	ETP	CMM 2019-05; CMS Appendix I; CITES Appendix II; Either Endangered or Vulnerable on IUCN Red List
Rays and skates	*Mobula spp. and Rajidae spp.*	WCPFC	ETP	CMM 2019-05; CMS Appendix I; CITES Appendix II; Vulnerable on IUCN Red List (*Mobula spp. only*)

5.8.2 Primary species and secondary species

Based on the scaled average observer values, logbook and bait data, the "main" species in this fishery are yellowfin, bigeye and albacore tuna, blue marlin, blue shark as well as bait species: South American pilchard Amberstripe scad and Indian oil sardine. As yellowfin, albacore and bigeye are target species (Principle 1) in this fishery depending on the UoA, they are not discussed further under Principle 2.

"Primary" species are defined in Section 5.8.1.1. Of the main species identified above, this applies to yellowfin, bigeye and albacore tuna (see above Principle 1), as well as the bait species - South American pilchard. While both blue marlin and blue shark have stock assessments, the lack of specific target or limit reference points and accompanying management led to the assessment team deciding to assess these species as "secondary" main. Amberstripe scad and Indian oil sardine were the only other secondary main species. Blue marlin, blue shark, South American pilchard, Amberstripe scad and Indian oil sardine are all discussed further below.

No other species reached the threshold of 5v % (or 2v % in the case of vulnerable species); the remainder were therefore assessed as either minor primary or secondary (Table 21). While swordfish made up 3 % of the overall catch it was not considered a main species in this assessment as the fishery under assessment is primarily conducting deep-setting fishing operations (A. Townley, pers. comm) where according to Peatman et al. (2018) swordfish is not encountered as frequently compared to shallow-setting fishing operations. Furthermore, the latest 2021 southwest Pacific swordfish stock assessment (Ducharme-Barth et al., 2021) indicates that the stock is not at significant risk of overfishing and is not overfished.

5.8.2.1 Blue marlin

Blue marlin in the Pacific Ocean is considered a single stock (ISC_BWG, 2021) caught primarily in tropical and sub-tropical waters. They are caught by various gear types and by both commercial and recreational fishers throughout their range, but the largest proportion (67 %) is taken by commercial longline gear (ISC_BWG, 2021).

The most recent assessment (2021) for blue marlin used a two-model ensemble of age and length structured Stock Synthesis models to fit a time series of standardised CPUE and size-composition data (ISC_BWG, 2021). The two models in the ensemble differed only in their growth curve assumption. It was recommended by the ISC Billfish Working Group (BWG) that both models were retained based upon their fit and diagnostics, so the biological reference points, spawning stock biomass, and fishing mortality were averaged between the two models assuming equal weights (ISC_BWG, 2021). While no target or limit reference points have been established for blue marlin by the WCPFC, the stock assessment provides default biological reference point estimates, such as MSY and 20 % in relation to fishing mortality (F), spawning stock biomass (SSB), recent average yield (C) and spawning potential ratio (SPR) (see Table 22).

Table 22. Estimates of biological reference points along with estimates of fishing mortality (F), spawning stock biomass (SSB), recent average yield (C), and spawning potential ratio (SPR) of Pacific blue marlin, derived from the assessment ensemble model. Source: ISC_BWG (2021)**.**

Reference Point	Estimate
F_{MSY} (age 1-10)	0.23
F_{2019} (age 1-10)	0.11

Reference Point	Estimate
$F_{20\%SSB0}$	0.18
SSB_{MSY}	20,677 mt
SSB_{2019}	24,241 mt
$SSB_{20\%SSB0}$	20,729 mt
MSY	24,600 mt
$C_{2017-2019}$	16,512 mt
SPR_{MSY}	17 %
SPR_{2019}	34 %
$SPR_{20\%SSB0}$	23 %

Female SSB was estimated to be 24,272 metric tonnes (mt) in 2019, or about 17 % above SSB_{MSY}. (SSB/SSB_{MSY} = 1.17 (95 % C.I. 0.87-1.51)). Fishing mortality on the stock (average *F*, ages 1 to 10) averaged *F*=0.13 during 2017-2019, which was 40 % below F_{MSY} and in 2019 was F=0.11, which was 50% below F_{MSY} (F/F_{MSY} = 0.50 (95 % C.I. 0.37-0.69)). Median fishing mortality has been below F_{MSY} every year except 2003 to 2006.

As depicted on the Kobe plot (Figure 26), relative to MSY-based reference points, the ensemble model indicates that overfishing was very likely not occurring (>90 % probability) and blue marlin is likely not overfished (81 % probability) (ISC_BWG, 2021).

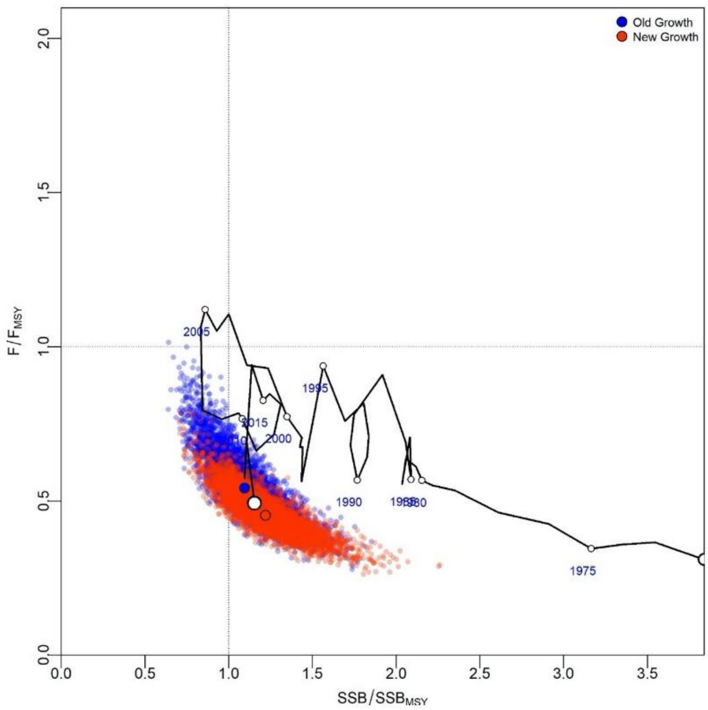


Figure 26. Kobe plot of the time series of estimates of relative fishing mortality and relative spawning stock biomass of blue marlin between 1971 and 2019. The white circle denotes the estimate of the combined

models in 2019, blue dots indicate the final year stock status of the old growth model and red dots indicate the final year stock status of the new growth model. Source: ISC_BWG (2021)**.**

The ensemble model identified issues with both the new growth and old growth model diagnostics and sensitivity runs that were consistent with the presence of data conflicts. While none of the model diagnostics indicated that the results of either model were invalid, it was advised that further model development work will be required to reduce these conflicts and modelling uncertainties, as well as a revaluation of the input assessment data to improve the time series (ISC_BWG, 2021).

Blue marlin is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential (ISC_BWG, 2021). Although fishing mortality has approached F_{MSY} and exceeded F_{MSY} from 2003 to 2006, the biomass of the stock has remained above SSB_{MSY} since then. Catches have declined in recent years and therefore the stock has a low risk of experiencing overfishing or being overfished unless fishing mortality increases to above F_{MSY} based upon stock projections (ISC_BWG, 2021).

5.8.2.2 Blue shark

Blue sharks are widely distributed throughout temperate and tropical waters of the Pacific Ocean. Two stocks are recognised in the Pacific, one in the north and another in the south Pacific.

The most recent stock assessment (2017) for the North Pacific blue shark was undertaken using Stock Synthesis (ISC_SWG, 2017). From the stock assessment, the reference case model showed that the spawning stock biomass is fluctuating close to the time-series high set back in the late 1970s. Recruitment has fluctuated around 37,000,000 age-0 sharks annually. Stock status is reported in relation to MSY. Female spawning biomass in 2015 (SB_{2015}) was 71 % higher than at MSY and estimated to be 308,286 mt (Figure 27). The recent annual fishing mortality ($F_{2012-2014}$) was estimated to be well below F_{MSY} at approximately 37 % of F_{MSY}. As depicted on the Kobe plot (Figure 27), relative to MSY-based reference points, the model predicts that it is likely the stock is not overfished, and overfishing is not occurring.

Management Quantity	Reference Case Model	Range for Sensitivity Runs
SB_{1971}	311,312	174,381 - 980,878
SB_{2015}	308,286	140,742 - 1,082,300
SB_{MSY}	179,539	100,984 - 482,638
F_{1971}	0.13	0.01 - 0.15
$F_{2012-2014}$	0.13	0.06 - 0.15
F_{MSY}	0.35	0.26 - 0.66
SB_{2015}/SB_{MSY}	1.71	1.39 - 2.59
$F_{2012-2014}/F_{MSY}$	0.37	0.15 - 0.50

Figure 27. Estimates of key management quantities for the North Pacific blue shark stock assessment reference case model and the range of values for 13 sensitivity runs. Source: ISC_SWG (2017)**.**

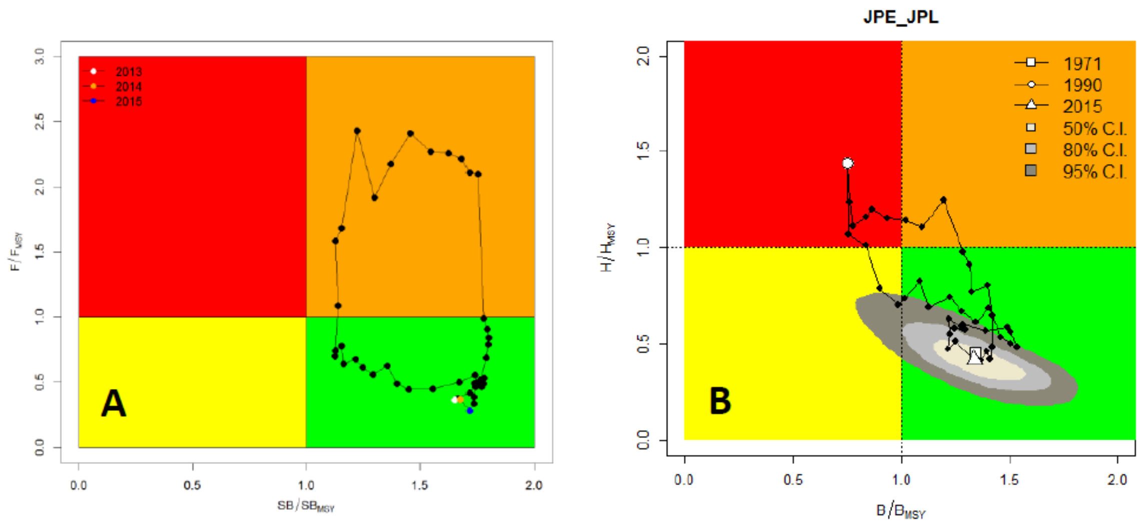


Figure 28. Kobe plots of the trends in estimates of relative fishing mortality and biomass of North Pacific blue shark between 1971-2015 for the reference case of (A) the SS stock assessment model, and (B) the BSSPM stock assessment model. Source: ISC_SWG (2017)**.**

The most recent assessment (2021) for South Pacific blue shark was undertaken using Stock Synthesis (Neubauer et al., 2021). In addition, a surplus production model (SPM) was run with both assessment models producing very similar results. The assessment was determined an improvement over the 2016 assessment in particular the catch reconstruction, CPUE time series, and re-parameterization through combined advance from south and north Pacific assessments (WCPFC_SC, 2021b). A total of 90 % of model runs indicated that F_{2020} was below F_{MSY} and 96 % of model runs shows that SB_{2020} was above SB_{MSY} (See Figure 34 in the assessment report for detailed Kobe plots) with an estimate of SSB of over 60,000 t.

The WCPFC Scientific Committee did not approve the results for providing management advice due to the need to conduct a more thorough investigation of diagnostics across the grid of models (WCPFC_SC, 2021b). However, it was noted that stock biomass is likely increasing, and fishing pressure has declined through the recent decade due to the fact that most sharks are released upon capture in most longline fleets. The results indicate that if assessed against conventional reference points it is likely that the stock will not be found to be overfished nor would overfishing be occurring (WCPFC_SC, 2021b).

5.8.2.3 <u>South American pilchard</u>

According to information provided by the client, the majority of South American pilchard (*Sardinops sagax*) used as bait by the UoAs between 2018 and 2020 was sourced from either China/Indonesia or Japan. The fishery on this species in the Northwest Pacific is predominantly a Japanese one, although according to Yatsu (2019), the stock is also targeted by Chinese vessels just outside the Japanese EEZ, near Hokkaido Island (see Fishbase, Schwartzlose and Alheit (1999) and Whitehead (1988)).

Japanese fisheries harvest two South American pilchard stocks: (i) Japanese Pacific Ocean and (ii) Tsushima Warm Current. Both stocks are assessed annually by the Fisheries Research and Education Agency of Japan (FRA) and are managed through a Total Allowable Catch (TAC), termed allowable biological catches (ABCs). It is important to note that the official World Register of Marine Species (WoRMS) now register *Sardinops melanostictus* as *Sardinops sagax,* but the FRA stock assessment continues to name them as *S. melanostictus*. To determine stock status, assessment scientists use cohort analysis to estimate biomasses at age and evaluate spawning stock biomass (SSB) against a target reference point aiming to achieve MSY (SSB_{MSY}) set at 1,187,000 t (Pacific stock) and 1,093,000 t (Tsushima stock) with the limit reference points set at 60 % of MSY. This limit reference point was the estimated SSB level below which recruitment is thought to be poor (Yukami et al., 2017). This was considered a suitable proxy for PRI by this assessment team. Furthermore, if the SSB is below a reference point set at 10 % of MSY, a fishing moratorium or other measures to ensure similar effect are imposed (Yatsu, 2019).

The latest assessment conducted for the Pacific stock was in 2020 (FRA, 2020a). The catch in 2019 was 521,000 t, which was an increase from 451,000 t in 2018 (FRA, 2020a). It is evident that in many early years, fishing mortality (F) exceeded F_{MSY} which is the point at which SSB_{MSY} is achieved, but in recent years has decreased to less than or equal to F_{MSY} (1.01 in 2019 -F_{2019}/F_{MSY}) (Figure 29), resulting in the SSB increasing and exceeding SSB_{MSY} since 2017 (1.33 in 2019 -SB_{2019}/SB_{MSY}) (Figure 29). This provides confidence that the stock is highly likely to be above biologically based limits. Projections indicate a 60 % probability that the stock will remain near the target reference point (TRP) by 2031 if fishing mortality remains around 0.80 F_{MSY} (FRA, 2020a). However, the population dynamics of this stock, particularly recruitment, are strongly linked to oceanographic variables which fluctuate on decadal timescales, making long-term management complex (Gascoigne et al., 2021).

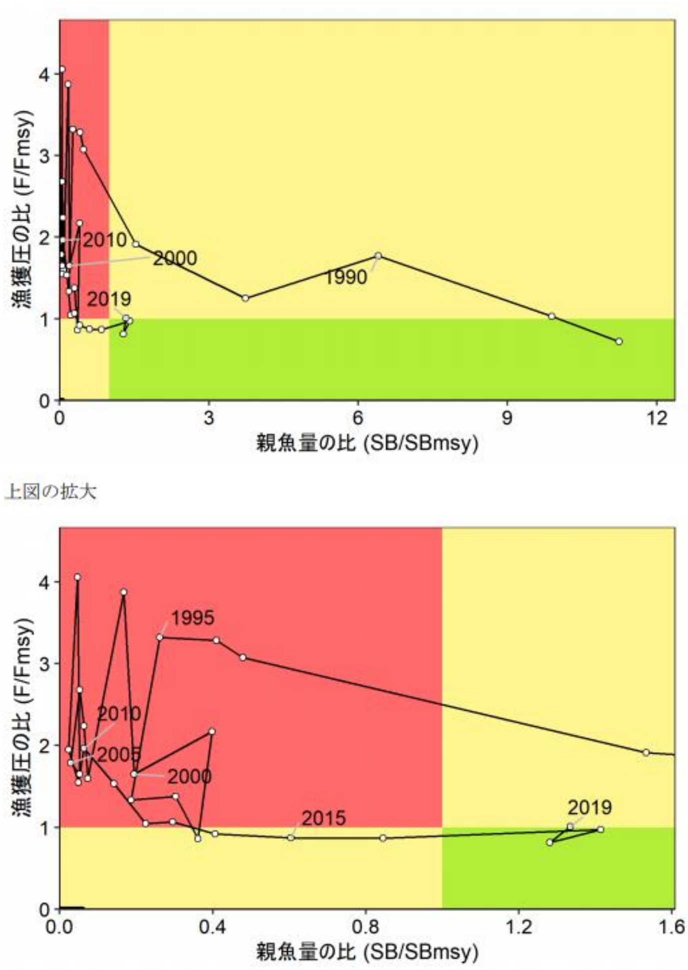


Figure 29. Kobe plot of the time series of estimates of relative fishing mortality and relative spawning stock biomass of South American Pilchard (Pacific Japanese stock). Note the bottom figure is an enlargment of top figure to improve readability. Source: FRA (2020a).

The latest assessment conducted for the Tsushima stock was in 2020 (FRA, 2020a). The catch in 2019 was estimated at 14,000 t, a decrease from 71,000 t in 2018 (FRA, 2020a). It is evident that for many years F exceeded F_{MSY} and as a result the level of SSB is currently lower than that to achieve MSY (0.18 in 2019 SB_{2019}/SB_{MSY}) (Figure 30). Trends in SSB suggest it has remained at low levels since 1994 (FRA, 2020a). Thus, the stock is currently below the PRI set at 60 % of MSY. Fishing mortality has been slightly higher than F_{MSY} in recent years but declined to a level significantly lower than F_{MSY} in 2019 (0.19 in 2019 -F_{2019}/F_{MSY}) (Figure 30). Projections indicate a 54 % probability of the stock rebuilding to the TRP by 2031 if fishing mortality does not exceed 0.80 F_{MSY} (FRA, 2020a). However, the population dynamics of this stock, particularly recruitment, are strongly linked to oceanographic variables which fluctuate on decadal timescales, making long-term management complex (Gascoigne et al., 2021).

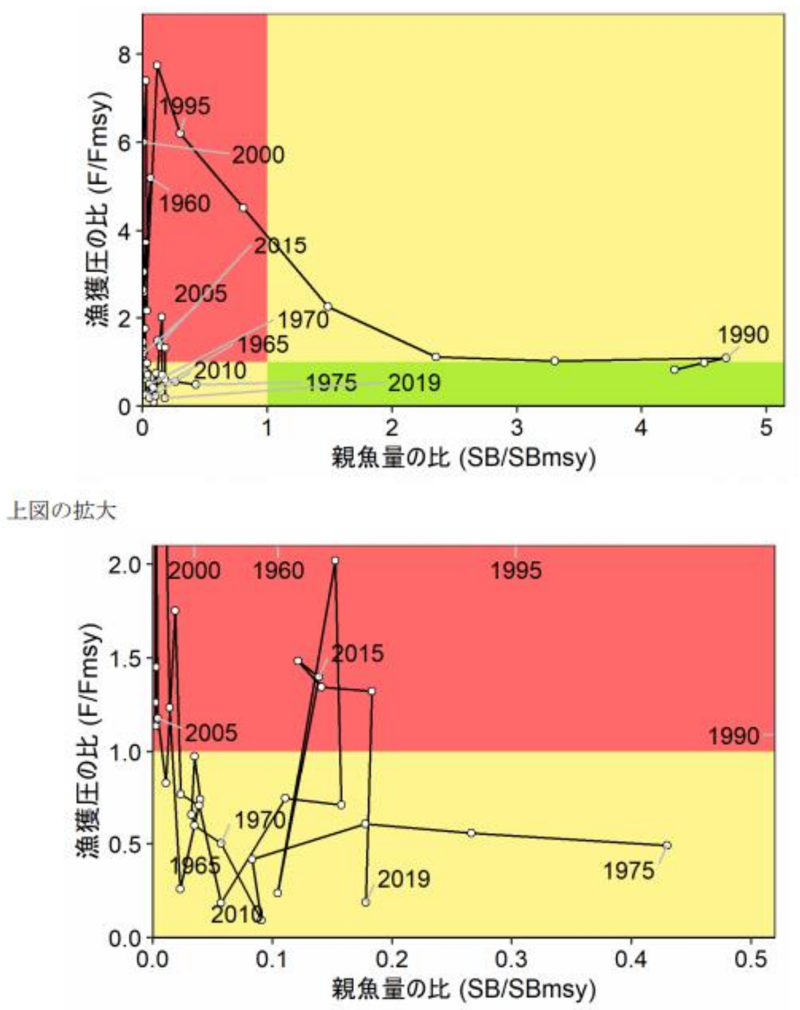


Figure 30. Kobe plot of the time series of estimates of relative fishing mortality and relative spawning stock biomass of South American Pilchard (Tsushima Japanese stock). Note the bottom figure is an enlargment of top figure to improve readability. Source: FRA (2020a)**.**

This species is used as bait by the UoA vessels, accounting for an average 278 t annually between 2018 and 2020, which represented around 7.1 % of the total catch reported in the logbook catch across the same time period. This represents a very small amount of the total catch (<1 % in 2019) in the Japanese South American pilchard fishery.

5.8.2.4 Amberstripe scad

According to the information provided by the client, the majority of Amberstripe scad (*Decapterus muroadsi*) used as bait by the UoAs between 2018 and 2020 was sourced from Indonesia (with a small amount in 2018 also sourced from Vietnam and China).

Amberstripe scad belongs to the *Carangidae* family and genus *Decapterus*. The genus *Decapterus* (Bleeker, 1851) contains 11 valid species, distributed in tropical to temperate areas of the Pacific, Indian and Atlantic Oceans (Eschmeyer et al., 2018). Amberstripe scad are very widely distributed in the tropics and well into the temperate zone, everywhere except the western and northern Atlantic Ocean (Figure 31) and are found to a depth of 320 metres (Jawad and Al-Mamry, 2018). Generally, these species are not vulnerable to fishing due to their fast life history (growth, maturation, reproduction).

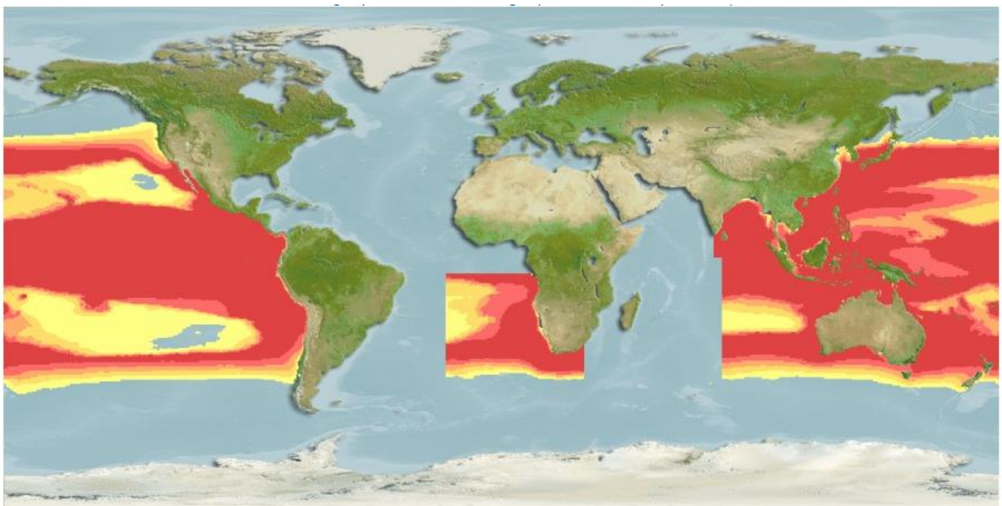


Figure 31. Distribution of Amberstripe scad (*Decapterus muroadsi*). Source: Kaschner et al. (2019)**.**

There is limited information to be found on commercial catches or management of this species in Indonesia. Jones et al. (2020) reported anecdotal information from several bait suppliers estimating that approximately 2,000 tonnes of this species were harvested annually in Indonesia. Primary gear types include gillnets and purse seine, although purse seine is the dominant gear type used (Jones et al. 2020).

Given that there is not sufficient information to determine the outcome status with respect to biologically based limits, the Risk Based Framework (RBF) has been triggered and a Productivity Susceptibility Analysis (PSA) was undertaken for this species. The rationales for the PSA scoring can be found in Section 7.3. In undertaking the RBF there was only limited information found on the life history characteristics of Amberstripe scad. Therefore, where there were data gaps, proxy data were used from other scad species within the same genus, as similarly undertaken by Jones et al. (2020). All information concerning this species and other related scad species was taken from either www.fishbase.org or the references cited in the PSA scoring tables (Appendix 8).

5.8.2.5 Indian oil sardine

According to the information provided by the client, all of the Indian oil sardine (*Sardinella longiceps*) used as bait by the UoAs between 2018 and 2020 was sourced from Oman.

Indian oil sardine belongs to the Family *Clupeidae* and Genus *Sardinella*, which contains 22 species. It is distributed within tropical waters of the northern and western Indian Ocean: Gulf of Aden, Gulf of Oman (not including the Red Sea or Persian Gulf) and eastward to India, including the Andaman Islands (Figure 32). According to Shaklee and Shaklee (1990), Indian oil sardine in Omani waters is its own stock and recent genetic work using microsatellite markers provides confirmation (Sebastian et al., 2017). The species makes up one of the main domestic marine fisheries in Oman, representing ~32 % of national catches according to reconstructed data for the period 1950 – 2010 (Khalfallah et al., 2016). The Omani sardine fishery is a market driven coastal traditional fishery targeted by beach seine, purse seine, and encircling gillnets (Al Jufaili and Piontkovski, 2020).

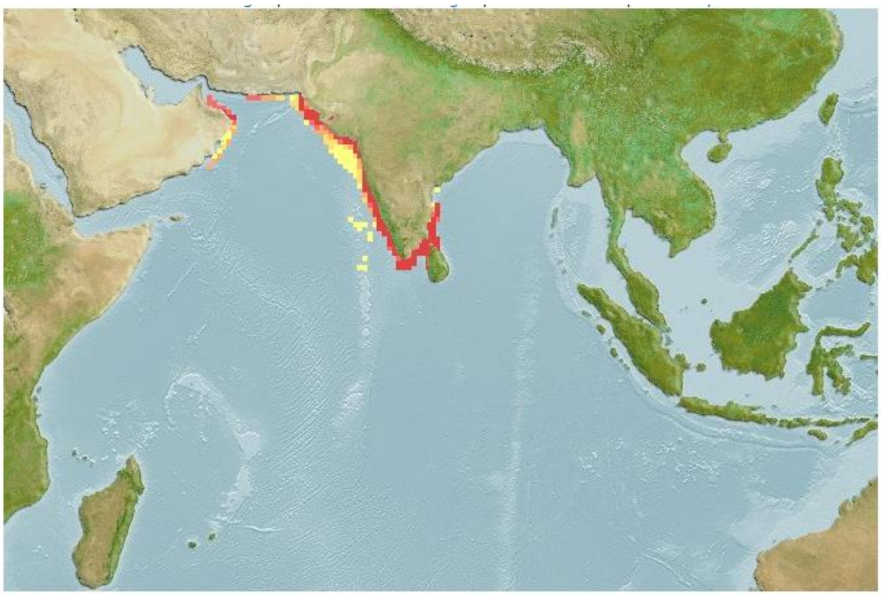


Figure 32. Distribution of Indian oil sardine (*Sardinella longiceps*). Source: Kaschner et al. (2019)**.**

An assessment of standing stock, total biomass and MSY was undertaken by Zaki et al. (2011) using data from the period 2005 to 2009. According to that assessment, the yield from the entire coastal waters of Oman was estimated at 27,151 t, lower than the estimated MSY of 34,048 t (note that another MSY value was estimated using a Thompson and Bell analysis, which was 46,144 t) (Sieben et al., 2020). The main issue with using the assessment from Zaki et al. (2011) to assess sustainability of the Indian oil sardine stock in Oman is the amount of time that has elapsed since it was undertaken. The work of Zaki et al. (2011) determined this MSY based on annual average landings of 30,112 t between 2000 and 2009. However, current catches have substantially increased since then, with 275,186 t of sardine landed in 2019 (NCSI, 2020). Indian oil sardine contributes around 80-95 % to Omani sardine landings (Dorr_III et al., 1990; Zaki et al., 2011).

Therefore, on a precautionary basis, the assessment team agreed that too much time had lapsed to determine the outcome status of this species with respect to biologically based limits. The RBF has thus been triggered and a PSA was undertaken. The rationales for the PSA scoring can be found in Appendix 8.

5.8.3 ETP species

The criteria for designating ETP species are set out in Section 5.8.1.1. For this assessment, the team considered species protected under the following national legislation and/or international treaties to be ETP:

- CITES Appendix I;
- IUCN Red List (vulnerable, endangered or critically endangered status) for species classified as “out-of-scope” (amphibians, reptiles, birds and mammals);
- Convention on Highly Migratory Species (CMS) Appendices I and II where binding agreements are in place; and
- WCPFC CMMs, which provides protection (i.e., a ban on landing), rather than management.

The observer data from 2018 to 2020 were used to identify ETP species (see Table 19 and Table 21). The raw (unscaled) numbers and scaled numbers from the observer records are provided below in Table 23. For details on observer coverage and fleet-level estimates of scaled catch by weight, see Section 6.7.1.

Table 23. Details of ETP species interacting with the UoA according to at-sea observer data between 2018 and 2020 (raw data/unscaled and scaled numbers). Source: supplied NIFS data.

Species	Scientific name	2018		2019		2020	
		Raw	Scaled	Raw	Scaled	Raw	Scaled
Green turtle	*Chelonia mydas*	1	16	0	0	0	0
Olive ridley turtle	*Lepidochelys olivacea*	14	217	3	47	0	0
Marine turtles	*Chelonioidea spp.*	2	31	0	0	0	0
Sooty albatross	*Phoebetria fusca*	0	0	1	16	0	0
Silky shark	*Carcharhinus falciformis*	428	6,647	270	4,193	22	342
Oceanic whitetip shark	*Carcharhinus longimanus*	46	714	42	652	4	62
Giant manta ray	*Mobula birostris*	4	62	19	295	2	31
Manta rays	*Mobula spp.*	0	0	20	311	0	0
Reef manta ray	*Mobula alfredi*	8	124	0	0	0	0
Rays and skates	*Mobula spp. and Rajidae spp.*	0	0	2	31	0	0

5.8.3.1 Elasmobranchs

Elasmobranchs (sharks and rays) were the main group of ETP species interacting with the fishery under assessment. In total, 877 individuals were recorded by at-sea observers between 2018 and 2020. The majority of these interactions were with silky shark and oceanic whitetip shark. The average annual scaled-up estimate of these two sharks in both weight and numbers between 2018 and 2020 was 61.5 t and 4,203 individuals respectively. The estimated total catch of other elasmobranch species was relatively low, with only a small number of individuals recorded in the observer data (Table 19).

The at-sea observer data (Table 19) indicated that the majority of elasmobranchs were discarded. For elasmobranchs, at-vessel and post-release 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 specifically, post-release survival depends on where the shark was hooked and whether the line was cut off or bitten off. Verification of gear use and configurations, including hook type and leader type will need to take place at the site visit. Figure 33 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 %. 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 recently commissioned by the WCPFC for silky and shortfin mako sharks was undertaken in 2019 (ABNJ, 2019). In this study, a total of 117 'survival' popup archival tags (sPAT) were attached to silky and shortfin mako sharks in New Zealand (n=35), Fiji (n=58), New Caledonia (n=10) and the Republic of the Marshall Islands (n=14). Post-release mortality was determined for 110 sharks classified as either "alive and uninjured" or "alive and injured". Most tagged sharks were reported to be uninjured (89 %), and the majority (88 %) survived until tag loss or the programmed pop-up date with 13 estimated mortalities. Mortality rates were found to be significantly higher for smaller shark individuals and for sharks with a high gangion ratio (the ratio of the amount of trailing gangion left on the released shark to its fork length). When the study data were accompanied by data from similar Pacific fisheries, mortality rates for silky sharks were found to be significantly higher for injured sharks and for sharks with high gangion ratios, with an overall post-release mortality rate of 15.4 % (ABNJ, 2019). For mako sharks, post-release mortality at 60 days was predicted to be 20.5 % (ABNJ, 2019). The study concluded that the proportion of sharks that survive fishing operations (hauling, handling, and post-release mortality) was 44 % for shortfin makos and 56 % for silky sharks.

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.

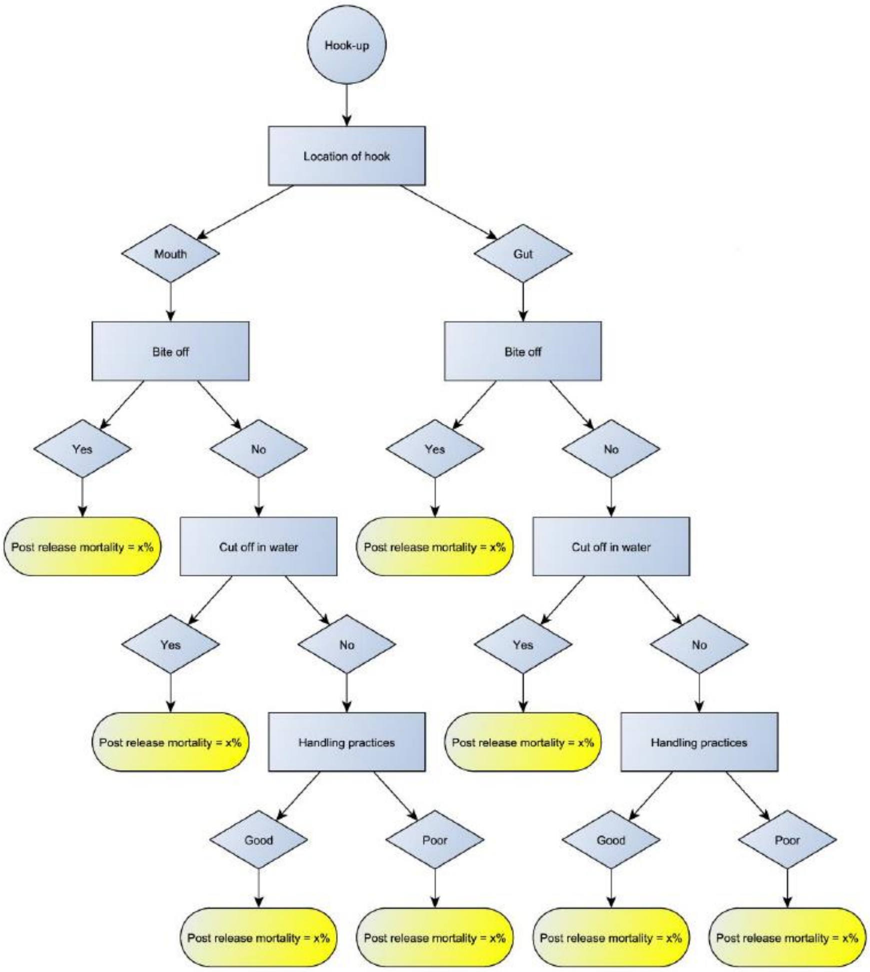


Figure 33. Flowchart depicting the mortality associated with the hooking and release of sharks in a longline fishery and factors that influence that mortality. Source: Patterson et al. (2014)**.**

Several elasmobranch species caught by longline operations in the WCPO have been listed on either CITES, CMS Appendices or as either vulnerable, endangered, or critically endangered on the IUCN Red List (https://www.iucnredlist.org/). The Republic of Korea has developed a National Plan of Action (NPOA) for Sharks, which has been implemented since 2011 and is available here: http://www.fao.org/3/CA3027EN/ca3027en.pdf. UoA-specific management of shark bycatch is to be discussed at the site visit. The WCPFC has also implemented various CMMs for sharks and specific shark species and rays as detailed below.

CMM 2019-04 covers all species of sharks, skates, rays and chimaeras and in recognising their vulnerability aims to introduce measures in the high seas and EEZs of the Convention Area to promote their conservation and management. CMM 2019-04 states *inter alia* the following, as applicable to longline vessels:

- CCMs should implement, as appropriate, the FAO International Plan of Action for the Conservation and Management of Sharks (IPOA). For implementation of the IPOA, each CCM should, as appropriate, include its National Plan of Action for sharks in its Part 2 Annual Report.
- CCMs shall take measures necessary to require that all sharks retained on board their vessels are fully utilized. CCMs shall ensure that the practice of finning is prohibited. In order to implement

this provision CCMs shall require their vessels to land sharks with fins naturally attached to the carcass.

- CCMs shall take measures necessary to prevent their fishing vessels from retaining on board (including for crew consumption), transhipping, and landing any fins harvested in contravention of this CMM.
- For longline fisheries targeting tuna and billfish, CCMs shall ensure that their vessels comply with at least one of the following options: (1) do not use or carry wire trace as branch lines or leaders; or (2) do not use branch lines running directly off the longline floats or drop lines, known as shark lines.
- The implementation of these measures shall be on a vessel by vessel or CCM basis.
- The Commission shall adopt and enhance bycatch mitigation measures and develop new or amend, if necessary, existing Shark Safe Release Guidelines to maximize the survival of sharks that are caught and are not to be retained. Where sharks are unwanted bycatch they should be released alive using techniques that result in minimal harm, taking into account the safety of the crew. CCMs should encourage their fishing vessels to use any Commission adopted guidelines for the safe release and handling of sharks
- Each CCM shall submit data on the WCPFC Key Shark Species for Data Provision in accordance with Scientific Data to be Provided to the Commission and CCMs shall advise the Commission (in their Part 2 Annual Report) on implementation of this CMM in accordance with Annex 2.

There are also species-specific requirements for oceanic whitetip shark and silky shark in CMM 2019-04 including:

- CCMs shall prohibit vessels flying their flag and vessels under charter arrangements to the CCM from retaining on board, transhipping, storing on a fishing vessel or landing any oceanic whitetip shark, or silky shark, in whole or in part, in the fisheries covered by the Convention.
- CCMs shall require all vessels flying their flag and vessels under charter arrangements to the CCM to release any oceanic whitetip shark or silky shark that is caught as soon as possible after the shark is brought alongside the vessel, and to do so in a manner that results in as little harm to the shark as possible, following any applicable safe release guidelines for these species.

CMM 2019-05 covers species of the family Mobulidae, which includes manta rays and mobula rays and are considered to be vulnerable to overfishing. In recognising their vulnerability CMM 2019-05 aims to introduce measures in the high seas and EEZs of the Convention Area to promote their conservation and management. CMM 2019-05 states *inter alia* the following, as applicable to longline vessels:

- CCMs shall prohibit their vessels from targeted fishing or intentional setting on mobulid rays in the Convention Area.
- CCMs shall prohibit their vessels from retaining on board, transhipping, or landing any part or whole carcass of mobulid rays caught in the Convention Area.
- CCMs shall require their fishing vessels to promptly release alive and unharmed, to the extent practicable, mobulid rays as soon as possible, and to do so in a manner that will result in the least possible harm to the individuals captured. CCMs should encourage their fishing vessels to implement the handling practices, while taking into consideration the safety of the crew.

- CCMs shall advise the Commission (in their Part 2 Annual Report) on implementation of this CMM in accordance with Annex 2.
- CCMs shall ensure that fishers are aware of proper mitigation, identification, handling and releasing techniques and should encourage them to keep on board all necessary equipment for the safe release of mobulid rays

Specific ETP elasmobranch species are discussed further in the ETP species performance indicators (Section 5.8.8).

5.8.3.2 Marine turtles

In total, there was 20 individual marine turtles recorded by at-sea observers between 2018 and 2020. This included 17 olive ridley turtles, 1 green sea turtle and 2 unidentified marine turtles. The average annual scaled-up estimate of these marine turtles, in numbers between 2018 and 2020 was 104 individuals (Table 23).

Six out of the seven species of marine turtles are threatened with extinction and fisheries bycatch has been ranked as the most significant threat to sea turtle populations globally, followed by climate change. A global comparison of calculated impact scores between three types of fishing gear (longlines, nets and trawls) interacting with marine turtles indicated that longline gear had similar interaction rates to other gears and affected similar sized individuals, but had a significantly lower mortality rate and thus had a significantly lower overall impact score (Wallace et al., 2013).

Incidental catch of marine turtles in longline fisheries occurs when opportunistic-feeding marine turtles encounter baited longline hooks, or when they are accidentally entangled with the longline gear (Jones et al., 2020). Mortalities are directly related to entanglement or hooking with the longline gear and typically result from drowning (Williams et al., 2009). Both the use of fish bait and circle hooks has been shown to reduce the interaction with some species of marine turtles, compared to the use of squid bait and J-style hooks (Gilman and Huang, 2017). Furthermore, wider circle hooks have been shown to reduce marine turtle catch rates and deep hooking, relative to narrower circle hooks (Gilman and Huang, 2017). Verification of gear use and configurations, including hook type will need to take place at the site visit. The depth of longline fishing and position of the hooks relative to floats has also been shown to influence marine turtle interaction rates (Clarke et al., 2014; ABNJ, 2017). It is understood that the majority of turtles spend the majority of their time in shallower waters <40 m deep and trials have shown that setting gear deeper than 100m does reduce interactions with turtles (Figure 34) (Clarke et al., 2014). For example, ABNJ (2017) found that interactions were increasingly likely for hooks closer to floats (i.e. the shallowest hooks in the basket) and increasing likely as the number of hooks between floats decreased, which is indicative of shallower setting. Furthermore, when deep setting, the probability of interactions were significantly reduced for green, loggerhead and olive ridley marine turtles but less so for leatherback turtles. According to the client, the majority of their fishing operations are using more than 20 (~ 25) hooks between floats (A. Townley, pers. comm), indicative of deeper setting.

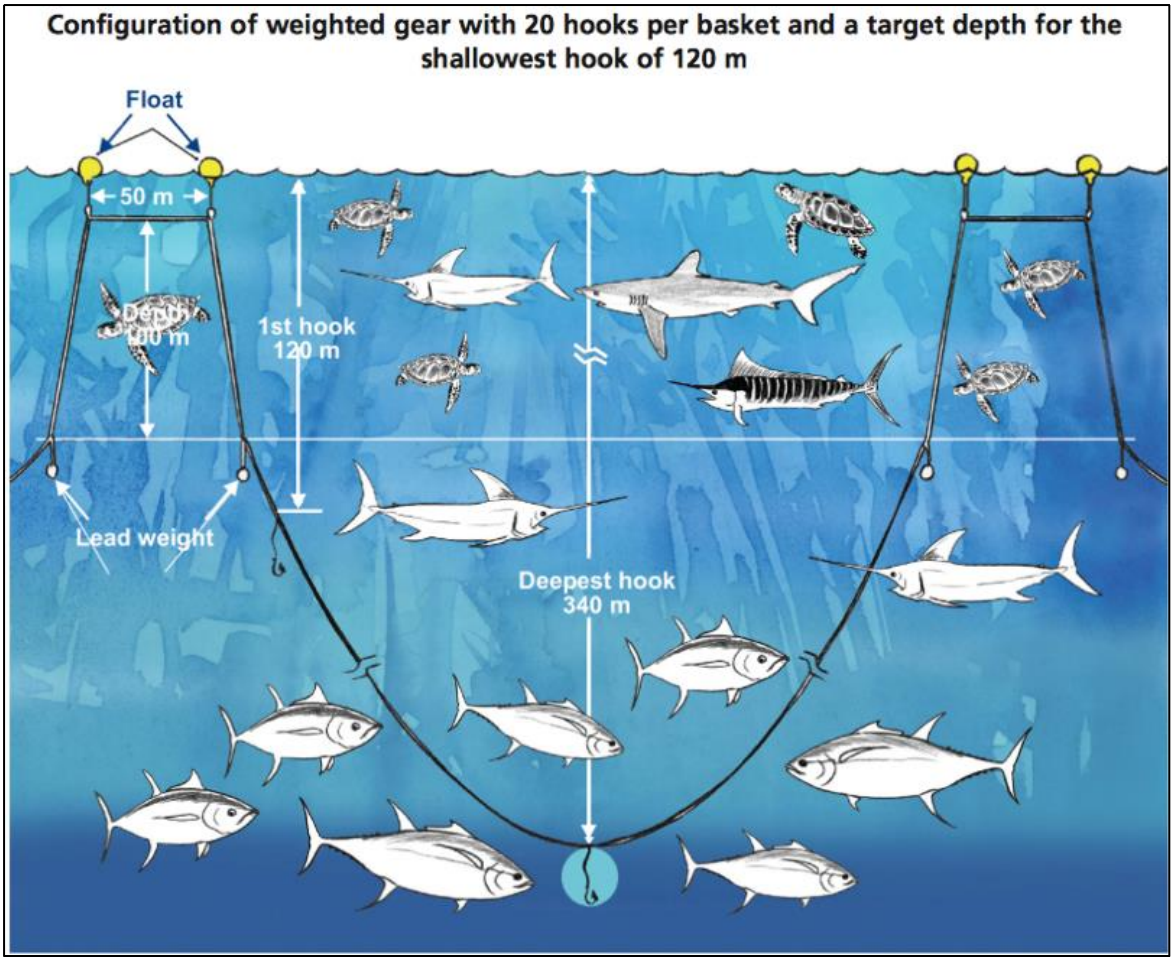
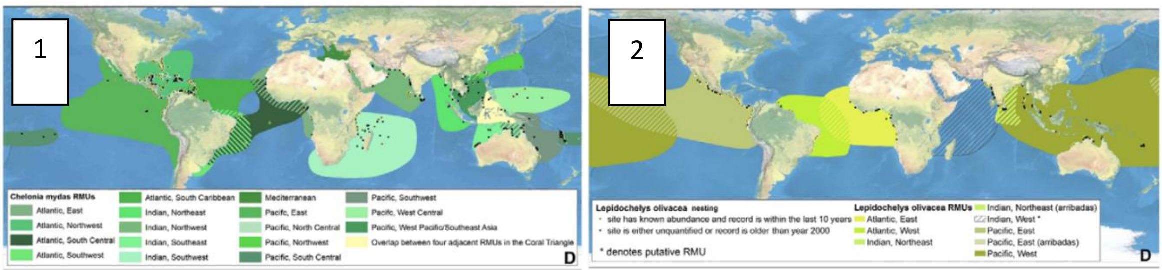


Figure 34. Diagram of example of deep-set longline gear to avoid turtle interactions, no hook is above 100 m. Source: Clarke et al. (2014)**.**

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 several RMUs for five marine turtles as shown in Figure 35 (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). According to the ABNJ (2017) report, the distribution area of four of these five turtles including leatherback, olive ridley, loggerhead and green turtles overlaps with 59.1 %, 60.6 %, 59.7 % and 66 % respectively of the WCPFC Convention Area.



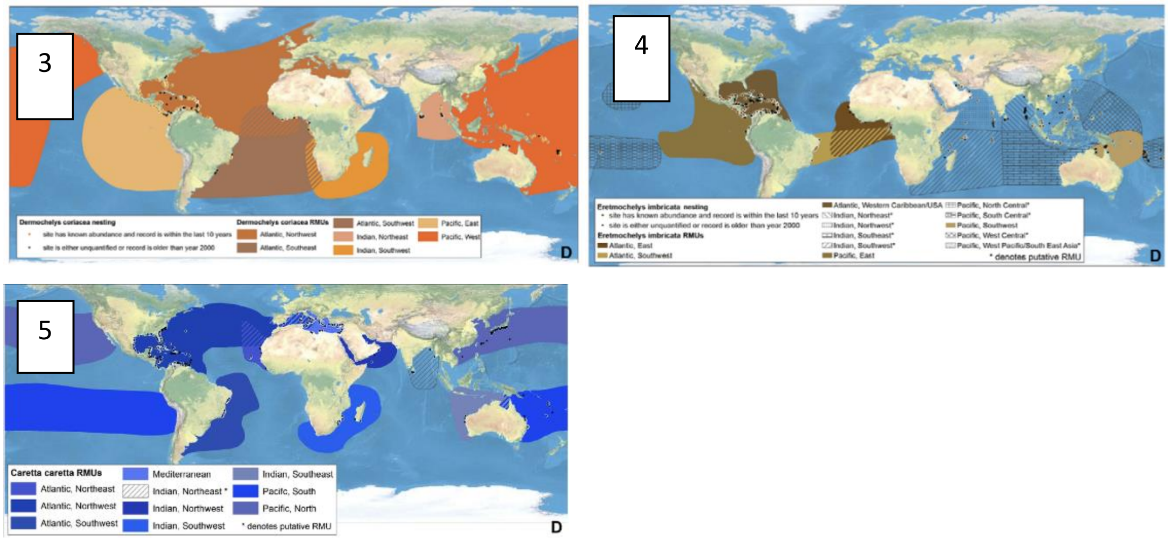


Figure 35. Sea turtle Regional Management Units according to Wallace et al. (2010)**. The fishery under assessment overlaps with the *Chelonia mydas* Pacific west central and Pacific southwest RMU (1), *Lepidochelys olivacea* Pacific west and Pacific east RMU (2), *Dermochelys coriacea* Pacific west RMU (3), *Eretmochelys imbricata* Pacific south central, Pacific west central and southwest RMU (4), *Caretta caretta* Pacific south RMU (5).**

Wallace et al. (2011) assessed the risk level and threats to marine turtles within these RMUs. This was based on the risk of 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. (2013) further evaluated the relative bycatch rates across longline, net and trawl fisheries to determine bycatch impact scores, which integrated information on bycatch rates, fishing effort, mortality rates, and body sizes (i.e. proxies for reproductive values) of turtles taken as bycatch—as well as mortality rates. In this study it was noted that 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 is likely to 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, threat levels and bycatch impact for each relevant RMU is shown in Table 24. The olive ridley turtle in Pacific East RMU ranked at high risk of longline bycatch, while all other RMUs for each species were considered either medium or low risk (Wallace et al. 2013). Specific ETP marine turtle species are discussed further in the ETP species outcome rationales (PI 2.3.1).

Table 24. Sea turtle Regional Management Units (RMU) that overlap with the UoAs (from Wallace et al. (2010)**) and their risk and threat level (from** Wallace et al. (2011)**) and their longline bycatch impact (from** Wallace et al. (2013)**) and IUCN Red List Status.**

Species	Scientific name	RMU	RMU Risk and Threat	RMU Bycatch Impact	IUCN Red List Status
Green turtle	*Chelonia mydas*	Pacific West Central and Pacific Southwest	Low Risk Low Threat	Low Bycatch Impact	Endangered

Species	Scientific name	RMU	RMU Risk and Threat	RMU Bycatch Impact	IUCN Red List Status
Olive ridley turtle	*Lepidochelys olivacea*	Pacific East and Pacific West	Low Risk High Threat	High Bycatch Impact (Pacific East) Medium Bycatch Impact (Pacific West	Vulnerable
Leatherback turtle	*Dermochelys coriacea*	Pacific West	High Risk Low Threat	Medium Bycatch Impact	Critically Endangered (West Pacific subpopulation)
Hawksbill turtle	*Eretmochelys imbricata*	Pacific Southwest, Pacific West Central and Pacific South Central	High Risk High Threat	Low Bycatch Impact (Pacific West Central) N/A Bycatch Impact (Pacific Southwest) Low Bycatch Impact (Pacific South Central)	Critically Endangered
Loggerhead turtle	*Caretta caretta*	Pacific South (Partial overlap)	High Risk High Threat	Medium Bycatch Impact	Critically Endangered (South Pacific subpopulation)

Given the vulnerability of marine turtles to commercial fishing operations, the WCPFC has also implemented CMM 2018-04 to specifically address marine turtle bycatch while fishing within the Convention Area. The Republic of Korea vessels also fully implements the FAO Sea Turtle Guidelines (http://www.fao.org/3/i0725e/i0725e00.htm). UoA-specific management of marine turtle bycatch is to be discussed at the site visit.

CMM 2018-04 recognises that the marine turtles in the WCPFC Convention Area are threatened or critically endangered and aims to introduce measures in the high seas and EEZs of the Convention Area to reduce sea turtle bycatch and mortality. CMM 2018-04 states *inter alia* the following as applicable to longline vessels:

- CCMs will implement, as appropriate the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations and ensure the safe handling of all captured sea turtles, in order to improve their survival.
- CCMs shall require fishermen on vessels targeting species covered by the Convention to bring aboard, if practicable, any captured hard-shell sea turtle that is comatose or inactive as soon as possible and foster its recovery, including giving it resuscitation, before returning it to the water. CCMs shall ensure that fishermen are aware of and use proper mitigation and handling techniques, as described in WCPFC guidelines.
- CCMs with longline vessels that fish in the Convention Area shall ensure that operators of all longline vessels carry and use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled, and that they do so in accordance with WCPFC guidelines. CCMs shall also ensure that operators of such vessels are, where appropriate, required to carry and use dip-nets in accordance with these WCPFC guidelines.

- Shallow setting longline vessels need to ensure that while they are fishing in the Convention Area they employ or implement at least one of the following three methods to mitigate the capture of sea turtles:
  - Use only large circle hooks;
  - Use only finfish for bait; or
  - Use any other measure, mitigation plan or activity that has been reviewed by the SC and TCC and approved by the Commission to be capable of reducing the interaction rate of turtles in shallow-set longline fisheries.
- The requirements outlined in the paragraph above are not applied to those shallow-set longline fisheries determined by the SC, (based on information provided by the relevant CCM), to have minimal levels of observed interaction rates of sea turtles over a three-year period and a level of observer coverage of at least 10 % during each of those three years. Furthermore, for the purpose of implementing this provision, CCMs must establish and enforce their own definitions of shallow-set longline fisheries, large circle hooks, and any measures outlined above or adopted by the Commission ensuring that they are as enforceable as possible, and report these definitions to the Commission in Part 2 of their annual reports.
- For longline vessels to record all incidents involving sea turtles during fishing operations and report such incidents to the appropriate authorities of the CCM and in their annual reporting of Scientific Data to the Commission.
- CCMs with longline fisheries other than shallow-set fisheries are urged to undertake research trials of circle hooks and other mitigation methods in those longline fisheries.

5.8.3.3 Seabirds

There was only one reported interaction with a seabird (sooty albatross) by at-sea observers between 2018 and 2020. The average annual scaled-up estimate of this in numbers between 2018 and 2020 was 5 individuals (Table 23). It seems likely that this reported interaction was a misidentification, as the WCPFC Convention Area is outside the core foraging range for this species (see ACAP (2012)). The sooty albatross is known to breed off Antarctica on Prince Edward and Marion Islands (South Africa), Iles Kerguelen, Iles Crozet, Ile Amsterdam and Ile Saint Paul (France), as well as Gough and Tristan da Cunha Islands (United Kingdom) (ACAP, 2012). Its pelagic distribution is mainly between 30°S and 60°S in the southern Indian and Atlantic Oceans, with a southern limit of c. 65°S near Antarctica and a northern limit of c. 20°S (ACAP, 2012).

According to the at-sea observer data, the UoA fleet in the period 2018 to 2020 has been operating in the tropical waters of the WCPO between >= 10°S and < 10°N, which is considered a low-risk area for seabird interactions (Figure 36) and likely explains why there was only one recorded individual across all observed trips. Furthermore, given that the distributions of albatrosses and large petrels, (which are the main vulnerable species susceptible to capture in pelagic longline fisheries), occur poleward of 20 degrees latitude in both hemispheres, it is unlikely that this fishery overlaps with these species. However, the team considered potential impacts of this fishery on vulnerable seabird species on a precautionary basis given the low level of at-sea observer coverage.

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 36. It is evident on this map that this fishery operates in a low-risk area for seabird interactions.

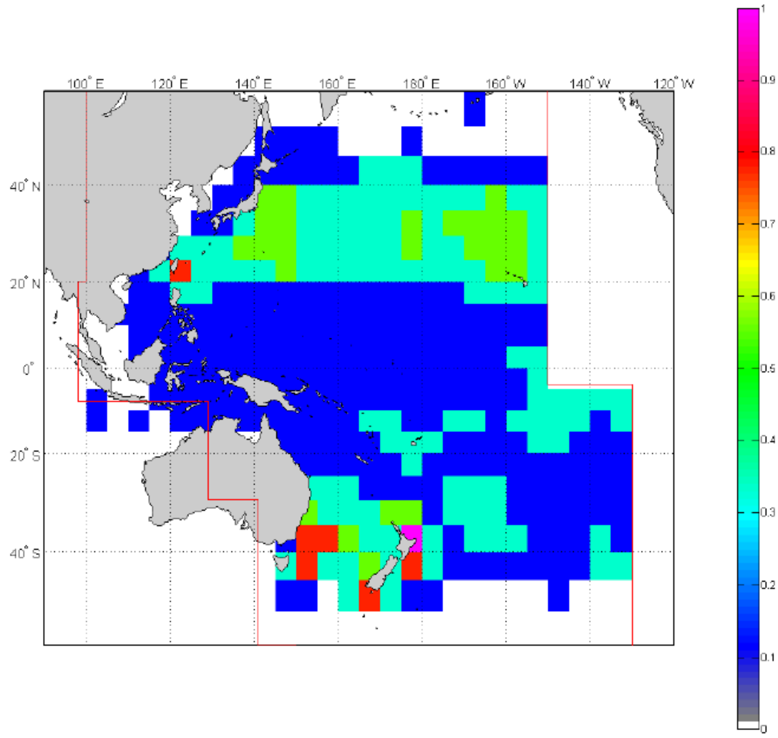


Figure 36. Areas of likely species-level effects of fishing in the WCPFC Convention Area. Highest risk areas - pink, Medium-high - orange; Medium – green; Medium-low – pale blue; Low – dark blue; Negligible risk – White. Map adapted from Filippi et al. (2010)**.**

In an assessment of annual mortalities of seabirds in longline and purse seine fisheries between 2015 to 2018, Peatman et al. (2019) fitted bycatch per unit effort (BPUE) and catch condition models for seabirds to obtain a "best estimate" of total seabird mortality for three regions: (i) the north Pacific - the region north of 10°N; (ii) south Pacific - the region south of 25°S; and (iii) the equatorial Pacific - the region between 10°N and 25°S. Estimated longline seabird bycatch from 2015 to 2018 was between 14,700 – 20,600 individuals per year (95 % CIs ranging from 12,000 to 28,600). A total of 65 % were accounted for by longline fisheries north of 20°N, with 23% accounted for by longline fisheries south of 30°S. The remainder was accounted for by fishing between 25°S and 25°N (9 %), and between 25°S and 30°S (4 %). The majority of bycatch was estimated to be dead at-vessel, with estimates of mortality ranging from 13,000 to 19,000 individuals per year (95 % CIs ranging from 10,800 to 25,000). It was noted that the proportions dead at vessel were relatively low for the region between 25°S and 20°N (75 %), compared to fishing elsewhere (95 %). This provides further evidence that the UoAs are operating in a low-risk area for seabird interactions.

The Republic of Korea has developed a National Plan of Action (NPOA) for Seabirds, which has been implemented since 2014 and available here: http://www.fao.org/3/CA2699EN/ca2699en.pdf. UoA-specific management of seabird bycatch is to be discussed at the site visit. The WCPFC has also implemented CMM 2018-03 to specifically address seabird bycatch, while fishing within the Convention Area. It is important to note, however, that the seabird mitigation measures set forth in CMM 2018-03 only apply to longline fisheries operating South of 30°S, between 25°S and 30°S, and North of 23°N; and therefore, they do not apply to the UoA fleet. Longline fisheries operating in 'other areas' (between 25°S and 23°N), where necessary, are encouraged to employ one or more of the seabird mitigation measures listed in Table 1 of the CMM (See Table 25). However, this clause in CMM 2018-03 is not enforceable.

Table 25. Seabird mitigation measures as detailed in WCPFC CMM 2018-03.

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
Hook-shielding devices	

5.8.3.4 Cetaceans

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., 2007; Anderson, 2014; Williams et al., 2021). Although relative to other fishing gear, 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)). An investigation of observer-reported cetacean interactions in the WCPFC for the period 2015-2020 by Williams et al. (2020b; 2021) identified that in longline fisheries the top five interactions (based on frequency of interactions per 100 sets) were false killer whale (*Pseudorca crassidens*), toothed whales, and several species of oceanic dolphins (bottlenose, rough-toothed and Risso's) (See Figures 12 to 16). For all reported interactions 95 % were sightings beside the vessel without interacting with the gear and for the 5 % that did interact with the gear, around 84 % of individuals were released alive (Williams et al., 2021).

No interactions with cetaceans were observed in the at-sea observer data from the UoA fleet between 2018 and 2020. Consequently, they were not considered as a scoring element in the ETP outcome and management performance indicators (i.e., PI 2.3.1 and 2.3.2). However, the ability of the observer programme to identify potential interactions with cetaceans was considered in the scoring of PI 2.3.3 (ETP species information).

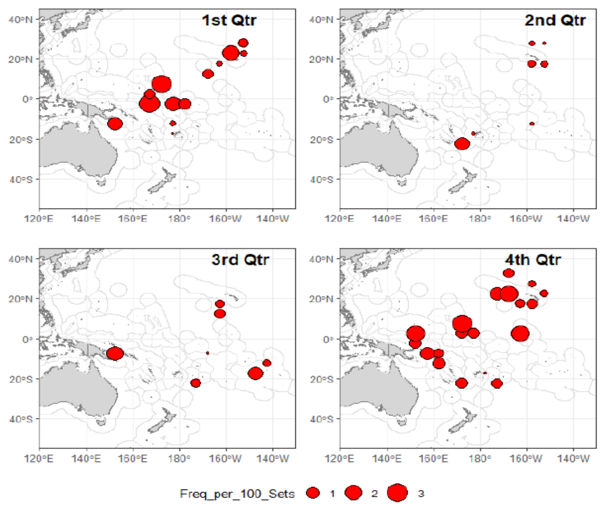


Figure 37. Interactions (frequency per 100 sets) with killer whales in the WCPFC longline fishery between 2015-2020. Adapted from Williams et al. (2020b).

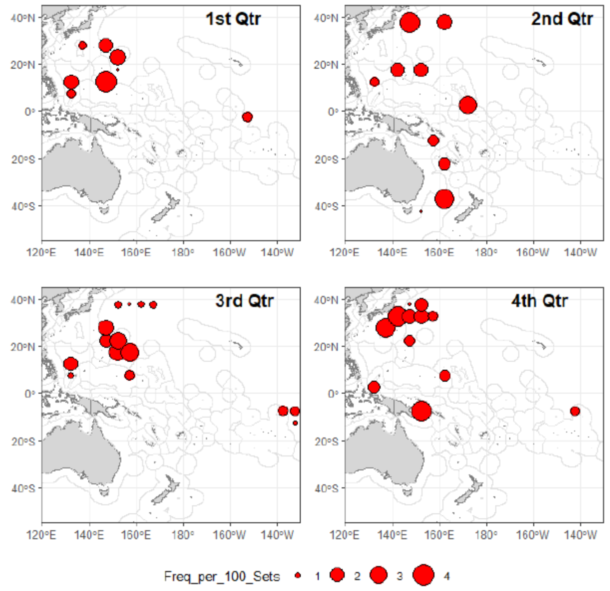


Figure 38. Interactions (frequency per 100 sets) with toothed whales in the WCPFC longline fishery between 2015-2019. Adapted from Williams et al. (2020b).

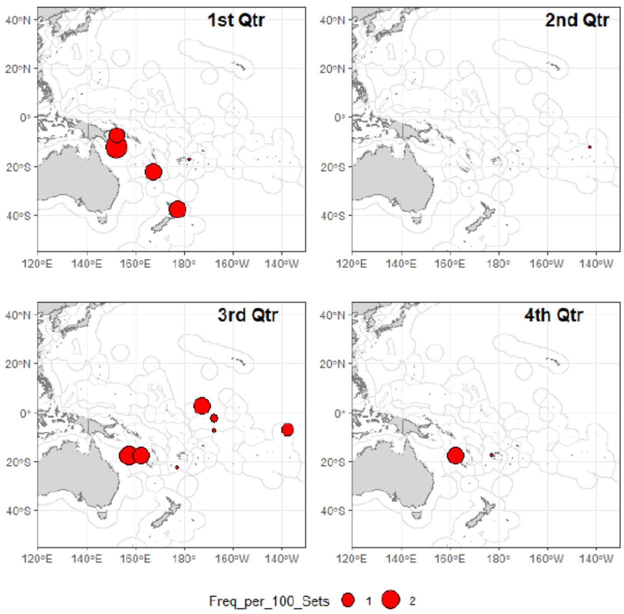


Figure 39. Interactions (frequency per 100 sets) with short-finned pilot whales in the WCPFC longline fishery between 2015-2019. Adapted from Williams et al. (2020b).

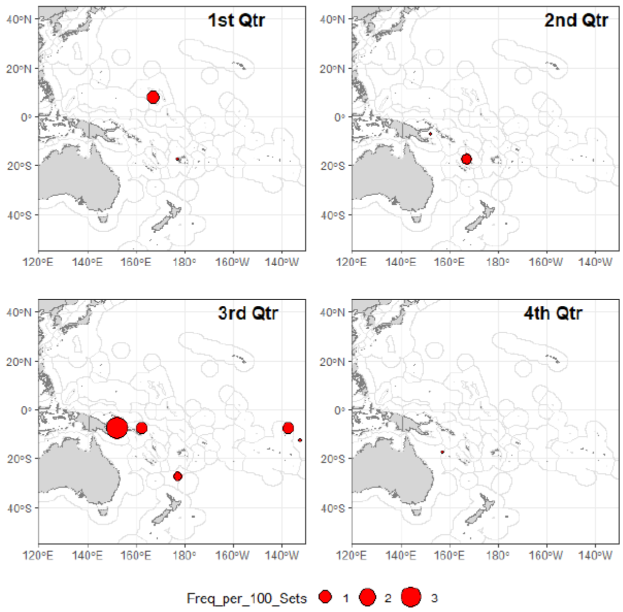


Figure 40. Interactions (frequency per 100 sets) with melon-headed whales in the WCPFC longline fishery between 2015-2019. Adapted from Williams et al. (2020b).

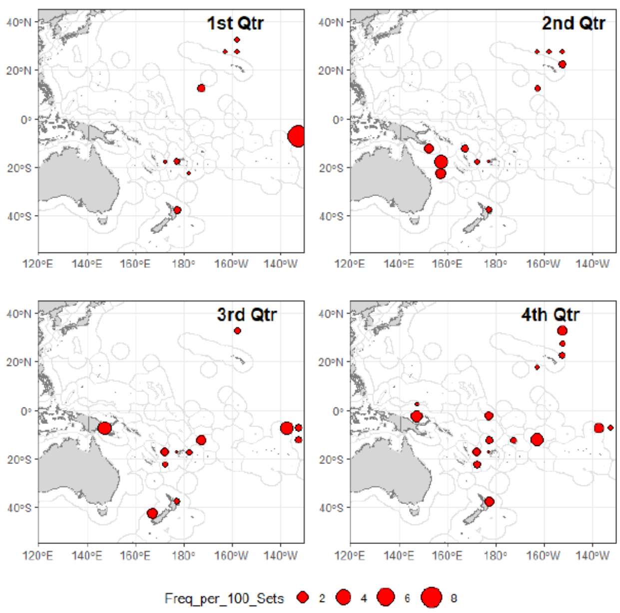


Figure 41. Interactions (frequency per 100 sets) with oceanic dolphins in the WCPFC longline fishery between 2015-2019. Adapted from Williams et al. (2020b).

5.8.4 Habitats

The habitat under consideration in this assessment is the tropical pelagic Pacific Ocean.

The MSC FCR v2.01 requires habitats interacting with the fishery to be defined as 'commonly-encountered', 'VME' or 'minor', with definitions as given in

Table 26.

Table 26. Habitat definitions as per the MSC Fisheries Certification Requirements v2.01.

FCR reference	Definition
SA3.13.3.1	A commonly encountered habitat shall be defined as a habitat that regularly comes into contact with a gear used by the UoA, considering the spatial (geographical) overlap of fishing effort with the habitat's range within the management area(s) covered by the governance body(s) relevant to the UoA.
SA3.13.3.2	A Vulnerable Marine Ecosystem (VME) shall be defined as is done in paragraph 42 subparagraphs (i)-(v) of the FAO Guidelines (definition provided in GSA3.13.3.2). This definition shall be applied both inside and outside EEZs and irrespective of depth.
GSA3.13.3.2	VMEs have one or more of the following characteristics, as defined in paragraph 42 of the FAO Guidelines: Uniqueness or rarity – an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems Functional significance of the habitat – discrete areas or habitats that are necessary for survival, function, spawning/ reproduction, or recovery of fish stocks; for particular life-history stages (e.g., nursery grounds, rearing areas); or for ETP species Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities Life-history traits of component species that make recovery difficult – ecosystems that are characterised by populations or assemblages of species that are slow growing, are slow maturing, have low or unpredictable recruitment, and/or are long lived Structural complexity – an ecosystem that is characterised by complex physical structures created by significant concentrations of biotic and abiotic features
N/a	Minor habitats are those that do not meet the above definitions.

All of the UoAs fishing operations in the WCPO occur in pelagic waters and gear is not expected to contact with any substrata (seafloor, seamount, corals, etc.), nor do they have any impact on any physical habitat during operations. As such, the water column (epipelagic zone) is the only habitat to be considered potentially impacted and it is not considered a Vulnerable Marine Ecosystem (VME) but is considered under Section 6.7.5.

A single set by vessels in the client fleet usually consists of a mainline that is 90 to 110 km line in length, with *ca*. 20 - 50 m branchlines attached at intervals along the length of the line. The distance between floats is about 1km. The depth of the shallowest hook is at approx. 100m and deepest hook at about 300m. There are usually more than 20 hooks deployed between floats (to be confirmed by the client). The lines are designed only for use in the water column, and do not come into contact with the seabed. Therefore, the UoA fleet is confined mostly to operating in the epipelagic habitat (top 200m of the water column).

The issue of unobserved mortality due to ghost fishing caused by discarded or lost fishing gear (monofilament line and hooks) needs to be considered. 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 in logbooks or by at-sea observers. Therefore, gear loss expressed as mainline, branchline and hook replacements, as well as gear marking (e.g., the use of radio buoys) will need to be discussed further at the site visit.

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).

Furthermore, under CMM 2017-04, CCMs are required to 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.

5.8.5 Ecosystem

The UoA fleet is operating across different ecological provinces in the tropical areas of the Pacific Ocean (Figure 42) including in the Western Pacific Warm Pool (Warm Pool) and the Pacific Equatorial Divergence (PEQD). The Warm Pool, which represents the western boundary of the South Pacific Subtropical Gyre is characterised by low salinity, low nitrates, low macronutrients and therefore low primary productivity, but is where the majority of tuna in the Pacific Ocean is caught. Le Borgne et al. (2011) discuss how in the PEQD, nutrient-rich water is brought to the surface from the Equatorial Undercurrent (EUC) and is carried poleward until sinking occurs at the convergences between the South Equatorial Current (SEC) and South Equatorial Counter Current (SECC), and with the SEC and North Equatorial Counter Current (NECC). The SEC further carries the water from the EUC upwelling to the west, where they meet with the Warm Pool. Along with the water converging between the PEQD and Warm Pool, there is also a transfer of phytoplankton and other particles.

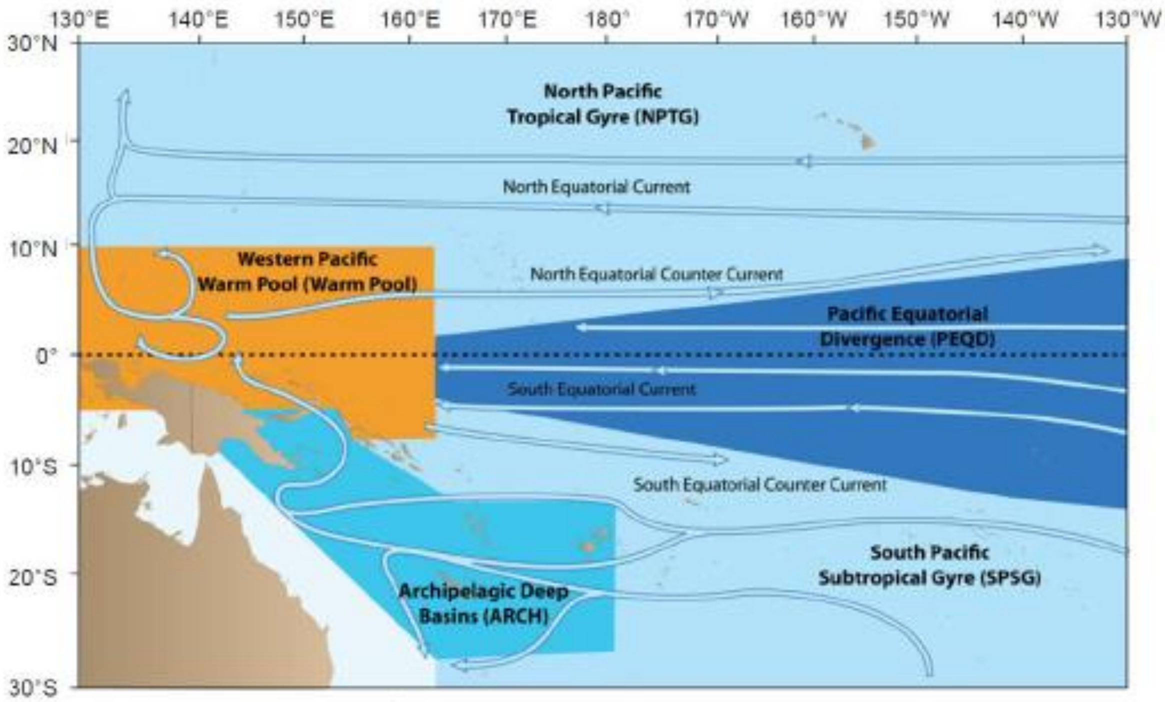


Figure 42. The five ecological provinces of the tropical Pacific Ocean. According to the at-sea observer data the UoA fleet is operating mainly within the Western Pacific Warm Pool (Warm Pool) and the Pacific Equatorial Divergence (PEQD). Source: Le Borgne et al. (2011)**.**

In addition to the flux between the PEQD and Warm Pool, the equatorial Pacific Ocean is strongly influenced by the El Niño Southern Oscillation (ENSO), which is the main cause of variability in both environmental factors such as sea surface temperatures, and the spatial distribution of tuna (Lehodey, 2001). El Niño events in the central (and eastern) tropical Pacific are typically associated with decreases in primary productivity, which corresponds to increases in productivity in the western tropical Pacific (Brainard et al., 2018). El Niño events have been documented to cause a cessation of upwelling, leading to extended periods of low chlorophyll-*a*, and heightened sea surface temperatures Pacific (Brainard et al., 2018) causing tuna to migrate to the east in El Niño years (Lehodey et al., 1997) and has been linked to significant variations in tuna catches throughout the tropical Pacific (Lehodey et al., 1997).

In the Pacific Ocean, exploited tuna populations have declined steadily to levels near the equilibrium biomass that is likely to produce MSY for each stock (See https://www.wcpfc.int/current-stock-status-and-advice). The impacts of this fishery under assessment on primary and secondary species, ETP species as well as habitats have all been considered and described in earlier sections of this report with further information available in the Ecosystem scoring tables. However, other risks exist, and further impacts of the fishery may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function. All the target species in this fishery (albacore, yellowfin and bigeye tuna) are considered second tier, high-level trophic predators, all of which are opportunistic carnivores with high degrees of trophic interaction and diet overlap (Kitchell et al., 1999). They therefore play an ecologically important role in the food chain and influence the overarching ecosystem structure and function (Cox et al., 2002; Sibert, Hampton, Kleiber, & Maunder, 2006, as referenced in Erauskin-Extramiana et al. (2019)). The "Warm Pool" Ecosim simulation by Allain et al. (2007) highlighted bigeye, yellowfin and other top predators' vulnerability to fishing, with biomass increasing dramatically in the simulation which removed all fishing pressure. Allain et al. (2012) later 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.

Given the likelihood that industrial tuna fisheries have altered the structure and function of the ecosystem in the WCPO through the removal of key predator species, it is important to determine how much could be removed before cascading effects occur and whether there are clear thresholds for large-scale ecosystem transformations (Baum and Worm, 2009). The assessment team therefore considered the stock biomass in relation to the point of recruitment impairment (PRI), MSY and any other relevant target and limit reference points to inform the likelihood of irreversible ecosystem impacts occurring. It is also important to note that there is evidence to suggest that ecosystem impacts caused by commercial fishing are not serious or irreversible. For example, Allain et al. (2007) found that most species rebuilt to virgin biomass after five years of no fishing.

5.8.6 Cumulative impacts

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

- For primary species, cumulative impacts assess whether the collective impact of overlapping MSC fisheries are hindering the recovery of 'main' primary species that are below a point of recruitment impairment (PRI); i.e. ensuring that the combined impact of MSC fisheries are not harming the recovery of the stock; if relevant this is scored at PI 2.1.1 SIa SG80.

- For secondary species, the same intent applies when a species is below a biologically based limit, but only in cases where two or more MSC fisheries have ‘main’ catches that are ‘considerable’, defined as a species being ten per cent or more of the total catch; if relevant this is scored at PI 2.2.1 SIa SG80.
- For ETP species, the combined impacts of MSC fisheries on all ETP species needs to be evaluated, but only in cases where either national and/or international requirements set catch limits for ETP species and only for those fisheries subject to the same national legislation or within the area of the same binding agreement’; if relevant this is scored at PI 2.3.1 SIa SG80.
- For habitats, in contrast, cumulative impacts are evaluated in the management PI (PI 2.4.2). The requirements here aim to ensure that the impacts of all fisheries (including non-MSC fisheries) on habitats, including vulnerable marine ecosystems (VMEs), are managed cumulatively to ensure serious and irreversible harm does not occur; this is scored for all fisheries and habitat types at SIa SG100. If relevant, there is also consideration of the UoA’s compliance with VME management measures established by other fisheries at SId SG80.

The results of the cumulative impact analysis for this fishery are found below in Table 27.

Table 27. Cumulative impact assessment for overlapping MSC fisheries

<table>
<tr><th>Outcome PI</th><th>Element</th><th>Cumulative impact?</th><th>Rationale</th></tr>
<tr><td rowspan="7">Primary species (main)</td><td>WCPO yellowfin tuna</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>WCPO bigeye tuna</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>South Pacific albacore tuna</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>North Pacific albacore tuna</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>Argentine shortfin squid</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>South American pilchard (Japanese Pacific)</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>South American pilchard (Japanese Tsushima)</td><td>Yes</td><td>Below PRI; cumulative impact assessment triggered</td></tr>
<tr><td rowspan="4">Secondary species (main)</td><td>Pacific blue marlin</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>Blue shark</td><td>No</td><td>Not below PRI</td></tr>
<tr><td>Amberstripe scad</td><td>No</td><td>Not below PRI, based on PSA result (preliminary scoring)</td></tr>
<tr><td>Indian oil sardine</td><td>Yes</td><td>Below PRI, based on PSA result (preliminary scoring)</td></tr>
<tr><td rowspan="6">ETP species</td><td>Green turtle</td><td>No</td><td rowspan="5">There are currently no national and/or international requirements setting catch limits for marine turtles in the WCPO. No retention policy does not constitute a “limit</td></tr>
<tr><td>Olive ridley turtle</td><td>No</td></tr>
<tr><td>Leatherback turtle</td><td>No</td></tr>
<tr><td>Hawksbill turtle</td><td>No</td></tr>
<tr><td>Loggerhead turtle</td><td>No</td></tr>
<tr><td>Sooty albatross</td><td>No</td><td>No limit in place</td></tr>
</table>

Outcome PI	Element	Cumulative impact?	Rationale
	Silky shark	No	No limit in place
	Oceanic whitetip shark	No	No limit in place
	Giant manta ray	No	No limit in place
	Manta rays	No	No limit in place
	Reef manta ray	No	No limit in place
	Rays and skates	No	No limit in place
Habitats	N/A	N/A	This fishery does not interact with any benthic habitats

5.8.7 Scoring elements

Table 28. Principle 2 scoring elements

Component	Scoring elements	Designation	Data-deficient
Primary species	Western Central Pacific yellowfin	Main	No
	Western Central Pacific bigeye	Main	No
	South Pacific albacore	Main	No
	North Pacific albacore	Main	No
	South American Pilchard (Japanese Pacific)	Main	No
	South American Pilchard (Japanese Tsushima)	Main	No
	Western Central Pacific Skipjack	Minor	No
	Southwest Pacific Swordfish	Minor	No
	Argentine shortfin squid	Minor	No
Secondary species	Pacific Blue Marlin	Main	No
	Blue Shark	Main	No
	Indian Oil Sardine	Main	Yes (RBF applied)
	Amberstripe Scad	Main	Yes (RBF applied)
	See Table 21	Minor	Some, although no RBF applied which caps the score at 80.
ETP species	Green turtle	N/a	No
	Olive ridley turtle	N/a	No
	Leatherback turtle	N/a	No
	Hawksbill turtle	N/a	No
	Loggerhead turtle	N/a	No
	Sooty albatross	N/a	No

	Silky shark	N/a	No
	Oceanic whitetip shark	N/a	No
	Giant manta ray	N/a	No
	Manta rays	N/a	No
	Reef manta ray	N/a	No
	Rays and skates	N/a	No
Habitats	Water column (epipelagic habitat)	Commonly encountered	No

5.8.8 Principle 2 Performance Indicator scores and rationales

Scoring table 25. PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guide post	Main primary species are **likely** to be above the PRI. OR If the species is below the PRI, the UoA has measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI. OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	All scoring elements – Yes	All scoring elements – Yes	WCPO yellowfin – Yes WCPO bigeye – No SP Albacore – Yes NP Albacore – No SA pilchard (Japanese Pacific) – No SA pilchard (Japanese Tsushima) – No

Rationale

Based on the scaled average observer values, logbook and bait data, the main primary species in this assessment include WCPO yellowfin, WCPO bigeye and SP and NP albacore tuna and South American pilchard. The tuna species are included here as SA 3.1.3.1 requires that primary species in Principle 2 must be assigned to species in the catch that are not covered under Principle 1 because they are not included in the UoAs.

WCPO bigeye, yellowfin tuna and SP and NP albacore

- WCPO bigeye tuna – see Section 6.5.4 and commentary under PI1.1.1 scoring. **SG60 and SG80 are met; SG100 is not met.**
- WCPO yellowfin tuna - see Section 6.4.4 and commentary under PI1.1.1 scoring. **SG60, SG80 and SG100 are met**.
- SP albacore tuna – see Section 6.6.4 and commentary under PI1.1.1 scoring. **SG60, SG80 and SG100 are met**.
- NP albacore tuna - see Section 6.7.4 and commentary under PI1.1.1 scoring. **SG60 and SG80 are met; SG100 is not met.**

South American pilchard (Japanese Pacific and Tsushima stocks)

This species is made up of two stocks (Kuroshio, or Pacific Ocean, and Tsushima, or East Chinese Sea and Japan Sea). According to the information provided by the client the bait is being supplied mainly from Japan and China/Indonesia who harvest South American Pilchard. Need to determine what specific stock the client is sourcing bait from if possible.

Both stocks are assessed annually by the Fisheries Research and Education Agency of Japan (FRA) and are managed through a TAC, termed allowable biological catches (ABCs). To determine stock status, assessment scientists use cohort analysis to estimate biomasses at age and evaluate spawning stock biomass (SSB) against a target reference point (TRP) aiming to achieve MSY (SSB_{MSY}) set at 1,187,000 t (Pacific stock) and 1,093,000 t (Tsushima stock) with the respective limit reference points (LRPs) set at 60% of MSY. This LRP was the estimated SSB level below which recruitment is thought to be poor (Yukami et al., 2017) - i.e. this is a suitable proxy for the PRI.

The latest assessment conducted for the **Pacific stock** was in 2020 (FRA, 2020a). The catch in 2019 was 521,000 t, which was an increase from 451,000 t in 2018 (FRA, 2020a). It is evident that in many early years fishing mortality (F) exceeded F_{MSY} at which SSB_{MSY} is achieved but in recent years has decreased to less than or equal to F_{MSY} (1.01 in 2019 -F_{2019}/F_{MSY}), resulting in the spawning stock biomass increasing and exceeding SSB_{MSY} since 2017 (1.33 in 2019 -SSB_{2019}/SSB_{MSY}) (see Figure 29). Trends in spawning stock biomass suggest the stock is increasing (FRA, 2020a). This provides confidence that the stock is highly likely above biologically based limits such **that SG60 and SG80 are met**. Projections indicate a 60 % probability that the stock will remain near the TRP by 2031 if fishing mortality remains around 0.80 F_{MSY} (FRA, 2020a). Given current (2019) fishing mortality is above 0.80 F_{MSY} and the population dynamics of this stock, particularly recruitment, are strongly linked to oceanographic variables, which fluctuate on decadal timescales, there is not a high degree of certainty that the SSB will fluctuate around a level consistent with MSY and the TRP. **SG100 is not met**.

The latest assessment conducted for the **Tsushima stock** was in 2020 (FRA, 2020b). The catch in 2019 was estimated at 14,000 t, a decrease from 71,000 t in 2018. It is evident that in many years fishing mortality (F) exceeded F_{MSY} at which SSB_{MSY} is achieved and as a result the level of spawning stock is currently lower than that to achieve MSY (0.18 in 2019 SSB_{2019}/SSB_{MSY}). Trends in spawning stock biomass suggest it has remained at low levels since 1994 (FRA, 2020b). Thus, the stock is currently below the PRI and the first part of SG60 and SG80 is therefore not met. Fishing mortality has been slightly higher than F_{MSY} in recent years but declined to a level significantly lower than F_{MSY} in 2019 (0.19 in 2019 -F2019/F_{MSY}) (See Figure 30). As outlined by GSA 3.4.6 this is an indication of "evidence of recovery". However, for P2 primary species, at the SG80 level, the assessment team needs to "evaluate whether the cumulative impact of overlapping MSC UoAs hinders the recovery of "main" primary species." Other MSC UoAs which classified this bait as a main species include the Kiribati albacore, bigeye, and yellowfin tuna longline fishery (Gascoigne et al., 2021) and Owasebussan Co. Ltd. North Pacific longline for albacore, yellowfin & bigeye tuna (DiNardo et al., 2021).

Average annual bait use between 2016 and 2018 was 278 t in this fishery under assessment, while DiNardo et al. (2021) reported bait use of 19.9 t annually and Gascoigne et al. (2021) reported bait use at around 185-241 t annually (this is to be confirmed at the site visit). Assuming this all came from the Tsushima stock this comes out at less than

4 % of the total catch in 2019. This is below the 30 % guideline set by the MSC for determining if the UoA combined catches are hindering recovery in a marginal sense under GSA 3.4.6. **SG60 and SG80 are met**. However, because the stock is below the PRI, **SG100 is not met**. Note: this scoring is preliminary until other MSC UoA bait quantities can be verified at the site visit.

In relation to the unobserved mortality of main primary species, the team considered the possible issue of ghost fishing caused by discarded or lost fishing gear (monofilament line and hooks). Gear loss is reportedly minimal (mainly limited to hooks that have been lost to sharks) This conclusion remains to be confirmed. The use of radio beacons and GPS on the mainline mean they are often able to be located even if the mainline breaks when hauling or otherwise. The assessment team therefore concluded that the incidence of gear loss is rare. This conclusion remains to be confirmed. 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 (Macfayden et al., 2009). Under CMM 2017-04, CCMs should 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. It was therefore concluded that unobserved mortality through ghost fishing at the scale of the UoA was highly unlikely to be a significant factor in the fishery's interactions with main primary species to the extent that this will have stock-level effects. This conclusion remains to be confirmed.

b	Minor primary species stock status		
	Guide post		Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?		All scoring elements – Yes

Rationale

Based on the scaled average observer values, logbook and bait data, the minor primary species in this assessment include South Pacific swordfish, skipjack tuna and Argentine shortfin squid. The status for each stock is summarised in the table below. All stocks are above the PRI. **SG100 is therefore met**.

In relation to the unobserved mortality of minor primary species, the team considered the possible issue of ghost fishing caused by discarded or lost fishing gear (monofilament line and hooks). Gear loss is reportedly minimal (mainly limited to hooks that have been lost to sharks) This conclusion remains to be confirmed. The use of radio beacons and GPS on the mainline mean they are often able to be located even if the mainline breaks when hauling or otherwise. The assessment team therefore concluded that the incidence of gear loss is rare. This conclusion remains to be confirmed. 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 (Macfayden et al., 2009).

It was therefore concluded that unobserved mortality through ghost fishing at the scale of the UoA was highly unlikely to be a significant factor in the fishery's interactions with minor primary species to the extent that this will have stock-level effects. This conclusion remains to be confirmed.

Stock	Highly likely to be above PRI?	Evidence that the UoA does not hinder the recovery or rebuilding?	Reference
Argentine shortfin squid	Yes. The management objective is to allow for a sufficient number of spawners to escape to ensure good recruitment the next year (this is set at 40 % and is an appropriate proxy for PRI). The 2019 Falkland Islands stock assessment used a depletion time-series model to identify that the maximum likelihood estimates of Argentine shortfin squid in the survey area decreased from 263,440 t (95 % CI 152,310 to 451,860 t) in week 1 (commencing 1 January 2019) to 57,022 t (15,426 to 123,956 t) in week 22 (ending 31 May, 2019). Assuming the estimated starting biomass (263,440 t) is representative of the entire Argentine shortfin squid, then the 2019 catch of 134,468 t (91,077 t -Argentine fisheries and 43,392 t Falkland Island fisheries) equated to an escapement rate of 49 % (128,972 t). It is therefore above the PRI based on latest information.	N/A	Winter (2019)
Southwest Pacific swordfish	Yes. Latest assessment in 2021 indicates the stock is above both the SB_{MSY} and the biomass LRP (applied to tunas) and recent fishing mortality is below F_{MSY}. Estimates of depletion ($SB/SB_{F=0}$) over the recent period were 0.39 (0.18-0.79 – 10th and 90th percentiles) with a 13 % risk the stock is below $20\%SB_{F=0}$. Recent fishing mortality is estimated to be below F_{MSY} (F_{recent}/F_{MSY} median 0.47; 0.25 – 1.29, 10th and 90th percentiles) with a 20 % risk of F_{recent} exceeding F_{MSY}. The stock is estimated to have spawning potential above the MSY level (SB_{latest}/SB_{MSY} median 2.95; 0.99 – 6.78, 10th and 90th percentiles) with a 10 % risk of SB_{latest} being below SB_{MSY}.	N/A	Ducharme-Barth et al. (2021)
WCPO skipjack	Yes. Latest assessment in 2019 indicates the stock is above the adopted LRP and fished at rates below F_{MSY} with 100 % probability. Estimates of depletion ($SB/SB_{F=0}$) over the recent period 2015-2018 was 0.44 (0.36-0.52 – 80th percentile) for the 8-region model and 0.40 (0.30-0.50 – 80th percentile) for the 5 region model. Fishing mortality (F/F_{MSY}) on the stock averaged *F*=0.44 (0.34-0.61 - 80th percentile) during 2014-2017 for the 8-region model and *F*=0.48 (0.35-0.66 – 80th percentile) for the 5 region model.	N/A	Vincent et al. (2019)

References

DiNardo et al. (2021), Ducharme-Barth et al. (2021), FRA (2020a, 2020b), Gascoigne et al. (2021), Vincent et al. (2019), Winter (2019), Yatsu (2019), Yukami et al. (2017), Macfadyen et al. (2009)

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

Draft scoring range	All UoAs: ≥80
Information gap indicator	More information is required on: - the specific stock of South American pilchard being used as bait: is it Japanese Pacific or Japanese Tsushima? The information provided by client suggests they are sourcing bait from China, Indonesia and Japan. Further information is needed. - Overlapping UoAs to be identified to complete scoring of South American pilchard. - Information regarding gear loss (hooks, mainlines) to be obtained.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 26. PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There **are measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	WCPO yellowfin – Yes WCPO bigeye – Yes SP Albacore – Yes NP Albacore – Yes SA pilchard (Japanese Pacific) – Yes SA pilchard (Japanese Tsushima) – Yes Minor species – Yes (default)	WCPO yellowfin – Yes WCPO bigeye – Yes SP Albacore – Yes NP Albacore – Yes SA pilchard (Japanese Pacific) – No SA pilchard (Japanese Tsushima) – No Minor species – Yes (default)	WCPO yellowfin – Yes WCPO bigeye – Yes SP Albacore – Yes NP Albacore – Yes SA pilchard (Japanese Pacific) – No SA pilchard (Japanese Tsushima) – No Minor species – No

Rationale

In the context of this performance indicator (Source: MSC FCR v2.01; Table SA8):

- "Measures" are actions or tools in place that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere.

- 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.

- 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.

Main primary species are as follows:

- WCPO yellowfin tuna
- WCPO bigeye tuna
- SP albacore tuna
- NP albacore tuna
- South American pilchard (Japanese Pacific and Tsushima stocks)

WCPO bigeye, yellowfin tuna and SP albacore

CMM 2014-06 commits WCPFC to putting in place a formal harvest strategy for its key tuna stocks (WCPO skipjack, yellowfin and bigeye, and SP albacore), with an associated workplan, the latest version of which was drafted in 2020 at WCPFC 17 (See: https://meetings.wcpfc.int/node/11954).

Currently, WCPO yellowfin, skipjack and bigeye are managed through CMM 2018-01 and 2020-01, which is intended as a “bridging measure” while work continues towards a formal harvest strategy (its timeframe was later extended through CMM 2021-01 until 15 February 2024). The objective of CMM 2021-01 for WCPO bigeye and yellowfin are to ensure that (pending agreement on a TRP) the spawning biomass depletion ratio ($SB/SB_{F=0}$) is to be maintained at or above the average $SB/SB_{F=0}$ for 2012-2015. Available HCR and some management tools are set out in 2020-01 (see Sections 6.4.3 and 5.5.3), along with the WCPFC process of monitoring, assessment and management review for each of the stocks. Further information can be found in scoring rationales for PI 1.2.1a. Despite further delays in the timeframe for the adoption of the CMM 2014-06 requirements, all of this can be regarded as a cohesive and strategic arrangement, with an understanding of how it works to achieve an outcome, and which is designed to manage the impact on that component specifically, **SG60, SG80 and SG100 are met**.

Currently, SP albacore is managed through CMM 2015-02 with the objective of ensuring that fishing vessels actively fishing for South Pacific albacore in the Convention Area south of 20°S do not increase above 2005 levels or recent historical (2000-2004) levels. It also sets out (catch and effort) reporting arrangements for CCMs and that the status of the stock is reviewed annually (see Section 5.6.3 for further information). Under the harvest strategy workplan (CMM 2014-06) a TRP was agreed for SP albacore in 2018 set at 56%$SSBcurrent_{F=0}$ with the objective of achieving an 8 % increase in CPUE compared to 2013 levels. **This meets the requirements for SG60 and SG80**. This TRP is also subject to change if revised stock assessments indicate it is not suitable for meeting this objective, which indicates it contains a mechanism for modification in the light of identification of unacceptable impacts. All of this can be regarded as a cohesive and strategic arrangement, with an understanding of how it works to achieve an outcome, and which is designed to manage the impact on that component specifically, **SG100 is met.**

NP Albacore

In 2017, the WCPFC adopted the *Interim harvest strategy framework for North Pacific albacore* with the interim management objective to maintain the biomass around its current level and to ensure there is a low risk of breaching the LRP. The framework establishes a LRP of 20%$SSBcurrent_{F=0}$ with a decision rule, which is consistent with the LRP for the other tropical tunas and SP albacore. The TRP is to be established following a MSE approach (see Section 5.7.3 for further information). Aside from this interim harvest strategy

WCPFC and IATTC 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. In 2019, CMM 2005-03 was replaced by CMM 2019-03, which requires the total level of fishing effort for NP albacore in the Convention Area north of the equator to not be increased beyond current levels and that CCMs take measures to ensure that the level of fishing effort by their vessels is not increased beyond 2002-2004 annual average levels. It also sets out (catch and effort) reporting arrangements for CCMs and that the status of the stock is reviewed annually. CMM-2019-03 recognises the need to adopt a consistent set of CMMs for NP albacore and tasks the WCPFC Executive Director to engage with IATTC to ensure continued harmonisation. All of this can be regarded as a cohesive and strategic arrangement, with an understanding of how it works to achieve an outcome, and which is designed to manage the impact on that component specifically, **SG60, SG80 and SG100 are met.**

South American pilchard (Japanese Pacific and Tsushima stocks)

Based on the information provided, the client is purchasing bait from mainly Japan and China/Indonesia. The relevant fishery as outlined in PI 2.1.1 is the South American pilchard fishery off Japan. It is predominately a Japanese one; however, according to Yatsu (2019), the Pacific stock of Japanese pilchard is targeted by Chinese vessels just outside the Japanese EEZ, near Hokkaido Island. Since this species is purchased from both EEZs, the management in place in both EEZs is discussed below:

Japanese EEZ: Both stocks are assessed annually by the Fisheries Research and Education Agency of Japan (FRA) and are managed through a TAC, termed allowable biological catches (ABCs). Available information suggests the Pacific stock is above the PRI, but the Tsushima stock is below the PRI. Available information suggests these stocks are strongly impacted by environmental variability, in particular the Pacific Decadal Oscillation, which is why the probabilities of the stock remaining near the TRP based on varying levels of fishing mortality are uncertain. A harvest strategy is in place to manage these stocks to a TRP of SSB_{MSY} with LRPs set at 60 % of MSY. This LRP was the estimated SSB level below which recruitment is thought to be poor (Yukami et al., 2017). Furthermore, if the SSB is below a reference point set at 10 % of MSY a fishing moratorium or other measures to ensure similar effect are imposed (Yatsu, 2019). Annual projections are undertaken to determine the probability of being near the TRP based on alternative levels of fishing mortality.

Chinese EEZ: As far as the team are aware there is no management in place to limit catches of the Japanese Pacific stock by Chinese vessels fishing outside the Japanese EEZ.

A review of bait purchase information indicates that the majority of the bait is being sourced from China/Indonesia (>50 %) so the majority of the stock are caught in a jurisdiction lacking in management measures to ensure the sustainability of the stock. The quantities of this bait used by the UoA fleet annually are negligible (<0.01 %) compared to the overall biomass and landings from these two stocks, constituting a measure that contributes to the UoA not having a significant impact on these stocks. **SG60 is therefore met for both stocks**. Nevertheless, it is not clear that the Client Group has in place a cohesive arrangement that ensures that bait is proactively purchased from sustainable fisheries, particularly considering the poor stock status of the Tsushima stock. The assessment team therefore concluded that a partial strategy is not in place for the UoA that is expected to maintain or not hinder rebuilding of South American pilchard at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery**. SG80 is not met for both stocks**.

Minor primary species are as follows:

- WCPO skipjack tuna
- SW Pacific swordfish

- Argentine shortfin squid

Note that minor species are only considered at the **SG100** level; **SG60 and SG80 are therefore met by default.**

WCPO Skipjack tuna

Currently WCPO skipjack tuna is managed through CMM 2018-01 and 2020-01 (now 2021-01) similar to the other tropical tunas. Under CMM 2015-06 an interim TRP has been introduced, which is set at maintaining the spawning biomass at 50 % of the estimated recent average spawning biomass in the absence of fishing (50% $SB_{F=0}$). There is also a process of monitoring, assessment and management review in place for skipjack tuna through the WCPFC. Similar to the other tuna stocks, **SG100 is met.**

SW Pacific swordfish

Currently SW Pacific swordfish is managed through CMM 2009-03. In the absence of TRP or LRPs and a formal harvest strategy, the team considered the measures in CMM 2009-03 to be insufficient to meet the requirements for **SG100**.

Argentine shortfin squid

Currently Argentine shortfin squid in the Falkland Islands and Argentina is managed through effort controls limiting the length of the fishing season and number of vessels. There is a TRP set, with an aim to ensure a 40 % proportional escapement (this was defined as the ratio of the final stock size after fishing to the final stock size that would have been present in the absence of fishing). While in 2019, the stock assessment indicated that the escapement rate had been adhered to (Winter, 2019), this has not occurred in other years. Furthermore, pre-recruitment surveys have not occurred as often as intended due to disputes within the Argentine Government. In the absence of a formal harvest strategy that contains mechanisms for modification of fishing practices in light of the identification of unacceptable impacts (i.e., ensuring the escapement rate is adhered to) or any further information to suggest this is in place, the team considered the measures to be insufficient to meet the requirements for **SG100**.

In conclusion, **SG100 is not met for minor species overall**.

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 – Yes WCPO bigeye – Yes SP Albacore – Yes	WCPO yellowfin – Yes WCPO bigeye – Yes SP Albacore – Yes	WCPO yellowfin – No WCPO bigeye – No SP Albacore – No

	NP Albacore – Yes SA pilchard (Japanese Pacific) – Yes SA pilchard (Japanese Tsushima) – Yes Minor species – Yes (default)	NP Albacore – Yes SA pilchard (Japanese Pacific) – Yes SA pilchard (Japanese Tsushima) – Yes Minor species – Yes (default)	NP Albacore – No SA pilchard (Japanese Pacific) – No SA pilchard (Japanese Tsushima) – No Minor species – No

Rationale

WCPO yellowfin: For yellowfin tuna, fishing mortality has always been below F_{MSY}, and the stock has never declined below the default target of SB_{MSY}. Stochastic projections were considered in the 2020 assessment, which provided an indication of the potential stock consequences of fishing at "status quo" conditions (2016-2018 average longline and other fishery catch and 2018 purse seine effort levels) and long-term recruitment scenario (see Section 5.4.2 for further information). Projections indicated that the risk that $SB_{2048}/SB_{F=0}$ is less than the LRP is 0%. Although the information on stock status and stock projections indicate that the harvest strategy is maintaining the stock at appropriate levels, providing some objective basis for confidence that the strategy will work (**SG60 and SG80 are met**), the strategy has not been fully tested. Evaluation of the performance of the harvest strategy and harvest control rules against management objectives is an element of CMM 2014-06 and its workplan. **SG100 is not met**.

WCPO bigeye: For bigeye tuna, stochastic projections were considered in the 2020 assessment (Ducharme-Barth et al., 2020), which provided an indication of the potential stock consequences of fishing at two "status quo" conditions: (i) 2016-2018 average fishing and short term recruitment scenario and (ii) 2016-2018 average fishing and long term recruitment scenario (see Section 5.5.2 for further information). Projections indicated that the risk that $SB_{2048}/SB_{F=0}$ is less than the LRP is 0 and 5 % respectively. Although the information on stock status and stock projections indicate that the harvest strategy is maintaining the stock at appropriate levels, providing some objective basis for confidence that the strategy will work (**SG60 and SG80 are met**), the strategy has not been fully tested. Evaluation of the performance of the harvest strategy and harvest control rules against management objectives is an element of CMM 2014-06 and its workplan. **SG100 is not met**.

SP albacore: For SP albacore tuna, stochastic projections were considered in the 2021 assessment (Castillo-Jordan et al., 2021), which provided an indication of the potential stock consequences of fishing at alternative "status quo" conditions based upon recent catch and effort levels including: 2017-19 average catches and effort levels across the South Pacific and 2020 average catches and effort levels within the WCPFC Convention Area (see Section 5.6.2 for further information). Projections indicated that the risk that $SB_{2049}/SB_{F=0}$ is less than the LRP ranged between 26-36 % for the catch-based scenario and 0-4 % for the effort-based scenario. On that basis, the team did not consider there was high confidence that the strategy would work (**SG100 is not met**). However, considering the WCPFC have committed to a workplan to adopt a management procedure for SP albacore, which will now occur in 2022 and potential update to the interim TRP based on the results of 2021 assessment, this provides some objective basis for confidence that the strategy will work. **SG60 and SG80 are met**.

NP albacore: Stochastic projections were considered in the 2020 assessment (ISC, 2020), which provided an indication of the potential stock consequences of fishing at two harvest scenarios – F constant at the 2015-2017 rate over ten years ($F_{2015-2017}$) and constant catch ($C_{2013-2017}$ – 69,354 t) over ten years (see Section 5.7.2 for further information). If a constant fishing intensity ($F_{2015-2017}$) is applied to the stock, then median SSB is expected to increase to 62,873 t and there will be a low probability of falling below the LRP as established by the WCPFC by 2028. If a constant average catch ($C_{2013-2017}$ = 69,354 t) is removed from the stock in the future, then the median SSB is also expected to increase to 66,313 t and the probability that SSB falls below the LRP by 2028 will be slightly higher than the fishing intensity scenario. Under both scenarios the 95 % CI for the projected SSB being below the LRP in 2030 was 0 %. This provides some objective basis for confidence that the strategy will work. **SG60 and SG80 are met**. However, the strategy has not been fully tested, **SG100 is not met**.

South American pilchard (Japanese Pacific and Tsushima stocks):

Available information suggests that the Japanese Pacific stock is currently above PRI, but the Japanese Tsushima stock is below the PRI (FRA, 2020a, 2020b). Projections undertaken indicate that for the Pacific and Tsushima stocks respectively, there is a 60 % and 54 % probability of the stock remaining at and rebuilding to the TRP by 2031 if fishing mortality does not exceed 0.80 F_{MSY} (FRA, 2020a, 2020b). On that basis, the team did not consider there was high confidence that the management in place would work especially given the population dynamics of the stock, particularly recruitment is strongly linked to oceanographic variables (**SG100 is not met for either stock**).

Average annual bait use between 2016 and 2018 was 278 t in this fishery under assessment. This represents a very small amount of the total catch (<1 % in 2019) in the Japanese South American pilchard fisheries. This should provide some objective basis for confidence that the management measures in place will work, at least at the UoA level and furthermore, not hinder the recovery of the Tsushima stock. **SG60** and **SG80** are met for both stocks.

Minor primary species

Minor species are scored at the SG100 level only; **SG60 and SG80 are therefore met by default**. Given that partial strategy for SW Pacific swordfish has not been tested, **SG100 is not met for minor species overall**.

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?		All scoring elements – Yes	All scoring elements – No

Rationale

Main primary species

Evidence for implementation of the partial strategies for all primary species includes VMS and observer data, landings data (port sampling), logbooks, bait volumes purchased, and the MCS system as described under Principle 3. All primary species stocks with the exception of Japanese Tsushima stock are above the PRI and in the absence of systematic non-compliance by the UoA fleet (PI 3.2.3d), the team considered that **SG80** should be met overall. However, considering the non-comprehensive level of observer coverage in the fishery under assessment and the fact that bait purchase records are self-reported (similar to logbooks), the team felt that clear evidence of its successful implementation is lacking. **SG100 is not met for main species overall**.

Minor primary species

Minor species are scored at the SG100 level only; **SG60 and SG80 are therefore met by default**. Owing to the non-comprehensive level of observer coverage in the fishery under assessment and the fact that bait purchase records are self-reported (similar to logbooks), the team felt that clear evidence of its successful implementation is lacking. **SG100 is not met for minor species overall**.

This scoring is provisional pending consideration of alternative measures as implemented by the UoA and confirming compliance with management regulations.

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

Rationale

No primary species are sharks in the UoAs, so this issue is not scored.

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?	No (more information needed)	No (more information needed)	No (more information needed)

Rationale

MSC GSA3.5.3 states that: “any non-negligible proportion of the catch that meets the unwanted definition for a particular species should be assessed as unwanted catch”. Unwanted catch is defined under MSC GSA 3.1.6 as including: “that part of the catch that has been thrown away or slipped where the components of that catch may not survive after release”. South American Pilchard are a bait species, sourced from a targeted fishery and all of which is used by the UoA; consequently, there is no unwanted catch. While the majority of albacore tuna is retained, there is evidence in the at-sea observer data of discard rates equating to 12 % for both bigeye and yellowfin tuna across the period 2018 to 2020 (Table 19). The client has indicated that these discard rates could be due to either: (i) depredation events with sharks and killer whales, which are subsequently damaged and discarded or, (ii) undersize and young fish (less than 6kg) that have no market value, which are subsequently discarded. To be confirmed at site visit. In the absence of guidance from the MSC on what constitutes 'negligible', the team chose to take a precautionary approach and agreed to assess this scoring issue.

According to MSC guidance, when assessing this scoring issue, CABs are expected to review evidence to determine whether the client (UoA) has undertaken a review of the potential effectiveness and practicality of alternative measures to minimise mortality of unwanted catch of main species, in order to achieve the SG60 level. This evidence could be, for example, a summary document listing information and measures reviewed along with an analysis of the measures and their appropriateness for the UoA, or the minutes of a meeting which has considered alternative measures. If the fishery were to adopt the use of this measure and it was being used at the time of the site visit, but there were no plans to undertake another review of measures, it would still only meet the SG60 level. If the fishery were to adopt the use of this measure and it was being used at the time of the site visit, and another review was scheduled to take place in three years' time, it would meet the SG80 level. If the plan was that alternative measures would be reviewed every two years, it would meet the SG100 level.

References

Castillo-Jordan et al. (2021), DiNardo et al. (2021), Ducharme-Barth et al. (2020), FRA (2020a, 2020b), Gascoigne et al. (2021), Jones et al. (2020), Sieben et al. (2020), Winter (2019), Yatsu (2019), Yukami et al. (2017), ISC_NC (2020)

CMM 2014-06: Conservation and Management Measure on establishing a harvest strategy for key fisheries and stocks in the Western and Central Pacific Ocean https://www.wcpfc.int/doc/cmm-2014-06/conservation-and-management-measures-develop-and-implement-harvest-strategy-approach

CMM 2015-02: Conservation and Management Measure for South Pacific Albacore https://www.wcpfc.int/doc/cmm-2015-02/conservation-and-management-measure-south-pacific-albacore

CMM 2015-06: Conservation and Management Measure on a target reference point for WCPO skipjack tuna https://www.wcpfc.int/doc/cmm-2015-06/conservation-and-management-measure-target-reference-point-wcpo-skipjack-tuna

CMM 2020-01: Conservation and Management Measure for bigeye, yellowfin and skipjack tuna in the Western Central Pacific Ocean () https://www.wcpfc.int/doc/cmm-2020-01/conservation-and-management-measure-bigeye-yellowfin-and-skipjack-tuna-western-and

CMM 2021-01: Conservation and Management Measure for bigeye, yellowfin and skipjack tuna in the Western Central Pacific Ocean () https://www.wcpfc.int/doc/cmm-2021-01/conservation-and-management-measure-bigeye-yellowfin-and-skipjack-tuna-western-and

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

Draft scoring range	All UoAs: <60 (more information needed)
Information gap indicator	More information sought:

	There needs to be further information from the client regarding the source of bait of South American Pilchard. Is the majority now being sourced from China/Indonesia, any information on the stock that is being sourced from – Pacific Japanese or Tsushima? Information on alternative measures employed to minimise unwanted catch of main species.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 27. PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main primary species			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	All scoring elements – Yes	All scoring elements – Yes	All scoring elements – No

Rationale

As discussed in Section 5.8.1, there is quantitative information for the catch of main primary species (catch from logbooks and catch and discards from at-sea observer data), including bait purchase records, which are provided to research and government authorities as well to assist in undertaking stock assessments, research and management. Each of the main primary species has a stock assessment (as detailed in Section 2.1.1a) that provides quantitative information on *inter alia* total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting recruitment. **Consequently, SG60 and SG80 are met**.

With regard to yellowfin, bigeye, NP and SP albacore, the WCPFC only requires an at-sea observer coverage level of 5 % for longline fisheries under CMM 2018-05. In 2018 and 2019, the national Republic of Korea longline fleet achieved observer coverage levels of 6.3 % and 10.4 % respectively (based on number of observed fishing days) (WCPFC_SC, 2020b, 2021a), although for the UoA fleet this translates into coverage rates ranging from 2.6 to 7.2 % (see Table 18). This assessment scaled up the observer data to mirror the actual catch taken by the UoA fleet between 2018 and 2020 (Table 19) and it is evident that for some primary species (yellowfin and bigeye tuna) discarding is not negligible (see PI 1.2.1 Scoring issue f for each species). Therefore, the assessment team decided that the impact of the fishery under assessment on these stocks cannot be evaluated with a "high degree of certainty". Therefore, **SG100 is not met.**

With regard to South American Pilchard, the quantities of this bait used by the fishery under assessment annually are reported by the client fishery and are negligible (<0.01 %) compared to the overall biomass and landings from these two stocks (FRA, 2020a, 2020b). **SG60 and SG80 are therefore met**. However, it is not clear that there is sufficient quantitative information to assess with a "high degree of certainty" the impact of the UoA fleet on the Japanese Tsushima stock given it's below the PRI and therefore necessitates higher quality information and data as detailed in GSA 3.6.3.1. Ultimately, bait purchase records are self-reported (similar to logbooks) so it cannot be concluded that there is "a high degree of certainty". Furthermore, it's not clear what amount of the bait is being purchased that is caught from either the Japanese Pacific or Tsushima stocks. Therefore, **SG100 is not met.**

b	Information adequacy for assessment of impact on minor primary species			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			All scoring elements – Yes

Rationale

As detailed above in 2.1.3a there is quantitative information for the catch of minor primary species (catch from logbooks and catch and discards from at-sea observers), including bait purchase records, which are provided to research and government authorities to assist in stock assessments, research and management. Each of the minor primary species has a stock assessment as detailed in Section 2.1.1b that provides quantitative information on *inter alia* total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting recruitment. As detailed in GSA3.6 **SG100 for minor primary species is equivalent to SG80 for main primary species**. **Consequently, SG100 is 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?	All scoring elements – Yes	All scoring elements – Yes	All scoring elements – No

Rationale

While only some primary species were assessed as having a partial strategy or strategy in place, all primary species (main and minor) have sufficient information available (fishing effort through logbooks, VMS, landings and discards through at-sea observers) that is adequate to support at least a partial strategy to manage them accordingly if one was developed and implemented. The Republic of Korea has been shown to exceed its at-sea observer coverage requirements in 2018 and 2019 (5 % under CMM 2018-

05) and according to PI 3.2.3a there is a high degree of confidence that fishers comply with the national and international management frameworks in place and there is a comprehensive monitoring, control and surveillance system that has been implemented, which has been shown to enforce relevant management measures, strategies and/or rules. **Therefore, SG60 and SG80 are met for the main primary target species (yellowfin, bigeye and albacore**). However, discarding is not negligible (see 2.1.2e). Given that observer data are the only source of information on discard rates in this fishery, the observer coverage is not sufficiently comprehensive to provide a high degree of certainty that the strategy is achieving its objective**. SG100 is not met**.

In relation to South American pilchard, although the majority of the bait is sourced from China and there is no partial strategy currently in place for the Japanese Pacific stock (as detailed in 2.1.2a), it does not preclude **SG60 and SG80** from being met as the information available (as detailed in 2.1.3a) is sufficient to support the development of a partial strategy. However, as stated in scoring issue a, bait purchase records are self-reported (similar to logbooks) so it cannot be concluded that there is "a high degree of certainty". Furthermore, it's not clear what amount of the bait is being purchased that is caught from either the Japanese Pacific or Tsushima stocks. **Therefore, SG100 is not met.**

Minor species are scored at SG100 only; **therefore, SG60 and SG80 are met by default**. Each of the minor primary species has a stock assessment that provides quantitative information on *inter alia* total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting recruitment; however, the information available at the UoA level is not always sufficient to provide a high degree of certainty (e.g. in the case of the Argentine shortfin squid which is used as bait). **SG100 is not met**.

References

FRA (2020a, 2020b), Gascoigne et al. (2021), WCPFC_SC (2020b, 2021a)

CMM 2018-01: Conservation and Management Measure for the Regional Observer Programme. - Western and Central Pacific Fisheries Commission (WCPFC)

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

Draft scoring range	All UoAs: ≥80
Information gap indicator	More information sought: There needs to be further information sought from the client regarding the source of bait of South American Pilchard. Is the majority now being sourced from China, any information on the stock that is being sourced from – Pacific Japanese or Tsushima?

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

Overall Performance Indicator score	

Condition number (if relevant)	

Scoring table 28. PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guide post	Main secondary species are **likely** to be above biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits. OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are above biologically based limits.
	Met?	Blue marlin – Yes Blue shark– Yes Amberstripe scad – RBF score 92 Indian oil sardine – RBF score 69	Blue marlin – Yes Blue shark– Yes Amberstripe scad – RBF score 92 Indian oil sardine – RBF score 69	Blue marlin – Yes Blue shark – No Amberstripe scad – RBF score 92 Indian oil sardine – RBF score 69

Rationale

Based on the scaled average observer values, logbook and bait data, the main secondary species in this assessment include blue marlin, blue shark, Amberstripe scad and Indian oil sardine (See Table 21).

Blue marlin

The most recent assessment (2021) for blue marlin used a two-model ensemble of age and length structured Stock Synthesis models to fit time series of standardised CPUE and size-composition data (ISC_BWG, 2021). The two models in the ensemble differed only in their growth curve assumption. It was recommended by the ISC BWG that both models were retained based upon their fit and diagnostics, so the biological reference points, spawning stock biomass, and fishing mortality were averaged between the two models assuming equal weights (ISC_BWG, 2021).

Female spawning stock biomass was estimated to be 24,272 mt in 2019, or about 17 % above SSB_{MSY} (SSB/SSB_{MSY} = 1.17 (95 % C.I. 0.87-1.51). Fishing mortality on the stock (average *F*, ages 1 to 10) averaged *F*=0.13 during 2017-2019, which was 40 % below F_{MSY} and in 2019 was F=0.11, which was 50 % below F_{MSY} (F/F_{MSY} = 0.50 (95 % C.I. 0.37-0.69)) (ISC_BWG, 2021). Median fishing mortality has been below F_{MSY} every year except 2003 to 2006. Relative to MSY-based reference points for other tunas, the ensemble model indicates that overfishing was very likely not occurring (>90 % probability) and blue marlin is likely not overfished (81% probability) (ISC_BWG, 2021). On that basis, there remains a high degree of certainty that this stock is above its biologically based limits. **SG60**, **SG80** and **SG100** are met.

Blue shark

Blue sharks are widely distributed throughout temperate and tropical waters of the Pacific Ocean. Two stocks are recognised in the Pacific, one in the north and another in the south Pacific. It is unclear from the data, from which stock the blue shark recorded in the fishery originated from.

The most recent stock assessment (2017) for the North Pacific blue shark was undertaken using Stock Synthesis (ISC_SWG, 2017). From the stock assessment, the reference case model showed that the spawning stock biomass is fluctuating close to the time-series high set back in the late 1970s. Recruitment has fluctuated around 37,000,000 age-0 sharks annually. Stock status is reported in relation to MSY. Female spawning biomass in 2015 (SB_{2015}) was 71 % higher than at MSY and estimated to be 308,286 mt. The recent annual fishing mortality ($F_{2012\text{-}2014}$) was estimated to be well below F_{MSY} at approximately 37 % of F_{MSY}. The results indicate that if assessed against conventional reference points it is likely that the stock is not overfished and that overfishing is not occurring (ISC_SWG, 2017).

The most recent assessment (2021) for South Pacific blue shark was undertaken using Stock Synthesis (Neubauer et al., 2021). In addition, a surplus production model (SPM) was run with both assessment models producing very similar results. The assessment was determined an improvement over the 2016 assessment in particular the catch reconstruction, CPUE time series, and re-parameterization through combined advance from south and north Pacific assessments (WCPFC_SC, 2021b). A total of 90 % of model runs indicated that F_{2020} was below F_{MSY} and 96 % of model runs shows that SB_{2020} was above SB_{MSY}, with an estimate of SSB of over 60,000 t. The WCPFC Scientific Committee did not approve the results for providing management advice due to the need to conduct a more thorough investigation of diagnostics across the grid of models (WCPFC_SC, 2021b). However, it was noted that stock biomass is likely increasing, and fishing pressure has declined through the recent decade due to the fact that most sharks are released upon capture in most longline fleets. The results indicate that if assessed against conventional reference points it is likely that the stock will not be found to be overfished nor would overfishing be occurring.

Based on the above, the team concludes it is highly likely that both stocks are above biologically-based limits. **SG60 and SG80 are met**. Owing to the non-comprehensive level of observer coverage in the fishery under assessment and some of the uncertainties in the assessments (ISC_SWG, 2017; Neubauer et al., 2021). **SG100 is not met**.

Amberstripe scad

Due to the lack of stock status reference points for this species/stock, the RBF is likely to be triggered to score this scoring element, requiring a Productivity Susceptibility Analysis to be undertaken. Although stakeholder input will be required to finalise the PSA, the provisional PSA results are shown in Appendix 8. The provisional PSA score for Amberstripe scad is 2.18. **This equates to an MSC PSA-derived score of 92**.

Indian oil sardine

Due to the lack of stock status reference points for this species/stock, the RBF is likely to be triggered to score this scoring element, requiring a Productivity Susceptibility Analysis to be undertaken. Although stakeholder input will be required to finalise the PSA, the provisional PSA results are shown in Appendix 8. The provisional PSA score for Indian oil sardine is 3.16. **This equates to an MSC PSA-derived score of 69.**

In relation to the unobserved mortality of secondary species, the team considered the possible issue of ghost fishing caused by discarded or lost fishing gear (monofilament line and hooks). Gear loss is reportedly minimal (mainly limited to hooks that have been lost to sharks). To be confirmed. The use of radio beacons and GPS on the mainline mean they are often able to be located even if the mainline breaks when hauling or otherwise. The assessment team therefore concluded that the incidence of gear loss is rare. To be confirmed. 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 (Macfayden et al., 2009). Under CMM 2017-04, CCMs should 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. It was therefore concluded that unobserved mortality through ghost fishing at the scale of the UoA was highly unlikely to be a significant factor in the fishery's interactions with main primary species to the extent that this will have stock-level effects. To be confirmed.

b	Minor secondary species stock status		
	Guide post		Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?		No

Rationale

There is a large list of minor secondary species (see Table 19) and they have not been evaluated individually; furthermore, some of these species may be data-deficient, requiring use of the RBF. As the RBF was not applied to minor species, this caps the scoring of the PI at 80.

See MSC Guidance: https://mscportal.force.com/interpret/s/article/Minor-species-and-scoring-element-approach-at-SG100-7-10-7-1527586956233

References

Macfadyen et al. (2009), ISC_BWG (2021), ISC_SWG (2017), Neubauer et al. (2021) and WCPFC_SC (2021b)

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

Draft scoring range	All UoAs: 60-79
Information gap indicator	More information sought: - Further review of the Amberstripe scad bait use among MSC accredited fisheries will need to occur. - Information regarding gear loss (hooks, mainlines) needs to be determined from the client - RBF to be carried out for Amberstripe scad and Indian oil sardine

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 29. PI 2.2.2 – Secondary species management strategy

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue	SG 60	SG 80	SG 100
a	Management strategy in place		
Guide post	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
Met?	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes Minor species – Yes (default)	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – No Minor species – Yes (default)	Blue marlin – No Blue shark – Yes Amberstripe scad – No Indian oil sardine – No Minor species – No

Rationale

In the context of this performance indicator (Source: MSC FCR v2.01; Table SA8):

- "Measures" are actions or tools in place that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere.

- 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.

- 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.

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Blue marlin

Blue marlin received a score of 100 in PI 2.2.1(a) – as such, the term 'if necessary' applies here and management as described under SG60 and SG80 is not required (GSA3.5.1). **SG80 is therefore met by default** for blue marlin. There is no specific strategy in place to manage the fishing mortality of blue marlin in either this fishery -to be confirmed 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.**

Blue shark

Currently, blue shark is managed through CMM 2019-04 with the objective to ensure the long-term conservation and sustainable use of sharks. CMM 2019-04 encompasses all species of sharks, skates, rays and chimaeras, which stipulates *inter alia*, that all sharks retained on board vessels should be fully utilised and the practice of shark finning is prohibited. CCMs are required to ensure their vessels land sharks with fins naturally attached to the carcass and longline fisheries targeting tuna and billfish are required to either not use or carry wire trace as branch lines or leaders or do not use shark lines. There are also various reporting requirements in place. At the national level, WCPFC CMMs are endorsed by the Republic of Korea and under Article 13 of the Distant Water Fisheries Development Act (DWFDA), where distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." The Republic of Korea has formulated a National Plan of Action for Sharks which has been implemented since 2011 (Republic_of_Korea, 2011). At the UoA level, shark finning is prohibited, and the fishing crews are educated about these requirements through company training materials. Further management measures in place for blue sharks are to be confirmed. The assessment team considered that all these elements constitute examples of a strategy (as detailed in Table GSA3), designed to minimise mortality on blue shark such that **SG60, SG80 and SG100 are met**.

Amberstripe scad

According to the bait source information, the majority is being sourced from Indonesia (with a small amount also from China and Vietnam). Jones et al. (2020) reported on some management measures in place (input controls) in Indonesia to manage Amberstripe scad, including limited entry, logbook records and various gear restrictions that they determined were consistent with a partial strategy. The amount of bait (770 t annually between 2018-2020) being utilised is small compared to the reported global catch of 31,580 t in 2016 (FAO http://www.fao.org/fishery/species/2314/en) but knowledge of stock structure is unknown. Given the reproductive strategy of Amberstripe scad (broadcast spawner), however, it is likely at a broad scale and the fishing activity within Indonesia would likely cover less than 10 % of the species concentration of the stock in the Indo-Pacific basin. There were no indications from the RBF results that the populations are below biologically based limits (see Appendix 8). Consequently, the management at the stock level, combined with the low MSC UoAs collective catches, constitute a partial strategy that would contribute to the fishery under assessment maintaining Amberstripe scad at levels highly likely to be above biologically based limits. **SG60 and SG80 are met**. It does not, however, meet MSC's definition of a strategy as given above, **so SG100 is not met**.

Indian oil sardine

According to the bait source information, this is being sourced exclusively from Oman. There are some management measures in place (input controls) in Oman to manage Indian oil sardine, including controls on fishing effort through limited entry and associated gear restrictions, with a ban on targeted shark fishing and a discard ban reportedly in place. Fishing activities are monitored by inspecting all industrial and artisanal fishing operations as well as fish processing plants. The export of seafood is strictly and regularly inspected (further information available here from FAO: http://www.fao.org/fishery/facp/OMN/en). The amount of bait (239 t annually between 2018-2020) being utilised by the fishery under assessment is negligible compared to the reported 275,186 t of sardine landed in 2019 (with 80-95 % of this Indian oil sardine) so <0.01 % (Dorr_III et al., 1990; NCSI, 2020).

The MSC-PSA derived score was less than SG80 for this species, so we are not certain that the population is above biologically based limits (see Appendix 8). Overall, the management in place at stock level combined with the low MSC UoAs collective catches, constitute measures that contribute to the fishery under assessment not having a significant impact on Indian oil sardine. **SG60 is met.** Nevertheless, it is not clear that the Client Group has in place a cohesive arrangement that ensures that bait is proactively purchased from sustainable fisheries. - this remains to be determined. The team therefore concludes that a partial strategy is not in place for the fishery under assessment that is expected to maintain or not hinder rebuilding of Indian oil sardine at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery. **SG80 is not met**.

Minor species

Note that minor species are only considered at the **SG100** level; **SG60 and SG80 are therefore met by default**. For minor species, bycatch is covered under the more generic WCPFC Resolution 2005-03 on Non-Target Fish Species (this also includes the main species), which does not constitute a 'strategy'. Minor species **were not considered to meet SG100 as a whole**.

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?	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes Minor species – Yes (default)	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes Minor species – Yes (default)	Blue marlin – No Blue shark – No Amberstripe scad – No Indian oil sardine – No Minor species – No

Rationale

Blue marlin

In the 2021 assessment (ISC_BWG, 2021) deterministic stock projections were conducted to evaluate the impact of various levels of fishing mortality on future SSB and yield. This included (i) a high F scenario, (ii) a F_{MSY} scenario, (iii) a status quo F scenario and (iv) low F scenario. Results indicated that for fishing mortalities at or above F_{MSY} (i and ii), SSB biomass decreases towards SSB_{MSY}, but remains above it in 2029. For scenarios iii and iv, F is below F_{MSY} therefore SSB remains above SSB_{MSY} and increases from

2019 levels to 2029. It was determined that all of the constant F projections have at least a 50 % probability of being above SSB_{MSY} and below F_{MSY} in 2029. On that basis, the team did not consider there was high confidence that the partial strategy would work (**SG100 is not met**). However, the results provide some objective basis for confidence that the current management in place is working. **SG60 and SG80 are met**.

Blue shark

Future projections from 2015 to 2024 under different fishing mortality harvest policies (status quo, +20 %, -20 %, F_{MSY}) were considered in the 2017 North Pacific blue shark assessment (ISC_SWG, 2017). These indicated that the median biomass in the North Pacific will likely remain above B_{MSY} in the foreseeable future. Projections showed that maintaining current fishing mortality levels resulted in much higher levels of spawning biomass than SSB_{MSY}. No stock projections were undertaken in the 2021 South Pacific blue shark assessment (Neubauer et al., 2021), however 90 % of model runs indicated that F_{2020} was below F_{MSY} and 96 % of model runs shows that SB_{2020} was above SB_{MSY}. It has been recognised that there has been a clear decline in fishing mortality (due to most sharks being released upon capture in longline fleets) over the last decade to low levels. Given the uncertainties in the 2021 South Pacific blue shark assessment (as detailed in PI 2.2.1a) and lack of future projections under different levels of fishing mortality the assessment team did not consider there was high confidence that the strategy would work (**SG100 is not met**). However, the results provide some objective basis for confidence that the current management in place is working. **SG60 and SG80 are met**.

Amberstripe scad

The highly fecund, wide distribution and fast maturing (r-selected) life history status of Amberstripe scad together with the small amount of bait used by the fishery under assessment relative to the global catch provides an objective basis for confidence that it is highly unlikely to be having any impact on the stock and the measures in place at the UoA level are likely to work – **SG60 and SG80 are met**. Although the assessment team had high confidence of a lack of impact from the UoA, there is nothing in place that would constitute testing. **SG100** is not met.

Indian oil sardine

The highly fecund, small sized and fast maturing (r-selected) life history status of Indian oil sardine together with the small amount of bait used by the fishery under assessment relative to the recent (2019) catch in Oman (Dorr_III et al., 1990; NCSI, 2020), provides an objective basis for confidence that it is highly unlikely to be having any impact on the stock and the measures in place at the UoA level are likely to work - **SG60 and SG80 are met**. Although the assessment team had high confidence of a lack of impact from the UoA, there is nothing in place that would constitute testing. **SG100** is not met.

Minor species

Note that minor species are only considered at the **SG100** level; **SG60 and SG80 are therefore met by default.** The quantity of bait used is known. The existence of at-sea observer data, although limited to around 5 %, provides some objective data against which to evaluate with confidence that the current fishery under assessment is not having adverse impacts on the minor secondary species. Logbook data for this fishery under assessment are not identified to a species level for species other than main target and by-product species (See Table 17) so do not assist in the assessment of the fishery's impact on secondary minor species. Although the assessment team had some level of confidence of a lack of impact from the UoAs, there is nothing in place that would constitute testing. **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?		Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes Minor species – Yes (default)	Blue marlin – No Blue shark – No Amberstripe scad – No Indian oil sardine – No Minor species – No

Rationale

Main secondary species

Evidence for implementation of the measures or partial strategies for all main secondary species includes VMS and observer data, landings data (port sampling), logbooks, bait volumes purchased, and the MCS system as described under Principle 3. All secondary main species stocks, with the possible exception of Indian oil sardine are considered to be above the PRI. Furthermore, the low catches of bait species – Indian oil sardine and Amberstripe scad from MSC UoAs relative to the total catches can be considered measures to take effect in not hindering the recovery of this species. In the absence of systematic non-compliance by the UoA fleet (PI 3.2.3d), the team considered that **SG80 should be met** on the whole for all main secondary species. However, considering both the low level of observer coverage in the fishery and a lack of clear information about bait source fisheries, **SG100 was not considered met**.

Minor primary species

Note that minor species are only considered at the **SG100** level; **SG60 and SG80 are therefore met by default**. Evidence for implementation of the measures or partial strategies for all minor secondary species includes VMS and observer data, landings data (port sampling), logbooks, bait volumes purchased, and the MCS system as described under Principle 3. In the absence of a partial strategy however, for all minor species, **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?	Yes	Yes - provisional	No

Rationale

The Republic of Korea's distant water fleet do not target shark species (Republic_of_Korea, 2011). Furthermore, the UoA prohibits targeted shark fishing and finning. Evidence from the at-sea observer data from the fishery under assessment suggests the majority of sharks caught incidentally in tuna longline operations are discarded (Table 19). WCPFC CMM 2019-04 requires all CCMs to take necessary measures to ensure all shark retained and board vessels are fully utilised. This includes banning the practice of shark finning and requiring that vessels land sharks with fins naturally attached to the carcass or an alternative measure as listed (e.g., tied to carcass using rope or wire). The UoA's compliance with all WCPFC CMMs is to be confirmed at the site visit. Based on the information received at this ACDR stage, no non-compliance incidents were identified. It is therefore highly likely that shark finning is not taking place. **SG60 and SG80 are provisionally scored as met**. As the at-sea observer coverage is only around 5 %, there is no comprehensive external validation of the vessel's activities to confirm with a high degree of certainty that shark finning is not taking place so **SG100 is not met**.

e	Review of alternative measures to minimise mortality of unwanted catch			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	Blue marlin – N/A Blue shark –TBD Amberstripe scad – N/A Indian oil sardine – N/A Minor species – Yes (default)	Blue marlin – N/A Blue shark –TBD Amberstripe scad – N/A Indian oil sardine – N/A Minor species – Yes (default)	Blue marlin – N/A Blue shark –TBD Amberstripe scad – N/A Indian oil sardine – N/A Minor species – No

Rationale

Amberstripe scad and Indian oil sardine are bait species and consequently there is no unwanted catch. The majority of blue marlin is retained for sale (Table 19) but the majority of blue shark (>99 %) is discarded, so there is unwanted catch of this species. Further information is requested from the client to score this SI.

Minor species are scored at SG100 only; **SG60 and SG80 are therefore met by default**. Many of the minor secondary species are discarded, however, and as far as the team are aware, there is no biennial review for any of these species. **SG100 is not met**.

According to MSC guidance, when assessing this scoring issue, CABs are expected to review evidence to determine whether the client (UoA) has undertaken a review of the potential effectiveness and practicality of alternative measures to minimise mortality of unwanted catch of main species, in order to achieve the SG60 level. This evidence could be, for example, a summary document listing information and measures reviewed along with an analysis of the measures and their appropriateness for the UoA, or the minutes of a meeting which has considered alternative measures. If the fishery were to adopt the use of this measure and it was being used at the time of the site visit, but there were no plans to undertake another review of measures, it would still only meet the SG60 level. If the fishery were to adopt the use of this measure and it was being used at the time of the site visit, and another review was scheduled to take place in three years' time, it would meet the SG80 level. If the plan was that alternative measures would be reviewed every two years, it would meet the SG100 level.

References

Dorr_III et al. (1990), Gascoigne et al. (2021), ISC_BWG (2021), Jones et al. (2020), NCSI (2020), Republic_of_Korea (2011), Sieben et al. (2020), ISC_SWG (2017) and Neubauer et al. (2021)

CMM 2019-04: Conservation and Management Measure for Sharks – Western and Central Pacific Fisheries Commission (WCPFC)

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

Draft scoring range	<60 (more information needed)
Information gap indicator	More information sought: - Any specific management of blue marlin catches in the UoA fleet. - Discuss any shark non-retention policy that the client has in place. - Compliance with shark finning regulations - Information on bait use and sourcing strategy for Amberstripe scad and Indian oil sardine

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 30. 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?	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes	Blue marlin – Yes Blue shark – Yes Amberstripe scad – Yes Indian oil sardine – Yes	Blue marlin – No Blue shark – No Amberstripe scad – No Indian oil sardine – No

Rationale

Blue marlin and blue shark

As discussed in Section 5.8.1 there is quantitative information for the catch of main secondary species (catch as detailed in the logbooks and catch and discards from limited at-sea observer data), which are provided to research and government authorities to assist in stock assessments, research and management. Both blue marlin and blue shark have stock assessments (as detailed in PI 2.2.1a) that provides quantitative information on *inter alia* total landings, stock biomass, species life history characteristics and total mortality and in some cases environmental parameters affecting recruitment. **SG60 and SG80 are met**. The WCPFC only requires an at-sea observer coverage level of 5 % for longline fisheries under CMM 2018-05. In 2018 and 2019, the national Republic of Korea longline fleet achieved observer coverage levels of 6.3 % and 10.4 % respectively (based on number of observed fishing days) (WCPFC_SC, 2020b, 2021a) although for the UoA fleet this translates into coverage rates ranging from 2.6 to 7.2 % (see Table 18). The assessment team had to scale up the observer data to mirror the actual catch taken by the UoA fleet between 2018 and 2020 (Table 19). Therefore, the assessment team decided that the impact of the fishery under assessment on blue marlin and blue shark cannot be evaluated with a "high degree of certainty". Therefore, **SG100 is not met**.

Indian oil sardine

The RBF was used to score 2.2.1 for Indian oil sardine. There is quantitative information on the purchase of bait, including Indian oil sardine. The client collects information on the bait species name (common and scientific), country where it was sourced/caught, and the total tonnage used. There was also some gear and operational information supplied by the client.

For productivity information - species specific information was available for all attributes including, average age at maturity, average maximum age, fecundity, average maximum size, average size at maturity, reproductive strategy and trophic level. Consequently, all seven productivity attributes were scored using quantitative information.

For susceptibility information – aerial overlap data was easy to assess given the production of global distribution maps (from Aquamaps). Encounterability is a default score. Selectivity of gear was assessed based on the gear used in the Omani fisheries and post capture mortality is a default score. Therefore, all of the susceptibility attributes (that are not default) can be adequately scored using quantitative information.

This meets SG60 and SG80. In the case of uncertainties, the most precautionary risk score had to be applied for the selectivity attribute due to a lack of information regarding the selectivity of fishing gears used in Omani fisheries, as per PF 4.4.2.2 (MSC, 2020). Consequently, there is not enough quantitative information available, nor is it adequate to assess with a high degree of certainty the impact of the fishery under assessment on Indian oil sardine with respect to status. **SG100 is not met**.

Amberstripe scad

The RBF was used to score 2.2.1 for Amberstripe scad. There is quantitative information on the purchase of bait, including Amberstripe scad. The client collects information on the bait species name (common and scientific), country where it was sourced/caught, and the total tonnage used. There was also some gear and operational information supplied by the client.

For productivity information - species specific information was only available for average maximum size, reproductive strategy and trophic level. All other attributes were available at the genus taxonomic level using congenerics. Therefore, three of the productivity attributes can be adequately scored on quantitative information about the species and four can be adequately scored based on related species of the same genus.

For susceptibility information – aerial overlap data was easy to assess given the production of global distribution maps (from Aquamaps). Encounterability is a default score. Selectivity of gear was assessed based on the gear used in the Indonesian fisheries, as reported by Jones et al. (2020) and post capture mortality is a default score. Therefore, all of the susceptibility attributes (that are not default) can be adequately scored using quantitative information.

This meets **SG60 and SG80**. However, there is a paucity of information regarding the stock structure of this species and the minor fisheries where bait is also sourced (China and Vietnam). In the case of uncertainties, the most precautionary risk score had to be applied for the selectivity attribute due to a lack of information regarding the selectivity of fishing gears used, as per PF 4.4.2.2 (MSC, 2020). Consequently, there is not enough quantitative information available, nor is it adequate to assess with a high degree of certainty the impact of the fishery under assessment on Amberstripe scad with respect to status. **SG100 is not met**.

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?		No

Rationale

There are a number of minor secondary species in this fishery (Table 21). The impact of the fishery under assessment on these stocks in terms of catch (landings, discards, mortality to point of discard) can be evaluated through the at-sea observer reports (albeit with only ~5 % coverage), but in some cases, little is known about the stock structure and status, so **SG100 is not met in full**.

c	Information adequacy for management strategy			
	Guide post	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and evaluate with a **high degree of certainty** whether the strategy is **achieving its objective.**
	Met?	All scoring elements – Yes	All scoring elements – Yes	All scoring elements – No

Rationale

All secondary main species have sufficient information available (fishing effort through logbooks, VMS, landings and discards through at-sea observers) that is adequate to support at least a partial strategy to manage them accordingly if one was developed and implemented. The Republic of Korea has been shown to exceed its at-sea observer coverage requirements in 2018 and 2019 (5 % under CMM 2018-05) and according to PI 3.2.3a there is a high degree of confidence that fishers comply with the national and international management frameworks in place and there is a comprehensive monitoring, control and surveillance system that has been implemented – to be confirmed at site visit, which has been shown to enforce relevant management measures, strategies and/or rules. **Therefore, SG60 and SG80 are met**. In relation to all secondary main species: (blue marlin, blue shark, Amberstripe scad and Indian oil sardine), the fact that no partial strategy is currently in place (as detailed in 2.2.2a), does not preclude **SG80** from being met as the information available (as detailed in 2.2.3a) is sufficient to support the development of a partial strategy. However, as there is a lack of formal management strategies for many secondary species, **SG100 cannot be met.**

References

CMM 2018-05: Conservation and Management Measure for the Regional Observer Programme - Western and Central Pacific Fisheries Commission (WCPFC)

Gascoigne et al. (2021), Jones et al. (2020), MSC (2020), WCPFC_SC (2020b, 2021a)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 31. 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?	NA	NA	NA

Rationale

ETP species are discussed in Section 5.8.3 and formal 'limits' (national or international) which trigger management action are not in place for any of these species. This SI was therefore not scored.

b	Direct effects			
	Guide post	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	All scoring elements – Yes	Silky shark – Yes Oceanic whitetip shark – Yes Giant manta ray/manta rays/rays and skates – Yes Reef manta ray/manta rays/rays and skates – Yes Olive ridley turtle – No Green turtle – Yes	All scoring elements – No

		Loggerhead turtle – Yes Hawksbill turtle – Yes Leatherback turtle – Yes Sooty albatross – Yes	

Rationale

ETP species are discussed in Section 6.7.3 and include the following species:

Elasmobranchs: silky shark, oceanic whitetip shark, giant manta ray, manta rays, reef manta ray, rays and skates.

Marine turtles: green turtle, olive ridley turtle, hawksbill turtle, loggerhead turtle and leatherback turtle

Seabirds: sooty albatross

Elasmobranchs

Elasmobranchs (sharks and rays) were the main group of ETP species interacting with the fishery under assessment. In total, 877 individuals were recorded by at-sea observers between 2018 and 2020. The majority of these interactions were with silky shark and oceanic whitetip shark. The average annual scaled-up estimate of these two sharks in both weight and numbers between 2018 and 2020 was 61.5 t and 4,203 individuals respectively. The estimated total catch of other elasmobranch species was relatively low, with only a small number of individuals recorded in the observer data (Table 19).

<u>Silky shark</u>

Silky sharks are a circumtropical species found in tropical waters of the Pacific Ocean. Scaled up observer data suggest that an average 3,727 individuals (47 t) were caught between 2018 and 2020. According to the raw observer data, 100 % were discarded, and an average 65 % were released alive. No information on condition was recorded. Assuming a precautionary 50 % post release mortality this was 1,863 individuals annually.

The most recent stock assessment (2018) for silky shark in the Pacific was undertaken using Stock Synthesis (Clarke et al., 2018). The assessment model estimated spawning biomass in 2016 to be at 47 % of the unfished level (SB_{2016}/SB_0 = 0.469). Current biomass is estimated to be above the MSY reference biomass level; however, there is considerable uncertainty associated with the estimate of stock status (SB_{2016}/SB_{MSY} = 1.178 95 % CI 0.590-1.770). Fishing mortality is estimated to be above F_{MSY} (F_{2016}/F_{MSY} = 1.607, Pr ($F_{2016} > F_{MSY}$) = 84 %). The results indicated that if assessed against conventional reference points it is likely that the stock will not be found to be overfished but that overfishing is occurring (Clarke et al., 2018). WCPFC SC noted the considered uncertainty in the assessment and that current estimates of stock status should be considered indicative only and are not considered a reliable basis for management decision-making (WCPFC_SC, 2020d). While the model estimates of depletion are not considered reliable, they do indicate that Pacific Ocean silky shark populations are likely to have declined considerably over the last two decades in response to the increased levels of catch. Correspondingly, fishing mortality rates are likely to have increased considerably over the same period (Clarke et al., 2018). The 2018 assessment estimates the most recent (2016) catches in the WCPO to be 725,400 sharks and 570,000 in the longline fishery based on trade-based records. Also SPC have reported 974 mt of silky shark caught in the WCPFC Convention Area in 2019 – as reported from CCM logbook data but this is likely an underestimate (SPC_OFP, 2020).

This catch compares with an estimated annual mortality (including an estimate of post-release mortality) from this fishery to the order of 1,863 ind./year (<0.01 %). On this basis, the known direct effects of the fishery are highly unlikely to hinder recovery of silky shark meaning **SG60 and SG80 are met**. Silky shark is considered "vulnerable" on IUCN red list. Owing to the non-comprehensive level of observer coverage in the fishery under assessment, as well as the decreasing population trend from the most recent assessment, **SG 100 is not met**.

Oceanic whitetip shark

Oceanic whitetip sharks are distributed worldwide in epipelagic tropical and subtropical waters (warmer than 20ºC) between the latitudes of 30º North latitude and 35º South. Scaled up observer data suggest that an average 476 individuals (14 t) were caught between 2018 and 2020. According to the raw observer data, 100 % were discarded, and on average 65 % were released alive. Assuming a precautionary 50 % post release mortality this was 238 individuals annually.

The most recent stock assessment (2019) for oceanic whitetip shark was undertaken using Stock Synthesis (Tremblay-Boyer et al., 2019). This was the first stock assessment carried out since CMM 2011-04 became active in 2013 (later replaced by CMM 2019-04), enacting a no-retention measure for this species for WCPFC CCMs. A new development in this assessment was the inclusion of three discard mortality (DM) scenarios in the historical catches to account for the potential impacts of the CMM. In addition, results from two new WCPO growth studies predicted a much less productive profile for the stock than what had been assumed previously. As was the case in the 2012 stock assessment, the assessment estimates the stock to be overfished and undergoing overfishing based on SB/SB_{MSY} and F/F_{MSY} reference points. Most model runs predict SB/SB_0 to be below 0.05, and all model runs predict SB/SB_0 to be below 0.1.F-based reference points improved in the period since the implementation of CMM 2011-04. Notably, F/F_{MSY} is predicted to have declined by more than half from 6.12 to 2.67 (median) for the last year of the assessment when the impact of CMM 2011-04 on survival is accounted for under the 25 % and 43.75 % discard mortality scenarios, although the median value of F/F_{CRASH} over all 648 grid runs for 2016 remains above 1 indicating that the population should go extinct on the long-term under current levels of fishing mortality (Tremblay-Boyer et al., 2019). These model conclusions were robust to uncertainties in key model assumptions and there was no indication that the WCPFC SC considered the current estimates of stock status as unreliable (WCPFC_SC, 2020e). The assessment's catch reconstruction between 1995 and 2016 indicated around 50,000-250,000 individuals were caught in 2016 (extrapolated from Figure 5 in Tremblay-Boyer et al. (2019)) based on median predictions of longline bycatch. MSY was estimated to be around 3,000-4,900 mt or 6,755 individuals (Tremblay-Boyer et al., 2019). Also SPC have reported 905 mt of oceanic whitetip shark caught in the WCPFC Convention Area in 2019 – as reported from CCM logbook data but this is likely an underestimate (SPC_OFP, 2020).

This catch compares with an estimated annual mortality (including an estimate of post-release mortality) from this fishery to the order of 238 individuals/year (<0.01 %). Oceanic whitetip shark is considered "critically endangered" on IUCN red list. The recent stock assessment was accepted for providing management advice on stock status (WCPFC_SC, 2020e). On this basis, the known direct effects of the fishery are highly unlikely to hinder recovery of oceanic whitetip shark. **SG60 and SG80 are met**. Owing to the non-comprehensive level of observer coverage in the fishery under assessment **SG100 is not met**.

Other elasmobranch species

Species	Average annual scaled up catch (tonnes)	Average annual scaled up catch (numbers)	Scoring conclusion
Giant manta ray (*Mobula birostris*) **Manta rays (*Mobula spp.*)** **Rays and skates (*Mobula spp. and Rajidae spp.*)**	13.3 10.7 1.6	129 104 10	Giant manta ray is considered "Endangered" on the IUCN Red List and they are vulnerable to fishing as their life history traits (k-selected) mean their maximum rates of intrinsic population increase are among the lowest of all elasmobranchs (Dulvy et al., 2014). Mobulids are particularly susceptible to incidental catch in tuna fisheries due to their epipelagic distribution in regions of high productivity, leading to a high level of distributional overlap with target species (Croll et al., 2012). The populations of giant manta ray are known to be sparsely distributed, small and highly fragmented (Marshall et al., 2018). A total of 25 observed interactions were recorded for the UoA across 2018-2020 for giant manta ray. According to the observer data 100 % of these have been released alive. The client adheres to WCPFC CMM 2019-05 in relation to mobulid rays caught in association with longline fishing (to be confirmed at the site visit). This interaction rate (per hooks observed between 2018 and 2020) is <0.0001. According to Peatman et al. (2018) the percentage of sets with observed catches of manta rays is around 2.5 % for deep-set fishing in tropical areas, which is where the client is mainly fishing and employing their gear. Therefore, the team considered the UoAs highly unlikely to hinder recovery of this species. Therefore, **SG60 and SG80 are met**. Given the non-comprehensive level of at-sea observer coverage and also unspecified *mobula spp*. catch **SG100 is not met**.
Reef manta ray (*Mobula alfredi*) **Manta rays (*Mobula spp.*)** **Rays and skates (*Mobula spp. and Rajidae spp.*)**	4.3 10.7 1.6	41 104 10	This species is considered "Vulnerable" on the IUCN Red List and they are vulnerable to fishing as their life history traits (k-selected) mean their maximum rates of intrinsic population increase are among the lowest of all elasmobranchs (Dulvy et al., 2014). Mobulids are particularly susceptible to incidental catch in tuna fisheries due to their epipelagic distribution in regions of high productivity, leading to a high level of distributional overlap with target species (Croll et al., 2012). The populations of reef manta ray are widely separated with low connectivity and mainly reside in shallow coastal waters (Marshall et al., 2019). A total of 8 observed interactions were recorded for the UoA for reef manta ray, only in 2018 with 0 observed in both 2019 and 2020. According to the observer data 100 % of these have been released alive. The client adheres to WCPFC CMM 2019-05 in relation to mobulid rays caught in association with longline fishing (to be confirmed at the site visit). This interaction rate (per hooks observed between 2018 and 2020) is <0.00001. According to Peatman et al. (2018) the percentage of sets with observed catches of manta rays is around 2.5 % for deep-set fishing in tropical areas, which is where the client is mainly fishing and employing their gear. Therefore, the team considered the UoAs highly unlikely to hinder recovery of this species. Therefore, **SG60 and SG80 are met.** Given the non-comprehensive level of at-sea observer coverage and also unspecified *mobula spp*. catch **SG100 is not met**.

Marine turtles

In total there was 20 individuals recorded by at-sea observers between 2018 and 2020, with the majority of these interactions (17) occurring in 2018. Three species (or groups) were interacted with including: green turtle, olive ridley turtle and unspecified marine turtles. The majority of these were discarded dead (82%). The average annual scaled-up estimate of these marine turtle interactions in both weight and numbers between 2018 and 2020 was <1 t and 104 individuals (Table 19 and Table 23). These numbers are highly uncertain.

The fishery overlaps with several marine turtle Regional Management Units (RMUs), for green, leatherback, olive ridley, hawksbill and loggerhead turtles as outlined in Section 5.8.3.2. According to ABNJ (2017), the distribution area of leatherback, olive ridley, loggerhead and green turtles overlaps with 59.1 %, 60.6 %, 59.7 % and 66 % respectively of the WCPFC Convention Area. The fishery under assessment does not operate inshore, uses circle hooks, fish bait – this needs to be confirmed and is conducting deeper pelagic longline sets (A Townley, pers comm. 2021). These have all been shown to reduce marine turtle interactions (Gilman and Huang, 2017; Gilman et al., 2017, 2019). In a study of the locally-based Palau tuna pelagic longline fishery and its interaction with bycatch and ETP species, Gilman et al. (2017) observed that the interaction rates for marine turtles were low when the Palau fleet conducted deeper sets (> 14 hooks between floats) (See Table 3 in Gilman et al. (2017)). While this study did not include distant water fishing pelagic longline vessels, it still provides an indication of relative interactions rates for deep and shallow set pelagic longlines, which is aligned with existing literature (e.g. Beverly et al. (2009) and Watson and Bigelow (2014)).

Population estimates for marine turtles are difficult to acquire due to a lack of demographic information. Data on nesting females were used as the most readily accessible component of sea turtle populations in order to acquire a population estimate and assess the status of commonly encountered marine turtles in the WCPO. The source of this information came from ABNJ (2017) and is reproduced below.

- **Green turtle**: In the Indo-Pacific, there may be approximately 200,000 females nesting annually at over 230 nesting locations (Seminoff et al., 2015). Some published and unpublished satellite telemetry data exists for Pacific green turtles and suggest that post-nesting females tend to migrate west from Oceania nesting beaches to foraging habitats of the western Pacific.

- **Olive ridley:** the western Pacific population nests primarily in India while an eastern Pacific population nests primarily in Mexico, Costa Rica and Nicaragua. The eastern Pacific population may consist of approximately 2.5 million nesting females and the western Pacific population may be comprised of approximately 300,000 females nesting annually with additional unquantified nesting activity in northern Australia (Limpus, 2009; NMFS_USFWS, 2014)).

- **Leatherback turtles** in the Pacific are comprised two demographic populations identified through genetic studies (Dutton et al., 2007) occurring in the western and an eastern Pacific. The western Pacific meta-population nests in Indonesia, Papua New Guinea and Solomon Islands where approximately 500-600 females may nest annually (Pilcher, 2011; Tapilatu et al., 2013). The eastern Pacific meta-population nests primarily in Mexico and Costa Rica where approximately 150-200 females may nest annually (IUCN_Marine_Turtle_Specialist_Group, 2013).

- **Loggerhead turtles** in the Pacific Ocean are comprised of two distinct population segments, a North Pacific and a South Pacific population. Approximately 500 to 1,000 loggerheads may nest annually in Japan and roughly 2,000-5,000 loggerheads may nest annually in eastern Australia and New Caledonia (Y. Matsuzawa, Sea Turtle Association of Japan, pers. comm. unpublished; UNEP/CMS/COP11 2014 cited in ABNJ (2017)). Both populations are currently stable or increasing.

Wallace et al. (2013) evaluated the relative bycatch rates across longline, net and trawl fisheries to determine bycatch impact scores, which integrated information on bycatch rates, fishing effort, mortality rates, and body sizes (i.e. proxies for reproductive values) of turtles taken as bycatch—as well as mortality rates. The resulting risk, threat levels and bycatch impact for each relevant RMU is shown in Table 24. The olive ridley turtle in Pacific East RMU ranked at high risk of longline bycatch, while all other RMUs for each species were considered either medium or low risk (Wallace et al., 2013). A threat that incurs high mortality and occurs in areas of high density of reproductively valuable individuals is likely to 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.

Taking into account the likelihood of interactions with marine turtles based on the fishery under assessment's gear configuration, the population estimates for individual species (from ABNJ (2017)) and the estimated threat level to individual turtle species (from Wallace et al. (2013)), it was considered that the direct effects of the UoAs are highly likely to not hinder recovery of green, leatherback, hawksbill and loggerhead turtles. **SG60 and SG80 are met**. **SG100 is not met** because of the non-comprehensive observer coverage in the fishery under assessment.

The population estimate of the eastern Pacific olive ridley turtle provides a level of confidence that the direct effects of the UoAs are unlikely to hinder recovery of olive ridley turtles meaning **SG60 is met**. However, given the estimated threat level from longline fishing being classified as high (Wallace et al. 2013), coupled with the non-comprehensive level of observer coverage and also olive ridley turtles being the species most interacted with in the at-sea observer data, the assessment team took a precautionary approach and did not consider it highly likely that the fishery would not hinder recovery of the olive ridley turtles. Consequently, **SG80 is not met**.

Seabirds

There was only one recorded interaction with a seabird (sooty albatross) by at-sea observers between 2018 and 2020. It was discarded dead. It seems likely that this reported interaction was a misidentification, as the WCPFC Convention Area is outside the core foraging range for this species (see ACAP (2012)).

The UoA fleet in the period 2018 to 2020 has been operating in the tropical waters of the WCPO between >= 10°S and < 10°N, which is considered a low risk area for seabird interactions (See Filippi et al. (2010)) and likely explains why there was only one recorded individual across all observed trips. Furthermore, given that the distributions of albatrosses and large petrels, (which are the main vulnerable species susceptible to capture in pelagic longline fisheries), occur poleward of 20 degrees latitude in both hemispheres, it is unlikely that this fishery overlaps with these species.

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 36. It is evident on this map that this fishery under assessment operates in a low-risk area for seabird interactions.

In an assessment of annual mortalities of seabirds in longline and purse-seine fisheries between 2015 to 2018, Peatman et al. (2019) fitted bycatch per unit effort (BPUE) and catch condition models for seabirds to obtain a "best estimate" of total seabird mortality for three regions: (i) the north Pacific - the region north of 10°N; (ii) south Pacific - the region south of 25°S; and (iii) the equatorial Pacific - the region between 10°N and 25°S. Estimated longline seabird bycatch from 2015 to 2018 was between 14,700 – 20,600 individuals per year (95% Cis ranging from 12,000 to 28,600). A total of 65 % were accounted for by longline fisheries north of 20°N, with 23% accounted for by longline fisheries south of 30°S. The remainder was accounted for by fishing between 25°S and 25°N (9 %), and between 25°S and 30°S (4 %). The majority of bycatch was estimated to be dead at-vessel, with estimates of mortality ranging from 13,000 to 19,000 individuals per year (95 % CIs ranging from 10,800 to 25,000). It was noted that the proportions dead at vessel were relatively low for the region between 25°S and 20°N (75 %), compared to fishing elsewhere (95 %). This provides further evidence that the UoAs are operating in a low-risk area for seabird interactions.

Based on this information the assessment team considered that the direct effects of the UoAs are highly likely to not hinder recovery of seabird species. **SG60 and SG80 are met. SG100 is not met** because of the non-comprehensive observer coverage in the fishery under assessment.

In relation to the unobserved mortality of ETP species, the team considered the possible issue of ghost fishing caused by discarded or lost fishing gear (monofilament line and hooks). Gear loss is reportedly minimal (mainly limited to hooks that have been lost to sharks) to be confirmed. The use of radio beacons and GPS on the mainline mean they are often able to be located even if the mainline breaks when hauling or otherwise. The assessment team therefore concluded that the incidence of gear loss is rare- to be confirmed. 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). Under CMM 2017-04, CCMs should 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. It was therefore concluded that unobserved mortality through ghost fishing at the scale of the UoAs was highly unlikely to be a significant factor in the fishery's interactions with ETP species. To be confirmed.

c	Indirect effects			
	Guide post		Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the UoA on ETP species.
	Met?		All scoring elements – Yes	All scoring elements – No

Rationale

Indirect effects on ETP species might include disturbance of nesting/roosting behaviour, noise or pollution and removal of potential prey species. Note: Discard and post-release mortality is accounted for in the information cited above and is therefore not an indirect effect.

Indirect trophic effects of fishing for tuna on the tropical pelagic ecosystem have been considered through a variety of modelling approaches (Allain et al., 2007, 2015) and, although the impacts are not negligible, they have not been considered irreversible and no particular impacts on ETP species have been identified.

The team considered possible indirect effects to be as follows:

Elasmobranchs: *Removal of prey* – sharks are opportunistic feeders with a varied diet consisting a range of teleosts including barracuda, jacks, dolphinfish, tuna, skipjack and other scombrids, white marlin, and squid, and occasionally stingrays, seabirds, turtles, marine gastropods, crustaceans, carrion from marine mammals, and garbage

(Compagno, 1984 in Bonfil et al. (2008)). Although they are apex predators, the diversity of prey items makes it highly unlikely that the UoA fishery, through its exploitation of mainly tunas, would lead to unacceptable impacts on any of the ETP shark species through competition. Giant and reef manta rays are planktivorous. The diet of sea turtles is restricted to algae, grasses and seaweeds, invertebrates and small fish. Finally, none of the bird species considered (sooty albatross) feed on the target species in this fishery.

Sea turtles: Disturbance around nesting / inter-nesting foraging areas – this is highly unlikely given the fishery is operating offshore and away from foraging or roosting areas.

Seabirds: Disturbance around nesting / roosting, foraging areas – this is highly unlikely given the fishery is operating in a low-risk area for seabird interactions, offshore and away from foraging or roosting areas.

In summary, indirect effects have been considered and the fishery under assessment is considered highly likely to not create unacceptable impacts on the ETP species. **SG80 is met**. There has been no dedicated research exploring likely indirect effects by the UoA and as such, **SG100 is not met**.

References

ACAP (2012), Allain et al. (2015), Allain et al. (2007), Wallace et al. (2010), Wallace et al. (2013), Wallace et al. (2011), Beverly et al. (2009), Clarke et al. (2018), Croll et al. (2012), Filippi et al. (2010), Dulvy et al. (2014), Dutton et al. (2007), Macfadyen et al. (2009), Gilman et al. (2017), Gilman et al. (2007), Gilman et al. (2019), Gilman and Huang (2017), IUCN_Marine_Turtle_Specialist_Group (2013), Limpus (2009), Marshall et al. (2019), Marshall et al. (2018), NMFS_USFWS (2014), Peatman et al. (2019), Peatman et al. (2018), Pilcher (2011), Anderson (2014), Seminoff et al. (2015), SPC_OFP (2020), Tapilatu et al. (2013), Tremblay-Boyer et al. (2019), Watson and Bigelow (2014), WCPFC_SC (2020d, 2020e)

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

Draft scoring range	60-79
Information gap indicator	More information sought: - Does the client have in place a no retention shark policy for UoA vessels? - Further information on specific gear configurations and amount of gear loss.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 32. PI 2.3.2 – ETP species management strategy

PI 2.3.2		The UoA has in place precautionary management strategies designed to: meet national and international requirements; ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place (national and international requirements)			
	Guide post	There are **measures** in place that minimise the UoA-related mortality of ETP **species, and are expected to be highly** likely to achieve national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	All scoring elements – Yes	All scoring elements – Yes	All scoring elements – No

Rationale

In the context of this performance indicator (Source: MSC FCR v2.01; Table SA8):

- "Measures" are actions or tools in place that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere.

- 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.

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.

All ETP species

There is a binding 5 % observer coverage level set by the WCPFC for all longline operations in the WCPO under CMM 2018-05. The ROP aims to collect independent fishery information on interactions with *inter alia* ETP species during longline operations, which inform management decision-making. In 2018 and 2019, the Republic of Korea longline fleet achieved observer coverage levels of 6.3 % and 10.4 % respectively (based on number of observed fishing days) (WCPFC_SC, 2020b, 2021a), which met the requirements of CMM 2018-05. UoA specific fleet at-sea observer coverage was 4.5 %, 7.2 % and 2. 6% in 2018, 2019 and 2020 respectively.

Elasmobranchs (4 scoring elements – see PI 2.3.1b for complete list)

The WCPFC has implemented various CMMs and resolutions for elasmobranch species to which the Republic of Korea is bound to implement. CMM 2019-04 encompasses all species of sharks, skates, rays and chimaeras, which stipulates *inter alia*, that all sharks retained on board vessels should be fully utilised and the practice of shark finning is prohibited. CCMs are required to ensure their vessels land sharks with fins naturally attached to the carcass and longline fisheries targeting tuna and billfish are required to either not use or carry wire trace as branch lines or leaders or do not use shark lines. Within CMM 2019-04 there is also species-specific management for silky and oceanic whitetip sharks. Both these sharks are prohibited from being retained and if an individual is caught, CCMs should ensure they are released as soon as possible after being brought alongside the vessel, and in a manner that results in as little harm to the shark as possible. There are also various reporting requirements in place. CMM 2019-05 encompasses all species in the family *Mobulidae*, which includes mantas and mobula rays, which stipulates *inter alia*, that CCMs are prohibited from targeted fishing or intentional setting on mobulid rays. CCMs are prohibited from retaining any of these species and if an individual is caught, CCMs should ensure they are released as soon as possible after being brought alongside the vessel, and in a manner that results in as little harm to the mobulid ray as possible. There are also various reporting requirements in place.

At the national level, WCPFC CMMs are endorsed by the Republic of Korea and under Article 13 of the DWFDA, where distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." The Republic of Korea has formulated a National Plan of Action for Sharks which has been implemented since 2011 (Republic_of_Korea, 2011). At the UoA level, the fleet has in place the following measures for sharks: no retention of any species of sharks or rays (including shark fins or other parts of sharks and rays), including no transhipping, landing or trading any sharks or rays – to be confirmed. Evidence from the at-sea observer reports for the UoA fleet suggests that compliance with shark CMMs is comprehensive; all this is to be confirmed at site visit.

The assessment team considered that all these elements constitute examples of a strategy (as detailed in Table GSA3), designed to minimise mortality on elasmobranchs such that **SG60 and SG80 are met**. **SG100 is not met** because of the non-comprehensive observer coverage in the fishery under assessment, lack of specific stock assessments and population estimates for some species, which mean it is not a comprehensive, tested, strategy made up of linked monitoring, analyses, and management measures and responses.

Marine turtles (5 scoring elements – see PI 2.3.1b for complete list)

The WCPFC has implemented various CMMs and resolutions for marine turtles species to which the Republic of Korea is bound to implement. CMM 2018-04 specifically addresses marine turtle bycatch which stipulates *inter alia*, ensuring all longline vessels that fish in the Convention Area shall carry line cutters and de-hookers to handle and promptly release sea turtles caught or entangled, that CCMs implement the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations and ensure the safe handling of captured sea turtles. Furthermore, for shallow-setting longline vessels they must implement at least one measure to mitigate capture of marine turtles out of: (i) using large circle hooks; (ii) using finfish for bait or; (iii) any other measure or mitigation plan/activity approved by SC and Commission to be capable of reducing sea turtle interactions. There are also various reporting requirements in place.

At the national level, WCPFC CMMs are endorsed by the Republic of Korea and under Article 13 of the DWFDA, where distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." The Republic of Korea fully implements the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations (See, https://www.iotc.org/science/table-progress-implementing-npoa-sharks-npoa-seabirds-and-fao-guidelines-reduce-sea-turtle-mortality). Evidence from the at-sea observer reports for the UoA fleet suggests that the use of marine turtle mitigation measures as specified by CMM 2018-04 is comprehensive – to be confirmed at the site visit. The WCPFC CMM for marine turtles is based on information that shows that the use of circle hooks, changing baits from squid to fish bait and fishing at greater depths (i.e., >100m) can reduce marine turtle interactions (Gilman and Huang, 2017; Gilman et al., 2017, 2019). This aligns with the fishing operations of the UoA fleet, which is operating in offshore waters, using circle hooks, fish bait and are conducting deeper pelagic longline sets (A Townley, pers comm. 2021). The UoA fleet requires the possession and use of line cutters and de-hookers to safely handle and release captured or entangled sea turtles. Therefore, the risk of marine turtle mortality is reduced and the propensity for indirect effects seems highly unlikely.

The assessment team considered that all these elements constitute examples of a strategy (as detailed in Table GSA3), designed to minimise mortality on marine turtles such that **SG60 and SG80 are met. SG100 is not met** because of the non-comprehensive observer coverage in the fishery under assessment, uncertainty in some population estimates for some species, which mean it is not a comprehensive, tested, strategy made up of linked monitoring, analyses, and management measures and responses.

Seabirds (1 scoring element – see PI 2.3.1b for complete list)

The WCPFC has implemented various CMMs and resolutions for seabirds to which the Republic of Korea is bound to implement. CMM 2018-03 specifically addresses seabird bycatch but it only applies to longline fisheries operating South of 30°S, between 25°S and 30°S, and North of 23°N; and therefore, they do not apply to the UoA fleet in their area of operation. Longline fisheries operating in 'other areas' (between 25°S and 23°N), where necessary, are encouraged to employ one or more of the seabird mitigation measures but this is not enforceable. Based on the analysis by Filippi et al. (2010) and Peatman et al. (2019), seabird interaction in the area of operation of the UoA fleet is considered low, as such the risk of seabird mortality is reduced and the propensity for direct effects seems highly unlikely.

At the national level, WCPFC CMMs are endorsed by the Republic of Korea and under Article 13 of the DWFDA, where distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." The Republic of Korea has formulated a National Plan of Action for Seabirds which has been implemented since 2014 (Republic_of_Korea, 2014a). This document specifies that the Republic of Korea will undertake research and development on reducing incidental catch of seabirds and educate fishers through the distribution of the published *Field Guide on Bycatch Species in Korean Distant Water Fisheries* and further training opportunities. Evidence from the at-sea observer reports for the UoA fleet suggests that the use of seabird mitigation measures as specified by CMM 2018-04 is variable due to where the UoA fleet is operating. Evidence of measures employed by the client group include weighted branch lines as one part of the recommended measures from CMM 2018-03 and also management of offal discharge as necessary – to be confirmed at site visit.

The assessment team considered that all these elements constitute examples of a strategy (as detailed in Table GSA3), designed to minimise mortality on seabirds such that **SG60 and SG80 are met. SG100 is not met** because of the non-comprehensive observer coverage in the fishery under assessment, which mean it is not a comprehensive, tested, strategy made up of linked monitoring, analyses, and management measures and responses.

As detailed in PI 2.3.1b ghost fishing may be a factor in the unobserved mortality of ETP species. In terms of management, the team concluded that this falls under the wider concept of waste management. Any UoA specific management of waste? Under the WCPFC Regional Observer Program and accompanying ROP Minimum Standard Data Fields, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether it discharged any oil or disposed of metals, plastics, chemicals or fishing gear at sea. Furthermore, under CMM 2017-04, CCMs should 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 assessment team was therefore satisfied that there is a management strategy in place to address the issue of ghost fishing, **SG60 and SG80 are met**, 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?	NA	NA	NA

Rationale

Since there are requirements for protection and rebuilding provided through national ETP legislation or international agreements, the team has only scored scoring issue (a) following SA 3.11.2.1.

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?	All scoring elements – Yes	All scoring elements – Yes - preliminary	All scoring elements – No

Rationale

Elasmobranchs and marine turtles (4 and 5 scoring elements – see PI 2.3.1b for complete list)

WCPFC CMMs are endorsed by the Republic of Korea and under Article 13 of the DWFDA, where distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." As this relates to elasmobranchs and respective CMMs, it is clear from the at-sea observer data that compliance with shark and marine turtle CMMs is comprehensive. – to be confirmed after the site visit.

More generally, as outlined in PI 3.2.3a "Korean fishing vessels are monitored by the fisheries monitoring centre (FMC), which has a state-of-the-art monitoring system generating real time reporting on the fleet (Campling et al., 2017). The FMC ensures proper functioning of VMS and operates the fisheries monitoring system (FMS), e-reporting system (daily for catch/bycatch and protected species interaction data) and the Korean fisheries information management system (FIMS) on a 24/7 basis. This allows detailed and operational fishery data to be sent to RFMOs and for the FMC to also monitor the fleet in real-time to ensure it is complying with regulations, such as not fishing in protected areas."

This provides an objective basis for confidence that the strategies for elasmobranchs as implemented by the WCPFC and Republic of Korea will work. **SG60** and **SG80** are met – preliminary scoring. The evidence base is not sufficiently comprehensive, however, to provide high confidence, especially in the absence of quantitative analyses for all species and non-comprehensive observer coverage. **SG100** is not met.

Seabirds (1 scoring element – see PI 2.3.1b for complete list)

CMM 2018-03 and the seabird mitigation measures detailed therein only apply to longline fisheries operating South of 30° South, between 25° South and 30° South, and North of 23° North. The fishery under assessment is not operating in this area and therefore these measures do not apply. Longline fisheries operating in 'other areas' (between 25°S and 23°N), where necessary, are however encouraged to employ one or more of the seabird mitigation measures listed in Table 1 of the CMM. Based on the at-sea observer data and analyses by Filippi et al. (2010) and Peatman et al. (2019), seabird interactions and resulting mortalities are likely to be rare and mitigation measures would therefore not seem to be required. Overall, there is a strategy in place to manage the fishery's impact on seabirds as detailed in PI 2.3.2a, which is in any case minimal, providing confidence that this would work by default. **Therefore, SG60 and SG80 are met**. The evidence base is not sufficiently comprehensive to provide high confidence, especially in the absence of quantitative analyses for all species, with non-comprehensive observer coverage. **SG100 is not met**.

d	Management strategy implementation			
	Guide post		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and **is achieving its objective as set out in scoring issue (a) or (b).**

	Met?		All scoring elements – Yes	All scoring elements – No

Rationale

All ETP species (10 scoring elements – see PI 2.3.1b for complete list)

Evidence for implementation of the measures or strategies for all ETP species includes VMS and observer data and the MCS system as described under Principle 3. As this relates to elasmobranchs and marine turtles, it is clear from the at-sea observer data that compliance with shark and marine turtle CMMs is comprehensive. The UoA fleet is operating in a low risk area for seabirds and using circle hooks, fish bait and – to be determined are conducting deeper pelagic longline sets (A Townley, pers comm. 2021), which reduces the risk for marine turtles.

More generally, as outlined in PI 3.2.3a "Korean fishing vessels are monitored by the fisheries monitoring centre (FMC), which has a state-of-the-art monitoring system generating real time reporting on the fleet (Campling et al., 2017). The FMC ensures proper functioning of VMS and operates the fisheries monitoring system (FMS), e-reporting system (daily for catch/bycatch and protected species interaction data) and the Korean fisheries information management system (FIMS) on a 24/7 basis. This allows detailed and operational fishery data to be sent to RFMOs and for the FMC to also monitor the fleet in real-time to ensure it is complying with regulations, such as not fishing in protected areas." Furthermore as detailed in PI 3.2.3d "Korean distant water fishing vessels are considered "good corporate citizens in regional fisheries, with good compliance with measures and regulations." (Campling et al., 2017). The level of compliance is high over the last few years with no major transgressions or fines. No infractions were committed by the UoA vessels in 2019 and 2020. Therefore, there is no evidence of systematic non-compliance. "This provides an objective basis for confidence that the measures and strategies for ETPs as implemented by the WCPFC and Republic of Korea are being implemented successfully. **SG80 is met**. However, considering the non-comprehensive observer coverage in this fishery under assessment, the assessment team felt that clear evidence of its successful implementation is lacking in this fishery under assessment. **SG100 is not met**.

e	Review of alternative measures to minimize mortality of ETP species			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	All scoring elements – Yes	All scoring elements – Yes	All scoring elements – No

Rationale

All ETP species (10 scoring elements – see PI 2.3.1b for complete list)

At annual WCPFC SC and TCC meetings, the CCMs are tasked with reviewing alternative bycatch management strategies with respect to improving existing CMMs or Resolutions. This is undertaken through a review of catch, interaction and compliance data with CMMs or Resolutions from a variety of sources (observer, logbooks, port sampling). Specifically, at the annual WCPFC SC meeting, the Ecosystem and Bycatch Mitigation Theme exists to conduct this review for ETP species. Close to 20 working and information papers presented to SC17 (2021) can be found here: https://meetings.wcpfc.int/meetings/sc17, which provide CCMs with the best available science on ETP mitigation in WCPO fisheries. 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 (See, e.g. ABNJ, 2017 – and others to be updated at the site visit). Recommendations from these meetings are developed and provided to the main WCPFC Commission meeting later in the year.

As a consequence of the above bycatch mitigation studies, WCPFC CMMs are regularly revised to ensure best practice. For example, the Republic of Korea at WCPFC 16 first introduced a proposal to amend CMM 2011-03, to include longline fisheries (Republic_of_Korea, 2019). This was not supported at WCPFC 16 without a review of available of data to provide estimates of fishing interaction types and levels with cetaceans. This was subsequently reported on at SC 16 and SC 17; see Williams et al. (2020b; 2021).This will lead to the WCPFC to consider whether CMM 2011-03 is updated to include longline fisheries. Other examples include the WCPFC adopting CMM 2017-06 *Conservation and Management Measure for Mitigating Impacts of Fishing on Seabirds*, to replace CMM 2015-03 based on further scientific information. 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 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 WCPFC 17 (see: https://meetings.wcpfc.int/meetings/wcpfc17).

The potential effectiveness and practicality of alternative measures to minimise UoA-related mortality on ETP species are regularly reviewed through the various instruments cited above (either at regional level, through WCPFC or projects such as ABNJ, or at client level through national submissions made to the WCPFC SC in Part 1- Annual Reports detailing information on fisheries, research and statistics (see: https://meetings.wcpfc.int/meetings/sc17) and…) and are implemented as appropriate, either at regional level through CMMs (which are then adopted by the Republic of Korea and must be implemented by the UoA) or at UoA level. **SG60 and SG80 are met**. **SG100 is not met** because it is not clear that there is a biennial review of all measures for ETP species.

References

ABNJ (2017), Campling et al. (2017), Filippi et al. (2010), Gascoigne et al. (2021), Gilman et al. (2019), Gilman and Huang (2017), Peatman et al. (2019), Republic_of_Korea (2011, 2014a, 2019), Sieben et al. (2020), Williams et al. (2020b; 2021)

CMM 2019-04: Conservation and Management Measure for Sharks – Western and Central Pacific Fisheries Commission (WCPFC)

CMM 2019-05: Conservation and Management Measure on Mobulid Rays caught in association with fisheries in the WCPFC Convention Area – Western and Central Pacific Fisheries Commission (WCPFC)

CMM 2018-04: Conservation and Management Measure of Sea Turtles – Western and Central Pacific Fisheries Commission (WCPFC)

CMM 2018-03: Conservation and Management Measure to mitigate the impact of fishing for highly migratory fish stocks on seabirds – Western and Central Pacific Fisheries Commission (WCPFC)

CMM 2011-03: Conservation and Management Measure to address the impact of purse seine activity on cetaceans.– Western and Central Pacific Fisheries Commission (WCPFC)

CMM 2018-05: Conservation and Management Measure for the Regional Observer Programme – Western and Central Pacific Fisheries Commission.

CMM 2017-04: Conservation and Management Measure on Marine Pollution - Western and Central Pacific Fisheries Commission (WCPFC)

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

Draft scoring range	≥80
Information gap indicator	More information sought: - Fleet-specific management of sharks and ray species – i.e. is there a non-retention ban in place and other measures such as leader material, best practice handling and release practices - Any UoA specific management of waste on board vessels - Information on bait use and hook types used during fishing operations - Further information on the review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and whether they are implemented as appropriate.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 33. PI 2.3.3 – ETP species information

PI 2.3.3		Relevant information is collected to support the management of UoA impacts on ETP species, including: Information for the development of the management strategy; Information to assess the effectiveness of the management strategy; and Information to determine the outcome status of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts			
	Guide post	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	All scoring elements – Yes	All scoring elements – No	All scoring elements – No

Rationale

All ETP species (10 scoring elements – see PI 2.3.1b for complete list)

At the regional level, there is sufficient information about ETP species and there is also arguably quantitative information about some ETP stocks/populations (e.g. various shark and marine turtle species) that interact with this type of fishery under assessment. The client does not keep adequate records of interactions with ETP species in their logbook compared to primary and some secondary species. There were no recorded interactions with any sharks, marine turtles, seabirds or cetaceans in the data provided for the period 2016 to 2020 (see Table 17). This made the assessment team reliant on at-sea observer records. The coverage of the at-sea observer is low for the period 2016 to 2020. Observer coverage levels in both 2016 and 2017 represented a small fraction (<1.5 %) of the total hooks deployed in the UoAs and was a significant factor in the reason behind the assessment team only using data from 2018 to 2020 to scale up the catch. In both 2018 and 2019 the observer coverage was 4.5 % and 7.2 % respectively but declined in 2020 to just 2.6 % due to the Covid-19 pandemic. While the observer coverage levels between 2018 and 2020 (on average) are aligned with WCPFC CMM 2018-05 (and similar to other MSC-certified longline fisheries), the coverage levels across the entire period 2016 to 2020 represent a low basis of information to determine a robust estimate of UoA related mortality on ETP species. Consequently, the scaled-up at-sea observer data provides some qualitative information with which to estimate the UoA-related mortality on ETP species such that **SG60** is met. However, the observer coverage is currently too low (in some specific years i.e. 2016, 2017 and 2020) to enable a robust estimation of mortality rates and conclusions cannot be drawn about the exact amount of species being caught. Consequently, **SG80 is not 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, minimise mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	All scoring elements – Yes	All scoring elements – No	All scoring elements – No

Rationale

<u>All ETP species (10 scoring elements – see PI 2.3.1b for complete list)</u>

Interactions with ETP species (possibly with the exception of some shark species) are rare events and much of the scoring of PI 2.3.1 is reliant on a non-comprehensive observer dataset and regional studies and research from pelagic longline fisheries (e.g. Filippi et al. (2010), Peatman et al. (2019) and Peatman et al. (2018)). As detailed in PI 2.3.3a, there were no recorded interactions with any sharks, marine turtles, seabirds or cetaceans in the logbook data provided for the period 2016 to 2020 (Table 17). This made the assessment team reliant on at-sea observer records. The coverage for the at-sea observer records is low (<5 %) for the period 2016 to 2020 which led to the assessment team only using at-sea observer data from 2018 to 2020 to scale up the catch. This does not meet the requirements detailed in WCPFC CMM 2018-05 (for 2016 to 2020) and represents a low basis of information to support a strategy to manage impacts on ETP species. Nevertheless, it does mean that there is some information to support measures to manage the impacts on ETP species, particularly for species that are not rare events, such as specific elasmobranchs. **SG60 is met**. While less than 5 % may be adequate for detecting whether ETP bycatch occurs, the estimation of bycatch rates will not be precise and conclusions cannot be drawn about the exact amount of species being caught ((Babcock et al., 2003; Gilman et al., 2012; Pierre, 2019). In the absence of having adequate information to measure trends in ETP bycatch rates **SG80 is not met**.

References

Filippi et al. (2010), Peatman et al. (2019), Peatman et al. (2018), Babcock et al. (2003), Gilman et al. (2012) and Pierre (2019)

CMM 2018-05: WCPFC (2018) Conservation and Management Measure for the Regional Observer Programme – Western and Central Pacific Fisheries Commission.

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 34. PI 2.4.1 – Habitats outcome

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates		
Scoring Issue		SG 60	SG 80	SG 100
a	Commonly encountered habitat status			
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Yes	Yes	Yes

Rationale

This fishery under assessment takes place in the high seas, in deep water and is highly unlikely to interact with benthic features. The gear impact on the water column – epipelagic habitat (considered here as the commonly encountered habitat, in line with MSC interpretation https://mscportal.force.com/interpret/s/article/pelagic-habitats-and-gear-Box-GSA7-1527262009346) is considered negligible. Gear loss may consist of monofilament and/or hooks, which could interact with the commonly encountered habitat. Under CMM 2017-04, CCMs are required to 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. There is evidence that the fishery under assessment is highly unlikely to reduce structure and function of any habitats to a point where there would be serious or irreversible harm. **Therefore SG60, SG80 and SG100 are provisionally scored as 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?	NA	NA	NA

Rationale

See Section 5.8.4 and PI 2.4.1a rationale. This fishery does not interact with VMEs as defined in GSA 3.13.3.2. **This scoring issue is not relevant.**

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?			Yes

Rationale

See Section 6.7.4 and PI 2.4.1a rationale. **SG100 is met.**

References

VMS data

CMM 2017-04: Conservation and Management Measure on Marine Pollution - Western and Central Pacific Fisheries Commission (WCPFC)

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

Draft scoring range	≥80
Information gap indicator	More information sought: - Client specific information about gear loss and retrieval - VMS data

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 35. 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?	Yes	Yes	No

Rationale

As discussed under PI 2.4.1a the fishery under assessment is highly unlikely to interact with benthic habitats as it is a pelagic longline fishery. Consequently, the term "if necessary" applies here and management measures should not be required. **SG60 and SG80 are met by default**. To meet **SG100** however, requires a strategy in place to manage the impact of the fishery under assessment on habitat types (either directly or indirectly through ghost fishing). Consequently, **SG100** is provisionally 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?	Yes	Yes	Yes

Rationale

As detailed in 2.4.2a the partial strategy is the nature of the fishery (pelagic longline). Knowledge in relation to the way pelagic longline fishing gear is fished, as well as the ocean areas where the UoA fleet operates (open ocean, deep waters) is sufficient to discount any significant impacts on benthic habitats from the fishery and there is high confidence that it works. **SG60, SG80 and SG100 are 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?		Yes	Yes

Rationale

Quantitative evidence such as latitude and longitude data from the at-sea observer data as well as VMS data tracks demonstrates the fishery is operating offshore in deep water and given the nature of the fishing gear would have no impact on benthic habitats. **SG80** and **SG100** are provisionally scored as 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?	NA	NA	NA

Rationale

In the absence of interactions with VMEs (see PI 2.4.1), this scoring issue is not relevant.

References

VMS data to be viewed at the site visit.

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

Draft scoring range	≥80

Information gap indicator	More information sought: - Client specific information about gear loss while fishing and its retrieval is required. Information on any strategy to reduce gear loss. - Information on VMS tracks to confirm the fishery is operating in deep water/open ocean.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 36. PI 2.4.3 – Habitats information

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	The types and distribution of the main habitats are **broadly understood**. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Yes	Yes	No

Rationale

As detailed in Section 5.8.4 and rationale PI 2.4.1a, the fishery under assessment is mostly confined to the epipelagic habitat – the uppermost 200m of the water column. The distribution of the pelagic habitat is known over the spatial range in which the fishery operates from wildly available bathymetric maps and sea charts of the WCPO. The effect of pelagic longlines from the UoAs on this habitat (i.e., epipelagic habitat) is negligible. **SG60 and SG80 are met**. Despite this, it cannot be said that the distribution of all habitats (pelagic and benthic) is known over their range and **SG100 cannot be awarded**.

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.	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.	The physical impacts of the gear on all habitats have been quantified fully.

		OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	Met?	Yes	Yes	No

Rationale

As detailed in PI 3.2.3a the Republic of Korea fishing vessels are monitored by the FMC, which has a state-of-the-art monitoring system generating real time reporting on the fleet (Campling et al., 2017). The FMC ensures proper functioning of VMS and operates the fisheries monitoring system (FMS), e-reporting system (daily for catch/bycatch and protected species interaction data) and the Korean fisheries information management system (FIMS) on a 24/7 basis. Consequently, there is accurate, near real time monitoring of the spatial extent of interaction, and the timing and location of use of the fishing gear. At-sea observer data and logbook data are also collected from the UoA fleet allowing a spatial assessment of impacts on habitats. The fishery does not interact with the benthic habitats due to operating in deep water and the open ocean. The only encountered habitat is the epipelagic habitat. **SG60 and SG80 are met**. Despite this it cannot be said that the physical impacts of the fishing gear on the epipelagic habitat have been fully quantified. **SG100 is not met**.

c	Monitoring			
	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.
	Met?		Yes	No

Rationale

The only commonly encountered habitat is the epipelagic habitat. VMS, logbook and at-sea observer data enable any increase in risk to benthic features to be detected. **SG80 is met. SG100 is not met** because changes in all habitat distributions (not just relevant to the UoA) are not measured over time.

References

Campling et al. (2017); VMS data to be viewed at the site visit.

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

Draft scoring range	≥80
Information gap indicator	More information sought: - VMS data to be viewed at the site visit.

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 37. 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?	Yes	Yes	No

Rationale

Section 5.8.5 of this report provides an overview of the Western Pacific Warm Pool (Warm Pool) and the Pacific Equatorial Divergence (PEQD), within the Pacific Ocean where the fishery under assessment is operating. The impacts of the UoAs on primary and secondary species, ETP species as well as habitats, have all been considered and described in the previous sections of this report. However, other risks exist and further impacts of the fishery under assessment may still arise at a higher ecosystem level, most notably those risks to ecosystem structure and function through the removal of higher-trophic level species (i.e., tuna and billfish). There are a myriad of scientific papers that outline the declines of predatory fish species, and the potential/likely impacts to the ecosystem through disturbance of trophic dynamics (e.g. Allain et al. (2015), Allain et al. (2007), Kitchell et al. (1999), Lehodey et al. (2013) and Sibert et al. (2006)). From these studies it is evident that there has been substantial impacts from the depletion of the main target species, however there is evidence that these are not irreversible or catastrophic. For example, Allain et al. (2007) found that most species rebuilt to virgin biomass after five years of no fishing. Furthermore, Sibert et al. (2006) 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. Other modelling by Allain et al. (2015) suggests that the structure of the Warm Pool ecosystem is resistant to considerable perturbation (e.g. large changes in the harvest of the predatory fish species). Nevertheless, given the likelihood that industrial tuna fisheries have altered the structure and function of the ecosystem in the WCPO to some extent, through the removal of key predator species, it is important to determine how much could be removed before cascading effects occur and whether there are clear thresholds for large-scale ecosystem transformations (Baum and Worm, 2009). The assessment team therefore considered the stock biomass in relation to the point of recruitment impairment (PRI), MSY and any other relevant target and limit reference points to inform the likelihood of irreversible ecosystem impacts occurring.

As has been presented under Principle 1 of this report, all of the stocks are near MSY and above the PRI. Furthermore, the UoAs take a small percentage (<0.01 %) of the overall total catch of target tuna stocks (yellowfin, bigeye and albacore tuna) across the WCPFC Convention Area (based on 2019 data from WCPFC Tuna Fishery Yearbook - https://www.wcpfc.int/doc/wcpfc-tuna-fishery-yearbook-2019). Coupled with the relatively low-level impact on Principle 2 components (as detailed above), it is therefore highly unlikely that the fishery under assessment would lead to irreversible ecosystem impacts. On this basis, it is considered highly unlikely that the fishery will disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. **SG60** and **SG80** are met. There is however limited formal evidence supporting this conclusion, particularly given the non-comprehensive at-sea observer coverage in the fishery under assessment. This means there is not enough evidence to demonstrate that the UoAs are highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. **SG100** is not met.

References

Allain et al. (2015), Allain et al. (2007), Kitchell et al. (1999), Baum and Worm (2009), Lehodey et al. (2013) and Sibert et al. (2006)

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

Draft scoring range	≥80
Information gap indicator	More information sought Further formal evidence on the impacts of the UoA on ecosystem structure and function

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 38. PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place, if necessary which take into account the potential impacts of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a plan, in place which contains measures to **address all main impacts of the UoA on the ecosystem**, and at least some of these measures are in place.
	Met?	Yes	Yes	No

Rationale

The objectives of the WCPFC Convention are 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 the Agreement. The Convention sets out to assess the impacts of fishing, other human activities and environmental factors on target stocks, non-target species, and species belonging to the same ecosystem or dependent upon or associated with the target stocks (Article 5), to encourage and promote cooperation in scientific research, (…), in order to improve information on highly migratory fish stocks, non-target species, and species belonging to the same ecosystem or associated with or dependent upon such stocks in the Convention Area (Article 12) and to conduct assessments of highly migratory fish stocks, non-target species, and species belonging to the same ecosystem or associated with or dependent upon such stocks, within the Convention Area. As detailed in PI 1.2.3, 2.1.2, 2.2.2, 2.3.2 and 2.4.2 there are management measures, partial strategies and strategies in place for target, non-target, ETP species and habitats (see these PI rationales for further information), which often take the form of CMMs at the regional level that are binding on CCMs. The WCPFC has also established the Ecosystem and Bycatch Scientific Working Group and the Ecosystem and Bycatch Mitigation Theme, which illustrates their commitment to the ecosystem approach to fisheries. In 2019, the WCPFC adopted the *Resolution on Climate Change as it relates to the Western and Central Pacific Fisheries Commission* (Resolution 2019-01), which highlighted the need to consider the potential impacts of climate change on highly migratory fish stocks in the Convention Area. SA 3.17.3.2 states that 'it may not be necessary to have a specific "ecosystem strategy" other than that which comprises the individual strategies for the other components under P1 and P2." For the most part, the range of CMMs and Resolutions used by the WCPFC and management measures by the Republic of Korea at a national level (See PI 3.1.1, 3.2.1 and 3.2.3), although not specifically designed to manage impacts on the ecosystem, represents a "partial strategy" that works to achieve the proposed outcome. There is some evidence that this partial strategy is being implemented successfully. For example, the main target tuna stocks are highly likely to be near MSY and above the PRI. Furthermore, within the WCPFC, there is a system of regular assessment, data collection, sharing of information as well as agreement over new and expanded management initiatives through the adoption of WCPFC CMMs (https://www.wcpfc.int/conservation-and-management-measures). Therefore, **SG60 and SG80 are met**. However, while it could be argued that this constitutes a strategy, it does not consist of a plan that addresses all aspects and impacts of the UoAs, therefore **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/ 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?	Yes	Yes	No

Rationale

There is an objective basis for confidence that the measures at the regional and national level (detailed in Principle 1 and 2 sections of this report), which form part of the measures outlined in PI 2.5.2a will work. As has been presented under Principle 1 of this report, none of these stocks are currently below the PRI. Furthermore, the extensive ecosystem modelling (described under PI 2.5.1) suggests that substantial impacts from the depletion of the main target tuna species are not irreversible or catastrophic and the UoAs only take a small percentage of the overall total catch of target tuna stocks (yellowfin, bigeye and albacore tuna) anyway across the WCPFC Convention Area. When coupled with the relatively low-level impact on Principle 2 components (as detailed in the rationales above), there is some objective basis for confidence that the measures will work. **SG60 and SG80 are met**. Testing in the form of say, ecosystem models for all UoA relevant stocks (e.g., ETP species), has not been undertaken, **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?		Yes	No

Rationale

The stock status (all target species being above PRI), a relatively small fleet size, and small volumes of target species taken compared to the total volumes caught in the WCPFC Convention Area overall, provides some evidence that the measures in place are being implemented successfully. Available ecosystem modelling suggests it is unlikely the fishery under assessment is having an irreversible impact on ecosystem functioning under 2.5.1a. **SG80 is met**. However, considering the non-comprehensive observer coverage in this fishery under assessment **the necessary clear evidence is not present in the UoAs in order to meet SG100.**

References

WCPFC Convention

WCPFC Conservation and Management Measures: https://www.wcpfc.int/conservation-and-management-measures

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 39. 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?	Yes	Yes	

Rationale

The key elements of the ecosystem are broadly understood when the main features of the ecosystem and their major inter-relationships can be specified (MSC, 2018). Key elements in this ecosystem have been identified to be the target species of tuna (bigeye, yellowfin and albacore) and the associated species engaged in trophic interactions with these tuna stocks (including elasmobranchs, cetaceans and teleosts). There are no associated habitat elements in this fishery as it is strictly confined to the epipelagic zone of the water column (see PI 2.4.1). Information on these elements is collected through fishery logbooks, landings records, at-sea observer data, port sampling and electronic monitoring records. Information is also collected through various scientific research programs and studies, which is used by the WCPFC SC to provide recommendations to the Commission for developing new or modifying existing CMMs. For example, tagging studies by the FAO's ABNJ tuna project has collected information about vulnerable shark species in the ecosystem and post capture mortality following release from commercial fisheries operations (ABNJ, 2019). As stipulated in previous MSC assessments for Pacific tuna fisheries, there is ongoing work to collect detailed data on the structure of the Pacific Ocean pelagic ecosystem (where the fishery operates), e.g. through at-sea 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**. SG60 and SG80 are 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?	Yes	Yes	No

Rationale

The trophic structure and top predator size-structure of pelagic ecosystems in the Pacific, including the WCPO, has been characterised using Ecopath and Ecosim models based on diet data (Allain et al., 2007, 2012). Recent work in the WCPO has also seen the formulation of a potential list of candidate ecosystem indicators of relevance to tuna RFMOs that can be used to track the impacts, on the broader pelagic ecosystem, of fisheries targeting tuna and tuna-like species (Allain et al., 2020). The dynamic model SEAPODYM was developed by the Oceanic Fisheries Programme of SPC and Collected Localisation Satellite (CLS) for investigating spatiotemporal dynamics of tuna populations under the influence of both fishing (which would include the UoA datasets) and environmental assumptions (Lehodey, 2004; Senina et al., 2016), and has been used to consider impacts of changing climate and environmental conditions as well as spatio-temporal effects of fishing (Dunn and Webber, 2020). The continued development and application of SEAPODYM for understanding the population dynamics of tropical tunas in the WCPO remains a key priority for SPC and the WCPFC under Project 62. In recent years, SEAPODYM has been applied to modelling each key tuna species in the WCPO and other ocean basins individually (Senina et al., 2018), providing abundance and distribution estimates for other studies (Miller et al., 2018), and including mark-recapture tagging data to directly inform movement parameters for target tuna species in the Pacific (Senina et al., 2020). The SEAPODYM model and its ability to fully understand the influence of fishing and environmental effects on tuna population dynamics is still under development within WCPFC, with a recent review (2020), highlighting several key areas for further development (Dunn and Webber, 2020). **This meets the requirements of SG60 and SG80.** However, it cannot be said that the main interactions between the UoAs and the ecosystem elements have been investigated in detail. **SG100 is not met.**

c	Understanding of component functions			
	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Yes	No

Rationale

As presented in the previous SIs, the ecology of the main species in the fishery (target, non-target and ETP) is relatively well known through information collected and collated by SPC and WCPFC from fishery logbooks, landings records, at-sea observer data, as well as completed and ongoing research projects and programs. Sufficient information is available to identify the range of species that are impacted by commercial fishing operations and to determine their respective role in the ecosystem; e.g. their trophic level and potential roles in transfer of energy and nutrients between various pelagic habitats (epipelagic, mesopelagic and bathypelagic) or between pelagic and demersal habitats. In order to improve the availability of data, the Kobe Bycatch Technical Working Group (KBTWG) was established in 2009 with the aim to "Identify, compare and review the data fields and collection protocols of logbook and observer bycatch data being employed by each Tuna RFMO". The KBTWG provides guidance for improving data collection efforts and, to the extent possible, the harmonization of data collection protocols among tuna RFMOs. These data will improve future analysis of ecosystem functioning. 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. In the WCPFC, work on this project has focused on *inter alia* collecting integrated bycatch data on sharks from the WCPFC and IATTC regions, carrying out a tuna 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 CMMs; and collating and disseminating new information on mitigation of impacts to bycatch species, thereby reducing technical uncertainties across a range of stakeholders allowing tuna RFMO discussions to focus on management issues such as cost and feasibility. The information gathered is sufficient to identify species impacted and understand the main functions of the ecosystem components. **SG80 is met. SG100 is not met** due to the non-comprehensive observer coverage in the fishery under assessment, which creates uncertainty as to the UoAs impacts on ecosystem components.

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?		Yes	No

Rationale

As presented in the previous SIs, adequate information is available on the impacts of the UoAs on ecosystem components (e.g., target, non-target, ETP species and habitats) to ensure that the main consequences for the ecosystem of commercial fishing operations can be estimated. For example, information on target species can be collected through the fishery logbooks and information on non-target, ETP species can be collected from the at-sea observer data. This information, when combined with similar data from other tuna and billfish fisheries in the WCPFO is sufficient to allow ecosystem modelling to detect an increase in risk levels to ecosystem components and allow some of the main consequences for the ecosystem to be inferred. **SG80 is met.** However, **SG100 is not met** due to limited observer coverage in the fishery under assessment, meaning that information on elements cannot necessarily be inferred.

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?		Yes	No

Rationale

As presented in the previous SIs, logbook and observer data are sufficient to detect any changes which might have ecosystem impacts e.g. changes in rates of bycatch and interactions with ETP species. **SG80 is therefore** met. Since there is not something that could be formally defined as an ecosystem management strategy (as yet), **SG100 is not met.**

References

ABNJ (2018, 2019), Allain et al. (2015), Allain et al. (2020), Allain et al. (2007), Allain et al. (2012), Dunn and Webber (2020), Lehodey (2004), Miller et al. (2018), Senina et al. (2018), Senina et al. (2016), Senina et al. (2020)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

5.9 Principle 3

At the regional level, the Western and Central Pacific Fisheries Commission (WCPFC) is the Regional Fishery Management Organization (RFMO) within the Western and Central Pacific Ocean (WCPO) responsible for managing tuna and other highly migratory fish stocks.

At the sub-regional level, the key organizations that are relevant to this fishery are the Pacific Community (SPC) and the Forum Fisheries Agency (FFA).

At the national level, the relevant management system where the DFC/HEC Western and Central Pacific longline bigeye, yellowfin and albacore tuna fishery operates in the WCPO high seas, is the Republic of Korea.

All relevant levels of jurisdiction are explored in more detail in the following sections.

5.9.1 Legal and Customary Framework

5.9.1.1 Western and Central Pacific Fisheries Commission (WCPFC)

The WCPFC is the RFMO responsible for, *inter alia*, the management of North Pacific albacore and South Pacific albacore, WCPO 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);
- The application of the dispute settlement provisions of the Fish Stocks Agreement to disputes between WCPFC members (Article 31); and
- 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).

The Commission Members, Cooperating Non-Members, and participating Territories (CCMs) have signed the WCPFC Convention and were 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 members of WCPFC and party to the Convention, the CCMs are legally bound to apply the precautionary approach for the sustainable management of highly migratory fish stocks and biodiversity conservation. Additionally, their national legislations must take into account regulations set by WCPFC.

WCPFC takes input and advice from a number of subsidiary bodies (e.g. Scientific Committee – SC; Technical Compliance Committee - TCC), 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 are legally bound to apply relevant CMMs as parties to the WCPFC Convention. The latest adopted CMMs can be found here: https://www.wcpfc.int/conservation-and-management-measures

The CCMs also cooperate in the development and recommendations for management of highly migratory stocks with regional and international fisheries organisations including WCPFC, IATTC, ISC and SPC 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).

The WCPFC Convention requires the Scientific Committee to "recommend to the Commission a research plan, including specific issues and items to be addressed by the scientific experts or by other organisations or individuals, as appropriate, and identify data needs and coordinate activities that meet those needs". The WCPFC Strategic Research Plan (SRP) 2017–2019 was adopted by the Scientific Committee (SC12) and approved by consensus at the WCPFC in 2016, pending funding availability. The Plan is directed towards providing information to enable the Commission to avoid overfishing or depletion of targeted stocks and the application of an ecosystem approach. The implementation process of the Plan is also designed to contribute to improving governance and policy, through the development of management information tools such as Management Strategy Evaluation (MSE) and the development of relevant scientific and technical capacities in developing country Commission members.

The WCPFC Convention provides information on the function, roles and responsibilities of the member states and committees formed under the Commission (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 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 WCPO. Attendance at these meetings has facilitated a greater understanding of WCPFC and member states responsibilities and has provided opportunities for consultation between the CCMs in the management of skipjack, albacore, bigeye and yellowfin and other tuna fisheries related species.

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.

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 overfishing. Based on the results of the assessments for bigeye, yellowfin and skipjack and the recommendations of the SC, CMM 2017-01, CMM 2018-01 and 2020-01 were adopted by WCPFC. To control fishing effort for North Pacific albacore in the WCPO area north of the equator the Commission adopted CMM 2005-03. The Oceanic Fisheries Programme of SPC at the Thirteenth Regular Session of WCPFC, December 2016, raised concerns about the economic viability of the South Pacific albacore fishery due to declining catch rates since 1992. The Commission responded to the declining catch rates of South Pacific albacore at the 15th Regular Session of the WCPFC, December 2018, by agreeing to an interim target reference point (TRP) for South Pacific albacore and to amending or developing appropriate CMMs to implement a harvest control rule, with the objective of maintaining the South Pacific albacore spawning stock biomass at the target level.

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.

5.9.1.2 Republic of Korea

Korea is a signatory to a range of international fisheries policy instruments and treaties, including UNCLOS and UNFSA, as well as a participating and active member of WCPFC. These treaties/agreements are consistent with the current international fisheries laws and standards for the management of highly migratory species and ecosystems (MSC P1 and P2). In Korea, coastal and offshore fisheries are managed under the Fisheries Act and the Fishery Resources Management Act, while distant water fisheries are managed by the Distant Water Fisheries Development Act (DWFDA) which was amended in 2019. The objective of the DWFDA is to advance "the sustainable development of the distant water fisheries industry and contribute to the growth of the national economy through the rational preservation, management, exploitation and utilisation of maritime living resources and the promotion of international cooperation." This Act was promulgated in 2007 and was revised in 2013 and 2014. The revised legislation took effect in July 2015. The key points of this legislation were to strengthen fishing permit control, Monitoring, Control and Surveillance (MCS), port state inspection and sanctions. Korea cooperates with other RFMO member countries through annual meetings and workshops formed to deliver the outcomes under Article 10 of UNSFA and the WCPFC Convention, including conservation and management measures (CMMs)/Resolutions and Recommendations) and as a member of the WCPFC is committed to its conservation objectives. Korea has national legislation which includes fisheries laws that are binding legal instruments consistent with the principles and provisions of UNCLOS, and UNFSA.

Korea has a dispute settlement mechanism in place which is based on the World Trade Organisation (WTO) Dispute Settlement Understanding model. The process commences with the consultation between the parties, with a view to reaching a solution. If the parties do not come to an agreement, the dispute is referred to an arbitration panel. The panel is composed of three experts that are chosen by the parties, or selected by lot from a list agreed in advance. The panel receives submissions from the parties, and holds a hearing that is open to the public. Interested persons or companies will be allowed to inform the panel of their views by sending *amicus curiae* submissions. The Arbitration Act 2016 (amended), ensures the appropriate, impartial and prompt settlement of disputes in private laws by arbitration. There are also two other types of Alternative Dispute Resolution Systems that are used in Korea: arbitration and mediation in the form of court-annexed or statutory conciliation.

The decision-making process for Korean distant water fisheries is structured around the consultation and negotiation of CMMs at WCPFC annual meetings and workshops. Korea participates in these international negotiations after which stakeholder information sessions are automatically scheduled whenever any WCPFC CMM is developed or modified requiring the DWFDA to be amended. Discussion and stakeholder input is sought and taken into consideration before a decision is made as to whether the new or amended CMM can be implemented in the Korean context. This system of decision-making allows Korean delegation representatives (including industry) at WCPFC meetings and then relevant stakeholders in the Korean national system to be fully informed of the issues under consideration and ensure that decision-making results in measures and strategies to achieve the fishery-specific objectives. The Fisheries Act recognizes the interests of small-scale and artisanal fishers under Article 41 which states that fishers permitted to operate in coastal fisheries are those which use non-powered fishing vessels or a powered fishing vessel that is less than ten gross tonnage, while the offshore fishers are those which use powered fishing vessels that are more than ten gross tonnage. In addition, coastal fisheries are often managed collectively through a fishing village fraternity or district fisheries cooperative, whose role is to “promote the common interests of fishers who reside in a certain locality”.

5.9.1.3 High Seas

Republic of Korea’s distant water fishing vessels (DWFV) are required to abide by the requirements of the international community represented by the Compliance Agreement and Fish Stock Agreement. These agreements provide the legal and technical requirements for DWFVs and management measures for flagged states. The laws and regulations include the registration of fishing vessels, authorization to fish in the high seas and compliance with international requirements. The Circular on Enhancement of Offshore Fishing Vessels issued by the MOA in 1994 requires vessels to:

- Carry fishing licenses and registration certificates onboard, mark vessels as required and fly the flag granted;
- Comply with international law, custom law, UN resolutions and fishing agreements which the Republic of Korea is a party;
- Fish in accordance with conditions specified in their licenses, such as the requirement for DWFVs not to enter coastal zones state EEZs; and
- Observe rules on innocent passage in coastal state territorial seas, the prohibition of transshipment, procedures for emergency calls and avoidance of pollution.

Regulations on DWFVs include requirements for the qualification of enterprises to apply for fishing licenses to conduct distant water fishing. In particular, the approval of the fishing license takes into account the vessel’s compliance record. Authorized fishing vessels are required to report their catches, species, landings, value and complete logbooks. To meet Monitoring, Control and Surveillance (MCS) requirements DWFVs are required to install VMS with a qualified crew member responsible for its operation. Observers may be placed onboard in accordance with international and regional requirements. Vessels violating the regulations will be sanctioned depending on the severity. Serious cases can result in the suspension or cancellation of the authorization for distant water fishing.

To address the challenge of IUU fishing activities in the Convention Area which undermine the effectiveness of the conservation measures adopted by WCPFC, Article 8 (4) of the Convention requires that the Commission pay special attention to the high seas in the Convention Area that are surrounded by exclusive economic zones (EEZs). Conscious of the need to address the issue of vessels conducting IUU fishing activities in the eastern high seas pocket (E-HSP), WCPFC established the Conservation and Management Measure for the Eastern High Seas Pocket Special Management Area (CMM 2016-02), adopted by the Republic of Korea, which stipulates that:

- CCMs shall encourage their flagged vessels operating in the E-HSP to report sightings of any fishing vessel to the Commission Secretariat;
- Adjacent coastal States/Territories shall receive continuous near-real-time VMS data and flag states shall monitor their vessels operating in the E-HSP, using at minimum the WCPFC VMS, to ensure compliance with this measure;
- The Commission Secretariat shall maintain a “live list” of all fishing vessels present in the E-HSP, based on near-real time VMS information;
- All transshipment activities are prohibited in the E-HSP, and
- Vessels found to be non-compliant with this measure shall be dealt with in accordance with CMM 2010-06, and any other applicable measures adopted by the Commission.

5.9.2 Objectives

6.8.2.1 Long-term Objectives

Western and Central Pacific Fisheries Commission

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 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.

Republic of Korea

The principal objective of the DWFDA under Article 1 is to “advance the sustainable development of the distant water fisheries industry and contribute to the growth of national economy, through the rational preservation, management, exploitation, and utilisation of maritime living resources, and the promotion of international cooperation”. In the formulation of plans for the distant water fisheries specifically, it is an explicit requirement under Article 4 of the DWFDA that the Minister of Oceans and Fisheries include “matters concerning the rational preservation and management and exploration and exploitation of marine living resources” where rational preservation and management means “measures to preserve or manage one or more species of marine and fisheries resources as adopted and applied in accordance with international law”.

6.8.2.2 Fishery-specific objectives

Western and Central Pacific Commission

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 2021-01 for bigeye, yellowfin and skipjack has the following explicit objectives:

- 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;
- Bigeye: pending an agreement on a target reference point the spawning biomass ratio (SB/SBF=0) is to be maintained at or above the average SB/SBF=0 for 2012 -2015 and,
- Yellowfin: pending an agreement on a target reference point the spawning biomass ratio (SB/SBF=0) is to be maintained at or above the average SB/SBF=0 for 2012 -2015.

The Commission has also adopted a number of measures to protect the unintentional catch of marine mammals and other non-target species that include sharks, mobulid rays, sea turtles and seabirds and that seek to address marine pollution (see https://www.wcpfc.int/conservation-and-management-measures). These regional level objectives and the requirements of the CMMs are incorporated into the Republic of Korea 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.

Republic of Korea

Short-term objectives relating to MSC P1 and P2 outcomes for high seas UoA can be found in the various WCPFC CMMs. These are endorsed by Korea and under Article 13 of the DWFDA, which stipulates that distant water fisheries operators must “comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas.”

5.9.3 Consultation Processes

Western and Central Pacific Fisheries Commission

The WCPFC Convention provides information on the function, roles and responsibilities of the member states and committees formed under the Commission (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 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 the Republic of Korea and the other CCMs in the management of skipjack, albacore, bigeye and yellowfin and other tuna fisheries related species.

Republic of Korea

The Ministry of Oceans and Fisheries (MOF) is the main government department responsible for managing all Korean fisheries and marine issues. MOF is comprised of three offices of particular relevance: (i) Planning and Coordination Office; (ii) Oceans Policy Office and (iii) Coastal Fisheries Policy Office. The most important office for distant water fisheries is the Oceans Policy Office. Three sub-offices operate under this Office with a General Director appointed to manage separate Divisions. Relevant Divisions for the distant water fisheries include: the International Cooperation Division and Distant Water Fisheries Division. The Distant Water Fisheries Division deals with licensing (five-year validity), administrative actions and investigations, IUU surveillance and international co-operation regarding IUU fishing and vessel listings, while the International Cooperation Division is responsible for international relations and negotiations at WCPFC to which Korea is a signatory https:/;/www.mof.go.kr).

The MOF also works closely with the National Institute of Fisheries Science (NIFS) (formerly the National Fisheries Research and Development Institute or NFRDI) which provides fisheries science and technology expertise. NIFS conducts scientific research and stock assessments and is involved in resource management for species such as tuna (WWF, 2016). It is responsible for: management of fishery resources and development of fishery engineering technology; research on and conservation of marine ecosystems; development of aquaculture technology and biotechnology; research on seafood safety and the control of aquatic life diseases; development and management of aquatic plant varieties; and training and support of fisheries technology (https//www.nifs.go.kr).

The MOF also collaborates with the Fisheries Monitoring Centre (FMC) which was established in 2014 which is responsible for monitoring approximately 260 Korean distant-water fishing vessels. FMC tasks include: conducting real-time monitoring and releasing of IUU alerts; preventing illegal fish from entering into the market by controlling transhipment and landings; cooperating with the international community to strengthen MCS capabilities for the eradication of IUU fishing; ensuring proper functioning of VMS onboard fishing vessels and maintaining vessel track data for all Korean fishing vessels worldwide; operating the Fisheries Monitoring System (FMS), E-Reporting System on a daily basis for catch/bycatch/ETP interactions and the Korean Fisheries Information Management System on a 24/7 basis. Also, vessel positional data from VMS units is polled hourly and supervised by 11 staff with 6 inspectors working 365 days per year.

In Korea, there are over 35 organisations that are relevant to domestic and distant water fisheries, seafood trade, ports etc. (WWF, 2016). The Korea Fisheries Association (KFA) and Korea Overseas Fisheries Association (KOFA) (established under Article 28 of the DWFDA) are the most relevant industry groups. KFA is the largest corporation and plays a key role in facilitating discussion between central government and fishery stakeholders for the coastal and offshore fisheries sectors, while the KOFA, an association of 71 distant fishing companies, supports the distant water fishing industry by providing statistics on fishing activities, analysis and research of foreign markets etc. (WWF, 2016). It also plays a key role in non-governmental cooperation with foreign countries (WWF, 2016) and represents more than 200 Korean flagged distant water fishing vessels.

The Korean government provides the opportunity for representatives from industry and NGOs to attend relevant international negotiations and WCPFC meetings as part of the Korean delegation so that their interests can be incorporated into decision-making and so they are aware of the reasoning behind eventual management and policy decisions (Republic_of_Korea, 2014b). It is a requirement under the DWFDA that stakeholder information sessions are scheduled whenever a WCPFC CMM is created or amended potentially requiring the DWFDA to be amended. At these sessions, discussions and explanations of potential consequences are presented to stakeholders and input sought that can then be taken into consideration when deciding whether the new or amended CMM can be implemented effectively in the Korean context. Also, various outreach activities are conducted to engage stakeholders and the general public on matters such as IUU fishing and provide an opportunity for feedback. When the Korean government implements any new policy, this is published for general comment.

5.9.4 Compliance and Enforcement

<u>Western and Central Pacific Fisheries Commission</u>

WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transhipment 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);
- 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);
- CMM for WVPFC implementation of a Unique Vessel Identifier (CMM 2013-04); and
- CMM for Minimum Standards for Port State Measures (CMM 2017-02).
- CMM for the Regional Observer Program ((CMM 2018-06)
- CMM for the Compliance Monitoring Scheme (CMM 2019-06)

To ensure that WCPFC CCMs implement and comply with obligations under the Convention and CMMs passed by the Commission, the CMM for Compliance Monitoring Scheme (2019-06) was adopted. This CMM is designed to assess CCMs compliance with their WCPFC obligations and to monitor and resolve outstanding instances of non-compliance by CCMs. Observers are an integral part of most aspects concerning the management of the WCPO fishery. Guidelines are provided for observers in most CMMs. WCPFC builds capacity in the CCMs through the training of observers and enforcement officers and provides funds when needed to promote and support MCS activities.

<u>Republic of Korea</u>

Korean fishing vessels engaged in distant water fishing in the high seas are managed by the DWFDA. Under DWFDA Article 13, distant water fishing vessels must comply with resolutions made by RFMOs, which apply equally inside EEZs and in the high seas. If a violation of these rules occurs then under Article 13, Part 9, the Minister of Oceans and Fisheries can immediately suspend fishing operations of the vessel, entry into designated ports or prohibit discharge and transhipment of catch. In order to fish in the high seas, Korea distant water fishing vessels must obtain a permit for each vessel from the MOF, which is valid for five years. Article 13 of the DWFDA outlines the rules for vessels engaged in distant water fisheries to observe and includes the requirement for complying with "regulations made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." Therefore, Korean vessels must adhere to relevant WCPFC CMMs, which apply equally on the high seas. To ensure compliance, vessels fishing in the high seas must install a VMS prior to departing from port (Article 15) and must obtain a permit in advance to tranship (Article 16). Penalties for non-compliance can be prosecuted under either administrative and/or criminal proceedings (including fines ranging from 500,000,000 (~US$450,000) to 1,000,000,000 (~US$900,000) Korean Won and up to five years imprisonment) as listed in Articles 33 through 36. But there are also lesser penalties or simple warnings for such transgressions as non-compliant vessel marking sizes. Korean fishing vessels are monitored in real-time by the FMC, which has a state-of-the-art monitoring system generating real time reporting on the fleet (Campling et al., 2017). This allows detailed and operational fishery data to be sent to WCPFC and for FMC to also monitor the fleet in real-time to ensure it is complying with regulations, such as not fishing in protected areas. According to Republic_of_Korea (2014b), Korea also takes part in high seas boarding and inspection schemes in the WCPO and intends to broaden its participation to other RFMOs. Korea also has a scientific observer programme on distant water fishing vessels, which is administered by the NIFS, with a total of 61 scientific observers at present (WCPFC-SC17AR/CCM-12). The percentage of observer coverage of UoA vessels based on information provided on hooks observed and deployed by the fleet from 2018 to 2020 are listed in Table 29 below.

Table 29. Percentage of observer coverage of UoA vessels 2018-2020. Source: NIFS data.

Year	No. of vessels observed	Total number of hooks deployed by UoA fleet	Total no. of hooks observed	Observer coverage (%)
2018	5	11,142,523	505,291	4.53 %
2019	4	10,684,997	764,593	7.16 %
2020	2	11,892,275	307,787	2.59 %

It should be noted that in April 2020, due to COVID-19 the Commission agreed to suspend the requirement for observer coverage on purse seine vessels set out in paragraphs 34 and 35 of CMM 2018-01 and CMM 2018-05. The suspension also impacted observer coverage on longline vessels; the low coverage was compounded by national COVID-19 restrictions prohibiting observers from boarding vessels.

In addition, every two months each captain receives training in endangered, threatened and protected (ETP) species identification, safe handling protocol and updates of new CMMs that have been approved or may be coming into effect (to be discussed further at the site visit). For client longline vessels operating in high seas areas, there is some degree of confidence that fishers comply with the international management frameworks in place. No infractions were committed by the UoA vessels in 2019 and 2020.

5.9.5 Management performance evaluation

Western and Central Pacific Fisheries Commission

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. To address the 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 was 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 issues through remedial options.

Republic of Korea

There is a requirement under Article 16-2 of the Distant Water Fisheries Development Act for the MOF to conduct an internal performance review on the operations of the distant water fisheries industry, including IUU fishing national legislation for distant water fisheries. An internal audit (performance review) of all MOF operations also occurs annually. Korea has also been externally reviewed by the EU to ensure their management system meets EU IUU Regulations, which has led to new legislation being developed and the FMC established. Progress with implementation of regionally agreed CMMs are also monitored and reviewed through the submission of annual reports to the WCPFC Secretariat.

5.9.6 Stakeholders

5.9.6.1 Regional Sub-committees and Sub-Regional Organizations

5.9.6.2 Northern Committee

The WCPFC established the Northern Commission to make recommendations on the implementation of conservation and management measures adopted by the Commission for the area north of the 20 degree parallel of north latitude and on the formulation of measures in respect to stocks which occur mostly in this area. The committee includes members situated in this area and those fishing in the area. Any member of the Commission not represented on the committee may send a representative to participate in the deliberations of the committee as an observer. The committee adopts recommendations to the Commission by consensus. In adopting measures in relation to particular stocks and species of this area, the decision of the Commission is based on the recommendations of the committee. The recommendations must be consistent with the general policies and measures adopted by the Commission in respect to stocks or species and with the principles and measures for conservation and management set out in the Convention. If the Commission, in accordance with the rules of procedure for decision-making on matters of substance, does not accept the recommendation of the committee on any matter, it will return the matter to the committee for further consideration (WCPFC Convention Article II paragraph 7).

Parties to the Nauru Agreement (PNA)

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

The Nauru Agreement is a binding Treaty-level instrument considered to be a sub-regional or regional fisheries management arrangement for the purpose of the UNFSA and the WCPFC Convention. The PNA countries (Federated States of Micronesia, 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:

- Develop strategic fisheries conservation and management initiatives;
- 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.

The PNA coordinates 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.

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

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

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

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 transhipment, 100 % observer coverage of purse seine vessels and 5 % observer coverage on longline 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.

To enhance the management of tuna resources in the Western Pacific, Tuvalu, Kiribati, Solomon Islands and the other Parties to the Palau Arrangement developed and implemented a Vessel Day Scheme (VDS) for the longline fisheries in the waters of the Parties. Through the longline VDS, 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 2016, the parties agreed to a five-year TAE of 165,132 days (Campling et al., 2017). In 2018, minor changes to Article 7 (Register of Longline Vessels) of the PNA longline vessel day scheme (VDS) were adopted. Parties to the VDS scheme were given the option to use the Fisheries Information Management System (FIMS) Electronic License Registry (ELR) to license vessels or provide the Administrator with updated licence lists to ensure that vessels are not licenced unless they are on the VDS register. Tuvalu signed onto the VDS for its longline fishing industry in 2016; however, the longline VDS wasn't implemented by Tuvalu in 2018 to allow time for additional research on historical patterns of longline fishing activity in Tuvalu waters. Ultimately, Tuvalu implemented the longline VSD in 2019. The longline VDS was implemented by the Solomon Islands in 2018. Kiribati pulled out of the PNA longline VDS in 2017, and recruited a catch-based management (CBM) advisor to develop a CBM system for their tuna longline fishery. The CBM system was not implemented and Kiribati re-joined the PNA longline VDS in January 2019.

The Pacific Community (SPC)

Based in Noumea, New Caledonia, the SPC, founded in 1947 is an intergovernmental organisation that provides technical and policy advice to its members. SPC has 26 member countries and territories, including American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna.

The Oceanic Fisheries Programme (OFP) within the SPC Division of Fisheries, Aquaculture and Marine Ecosystems (FAME) provides 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:

1. 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;

2. 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;

3. 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.

<u>The Forum Fisheries Agency (FFA)</u>

Based in Honiara, Solomon Islands, the FFA is an expertise-based organisation providing advice, technical assistance and other support to its members who make sovereign decisions about their fisheries resources and participate in regional decision making on tuna management through organisations such as the WCPFC. The FFA was established under the South Pacific Forum Fisheries Agency Convention and the governing body is the Forum Fisheries Committee (FFC). The FFA has seventeen members: Australia, Federated States of Micronesia, Fiji, Kiribati, Cook Islands, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. The FFA is responsible, through the FFC, for updating and harmonising the Minimum Terms and Conditions (MTCs) for fisheries access throughout the Pacific region (FFA, 2016). MTCs are given national effect through vessel licensing conditions or by incorporation into national law as appropriate.

Within the overall FFA programmes, the fisheries management programme is designed to assist FFA Members to refine and maintain effective policy and legal frameworks for the sustainable management of the shared tuna fisheries resources of the region by providing advice on:

- Appropriate legal frameworks for national tuna management, including members' obligations under various treaties and arrangements;
- Appropriate fisheries management frameworks including the incorporation of the principles of ecosystem based fisheries management;

- Effective fisheries administration, including access arrangements, licensing of foreign and domestic fishing vessels, economic implications of different management systems, and the use of new systems and technologies;
- Development and implementation of monitoring, control and surveillance systems and effective compliance regimes; and provides these services assisting members to keep abreast of best practice fisheries management models, and develop stronger and deeper regional co-operation in fisheries management;
- Providing effective oversight, and where appropriate management of a regional vessel register, vessel monitoring system, and observer programme (including for US vessels); and
- Servicing regional fisheries treaties and arrangements; and improving capacity in fisheries management.

Two key instruments in the implementation of this programme are:

- The Regional Tuna Management and Development Strategy; and
- The Regional Monitoring Control and Surveillance Strategy (MCS).

FFA maintains databases on regional VMS, licensing, vessel register, violations and prosecutions. Over-flight surveillance is provided by France, US, Australia, and New Zealand (QUAD – Quadrilateral Defence Coordinating Group). The FFA secretariat also supports the WCPFC regional VMS, providing establishment, maintenance, diagnostic and support infrastructure and services, automatic location communicator (ALC) management services and communication gateways for the Commission VMS, along with training for Commission staff.

The FFA commissions independent external review of its performance (see FFA (2017)) in addition, to "supplement the existing processes that the FFC and its Audit Committee use to assess routine performance" and to provide "forward-looking…comment on future needs". The FFC/FFA has also commissioned a Strategic Plan (2014 – 2020) to identify and structure the way forward to 2020 and beyond. A new report is in preparation to chart the course for FFA to maintain sustainable tuna fisheries over the next ten years. It is to be presented at the FFC Ministerial meeting by the July 2019 due date.

5.9.6.3 National

Ministry of Oceans and Fisheries (MOF)

The Ministry of Oceans and Fisheries (MOF) is a cabinet-level division of the government of the Republic of Korea. It is responsible for: the maritime and fisheries sectors, ranging from the promotion of maritime safety and security, the protection of the marine environment, the development of fishing ports, the research and development of management measures for the sustainable use of fisheries resources and the promotion of maritime leisure activities.

National Institute of Fisheries Science (NIFS)

National Institute of Fisheries Science (NIFS) is a national research institute responsible for development and management marine and fisheries science. It is a scientific body operated the Republic of Korea, under the authority of the Ministry of Food, Agriculture, Forestry and Fisheries. The NIFS Headquarters and its Affiliate Offices, spread throughout the Republic of Korea, are responsible for:

1) Management of fishery resources and development of fishery engineering technology'
2) Research on and conservation of marine ecosystems,
3) Development of aquaculture technology and biotechnology,
4) Research on seafood safety and the control of aquatic life diseases,
5) Development and Management of aquatic plant varieties' and
6) Guidance, training and support of fisheries technology.

Korea Maritime Institute (KMI)

Korea Maritime Institute (KMI) is a government-funded research institute established under the auspices of the Prime Minister's Office is responsible for the formulation of national policies in maritime and fisheries affairs to boost the national economy. The institute conducts research activities for the marine and fisheries sectors, including oceans, marine products, maritime shipping and port logistics.

Korean Fisheries Association (KFA)

Korean Fisheries Association is a non-profit organization established in 1965 which promotes fisheries industry needs and issues and protects the rights of people in the fisheries sector in the Republic of Korea. KFA is comprised of various fisheries organizations, private companies and the National Federation of Fisheries Cooperatives. The association plays a key role in facilitating discussion between central government and fishery stakeholders for the coastal and offshore fisheries sectors.

Korea Oversea Fisheries Association (KOFA)

Korea Overseas Fisheries Association (KOFA) established under Article 28 of the DWFDA in 1964, has a mandate to contribute to the sustainable use and effective conservation of living marine resources through the implementation of national, regional and international management policies and measures. It also is committed to increasing its member's profits through improved production, processing and marketing. KOFA supports the distant water fishing industry by providing statistics on fishing activities, analysis and research of foreign markets etc. It also plays a key role in non-governmental cooperation with foreign countries. KOFA has a total of 33 regular and 14 associate members from various commercial fishing companies.

5.9.7 Principle 3 Performance Indicator scores and rationales

Scoring table 40. PI 3.1.1 – Legal and/or customary framework

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: Is capable of delivering sustainability in the UoA(s); Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and Incorporates an appropriate dispute resolution framework			
Scoring Issue		SG 60	SG 80	SG 100
a	Compatibility of laws or standards with effective management			
	Guide post	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Yes	Yes	Yes

Rationale

WCPFC

The WCPFC is the first RFMO established after the UNFSA entered into force. As such, it extensively incorporates all key provisions of the UNFSA while still reflecting WCPO environmental, political, socio-economic and geographical specificities. Functioning of the WCPF Convention is implemented through CMMs, and since all Commission CCMs are legally bound to implement all obligations under the Convention in their domestic law, management outcomes are consistent with MSC Principles 1 and 2. Within the Convention there are also mechanisms for cooperation specifically for Principle 2 species (e.g. CMMS for other tuna species, sharks, turtles etc.), as well as for research for issues such as ecosystems (via SPC and the Scientific Committee of WCPFC).

Effective regional cooperation occurs via SPC and directly via FFA and PNA. Through the SPC, regionally (and sub-regionally), management initiatives are developed and promoted at the WCPFC level. Support for management outcomes is provided through:

1. The collection and sharing of scientific data via an in-country logbook and observer programme;

2. Regular stock assessments carried out by SPC;

3. The development and consideration of scientific advice, primarily through the scientific committee of the WCPF Commission;

4. Agreement on matters of common interest between states fishing for skipjack and yellowfin, initially at PNA level, the FFA/FFC and ultimately promoted via the WCPF Commission; and

5. Regional MCS initiatives, including the regional VMS, VDS and vessel register.

While providing for the development of cooperative and compatible regional fisheries management approaches, this framework of cooperation also effectively addresses the capacity and resource constraints facing some Pacific Island Countries and territories' national fisheries management authorities. Cooperation through SPC and the WCPFC has allowed for the development and implementation of sustainable management arrangements for the tuna fishery as required under the obligations of UNCLOS Articles 63(1 & 2), 64 and UNFSA Article 8. The work of SPC as the science provider and the Commission as coordinating secretariat provides a framework for cooperation as required under UNSFA Article 10 (in reference to RFMOs). On the basis of the above, **SG60, SG80 and 100 are met**.

<u>Republic of Korea</u>

Korea is a signatory to a range of international fisheries policy instruments and treaties, including UNCLOS and UNFSA, which create international obligations for Korea to maintain a minimum international standard of management and governance. These treaties/agreements are consistent with the current international fisheries laws and standards for the management of highly migratory species and ecosystems. Korea is also a participating and active member of the WCPFC. Korea cooperates with other RFMO member countries through annual meetings and workshops, formed to deliver the outcomes under Article 10 of UNSFA and the WCPFC Convention, including conservation and management measures/Resolutions and Recommendations, and as a member of the WCPFC is committed to their conservation objectives. Korea has national legislation, that includes fisheries laws which are binding legal instruments consistent with the principles and provisions of UNCLOS, and UNFSA. Coastal and offshore fisheries are managed under the Fisheries Act and the Fishery Resources Management Act, while distant water fisheries are managed by the Distant Water Fisheries Development Act (DWFDA) which was amended in 2019. On the basis of the above there is evidence to suggest that there is an effective national legal system and organised and effective cooperation between parties on the principles associated with stock management and ecosystem-based management, therefore **SG60, SG80 and SG100 are met.**

On the basis of the above, there are effective national and regional level systems, with organised and effective cooperation with other parties to deliver management outcomes consistent with MSC Principles 1 and 2, therefore, **SG60, SG80 and SG100 are met at all levels of jurisdiction**.

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	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

			most issues and that is appropriate to the context of the UoA.	of the fishery and has been **tested and proven to be effective.**
	Met?	Yes	Yes	No

Rationale

WCPFC

There are three mechanisms for dealing with legal disputes at the regional level. First, disputes can be dealt with at WCPFC annual meetings through consultation and conciliation with the members. Second, disputes may be resolved through constituting an appropriately composed review panel. As set out in WCPFC Section 6, Article 20(4): "Where this Convention expressly provides that a decision on a proposal shall be taken by consensus and the Chairman determines that there would be an objection to such proposal, the Commission may appoint a conciliator for the purpose of reconciling the differences in order to achieve consensus on the matter", and 20(6) where: "A member which has voted against a decision or which was absent during the meeting at which the decision was made may, within 30 days of the adoption of the decision by the Commission, seek a review of the decision by a review panel constituted in accordance with the procedures set out in Annex II to this Convention" on specified grounds. Third, disputes might also be resolved through either the International Court of Justice (ICJ) or the International Tribunal for the Law of the Sea. Within the WCPFC, but also for other RFMOs, the first two mechanisms should preferentially be used before invoking the third alternative. It should be noted that the WCPFC has not been subject to any court challenges as of 2020 (to be reviewed at the site visit).

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. The WCPFC has a consensus-based decision-making process as its primary preferred *modus operandi*. A voting process, without voting rights for Participating Territories, requiring a 75 % majority of *both* SIDS and DWFN members, is available if all efforts to reach a decision by consensus have been exhausted. This alternative decision-making process was threatened at WCPFC12 (2016) over the implementation of a CMM, which was blocked by only one member country, thus provoking the call for a vote (the first time in Commission history). However, consensus was eventually achieved.

The Commission is required to promote transparency in its decision-making processes and other activities under Article 21 of the Convention, such that independent observers, including IGOs and NGOs can participate in committee and commission meetings and are able to observe discussions. Article 21 specifically states that: "Such intergovernmental organisations and non-governmental organisations shall be given timely access to pertinent information subject to the rules and procedures which the Commission may adopt". Observers are also allowed to make presentations to members, subject to approval by the Chairperson. However, not all sessions of all meetings are open to observers.

The WCPFC does have well-defined arrangements for consideration of proposals prior to decisions being taken. Decisions can take the form of binding CMMs or non-binding Resolutions. Commission meetings are held annually and are supported by annual Scientific Committee and Technical and Compliance Committee meetings. Observers can attend these meetings but are not be able to participate in all sessions.

While the mechanisms for dispute resolution are transparent and considered to be effective in dealing with most issues at the regional level, they have not been tested and proven to be effective, therefore, **only SG60 and SG80 are considered met. SG100 is not met**.

Republic of Korea

Korea has a dispute settlement mechanism which is based on the model of the WTO Dispute Settlement Understanding. The first step of the procedure is the consultation between the parties, with a view to reaching a solution. If the parties do not come to an agreement, the dispute is referred to an arbitration panel. The panel is composed of three experts that are chosen by the parties, or selected by lot from a list agreed in advance. The panel receives submissions from the parties, and will hold a hearing that will be open to the public. Interested persons or companies will be allowed to inform the panel of their views by sending *amicus curiae* submissions. Specifically, in regard to fishing permit disputes, Article 32 of the DWFDA states, "when the Minister of Oceans and Fisheries intends to cancel or suspend a permit for fisheries under Article 11, he/she shall hold a hearing thereon". Under Article 88 of the Fisheries Act, Fisheries Mediation Committees are established within the MOF with responsibility for deliberating "on matters of mediation" in various jurisdictions. For example, the East Coast Fisheries Coordination Committee is an internal body under the East Sea Fisheries Management Service within the MOF that mediates disputes related to fishing and fishing gear/fishing method and the disputes related to marine resources in the coastal waters of Busan, Ulsan, Gyeongnam, Daegu, Gyeongbuk, Chungbuk, Gangwon and Jeju. In addition to the Arbitration Act 2016 (amended), which ensures the appropriate, impartial and prompt settlement of disputes in private laws by arbitration, there are also two other types of Alternative Dispute Resolution Systems that are used in Korea: arbitration and mediation in the form of court-annexed or statutory conciliation. The conciliation system can be classified as either a judicial conciliation, such as those court-annexed conciliation procedures under the CCA or non-judicial conciliation such as statutory conciliation administered by governmental agencies. These transparent mechanisms under the various Acts for the resolution of legal disputes in Korea are considered effective in dealing with disputes, therefore, **SG60 and SG80 are met but there is no evidence the dispute mechanism has been tested so SG100 not met.**

While the mechanisms for dispute resolution are transparent and considered to be effective in dealing with most issues at the national, and regional level, they have not been tested and proven to be effective at the regional and national levels, so **only SG60 and SG80 are considered met. SG100 is not met**.

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?	Yes	Yes	No

Rationale

WCPFC

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. Under Article 5 the Convention states that "in order to conserve and manage highly migratory fish stocks in the Convention area.... the members of the Commission shall... (h) take into account the interests of artisanal and subsistence fishers". Under Article 10, paragraph 3, the Convention States that "in developing criteria for allocation of the total allowable catch or total allowable effort the Commission shall take into account.... (d) the needs of small island developing States and territories and possessions, in the Convention area whose economies, food supplies and livelihoods are overwhelmingly, dependent on the exploitation of marine living resources and (g) the needs of coastal communities which are dependent on the fishing stock". 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. WCPFC has an intention and has a management system that observes the legal rights that are created explicitly or established by custom for people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. Therefore, the WCPFC management system **meets the requirement for SG60 and SG80.** However, although the WCPFC considers common allocation principles such as historical participation, the rights of coastal States, and the rights of developing States, these are not formally part of the allocation process (Akroyd et al., 2020). On this basis, **SG100 is not met**.

Republic of Korea

While there is no formal commitment in any of the relevant Korean legislation to ensure the management system considers the legal rights by custom of people dependent on fishing for food and livelihood in a manner consistent with MSC P1 and P2, Article 41 of the Fisheries Act takes into account the interests of these fishers in their licensing of fishing vessels. Article 41 states that fishers permitted to operate in coastal fisheries are those which use non-powered fishing vessels or a powered fishing vessel which is less than ten GT, while the offshore fisheries are those which use powered fishing vessels which are more than ten GT. In addition, coastal fisheries are managed collectively through a fishing village fraternity or district fisheries cooperative, whose role is to "promote the common interests of fishers who reside in a certain locality". As the management system has mechanisms to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood, **SG60 and SG80 are met**, but given there is no formal commitment, **SG100 is not**.

On the basis of the above, the team concluded that the national and regional management systems do not have formal mechanisms in place. Therefore, **SG60 and SG80 are met but SG100 is not met.**

References

Akroyd et al. (2020), Blyth-Skyrme et al. (2018), Campling et al. (2017), Medley and Gascoigne (2017)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

Republic of Korea Fisheries Act (2014 revised).

Republic of Korea Fisheries Resources Management Act (2011 revised, amended 2015)

National Plan of Action of the Republic of Korea to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (NPOA-IUU), August 2014, Ministry of Oceans and Fisheries

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 41. PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	Roles and responsibilities			
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood.**	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	Yes	Yes	No

Rationale

WCPFC

The WCPFC 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. WCPFC has encountered problems with flag states that have not applied appropriate controls for all their vessels and not all vessels understand their responsibilities. In some cases, there appear to be conflicts between the requirements for confidentiality and the responsibility to provide information necessary for management. This includes Commission members not submitting data in a timely manner. WCPFC CMMs outline the responsibilities of the vessel masters and CCMs for the recording and provision of data in the CMM on Daily Catch and Effort Reporting (CMM 2013-05) which stipulates that the master of each vessel flying its flag in the Convention Area provides an accurate and unaltered original or copy of the required information to its national authority within 15 days of the end of the trip; and Conservation and Management Measure for Bigeye, Yellowfin and Skipjack (CMM 2020-01) which states that CCMs whose vessel fish in EEZs and high seas north of 20N are required to provide aggregated data to the Commission. The ROP, despite being overall effective, has received reports of inappropriate behaviour of vessel crews towards observers, suggesting those conducting fishing operations do not fully understand or comply with their responsibilities. Although most data are available to the SPC-OFP not all of this data have been entered and made available to the Commission. The Scientific Committee noted that the incomplete submission of data increases uncertainty in stock assessments and has encouraged members to provide data in accordance with WCPFC data rules (Akroyd et al., 2020).

The PNA countries (Federated States of Micronesia, 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 Nauru Agreement. 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 Nauru Agreement is implemented through binding Implementing Arrangements and associated Arrangements, which include:

a) 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;

b) The 2nd Implementing Arrangement, 1990, adding additional conditions relating to VMS, high seas reporting and a prohibition on transshipment at sea;

c) The Palau Arrangement, 1995, limiting the purse seine fishery, initially by limiting vessel numbers, but now through the Vessel Day Scheme (VDS);

d) The FSM Arrangement: 1994, establishing arrangements for preferential access among the parties for vessels meeting certain standards for the provision of domestic economic benefits; and

e) 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.

The Oceanic Programme (OFP) of SPC provides 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.

The FFA is an advisory body that provides expertise and technical assistance to 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.

On the basis of the above, the functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction for the sub-regional management systems but not for the regional management system, where they are only explicitly defined and well understood for key areas of responsibility and interaction. Therefore, **SG60 and SG80 are met but SG100 is not**.

Republic of Korea

Organisations and individuals directly involved in the management process and their roles are explicitly defined and well understood for all areas. Other interested parties such as NGOs and industry consult with MOF in Korea on a range of management-related issues. Attendance at WCPFC meetings (including SC and TCC) by Korean delegations, has expanded understanding of the functions, roles and responsibilities of national jurisdictions and WCPFC Commission and the components of the management structure. The Ministry of Oceans and Fisheries (MOF) is the main department responsible for managing all fisheries and marine issues. MOF is comprised of three offices (i) Planning and Coordination Office; (ii) Oceans Policy Office and; (iii) Coastal Fisheries Policy Office. The most important office for distant water fisheries is the Oceans Policy Office.

Three sub-offices operate under this Office with a General Director appointed to manage separate Divisions. Relevant Divisions for the distant water fisheries include the International Cooperation Division and Distant Water Fisheries Division. The Distant Water Fisheries Division administers the distant water fisheries, while the International Cooperation Division works on international relations and negotiations at RFMOs. The MOF also works closely with the National Institute of Fisheries Science (NIFS), which provides fisheries science and technology expertise. NIFS conducts scientific research and stock assessments and is involved in resource management for species such as tuna (WWF, 2016). The MOF also works closely with the Fisheries Monitoring Centre (FMC) whose responsibility is to monitor in real time through vessel monitoring systems (VMS)) all distant water fishing vessels and the Korea Maritime Institute (KMI), which specialises in maritime and fishery policy. There are over 35 organisations that are relevant to domestic and distant water fisheries, seafood trade, ports etc. (WWF, 2016). The Korea Fisheries Association (KFA) plays a key role in facilitating discussion between central government and fishery stakeholders for the coastal and offshore fisheries sectors and Korea Overseas Fisheries Association (KOFA) (established under Article 28 of the DWFDA) supports the distant water fishing industry by providing statistics on fishing activities, analysis and research of foreign markets etc. (WWF, 2016). It also plays a key role in non-governmental cooperation with foreign countries (WWF, 2016). Based on the above, **SG60, SG80 and SG100 are met**.

On the basis of the above, the functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction for the national management system but not for the regional management system. **Therefore, SG60 and SG80 are met but SG100 is not met**.

b	Consultation processes			
	Guide post	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used.**
	Met?	Yes	Yes	No

Rationale

WCPFC

WCPFC has extensive formal and informal consultation processes (including ad hoc inter-sessional Working Groups for specific issues) that regularly seek and accept information from CCMs and CNMs. 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 the SPC. The WCPFC also actively uses information from the fishery and its member states in order to develop fisheries management decisions and to formulate CMMs. This is demonstrated through reports and outcomes of WCPFC meetings, which detail the decision-making process and are readily accessible online. Although much of this information can be accessed from various sources, it is not necessarily clear how different sources of information are used or not used in decision-making (Medley and Gascoigne, 2017). WCPFC has three major annual meetings that include members, stakeholders, industry etc.; at these meetings stakeholders have the opportunity to present papers, discuss concerns etc. This information has been used in the adoption of CMMs. **SG60 and SG80 are considered met at regional level**, on the basis that WCPFC consultation processes regularly seek and accept relevant information and the management systems have demonstrated consideration of this information through the adoption of WCPFC CMMs. The WCPFC management system demonstrates consideration of information obtained and scientific reports indicate what information is being used, how it is used, and justification is provided for information which is rejected. However, information used by WCPFC management, other than scientific information, is not clearly reported and it is not clear how different sources of information are weighed (Akroyd et al., 2020). Thus, **SG100 is not met.**

Republic of Korea

It is a requirement under the DWFDA that stakeholder information sessions are scheduled whenever a WCPFC CMM is created or amended potentially requiring the DWFDA to be amended. At these sessions, discussions and explanations of potential consequences are presented to stakeholders and input sought that can then be taken into consideration when deciding whether the new or amended CMM can be implemented effectively in the Korean context. Various outreach activities are conducted to engage stakeholders and the general public on matters such as IUU fishing and provide an opportunity for information and local knowledge to be incorporated into decision-making. Under Article 5 of the DWFDA, a “Deliberative Committee for Development of the Distant Water Fisheries Industry” was established under the jurisdiction of the MOF to consult on matters such as:

1. The formulation of comprehensive plans to develop the distant water fisheries industry;

2. The balanced development of the distant water fisheries industry;

3. Decisions on permitted quotas for distant water fisheries;

4. Matters necessary for the structural improvement of distant water fisheries, strengthening the competitiveness of distant water fisheries, and establishing foundations for the development of the distant water fisheries industry;

5. Matters concerning administrative and financial assistance for the development of the distant water fisheries industry; and

6. Other important matters tabled by the Minister of Oceans and Fisheries for deliberation with regard to the development of the distant water fisheries industry.

This committee (which is not allowed to exceed 20 persons) includes government officials, persons with “knowledge about and experience in the distant water fisheries industry” and those recommended by the competent Standing Committee of the National Assembly. As there are processes in place to obtain relevant information from stakeholders, including local knowledge, **SG60 and SG80 are met. SG 100 is not met** as there is insufficient evidence to demonstrate how stakeholder information is used or not used in decision-making.

On the basis of the above, **SG60 and SG80 are are met at the national and regional levels but SG100 is not met**.

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?		Yes	No

Rationale

WCPFC

The WCPFC Secretariat facilitates effective engagement by stakeholders. Attendance at Commission and related meetings is comprehensive with logistic and financial support provided to Pacific Island Countries and Territories (PICTs) to ensure attendance, meaningful involvement and interaction in the cooperative management of fisheries in the WCPO. Registered NGOs and eNGOs (within limits for the number of delegates) are able to attend meetings as observers and may make verbal presentations and/or written statements, which are included in the official record. Based on the above, there is sufficient evidence that at the regional levels consultation processes provide opportunity and encouragement for all interested and affected parties to be involved, and facilitate their effective engagement. **SG60, SG80 and SG100 are met.**

Republic of Korea

The Korean government provides the opportunity for representatives from industry and NGOs to attend relevant international negotiations and WCPFC meetings as part of the Korean delegation so that their interests can be incorporated into decision-making and to ensure that they are aware of the reasoning behind eventual management and policy decisions (Republic_of_Korea, 2014b). When a new CMM is agreed upon at WCPFC, the Korean government will hold stakeholder consultations to explain what the new measure is and what it means for the fishery as the DWFDA requires compliance with all WCPFC CMMs. Various outreach activities are conducted to engage stakeholders and the general public on matters such as IUU fishing and provide an opportunity for feedback. In 2019, the USA placed the Republic of Korea on a preliminary list of countries engaged in illegal fishing. The Korean government and stakeholders reacted quickly by addressing the flaws in the DWFDA that made it difficult to sanction illegal vessels. Amendments to the DWFDA which were developed in consultation with relevant NGOs were approved within 125 days of the Republic of Korea being placed on the list which enabled the government to take action in a timely and effective manner when it is determined that a vessel has fished illegally.

When the Korean government implements a new policy, it is published for general comment. A Deliberative Committee for Development of the Distant Water Fisheries Industry was established under the DWFDA, which includes representatives with “knowledge about and experience in the distant water fisheries industry” and provides opportunity for interested parties to be involved in the decision-making process. **Based on this SG60 and SG80 are met**. **SG100 is not met** as there is insufficient evidence to suggest meaningful facilitation by MOF or the other Korean government agencies to achieve effective engagement of all interested and affected parties.

The team determined that there is sufficient evidence that at the regional level that consultation processes provide opportunity and encouragement for all interested and affected parties to be involved, and facilitate their effective engagement, however at the national level there is not sufficient evidence. **Therefore, SG60 and SG80 are met but not SG100.**

References

Akroyd et al. (2020), Blyth-Skyrme et al. (2018), Medley and Gascoigne (2017), WWF (2016), Republic_of_Korea (2014b), Scarcella et al. (2021)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

Republic of Korea Fisheries Act (2014 revised).

Republic of Korea Fisheries Resources Management Act (2011 revised, amended 2015)

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 42. 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?	Yes	Yes	Partial

Rationale

WCPFC

The WCPFC is responsible for decision-making for key management measures which affect the skipjack, albacore, 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. Commission reports also indicate that explicit action is being undertaken through CMMs to support 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. 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 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 indicates that explicit action is being undertaken to develop and implement management arrangements that support achievement of the objectives, **thus SG60 and SG80 are met.** However, it is not clear that a precautionary approach is applied in practice across all policies for all stocks (Akroyd et al., 2020). Evidence of this is that WCPFC has not established HCRs for yellowfin, bigeye or albacore. Therefore, **SG100 is not met in its entirety** at the regional level. Based on the above, **SG60 and SG80 are met but SG100 is not met in its entirety**.

Republic of Korea

The principal objective of the DWFDA under Article 1 is to "advance the sustainable development of the distant water fisheries industry and contribute to the growth of national economy, through the rational preservation, management, exploitation, and utilisation of maritime living resources, and the promotion of international cooperation". In the formulation of plans for the distant water fisheries, it is a requirement under Article 4 of the DWFDA that the Minister of Oceans and Fisheries include "matters concerning the rational preservation and management and exploration and exploitation of marine living resources". Korea is a signatory to UNCLOS and UNFSA, which refers to the implementation of ecosystem-based management and the precautionary approach, which is consistent with the MSC fisheries standard. In 2006 the government defined a Vision for Korean Fisheries, with four major goals that included (i) rebuilding fishery resources based on an ecosystem approach; (ii) modifying the structure of fishery production; (iii) preventing harmful and illegal fishing activities and (iv) improving marine environmental quality (Zhang et al., 2009). These objectives are consistent with the requirements of the Conservation and Management of Marine Ecosystems Act (amended 2015), which specifies that governments must take into account measures to conserve or manage marine ecosystems. Based on this evidence **SG60 and SG80 are met** as there are clear explicit objectives incorporating the precautionary approach and ecosystem-based management in various Acts and policies, but **SG100 is not met** in its entirety as there is insufficient evidence to show how the precautionary approach and ecosystem approach to fisheries are used in decision-making and a requirement of management policy.

Based on the above, the team considered that SG60 and SG80 are met for the national and regional management systems, SG100 is not met in its entirety for the national and regional systems. **Therefore, the overall score is 90** (partial scoring is permitted for PIs with a single scoring issue – FCPv2.2 7.17.9.3).

References

Akroyd et al. (2020), Medley and Gascoigne (2017), Zhang et al. (2009), Scarcella et al. (2021)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

Republic of Korea Conservation and Management of Marine Ecosystems Act (2015 revised).

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 43. 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?	Yes	Yes	Partial

Rationale

WCPFC

The management measures applied by the WCPFC are principally "to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 United Nations Convention on the Law of the Sea and the 1995 UN Fish Stocks Agreement. Regional fishery-specific objectives are set out in CMMs, which are regularly reviewed, updated/revised and new ones added. Objectives relating to MSC P1 (target) and P2 (non-target) outcomes are endorsed by CCMs as enunciated in CMMs related to target fish stocks (CMM 2021-01, CMM 2020-01, CMM 2018-01, CMM 2017-01; 2015-02; CMM 2015-06), and non-target species: e.g. the CMMs for Sharks (CMM 2019-04), on Mobilid Rays Caught in Association with Fisheries in the WCPFC Convention Area (CMM 2019-05), of Sea Turtles (2018-04), to Mitigate the Impact of Fishing of Highly Migratory fish Stocks on Seabirds (CMM 2018-03), and on Marine Pollution (2017-04). More specifically, CMM 2021-01 for bigeye, yellowfin and skipjack has the following explicit objectives: yellowfin: pending agreement on a target reference point the spawning biomass depletion ration (SB/SBF=0) is to be maintained at or above the average for 2012-2015; 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, a adopted in accordance with CMM 2015-06 and bigeye: pending agreement on a target reference point the spawning biomass depletion ration ($SB/SB_{F=0}$) is to be maintained at or above the average for 2012-2015.. For South Pacific albacore in 2018 an interim target reference point (TRP) of 56 % of the spawning biomass in the absence of fishing was adopted with the objective of achieving an 8 % increase in CPUE for the southern tuna longline fishery as compared to 2013 levels, and to amending or developing appropriate CMMS with the objective of maintaining the South Pacific albacore spawning stock biomass at the target level on average and according to the timeframe for achieving the interim TRP in no later than 20 years. The Conservation and Management Measure for North Pacific albacore (CMM 2019-03 replaces CMM 2005-03 which adopted the measure that the total level of fishing effort for North Pacific albacore in the Convention Area north of the equator shall not be increased beyond current levels and CCMs shall take necessary measures to ensure that the level of fishing effort by their vessels fishing for North Pacific albacore in the Convention Area is not increased beyond 2002-2004 annual average levels, with the objective of ensuring that the species is not overfished. WCPFC also provides supplementary information on CMMs that include Guidelines for Handling and Safe Release of sea turtles, sharks, seabirds, manta and mobulid rays. In most cases the objectives in these CMMs are not well defined or measurable. Although commission reports indicate that explicit action is being undertaken through CMMs to support the achievement of objectives, 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. **Therefore, SG60 and SG80 are met but SG100 is not met in its entirety.**

Republic of Korea

Short-term objectives relating to MSC P1 and P2 are set out in various WCPFC CMMs. These are endorsed by Korea and under Article 13 of the DWFDA, distant water fisheries operators must "comply with resolutions made by international fisheries organisations for the conservation and management of resources and international standards regarding fisheries in high seas." The objective of the Distant Water Fisheries Development Act (2019) is to advance the sustainable development of the distant water fisheries industry and contribute to the growth of the national economy, through the rational preservation, management, exploitation and utilization of marine resources and the promotion of international cooperation. The Conservation and Management of Marine Ecosystems Act (2015) has the objective to protect marine resource assets by preserving and managing the marine ecosystem in a comprehensive and systematic manner in order to protect the marine ecosystem from human activity related damage, preserve biodiversity and promote sustainable use of marine resources. As Korea has explicit long-term objectives in relevant legislation and current WCPFC CMMs contain objectives for tunas, sea turtles, sharks, seabirds, manta and mobulid rays, **SG60 and SG80 are met**. However, the objectives are not necessarily well-defined and operational. so **SG100 is not met.**

On the basis of the above, at the national and regional levels SG60 and SG80 are met but SG100 is not met at the national level and at the regional level SG100 is not met in its entirety, therefore overall the score of **SG80 has been awarded**.

References

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Medley and Gascoigne (2017), Scarcella et al. (2021)

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

Republic of Korea Conservation and Management of Marine Ecosystems Act (2015 revised, amended 2017).

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 44. 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?	Yes	Yes	

Rationale

WCPFC

The WCPFC decision-making processes are transparent and clearly defined in Article 20 of the Convention and Rules of Procedure and allows consideration of serious and important issues through its committees (SC and TCC) as well as at the Commission Plenary itself. These decision-making processes use the precautionary approach and are based on the best available scientific information. The system allows Commission members to be fully informed of the issues under consideration and enables participation in informed decision-making. Information used in decision-making is published and decisions are made by consensus whenever possible. If consensus cannot be reached, then voting becomes necessary (by a 75 % majority but without voting rights for Participation Parties and Territories). CMMs are binding, but resolutions are non-binding on members. Members may request an independent review of a decision, to ensure it is consistent with the Convention and management objectives. The Convention also provides guidance in relation to overarching fisheries management arrangements, which requires that the precautionary approach be applied consistent with Articles 5 and 6 as well as Annex II of the UNFSA. The decision-making processes have resulted in a comprehensive set of CMMs and strategies to achieve specific objectives for the longline fishery. Based on the above, there are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. Therefore, **SG60 and SG80 are met**.

Republic of Korea

The decision-making process for Korean distant water fisheries is structured around the consultation and negotiation of CMMs at WCPFC annual meetings and workshops. If these international negotiations result in the development or modification of a CMM requiring the DWFDA to be amended stakeholder information sessions are automatically scheduled. Discussion and stakeholder input is sought and taken into consideration before a decision is made as to whether the new or amended CMM can be implemented in the Korean context. In 2019, the USA placed the Republic of Korea on a preliminary list of countries engaged in illegal fishing. The Korean government and stakeholders reacted quickly by addressing the flaws in the DWFDA that had made it difficult to sanction illegal vessels. Amendments to the DWFDA which were developed in consultation with relevant NGOs were approved within 125 days of the Republic of Korea being placed on the list which enabled the government to take action in a timely and effective manner when it is determined that a vessel has fished illegally. Due to reforms that were implemented by South Korea, it was taken off the list 4 months later. The system of decision-making allows Korean delegation representatives (including industry) at WCPFC meetings and relevant stakeholders in the Korean national system to be fully informed of the issues under consideration and ensure that decision-making results in measures and strategies to achieve fishery-specific objectives, therefore **SG60 and SG80 are met**.

Based on the above, there are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives at the national and regional levels. Therefore, **SG60 and SG80 are met**.

b	Responsiveness of decision-making processes			
	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the 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?	Yes	Yes	No

Rationale

<u>WCPFC</u>

The WCPFC allows for the Scientific Committee, the Technical and Compliance Committee and stakeholders to bring serious and important issues (most notably from SPC stock assessments) to the attention of the WCPFC. The transparency in decision-making is a requirement of the Convention (Article 21). The WCPFC responds to tuna fisheries issues through the development and implementation of CMMs and Resolutions. The CMMs and Resolutions provide a transparent response to scientific, technical, social, and cultural issues. Stock assessments and studies presented at the SC identify serious issues at the regional or sub-regional level that are addressed through agreed CMMs, for example Conservation and Management Measure for Bigeye, Yellowfin and Skipjack Tuna (CMM 2020-01 and CMM 2018-01) in the Western and Central Pacific Ocean. The Commission has adopted Conservation and Management Measure for North Pacific albacore (CMM 2019-03) and a stock assessment for albacore tuna in the North Pacific Ocean was conducted by SPC in 2020. Also, the Oceanic Fisheries Programme of SPC at the Thirteenth Regular Session of WCPFC, December 2016, raised concerns about the economic viability of the South Pacific albacore fishery due to declining catch rates since 1992. The SPC projections suggested that current catch and effort was not sustainable and consideration should be given for the implementation of alternative management measures as the CMM for South Pacific albacore (CMM 2015-02) appears to not be effective in constraining effort. The Commission responded to the declining catch rates of South Pacific albacore at the 15th Regular Session of the WCPFC, December 2018, by agreeing to the following:

- To task the SPA-VIWG, chaired by New Zealand, to continue to develop the road map for effective conservation and management of South Pacific albacore;
- To an interim target reference point (TRP) for South Pacific albacore at 56 % of the spawning biomass in absence of fishing with the objective of achieving an 8 % increase in CPUE for the southern tuna longline fishery as compared to the 2013 levels; and
- To amending or developing appropriate CMMs to implement a harvest control rule, developed in accordance with CMM 2014-06, with the objective of maintaining the South Pacific albacore spawning stock biomass at the target level on average and according to the timeframe of achieving the interim TRP in no later than 20 years.

The WCPFC meetings enable Commission members to be fully informed of the issues under consideration and provides participation in decision-making processes. However, decision-making is sometimes hampered due to the operational particularities of cooperative regional fisheries management, especially with consensus decision-making. WCPFC decision-making processes respond to serious and important issues in a transparent and adaptive manner, however, it has not been successful in addressing issues such as establishing HCRs for bigeye and yellowfin. A Harvest Strategy Workplan was developed in 2015 in accordance with CMM 2014-06, however, delays have occurred due to the complexity of developing the harvest strategies for multiple species as well as the capacity of the CCMs to understand and participate fully in the process. Based on the above, at the regional level **SG60 and SG80 are met but SG100 is not met**.

Republic of Korea

Korea has responded to some serious issues identified in relevant research, monitoring, evaluation and consultation. For example, Korea was listed as a potentially non-cooperating country in the fight against IUU fishing by the EU in November 2013 (http://europa.eu/rapid/press-release_IP-13-1162_en.htm) due to deficiencies in fisheries monitoring, control and surveillance (MCS). In response, Korea revised the DWFDA in 2013 and 2014 to strengthen MCS for this sector (strengthening controls on nationals, greater monitoring of fishing activities and high risk vessels, Port-State controls, VMS e-logbook requirements etc.) and respective sanctions (criminal prosecution and higher financial fines). In 2019, the USA placed the Republic of Korea on a preliminary list of countries engaged in illegal fishing. The Korean government and stakeholders reacted quickly by addressing the flaws in the DWFDA that had made it difficult to sanction illegal vessels. Amendments to the DWFDA which were developed in consultation with relevant NGOs were approved within 125 days of the Republic of Korea being placed on the list which enabled the government to take action in a timely and effective manner when it is determined that a vessel has fished illegally. Korea also created an FMC, which has real-time reporting capability on the fleet with 100 % VMS coverage and provides detailed vessel operational data to RFMOs and developed a NPOA on IUU fishing. These reforms to the legal system and the establishment of FMC led to the European Commission lifting its “yellow card” warning to Korea in April 2015 (http://europa.eu/rapid/press-release_IP-15-4806_en.htm). In addition, Korea participates in decision-making at the regional level (WCPFC) to address serious and other important issues identified in relevant research. As the high seas fishery management systems of Korea are structured to respond to serious and other important issues that may be identified by national stakeholders and apply to national policy making relevant to the fishery specific management system, **SG60 and SG80 are met**. However, there is insufficient evidence that all identified issues are responded to, therefore **SG100 is not met.**

On the basis of the above, at the national and regional levels **SG60 and SG80 are met but SG100 is not met**.

c	Use of precautionary approach		
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.
	Met?		Yes

Rationale

WCPFC

Under provisions of Article 5(c) of the WCPFC Convention the Commission and members are directly or, through the Commission, required to apply the precautionary approach in decision-making. Article 6 further requires the application of the precautionary approach and use of a Scientific Committee to ensure that the Commission obtains the best scientific information available (see Res. 2012-01 - Resolution on the best available science) for its consideration and decision-making. The Convention, in compliance with Annex II of the UNFSA, requires that the Commission be more cautious when information is uncertain, unreliable or inadequate and does not use the absence of adequate scientific information as a reason for postponing or failing to take conservation and management measures. Evidence that WCPFC is attempting to apply the precautionary approach is found in CMM 2018-01 and CMM 2020-01 which provides measures for constraining fishing effort of bigeye tuna fishery, pending agreement on a target reference point. There is sufficient information to conclude that decision-making processes for WCPFC are based on the best available information and the precautionary approach. Based on the above, the management system decision-making processes **meet SG80**.

Republic of Korea

It is an explicit requirement under Article 4 of the DWFDA that the Minister of Oceans and Fisheries include “matters concerning the rational preservation and management and exploration and exploitation of marine living resources” where rational preservation and management means “measures to preserve or manage one or more species of marine and fisheries resources as adopted and applied in accordance with international law”. Korea is a signatory to UNCLOS and UNFSA, which refer to ecosystem-based management and the precautionary approach. WCPFC develops CMMs based on the precautionary approach and use of the best available information. Korea is bound to implement these CMMs in their national management system under Article 13 of the DWFDA that ensures adherence to the precautionary approach by making distant water fishers comply with relevant CMMs and international standards while fishing in the high seas. On this basis, **SG80 is met**.

Based on the above, the national and regional management system decision-making processes, **SG80 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?	Yes	Yes	No

Rationale

WCPFC

The WCPFC maintains a publicly accessible website where all meeting minutes, reports and scientific reports from the Commission and its subsidiary bodies are posted are available for download. However, TCC management and compliance issues in country reports remain confidential; only annual summary reports are available. 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 at the Commission. While reports are available, it is not clear that they represent all the information that is used in decision-making or that all the information provided is used in decision making. There is no formal, detailed explanation linking the information available/provided to the decision that results. In an international context it is recognized that it is very difficult to give full explanations for all decisions, since this might undermine co-operation. Decisions are often negotiated outcomes with the trade-offs not always apparent (Medley and Gascoigne, 2017). With detailed formal public reporting of decisions and information on how decisions are based, the WCPFC meets **SG60 and SG80**. However, formal reporting criteria that can be clearly linked to all information is not always available, so **SG100 is not met**.

Republic of Korea

Information on the relevant fisheries performance and management actions are available online through the WCPFC. Korea responds to its WCPFC reporting commitments by providing comprehensive national reports and data to the Secretariat. Korea provides two annual reports, the Part 1 country report to WCPFC (WCPFC-SC14-AR/CCM-12) provides a summary of fisheries, research and statistics from the preceding calendar year while the Part 2 Country Report summarises management and compliance measures taken by Korea in the previous calendar year. With the exception of the Part 2 Report, information is publicly available on the WCPFC website https://www.wcpfc.int/home. Korea provided both WCPFC annual reports to the Secretariat in 2017, 2018 and 2019 (WCPFC-TCC13-2017, WCPFC-TCC14-2018, WCPFC TCC15-2019). Korea also provides information and explanations for actions or lack of action taken at the national level, for example, the reasoning behind the amendments to the DWFDA, establishment of the Fisheries Monitoring Center and development of the NPOA-IUU in response to European Commission "yellow card". However, information on the rationale behind most decision-making at the national level is lacking on the MOF website or in various reports or minutes from stakeholder meetings. Therefore, it is not clear that explanations are provided for most actions or lack of action associated with findings and relevant recommendations. Information on the fishery's performance and management action is available on specific request through MOF and/or their associated agencies. As information on the fishery's performance and management action is available on request, and explanations are provided for actions or lack of action, **SG60 and SG80 are met**. **However, SG100 is not met** as formal reporting of comprehensive information on the fishery's performance and management actions is not always available to interested stakeholders.

On the basis of the above, at the national and regional levels **SG60 and SG80 are met but not SG100**.

e	Approach to disputes			
	Guide post	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Yes	Yes	No

Rationale

<u>WCPFC</u>

Article 31 of the WCPFC Convention fully articulates the dispute mechanism for legal challenges. The WCPFC has a consensus-based decision-making process, with provision for a two-tier voting process requiring a 75 % majority (excluding Participating Territories and Cooperating Non-members) of both PICTs and DWFNs if all efforts to reach a decision by consensus have been exhausted. The Commission has not been subject to any court challenges as of 2021 (Scarcella et al., 2021). Given that there are no current outstanding judicial disputes or outstanding international disputes, the management system meets **SG60 and SG80 requirements**. The management system acts proactively to avoid legal disputes at the regional level by the prompt incorporation of CMMs into national legislation and the implementation of measures to support such legislation. However, there is increasing potential for legal challenges (e.g., in relation to resource allocation) but there is no evidence as yet of proactive actions by WCPFC to limit disputes so the requirements of **SG100 are not considered to be met**.

<u>Republic of Korea</u>

There are mechanisms in place in Korea to resolve disputes. There is no evidence that Korea is disrespectful or in defiance of national laws or legally binding agreements at the national level. There is evidence MOF attempts to proactively avoid legal disputes, through inviting industry to attend WCPFC meetings as part of the Korean delegation so that their interests can be incorporated into decision-making and they are made aware of the reasoning behind agreed CMMs (Republic_of_Korea, 2014b). When a new CMM is agreed upon by WCPFC, the Korean government will hold stakeholder consultations to explain what the new measure is and what it means for the fishery as the DWFDA requires compliance with all WCPFC CMMs. In 2019, the USA placed the Republic of Korea on a preliminary list of countries engaged in illegal fishing. The Korean government and stakeholders reacted quickly by addressing the flaws in the DWFDA that had made it difficult to sanction illegal vessels. Amendments to the DWFDA which were developed in consultation with relevant NGOs were approved within 125 days of the Republic of Korea being placed on the list which enabled the government to take action in a timely and effective manner when it is determined that a vessel has fished illegally. Various outreach activities are conducted to engage stakeholders and the general public on matters such as IUU fishing and provide an opportunity for feedback and avoid the potential for future disputes. There is also evidence that the MOF has taken steps to rectify the European Commission issuing of an IUU yellow card in November 2013 through amendments to the DWFDA and the establishment of the FMC, which resulted in the "yellow card" being lifted in April 2015. The management system has mechanisms in place to comply in a timely fashion with judicial decisions arising from legal challenges and works proactively to avoid legal disputes, **therefore SG60, SG80 and SG100 are met**.

On the basis of the above, **SG60 and SG80 are met** at the national and regional levels, however, as there is no evidence that proactive actions have been taken to limit disputes at the regional level **SG100 is not met**.

References

Campling et al. (2017), Medley and Gascoigne (2017), Republic_of_Korea (2014b), WWF (2016), Scarcella et al. (2021)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

Republic of Korea Fisheries Act (2014 revised).

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 45. 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?	Yes	Yes	No

Rationale

WCPFC

The WCPFC seeks to ensure compliance through mandatory VMS, an IUU vessel list, port state controls, observers (and e-monitoring), logbooks (plus e-reporting), a record or fishing vessels and transhipment monitoring. The WCPFC's Technical and Compliance Committee has codified port State measures (CMM 2017-02), chartering arrangements (CMM 2016-05), catch/statistical documentation, and compliance monitoring and reporting. The WCPFC relies heavily upon the IUU vessel listing process as an incentive for compliance. WCPFC has a well-established Compliance Monitoring Scheme (CMS, detailed in CMM 2017-07), which is largely dependent on the submission by members of information in annual country reports. The stated purpose of the CMS is to:

- Assess CCMs' compliance with their obligations;
- Identify areas in which technical assistance or capacity building may be needed to assist CCMs to attain compliance;
- Identify aspects of conservation and management measures which may require refinement or amendment for effective implementation;
- Respond to non-compliance through remedial options that include a range of possible responses that take account of the reason for and degree of noncompliance, and include cooperative capacity-building initiatives and, in case of serious non-compliance, such penalties and other actions as may be necessary and appropriate to promote compliance with CMMs and other Commission obligations; and

- Monitor and resolve outstanding instances of non-compliance.

The regional MCS is supported by the QUAD Operational Working Group, comprised of the aerial and naval divisions of Australia, France, New Zealand and the U.S. They provide aerial and surface assets to assist regional surveillance, and participate in four annual coordinated sea surveillance actions. FFA has the responsibility for facilitating the coordination of the surveillance assets provided by the QUAD nations in support of national and multilateral fishing surveillance and response activities. FFA provides policy and services to its members to build national capacity and regional solidarity to control fishing in the Pacific, including IUU activities. As well as VMS, this includes technical expertise, information sharing and projects of monitoring activities, regional surveillance operations, the FFA Observer Programme, FFA licence information and staff training and support. The PNA Agreement promotes MCS cooperation among parties. MCS systems include harmonised minimum terms and conditions of access, a regional VMS system, a regional register of foreign fishing vessels and a range of regional MCS cooperation programmes, including the Niue Treaty information system (NTIS), which became operational in May 2017. Regional coordination of MCS is undertaken by FFA Surveillance Centre (RFSC) operating from Honiara. Fishers by-and-large comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery. A problem among many tuna fisheries management systems is monitoring transhipment to prevent illegal catch entering the legal market. To address this issue, transhipment at sea is prohibited (CMM 2009-06) and there is monitoring of in-port transhipment. WCPFC continues to refine its development of a Catch Documentation Scheme, which should reduce the opportunities for IUU fishing and complement the vessel register. For longline vessels WCPFC implemented a 5 % observer coverage requirement. Observer records of target species and bycatch are used to estimate and report catches of the tuna fleets operating in the WCPO. However, in April 2020, due to COVID-19 the Commission agreed to suspend the requirement for observer coverage on purse seine vessels set out in paragraphs 34 and 35 of CMM 2018-01 and CMM 2018-05. Although, longline vessel observer coverage was not suspended under the WCPFC agreement, national COVID-19 restrictions significantly reduced observer coverage in 2020. Based on the above, the MCS system in place has demonstrated to be effective **meeting SG60 and SG80**, but it is not comprehensive, as evidence exists of gaps in port state controls (Medley and Gascoigne, 2017) and it cannot be demonstrated to have the ability to consistently enforce relevant CMMs, therefore **failing to meet SG100**.

<u>Republic of Korea</u>

Korean fishing vessels engaged in distant water fishing in the high seas are managed under the Distant Water Fisheries Development Act (DWFDA). Under DWFDA Article 13, distant water fishing vessels must comply with resolutions made by RFMOs, which apply inside EEZs and in the high seas. If a violation of these rules occurs then under Article 13, Part 9, the Minister of Oceans and Fisheries can immediately suspend fishing operations of the vessel, entry into designated ports or prohibit discharge and transhipment of catch. To ensure compliance, vessels must install a VMS prior to departing from port (Article 15) and must obtain a permit in advance to tranship (Article 16). Vessels suspected of IUU fishing can be denied port entry or prohibited from departing or restricted from unloading etc. and/or use of port services (Article 14). Penalties for non-compliance (fines and imprisonment) are listed in Article 33. Vessels that conduct IUU fishing activities in the EEZs outside Korea's jurisdiction or in the high seas are subject to imprisonment of up to three years or a fine of up to three times the amount of the value of the illegal catch. Korean fishing vessels are monitored by the FMC, which has a state-of-the-art monitoring system generating real time reporting on the fleet (Campling et al., 2017). The FMC ensures proper functioning of VMS and operates the fisheries monitoring system (FMS), e-reporting system (daily for catch/bycatch and protected species interaction data) and the Korean fisheries information management system (FIMS) on a 24/7 basis. This allows detailed and operational fishery data to be sent to RFMOs and for FMC to also monitor the fleet in real-time to ensure it is complying with regulations, such as not fishing in protected areas. According to Republic_of_Korea (2014b), Korea also takes part in high seas boarding and inspection schemes in the WCPO and intends to broaden its participation to other RFMOs. In 2019, Korean authorities boarded Dongwon 619 for an inspection. Also, Hansung 38 and Hansung 39 were boarded by the Tuvalu patrol vessel in October 2019. In 2020, Korea did not participate in any boarding operations due to Covid-19 restrictions. Korea also has a scientific observer programme on distant water fishing vessels, which is administered by the National Institute of Fisheries Science (NIFS), with a total of 31 scientific observers at present (WCPFC-SC14-AR/CCM-12), who are provided training through a MOU with Marine Resources Assessment Group (MRAG). According to Republic_of_Korea (2014b), observers are tasked to collect operational and biological information, to collect samples for scientific analyses and to monitor the vessel's compliance with relevant rules and regulations. In the WCPO the percentage of observer coverage on UoA vessels was estimated to be 4.53 % in 2018, 7.16 % in 2019 and 2.59 % in 2020 (WCPC requires minimum of 5 % observer coverage on tuna longline vessels). It should be noted that in April 2020, due to COVID-19 the Commission agreed to suspend the requirement for observer coverage on purse seine vessels set out in paragraphs 34 and 35 of CMM 2018-01 and CMM 2018-05. The suspension also impacted observer coverage on longline vessels; the low coverage was compounded by national COVID-19 restrictions prohibiting observers from boarding vessels. For UoA longline vessels operating in high seas areas, there is some degree of confidence that fishers comply with the national and international management frameworks in place as no infractions were committed in 2019 and 2020. A comprehensive monitoring, control and surveillance system has therefore been implemented at the national level by Korea, which has shown a consistent ability to enforce relevant management measures, strategies and/or rules such that **SG60 and SG80.** However, **SG100 is not met** as it cannot be demonstrated that the monitoring, control and surveillance system has the consistent ability to enforce relevant management measures, strategies and/or rules due to the low observer coverage in the high seas.

On the basis of the above, at the national and regional levels **SG60 and SG80 are met**, however, as it cannot be demonstrated at the regional level that there is the ability to consistently enforce relevant CMMs, **SG100 is not met**.

b	Sanctions			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Yes	Yes	No

Rationale

<u>WCPFC</u>

Conservation measures are set by WCPFC, but their enforcement falls to member States. The WCPFC relies largely on the IUU vessel listing process (CMM 2010-06) as an incentive for compliance along with port state controls, at-sea observers, logbooks and transhipment monitoring. Non-compliance by vessels is addressed with the application of WCPFC IUU listing procedures. Non-compliance by member States, rather than vessels, is currently addressed through Commission processes of monitoring, reporting and accountability under the Compliance Monitoring Scheme (CMM 2019-06), but sanctions are applied to IUU vessels and vessels detected as being non-compliant with CMMs and/or resolutions. WCPFC notifies Flag States of non-compliant vessels, which the Flag States order to withdraw from the Commission Area. Sanctions appear to be consistently applied and provide effective deterrence in relation to proven IUU fishing. Therefore, there is sufficient evidence to suggest that **SG60 and SG80 are met**.

WCPFC TCC discusses compliance issues based on available information on infringements from observers and other sources. Responses to reported non-compliance are considered at the TCC and reported to the Commission plenary in the Compliance Monitoring (CMS) Report. Each annual TCC Report provides a matrix of each CCM's and Participating non-members compliance performance with CMMs. In December 2018 at the WCPFC Fifteenth Regular Session CMM 2018-06 was adopted for the WCPFC Record of Fishing Vessels and Authorization to Fish. This CMM establishes provisions for Members of the Commission to authorize the vessels to fish in the Convention area, consistent with Article 24 of the Convention, and maintain a record of fishing vessels entitled to fly its flag and authorized to fish in the Convention Area beyond its area of national jurisdiction and ensure that all such fishing vessels are entered in the record. Also, WCPFC adopted Conservation and Management Measure to Establish a List of Vessels Presumed to Have Carried out Illegal, Unreported, and Unregulated Fishing Activities in the WCPO (2019-07) which stipulates that CCMs and non-CCMs apply all necessary measures under their applicable legislation, international law and international obligations against vessels on the WCPFC IUU Vessel List to reduce IUU fishing activities.

While some progress has been demonstrated towards transparency in reporting on Flag State compliance, the TCC reports still do not provide sufficient information on outcomes of investigations into non-compliance such that effective deterrence can be demonstrated. Therefore, **only SG60 and SG80 are met and SG100 is not met** at regional level.

<u>Republic of Korea</u>

Article 13, paragraph 2 of the Korean DWFDA lists activities considered to be serious violations in overseas waters, including fishing without a licence, failing to maintain accurate catch records, fishing in closed or marine protected areas or fishing with unauthorised gear. If an operator is found to have violated a rule under paragraph 9, the Minister of Oceans and Fisheries can immediately suspend fishing operations of the vessel, entry into designated ports or prohibit offloading or transhipping of catch. Fishing vessels must also submit pre-port entry reports on catches under Article 14, have an operational VMS prior to departing port under Article 15 and obtain a permit prior to transhipping and report on the amount transhipped to the Minister of Oceans and Fisheries under Article 16. Individuals or businesses can be prosecuted under administrative and/or criminal proceedings, including under Article 33 fines not exceeding five times the value of the marine products or up to one billion won and up to five years imprisonment for violations. For repeat violations (two or more times within five years) the penalties are higher. Lesser administrative fines not exceeding five million won are awarded for simple transgressions such as failing to file reports under Article 36. In 2019, the USA placed the Republic of Korea on a preliminary list of countries engaged in illegal fishing. The Korean government and stakeholders reacted quickly by addressing the flaws in the DWFDA that had made it difficult to sanction illegal vessels. Amendments to the DWFDA which were developed in consultation with relevant NGOs were approved within 125 days of the Republic of Korea being placed on the list which enable the government to take action in a timely and effective manner when it is determined that a vessel has fished illegally. For UoA longline vessels operating in high seas areas, there is high degree of confidence that these sanctions ensure effective compliance such that **SG60 and SG80 are met**. However, there is insufficient evidence (i.e., enforcement effort and decline in the number of violations detected) to demonstrate effective deterrence so **SG100 is not met**.

On the basis of the above, at the national and regional levels **SG60 and SG80 are met but SG100 is not met**.

c	Compliance

	Guide post	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Yes	Yes	No

Rationale

WCPFC

WCPFC members must submit confidential reports to the TCC relating to compliance with all active CMMs. WCPFC TCC has a permanent MCS Working Group, with a role to review and monitor compliance with WCPFC management measures. The working group also recommends measures to promote compatibility among the national fisheries management systems in addressing matters related to compliance with CMMs, analyses information on compliance and reports the findings to the WCPFC. An annual report which identifies infringements is produced as part of the compliance review. These reports provide tables of compliance/non-compliance of each CCM and PNM with CMMs of the WCPFC, but do not present compliance levels of fishers at a national level. The 5 % observer coverage requirement on longline vessels, although low, contributes to minimizing non-compliance and assists in identifying inaccurate reporting. However, SPC suggests that there are still some inconsistencies in observer data, requiring ongoing checking and verification. VMS provides additional evidence of general compliance with the management system. Other regional MCS operations support the implementation of WCPFC management system which include Pacific patrol boats from participating FFA member nations and 'QUAD' nations that offer defence and military assets to support regional surveillance covering more than 14 million km^2 of the WCPO. These operations detect vessels via radar, and conduct at-sea and in-port vessel boardings. A review of the Commission's Compliance Monitoring Scheme was conducted in March 2017 and concluded that the current system was sound and achieves its overall objectives. Also, the CMS appears to be having positive effects upon overall compliance in the region. Given the above, **SG60 and SG80 are deemed to be met**, but there is some evidence that the timeliness and quality of data submitted could be improved. At the SG100 level it would be difficult to conclude that there is a high degree of confidence that fishers comply with all aspects of the management system. **SG100 is not met**.

Republic of Korea

Following the listing of Korea as a potential non-cooperating country in the fight against illegal fishing and issuing of a "yellow card" in November 2013 by the European Union, Korea created a new FMC, which operates a state-of-the-art monitoring system generating real time reporting on approximately 260 distant water fishing vessels (Campling et al., 2017). The monitoring system provides detailed fishery data to WCPFC and SPC and allows for FMC to also monitor the fleet in real-time. FMC can call a vessel directly to ensure it is complying with regulations, such as not fishing in protected areas. The implementation of the FMC, along with the EU "yellow card" being subsequently lifted in April 2015 has led to Korea being perceived as a "good corporate citizen in regional fisheries, with good compliance with measures and regulations." (Campling et al., 2017). For client longline vessels operating in high seas areas, there is some degree of confidence that fishers comply with the national and international management frameworks in place (no infractions were committed by the UoA vessels in 2019 and 2020), **therefore SG60 and SG80 are met**. Demonstrating this however is challenging, especially in an absence of convictions or evidence of action taken by authorities, **therefore SG 100 cannot be awarded**.

On the basis of the above, at the national and regional levels **SG60 and SG80 are met but SG100 is not met**.

d	Systematic non-compliance			
	Guide post		There is no evidence of systematic non-compliance.	
	Met?		Yes	

Rationale

WCPFC

There is no evidence of systematic non-compliance. Non-compliance within the WCPO is mostly opportunistic or due to fishers lack of knowledge of the CMMs, resolutions or sanctions. When non-compliance does occur, the offences vary from minor (e.g., late submission of reports) to serious (e.g., not complying with shark finning regulations). As non-compliance is not systematic it does not threaten the sustainability of the tuna fishery. **On this basis, SG80 is met**.

Republic of Korea

No infractions were committed by the UoA vessels in 2019 and 2020. Therefore, there is no evidence of systematic non-compliance and **SG80 is met**.

On the basis of the above, at the national and regional levels, **SG80 is met**.

References

Campling et al. (2017), Medley and Gascoigne (2017), Peatman et al. (2018), Republic_of_Korea (2014b), WWF (2016), WCPFC_SC (2020b, 2021a), Dunn et al. (2018), MRAGAsiaPacific (2016), WCPFC_TCC (2017), Scarcella et al. (2021)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (“WCPFC Convention”)

Republic of Korea Distant Water Fisheries Development Act (2015 revised).

Republic of Korea Fisheries Act (2014 revised).

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 46. 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?	Yes	Yes	No

Rationale

WCPFC

WCPFC has mechanisms in place to evaluate all parts of the management system through the various committees and working groups that meet regularly and report their findings to the Commission. The WCPFC Secretariat submits a report on compliance of members with the reporting provisions of the Commission (CMM 2017-07). Progress with implementation of CMMs is monitored through the reporting provisions within the CMMs themselves, or the members' Annual Reports (Parts 1 & 2) to the Commission. Stock assessments conducted by the SPC are subject to peer review by other members of the Scientific Committee and through occasional external reviews. Commission meetings provide an overall review of processes and outcomes. The Northern Committee provides documents and summary reports for review of Regular Session meetings. The WCPFC has well-developed arrangements to provide a range of information to the Secretariat and Commission Members through the Scientific Committee and the Technical and Compliance Committee. Both these committees are established by the Convention, which sets out the functions for each. The Scientific Committee:

- Recommends a research plan;
- Reviews stock assessments, analyses, other work and recommendations prepared for the Commission by scientific experts;
- Reviews the results of research and analyses of target stocks, non-target, associated or dependent species in the Convention Area;
- Reports to the Commission its findings or conclusions on the status of target stocks or non-target or associated or dependent species in the Convention Area;

- In consultation with the Technical and Compliance Committee, recommends to the Commission the priorities and objectives of the regional observer programme and assesses results of that programme; and
- Makes reports and recommendations on the conservation and management of and research on target stocks or non-target or associated or dependent species in the Convention Area;

In addition, the Technical and Compliance Committee:

- Provides the Commission with information, technical advice and recommendations relating to the implementation of and compliance with, conservation and management measures;
- Monitors and reviews compliance with conservation and management measures adopted by the Commission and makes such recommendations to the Commission as may be necessary; and
- Reviews the implementation of cooperative measures for monitoring, control, surveillance and enforcement adopted by the Commission and makes such recommendations to the Commission as may be necessary.

On the basis of the above, **SG60, SG80 and SG100 are met.**

<u>Republic of Korea</u>

There are mechanisms in place to evaluate key parts of the fishery-specific management system. The national legislation for distant water fisheries was reviewed and revised following the issuing of a "yellow card" to Korea by the EU under its IUU Regulation. An internal audit (performance review) of all MOF operations occurs annually. When a new CMM is agreed upon at RFMOs, the Korean government will hold stakeholder consultations to explain what the new measure is and what it means for the fishery as the DWFDA requires compliance with all WCPFC CMMs. This allows opportunities to review and evaluate the new CMM with relevant stakeholders before changes are made to the DWFDA. Progress with the implementation of regionally agreed CMMs is monitored and reviewed through the submission of annual reports to the WCPFC Secretariat. On this basis **SG60 and SG80 are met**. In the absence of evidence that all parts of the fishery specific management system are evaluated, **SG100 is not met**.

On the basis of the above, at the national and regional levels **SG60 and SG80 are met**, however, at the national level there is insufficient evidence that all parts of the management system are evaluated thus **SG100 is not 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?	Yes	Yes	No

Rationale

WCPFC

Although the WCPFC does not have a regular programme of external reviews, independent performance reviews were undertaken in 2011 and in 2014, consistent with the Kobe Course of Actions. As a result, the Commission established several working groups to address the recommendations of the reviews, which can be found on the WCPFC website. Also, an independent review (MRAG, 2008) has been conducted of the Commission's science and TCC structure and functions, resulting in the overhauling of their operations and adoption of review processes and changes to the data submissions and science functions. In 2017, there was an Independent Review of the Compliance Monitoring Scheme (MacKay et al., 2018) which assessed CCMs' compliance with their obligations; identified areas that required capacity building and technical assistance; identified aspects of CMMs that need to be amended or refined. As regional management system has regular internal reviews but only occasional external reviews, only **SG60 and SG80 are met and SG100 is not met**.

Republic of Korea

There is a requirement under Article 16-2 of the DWFDA for the MOF to conduct an annual internal performance review on the operations of the distant water fisheries industry, including IUU fishing. The NPOA-IUU is reviewed every four years as recommended by the IPOA (latest to be viewed by team). When a new CMM is agreed upon at WCPFC, the Korean government will hold stakeholder consultations to explain what the new measure is and what it means for the fishery as the DWFDA requires compliance with all WCPFC CMMs. This allows opportunities to review and evaluate the CMM with relevant stakeholders before changes are made to the DWFDA. Korea has also been externally reviewed by the EU to ensure their management system meets EU IUU Regulations, which led to new legislation being developed and the establishment of the FMC. It is therefore concluded that the management system is subject to regular internal reviews and occasional external reviews, thus **SG60 and SG80 are met**. In the absence of regular external reviews, **SG100 is not met**.

On the basis of the above, **SG60 and SG80 are met** at the national and regional levels but **SG100 is not met**.

References

MacKay et al. (2018), MRAG (2008), Republic_of_Korea (2014b), Scarcella et al. (2021)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Republic of Korea Distant Water Fisheries Development Act (2019 revised).

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

Draft scoring range	≥80
Information gap indicator	More information sought: - Latest review of NPOA-IUU for Republic of Korea

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

Overall Performance Indicator score	
Condition number (if relevant)	

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7. Appendices

7.1 Appendix 1 Assessment information

Appendix 1.1 Small-scale fisheries

To help identify small-scale fisheries in the MSC program, the CAB should complete the table below for each Unit of Assessment (UoA). For situations where it is difficult to determine exact percentages, the CAB may use approximations, e.g., to the nearest 10 %.

Unit of Assessment (UoA)	Percentage of vessels with length <15m	Percentage of fishing activity completed within 12 nautical miles of shore
All	0 %	0 %

7.2 Appendix 2 Evaluation processes and techniques

Appendix 2.1 Site visits

The report shall include:

- An itinerary of site visit activities with dates.
- A description of site visit activities, including any locations that were inspected.
- Names of individuals contacted.

Reference(s): FCP v2.2 Section 7.16

The site visit was held at XXXX, on the XXXX. The individuals met during the site visit and their roles in the fishery are listed in Table 30.

Table 30. List of attendees at the on-site meetings.

Name	Position	Type of consultation

Appendix 2.2 Stakeholder participation

The report shall include:

- Details of people interviewed: local residents, representatives of stakeholder organisations including contacts with any regional MSC representatives.
- A description of stakeholder engagement strategy and opportunities available.

Reference(s): FCP v2.2 Section 7.16

Appendix 2.3 Evaluation techniques

At Announcement Comment Draft report stage, if the use of the RBF is triggered for this assessment, the CAB shall include in the report:

a. The plan for RBF activities that the team will undertake at the site visit.
b. The justification for using the RBF, which can be copied from previous RBF announcements, and stakeholder comments on its use.
c. The RBF stakeholder consultation strategy to ensure effective participation from a range of stakeholders including any participatory tools used.
d. The full list of activities and components to be discussed or evaluated in the assessment.

At Client Draft Report stage, if the RBF was used for this assessment, the CAB shall include in the report:

e. A summary of the information obtained from the stakeholder meetings including the range of opinions.
f. The full list of activities and components that have been discussed or evaluated in the assessment, regardless of the final risk-based outcome.

The stakeholder input should be reported in the stakeholder input appendix and incorporated in the rationales directly in the scoring tables.

Reference(s): FCP v2.2 Section 7.16, FCP v2.2 Annex PF Section PF2.1

A key purpose of the site visit is to collect information and speak to stakeholders with an interest in the fishery. For those parts of the assessment involving the MSC's Risk-Based Framework (RBF, see msc.org), we will be using a stakeholder-driven, qualitative and semi-quantitative analysis. To achieve a robust outcome from this consultative approach, we rely heavily on participation of a broad range of stakeholders with a balance of knowledge of the fishery. We encourage any stakeholders with experience or knowledge of the fishery to participate in the RBF analysis. Stakeholders wishing to be involved should review the information provided below and return answers to the questions posed in Appendix 8 (pg. 321) to CU (UK), using the email address infofishuk@controlunion.com by 17:00 UTC on the 17/07/2021. Stakeholders who complete this questionnaire will also are offered the opportunity to discuss this RBF at a meeting as requested.

Stakeholder comments on the use of the RBF need to be considered (FCP v2.2 Annex PF 2.1.1.e). The stakeholder comment and CAB response shall be included in the Public Comment Draft Report (FCP v2.2 7.20.5).

Following the preparation of the ACDR for this fishery, two secondary main species were identified as triggering RBF scoring. As such CU (UK) are required to announce the use of RBF for PI2.2.1 for these elements. The species are listed below. The gear types concerned are gill nets and purse seines.

The RBF will be applied to PI 2.2.1, Secondary Species Outcome for the following species:

- Indian oil sardine (*Sardinella longiceps*)
- Amberstripe scad (*Decapterus muroadsi*)

Further information on why these species triggered the use of the RBF can be found in Section 5.8.2.4 and Section 5.8.2.5. The outputs of the provisional RBF scoring can be found in Section 7.3.

As per the requirements of Annex PF of the MSC FCP2.2., the required approach for PI 2.2.1 is use of the Productivity Susceptibility Analysis (PSA). The PSA is a tool that can be used by MSC Assessment Teams to assess the risk posed by a fishery to species for which there is only limited information available. The RBF process is intended to gather and use information from stakeholders in a structured manner; it is also intended to produce a more precautionary assessment of impact than if the MSC's default assessment tree is employed. We have tried to simplify the PSA process to produce this questionnaire, but there is still some complexity in the process. Where we ask for information from stakeholder on areas of this PSA we have highlighted in the following sections in green highlight.

If you have any queries about the MSC process, you can find more information at the MSC website (www.msc.org), including information about the fishery; alternatively, you can get in touch with us directly (infofishuk@controlunion.com). The MSC also provides an official template for stakeholder comments, to use if you have views on this aspect of the fishery; it can be downloaded at http://www.msc.org/documents/get-certified/stakeholders. Thank you for taking the time to participate in this assessment.

Guide to PSA

The PSA is described in detail in the MSC Fisheries Certification Process V2.2 (Annex PF4, MSC 2018). In summary, the data required for the PSA are divided in to two sections, one covering 'productivity' attributes (which effectively describe the biological attributes of the species'), and one covering 'susceptibility' attributes (which effectively describe the potential for interaction between the species and the UoA).

The productivity attributes for a species are species-specific and do not change between fisheries. The Assessment Team has already derived productivity information for each species from the available literature.

Information and provisional scoring of 'Productivity' is provided in the following sections. We request that you review this information and confirm that you agree with the Assessment Team's findings, or otherwise.

Information of "Susceptibility" is provided in the following sections. Please, review the 'Susceptibility' information provided and please use the space provided to draft your own scores for susceptibility to support finalisation of the PSA scores for the species under review.

Susceptibility attributes and scores

A few guidance notes have been listed below to aid stakeholders in the completion of the susceptibility questionnaire. Please note that this guidance is not exhaustive and stakeholders are encouraged to consult the MSC Fisheries Certification Process v2.2 (Annex PF). Where there is limited information available to score a susceptibility attribute, the more precautionary score shall be awarded.

Table: PSA susceptibility attributes and scores (extract from MSC FCP v2.2, Annex PF)

Susceptibility attribute	Low susceptibility (Low risk, score=1)	Medium susceptibility (medium risk, score=2)	High susceptibility (high risk, score=3
Areal overlap (availability) Overlap of the fishing effort with a species concentration of the stock	<10% overlap	10-30% overlap	>30% overlap
Encounterability The position of the stock/species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Low overlap with fishing gear (low encounterability)	Medium overlap with fishing gear	High overlap with fishing gear (high encounterability) Default score for target species (P1)
Selectivity of gear type Potential of the gear to retain species	a Individual < size at maturity are rarely caught	a Individuals < size at maturity are regularly caught	a Individuals < size at maturity are frequently caught
	b Individuals < size at maturity can escape or avoid gear	b Individuals < half the size at maturity can escape or avoid gear	b Individuals < half the size at maturity are retained by gear
Post-capture mortality (PCM) The chance that, if captured, a species would be released and that it would be in a condition permitting subsequent survival	Evidence of majority released postcapture and survival	Evidence of some released postcapture and survival	Retained species or majority dead when released Default score for retained species (P1 or P2)

Aerial overlap:

- Where the impacts of fisheries other than the UoA are taken into account, the areal overlap shall be scored as the combined overlap of all listed fisheries with the areal concentration of a stock
- The scoring of areal overlap shall consider the concentration of species and the overlap of the fishing gear with the concentration species

Encounterability:

- Where the impacts of fisheries other than the UoA are taken into account, encounterability shall be scored as the combined encounterability of all listed fisheries
- The scoring of encounterability shall consider the concentration of species and the overlap of the fishing gear with the concentration species
- The deployment of fishing gear in relation to each species adult habitat is the main aspect to be considered for each species

Gear selectivity:

- 'Rarely' means that the capture of individuals smaller than the size at maturity occurs in less than 5% few gear deployments.
- 'Regularly' means that the capture of individuals smaller than the size at maturity occurs in 5% to 50% of the gear deployments.
- 'Frequently' means that the capture of individuals smaller than the size at maturity occurs in more than 50% of gear deployments.

Post-capture mortality:

- The team shall use its knowledge of species biology and fishing practice together with independent field observations to assess the chance that, if captured, a species would be released and that it would be in a condition to permit subsequent survival

- In the absence of observer data or other verified field observations made during commercial fishing operations that indicate the individuals are released alive and post-release survivorship is high, the default value for the PCM of all species shall be high

Productivity attributes and scores

A few guidance notes have been listed below to aid stakeholders in the completion of the productivity questionnaire. Please note that this guidance is not exhaustive, and stakeholders are encouraged to consult the MSC Fisheries Certification Process v2.2 (Annex PF). Where there is limited information available to score a productivity attribute, the more precautionary score shall be awarded.

Table PF4: PSA productivity attributes and scores

Productivity attribute	High productivity (Low risk, score = 1)	Medium productivity (medium risk, score = 2)	Low productivity (high risk, score = 3)
Average age at maturity	<5 years	5-15 years	>15 years
Average maximum age	<10 years	10-25 years	>25 years
Fecundity	>20,000 eggs per year	100-20,000 eggs per year	<100 eggs per year
Average maximum size (not to be used when scoring invertebrate species)	<100 cm	100-300 cm	>300 cm
Average size at maturity (not to be used when scoring invertebrate species)	<40 cm	40-200 cm	>200 cm
Reproductive strategy	Broadcast spawner	Demersal egg layer	Live bearer
Trophic Level	<2.75	2.75-3.25	>3.25

7.3 Appendix 3 Risk-Based Framework outputs

The following PSA analyses are provisional only and were carried out to provide an indicative score in the ACDR. The analyses will be finalised following stakeholder input during the site visit.

See stakeholder announcement for RBF on the Track a Fishery webpage. Please contact infofishuk@controlunion.com should you wish to provide input on the use of the RBF.

Table 31. PSA Rationale Table – Indian oil sardine (*Sardinella longiceps*)

PI number	**2.2.1 (Secondary species outcome)**	
Productivity		
Scoring element (species)	**Indian oil sardine (*Sardinella longiceps*)**	
Attribute	**Rationale**	**Score**
Average age at maturity.	Average age of maturity is one year according to Nair et al. (2016) and Zaki et al. (2011). This is below five years so is considered low risk and awarded a 1 in the PSA.	1
Average maximum age	Average max age of Indian oil sardine is 2.5 years (Zaki et al., 2013) or 3 years according to *Fishbase* https://fishbase.mnhn.fr/summary/1511 and around 2.5-3 years by Balan (1964). This is below 10 years and is considered low risk and awarded a 1 in the PSA.	1
Fecundity	Indian oil sardine is a highly fecund species producing an average 40,000 eggs (22,456-61,867 eggs) each spawning (Zaki et al., 2012). This is considered low risk and awarded a 1 in the PSA.	1
Average maximum size	Average max size: 23cm according to Fishbase, Balan (1964) and Jayabalan et al. (2014). This is considered low risk and awarded a 1 in the PSA. (*Fishbase - https://fishbase.mnhn.fr/summary/1511*)	1
Average size at maturity	Average size at maturity for the species depends on the location of sampling across the Omani coastal waters but studies indicate this is consistently below 20cm (see examples below). Between 15.6cm and 16.3cm (Zaki et al., 2012) 18.2cm (Al-Anbouri et al., 2013) This is considered low risk and awarded a 1 in the PSA.	1
Reproductive strategy	Is a broadcast spawner according to *Fishbase* and Al-Jufaili (2012) so is considered low risk and awarded a 1 in the PSA. https://fishbase.mnhn.fr/summary/1511	1
Trophic level	Trophic level 2.4 ± 0.22 se according to *Fishbase* so is considered low risk and awarded a score of 1 in PSA. https://fishbase.mnhn.fr/summary/1511 Feeds mainly on phytoplankton (especially diatoms) and small crustaceans.	1

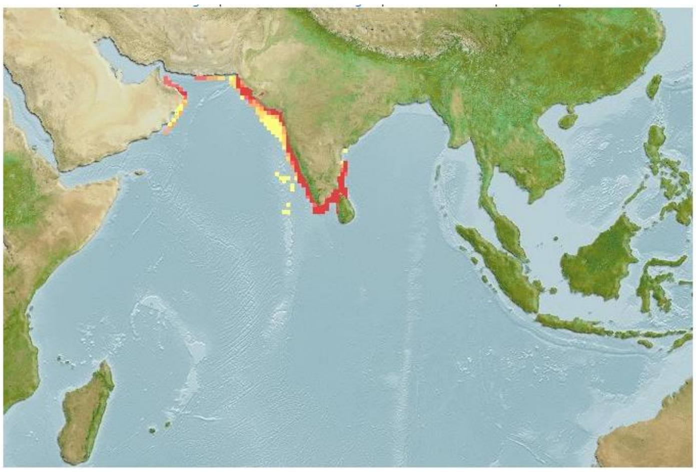
Susceptibility		
Fishery only where the scoring element is scored cumulatively		
Attribute	**Rationale**	**Score**
Areal Overlap	Indian oil sardine is distributed within the tropical waters of the northern and western Indian Ocean, Gulf of Aden, Gulf of Oman (not including the Red Sea or Persian Gulf) and eastward to India, including the Andaman Islands(Figure A). One study investigating genetic stock structure using microsatellite markers from locations along the Indian coast and Gulf of Oman (Sebastian et al., 2017) found significant genetic differentiation between samples from Oman and the Indian coastline. Coupled with evidence from Shaklee and Shaklee (1990), Indian oil sardine in Omani waters is considered a single unit stock. Fishing activity within Oman is therefore likely to cover >30 % of the distribution of the Omani stock based on the distribution in Figure A. A score of 3 has been awarded as a precaution.  **Figure A. Distribution of Indian oil sardine (*Sardinella longiceps*). Source: Aquamaps (2019)** **https://www.aquamaps.org/receive.php?type_of_map=regular**	3
Encounterability	Indian oil sardine makes up one of the many target species taken by Oman in its small pelagic fisheries. Therefore by default must score 3.	3
Selectivity of gear type	The specific gear types that were used to catch this bait species for the vessels in the UoA is likely to be purse seine. However, there is evidence that other gears, such as beach seine and encircling gillnets are also used in the Omani artisanal fishery to catch Indian oil sardine (Al Jufaili and Piontkovski, 2020). Due to an inability to assess the selectivity of this gear and overall high level of uncertainty due to a lack of information it was decided to take a precautionary approach to scoring this attribute. Therefore, the highest risk level score was awarded.	3
Post capture mortality	This is a retained species for the Omani artisanal fishery by all gear types. Therefore, by default must score 3.	3

Table 32. PSA Rationale Table – Amberstripe Scad (*Decapterus muroadsi*)

PI number	**2.2.1 (Secondary species outcome)**	
Productivity		
Scoring element (species)	**Amberstripe Scad (*Decapterus muroadsi*)**	
Attribute	**Rationale**	**Score**
Average age at maturity.	While this is not available for this species, it is known for other scad species including *Decapterus russelli*, *Decapterus macrosoma, Decapterus macarellus* and *Decapterus maraudsi* which indicate average age at maturity of two years (Ohshimo et al., 2006; Shiraishi et al., 2010). This is below 5 years so are considered low risk and awarded a 1 in the PSA.	1
Average maximum age	While this is not available for this species, it is known for only two other scad species from the same Genus including *Decapterus russelli* and *Decapterus maraudsi*, which indicate average maximum age between six and 13-15 years (Ohshimo et al., 2006). As this ranges across the high and medium productivity classifications a precautionary approach has been taken by awarding a higher PSA score to account for the highest age value.	2
Fecundity	Scad species such as *Decapterus russelli* and *Decapterus maraudsi*, are all highly fecund species producing well over 20,000 eggs each spawning. Some species such as *Decapterus russelli* produce over 100,000 eggs (Poojary et al., 2015). This is considered low risk and awarded a 1 in the PSA.	1
Average maximum size	Average max size: 50cm more commonly found around 30cm (*Fishbase - https://www.fishbase.se/summary/12302*)	1
Average size at maturity	Average size at maturity ranges for the species, including: 24-27cm for *Decapterus macarellus* (Costa et al., 2020). 16-19cm for *Decapterus macrosoma* (Asni and others, 2019) 17cm for *Decapterus russelli* (Bintoro et al., 2019) 15.3cm for *Decapterus russeli* (Poojary et al., 2015) 14-24.5cm for *Decapterus russeli* (*https://www.fishbase.se/summary/Decapterus-russelli.html)* These values are all below the 40cm value so are considered low risk and awarded a 1 in the PSA.	1
Reproductive strategy	All scads are broadcast spawners so are considered low risk and awarded a 1 in the PSA. https://www.fishbase.se/summary/12302	1
Trophic level	Trophic level 3.4 ± 0.5 se so considered high risk and awarded a score of 3 in PSA. https://www.fishbase.se/summary/12302. Feeds mostly on planktonic invertebrates primarily copepods, but also on gastropod larvae, ostracods and pteropods. http://fishesofaustralia.net.au/home/species/4271#moreinfo	3

<table>
<tr><th colspan="3">Susceptibility</th></tr>
<tr><td>Fishery only where the scoring element is scored cumulatively</td><td colspan="2"></td></tr>
<tr><th>Attribute</th><th>Rationale</th><th>Score</th></tr>
<tr><td>Areal Overlap</td><td>
The UOAs currently source Amberstripe scad from three countries, China, Indonesia and Vietnam with the majority coming from Indonesia between 2018 and 2020. The percentage contributions from suppliers as provided by the client are detailed below:
<table>
<tr><th>Year</th><th>Country</th><th>Tonnes</th><th>%</th></tr>
<tr><td rowspan="3">2018</td><td>Indonesia</td><td>533</td><td>77 %</td></tr>
<tr><td>China</td><td>24</td><td>3 %</td></tr>
<tr><td>Vietnam</td><td>136</td><td>20 %</td></tr>
<tr><td>2019</td><td>Indonesia</td><td>740</td><td>100 %</td></tr>
<tr><td>2020</td><td>Indonesia</td><td>877</td><td>100 %</td></tr>
</table>
The species has a global distribution with a distribution map available from Aquamaps (Figure B) . Knowledge of stock structure is unknown, but given the reproductive strategy of the species (broadcast spawners) is likely at a broad scale as per Decapterus russelli (Sen et al., 2011). Fishing activity within Indonesia would likely cover less than <10 % of the global distribution and the Indo-Pacific basin. The inclusion of the other two minor countries fisheries in question would still cover less than 10 % of the species concentration of the stock in the Indo-Pacific basin. A score of 1 has been awarded.

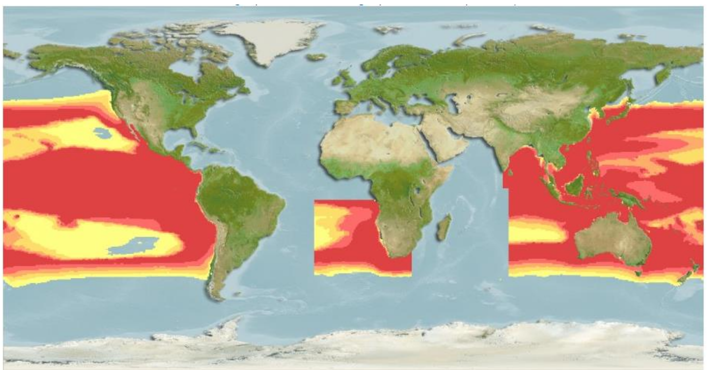


Figure B. Distribution of Amberstripe scad (Decapterus muroadsi). Source: Aquamaps (2019) https://www.aquamaps.org/receive.php?type_of_map=regular
</td><td>1</td></tr>
<tr><td>Encounterability</td><td>This species makes up one of the many target species taken by China, Indonesia and Vietnam fisheries, and is a target species of these fisheries, therefore by default must score 3.</td><td>3</td></tr>
<tr><td>Selectivity of gear type</td><td>The specific fisheries and gear types that were used to catch this bait species for the vessels in the UoA is assumed to be the same as in Jones et al. (2020) and identified as gillnet and purse seine.</td><td>3</td></tr>
</table>

Susceptibility		
	However, there are many other various fisheries and gear types that catch this species within the three countries where it was sourced. Due to an inability to assess the selectivity of this gear and overall high level of uncertainty it was decided to take a precautionary approach to scoring this attribute. Therefore, the highest risk level score was awarded.	
Post capture mortality	This is a retained species from all fisheries and by all gear types. Therefore, by default must score 3.	3

Only main species scored?			Yes						Productivity Scores [1-3]									Susceptibility Scores [1-3]					Cumulative only							
Scoring element	**First of each scoring element**	**Species Grouping only** ID 'At Risk' species by selecting associated species group	**Species Grouping only** Number of species in species group which this species represents (N/2)	**Family name**	**Scientific name**	**Common name**	**Species type**	**Fishery descriptor**	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Catch (tons)	Weighting	Weighted Total	Weighted PSA Score	**MSC PSA-derived score**	Risk Category Name	MSC scoring guidepost
1	First	Species Group 1		Carangidae	Decapterus muroads	Amberstripe Scad	Vertebrate	Indonesia Seine	1	2	1	1	1	1	3		1.43	1	3	3	3	1.65	2.18	770	1.00	2.18	2.18	92	Low	≥80
2	First	Species Group 2		Clupedae	Sardinella longiceps	Indian Oil Sardine	Vertebrate	Oman Purse Seine	1	1	1	1	1	1	1		1.00	3	3	3	3	3.00	3.16					69	Med	60-79

7.4 Appendix 4 Peer review reports

To be drafted at Public Comment Draft Report stage

The report shall include unattributed reports of the Peer Reviewers in full using the relevant templates. The report shall include explicit responses of the team that include:

- Identification of specifically what (if any) changes to scoring, rationales, or conditions have been made; and,
- A substantiated justification for not making changes where peer reviewers suggest changes, but the team disagrees.

Reference(s): FCP v2.2 Section 7.14

7.5 Appendix 5 Stakeholder input

To be drafted at Client and Peer Review Draft Report

The CAB shall use the 'MSC Template for Stakeholder Input into Fishery Assessments' to include all written stakeholder input during the stakeholder input opportunities (Announcement Comment Draft Report, site visit and Public Comment Draft Report). Using the 'MSC Template for Stakeholder Input into Fishery Assessments', the team shall respond to all written stakeholder input identifying what changes to scoring, rationales and conditions have been made in response, where the changes have been made, and assigning a 'CAB response code'.

The 'MSC Template for Stakeholder Input into Fishery Assessments' shall also be used to provide a summary of verbal submissions received during the site visit likely to cause a material difference to the outcome of the assessment. Using the 'MSC Template for Stakeholder Input into Fishery Assessments' the team shall respond to the summary of verbal submissions identifying what changes to scoring, rationales and conditions have been made in response, where the changes have been made, and assigning a 'CAB response code'.

Reference(s): FCP v2.2 Sections 7.15, 7.20.5 and 7.22.3

7.6 Appendix 6 Conditions

To be drafted at Client and Peer Review Draft Report stage

The CAB shall document in the report all conditions in separate tables.

Reference(s): FCP v2.2 Section 7.18, 7.30.5 and 7.30.6

Table 33. Condition 1

Performance Indicator	
Score	State score for Performance Indicator
Justification	Cross reference to page number containing scoring template table or copy justification text here. If condition relates to a previous condition or one raised and closed in the previous assessment include information required here
Condition	State condition
Condition deadline	State deadline of condition
Exceptional Circumstances ☐	Check the box if exceptional circumstances apply and condition deadline is longer than the period of certification (FCP v2.2 7.18.1.6). Provide a justification
Milestones	State milestones and resulting scores where applicable
Verification with other entities	Include details of any verification required to meet requirements in FCP v2.2 7.19.8.
Complete the Following Rows for reassessments	
Carried over condition ☐	Check the box if the condition is being carried over from a previous certificate and include a justification for carrying over the condition (FCP v2.2 7.30.5.1.a). Include a justification that progress against the condition and milestones is adequate (FCP v2.2 7.30.5.2). The CAB shall base its justification on information from the reassessment site visit.
Related condition ☐	Check the box if the condition relates to a previous condition that was closed during a previous certification period but where a new condition on the same Performance Indicator or Scoring Issue is set. Include a justification – why is a related condition being raised? (FCP v2.2 7.30.6 & G7.30.6).
Condition rewritten ☐	Check the box if the condition has been rewritten. Include a justification (FCP v2.2 7.30.5.3).

7.7 Appendix 7 Client Action Plan

To be added from Public Comment Draft Report stage

The report shall include the Client Action Plan from the fishery client to address conditions.

Reference(s): FCP v2.2 Section 7.19

Before accepting the Client Action Plan please make sure that FCP v2.2 7.19.8 has been addressed correctly.

"7.19.8 The CAB shall not accept a Client Action Plan if the client is relying upon the involvement, funding and/or resources of other entities (fisheries management or research agencies, authorities or regulating bodies that might have authority, power or control over management arrangements, research budgets and/or priorities) without:

a. Verifying with those same entities, whether the closure of conditions is likely to require any or all of the following:

i. Investment of time or money by these entities.

ii. Changes to management arrangements or regulations.

iii. Re-arrangement of research priorities by these entities.

b. Being satisfied that the closure of conditions is both achievable by the client and realistic in the period specified."

INSERT CAP TABLE HERE

Please complete Table:

7.19.8a i-iii : Verified by :	Initials: **TO BE COMPLETED** Date: **TO BE COMPLETED**
7.19.8b Based on the above Control Union UK (CUUK) is satisfied that the closure of conditions is both achievable by the client and realistic in the period specified.	

7.8 Appendix 8 Surveillance

To be drafted at Client and Peer Review Draft Report stage

The report shall include the program for surveillance, timing of surveillance audits and a supporting justification

Reference(s): FCP v2.2 Section 7.28

Table 34. Fishery surveillance programme

Surveillance level	Year 1	Year 2	Year 3	Year 4
e.g. Level 5	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit & re-certification site visit

Table 35. Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
e.g. 1	e.g. May 2018	e.g. July 2018	e.g. Scientific advice to be released in June 2018, proposal to postpone audit to include findings of scientific advice

Table 36. Surveillance level justification

Year	Surveillance activity	Number of auditors	Rationale
e.g.3	e.g. On-site audit	e.g. 1 auditor on-site with remote support from 1 auditor	e.g. From client action plan it can be deduced that information needed to verify progress towards conditions 1.2.1, 2.2.3 and 3.2.3 can be provided remotely in year 3. Considering that milestones indicate that most conditions will be closed out in year 3, the CAB proposes to have an on-site audit with 1 auditor on-site with remote support – this is to ensure that all information is collected and because the information can be provided remotely.

7.9 Appendix 9 Harmonised fishery assessments

The MSC's intent is that the assessment team identifies overlapping fisheries, the need for harmonisation and informs the relevant CABs that harmonisation discussions might be needed after the site visit. Assessment teams are not expected to have had harmonisation discussions with other assessment teams of overlapping fisheries to produce the ACDR. Instead, the assessment team should use the outcomes of already certified overlapping fisheries as their baseline for the draft scores of relevant scoring elements (as per FCP v2.2 PB1.3.4.1) and indicate information gaps (see FCP v2.2 7.10.2.h).

On 14 January 2019, MSC accepted a variation request submitted by all fisheries CABs for Regional Fisheries Management Organisation (RFMO) managed highly migratory stocks in the MSC programme, including tuna and swordfish. MSC has required overlapping fisheries to harmonise assessment outcomes, but not condition timelines. CABs sought the variation due to the inconsistencies between fisheries in addressing conditions, in particular the high number of outstanding conditions relating to harvest strategies, reference points and harvest control rules.

The outcomes of this variation request were that:

- fisheries certified against FCR v1.3: will be upgraded to v2.0 to at the next surveillance audit. No suspension action will be undertaken for fisheries that are behind target on P1 conditions raised against v1.3.
- fisheries already certified against FCR v2.0: Principle 1 conditions and timelines will be harmonised for all tuna fisheries on the same stock. A shared deadline for achievement of conditions is to be set, based on the most recent RFMO workplan (i.e. as at the time of the variation).
- to facilitate harmonisation efforts between CABs, surveillance schedules of the relevant tuna fisheries will be aligned (to the extent that is practical) so that annual progress can be assessed collectively by CABs.

The details of this variation were updated in light of the COVID-19 pandemic and can be accessed here. The new hard deadline for HCRs for SP ALB, YFT and BET is June 2023.

Appendix 9.1 Principle 1

For WCPO bigeye and yellowfin, and North and South Pacific albacore, Principle 1 has been harmonised with the fisheries listed in Table 37 to Table 40. Note that some scores were recently amended following the release of the 2020 stock assessments for WCPO bigeye and yellowfin. All scores have been harmonised between CABs and are being implemented at the 'next available opportunity' for the respective assessments (this explains why some of the scores are not exactly the same).

Table 37. Comparison of Principle 1 scores between this assessment and other WCPO yellowfin fisheries. Note: pre-FCR v2.0 performance indicators are shown in yellow.

Fishery	Version (pre 2.0 / 2.0)	1.1.1 (Stock status)	1.1.2 (Reference points)	1.1.3 (Rebuilding)	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/ Monitoring)	1.2.4 (Stock assessment
		1.1.1 (Stock status)	**1.1.2 (Rebuilding)**	**-**	**1.2.1 (Harvest Strategy**	**1.2.2 (Harvest Control Rules and Tools)**	**1.2.3 (Information/Monitoring)**	**1.2.4 (Stock assessment**
Pan Pacific yellowfin, bigeye and albacore longline fishery	2.0	90	N/a	-	70	60	80	95
Tropical Pacific yellowfin and skipjack free-school purse seine fishery	2.0	90	N/a	-	70	60	80	95
PT Citraraja Ampat, Sorong pole and line Skipjack and Yellowfin Tuna	2.0	90	N/a	-	70	60	90	95
SZLC CSFC & FZLC FSM EEZ Longline Yellowfin and Bigeye Tuna	2.0	100	N/a	-	70	60	80	95
Solomon Islands longline albacore and yellowfin tuna fishery	2.0	90	N/a	-	70	60	90	95
North Buru and Maluku Fair Trade Fishing Associations, Indonesian Handline Yellowfin Tuna	2.0	90	N/a	-	70	60	80	95
Fiji Albacore and Yellowfin Tuna longline	2.0	90	N/a	-	70	60	90	95
French Polynesia albacore and yellowfin longline fishery	2.0	100	N/a	-	70	60	80	95
American Samoa EEZ Albacore and Yellowfin Longline Fishery	2.0	100	N/a	-	70	60	80	95
Tri Marine Western and Central Pacific Skipjack and Yellowfin Tuna	Pre-2.0	90	90	N/a	70	60	80	95
Solomon Islands skipjack and yellowfin tuna purse seine and pole and line	Pre-2.0	90	90	N/a	70	60	90	95
Australian Eastern Tuna and Billfish Fishery (albacore tuna, yellowfin tuna, bigeye tuna and swordfish)	2.0	90	N/a	-	70	60	80	95
PNA Western and Central Pacific skipjack and yellowfin, unassociated / non-FAD set, tuna purse seine	2.0	100	N/a	-	70	60	90	95
MIFV RMI EEZ Longline Yellowfin and Bigeye Tuna	2.0	100	N/a	-	70	60	80	95
WPSTA Western and Central Pacific skipjack and yellowfin free school purse seine	2.0	90	N/a	-	70	60	80	95
PNG Fishing Industry Association’s purse seine Skipjack & Yellowfin Tuna Fishery	2.0	90	N/a	-	70	60	80	95
Kiribati albacore, bigeye and yellowfin tuna longline fishery	2.0	90	N/a	-	70	60	80	95
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific albacore, yellowfin and bigeye longline	2.0	90	N/a	-	70	60	80	95
Owasebussan Co. Ltd. North Pacific Longline Tuna Fishery for Albacore, Yellowfin Tuna & Bigeye	2.0	90	N/a	-	70	60	80	95
Indonesia pole-and-line and handline, skipjack and yellowfin tuna of Western and Central Pacific archipelagic waters	2.0	100		-	90	60	90	95
Philippine Small-Scale Yellowfin Tuna (Thunnus albacares) Handline Fishery	2.0	100	N/a	-	70	60	80	95
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery	2.01	100	N/a	-	70	60	80	95
Micronesia Skipjack, Yellowfin and Bigeye Tuna Purse Seine Fishery	2.01	100	N/a	-	70	60	80	95
This assessment	2.01	>80	N/a	-	<60	60-79	>80	>80

Table 38. Comparison of Principle 1 scores between this assessment and other WCPO bigeye fisheries.

Fishery	Version (pre 2.0 / 2.0)	1.1.1 (Stock status)	1.1.2 (Rebuilding)	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/Monitoring)	1.2.4 (Stock assessment
Pan Pacific yellowfin, bigeye and albacore longline fishery	2.0	100	N/a	70	60	90	100
SZLC CSFC & FZLC FSM EEZ Longline Yellowfin and Bigeye Tuna	2.0	90	N/a	70	60	90	90
MIFV RMI EEZ Longline Yellowfin and Bigeye Tuna	2.0	90	N/a	70	60	90	90
Kiribati albacore, bigeye and yellowfin tuna longline fishery	2.0	100	N/a	70	60	90	95
Fiji Albacore, Yellowfin and Bigeye Tuna longline	2.0	100	N/a	70	60	90	95
Australian Eastern Tuna and Billfish Fishery (albacore tuna, yellowfin tuna, bigeye tuna and swordfish)	2.0	100	N/a	70	60	90	95
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific albacore, yellowfin and bigeye longline	2.0	100	N/a	70	60	90	100
Owasebussan Co. Ltd. North Pacific Longline Fishery for Albacore, Yellowfin, & Bigeye Tuna	2.0	100	N/a	70	60	90	95
Micronesia Skipjack, Yellowfin and Bigeye Tuna Purse Seine Fishery	2.0	90	N/a	70	60	90	90
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery	2.01	90	N/a	70	60	90	90
PNA Western and Central Pacific skipjack, yellowfin and bigeye tuna purse seine fishery (FAD and non-FAD sets)	2.0	90	N/a	70	60	90	90
This assessment	2.01	>80	N/a	<60	60-79	>80	>80

Table 39. Comparison of Principle 1 scores between this assessment and other South Pacific albacore fisheries. Note: pre-FCR v2.0 performance indicators are shown in yellow. PCR: Public Certification Report.

Fishery	Version (pre 2.0 / 2.0)	1.1.1 (Stock status)	1.1.2 (Reference points)	1.1.3 (Rebuilding)	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/ Monitoring)	1.2.4 (Stock assessment
		1.1.1 (Stock status)	1.1.2 (Rebuilding)	-	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/Monitoring)	1.2.4 (Stock assessment
Pan Pacific yellowfin, bigeye and albacore longline fishery	2.0	100	N/a	-	70	60	80	90
Solomon Islands longline albacore and yellowfin tuna fishery	2.0	100	N/a	-	70	60	80	85
Fiji Albacore and Yellowfin Tuna longline	2.0	100	N/a	-	70	60	80	95
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific Albacore and Yellowfin Longline Fishery	2.0	100	N/a	-	70	60	80	95
American Samoa EEZ Albacore and Yellowfin Longline Fishery	2.0	100	N/a	-	70	60	80	95
Walker Seafood Australian albacore, yellowfin tuna, and swordfish longline	Pre-2.0	100	N/a	-	70	60	80	95
Kiribati albacore, bigeye and yellowfin tuna longline fishery	2.0	100	N/a	-	70	60	80	90
New Zealand albacore tuna troll	2.0	100	N/a	-	70	60	80	95
AAFA and WFOA South Pacific albacore tuna	2.0	100	N/a	-	70	60	80	85
French Polynesia albacore and yellowfin longline fishery	2.0	100	N/a	-	70	60	80	95
This assessment	2.01	>80	N/a	-	<60	60-79	>80	>80

Table 40 Comparison of Principle 1 scores between this assessment and other North Pacific albacore fisheries. Note: pre-FCR v2.0 performance indicators are shown in yellow. PCR: Public Certification Report.

Fishery	Version (pre 2.0 / 2.0)	1.1.1 (Stock status)	1.1.2 (Reference points)	1.1.3 (Rebuilding)	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/ Monitoring)	1.2.4 (Stock assessment)
		1.1.1 (Stock status)	1.1.2 (Rebuilding)	-	1.2.1 (Harvest Strategy	1.2.2 (Harvest Control Rules and Tools)	1.2.3 (Information/Monitoring)	1.2.4 (Stock assessment)
Pan Pacific yellowfin, bigeye and albacore longline fishery	2.0	80	N/a	-	85	60	90	100
Canada Highly Migratory Species Foundation (CHMSF) British Columbia albacore tuna North Pacific	2.0	90	N/a	-	85	60	90	100
AAFA and WFOA North Pacific albacore tuna	2.0	90	N/a	-	80	60	90	100
Japanese pole and line skipjack and albacore tuna fishery	2.0	100	N/a	-	85	60	90	100
Ishihara Marine Products albacore and skipjack pole and line fishery	2.0	80	N/a	-	85	60	90	100
Kiribati albacore, bigeye and yellowfin tuna longline fishery	2.0	80	N/a	-	85	60	90	100
Owasebussan Co. Ltd. North Pacific Longline Tuna Fishery for Albacore, Yellowfin Tuna & Bigeye Tuna	2.0	80	N/a	-	85	60	90	100
This assessment	2.01	≥80	N/a	-	<60	60-79	≥80	≥80

Appendix 9.2 Principle 2

For Principle 2, the team applied the following table in its harmonisation activities (from Table GPB1, MSC FCPv2.2). The resulting harmonisation activities are to be presented at the CPRDR stage.

PIs / SIs	Harmonise?	Comments
All P1 PIs	Yes	P1 always considers the impacts of all fisheries on a stock, so any fisheries which have the same P1 species (stocks) should be harmonised.
PI 2.1.1a	Partially	For stocks that are 'main' in both UoAs, harmonise status relative to PRI (at SG60, 80 and 100), and if below PRI, harmonise cumulative impacts at SG80 (not at SG60).
PI 2.2.1a	Partially	For stocks that are 'main' in both UoAs, harmonise status relative to BBL (at SG60, 80 and 100), and if below BBL, harmonise cumulative impacts at SG80 (not at SG60).
PI 2.3.1a	Partially	Harmonise recognition of any limits applicable to both UoAs (at SG60, 80 and 100), and cumulative effects of the UoAs at SG80 and SG100 (not at SG60).
PI 2.4.1b	Partially	Harmonise recognition of VMEs where both UoAs operate in the same 'managed area/s' (as in SA3.13.5).
PI 2.4.2a,c	Partially	Harmonise scoring at SG100, since all fishery impacts are considered (not at SG60 or 80).
All P2 PIs	Yes, if ->	Two UoAs are identical in scope, even if the UoCs are different (e.g. separate clients).
PIs 3.1.1-3	Yes, if ->	Both UoAs are part of the same larger fishery or fleet, or have stocks in either P1 or P2 which are at least partially managed by the same jurisdiction/s (nation states, RFMOs or others) or under the same agreements. Harmonisation may sometimes be possible for those management arrangements that apply to both UoAs (noting the limitations accepted in GPB3).
PIs 3.2.1-4	Yes, if ->	Both UoAs have stocks within either P1 or P2 which are at least partially managed by the same jurisdiction/s (nation states, RFMOs or others) or under the same agreements. Harmonisation is needed for those management arrangements that apply to both UoAs, e.g. at the RFMO level but not the national level in the case of two separate national fleets both fishing the same regional stock.

Appendix 9.3 Principle 3

A more in-depth review of harmonised scoring under Principle 3 will be completed after the site visit. In the meantime, the assessment team harmonised scoring with all overlapping fisheries at the regional and national level, i.e. in terms of the WCPFC and Korean jurisdictions.

7.10 Appendix 10 Objection Procedure

To be added at Public Certification Report stage

The report shall include all written decisions arising from the Objection Procedure. Reference(s): MSC Disputes Process v1.0, FCP v2.2 Annex PD Objection Procedure