

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

Hawaii longline swordfish, bigeye and yellowfin tuna fishery

On Behalf of

Hawaii Longline Association

Prepared by

Control Union (UK) Limited

October 2021

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QA

ACDR

Role	Signature and date	Date
Originator:	C. Sieben	17 th September 2021
Reviewer:	B O’Kane	8 th October 2021
Approver:	T. Tsuzaki	20 th October 2021

Glossary

Acronym	Definition
ACL	Annual catch limit
AP	Advisory Panel (of the WPRFMC)
BB ₀	Biomass equilibrium unexploited total biomass
BET	Bigeye tuna
BiOp	Biological Opinion
B _{MSY}	Equilibrium total biomass at MSY
CAB	Conformity Assessment Body
CFR	Code of Federal Regulations (US Government)
CCM	WCPFC Commission Members, Cooperating Non-Members, and participating Territories
CML	Commercial Marine License
CPCs	Members and Cooperating Non-Members (IATTC)
CHMS	Convention on Highly Migratory Species
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CML	Hawaii Commercial Licence
CMM	WCPFC Conservation and Management Measure
CNM	Cooperating Non-Member (to WCPFC)
CNMI	Commonwealth of the Northern Mariana Islands
CoC	Chain of Custody
CPUE	Catch per Unit Effort
CV	Coefficient of Variation
DPS	Distinct population segment
EAFM	Ecosystem Approaches to Fishery Management
EBFM	Ecosystem-Based Fisheries Management
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ENSO	El Nino Southern Oscillation
EPO	Eastern Pacific Ocean
ESA	Endangered Species Act of 1973
ETP	Endangered, threatened and/or protected (species)
F	Fishing mortality
FAD	Fish-aggregating device
FAME	SPC Division of Fisheries, Aquaculture and Marine Ecosystems
FAO	Food and Agriculture Organisation (UN) Agricultural Organisation
F _{current}	Average fishing mortality at age

Acronym	Definition
FEP	Fishery Ecosystem Plan
FIP	Fishery Improvement Plan
FFA	Pacific Islands Forum Fisheries Agency
FMP	Fishery management plan
F _{MSY}	Fishing mortality at age resulting in MSY
FSA	UN Fish Stocks Agreement
FWS	US Fish and Wildlife Service
HCR	Harvest Control Rule
HDAR	Hawaii Division of Aquatic Resources
HLA	Hawaii Longline Association
HMS	Highly Migratory Species
HSFCA	US High Seas Fishing Compliance Act
IATTC	Inter-American Tropical Tuna Commission
ISC	International Scientific Committee
ISSF	International Seafood Sustainability Foundation
ITS	Incidental Take Statement
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported, Unregulated
LME	Large Marine Ecosystem
LRP	Limit Reference Point
m	Meters
M&SI	Mortality and serious injury
MBTA	Migratory Bird Treaty Act of 1918 and subsequent amendments
MCS	Monitoring, Control and Surveillance
MHI	Main Hawaiian Islands
MMAP	Marine Mammal Authorization Program
MMPA	Marine Mammal Protection Act of 1972 and subsequent amendments
MOW	Management Options Workshop
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
MT	Metric or long ton = 2200 lbs. written tonne (t)
NBR	National Bycatch Report
NC	Northern Committee (WCPFC)
NEPA	National Environmental Policy Act

Acronym	Definition
NGO	Non-governmental organisation
nm	Nautical mile
NMFS	National Marine Fisheries Service (aka NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
NPFC	North Pacific Fisheries Commission
NPOA	National Plan of Action
NPSG	North Pacific Subtropical Gyre
NWHI	Northwest Hawaiian Islands
OFP	Programme within the SPC Division of Oceanic Fisheries, Aquaculture and Marine Ecosystems
OLE	Office of Law Enforcement (NOAA)
PBR	Potential Biological Removal
PCDR	Public Comment Draft Report
PDO	Pacific Decadal Oscillation
PIFSC	Pacific Islands Fisheries Science Center (NOAA)
PIRO	Pacific Islands Regional Office of NOAA Fisheries (NMFS)
PIROP	Pacific Islands Regional Observer Program – NOAA Fisheries
PMUS	Pelagic Management Unit Species
PNA	Parties to the Nauru Agreement
PNG	Papua New Guinea
PSW	Protected Species Workshop
PRI	Point of Recruitment Impairment
PRIA	Pacific Remote Insular (Island) Areas (USA)
RBF	Risk Based Framework
REAC	Regional Ecosystem Advisory Committees (of WPRFMC)
RFA	Regulatory Flexibility Act
RFMO	Regional Fisheries Management Organisation
ROP	Regional Ocean Partnership
SAFE	Stock Assessment and Fishery Evaluation Report for Hawaii pelagic fisheries – NOAA Fisheries
SAR	Stock Assessment Reports (under the MMPA)
SB	Spawner biomass
SB ₀	Equilibrium unexploited spawning potential
SBF _{current}	Average current spawning potential in the absence of fishing
SC	Scientific Committee (of WCPFC)
SEZ	Southern Exclusion Zone
SIDS	Small Island Developing states

Acronym	Definition
SP	Spawning potential - equivalent measure to spawning stock biomass under the assumption that reproductive output is proportional to biomass over the size at maturity – but can take account of other patterns of reproductive output
SPC	Pacific Community (formerly Secretariat to the Pacific Community)
SSC	Scientific and Statistics Commission (of WPRFMC)
SST	Sea surface temperature
SWO	Swordfish
TAC	Total Allowable Catch
TCC	Technical and Compliance Committee (of WCPFC)
UNCLOS	UN Convention on the Law of the Sea
UoC	Unit of Certification
USFWS	U.S. Fish and Wildlife Service
VDS	Vessel Day Scheme
VMS	Vessel Monitoring System
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WPacFIN	Western Pacific Fishery Information Network
WPRFMC	Western Pacific Regional Fishery Management Council (or the Council)
WWF	World Wildlife Fund
YFT	Yellowfin Tuna
YF _{MSY}	Equilibrium yield at F _{MSY}

1 Executive Summary

This report covers the MSC full assessment of the Hawaii longline swordfish, bigeye and yellowfin tuna fishery. The assessment team consists of Chrissie Sieben (Team Leader, Principle 2), Kevin McLoughlin (Principle 1) and Charles Daxboeck (Principle 3). The site visit is scheduled to take place during the week of the 10th January 2022. Due to the Covid-19 pandemic and the associated global travel restrictions, the MSC instated a derogation to ensure that site visits planned prior to the 28th March 2022, could be held remotely. It is therefore considered more appropriate that the audit is held remotely. The assessment will be undertaken in accordance with the MSC Fisheries Certification Process (FCP) v2.2 and MSC Fisheries Standard v2.01. At this ACDR stage, it is envisaged that the Risk-Based Framework (RBF) may be needed for the Secondary Species component.

This assessment covers two separate components of the longline fishery carried out by members of the Hawaii Longline Association (HLA - <https://www.hawaiilongline.org/>): the Hawaii shallow-set swordfish longline fishery (UoAs 1 – 5) and the Hawaii deep-set tuna longline fishery (UoAs 6 – 10). A deep set (generally 40 – 350 m depth) is defined as a set with 15 or more hooks between floats as opposed to a shallow set (generally 45 – 75 m depth) that is characterized by setting less than 15 hooks between floats. The shallow-set fishery targets swordfish at night, whereas the deep-set fishery targets bigeye tuna during the day. Shallow-set trips are subject to 100% observer coverage, while a coverage of at least 20% is aimed at for deep-set trips. This fishery takes place in the U.S. EEZ around Hawaii and on the high seas. Management at the national level is ensured through a single limited-access program with no more than 164 vessels holding permits at any given time. Currently there are 142 HLA member vessels holding valid Hawaii limited-entry pelagic fishing permits. All vessels store their catch on ice, with minimal processing (heading, gilling and gutting). Points of landing include Hawaiian ports as well as ports in California (San Francisco, San Diego) and Pago Pago in American Samoa. All retained catch is landed in port. There is no at-sea transshipment. No certificate sharing is in place.

The Principle 1 target species in this fishery are North Pacific swordfish (*Xiphias gladius*), and Western Central Pacific (WCPO) and Eastern Pacific (EPO) yellowfin (*Thunnus albacares*) and bigeye (*T. obesus*) tuna. Except for EPO bigeye tuna, the most recent stock assessments for all Principle 1 stocks conclude that the stocks are at, fluctuating around or above a level consistent with maximum sustainable yield (MSY). The core regional management measures include WCPFC CMM 2020-01, which provides for a series of management measures aimed at constraining effort on tropical tunas in the WCPO and is intended to be a 'bridging measure' while work continues towards a formal harvest strategy. The latter is covered by CMM 2014-06 which commits the Western and Central Pacific Fisheries Commission (WCPFC) to putting in place a formal harvest strategy for its key WCPO stocks, with an associated workplan. For swordfish, the harvest strategy includes a requirement that if the average exploitation rate for the most recent period exceeds the F-limit, the Northern Committee (NC) will formulate conservation and management recommendations that are designed to reduce the fishing mortality rate below the F-limit as soon as feasible. The work programme for the WCPFC NC for 2021-2023 includes an objective to further develop the harvest strategy consistent with CMM 2014-06. The IATTC harvest strategy for EPO yellowfin and bigeye is set out in Resolutions C-16-02 and C-20-06 and depends on all tropical EPO tuna stocks assessed, with resultant measures based on the worst case. At this ACDR stage, except for EPO bigeye, all P1 stocks are assessed to be in conformity with the MSC Standard for Principle 1, although conditions have been identified in relation to the harvest strategy (PI 1.2.1) and harvest control rules (1.2.2). At this ACDR stage, EPO bigeye is not in conformity with the MSC Standard, in that the stock is unlikely to achieve an overall aggregate score of 80 for P1.

Key data sources on interactions with other species in this fishery are the Western Pacific Daily Longline Fishing Logbook data, observer data from the Pacific Islands Region Observer Program (PIROP) and HLA data on bait use per year. Other than the P1 species, the only 'main' primary species identified are Pacific mackerel and saury, both of which are bait species. 'Main' secondary species include blue shark, bigeye thresher shark, shortfin mako shark and moonfish. In the absence of a stock assessment or biologically-based limits for moonfish, the Risk-Based Framework (RBF) is likely to be triggered for this scoring element. Endangered, Threatened or Protected (ETP) species include elasmobranchs (sharks and rays), cetaceans, sea turtles and seabirds. At this ACDR stage, precautionary scoring has been given to the deep-set fishery under secondary species (Component 2.2) because of the likely need to apply the RBF for moonfish. The RBF will be undertaken during the site visit and none of the secondary species PIs could therefore be fully scored. Additional precautionary scoring has been awarded for the deep-set fishery under ETP species outcome (PI 2.3.1a), because of the recent exceedance of sea turtle Incidental Take Statements (ITSs) in this fishery. At this ACDR stage, ITSs were considered as 'limits' under PI 2.3.1a, but this may be subject to change following team and harmonisation discussions. In addition, further site visit discussions are required to finalise scoring of this Principle.

The entirety of the US EEZs in the Pacific is in the WCPO where the WCPFC is the Regional Fishery Management Organisation (RFMO) responsible for managing tuna and other highly migratory fish stocks. However, a significant portion of the fishery takes place to the east of the 150°W boundary, in the EPO, where the Inter-American Tropical Tuna Commission (IATTC) is the RFMO responsible for managing tuna and other marine resources. The management of the Hawaiian longline fishery therefore falls under the overarching regional management framework of both the WCPFC and the IATTC. At the national level, the fishery is managed according to the Fishery Ecosystem Plan for the Pelagic Fisheries of the Western Pacific, developed by the Western Pacific Fishery Management Council and approved and implemented by the National Marine Fisheries Service, under the authority of the Magnuson-Stevens Fishery Conservation and Management Act. A valid Hawaii longline limited entry permit is required for anyone using longline gear to fish for pelagic species within the EEZ around Hawaii or anyone landing or transshipping longline catch in Hawaii or within the EEZ around Hawaii. In addition to the permit requirements, regulatory requirements include vessel and gear marking, vessel length restrictions, the possession and use of sea turtle and seabird mitigation gear and safe handling techniques. Longline vessels are restricted from areas surrounding the Northwest Hawaiian Islands to avoid interactions with protected species and are further restricted from nearshore areas surrounding the main Hawaiian Islands to separate longline gear from small vessel fisheries using troll and handline gear. Shark finning was banned in 2001 by federal and state regulations requiring the landing of the entire shark carcass if fins are to be taken. Overall, there is a robust management and regulatory framework with clearly defined roles and responsibilities at national and regional level. At this ACDR stage, a likely condition was identified in relation to decision-making processes at the IATTC level. This scoring is harmonised with overlapping fisheries in the MSC programme and remains provisional until site visit interviews and team scoring discussions have taken place.

To be completed at Public Certification Report stage

2 Report Details

2.1 Authorship and Peer Reviewers

Chrissie Sieben (Team Leader, Principle 2)

Chrissie Sieben has a Master's Degree in Marine Environmental Protection which she obtained at the University of Wales, Bangor, and specialises in marine and fisheries ecology, marine environmental impact assessments and sustainable fisheries development. She was the MSC fisheries scheme manager at ME Certification Ltd (which later became CU Pesca) up until December 2018. Previous to joining MEC, she worked as a fisheries consultant and marine ecologist on UK-based and international projects. Chrissie is now an independent assessor with over eight years' experience with the MSC certification requirements and has acted as team leader and P2 assessor on a range of preassessments, surveillance audits and full assessments of demersal and pelagic fisheries in the Atlantic, Mediterranean, Indian Ocean, Southern Ocean and Pacific. She also regularly participates in MSC training sessions and workshops. Chrissie speaks fluent French and Dutch in addition to English. She acts as the Team Leader for this assessment. Chrissie has successfully completed the MSC online training on the Risk-Based Framework (RBF), FCRv2.0, FCPv2.1 and FCPv2.2, as well as ISO19011 on auditing management systems. She acts as the Team Leader for this assessment and is responsible for Principle 2. Chrissie has no conflict of interest for this assessment.

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 (FCRv2.0, FCP v2.1, FCP v2.2 and the Risk-Based Framework) and has no conflict of interest in relation to this fishery.

Charles Daxboeck (Principle 3)

Charles obtained a Ph.D. in comparative respiratory physiology from the University of British Columbia, Vancouver and has been a legal resident of French Polynesia for the past 27 years, following twelve years in Hawaii. Aside from his scientific and consulting activities, Charles has been a member of the US delegation to the 19th Annual Consultation on Multilateral Treaty on Fisheries between Governments of certain Pacific Island States and the US Government (the Tuna Treaty) and to the Fourth Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. He has also been a member of French Polynesian delegations to numerous pre-WCPFC ratification meetings (MHLC4, 5, 6 and 7, PrepCon I, PrepCon 7), then WCPFC1, WCPFC6 and WCPFC17 from 1999 to 2020). Charles has also been a member of the American Samoa delegation to WCPFC7 (2010) and of the CNMI delegation to WCPFC13 (2016). His experience also includes being Scientific and Executive Director of the Pacific Ocean Research Foundation (focus on marlin and tuna), Kailua-Kona, Hawaii (P.O.R.F.), and then as a Member of its Board of Governors and Scientific Advisory Committee for six years. He was also a member of the Scientific and Statistical Committee for thirty-three years (SSC Chairman from 2011 to 2016), Western Pacific Regional Fishery Management Council (Department of Commerce, NOAA Fisheries). Charles' other experience in tuna fisheries include MSC assessments of the French Polynesia EEZ albacore and yellowfin longline fishery, Pan Pacific yellowfin, bigeye and albacore tuna longline fishery on behalf of Dongwon Industries, Tropical Pacific yellowfin and skipjack tuna free-school purse seine fishery on behalf of Dongwon Industries, as well as the Y2, Y3, Y4 surveillance audits and the re-assessment of the SZLC, CSFC & CFA Cook Islands EEZ South Pacific albacore and yellowfin longline fishery. Dr. Daxboeck has joined The Nature Conservancy's Large Pelagics Fisheries Program as a contract consultant member. Charles meets all Fishery Team Member Qualification and Competency Criteria (Table PC2) and the following Table PC 3 competency criteria: 4 Fishery management and operations; 5 Current knowledge of the country, language, and local fishery context. Charles has successfully completed the MSC online team member training on FCRv2.0.

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](#)

2.2 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

3 Unit(s) of Assessment and Certification

3.1 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 prosecuted 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);
- 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 **proposed** Unit of Assessment (UoA) is given in Table 2. Since there are substantial differences in operational characteristics, catch and management between the deep-set longline fishery targeting tunas and the shallow-set longline fishery targeting swordfish, these fisheries were assessed as separate UoAs. The table below separates UoAs by fishing practice (i.e. deep-set or shallow-set) and by species/stock, making up a total of 10 UoAs. The differences in gear characteristics according to set type are further discussed in Section 6.2.3.

Table 2. Units of Assessment (UoAs)

Species and stock	UoA 1, 6: North Pacific swordfish (<i>Xiphias gladius</i>) UoA 2, 7: Western Central Pacific bigeye tuna (<i>Thunnus obesus</i>) UoA 3, 8: Western Central Pacific yellowfin tuna (<i>T. albacares</i>) UoA 4, 9: Eastern Pacific yellowfin tuna (<i>T. albacares</i>) UoA 5, 10: Eastern Pacific bigeye tuna (<i>Thunnus obesus</i>)
Geographical range of the fishery	FAO area 77 and 61 High Seas in the WCPFC and IATTC convention areas and US Exclusive Economic Zone (EEZ) – see Figure 1
Fishing Gear	UoAs 1 – 5: Shallow-set pelagic longline UoAs 6 – 10: Deep-set pelagic longline
Client group	Hawaii Longline Association (HLA) member vessels

Other Fishers	Eligible	None
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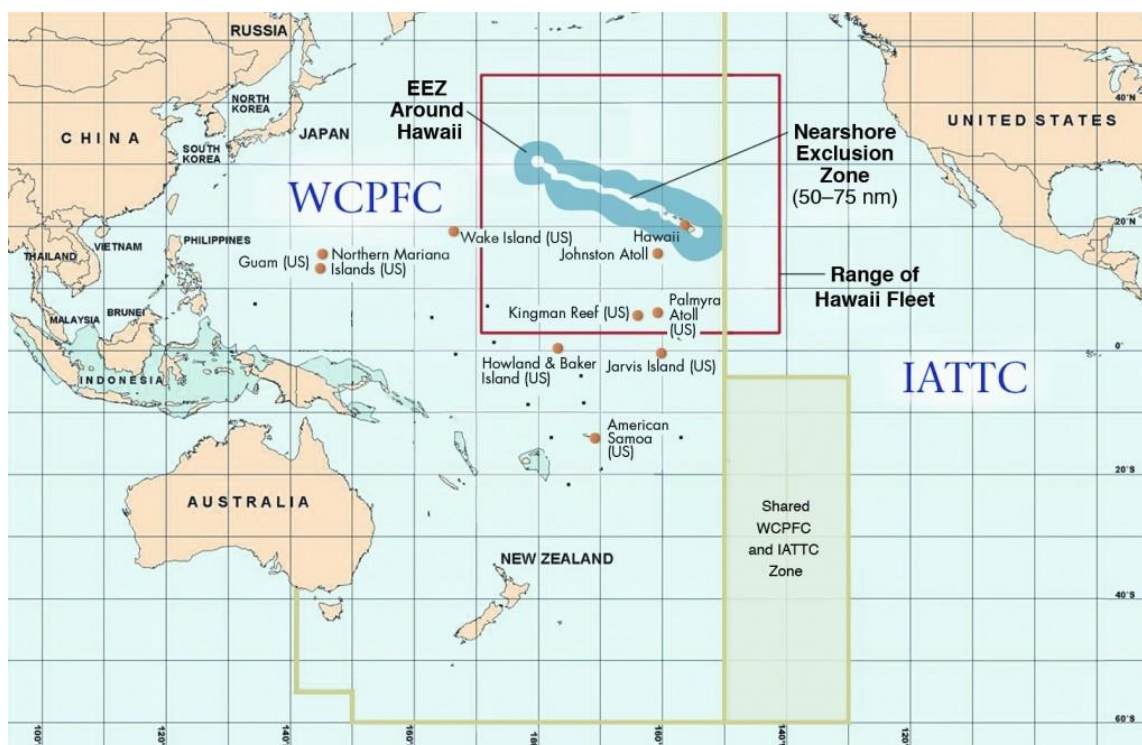


Figure 1. Map of the Pacific Ocean showing WCPFC and IATTC boundaries. Red lines denote the approximate fishing area – see Section 6.2.4 for more detailed information. Source: <https://www.hawaii-seafood.org/fip/fishery-improvement-project/>.

3.2 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	
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4 Assessment results overview

4.1 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

4.2 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		

4.3 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
				Yes/No	Yes / No / NA	Yes / No / NA
				Yes/No	Yes / No / NA	Yes / No / NA

4.4 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.

5 Traceability and eligibility

5.1 Eligibility date

The eligibility date is the date of certification, pending the successful outcome of this assessment.

5.2 Traceability within the fishery

The longline vessels in the client fishery generally operate out of Hawaii ports, with the vast majority based in Honolulu. Infrequently, deep-set trips originate from other ports such as Long Beach or San Francisco (California) or Pago Pago (American Samoa). Fishermen departing from California begin fishing on the high seas, outside the EEZ. Fishermen departing from American Samoa usually begin fishing near the Equator or farther north where they expect higher catch rates of bigeye tuna. The shallow-set (swordfish-targeting) longline fishery operates in the U.S. EEZ around Hawaii and on the high seas to the north and northeast of the Main Hawaiian Islands (MHI) seasonally (see Section 6.2.4 for more detail on fishing areas).

All vessels in either the shallow-set or deep-set fishery must carry a valid Hawaii longline permit registered to the vessel, a valid High Seas Fishing Compliance Act permit and Western and Central Pacific Fisheries Commission Area Endorsement on board the vessel if fishing in international waters; and carry an operational vessel monitoring system (VMS) unit (typically with hourly ping-rate) supplied and installed by the NOAA Office of Law Enforcement (OLE). Before a trip, longline vessel operators are required to notify the NOAA Fisheries Observer Program 72 hours before departure on a trip and declare whether the trip type is deep-set (targeting tunas) or shallow-set (targeting swordfish), and carry a NOAA Fisheries observer if directed to do so by NOAA Fisheries. A deep set is defined as a set with 15 or more hooks between floats as opposed to a shallow set that is characterized by setting less than 15 hooks between floats. Shallow-set trips are subject to 100% observer coverage, while a coverage of at least 20% is aimed at for deep-set trips (see Section 6.2 for more detail).

Logbook coverage is 100%. The Western Pacific Daily Longline Fishing Log contains detailed operational information on trip timing, set type, set and haul timing and coordinates, number of hooks set, hooks per float, number of light sticks, length of mainline and bait type. Catch is reported by species in number of fish. The vessel operator must complete a paper or electronic logbook form within 24 hours of the end of each fishing day and the vessel operator must submit the completed and signed logbook to the NMFS Pacific Islands Fisheries Science Center (PIFSC) within 72 hours of returning to port.

At-sea processing involves heading, gilling and gutting. Heading, gilling and gutting mostly concerns swordfish and other billfish such as marlin. Tuna, mahi mahi, wahoo and moonfish are gilled and gutted only. The rest of the catch is kept whole. The tunas therefore remain identifiable to species-level. The risk of mixing swordfish with other species should be discussed at the site visit. The fish are stored on ice in the hold and are kept fresh, not frozen. At this ACDR stage, one identified risk of substitution happening on board the vessels is for bigeye, where EPO bigeye are currently not passing Principle 1 of the assessment (see Section 6.1). Because both shallow-set and deep-set trips may straddle the nominal WCPO/EPO boundary of 150°W, there is a risk that catches of both stocks will be on board at the same time. The only way of separating these catches would be by area of catch. Mitigation measures are being put in place by the client fishery which would ensure on-board separation of bigeye catch according to geographical area (EPO vs WCPO). However, this should be discussed further at the site visit.

The fish are then offloaded by on-board boom into carts and taken to scale at auction or Fresh Island Fish, one of Hawaii's largest wholesale fish distributors. Fish are weighed and bar coded in a temperature-controlled facility and stored (information on bar code to be discussed at site visit). At auction, the fish are displayed on pallets and sold individually (except for shallow-set trips, where swordfish are sold by rows).

Product from both set-type fisheries is sold fresh locally in Hawaii to restaurants and retail markets, or air freighted to U.S. mainland destinations with a very small proportion of high-quality bigeye tuna exported to Japan. Points of landing include Hawaiian ports as well as ports in California (San Francisco, San Diego) and Pago Pago in American Samoa. All retained catch is landed in port. There is no at-sea transshipment.

At this ACDR stage, given the likely risk of substitution between EPO and WCPO bigeye aboard the vessels, chain of custody is likely to commence from the point of catch; i.e. on board the vessels.

Table 6. Traceability within the fishery

Factor	Description
<p>Will the fishery use gears that are not part of the Unit of Certification (UoC)?</p> <p>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.</p>	<p>No, no other gears are used (to be confirmed at site visit)</p>
<p>Will vessels in the UoC also fish outside the UoC geographic area?</p> <p>If Yes, please describe: If this may occur on the same trip; How any risks are mitigated.</p>	<p>At this ACDR stage, the only identified risk of substitution happening on board the vessels in this context is for bigeye, where EPO bigeye are currently not passing Principle 1 of the assessment. Because both shallow-set and deep-set trips may straddle the nominal WCPO/EPO boundary of 150°W, there is a risk that catches of both stocks will be on board at the same time. The only way of separating these catches would be by area of catch. Mitigation measures are being put in place by the client fishery which would ensure separation of bigeye catch according to geographical area (EPO vs WCPO). However, this should be discussed further at the site visit.</p>
<p>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.</p> <p>Transport Storage Processing Landing Auction</p> <p>If Yes, please describe how any risks are mitigated.</p>	<p>At-sea processing involves heading, gilling and gutting. Heading, gilling and gutting mostly concerns swordfish and other billfish such as marlin. Tuna, mahi mahi, wahoo and moonfish are gilled and gutted only. The rest of the catch is kept whole. The tunas therefore remain identifiable to species-level. The risk of mixing swordfish with other species should be discussed at the site visit.</p> <p>See above for the risk of substituting EPO and WCPO bigeye.</p>
<p>Does transshipment occur within the fishery?</p>	<p>There is no transshipment in this fishery.</p>

Factor	Description
<p>If Yes, please describe: If transshipment takes place at-sea, in port, or both; If the transshipment vessel may handle product from outside the UoC; How any risks are mitigated.</p>	
<p>Are there any other risks of mixing or substitution between certified and non-certified fish?</p> <p>If Yes, please describe how any risks are mitigated.</p>	No

5.3 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:

- Notify any affected customers and the CAB of the issue within 4 days of detection.
- Immediately cease to sell any non-conforming products in stock as MSC certified until their certified status has been verified by the CAB.
- 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

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

There are no IPI catches in this fishery. Should a set occur on the boundary line between the EPO and WCPO, all of the catch will be considered as coming from the EPO. At the time of ACDR drafting, this would make all bigeye catch non-eligible for MSC certification. However, given the need for robust separation and traceability systems enabling separation of catch by geographical area on-board the vessels, the team has concluded that MSC CoC from the point of catch will be needed.

6 Scoring

6.1 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.

At this ACDR stage, Eastern Pacific (EPO) bigeye is not in conformity with Principle 1 of the MSC Standard, in that the stock is unlikely to achieve an overall aggregate score of 80 (see Table 7).

For Principle 2 (Table 8), precautionary scoring has been given to the deep-set fishery under secondary species (Component 2.2) because of the likely need to apply the Risk-Based Framework (RBF) for moonfish, a 'main' secondary species. The RBF will be undertaken during the site visit and none of the secondary species PIs could therefore be fully scored. Additional precautionary scoring has been awarded for the deep-set fishery under ETP species outcome (PI 2.3.1a), because of the recent exceedance of sea turtle Incidental Take Statements (ITSs) in this fishery. At this ACDR stage, ITSs were considered as 'limits' under PI 2.3.1a, but this may be subject to change following team and harmonisation discussions. In addition, further site visit discussions are required to finalise scoring of this PI.

No obstacles to certification were identified under Principle 3 (Table 9).

Table 7. Principle 1 performance Indicator scores

Component	Wt	Performance Indicator (PI)		Wt	Shallow-set and Deep-set UoAs				
					WCNPO SWO	WCPO BET	WCPO YFT	EPO YFT	EPO BET
Outcome	0.33	1.1.1	Stock status	0.5	≥80	≥80	≥80	≥80	60-79
		1.1.2	Stock rebuilding	0.5	N/a	N/a	N/a	N/a	60-79
Management	0.67	1.2.1	Harvest strategy	0.25	60-79	60-79	60-79	≥80	60-79
		1.2.2	Harvest control rules & tools	0.25	60-79	60-79	60-79	≥80	60-79
		1.2.3	Information & monitoring	0.25	≥80	≥80	≥80	≥80	≥80
		1.2.4	Assessment of stock status	0.25	≥80	≥80	≥80	≥80	≥80

Table 8. Principle 2 performance Indicator scores. *Scoring not yet completed, more information needed

Component	Wt	Performance Indicator (PI)		Wt	Shallow-set	Deep-set
Primary species	0.2	2.1.1	Outcome	0.33	60 – 79	60 – 79
		2.1.2	Management strategy	0.33	60 – 79	60 – 79
		2.1.3	Information/Monitoring	0.33	≥80	≥80
Secondary species	0.2	2.2.1	Outcome	0.33	≥80	RBF*
		2.2.2	Management strategy	0.33	≥80	RBF*
		2.2.3	Information/Monitoring	0.33	≥80	RBF*

Component	Wt	Performance Indicator (PI)		Wt	Shallow-set	Deep-set
ETP species	0.2	2.3.1	Outcome	0.33	≥80	<60*
		2.3.2	Management strategy	0.33	≥80	≥80
		2.3.3	Information strategy	0.33	≥80	≥80
Habitats	0.2	2.4.1	Outcome	0.33	≥80	≥80
		2.4.2	Management strategy	0.33	≥80	≥80
		2.4.3	Information	0.33	≥80	≥80
Ecosystem	0.2	2.5.1	Outcome	0.33	≥80	≥80
		2.5.2	Management	0.33	≥80	≥80
		2.5.3	Information	0.33	≥80	≥80

Table 9. Principle 3 performance Indicator scores

Component	Wt	Performance Indicator (PI)		Wt	All UoAs
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 management system	0.5	3.2.1	Fishery specific objectives	0.25	≥80
		3.2.2	Decision making processes	0.25	60 – 79
		3.2.3	Compliance & enforcement	0.25	≥80
		3.2.4	Monitoring & management performance evaluation	0.25	≥80

6.2 Fishery overview

6.2.1 The Client fishery

This assessment covers two separate components of the longline fishery prosecuted by members of the Hawaii Longline Association (HLA - <https://www.hawaiilongline.org/>): the Hawaii shallow-set swordfish longline fishery (UoAs 1 – 5) and the Hawaii deep-set tuna longline fishery (UoAs 6 – 10). Hawaii's pelagic fisheries, which include longline, troll and handline, offshore handline, and the aku boat (pole and line) fisheries, make up the State's largest and most valuable fishery sector with a total ex-vessel value of \$105.6 million in 2019; the most important contributor to this (in terms of catch and revenue) was the deep-set longline fishery, at 87% of the total commercial pelagic catch and 88% of the ex-vessel revenue (Figure 2; WPRFMC (2020)). Honolulu ranks 6th among United States commercial fishing ports in terms of the value of fish landed and over half the nation's tuna landings are from this fishery (Woodworth-Jefcoats et al., 2019).

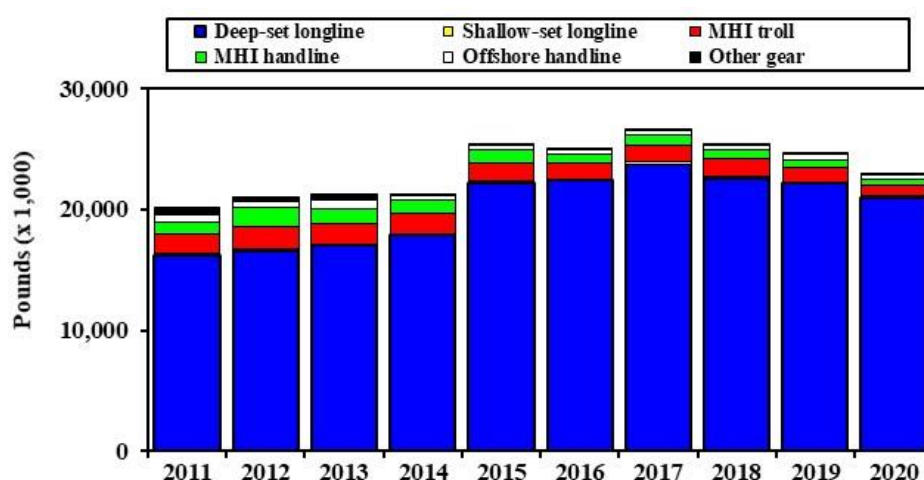


Figure 2. Hawaii commercial tuna catch by gear type, 2011-2020. Source: WPRFMC (2021a)

The Hawaii Longline Association (HLA) was established in 2000 to advance the interests of the fishermen and related industries involved in the Hawaii longline fisheries (deep-set targeting bigeye tuna; shallow-set targeting swordfish). HLA supports science-based conservation and management measures and advocates on the behalf of its members within both domestic and international management settings. HLA also coordinates cooperative research activities within the Hawaii longline fleet.

Currently there are 142 HLA member vessels holding valid Hawaii limited-entry pelagic fishing permits (see Appendix 11); the largest of which is 28.25 m. There are currently 5 (as of September 2021) vessels that are part of the fishery that are not HLA members; these vessels are based out of California. The trends in vessel numbers and trips for both fisheries over the last decade are shown in Figure 3. There were 150 active Hawaii-permitted deep-set longline vessels in 2019, seven more vessels than the previous year. The number of deep-set trips (1,724) has been continually increasing over the last 10 years. 14 vessels were active in the shallow-set swordfish fishery in 2019, with only 25 trips completed. The significantly lower effort for this segment of the fishery is due to the closure of the fishery in March 2019 as a result of reaching the loggerhead sea turtle interaction limit (discussed in Section 6.9.3) and hit a record low since the reopening of the shallow-set fishery in 2004 (WPRFMC, 2020).

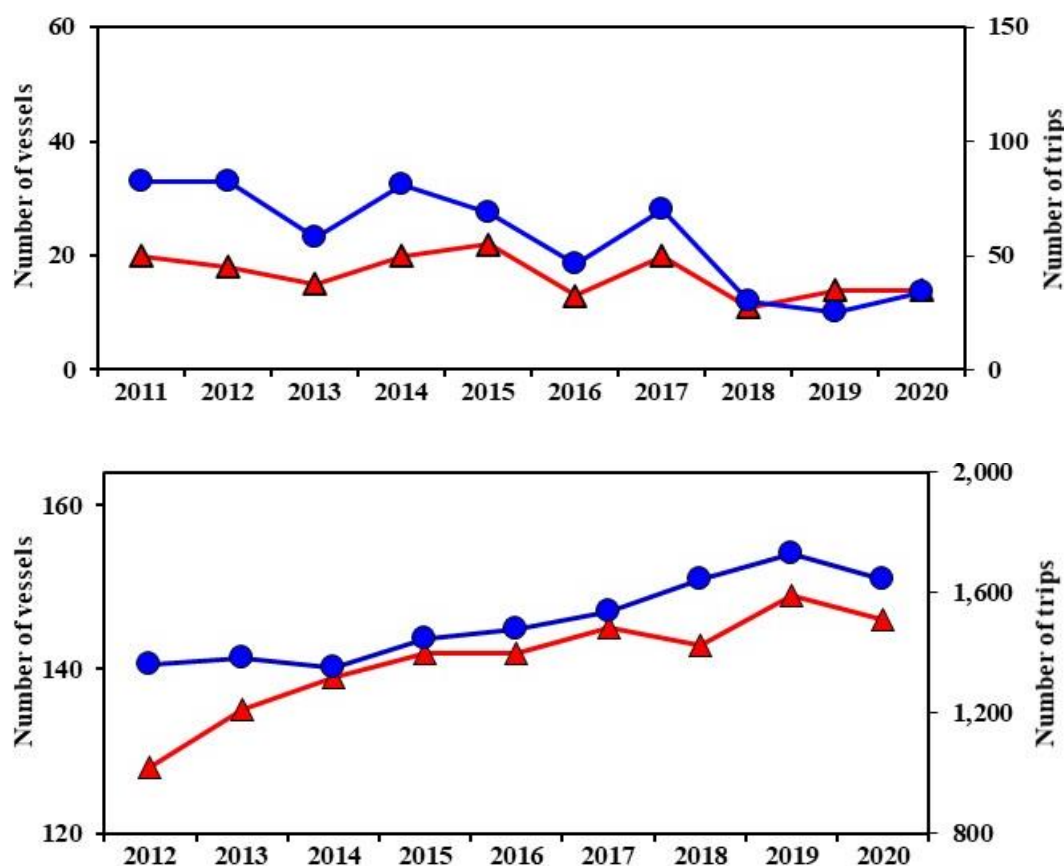


Figure 3. Number of trips (blue line) and vessels (red line) in the Hawaii shallow-set (top) and deep-set (bottom) fisheries for the 2011-20 period. Source: WPRFMC (2021a).

6.2.2 History of the fishery and its management

Longline fishing was introduced to Hawaii by Japanese immigrants in the early 1900s, using wooden sampans-style boats and basket-style gear on tarred rope mainline. Large yellowfin and bigeye tuna were landed for domestic markets, but during this period the fishery was second in importance to the skipjack pole and line industry, referred to in Hawaii as “aku sampan” fishing (Swenarton and Beverly, 2004). The early “flagline” fishery as it was then called declined steadily into the 1970s due to low profitability and lack of investment. During the 1980s, tuna longline effort began to expand to supply developing domestic and export markets for high quality fresh and sashimi grade tuna. In the late 1980s and early 1990s, the nature of the fishery changed completely with the arrival of swordfish- and tuna-targeting fishermen from longline fisheries of the Atlantic and Gulf States. Longline effort increased rapidly from 37 vessels in 1987 to 138 vessels in 1990. The influx of large, modern longline vessels promoted a revitalization of the fishery, and the fleet quickly adopted new technology to better target bigeye tuna at depth. The near-full adoption of monofilament mainline longline reels further modernized the fleet and improved profitability (WPRFMC, 2009).

To manage the rapidly expanding fishery, longline fishing was prohibited around the main Hawaiian Islands to reduce gear conflicts between small troll and handline boats and longline vessels. Another area closure was established prohibiting longline fishing within a 50 nm radius of the Northwest Hawaiian Islands to prevent interactions with the endangered Hawaiian monk seals. A limited access program was established in 1994 allowing for a maximum of 164 transferable longline permits for vessels ≤101 feet in overall length. During the same year, the Hawaii Longline Observer Program was initiated, primarily to monitor interactions with protected species (WPRFMC, 2009).

Regulations imposed in 2001 temporarily prohibited swordfish targeted longline fishing for Hawaii-based vessels due to concerns of interactions with sea turtles. Subsequently a suite of regulations was adopted to minimize interactions and facilitate the safe release of accidentally hooked sea turtles and seabirds (see Section 6.9.3 for detail). In April 2005, the Hawaii-based swordfish fishery re-opened in Hawaii under a quota system for both the number of swordfish sets and the maximum number of sea turtle interactions allowed. Integral to this program has been the requirement for 100% observer coverage. Additional operational requirements also apply including the use of large circle hooks and mackerel-type bait instead of squid (WPRFMC, 2009).

Presently, this fishery is managed at the national level through a single limited-access program with no more than 164 vessels holding permits at any time. A valid Hawaii longline limited entry permit is required for anyone using longline gear to fish for pelagic species within the EEZ around Hawaii or anyone landing or transshipping longline catch in Hawaii or within the EEZ around Hawaii. A Hawaii longline permit may also be used to fish with longline gear and land longline catch in Guam, the Northern Mariana Islands, and the Pacific Remote Island Areas. It may be used to fish outside the EEZ around American Samoa or land fish in American Samoa caught outside the EEZ around American Samoa, but may not be used to fish within the EEZ around American Samoa. The following permit requirements apply¹:

- Carry a valid High Seas Fishing Compliance Act permit and Western and Central Pacific Fisheries Commission Area Endorsement on board the vessel if fishing in international waters;
- Carry a valid Marine Mammal Authorization Program certificate on board the vessel;
- Vessel operators must carry a valid Protected Species Workshop certificate on board the vessel;
- Carry a valid Hawaii longline permit registered to the vessel on board the vessel;
- Carry an operational vessel monitoring system (VMS) unit supplied and installed by the NOAA Office of Law Enforcement;
- Notify the NOAA Fisheries Observer Program 72 hours before departure on a trip and declare whether trip type is deep-set (targeting tunas) or shallow-set (targeting swordfish), and carry a NOAA Fisheries observer if directed to do so by NOAA Fisheries; and
- Maintain and submit the Western Pacific longline logbook to NOAA Fisheries within 72 hours of returning to port.

The fishery is managed according to the Fishery Ecosystem Plan for the Pelagic Fisheries of the Western Pacific (FEP), developed by the Western Pacific Fishery Management Council (WPRFMC – or Council) and approved and implemented by the National Marine Fisheries Service (NOAA Fisheries or NMFS), under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The FEP was implemented in 2010 by the Council and NMFS and strives to integrate vital ecosystem elements important to decision-making, including social, cultural, and economic dimensions, protected species, habitat considerations, climate change effects, and the implications to fisheries from various spatial uses of the marine environment (WPRFMC, 2020). In addition to the permit requirements already mentioned, regulatory requirements include vessel and gear marking,

¹ <https://www.fisheries.noaa.gov/permit/hawaii-longline-limited-entry-permit>

vessel length restrictions, the possession and use of sea turtle and seabird mitigation gear and safe handling techniques. Longline vessels are restricted from areas surrounding the Northwest Hawaiian Islands to avoid interactions with protected species and are further restricted from nearshore areas surrounding the main Hawaiian Islands to separate longline gear from small vessel fisheries using troll and handline gear (discussed in Section 6.2.4). Shark finning was banned in 2001 by federal and state regulations requiring the landing of the entire shark carcass if fins are to be taken (Swenarton and Beverly, 2004). Finally, the vessel operator must notify NMFS prior to departure whether the vessel is undertaking a deep-set or shallow-set trip. Once the trip type is set, it cannot be changed during the trip. Vessels are required to carry observers through the NMFS Pacific Islands Regional Observer Program (PIROP). For the deep-set fishery the target observer coverage is 20% of trips; for the shallow-set fishery this is 100%.

The entirety of the US EEZs in the Pacific are located in the Western Central Pacific Ocean (WCPO) where the Western and Central Pacific Fisheries Commission (WCPFC) is the Regional Fishery Management Organisation (RFMO) responsible for managing tuna and other highly migratory fish stocks. However, as discussed further on in Section 6.2.4, a significant portion of the fishery takes place to the east of the 150°W boundary, in the Eastern Pacific Ocean (EPO), where the Inter-American Tropical Tuna Commission (IATTC) is the relevant RFMO responsible for managing tuna and other marine resources. The management of the Hawaiian longline fishery therefore also falls under the overarching regional management framework of both the WCPFC and the IATTC.

A detailed description of the fishery management system at all levels of jurisdiction is given in Section 6.10.

6.2.3 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 4. 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.

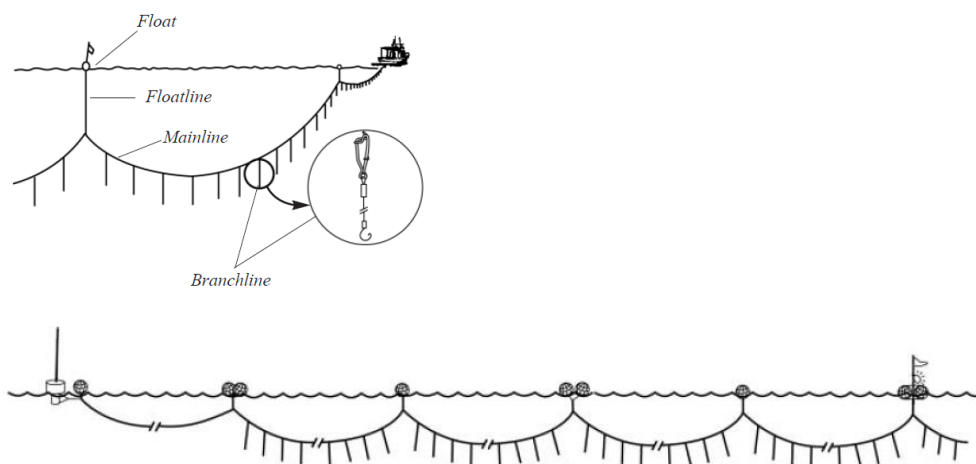


Figure 4. Generic illustration of longline set – not to scale (Beverly et al., 2003). The close-up of the branchline shows the leader, which in the case of the shallow-set fishery is made up of monofilament; for the deep-set fishery this is wire although the fishery is transitioning to monofilament.

The Hawaii-based longline fishery has two components, based on the method of longline deployment. In shallow-set longline fishing, the gear is configured so that the hooks (mandatory 18/0 or larger circle hooks) remain above 100 meters (m) in depth to target swordfish at night, when the target species is relatively closer to the surface during their diel vertical migration cycle. In deep-set longline fishing, the gear is configured so that all the hooks (circle but usually 15/0) fall below 100 m to target bigeye tuna during the day, when the bigeye occur at the deeper end of their vertical distribution (see Table 10, Figure 5 and Figure 6). The swordfish-targeting vessels use light sticks during their nocturnal sets, with the gear then hauled during the day (this also minimises seabird encounters). In the deep-set fishery, the use of light sticks is prohibited north of the Equator and gear is allowed to soak during the day, with total fishing time typically lasting about 19 hours, including the setting, and hauling of gear. Longline vessel operators are required to declare whether they will be making a deep-set or shallow-set trip prior to their departure. A deep set (generally 40 – 350 m depth) is defined as a set with 15 or more hooks between floats as opposed to a shallow set (generally 45 – 75 m depth) that is characterized by setting less than 15 hooks between floats. A summary of the operational and gear characteristics of the Hawaii-based longline fishery is given in Table 10. Of note is that the shallow-set fishery only uses monofilament leaders whereas the deep-set fishery still uses wire leaders (although it is transitioning to monofilament). The implications of this in relation to shark bycatch are further discussed under Principle 2 (Section 6.9).

For bait, the fishery generally uses saury, sardines or mackerel and the use of squid bait is prohibited in the shallow-set fishery to minimize sea turtle interactions. Data on bait use are provided in Section 6.2.5.3.

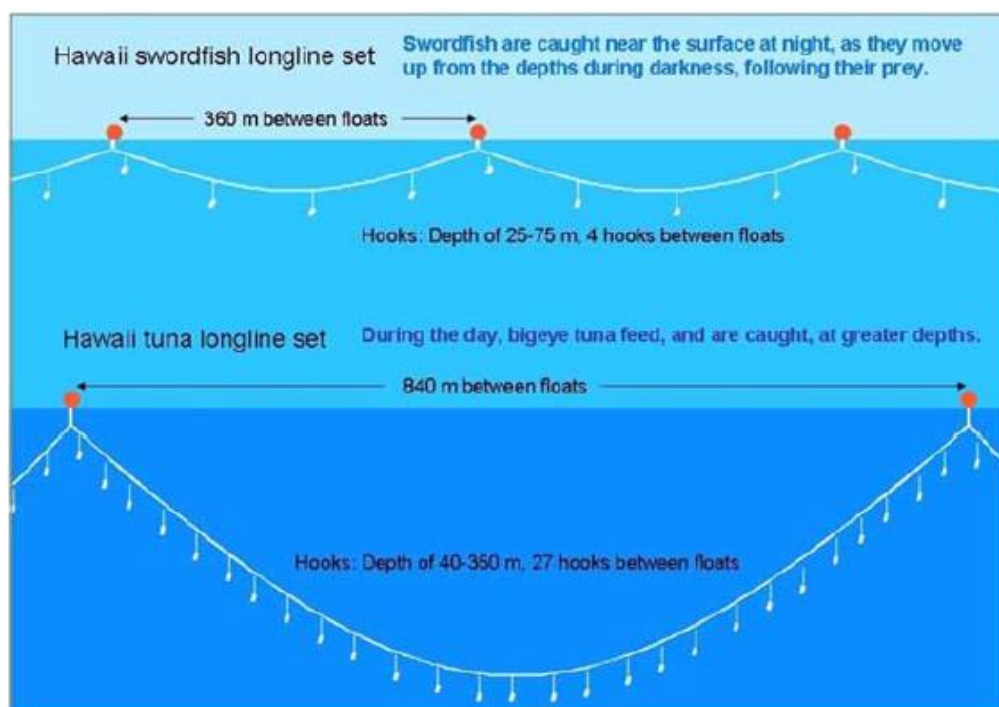


Figure 5. Generalized depiction of shallow-set and deep-set gear configuration. Source: NMFS_BiOp (2019).

Table 10. Summary of operational and gear characteristics for the Hawaii-based longline fishery. Note these values may vary between vessels, and between sets and trips of a vessel. Source: HLA.

Characteristic	Shallow-set fishery	Deep-set fishery
Hook type	18/0 circle hook with maximum of 10 degree offset (Figure 6)	15/0 circle hook with 10 degree offset with max wire diameter of 4.5 mm (Figure 6)
Floatline length	8 m	22 m (required to be ≥ 20 m north of the Equator)
Branchline length	17 m	13 m
Mean fishing depth of shallowest hook	40 m	90 m
Mainline length	54 km	30 to 100 km
Leader material	Monofilament	Wire (but entire fishery is transitioning to monofilament)
Lightstick use	Yes	Prohibited north of the Equator
Radio beacons number per set	6	6
Trip duration	30 days	21 days
Sets per trip	18	13

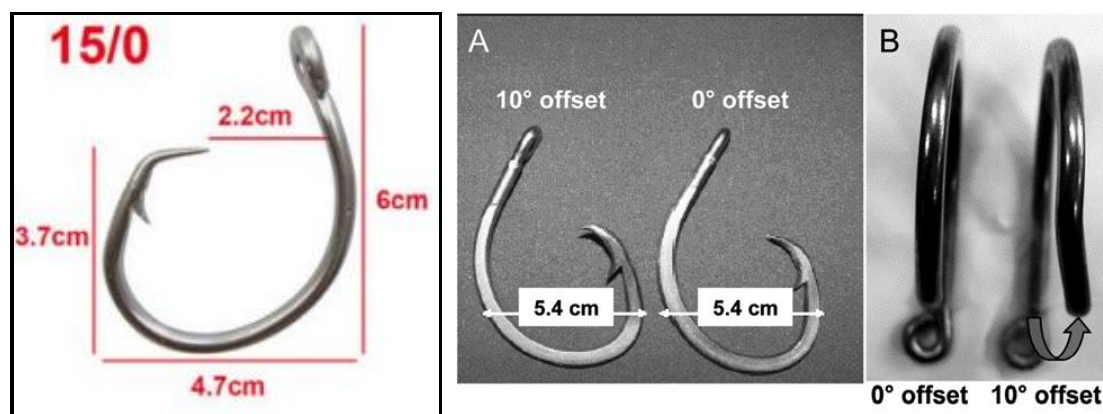


Figure 6. Size comparison for typical deep-set tuna circle hook and shallow-set circle hook. Source: Rice and Harley (2012).

6.2.4 Fishing areas and seasons

The shallow-set fishery operates mainly in the first half of the year. The fishery takes place in the U.S. EEZ around Hawaii and on the high seas to the north and northeast of the Main Hawaiian Islands (MHI) seasonally, centered on the Subtropical Convergence Zone, in a broad east/west band around 30 to 40 degrees North latitude (Swenarton and Beverly, 2004; WPRFMC, 2020). Figure 7 shows the distribution of fishing effort by the Hawaii shallow-set longline fleet as the annual average number of hooks per 5-degree square in millions of hooks in 2019 and over the 2008-19 period.

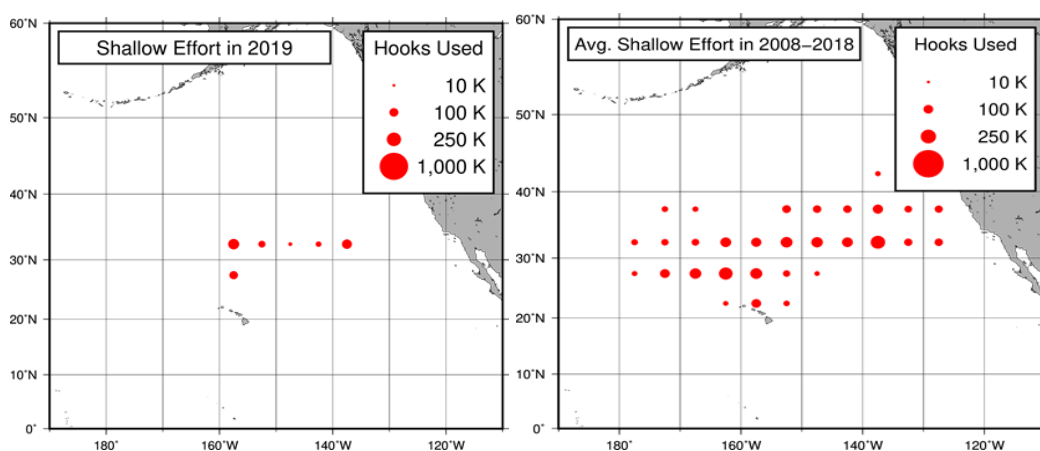


Figure 7. Fishing effort distribution of the Hawaii shallow-set longline fleet as the annual average number of hooks per 5 degree square in millions of hooks over 2019 (left) and over 2008-19 (right). Source: WPRFMC (2020).

The deep-set fishery targets primarily bigeye tuna in the EEZ around Hawaii and on the high seas in all directions and up to 1000 nautical miles from the home port of Honolulu. The fishery is active throughout the year, shifting north and south depending on the season and year (Swenarton and Beverly, 2004). In general, deep-set longline vessels operate out of Hawaii ports, with the vast majority based in Honolulu. Infrequently, deep-set trips originate from other ports such as Long Beach or San Francisco, California, or Pago Pago, American Samoa, and then fishermen land their catches in Hawaii. Fishermen departing from California begin fishing on the high seas, outside the EEZ. Fishermen departing from American Samoa usually begin fishing near the Equator or farther north where they expect higher catch rates of bigeye tuna (WPRFMC, 2020). Figure 8 shows the distribution of fishing

effort by the Hawaii deep-set longline fleet as the annual average number of hooks per 5-degree square in millions of hooks in 2019 and over the 2008-19 period.

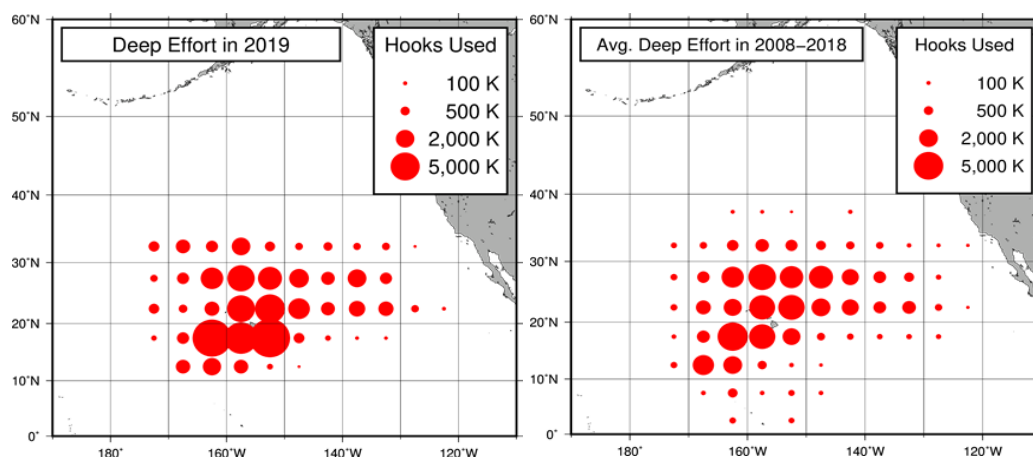


Figure 8. Fishing effort distribution of the Hawaii deep-set longline fleet as the annual average number of hooks per 5 degree square in millions of hooks over 2019 (left) and over 2008-19 (right). Source: WPRFMC (2020).

Federal regulations and other applicable laws prohibit longline fishing inside the 200 nm U.S. EEZ around the Northwestern Hawaiian Islands (as part of the Papahānaumokuākea Marine National Monument - Figure 10). Longline fishing within 50 (winter season) to 75 nm (summer season) from the shoreline in the MHI is prohibited to minimize the potential for gear conflicts with small boat fisheries and interactions with protected species, especially marine mammals (referred to as the MHI Longline Fishing Prohibited Area). Federal regulations may also temporarily prohibit deep-set longline fishing in the Southern Exclusion Zone (SEZ), an area in the EEZ south of Hawaii. An SEZ closure is triggered under regulations implementing the False Killer Whale Take Reduction Plan if there are two or more observed serious injuries or mortalities of false killer whales in the EEZ around Hawaii in a given year. The latest closure was implemented by NMFS in February 2019 (NMFS, 2019a) although it has currently been reopened (Figure 9 and also further discussed in Section 6.9.3.2). Finally, although U.S.-flagged vessels, and especially those permitted under the longline limited-entry management scheme, can fish the entire high seas of the Pacific Ocean and the EEZ of the United States and its Territories, there are prohibitions to fish within the US marine National Monument areas², as shown in Figure 10, in addition to those already mentioned previously.

² Monuments are designated by Presidential Proclamation via the Antiquities Act, which provides the President broad power to set aside public areas for protection.

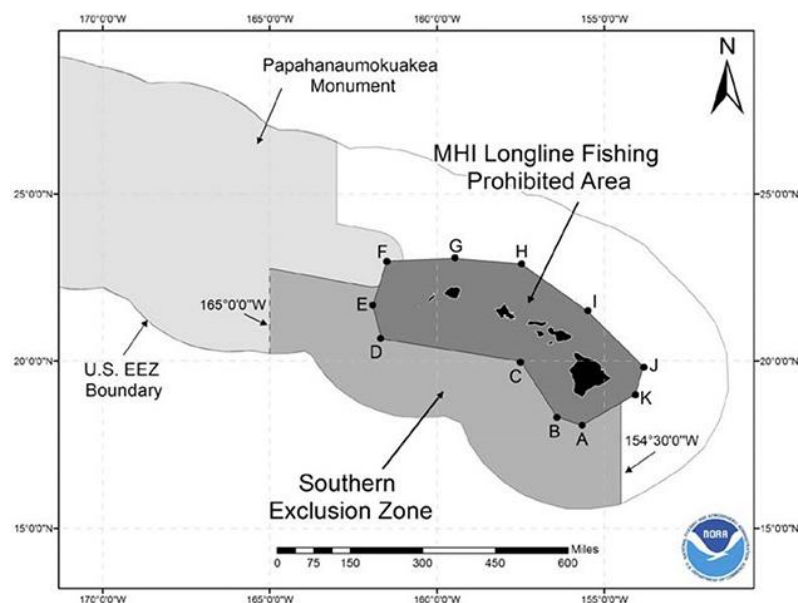


Figure 9. Map closed areas to the longline fishery in Hawaiian waters, including the temporal Southern Exclusion Zone and the permanent Papahānaumokuākea Marine National Monument and the Main Hawaiian Islands Longline Fishing Prohibited Area. Source: <https://www.fisheries.noaa.gov/pacific-islands/marine-mammal-protection/frequently-asked-questions-about-2019-southern-exclusion>

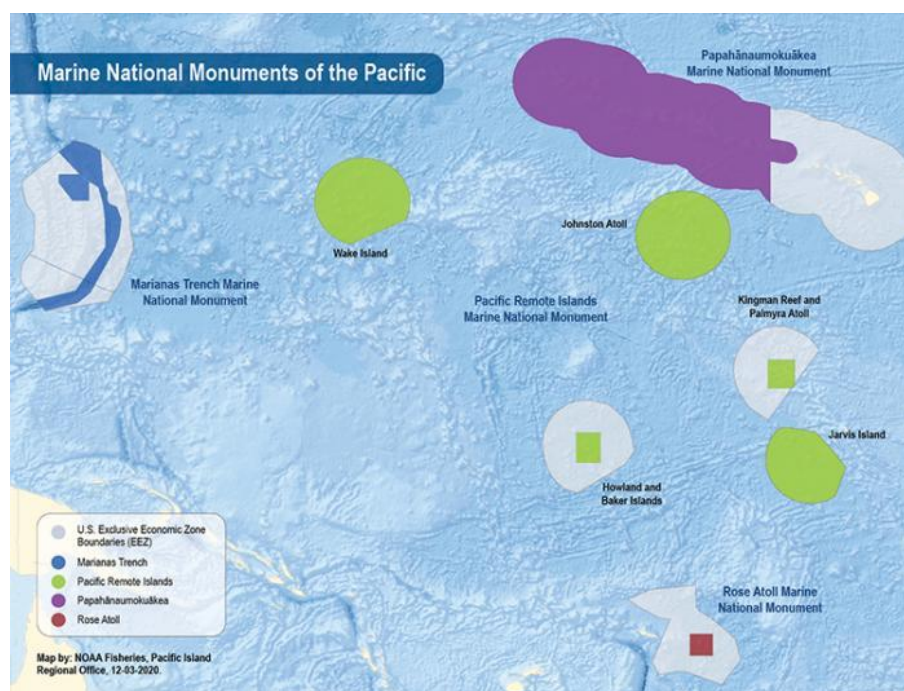


Figure 10. Map of the U.S. Pacific islands Region, including Marine National Monuments. Source: <https://www.fisheries.noaa.gov/pacific-islands/habitat-conservation/marine-national-monuments-pacific>.

6.2.5 Catch profiles and data availability

6.2.5.1 Logbook data

The U.S. federal longline logbook system was implemented in the early 1990s and is the main source of the data used to determine longline vessel activity, effort, fish catches and catch per unit effort (CPUE). In 1992, the Hawaii longline fishery was the first in the U.S. to require daily logbook reporting (Kaneko and Bartram, 2014) and coverage is 100%. The Western Pacific Daily Longline Fishing Log contains detailed operational information on trip timing, set type, set and haul timing and coordinates, number of hooks set, hooks per float, number of light sticks, length of mainline and bait type. Catch is reported by species in number of fish. Interactions with protected species are also required to be reported (released uninjured, injured, or dead) and a species guide is provided to aid with identification. The vessel operator must complete **a paper or electronic logbook form** within 24 hours of the end of each fishing day and the vessel operator must submit the completed and signed logbook to the NMFS Pacific Islands Fisheries Science Center (PIFSC) within 72 hours of returning to port.

To cross-validate the landings data, and to estimate the total weight of landed fish, NMFS combine the logbook data with fish sales records from the Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data, dating back to 1990. Revenue, average weight, and average price are derived from the Dealer data and longline purchases in the Dealer data are identified and separated out by matching longline trips based on a specific vessel name and its return to port date in the logbook data with the corresponding vessel name and purchase date(s) in the Dealer data. A conversion factor is also applied to processed fish to estimate whole weight (WPRFMC, 2020). The logbook and HDAR Dealer data were used to calculate the weight of longline retained catch for both Hawaiian longline fleets, as summarised in Table 11 for the 2015-20 period.

Table 11. 2015-20 retained catch in the Hawaiian deep-set and shallow-set longline fishery (in 1000 lbs). Principle 1 species are shown in bold. See Appendix 12 for complete species names. *PMUS = Pelagic Management Unit Species. Source: WPRFMC (2021a).

Species	Deep-set fishery						Shallow-set fishery					
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Bigeye	19,248	18,070	17,498	16,635	16,916	16,438	99	75	126	108	60	98
Yellowfin	2,012	3,304	5,581	5,437	4,445	3,848	17	29	137	75	30	38
Swordfish	843	794	998	1,111	898	538	2,500	1,615	2,570	1,210	720	656
Moonfish	2,622	2,148	2,261	3,057	2,289	1,609	39	19	32	13	3	22
Blue marlin	1,380	1,194	1,502	1,463	1,987	1,168	12	28	14	1	0	3
Striped marlin	1,064	831	861	1,021	1,200	738	24	29	34	4	1	2
Pomfrets	1,242	1,038	888	857	732	501	1	0	0	0	0	0
Ono/wahoo	781	920	784	859	1,259	738	1	1	3	1	0	0
Mahimahi	692	636	548	495	434	262	30	16	15	6	2	2
Albacore	529	546	200	187	227	350	7	2	9	5	3	9
Shortbill spearfish	576	743	662	481	438	255	3	5	6	1	0	1
Skipjack tuna	467	529	485	329	576	370	1	0	1	0	0	0
Oilfish	507	475	329	313	307	182	20	6	8	2	1	2
*PMUS sharks	120	140	116	126	108	41	25	24	49	12	6	1

Species	Deep-set fishery						Shallow-set fishery					
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020
Other marlins	36	46	37	30	41	18	0	0	1	0	2	2
Non-PMUS marine fishes	18	19	6	10	4	4	0	0	0	0	0	0
Bluefin tuna	0	1	3	1	4	3	0	0	0	0	0	1

6.2.5.2 Observer data

The Pacific Islands Region Observer Program (PIROP) is responsible for deploying observers on U.S. fishing vessels to collect data on effort and catch, as well as incidental interactions with protected species, such as sea turtles and marine mammals. The programme was established in 1994 and aims at 100% coverage in shallow-set trips and usually 20% (or more) for deep-set trips over the course of a fishing year. As a permit condition, vessels are required to accept a NOAA Fisheries observer on-board if directed to do so by NOAA Fisheries (Section 6.2.2). A summary of the observer coverage for the Hawaiian shallow-set and deep-set fleets since 2017 is given in Table 12. Although the Covid-19 pandemic caused a decline in coverage in 2020, the 15.2% coverage is still well above the WCPFC and IATTC minimum requirement of 5% (IATTC, 2019a; WCPFC, 2020a).

Table 12. Observer coverage in the Hawaiian shallow-set and deep-set longline fishery. Source: NMFS Annual Status Reports (references in table).

Fishery/year	Departures	Departures with observers	Observer coverage
Shallow-set fishery (NMFS, 2018a, 2019b, 2020a)			
2020	TBC	TBC	TBC
2019	34	34	100%
2018	22	22	100%
2017	67	67	100%
Deep-set fishery (NMFS, 2018b, 2019c, 2020b, 2021)			
2020	1587	242	15.2%
2019	1665	342	20.5%
2018	1577	321	20.4%
2017	1491	304	20.4%

The U.S. observer program does not collect weights data and interactions are reported in numbers only. For this assessment, the team estimated total catch weight based on the observed interactions (**extrapolated by NMFS to fleet level in the case of the deep-set fishery**) and average landed weight based on Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data. A summary of the total annual catch for both fleets for 2015-20, together with overall species composition (in %) and P2 designations is given in Table 13 and Table 14 for the shallow- and deep-set fleets, respectively. For both fleets, sharks make up a significant proportion of the catch (at 30 – 60%) the majority of which are released; for that group in particular, species composition was derived from the more detailed observer data in Table 15 (shallow-set) and Table 16 (deep-set).

An overview of discard rates (% released individuals) for species caught in the Hawaiian shallow- and deep-set fisheries in 2019 and 2020 is given in Table 17.

Interactions with U.S. protected species (seabirds, sea turtles and marine mammals) are discussed in Section 6.9.3.

Electronic monitoring systems are reportedly being trialed on 22 HLA vessels. This is to be discussed further at the site visit.

Table 13. Summary of 2015-20 total catch (in 1000 lbs and as % total catch) for the Hawaiian shallow-set longline fleet (UoAs 1 – 5) including retained catch and discards, based on NMFS observer data in numbers (at 100% coverage – to be discussed at the site visit) and average weight per species for the shallow-set fishery from 2015-20 State HDAR Commercial Marine Dealer data. PMUS Shark species composition derived from 2019-20 data shown in Table 15. Main species are shown in bold (see Section 6.9.2 for discussion). See Appendix 12 for complete species names. Source: CU analysis based on data in WPRFMC (2021a). [‡] Based on 2017-20 observer data, > 99% of these correspond to shortfin mako (IATTC_SAC, 2020a).

Species	Total annual catch in 1000 lbs						% of total annual catch						P2 designation
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020	
PMUS sharks	2,756	2,720	2,290	621	527	1,429	47.76	58.09	41.64	28.80	38.31	62.29	N/a
*blue shark at 88.8%	2,447	2,416	2,033	552	468	1,269	42.41	51.58	36.98	25.58	34.02	55.31	Secondary
*mako sharks at 10.7%	295	291	245	66	56	153	5.11	6.22	4.46	3.08	4.10	6.66	Secondary
*thresher sharks at 0.5%	14	14	11	3	3	7	0.24	0.29	0.21	0.14	0.19	0.31	Secondary
*oceanic whitetip shark at 0.01%	0	0	0	0	0	0	0.00	0.01	0.00	0.00	0.00	0.01	ETP
Bigeye tuna	106	81	150	115	63	107	1.84	1.73	2.73	5.33	4.57	4.67	Primary
Yellowfin tuna	17	31	146	76	30	41	0.29	0.66	2.65	3.54	2.21	1.79	Primary
Albacore	7	2	10	5	3	10	0.12	0.04	0.18	0.23	0.21	0.43	Primary
Swordfish	2,758	1,742	2,786	1,308	745	673	47.79	37.19	50.66	60.64	54.17	29.33	N/a – P1
Blue marlin	14	29	15	2	0	4	0.25	0.62	0.27	0.10	0.00	0.16	Secondary
Striped marlin	26	32	42	6	2	3	0.45	0.68	0.76	0.27	0.11	0.11	Primary
Spearfish	4	6	6	2	1	1	0.07	0.13	0.11	0.07	0.05	0.04	Secondary
Mahimahi	32	16	16	6	2	2	0.55	0.34	0.28	0.30	0.16	0.09	Secondary
Ono (Wahoo)	1	1	3	1	0	0	0.01	0.03	0.05	0.05	0.01	0.02	Secondary
Moonfish	49	22	36	14	3	24	0.85	0.48	0.65	0.67	0.19	1.05	Secondary
Pomfrets	2	0	1	0	0	0	0.03	0.00	0.01	0.02	0.01	0.01	Secondary
Total	5,771	4,683	5,499	2,156	1,376	2,294	100.00	100.00	100.00	100.00	100.00	100.00	

Table 14. Summary of 2015-20 total catch (in 1000 lbs and as % total catch) for the Hawaiian deep-set longline fleet (UoAs 6 – 10) including retained catch and discards, based on scaled up NMFS observer data in numbers (**scaling up method to be discussed at site visit**) and average weight per species for the deep-set fishery from 2015-20 State HDAR Commercial Marine Dealer data. PMUS Shark species composition derived from 2019-20 data shown in Table 16. Main species are shown in bold (see Section 6.9.2 for discussion). See Appendix 12 for complete species names. Source: CU analysis based on data in WPRFMC (2021a). [‡] Based on 2017-20 observer data, > 80% of these correspond to bigeye thresher (IATTC_SAC, 2020a).

Species	Total annual catch in 1000 lbs						% of total annual catch						P2 designation
	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020	
PMUS sharks	17,781	16,125	18,857	18,812	23,904	21,706	36.35	34.42	36.89	36.85	42.99	44.62	N/a
*blue shark at 88.4%	15,736	14,271	16,688	16,649	21,155	19,210	32.17	30.46	32.64	32.61	38.05	39.49	Secondary
*mako sharks at 3.8%	676	613	717	715	908	825	1.38	1.31	1.40	1.40	1.63	1.70	Secondary
*thresher sharks at 7.2% [‡]	1,270	1,151	1,346	1,343	1,707	1,550	2.60	2.46	2.63	2.63	3.07	3.19	Secondary
*oceanic whitetip shark at 0.4%	69	63	74	73	93	85	0.14	0.13	0.14	0.14	0.17	0.17	ETP
*silky shark at 0.2%	43	39	45	45	57	52	0.09	0.08	0.09	0.09	0.10	0.11	ETP
Bigeye tuna	19,341	18,355	17,727	17,088	17,493	16,778	39.54	39.18	34.68	33.47	31.46	34.49	Primary
Yellowfin tuna	1,990	3,392	5,733	5,496	4,601	3,916	4.07	7.24	11.21	10.77	8.28	8.05	Primary
Moonfish	2,627	2,143	2,281	3,086	2,299	1,644	5.37	4.57	4.46	6.05	4.13	3.38	Secondary
Blue marlin	1,390	1,227	1,507	1,489	2,016	1,177	2.84	2.62	2.95	2.92	3.63	2.42	Secondary
Striped marlin	1,063	846	872	1,038	1,228	741	2.17	1.81	1.71	2.03	2.21	1.52	Primary
Swordfish	889	844	1,059	1,156	926	560	1.82	1.80	2.07	2.26	1.67	1.15	Primary
Pomfrets	1,266	1,062	881	839	743	505	2.59	2.27	1.72	1.64	1.34	1.04	Secondary
Ono (Wahoo)	765	937	788	876	1,247	731	1.56	2.00	1.54	1.72	2.24	1.50	Secondary
Spearfish	589	745	661	495	456	259	1.20	1.59	1.29	0.97	0.82	0.53	Secondary
Mahimahi	723	630	554	486	453	263	1.48	1.35	1.08	0.95	0.82	0.54	Secondary
Albacore	495	542	201	190	230	367	1.01	1.16	0.39	0.37	0.41	0.75	Primary
Total	48,919	46,850	51,122	51,052	55,598	48,649	100.00	100.00	100.00	100.00	100.00	100.00	

Table 15. Summary of 2019-20 Pelagic Management Unit Species (PMUS) shark bycatch for the Hawaiian shallow-set longline fleet (UoAs 1 – 5) based on NMFS observer data in numbers (at 100% coverage – to be discussed at the site visit). Data shown as total across both years. See Appendix 12 for complete species names. Source: CU analysis based on data in WPRFMC (2020, 2021a).

PMUS shark species	Released catch (ind.)	Retained catch (ind.)	Total Catch (ind.)	% Composition total PMU shark catch
Blue shark	8,910	0	8,910	88.82
Mako shark	811	263	1,074	10.71
Thresher shark	38	8	46	0.46
Oceanic whitetip shark	1	0	1	0.01
Total PMUS sharks	9,760	271	10,031	100.00

Table 16. Summary of 2019-20 Pelagic Management Unit Species (PMUS) shark bycatch for the Hawaiian deep-set longline fleet (UoAs 6 – 10) based on scaled up NMFS observer data in numbers (scaling up method to be discussed at site visit). Data shown as total across both years. See Appendix 12 for complete species names. Source: CU analysis based on data in WPRFMC (2020, 2021a).

PMUS shark species	Released catch (ind.)	Retained catch (ind.)	Total Catch (ind.)	% Composition total PMU shark catch
Blue shark	215,749	3	215,752	88.39
Mako shark	8,845	501	9,346	3.83
Thresher shark	17,368	76	17,444	7.15
Oceanic whitetip shark	956	0	956	0.39
Silky shark	597	0	597	0.24
Total PMUS sharks	243,515	580	244,095	100.00

Table 17. 2019/20 discard rates (% released individuals) for species caught in the Hawaiian shallow- and deep-set fisheries. N/a means that the species was not reported as caught. Source: WPRFMC (2020, 2021a).

Species	Shallow-set		Deep-set	
	2020	2019	2020	2019
Albacore	16.0	0.0	5.0	2.1
Bigeye tuna (P1)	5.6	4.1	2.2	2.7
Bluefin tuna	0.0	0.0	0.0	0.0
Skipjack tuna	0.0	20	0.8	1.1
Yellowfin tuna (P1)	7.5	1.2	2.2	3
Swordfish (P1)	2.9	3.4	4.0	3.2
Blue marlin	9.5	0.0	0.7	1.2
Striped marlin	38.1	25	1.2	3.1
Shortbill spearfish	18.2	27.8	2.9	2.5
Other marlin	0.0	0.0	2.1	1.8
Mahimahi	2.9	0.4	0.8	1.1
Wahoo	9.1	0.0	0.5	0.5

Species	Shallow-set		Deep-set	
	2020	2019	2020	2019
Moonfish	9.0	0.0	2.6	1
Oilfish	44.0	32.1	37.8	15.7
Pomfret	0.0	0.0	0.9	0.8
Blue shark	100.0	100	100.0	100
Mako shark	81.2	50.3	99.1	90.5
Thresher shark	80.5	100	99.7	99.4
Oceanic whitetip shark	100.0	N/a	100.0	100
Silky shark	N/a	N/a	100.0	100

6.2.5.3 Bait

For bait, the fishery generally uses saury, sardines or mackerel and the use of squid bait is prohibited in the shallow-set fishery to minimize sea turtle interactions. Although the deep-set fishery could use squid, the vessels only use small pelagic species. For 2018 to 2020, HLA provided a summary of the weight of bait used per year for shallow-set trips and for deep-set trips for each species used for bait, and the country where the bait was sourced (Table 18).

Table 18. Bait use (in tonnes) in the Hawaiian shallow-set and deep-set longline fishery and as average % out of total catch (reported in Table 13 and Table 14). Main species are shown in bold. P2 designation is also given. See Appendix 12 for complete species names. Source: HLA.

Bait species (source)	2018	2019	2020	Average % out of total catch	P2 designation
Shallow-set fishery					
Pacific mackerel (Taiwan EEZ)	22	85	37	5.45	Primary
Deep-set fishery					
Pacific saury (Taiwan EEZ)	2,486	2,804	2,490	11.04	Primary
Pacific saury (Japan EEZ)	135	456	-	0.84	Primary
Pacific sardines (Japan EEZ)	-	-	433	0.61	Primary
Pacific mackerel (Taiwan EEZ)	-	-	7	0.01	Primary
Milkfish (farmed, Indonesia)	-	-	24	0.03	N/a ³

³ Not required to be considered as a scoring element: <https://mscportal.force.com/interpret/s/article/Bait-from-sources-other-than-wild-caught-SA3-1-7-1527262006143>.

6.3 Principle 1: general

6.3.1 Total Allowable Catch (TAC) and Landings Data

The TAC and landings data for all Principle 1 species and stocks are shown in Table 19 to Table 21. Note, none of these stocks are managed via TAC. All data were extracted from Table 11 in Section 6.2.5.1.

Table 19. TAC and Catch Data – WCNPO swordfish

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 by UoC – Shallow-set	Year (most recent)	2020	Amount	656 lbs
	Year (second most recent)	2019	Amount	720 lbs
Total green weight landed catch by UoC – Deep-set	Year (most recent)	2020	Amount	538 lbs
	Year (second most recent)	2019	Amount	898 lbs

Table 20. TAC and Catch Data – WCPO and EPO bigeye tuna

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 by UoC – Shallow-set	Year (most recent)	2020	Amount	98 lbs
	Year (second most recent)	2019	Amount	60 lbs
Total green weight landed catch by UoC – Deep-set	Year (most recent)	2020	Amount	16,438 lbs
	Year (second most recent)	2019	Amount	16,916 lbs

Table 21. TAC and Catch Data – WCPO and EPO yellowfin tuna

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 by UoC – Shallow-set	Year (most recent)	2020	Amount	38 lbs
	Year (second most recent)	2019	Amount	30 lbs
Total green weight landed catch by UoC – Deep-set	Year (most recent)	2020	Amount	3,848 lbs

	Year (second most recent)	2019	Amount	4,445 lbs
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6.3.2 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) (see Figure 1) 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).

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). North Pacific swordfish are caught primarily by longline fisheries of Japan, Taiwan and the U.S. Catches have averaged around 10,498 t since 2010.

The Inter-American Tropical Tuna Commission (IATTC) region is shown in Figure 1. Reported annual total catches of yellowfin tuna have averaged approximately 240,000 t in the 10-year period to 2019. Catches peaked in the early 2000s at approximately 240,000 t per year. More than 90% of reported catches of tuna in the EPO are now made by purse seine vessels, with longline vessels taking the majority of the remaining catch. Pole-and-line vessels and various artisanal and recreational fisheries account for a small percentage of the total catches.

6.4 Principle 1: WCNPO swordfish

6.4.1 Biology and ecology

Swordfish are a widely distributed pelagic species, supporting major fisheries in all oceans of the world. They are observed from 50°N to 50°S and across all longitudes in the Pacific Ocean. Swordfish are mainly a warm-water species, but have the widest temperature tolerance of any billfish, and can be found in waters from 5-27°C. Swordfish are commonly observed in surface waters, although they are believed to swim to depths of 650 m or greater. They are opportunistic predators, feeding at the surface as well as the bottom of their depth range. Their diet consists mostly of pelagic fishes, and

occasionally squids and other cephalopods. At lower depths they feed on demersal fishes. Swordfish are not a key low-trophic level (LTL) species.

Domestic U.S. longline vessels have operated in the Hawaii Exclusive Economic Zone since the 1920s, primarily targeting tunas. Vessels began targeting swordfish in the early 1990s, and the fleet accounted for 40% of the total U.S. swordfish catch in 2012 (Sculley and Brodziak, 2020). Swordfish are also an important recreational species.

6.4.1.1 Growth and natural mortality

Larval and young swordfish actively feed on zooplankton and by 11-12 mm in length start feeding on a variety of epipelagic fish larvae. Swordfish grow extremely fast during their first year of life, and by one year of age may reach 90 cm (Ward et al., 2000). Growth is highly variable among fish of the same age and sex, and there is a marked difference in growth rate between males and females. After two years of age, females tend to grow faster than males, grow to a larger size, and are proportionately heavier at the same length. Swordfish reach their maximum size (around 350 kg) at about 15 years of age. Male and female swordfish have different geographical and seasonal distribution depending on size.

Uncertainty in growth rates and maturity of swordfish has contributed to stock assessment uncertainty. In response to this uncertainty, the WCPFC Scientific Committee recommended that additional work on age, growth and age validation be undertaken. New growth and maturity estimates were developed based on otolith readings, which indicate that swordfish live longer and grow more slowly than previously estimated (Farley et al., 2016). The maximum estimated age for (female) swordfish was 14 years from rays and 21 years from otoliths (the authors indicate that age estimates from otoliths are likely to be more reliable than for rays, especially in larger/older fish). The study found that the length at 50% maturity for female swordfish in the southwest Pacific is 161.5 cm orbital fork length (FL) and the age at 50% maturity is approximately 4.4 years (Farley et al., 2016). These estimates are used in the current WCPO stock assessment.

6.4.1.2 Reproduction

Swordfish are highly fecund, with large females releasing several million eggs at a time in batches. The number of eggs released is related to the size of the female. A 68kg female may release from 1 million to 16 million eggs at a time, while a 272 kg female may release up to 29 million eggs (Kailola et al., 1993). Western and Central North Pacific Ocean (WCNPO) swordfish have an age of 50% maturity of about age 3. Swordfish do not necessarily have discrete spawning grounds and spawning seasons. In the central North Pacific spawning occurs in spring and summer (March through to July) and all year round in equatorial Pacific waters.

6.4.1.3 Stock structure

Multiple stocks of swordfish have been identified in the Pacific Ocean. Although uncertainty remains in relation to the degree to which individuals migrate and sub-populations mix, recent research provides insight into stock structure. Larval surveys suggest that spawning takes place in tropical and sub-tropical regions, with the exception of the western Pacific equatorial region. Genetic studies indicate that there is no uniform gene flow among Pacific swordfish populations (Takeuchi et al., 2017). In the Pacific, there is genetic evidence of three independent populations (north, southwest and southeast) with no mixing across the equator in the western Pacific (Farley et al., 2016).

In the North Pacific, the fishery is divided into two stocks for management: the Western and Central North Pacific Ocean (WCNPO) (Figure 13) and the Eastern North Pacific (EPO). The WCNPO stock is assessed by the International Scientific Committee for Tuna and Tuna-like Species (ISC) and is managed by the Western and Central Pacific Fisheries Commission (WCPFC). The EPO stock is assessed and managed by the Inter-American Tropical Tuna Commission (IATTC).

A recent study has examined the nursery origin and population connectivity of swordfish in the North Pacific (Wells et al., 2021). The study found that in the Hawaii fishing region, estimates of nursery origin suggest that adult swordfish samples were equally from the Central Equatorial North Pacific Ocean (CENPO) and Western North Pacific Ocean (WNPO), with negligible inputs from the Central North Pacific Ocean (CNPO) and Eastern Equatorial North Pacific Ocean (EENPO) nurseries. These results are particularly interesting as much of the Hawaii fishing region is located within the CNPO (Wells et al., 2021). The study also indicates that the primary contributors to the California and Mexico fishing regions were also the CENPO and WNPO rather than spawning regions that are in closer proximity to these fisheries, the CNPO and EENPO. Wells et al. (2021) suggest caution must be used in the interpretation of the mixed stock analysis results of the study as the sample sizes of adult swordfish otoliths from the three fishing regions investigated were small (<25 cm). Also, the study does not provide information on whether swordfish return to their natal spawning grounds. Whilst the study provides new information on the connectivity of the swordfish population in the North Pacific Ocean, this assessment report is based primarily on the WCNPO-managed stock as the UoA, with uncertainty in stock structure acknowledged.

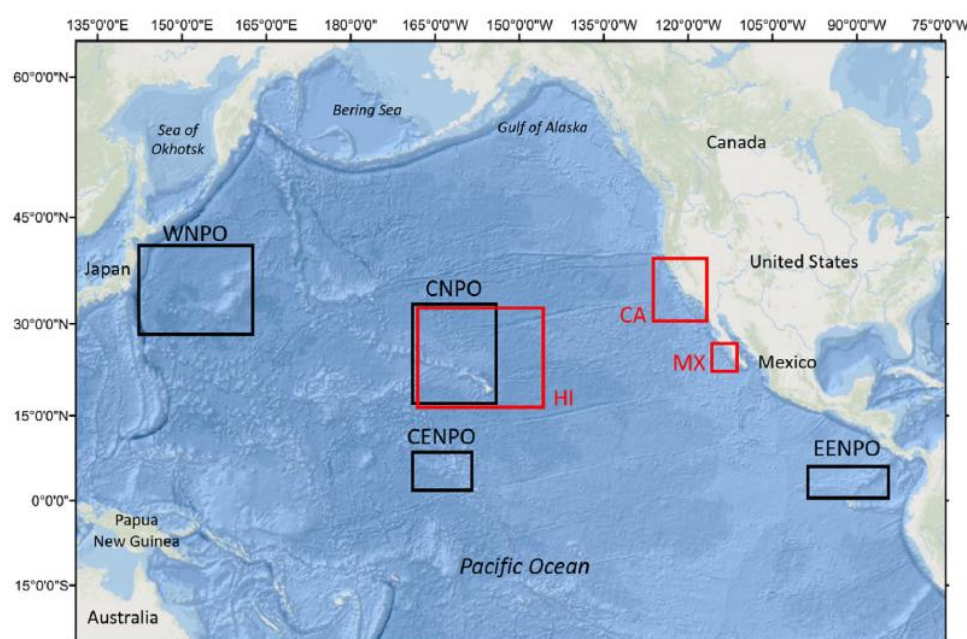


Figure 11. Map of the Wells et al. (2021) study regions located in the North Pacific Ocean where young-of-the-year and adult swordfish were collected. Regional nurseries are indicated by boxes outlined in black and adult fishing regions are indicated by boxes outlined in red. Source: Wells et al. (2021).

6.4.2 Stock assessment and information

WCNPO swordfish catches averaged about 12,933 t during 1975-1999 and increased to an average of 14,343 t during 2000-2009. Catches subsequently declined to an average of around 10,498 t since 2010. The 2018 catch was reported as approximately 9,900 t and the 2019 catch was 8,640 t (ISC,

2018). Overall, longline gear has accounted for the vast majority of WCNPO swordfish catches since the 1970s. Annual catches considered in the latest stock assessment are shown in Figure 12.

The majority of the US Pacific swordfish catch comes from Hawaiian-based longline vessels – accounting for roughly 65 % of the total US North Pacific catch. In 1992, the Hawaii longline fishery was the first in the U.S. to require daily logbook reporting (Kaneko and Bartram, 2014). Logbook data are the main source of the data used to determine longline vessel activity, effort, fish catches and catch-per-unit-effort (CPUE). Logbooks provide detailed operational information and catch in number of fish. Operators are required to declare whether they will be making a deep-set or shallow-set trip prior to their departure. A deep set is defined as a set with 15 or more hooks between floats as opposed to a shallow set that is characterized by setting less than 15 hooks between floats. Another important dataset is Hawaii's Division of Aquatic Resources Commercial Dealer data. Dealer data date back to 1990 with electronic submission beginning in mid-1999. Revenue, average weight, and average price are derived from the Dealer data.

Assessments undertaken by the ISC are considered by the WCPFC Northern Committee (NC) and presented to the WCPFC Scientific Committee (SC). Several stock assessment models were developed in 2018 for WCNPO swordfish for discussion at the ISC Billfish Working Group (BWG). The assessment accepted as appropriate for the provision of management advice was based on an age-, length-, and sex-structured Stock Synthesis (SS) model fit to time series of standardized CPUE and size composition data (ISC_BWG, 2018a).

For the assessment, as summarised in ISC_BWG (2018a), catch and size composition data were collected from ISC countries (Japan, Taiwan, and U.S.), IATTC member countries, and the WCPFC (Figure 12). Standardized CPUE data used to measure trends in relative abundance were provided by Japan, U.S., and Chinese Taipei. Sex-specific growth curves and natural mortality rates were used to account for the sexual dimorphism of adult swordfish. The value for stock-recruitment steepness used for the base case model was $h = 0.9$. The assessment model was fit to relative abundance indices and size composition data in a likelihood-based statistical framework. Maximum likelihood estimates of model parameters, derived outputs, and their variances were used to characterize stock status and to develop stock projections (ISC_BWG, 2018a). Several sensitivity analyses were conducted to evaluate the effects of changes in model parameters, including the natural mortality rate, the stock-recruitment steepness, the growth curve parameters, and the female age at 50% maturity.

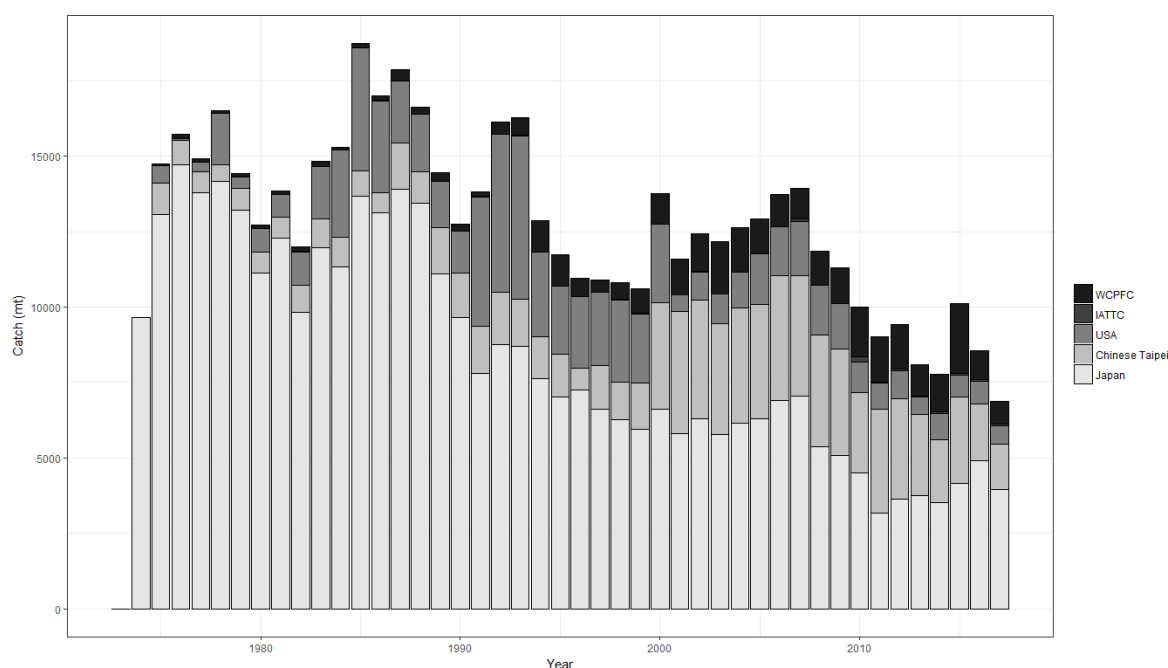


Figure 12. Annual catch (t) of WCNPO swordfish by country for Japan, Chinese Taipei, the U.S.A., and all other countries during 1975-2016. Source: ISC_BWG (2018a).

A total of 18 fisheries that impacted swordfish were defined on the basis of country, gear type, location, and time period where each fishery was considered to target a distinct component of the stock (ISC_BWG, 2018a). Eleven of the fisheries are longline fisheries which included: the Japanese offshore and distant-water longline early and late period; the Hawaii longline deep-set sector, early shallow-set sector, and late shallow-set sector; and the Taiwanese distant-water longline early and late period. Operational fishing data collected in the Hawaiian longline fishery by fishery observers in 1995-2014 were used for CPUE standardization of U.S. longline fleets. Quarterly fish length composition data from 1975–2016 for four of the fisheries were used in the assessment.

The area considered in the assessment consisted of waters of the North Pacific Ocean contained in the boundaries north of the equator and west of the diagonal purple line in Figure 13 labelled stock area 1 (ISC_BWG, 2018a). All available fishery data from this area were used for the stock assessment.

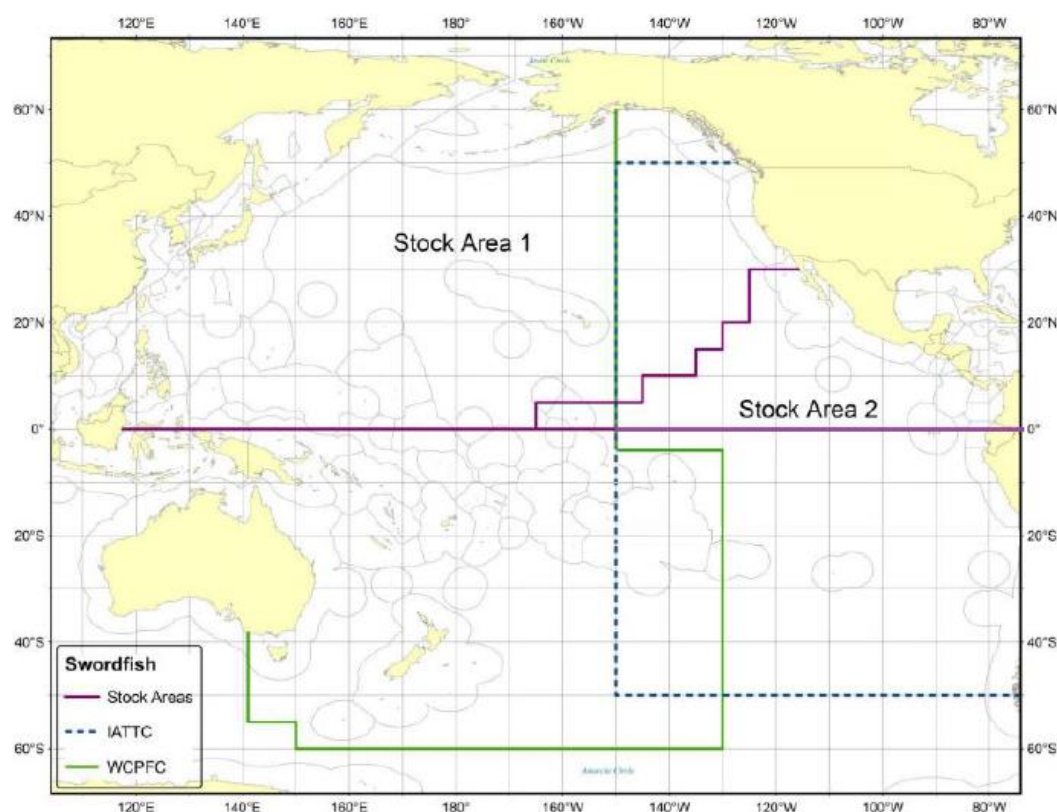


Figure 13. Stock boundaries used for this assessment of North Pacific Ocean swordfish: purple lines indicate stock area divisions; stock area 1 was assessed as the Western and Central North Pacific Ocean stock, stock area 2 contains the Eastern Pacific Ocean stock, the green line indicates Western Central Pacific Fisheries Commission convention area, blue dashed line indicates Inter-American Tropical Tuna Commission convention area. Source: ISC_BWG (2018a).

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 WCNPO swordfish, derived from the base case model assessment model (Table 22) (ISC_BWG, 2018a). Biomass status is based on female SSB . Female SSB was estimated to be 29,403 t in 2016, or about 90% above SSB_{MSY} (Table 22). Fishing mortality on the stock (average F , ages 1 – 10) averaged roughly $F = 0.08 \text{ yr}^{-1}$ during 2013-2015, or about 45% below F_{MSY} . The estimated SPR (the predicted spawning output at the current F as a fraction of unfished spawning output) is currently $SPR_{2016} = 45\%$. Annual recruitment averaged about 717,000 recruits during 2012-2016, and no long-term trend in recruitment was apparent.

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 WCNPO swordfish, derived from the base case model assessment model, where “ MSY ” indicates reference points based on maximum sustainable yield. Source: ISC_BWG (2018a).

Reference Point	Estimate
F_{MSY}	0.17 yr^{-1}
$F_{0.2*SSB(F=0)}$	0.16 yr^{-1}
$F_{2013-2015}$	0.08 yr^{-1}
SSB_{MSY}	15,702 mt

Reference Point	Estimate
SSB_{2016}	29,403 mt
$SSB_{F=0}$	97,286 mt
MSY	14,941 mt
$C_{2012-2016}$	10,160 mt
SPR_{MSY}	18%
SPR_{2016}	45%

Overall, the time series of spawning stock biomass and recruitment estimates indicate a stable SSB and suggest a fluctuating pattern without trend for recruitment (Figure 14). The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model (Figure 15) and shows that spawning stock biomass declined to almost the MSY level in the mid-1990s, but SSB has remained above SSB_{MSY} throughout the time series (Figure 14).

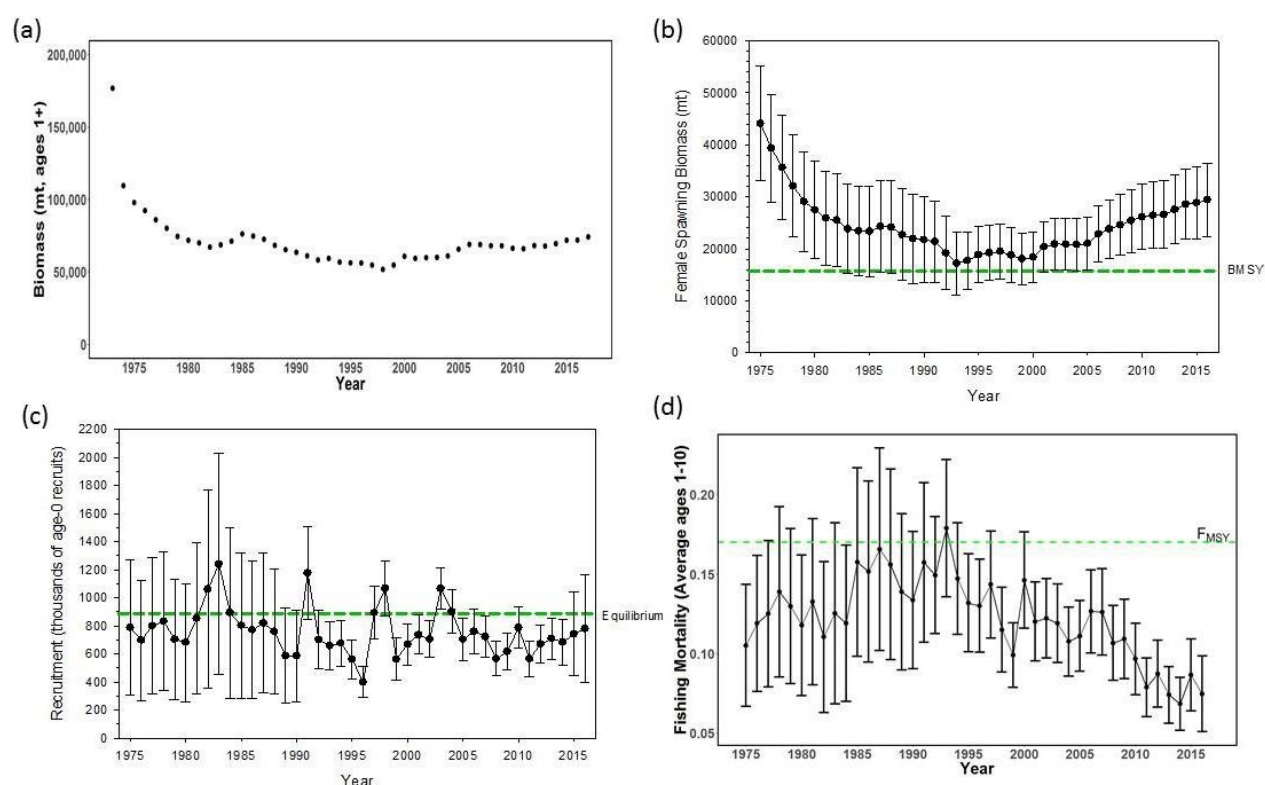


Figure 14. Time series of estimates of (a) population biomass (age 1+) (first point in time series represents unfished biomass), (b) spawning biomass, (c) recruitment (age-0 fish), and (d) instantaneous fishing mortality (average for ages 1 to 10, yr-1) for WCNP swordfish derived from the 2018 stock assessment. The solid circles are the maximum likelihood estimates by year for each quantity and the error bars represent the uncertainty of the estimates (80% confidence intervals), green dashed lines indicate B_{MSY} , equilibrium recruitment, and F_{MSY} except for the population biomass time series. Source: ISC_BWG (2018a).

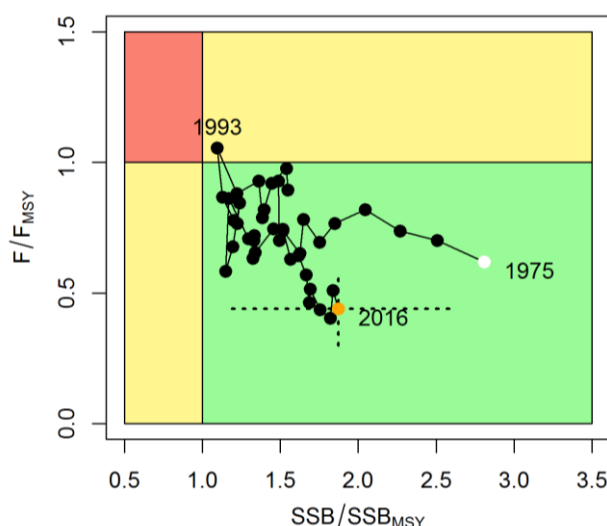


Figure 15. Kobe plot of the time series of estimates of relative fishing mortality (average of ages 1-10) and relative spawning stock biomass of WCNPO swordfish during 1975-2016. The white circle denotes the first year (1975) and the yellow circle denotes the last year (2016) of the assessment time horizon. The dashed lines represent the 95% confidence intervals around the 2016 estimate. Source: ISC_BWG (2018a)

Five stock projection scenarios were applied to the base case model results to evaluate the impact of alternative levels of fishing intensity on future spawning biomass and yield for WCNPO swordfish (Figure 16). The projected recruitment pattern was generated by stochastically sampling the estimated stock-recruitment model from the base case model. The projection calculations employed model estimates for the multi-fleet, multi-season, size- and age-selectivity, and structural complexity in the assessment model to produce consistent results.

Based on these outcomes, the ISC reported the following on the status of the WCNPO SWO (ISC_BWG, 2018a):

- The WCNPO swordfish stock has produced annual yields of around 10,200 t per year since 2012, or about 2/3 of the MSY catch level;
- There is no evidence of excess fishing mortality above F_{MSY} ($F_{2013-2015}$ is 45% of F_{MSY}) or substantial depletion of spawning potential (SSB_{2016} is 87% above SSB_{MSY});
- Overall, the WCNPO swordfish stock is not likely overfished and is not likely experiencing overfishing relative to MSY-based or 20% of unfished spawning biomass-based reference points.

In addition, based on the stock projections:

- The results show that projected female spawning biomass is expected to remain above SSB_{MSY} under all of the harvest scenarios (Figure 16), with increases in spawning biomass expected under lower fishing mortality rates.
- Similarly, projected catch is expected to increase under each of the five harvest scenarios, with greater increases expected under higher fishing mortality rates (Figure 16).

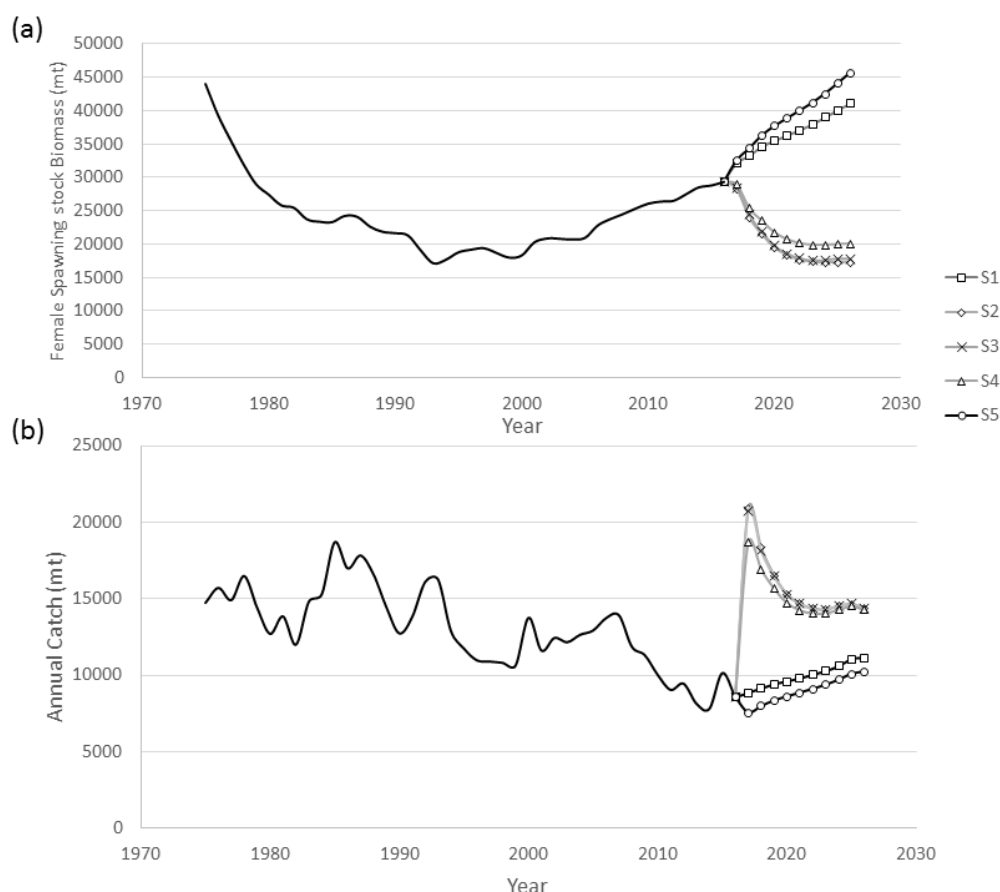


Figure 16. Historical and projected trajectories of (a) spawning stock biomass and (b) total catch from the WCNPO swordfish base case model. Stock projection results are shown for scenario S1 = the status quo or average fishing intensity during 2013–2015 ($F_{2013-2015} = F_{43\%}$); S2 = F_{MSY} ($F_{18\%}$); S3 = F to produce 20% of unfished spawning stock biomass or $F_{0.2} * SSBF=0$ ($F_{22\%}$); S4 = the highest 3-year average F during 1975–2016 or High F ($F_{20\%}$); S5 = Low F ($F_{50\%}$). Source: ISC_BWG (2018a).

6.4.3 Harvest strategy

There are both domestic and international components of the harvest strategy for WCNPO swordfish. The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS, also referred to as NOAA Fisheries) and the Western Pacific Regional Fishery Management Council (WPRFMC) manage the North Pacific swordfish fishery in the US Pacific Islands under the Fishery Ecosystem Plan (FEP) for the Pelagic Fisheries of the Western Pacific (WPRFMC, 2009). The WPRFMC developed and the NOAA fisheries implemented the first management plan for Pelagic Fisheries of the Western Pacific Region in 1987. As with other U.S.-managed fisheries, the Hawaiian longline fishery operates under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to prevent overfishing. Under the Act, the WPRFMC has authority over fisheries seaward of state/territorial waters of Hawaii and the U.S. Pacific Islands. Management decisions are based on science and are informed by traditional knowledge and practices of the local users for the benefit of the island communities and the nation. The WPRFMC serves the primary purpose of formulating and modifying the FEP based on scientific advice and input from the diverse range of stakeholders through a transparent, open process.

U.S. management measures include: a limit on the number of permits, and gear restrictions to reduce bycatch. Hawaii-based longline vessels must carry onboard observers when requested by NOAA Fisheries (this is at 20% coverage for the deep-set fishery and 100% for the shallow-set fishery).

Although the management focus for WCNPO swordfish is predominantly at the WCPFC level, under the guidelines of the MSA, the WPRFMC must take corrective action immediately in the form of a FEP or proposed regulations when it has been determined that: the maximum fishing threshold for overfishing is being approached, overfishing is occurring (i.e. the level of fishing has exceeded the level that produces MSY), or the minimum fish population (biomass) threshold that will produce MSY is being approached.

The U.S. is a member of the WCPFC, which has responsibility for conservation and management of WCNPO swordfish. The U.S. must ensure that the Hawaii longline fishery is in compliance with WCPFC-agreed conservation and management measures and is required to follow WCPFC data collection protocols.

In December 2019, the WCPFC accepted a recommendation from the Northern Committee (NC) on the harvest strategy for North Pacific swordfish fisheries to apply to swordfish stocks in the Convention Area north of 20°N, and associated fisheries (WCPFC (2020b) - Attachment K). The objective of this strategy is stated as “.....to support thriving swordfish fisheries in the North Pacific while maintaining the stock size at levels capable of producing maximum sustainable yield”. More refined management objectives are to be developed by the NC. The agreed limit reference point for the exploitation rate (F-limit) is F_{MSY} . The NC is to conduct any necessary further analysis and specify a target reference point for the stock size and/or the exploitation rate. The strategy includes a decision rule that if, based on information from the ISC and Scientific Committee, the average exploitation rate for the most recent period has been found, using the best point estimate, to exceed the F-limit, the NC will, at its next regular session or intersessionally if warranted, formulate conservation and management recommendations that are designed to reduce the fishing mortality rate below the F-limit as soon as feasible. In considering such recommendations, the difficulties of fleets not targeting swordfish should be addressed properly.

The work programme for the WCPFC NC for 2021-2023 includes an objective to further develop the harvest strategy consistent with Conservation and Management Measure (CMM) 2014-06 (WCPFC_NC, 2020). The NC is to consider and recommend an appropriate target reference point, associated harvest control rule and develop a draft CMM.

6.4.4 Principle 1 Performance Indicator scores and rationales: WCNPO swordfish

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

The latest stock assessment for WCNPO swordfish was developed in 2018 for discussion at the ISC BWG using the Stock Synthesis modelling framework (ISC_BWG, 2018a). Biomass status is based on female spawning stock biomass. Overall, the time series of spawning stock biomass and recruitment estimates indicate a spawning stock biomass well above the B_{MSY} level and suggests a fluctuating pattern without trend for recruitment (Figure 14).

The PRI is not analytically determined but B_{MSY} is estimated in the stock assessment. The ratio of B_{MSY}/B_0 is 0.16 (15,702/97,286) in the base case, hence MSC guidance (GSA2.2.3.1) suggests an appropriate proxy for the PRI is $75\%B_{MSY}$ or 11,776 t. Female spawning stock biomass was estimated to be 29,403 t in 2016, or about 90% above SSB_{MSY} , well above the proxy PRI (Table 22). Values are not provided for the confidence intervals, but 95% intervals are shown in Figure 14, indicating lower values in the estimated range well above B_{MSY} . Stock projections indicate that female spawning biomasses would be expected to increase under the harvest scenarios examined.

The stock assessment produce estimates of stock size well above the proxy PRI of $75\%B_{MSY}$, providing a high level of certainty. **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

Fishing mortality on the stock (average F , ages 1–10) averaged roughly 0.08 yr^{-1} during 2013-2015, or about 45% below F_{MSY} . The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model (Figure 15) and shows that spawning stock biomass declined to almost the MSY level in the mid-1990s, but SSB has remained above SSB_{MSY} throughout the time series (Figure 14). Confidence intervals indicated in the figures provide a high degree of certainty that the stock has been above the MSY level over recent years. **SG80 and SG100 are met.**

References

ISC_BWG (2018a)

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)	The level of spawning biomass in the absence of fishing ($\text{SB}_{F=0}$) Assumed PRI: $75\%B_{\text{MSY}}$	Base case estimate $\text{SB}_{\text{latest}}/\text{SB}_{\text{MSY}}$: 1.87 (range shown in Figure 14)	A high level of confidence that $\text{SB}_{\text{latest}}$ is above the PRI.
Reference point used in scoring stock relative to MSY (SIb)	B_{MSY}	Base case estimate $\text{SB}_{\text{latest}}/\text{SB}_{\text{MSY}}$: 1.87 (range shown in Figure 14)	A high level of confidence that $\text{SB}_{\text{latest}}$ is above the MSY level.

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

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 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 defines a harvest strategy as ‘the combination of monitoring, stock assessment, harvest control rules and management actions’. An overriding principle of the WCPFC Convention is ensure that management is based on the best scientific evidence available and measures adopted are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield. In 2019, the WCPFC accepted a recommendation from the Northern Committee on the harvest strategy for WCNPO swordfish fisheries to apply to stocks in the Convention Area north of 20°N, and associated fisheries (WCPFC (2020b) - Attachment K). The objective of this strategy is stated as “.....to support thriving swordfish fisheries in the North Pacific while maintaining the stock size at levels capable of producing maximum sustainable yield”. This harvest strategy includes a requirement that if the average exploitation rate for the most recent period has been found, using the best point estimate, to exceed the F-limit, the Northern Committee will, at its next regular session or intersessionally if warranted, formulate conservation and management recommendations that are designed to reduce the fishing mortality rate below the F-limit as soon as feasible. The work programme for the WCPFC NC for 2021-2023 includes an objective to further develop the harvest strategy consistent with CMM 2014-06 (WCPFC_NC, 2020).

The current assessment and status information, as well as the monitoring in place, suggest that the measures in place are sufficient to expect stock management objectives to be achieved, **meeting SG60 requirements**. However, further development of the harvest strategy is required to demonstrate it is responsive to the state of the stock and that the elements of the strategy are working together to achieve objectives. **SG80 and SG100 are not met**.

b	Harvest strategy evaluation
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	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 2018 stock assessment (ISC_BWG, 2018a) found that the stock is likely not overfished and not subject to overfishing. The assessment provides projection scenarios, applied to the base case model results, to evaluate the impact of alternative levels of fishing intensity on future spawning biomass and yield for WCNPO swordfish. The results show that projected female spawning biomass is expected to remain above SSB_{MSY} under all harvest scenarios examined. This provides evidence that the measures in place have been achieving sustainability objectives reflected in PI 1.1.1 SG80. **SG60 and SG80 requirements are met.** Development of the harvest strategy is a component of the ISC research program and has not been 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

As indicated in PI 1.2.3, monitoring is in place for the fishery which provides sufficient information to support regular stock assessments. Internationally, systems are in place for recording catch and effort for fishing entities fishing on WCNPO swordfish. Fishing entities fishing in the WCPO are required to report all data on standard WCPFC forms. The available data support a sophisticated stock assessment process which provides outputs relative to reference points, enabling evaluation of whether the harvest strategy is working. **SG60 requirements are met.**

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

Rationale

The effectiveness of the harvest strategy has not been reviewed in any detail; **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

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?	NA	NA	NA

Rationale

Swordfish are 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. In addition, Hawaii longline SAFE data for 2020 (WPRFMC, 2020) indicate a release rate of swordfish of 3.3%. Available information indicates that this scoring issue is likely not relevant to the UoA. **However, this should be discussed further at the site visit.**

References

ISC_BWG (2018a), WCPFC (2020b) and WPRFMC (2020)

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

Draft scoring range	60-79
Information gap indicator	<p>More information sought:</p> <ul style="list-style-type: none"> - What is the reason for swordfish (and yellowfin and bigeye) being released? Are these released fish included in catch reporting to the RFMO? - MSC assessment of the US North Atlantic Swordfish Fishery discusses a prohibition on the taking of swordfish weighing less than 25 kg live weight. Are there any similar regulations for the Hawaii longline fishery?

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

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

First, MSC FS v2.01 SA2.5.2a provides for a 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 WCNPO swordfish stock assessment provides probabilistic estimates of parameters of interest, and uncertainty has been extensively explored through sensitivity tests (ISC_BWG, 2018a). The time series of SSB shows that SSB declined to almost the MSY level in the mid-1990s, but SSB has remained above SSB_{MSY} throughout the time series (Figure 14). The 2018 assessment provides projection scenarios, applied to the base case model results, to evaluate the impact of alternative levels of fishing intensity on future spawning biomass and yield for WCNPO swordfish. The results show that projected female spawning biomass is expected to remain above SSB_{MSY} under all harvest scenarios examined (Figure 16). **The SA2.5.2a requirement is therefore met (SG60).**

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 to adopt HCRs before the stock declines below B_{MSY} ”.

In December 2019, the WCPFC accepted a recommendation from the Northern Committee on the harvest strategy for WCNPO swordfish fisheries to apply to stocks in the Convention Area north of 20°N, and associated fisheries (WCPFC (2020b) - Attachment K). The objective of this strategy is stated as “.....to support thriving

swordfish fisheries in the North Pacific while maintaining the stock size at levels capable of producing maximum sustainable yield”. This harvest strategy includes a requirement that if the average exploitation rate for the most recent period has been found, using the best point estimate, to exceed the F-limit, the Northern Committee will, at its next regular session or intersessionally if warranted, formulate conservation and management recommendations that are designed to reduce the fishing mortality rate below the F-limit as soon as feasible. The work programme for the WCPFC NC for 2021-2023 includes an objective to further develop the harvest strategy consistent with CMM 2014-06 (WCPFC_NC, 2020). 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 SA2.5.3b requirement is therefore met and the **fishery meets SG60**.

SG80 and SG100 not met because there are not yet well-defined harvest control rules in place.

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.
	Met?	Yes	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 2018 assessment suggests that the stock is not overfished nor is there overfishing. Stock projections indicate that female spawning biomass is expected to remain above SSB_{MSY} under all harvest scenarios examined in the assessment (Figure 16). The agreed limit reference point for the exploitation rate is F_{MSY} . There is no evidence of excess fishing mortality above F_{MSY} ($F_{2013-2015}$ is 45% of F_{MSY}) in the 2018 assessment (ISC_BWG, 2018a). This provides evidence that the current tools are working. FS 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, MSC FS 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 (2019 agreement to develop the current harvest strategy to be consistent with CMM 2014-06).

The requirements for **‘available’ tools at SG60 are therefore met. SG80 and SG100 are not met** because there is not a well-defined HCR.

References

ISC (2018), ISC_BWG (2018a), WCPFC (2020b) and WCPFC_NC (2020)

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

As summarised in ISC_BWG (2018a), catch and size composition data are collected from ISC countries (Japan, Taiwan, and USA), IATTC member countries, and the WCPFC. Standardized CPUE data used to measure trends in relative abundance were provided by Japan, USA, and Chinese Taipei for the stock assessment. Sex-specific growth curves and natural mortality rates are used to account for the sexual dimorphism of adult swordfish. The Hawaii longline fishery was the first in the U.S. to require daily logbook reporting (Kaneko and Bartram, 2014). These logbooks provide detailed operational information and catch in number of fish. The vessel operator must complete a paper or electronic logbook form within 24 hours of the end of each fishing day and the vessel operator must submit the completed and signed logbook to NMFS PIFSC within 72 hours of returning to port.

The ISC BWG coordinates biological research and disseminates research results and statistics to cooperating scientists and the management bodies in support of the harvest strategy. Detailed fleet information on the WCNPO swordfish fisheries is maintained and used in the stock assessment. Relative abundance indices for WCNPO swordfish based on standardized CPUE are an important element of the stock assessment in support of the generally understood HCR. **SG60 and SG80 requirements are met.**

ISC_BWG (2018a) acknowledges that the lack of sex-specific size data and the simplified treatment of the spatial structure of swordfish population dynamics remained as two important sources of uncertainty for improving future assessments. A recent study has examined the nursery origin and population connectivity of swordfish in the North Pacific, providing new information on the connectivity of the swordfish population which warrants consideration in future consideration of stock status (Wells et al., 2021).

At NC15 in 2019 the U.S. delegation emphasized that it is in the interest of the NC that the ISC work with IATTC staff scientists so that the next North Pacific swordfish stock assessment includes both the WCNPO stock and the stock that straddles the EPO and WCPO regions. The team concludes that the available information is not comprehensive and **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

The WCNPO stock assessment estimates stock abundance using catch and effort data and size composition data. Standardized abundance indices are regularly developed by the ISC BWG. A total of 18 fisheries that impacted swordfish were defined on the basis of country, gear type, location, and time period where each fishery was considered to target a distinct component of the stock (ISC_BWG, 2018a). The area considered in the assessment consisted of waters of the North Pacific Ocean contained in the boundaries north of the equator and west of the diagonal purple line in Figure 13 labelled stock area 1 (ISC_BWG, 2018a). All available fishery data from this area were used for the stock assessment in support of the harvest strategy. Relative abundance indices for WCNPO swordfish based on standardized CPUE are an important element of the stock assessment in support of the generally understood HCR.

Various sources of data are used to monitor U.S. pelagic fisheries. The statistical data systems that collect and process fisheries data consist of logbooks and fish catch reports submitted by fishers, at-sea observers, and port samplers. The Hawaii longline fisheries are monitored using the NOAA Fisheries Western Pacific Daily Longline Fishing Logs for effort and resulting catch. The coverage of logbook data is assumed to be complete (100%). In Hawaii, fish sales records from the Hawaii Division of Aquatic Resources (DAR) Commercial Marine Dealer Report database are an important supplementary source of information, covering virtually 100% of the Hawaii-based longline landings.

The data are sufficient to meet SG60 and SG80 requirements.

In relation to SG100, it is unlikely that all information is collected with a high frequency and high degree of certainty. The stock assessment and ISC note a variety of uncertainties (e.g. the spatial structure of swordfish population). A more comprehensive harvest strategy with appropriate harvest control rules is required for the fishery. It is not clear whether information required for this is sufficient to meet SG100 requirements. **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

For the assessment, as summarised in ISC_BWG (2018a), catch and size composition data were collected from ISC countries (Japan, Taiwan, and USA), IATTC member countries, and the WCPFC. ISC_BWG (2018a) notes some gaps in the data which require the use of alternative data sources. Overall, the BWG preparing the data for the 2018 stock assessment accepted the updated swordfish catch time series as the best available scientific information to conduct the assessment (ISC_BWG, 2018b). The available information **meets SG80 requirements**. However, further information is requested on the level of recreational catch of swordfish.

References

ISC_BWG (2018a, 2018b), Kaneko and Bartram (2014), Wells et al. (2021)

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

Draft scoring range	≥80
Information gap indicator	More information sought re the level of recreational fishing for swordfish.

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	No

Rationale

The stock assessment is undertaken by the ISC Billfish Working Group using the Stock Synthesis v3.3 (SS3) framework. SS3 is a framework for exploring and implementing integrated length-and-age-based statistical catch-at-age models. The method has generally been accepted as rigorous. The WCNPO model was set up as a single area model with two sexes and four seasons (quarters), with agreed sex specific biological parameters for sex- and age-specific natural mortality (ISC_BWG, 2018a). The integrated stock assessment considers a range uncertainty and takes into account the details of various fisheries catching the stock (for example, a total of 18 fisheries that impacted swordfish were defined on the basis of country, gear type, location, and time period, where each fishery was considered to target a distinct component of the stock). Relative abundance indices for WCNPO swordfish based on standardized CPUE were prepared for the assessment. Sensitivity analysis is used to examine the effects of plausible alternative model assumptions and data input.

The assessment is appropriate for the generally understood HCR, **meeting SG80**. Whilst the assessment incorporates features relevant to the biology of swordfish and the nature of the UoA, ISC_BWG (2018a) acknowledges that the lack of sex-specific size data and the simplified treatment of the spatial structure of swordfish population dynamics remained as two important sources of uncertainty for improving future assessments. **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

The stock assessment provides reference point outputs such as MSY-related values and values of current biomass compared with the biomass in the absence of fishing. The assessment provides outputs of management-related indicators that are appropriate to the stock and can clearly be estimated, **meeting the SG60 and SG80 requirements**.

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

An intersessional workshop of the Billfish Working Group took place in January 2018, prior to the assessment meeting, to examine data uncertainties and prepare data for the stock assessment of North Pacific swordfish undertaken in July 2018 (ISC_BWG, 2018b). Data examined and prepared included catch by quarter, standardized CPUE, size composition data by quarter, tagging data, and life history parameters. Several sensitivity analyses were conducted to evaluate the effects of changes in model parameters, including the natural mortality rate, the stock-recruitment steepness, the growth curve parameters, and the female age at 50% maturity. **SG60 and SG80 requirements are met**.

The assessment examines stock status relative to MSY-based reference points and provides 95% confidence intervals for estimated values. **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

As indicated above, sensitivity analyses are conducted to evaluate uncertainty in the stock assessment. In addition, in 2018 the Billfish Working Group was provided with the outputs of a Bayesian surplus production model which was an update of a 2014 model. The outcomes of this update also indicated that the stock was not overfished nor subject to overfishing (ISC_BWG, 2018a). However, it is not evident that this work and the sensitivity analyses undertaken comprise a rigorous exploration of alternative hypotheses. **SG100 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

The stock assessment report is reviewed by ISC in their plenary and through other WCPFC and IATTC internal processes. This level of internal review is sufficient to indicate that **SG80 is met**. There is no indication that the assessment has been externally peer reviewed. **SG100 is not met.**

References

ISC_BWG (2018a, 2018b)

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)	

6.5 Principle 1: WCPO bigeye tuna

6.5.1 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 17). 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) is not a key low trophic level species.

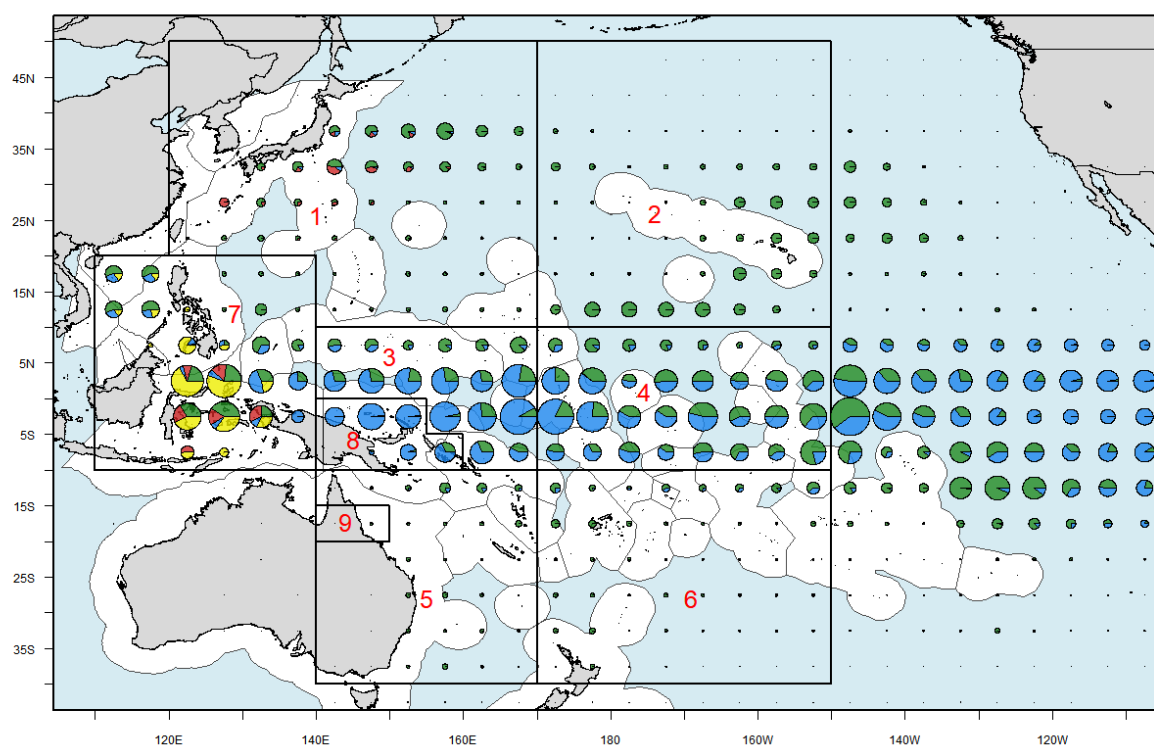


Figure 17. Distribution and magnitude of bigeye tuna catches for the most recent decade of the stock assessment (2009-2018) by 5 degree square and fishing gear: longline (green), pole-and-line (red), purse seine (blue) and miscellaneous (yellow), for the WCPO and part of the EPO. Overlaid are the regional boundaries for the stock assessment. Source: Ducharme-Barth et al. (2020).

6.5.1.1 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.

6.5.1.2 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.

6.5.1.3 Stock definition

Bigeye tuna are distributed throughout tropical and sub-tropical waters of the Pacific Ocean (Figure 17). 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.

6.5.2 **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 17 and the time series of total annual catch by fishing gear over the full assessment period is shown in Figure 18. 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).

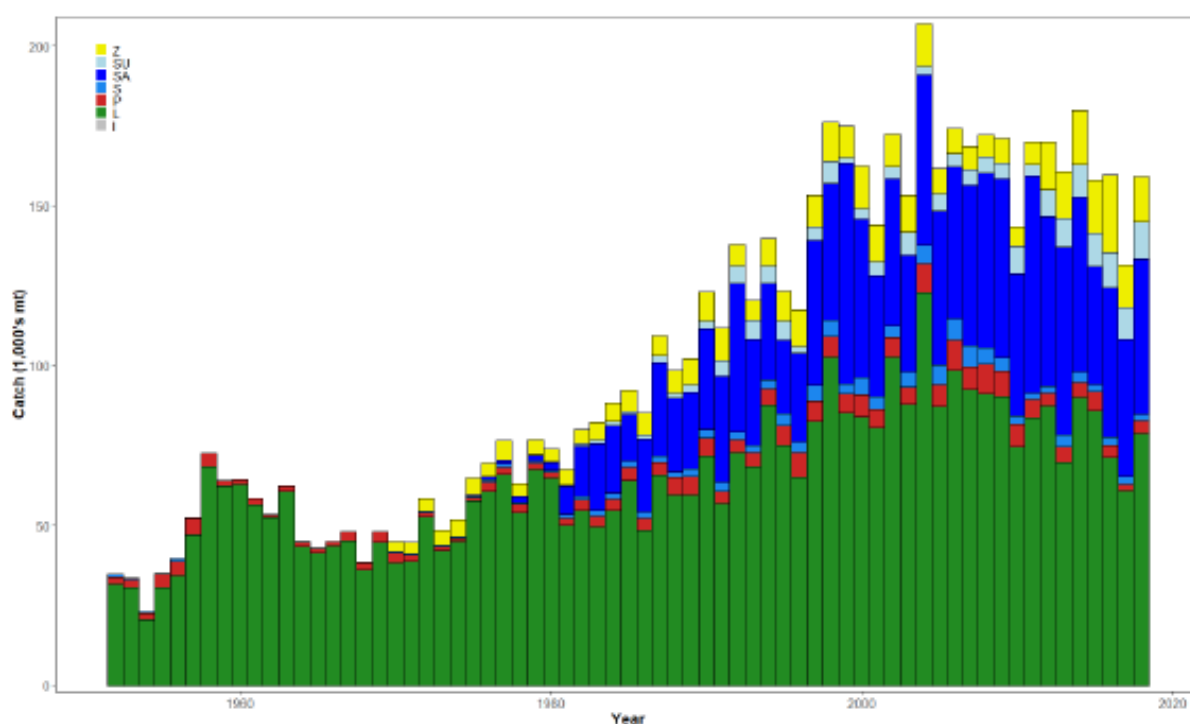


Figure 18. Time series of total annual catch (1000's mt) by fishing gear for the diagnostic case model over the full assessment period. The different colours refer to longline (green), pole-and-line (red), purse seine (blue), purse seine associated (dark blue), purse seine unassociated (light blue), 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 ($SB_{2015-2018}/SB_{F=0}$) 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 ($F_{2014-2017}/F_{MSY}$) 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 23. Time-dynamic percentiles of depletion ($SB_t/SB_{t,F=0}$) for the 24 models are shown in Figure 19. A Kobe plot summarising the results for each of the 24 models in the structural uncertainty grid is shown in Figure 20. 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 23. 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	10 th percentile	90 th 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_{Recent}	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
$F_{\text{Recent}}/F_{\text{MSY}}$	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
$SB_{\text{MSY}}/SB_{F=0}$	0.23	0.23	0.19	0.2	0.26	0.26
$SB_{\text{latest}}/SB_{F=0}$	0.38	0.38	0.23	0.3	0.47	0.51
$SB_{\text{latest}}/SB_{\text{MSY}}$	1.7	1.67	0.95	1.23	2.15	2.6
$SB_{\text{recent}}/SB_{F=0}$	0.4	0.41	0.21	0.27	0.52	0.55
$SB_{\text{recent}}/SB_{\text{MSY}}$	1.78	1.83	0.87	1.18	2.32	2.84

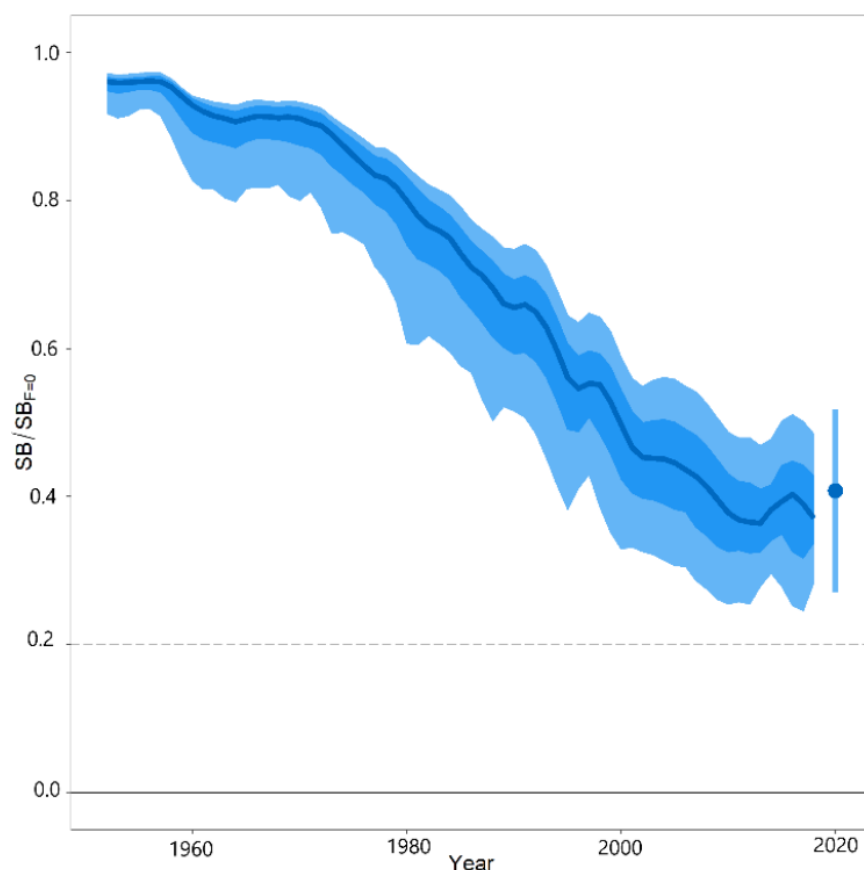


Figure 19. Time-dynamic percentiles of depletion ($SB_t/SB_{t;F=0}$) and median (dark line) across all 24 models in the structural uncertainty grid. The lighter band shows the 10th to 90th percentiles around the median, and the dark band shows the 50th percentile around the median. The median $SB_{\text{recent}}/SB_{F=0}$ and 80th percentile is shown on the right by the dot and line. Source: WCPFC_SC (2020a).

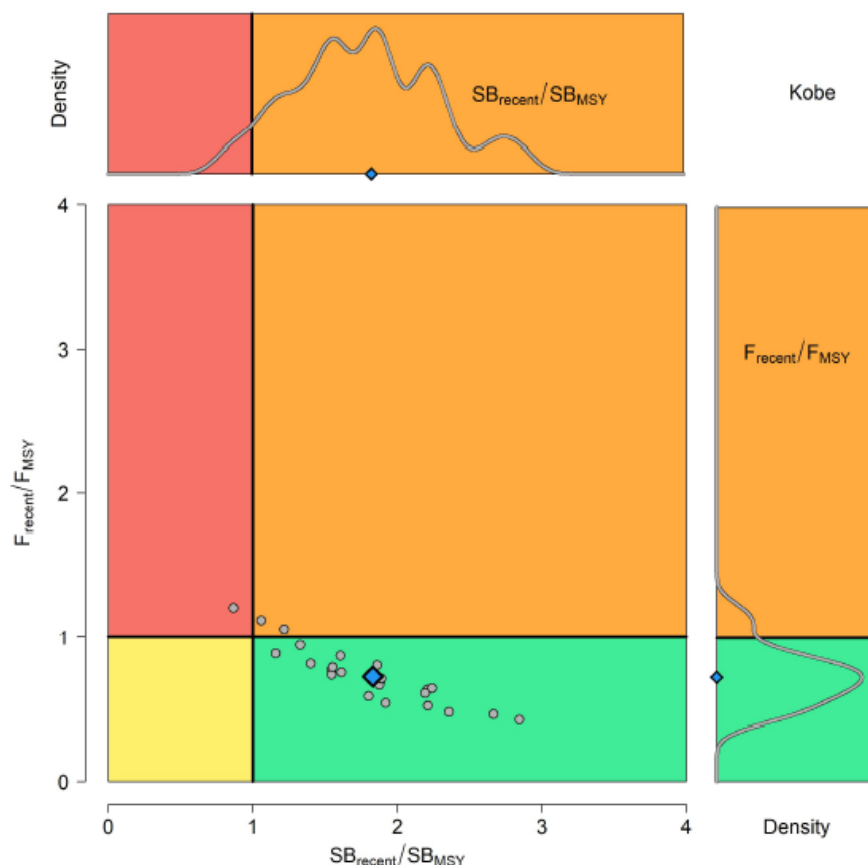


Figure 20. Kobe plot for the recent spawning potential (2015–2018) summarizing the results for each of the models in the structural uncertainty grid. The plots represent estimates of stock status in terms of spawning biomass depletion and fishing mortality. Marginal distributions of each are presented. The median is shown in blue. Source: WCPFC_SC (2020a).

6.5.3 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 (WCPFC, 2020a). The WCPO bigeye 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. CMM 2020-01 also sets longline bigeye catch limits by flag (including charter vessels) for the distant water nations. The U.S. longline fishery bigeye tuna limit in the WCPO was 3,554 t in 2015. In 2016, it was reduced to 3,138 t in 2017 but increased back to 3,554 t in 2018 and 2019. An example of this limit in operation is that on July 24, 2019, NMFS issued

a temporary rule closing the U.S. pelagic longline fishery for bigeye tuna in the WCPO because the fishery had reached the 2019 catch limit (NMFS, 2019d).

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, 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 21.

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

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

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) lists the activities for the latest workplan schedule for yellowfin and bigeye, as follows:

2021: Agree Target Reference Point

- SC provide advice on potential Target Reference Points for yellowfin and bigeye; and
- Commission agree a TRP for yellowfin and bigeye.

2022: Develop management procedures and Management strategy evaluation.

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

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 derogation⁴ 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 derogation⁵ 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.

6.5.3.1 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'.

⁴ <https://www.msc.org/docs/default-source/default-document-library/stakeholders/covid-19-pandemic-derogation-march-2020.pdf>.

⁵ <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>.

6.5.4 Principle 1 Performance Indicator scores and rationales: WCPO bigeye

Scoring table 7. 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 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 23). 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 was an 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 SB_{latest}) 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 23). 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 21.

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) lists the activities for the latest workplan schedule for yellowfin and bigeye, as follows:

2021: Agree Target Reference Point

- SC provide advice on potential Target Reference Points for yellowfin and bigeye; and
- Commission agree a TRP for yellowfin and bigeye.

2022: Develop management procedures and Management strategy evaluation.

- SC provide advice on performance of potential management procedures;
- TCC consider the implications of potential management procedures; and
- Commission consider advice on progress towards management procedures.

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 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

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. **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 U.S Federal reporting requirements. Observer data are collected through the Regional Observer Programme (ROP) or national observer programmes. As indicated above, WCPFC has adopted numerous CMMs that 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			
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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?	NA	NA	NA

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). Hawaii longline SAFE data for 2020 indicate a discard rate of bigeye of 2.3% (WPRFMC, 2020).

Available information suggests that this scoring issue is not relevant to the UoA, **although this should be confirmed at the site visit.**

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	60-79
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?
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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 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

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 $SB_{\text{recent}}/SB_{\text{MSY}}$ is 1.83 and the probability that $SB_{\text{recent}} < LRP$ is estimated to be 0%. The median $F_{\text{recent}}/F_{\text{MSY}}$ 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.
	Met?	Yes	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 and SG100 are 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:

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. 2020). 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.

Fishery-independent information

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.

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.

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)).

Various sources of data are used to monitor U.S. pelagic fisheries. The statistical data systems that collect and process fisheries data consist of logbooks and fish catch reports submitted by fishers, at-sea observers, and port samplers. The Hawaii longline fisheries are monitored using the NOAA Fisheries Western Pacific Daily Longline Fishing Logs for effort and resulting catch. The coverage of logbook data is assumed to be complete (100%). In Hawaii, fish sales records from the Hawaii Division of Aquatic Resources (DAR) Commercial Marine Dealer Report database are an important supplementary source of information, covering virtually 100% of the Hawaii-based longline landings.

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 illegal, unreported and unregulated (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 transshipments and provides evidence that points to the possibility of significant levels of undeclared transshipments 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
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	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, 2020a). 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)	

6.6 Principle 1: WCPO yellowfin tuna

6.6.1 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.

6.6.1.1 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 22). However, growth rates are uncertain and may vary significantly by area in the Western Pacific.

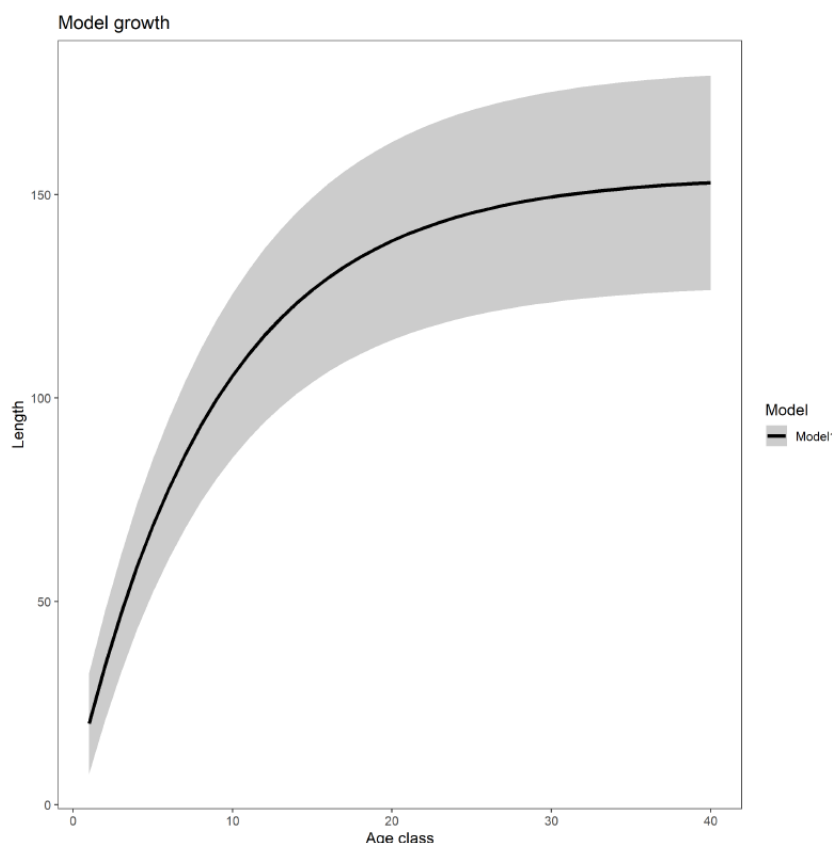


Figure 22. Yellowfin tuna estimated growth for the diagnostic case model. The black line represents the estimated mean fork length (cm) at-age and the shaded region represents the length-at-age within one standard deviation of the mean, for the diagnostic case model. Source: Vincent et al. (2020).

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.

6.6.1.2 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 23). 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.

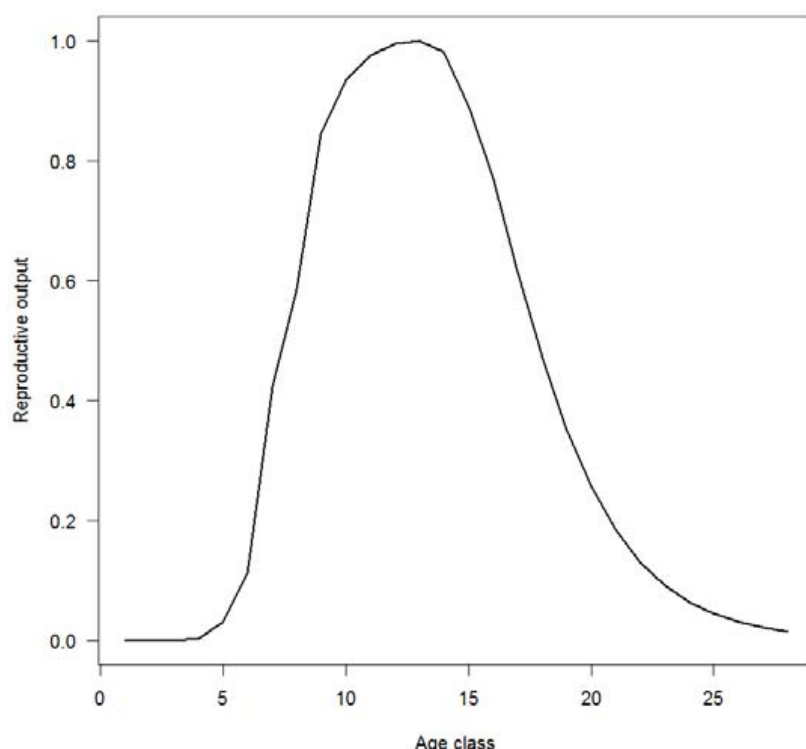


Figure 23. Yellowfin tuna: Index of spawning potential incorporating information on sex ratios, maturity at age, fecundity, and spawning fraction. Source: Davies et al. (2014).

6.6.1.3 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 24) (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).

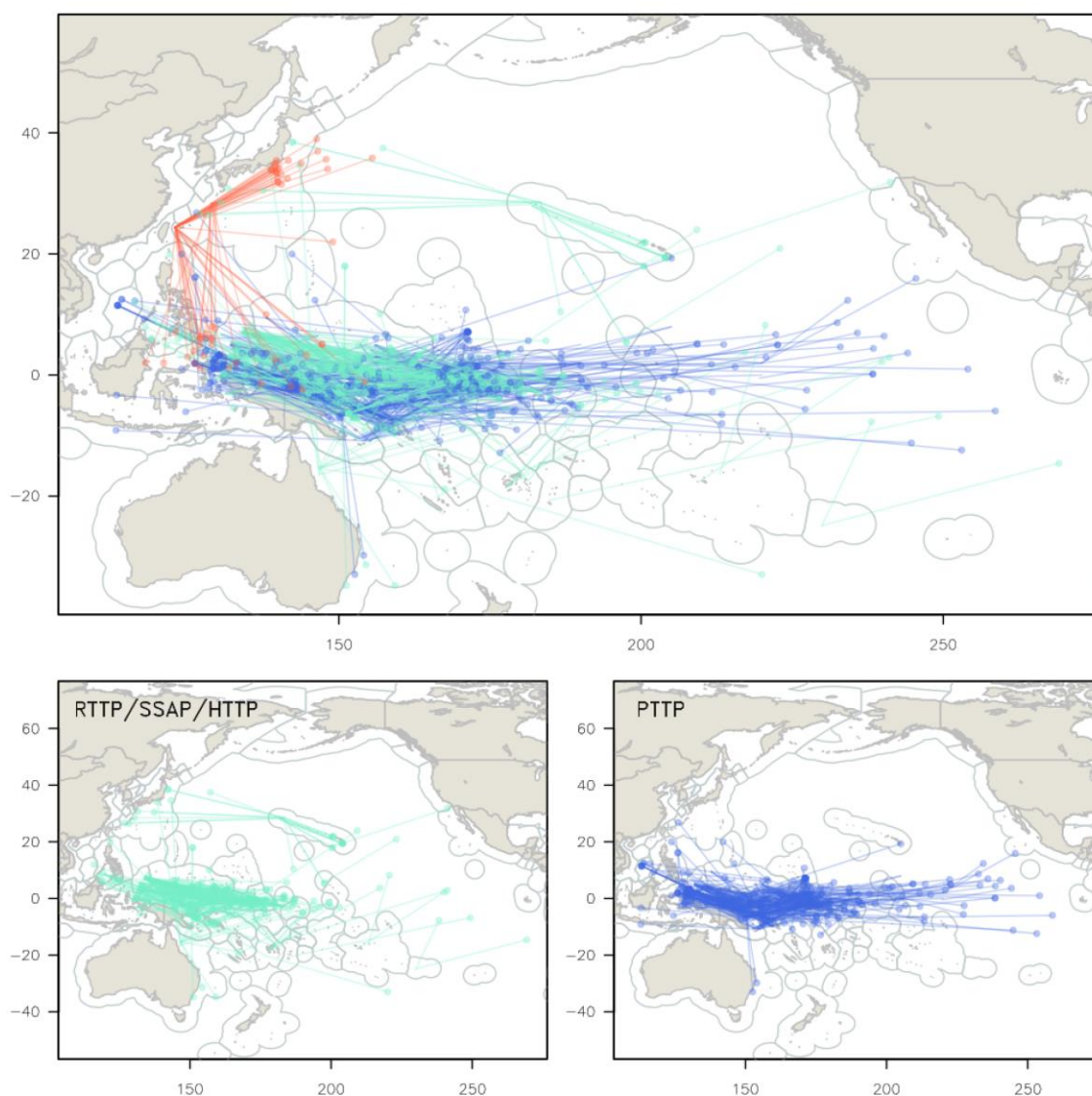


Figure 24. Map of the movements of tagged yellowfin released in the Pacific Ocean and subsequently recaptured more than 1,000 nautical miles from their release site. RTTP – Regional Tuna Tagging Program;

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 25) (Vincent et al., 2020).

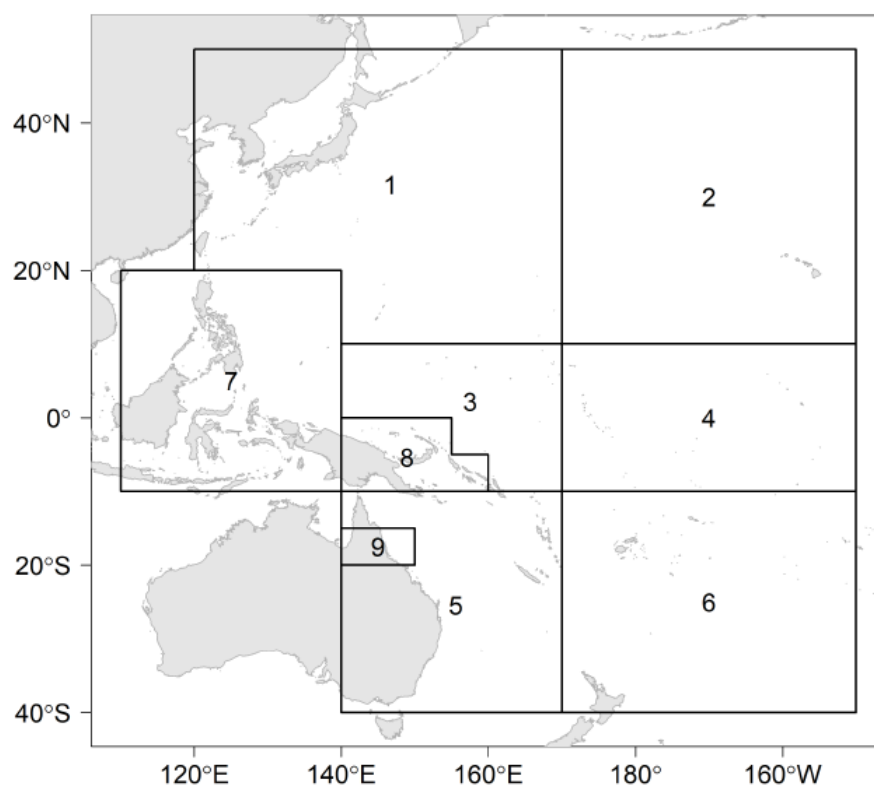


Figure 25. The geographical area covered by the stock assessment and the boundaries for the 9 regions defined in the 2020 assessment. Source: Vincent et al. (2020).

6.6.2 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 26 and the time series of total annual catch by fishing gear over the full assessment period is shown in Figure 27. 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 ($SB_{2015-2018}/SB_{F=0}$) 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 ($F_{2014-2017}/F_{MSY}$) 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%.

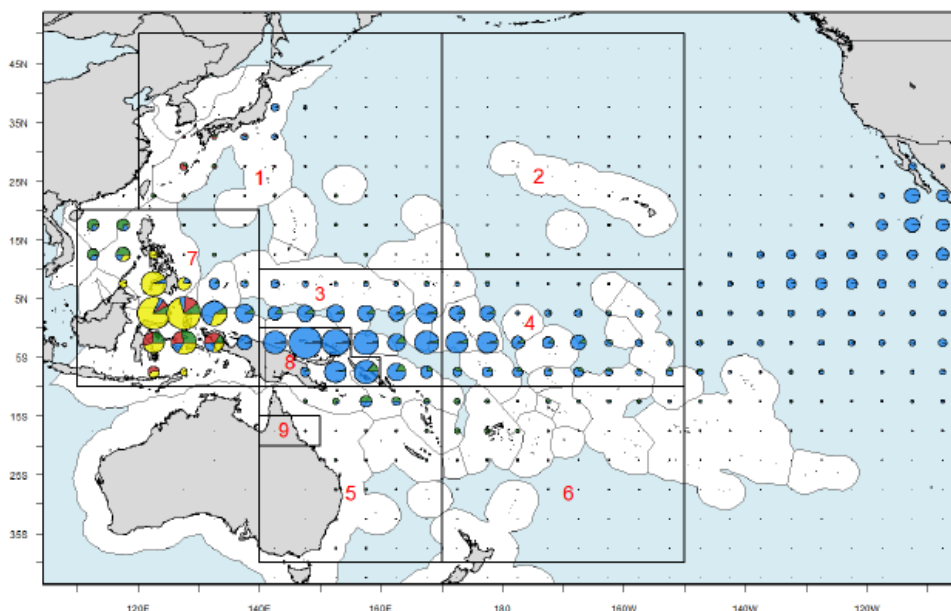


Figure 26. Yellowfin tuna catches for the most recent decade of the stock assessment (2009-2018) by 50 square and fishing gear: longline (green), pole-and-line (red), purse seine (blue) and miscellaneous (yellow), for the WCPO and part of the EPO. Overlaid are the regional boundaries for the stock assessment. Source: Vincent et al. (2020).

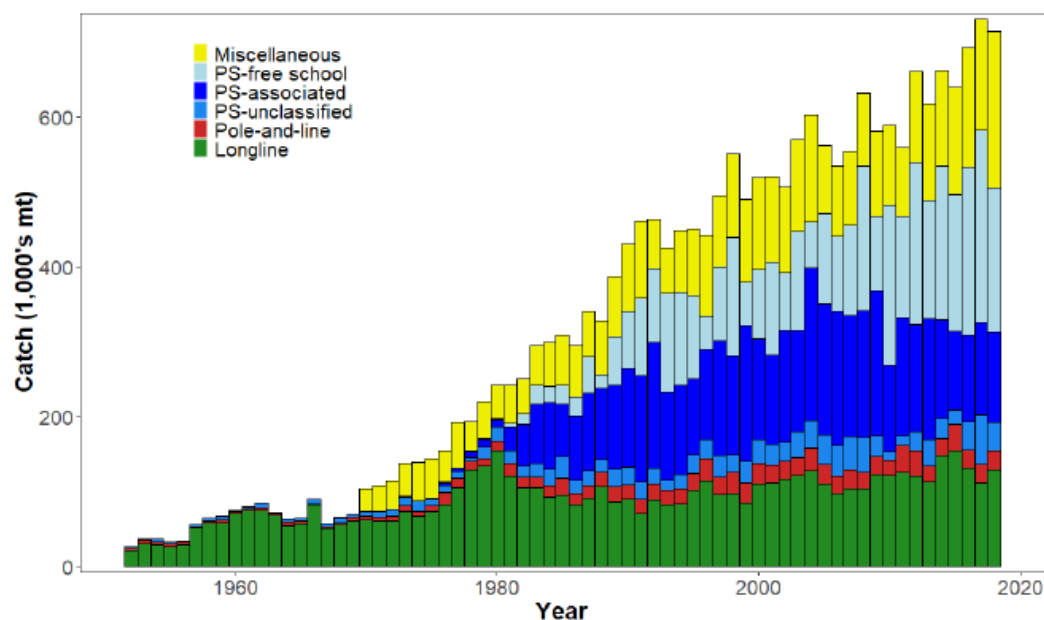


Figure 27. Time series of total annual catch (1000's mt) by fishing gear over the full assessment region and time period. The different colours denote longline (L) (green), pole-and-line (P) (red), purse seine (S) (blue), purse seine-associated (S) (dark blue), purse seine-unassociated (S) (lightblue), miscellaneous (yellow) Source: Vincent et al. (2020).

Reference point values for the 2020 assessment are summarized in Table 24. Time-dynamic percentiles of depletion ($SB_t/SB_{t,F=0}$) for the 72 models are shown in Figure 27. A Kobe plot summarising the results for each of the 72 models in the structural uncertainty grid is shown in Figure 28.

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 24. 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

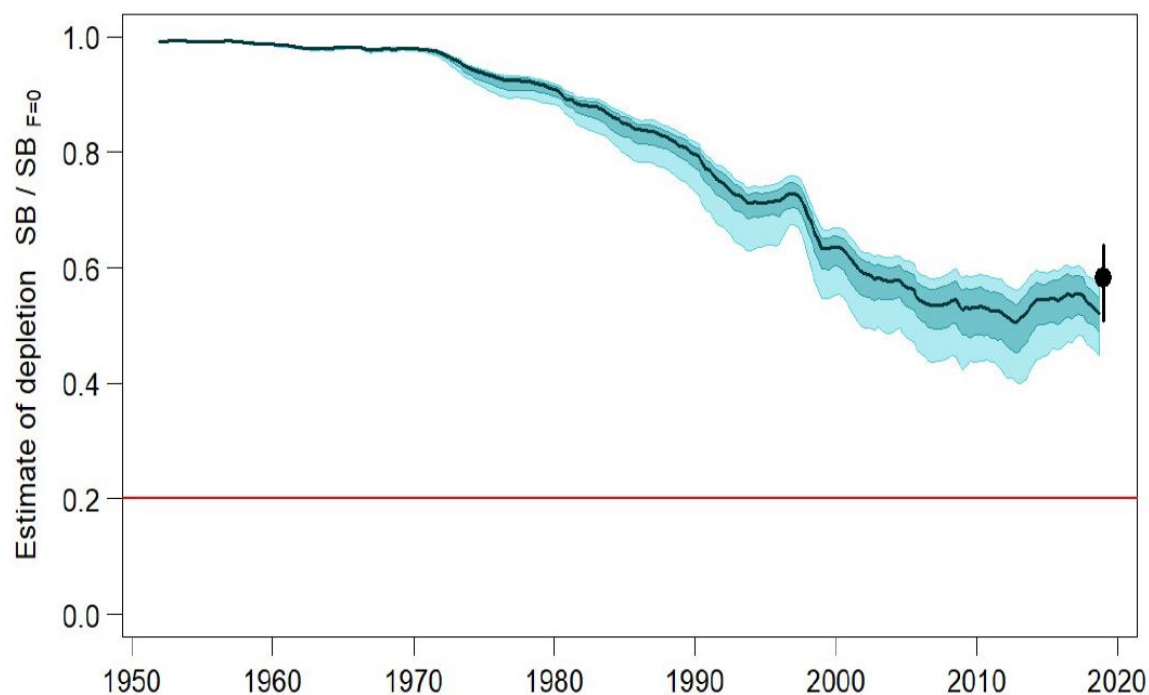


Figure 28. Plot showing the trajectories of fishing depletion of spawning potential for the models in the structural uncertainty grid for the median, 50% quantile, and 80% quantile of instantaneous depletion across the structural uncertainty grid and the point and error bars is the median and 10th and 90th percentile of estimates of $SB_{\text{recent}}/SB_{F=0}$. Source: WCPFC_SC (2020a).

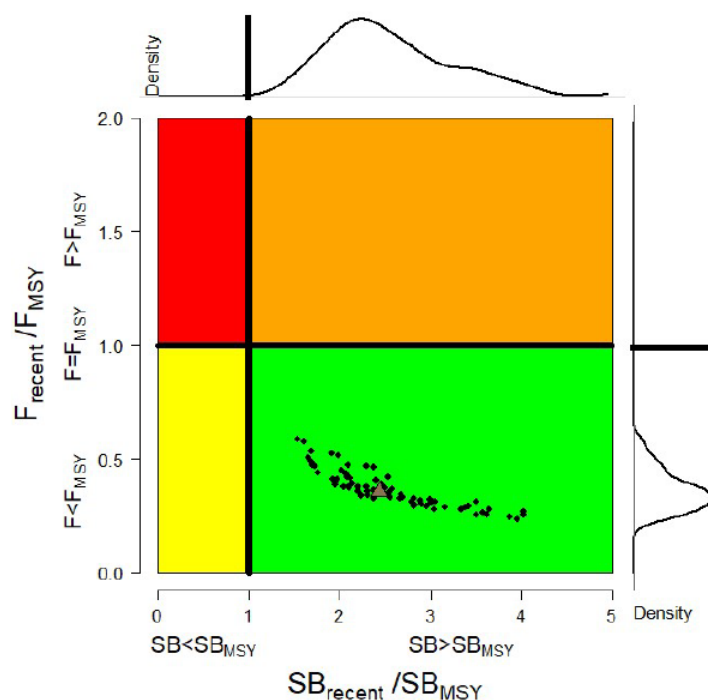


Figure 29. Kobe plot for the recent spawning potential (2015–2018) summarizing the results for each of the models in the structural uncertainty grid. The plots represent estimates of stock status in terms of spawning biomass depletion and fishing mortality relative to MSY quantities and marginal distributions of each are presented with the median of the structural uncertainty grid displayed as a brown triangle. Source: WCPFC_SC (2020a).

6.6.3 Harvest strategy

The CMM 2020-01 measures related to longline fishing for bigeye are not in place for yellowfin. Other than that, the harvest strategy status and development is as indicated in Section 6.5.3 for WCPO bigeye.

6.6.4 Principle 1 Performance Indicator scores and rationales: WCPO yellowfin

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

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 24). 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 was an 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 SB_{latest}) 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 24). 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 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**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 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 21.

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) lists the activities for the latest workplan schedule for yellowfin and bigeye, as follows:

2021: Agree Target Reference Point

- SC provide advice on potential Target Reference Points for yellowfin and bigeye;
- Commission agree a TRP for yellowfin and bigeye.

2022: Develop management procedures and Management strategy evaluation.

- SC provide advice on performance of potential management procedures;
- TCC consider the implications of potential management procedures;
- Commission consider advice on progress towards management procedures

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 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

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, 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 U.S Federal 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

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 are not a shark; this scoring issue is not relevant.

f	Review of alternative measures		
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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?	NA	NA	NA

Rationale

Available information indicates there is negligible unwanted catch of the target stock. 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). Hawaii longline SAFE data for 2020 indicates a release rate of yellowfin of 2.2% (WPRFMC, 2020).

Available information suggests the scoring issue is not relevant, **although this requires confirming at the site visit.**

References

Vincent et al. (2020), WCPFC (2021), WCPFC_SC (2020a), WPRFMC (2020), 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	60-79
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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 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

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 and SG100 are not met**.

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

Rationale

HCRs are still under development, The ‘available’ HCR does not allow evaluation of robustness to the main uncertainties; **SG80 and SG100 are 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.
	Met?	Yes	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 Sla 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, 2020a)

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 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

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.

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:

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., 2020). 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 uncertainty about age and growth and stock structure. 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. Abundance indices monitored include CPUE for purse seine and 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.

Various sources of data are used to monitor U.S. pelagic fisheries. The statistical data systems that collect and process fisheries data consist of logbooks and fish catch reports submitted by fishers, at-sea observers, and port samplers. The Hawaii longline fisheries are monitored using the NOAA Fisheries Western Pacific Daily Longline Fishing Logs for effort and resulting catch. The coverage of logbook data is assumed to be complete (100%). In Hawaii, fish sales records from the Hawaii Division of Aquatic Resources (DAR) Commercial Marine Dealer Report database are an important supplementary source of information, covering virtually 100% of the Hawaii-based longline landings.

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 transshipments and provides evidence that points to the possibility of significant levels of undeclared transshipments 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 2020; Williams et al. 2020 ; WCPFC-SC16-2020/ST-WP-01 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 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	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)	

6.7 Principle 1: EPO yellowfin tuna

6.7.1 Biology and ecology

Yellowfin tuna belong to the family Scombridae. They 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.

Yellowfin tuna grow rapidly, reaching 25 cm fork length at around three months and begin spawning at around 100 cm fork length. They grow to an estimated mean length for the final age-class of approximately 153 cm, with a maximum fork length close to 200 cm. Age and growth of yellowfin in the Eastern Pacific Ocean (EPO) has been based on daily otolith increments up to age 4. The panel reviewing the recent assessment have supported this approach and whilst supporting further examination of alternative growth relationships they indicated that this should be a low priority for the 2020 assessment (Cass-Calay et al., 2019).

Natural mortality varies with size, being lowest for pre-mature individuals (around 50-100 cm) and increasing for younger and older fish. 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. Tagging data suggest that it is commonplace for individuals to reach four years old. In stock assessments, natural mortality of yellowfin tuna has been modelled as a function of age and the curve representing this relationship has varied with the years, with maximum age at around 7 years.

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. 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 ~50 cm, but it will depend on, for instance, relative food availability in surface vs. deeper waters (Lehodey and Leroy, 1999).

6.7.1.1 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. Results of tagging in the EPO are limited but some have suggested the possibility of movements restricted to relatively small areas

(Schaefer, 2009). Tagging in the WCPO does indicate some level of long-distance movement towards the east.

There is some evidence that yellowfin stocks may be more discrete than simply western/eastern Pacific, based on genetic information (Grewe et al., 2016); however, there is insufficient information to base stock assessments on this possibility.

6.7.2 Stock assessment and information

The assessment of tropical tunas in the EPO is conducted by the IATTC. The IATTC has a role to manage yellowfin, bigeye and skipjack tuna stocks at levels that will support maximum sustainable yield (MSY).

Catches of yellowfin over time and their distribution for 2014-2018 are shown in Figure 30 and Figure 31, respectively. Catches peaked from 2001 to 2003. They subsequently declined and have been relatively stable for more than 10 years.

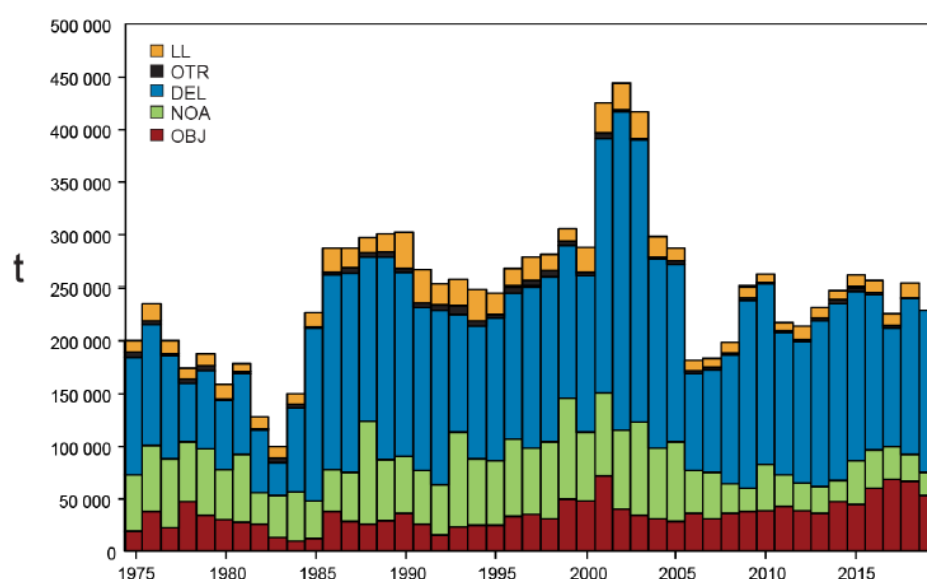


Figure 30. Total catches (retained catches plus discards) for the purse seine fisheries, by set type (DEL: dolphin-associated, NOA: Unassociated, OBJ: floating objects), and retained catches for the longline (LL) and other (OTR) fisheries, of yellowfin tuna in the eastern Pacific Ocean, 1975-2019. The purse seine catches are adjusted to the species composition estimate obtained from sampling the catches. The 2019 data are preliminary. Source: IATTC (2020a).

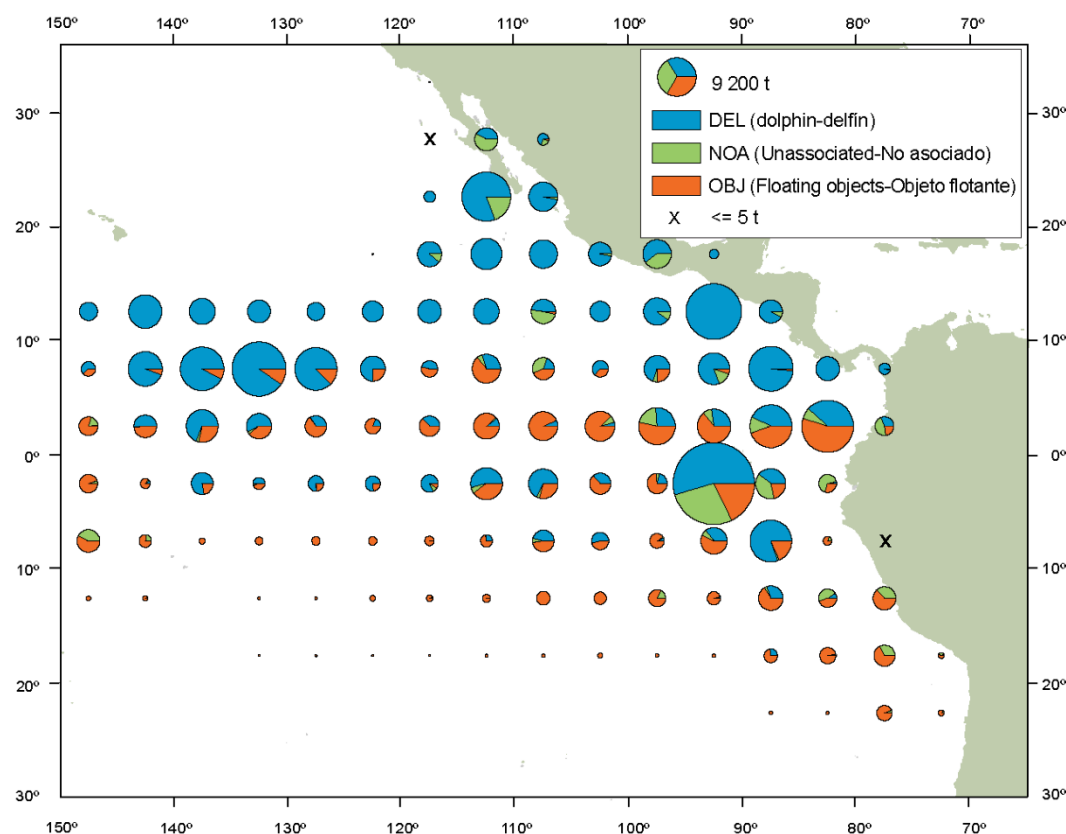


Figure 31. Distribution of purse seine catches of yellowfin, by set type, 2018. The sizes of the circles are proportional to the amount of yellowfin caught in those 5° by 5° areas. Source: IATTC (2019b).

There have been several recent stock assessments of EPO yellowfin. Data available for the assessments including retained catch, discards, CPUE, and size compositions of the catches from several different fisheries have been analyzed. Several assumptions regarding processes such as growth, recruitment, movement, natural mortality (M), and fishing mortality (F) are made. An integrated statistical catch-at-age model has been used in the stock assessments, implemented in Stock Synthesis 3 software which is able to integrate various sources of information and datasets. Advice from the assessments has typically been based on a base case model, with the sensitivity of the model outputs to a wide range of uncertainty being considered, including age/sex specific mortality, nature of the stock-recruitment relationship, selectivity patterns and model structure. The assessment typically provides estimates of spawning biomass, yield per recruit, MSY and other parameters. Assessments can be a “full assessment” or “benchmark” assessment, in which all major assumptions are reviewed and revised if appropriate; or an “update assessment” whereby new and updated data are incorporated using the current assumptions.

The 2019 stock assessment (Minte-Vera et al., 2019a) was an update of the previous assessment (Minte-Vera et al., 2018), using the same base case model as the previous assessment with the inclusion of new and updated data. Uncertainties in the 2019 assessment led the IATTC Scientific Advisory Committee (SAC) to conclude that further work was needed before the outcomes could be used as a basis for management advice, and a workplan was developed in preparation for the scheduled benchmark assessment in 2020 (IATTC, 2019b).

6.7.2.1 2020 assessment

Prior to 2020, stock assessments were based on a 'best assessment' approach consisting of defining a single stock assessment model (the 'base case') for each of yellowfin and bigeye which IATTC staff believed represented the most plausible ('best') assumptions and data about the biology and fisheries (IATTC_SAC, 2020b). As indicated above, in 2018 IATTC staff concluded that the results of its stock assessment of bigeye in the EPO were not reliable enough to be used as a basis for management advice to the Commission (in 2019 this conclusion was extended to the assessment of yellowfin; IATTC (2019c)). A major problem with these assessments is that their results became overly sensitive to the inclusion of new data, in particular recent observations for the indices of relative abundance from the longline fishery (IATTC_SAC, 2020b). A workplan was adopted to improve the stock assessments for tropical tunas, including external reviews of the assessments for bigeye and yellowfin which suggested a variety of alternatives to be considered.

In 2020, as a result of the workplan, a new benchmark assessment was produced for yellowfin (Minte-Vera et al., 2020). Rather than the 'base case' approach of previous assessments, a 'risk analysis' approach was adopted in which reference models are adopted to represent alternative assumptions about the species' biology, stock productivity, and/or the operation of the fisheries (IATTC_SAC, 2020b). The 2020 yellowfin benchmark assessment uses a total of 48 reference models, representing 12 different model configurations, each with four different values of steepness (0.7, 0.8, 0.9 and 1.0). The results from the reference models are combined in a risk analysis to provide management advice (Aires-da-Silva et al., 2020).

Aires-da-Silva et al. (2020) indicate the following elements of the updated approach:

- A benchmark stock assessment report for yellowfin (Minte-Vera et al., 2020) presenting the results from all reference models (model fits, diagnostics, derived quantities and estimated parameters that define stock status);
- A risk analysis (Maunder et al., 2020) which assesses current stock status and quantifies the probability (risk) of exceeding target and limit reference points specified in the IATTC harvest control rule, as well as the expected consequences of alternative management measures in terms of closure days;
- Stock status indicators (IATTC_SAC, 2020c) for all three tropical tuna species (yellowfin, bigeye, and skipjack); and
- Recommendations by the IATTC staff for the conservation of tropical tunas (IATTC_SAC, 2020b), based on the above.

The overall results of the risk analysis were presented, expressed in terms of the probabilities of exceeding the reference points specified in the HCR. For yellowfin, the overall results of the risk analysis indicate only a 9% probability that the fishing mortality corresponding to the maximum sustainable yield (F_{MSY}) has been exceeded (Figure 32). There is a 12% probability that the spawning stock biomass corresponding to the maximum sustainable yield (S_{MSY}) has been breached (Figure 33). The probability that the F and S limit reference points have been exceeded is zero (Figure 32 and Figure 33).

Aires-da-Silva et al. (2020) conclude that the risk analysis unambiguously shows that the yellowfin stock in the EPO is healthy. To capture the uncertainty about the population dynamics of yellowfin in the EPO, the 48 reference models, each reflecting a different hypothesis, were considered when

evaluating the status of the stock. Results from each model are shown on a Kobe plot (Figure 34). Spawning biomass ratios for the 48 models from the reference set are shown in Figure 35.

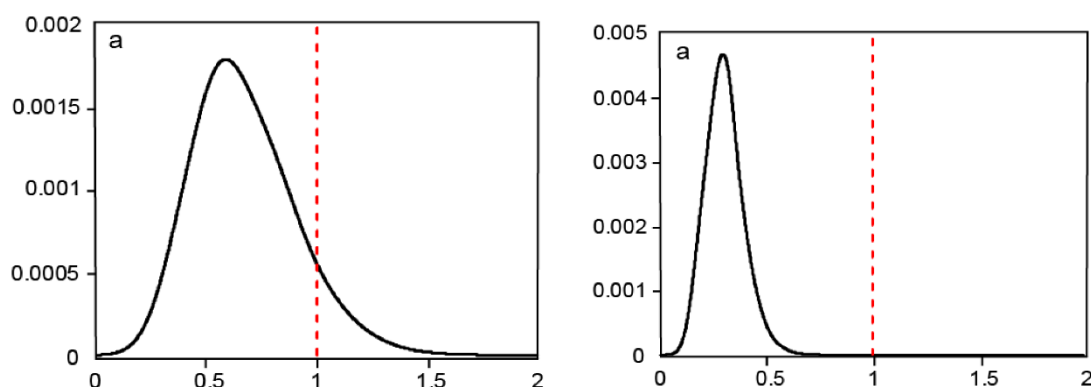


Figure 32. Yellowfin probability density functions for F_{cur}/F_{MSY} (left) and F_{cur}/F_{limit} (right). Source: Aires-da-Silva et al. (2020).

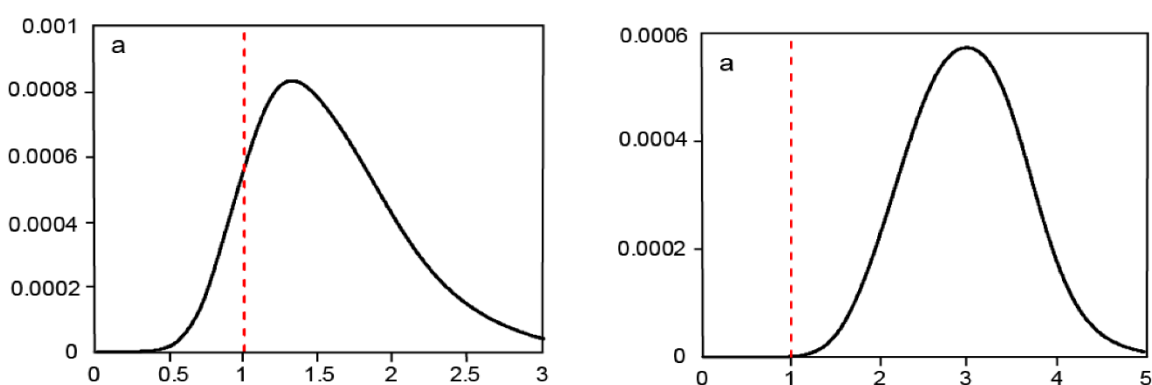


Figure 33. Yellowfin probability density functions for S_{cur}/S_{MSY} (left) and S_{cur}/S_{limit} (right). Source: Aires-da-Silva et al. (2020).

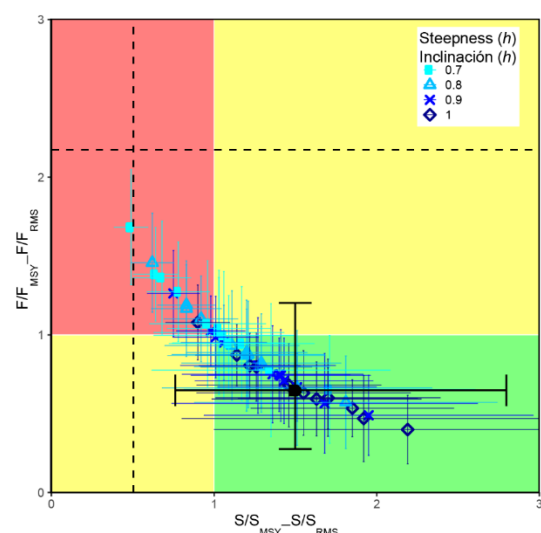


Figure 34. Kobe (phase) plot showing the current estimates of spawning stock size (S) and fishing mortality (F) of yellowfin tuna relative to MSY reference points. The colored panels are separated by the target reference points (S_{MSY} and F_{MSY}) and limit reference points (dashed lines). The center point for each model indicates the current stock status, based on the average fishing mortality (F) over the last three years. The solid black circle represents all models combined. The lines around each estimate represent its approximate 95% confidence interval. Source: IATTC_SAC (2020b).

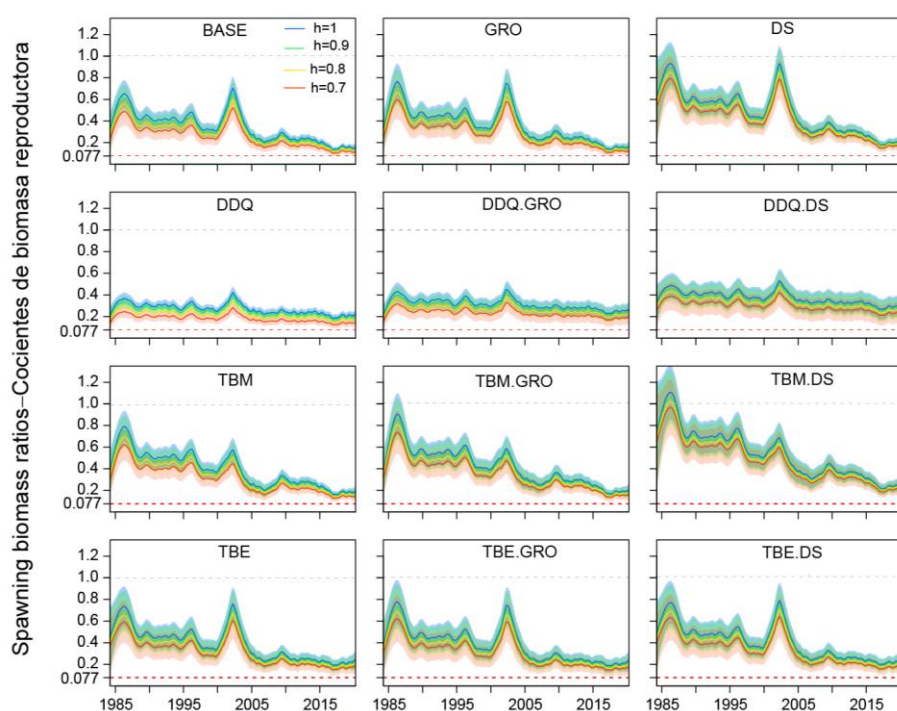


Figure 35. Spawning biomass ratios (SBRs) for yellowfin tuna in the EPO for the 48 models from the reference set. The red dashed horizontal line (at 0.077) identifies the SBR at the limit. The solid lines represent the maximum likelihood estimates (with colors corresponding to different values of the steepness parameter, h). The shaded areas are the approximate 95% confidence intervals around those estimates. Source: Minte-Vera et al. (2020).

Data-based stock status indicators (SSIs) have also been developed to monitor the yellowfin stock. The purse seine-based indicators used include: number of sets, by set type, closure-adjusted capacity, catch by set type, catch-per-set by set type, and average length of the fish in the retained catch, by set type. The indicators are used for historical comparisons and to identify trends, and can provide information that may be useful for stock management. The indicators are based on relative quantities, i.e. instead of comparing a value with a reference point based on the MSY of a species, it is compared with the distribution of its historical values (based on data from 2000 and using reference levels set at the 10% and 90% percentiles). IATTC_SAC (2020c) provides an update of the indicators for consideration in conjunction with the 2020 stock assessment. These indicators do not provide information on the state of the stock relative to the PRI, but do provide additional information for consideration. An important feature of the indicators is an increasing trend in the number of purse seine floating object sets over time. There has been a decrease in catch-per-set of yellowfin (as well as bigeye and skipjack) in the floating object fishery since 2000. There has also been a decline in average length of yellowfin (and bigeye and skipjack) in the floating object fishery. Longline catch has also decreased markedly since 2000. Yellowfin and bigeye CPUE has declined over time in the longline fishery (apart from an increase in 2020 for bigeye). Overall, IATTC staff conclude that the SSIs suggest that fishing mortality has increased for bigeye, yellowfin and skipjack, mainly due to the increase in the number of floating object sets.

6.7.3 Harvest strategy

The design of the harvest strategy is relatively straightforward. Put simply, if fishing mortality is higher than the level consistent with producing MSY, then reduce F to F_{MSY} . Implementation of the harvest

control rule has relied on estimation of a derived management parameter called the F-multiplier, which is the ratio of $F_{MSY}/F_{current}$ so that the amount of fishing mortality above or below F_{MSY} is represented as a proportion of effort (in days of fishing) that would have to be reduced if F exceeds F_{MSY} or that could allow an increase if $F_{current}$ is still below F_{MSY} . The F-multiplier is adjusted to account for the change in the fleet carrying capacity and then applied to the current number of days of open season. The multiplier is computed for yellowfin, bigeye and skipjack stocks, and the one with the lowest value is used as input in the following equation to obtain the total length in days of closure for the following fishing year.

In 2014, IATTC agreed on interim limit and target reference points intended to maintain stocks at MSY. The LRP for yellowfin is set at $0.28 * S_{MSY}$ which corresponds to a 50% reduction in recruitment from its average unexploited level based on a conservative value of stock-recruitment steepness (i.e. $h = 0.75$). The interim TRPs are F_{MSY} and S_{MSY} .

The harvest control rules for yellowfin, bigeye and skipjack are set out in IATTC Resolution C-16-02, based on the reference points set out above. The HCR is as follows:

- Multi-year management measures (closures are given as an example) will attempt to keep F below F_{MSY} for the species requiring the strictest management (i.e. the most vulnerable of the three tropical tuna species in terms of stock status);
- If the probability that $F > F_{lim}$ is $>10\%$, management measures shall be established such that there is at least a 50 % probability that F will reduce to F_{MSY} or below, and a probability of $<10\%$ of $F > F_{lim}$; and
- If the probability that $SB < SB_{lim}$ is $>10\%$, management measures shall be established such that there is at least a 50 % probability that SB will recover to SB_{MSY} or above, and a probability of $<10\%$ that SB will decline to $<SB_{lim}$ within two generations or 5 years, whichever is greater.

The main conservation measures for 2018 to 2020 established by the IATTC for yellowfin, bigeye and skipjack were Resolutions C-17-01 and C-17-02. These measures included:

- A closure of 72 days for purse seine vessels greater than 182 t capacity from 2018 to 2020 (vessels with Dolphin Mortality Limits are allowed an additional 10 days of fishing in 2018-2020);
- A seasonal closure (9 October to 8 November) of the purse seine fishery in an area known as the "corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
- A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
- Limits on the number of active FADs that each purse seiner can have at any time, ranging from 70 FADs/vessel for the smallest vessels to 450 FADs/vessel for Class 6 vessels (1200 m³ capacity). Class 6 vessels are also required to not deploy FADs 15 days before the selected closure period and to recover within 15 days prior to the start of the closure period a number of FADs equal to the number of FADs set upon during that same period; and
- Bigeye catch limits for the main longline fishing nations.

Pole-and-line, troll, and sportfishing vessels, and purse seine vessels of IATTC capacity classes 1-3 (182 t carrying capacity or less) and longline vessels less than 24 m length overall, are not subject to the above measures, except those related to the management of FADs.

The HCR has evolved from the use of closures in the fishery over a number of years. Maunder and Deriso (2016) provide an analysis of the performance of the adopted HCR by examining estimated F-multiplier values for yellowfin and bigeye over the period 2002-2015, in conjunction with the recommended and implemented closure days over that period. The analysis indicated that the implemented closures were shorter than indicated by the stock assessments and recommended by the IATTC staff until 2010. After that, the implemented closures were consistent with the stock assessments and IATTC recommendations over the period examined.

Uncertainty in the stock assessment has led to difficulties in the operation of the HCR. In 2018, the outcomes of assessments of bigeye and yellowfin were considered in relation to the C-16-02 HCR and the requirements of C-17-02. The results of the 2018 assessment of bigeye, specifically the F-multiplier (0.87), was considerably below the previous estimate and suggested that the current 72-day seasonal closures should be extended to 107 days. The 2018 estimated F-multiplier for yellowfin was 0.99. However, no change in the duration of the closures was recommended for two reasons: 1) there is too much uncertainty in the bigeye tuna assessment to support modifying the current management measure; and 2) the current fishing mortality for yellowfin is at about the level corresponding to MSY. However, taking into account the continuing increase in fishing effort in the purse seine fishery, in terms of the number of sets, IATTC recommended a limit on the total number of floating-object and unassociated sets.

In 2019, due to concerns over the reliability of the current stock assessments, stock status indicators were used to monitor all three species of tropical tunas. These indicators suggested that fishing mortality is continuing to increase for all three species, due to increases in fishing effort in the purse seine fishery, specifically in the number of sets on floating objects. Because it is not practical to limit floating-object sets alone (IATTC, 2019c), IATTC staff maintained its 2018 recommendation to limit the total combined number of floating-object and unassociated purse-seine sets.

6.7.3.1 2020 update

The implications of the 2020 stock assessments for yellowfin and bigeye on the harvest strategy are discussed in Section 6.8.3.

6.7.4 Principle 1 Performance Indicator scores and rationales: EPO yellowfin

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	No

Rationale

Uncertainty in the 2018 and 2019 yellowfin assessment outcomes led the IATTC Scientific Advisory Committee (SAC) to conclude that further work needed to be undertaken before being used as a basis for management advice. A workplan was adopted to address shortcomings, with an updated assessment undertaken by IATTC in 2020. The 2020 SAC meeting was by videoconference due to the Covid-19 virus. IATTC staff have made recommendations to the Commission based on the 2020 assessment (IATTC_SAC, 2020b). The approach taken in the 2020 assessment is discussed at PI 1.2.4. Two approaches in the 2020 assessment are a 'benchmark' stock assessment (Minte-Vera et al., 2020) and a 'risk analysis' (Aires-da-Silva et al., 2020) which examines the probability of exceeding target and limit reference points.

Interim limit reference points (LRPs) for biomass and fishing mortality were adopted by IATTC at its 87th meeting in 2014. These interim values were reaffirmed in IATTC Resolution C-16-02 (*Harvest Control Rules for Tropical Tunas*). The biomass reference point is $SB_{0.5R0}$, the biomass which corresponds to a 50% reduction in recruitment from its average unexploited level, based on a conservative value of stock-recruitment steepness ($h = 0.75$). This spawning biomass is equal to 0.077 of the equilibrium virgin spawning biomass (Maunder and Deriso, 2014). The fishing mortality reference level (F_{LIMIT}) adopted is the fishing mortality rate that, under equilibrium conditions, maintains the spawning population level at S_{LIMIT} .

There were 48 model runs for the benchmark assessment representing 12 different model configurations, each with four different values of steepness (0.7, 0.8, 0.9, 1.0) (Minte-Vera et al., 2020). The point estimate for the spawning biomass at the beginning of 2020 ranged from 145% to 345% of the limit reference point. The probability that the spawning biomass at the beginning of 2020 is below the limit reference point ranges from 0 to 2%. The point estimate of the fishing mortality in 2017-2019 ranged from 22% to 65% of the limit reference point. The probability that the fishing mortality in 2017-2019 is higher than the limit reference point was estimated to be zero for all models.

The probability of exceeding a reference point was calculated using the cumulative distribution functions for the ratios of F_{cur} and S_{cur} relative to the reference points for each of the alternative models, which are then combined using the model probabilities. Considering the relative weights of the different models; and their combined distributions for the management parameters, there is only a 12% probability that the yellowfin stock is overfished ($P(S_{cur} < S_{MSY}) = 12\%$), and a 9% probability that overfishing is taking place ($P(F_{cur} > F_{MSY}) = 9\%$). There is zero probability that both S and F limit reference points have been exceeded ($P(S_{cur} < S_{LIMIT}) = 0\%$; $P(F_{cur} > F_{LIMIT}) = 0\%$) (Figure 32 and Figure 33) (Aires-da-Silva et al., 2020).

As indicated above, the spawning biomass limit reference point is equal to 0.077 of the equilibrium virgin spawning biomass. This value is analytically determined and could be considered as the PRI for yellowfin; however, it is a lower value than used for other MSC certified stocks. Where an analytically determined estimate for MSY is available and there is no analytical determination of the PRI, the MSC Guidance (GSA 2.2.3.1) suggests a more precautionary approach is to adopt a default PRI of $20\%S_0$ or $75\%B_{MSY}$ if $B_{MSY} < 27\%B_0$. The assessors have adopted this approach. The assessment outcomes capture a range of states of nature and steepness combinations, encapsulating a wide range of uncertainties. It is highly likely that the stock is above the more precautionary MSC PRI (and well above the established LRP in the IATTC). Unfortunately, the stock assessment does not provide probability outcome in relation to $20\%B_0$ or $75\%B_{MSY}$. Results are provided for $S_{current}/S_0$ for each of the model combinations. Weighted average values of the model outcomes for each of the steepness parameters used ($h=1.0, 0.9, 0.8, 0.7$) are 0.24, 0.23, 0.19 and 0.22 with an average of 0.22. This is interpreted as meeting highly likely requirements. **SG60 and SG80 requirements are met.** However, there are outcomes which suggest the stock is below $20\%S_0$. **SG100 is not 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

Interim target and limit reference points in terms of biomass and fishing mortality were defined in IATTC Resolution C-16-02. The spawning biomass target is the spawning biomass that produces MSY ($S_{cur}/S_{MSY} > 1$) the fishing mortality target is the fishing mortality rate that produces MSY ($F_{cur} < F_{MSY}$). For yellowfin, there is only a 12% probability that the yellowfin stock is overfished ($P(S_{cur} < S_{MSY}) = 12\%$), and a 9% probability that overfishing is taking place ($P(F_{cur} > F_{MSY}) = 9\%$) (Figure 32 and Figure 33) (Aires-da-Silva et al., 2020). The combined ratio of F_{cur}/F_{MSY} is estimated at approximately 0.65, and the combined ratio of S_{cur}/S_{MSY} is estimated at 1.58. The current spawning biomass and fishing mortality relative to their MSY reference points are shown in the Kobe plot (Figure 34). The probability that the spawning biomass at the beginning of 2020 is lower than the MSY level is 50% or less for thirteen of the 48 models (Minte-Vera et al., 2020). The overall trend in spawning biomass has been gradually declining over time (1985-2019; Figure 35). **Overall, it is concluded that SG80 requirements are met. SG100 is not met.**

References

Aires-da-Silva et al. (2020); Minte-Vera et al. (2018, 2019a, 2020); IATTC_SAC (2020b)

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (S _{la})	IATTC limit reference point	0.077S ₀	Prob S _{cur} < S _{LIMIT} = 0% across all runs)
	MSC default PRI (adopted based on GSA 2.2.3.1)	20%S ₀	S _{cur} /S ₀ from 0.11 to 0.30 across all runs
Reference point used in scoring stock relative to MSY (S _{lb})	S _{cur} /S _{MSY}	1	Prob S _{cur} < S _{MSY} = 0.12
			Prob F _{cur} > F _{MSY} = 0.09

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 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

Stock rebuilding is not triggered.

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

Stock rebuilding is not triggered.

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 a harvest strategy as the combination of monitoring, stock assessment, harvest control rules and management actions, which may include a management procedure or a management procedure (implicit) and be tested by management strategy evaluation (MSC Vocabulary v1.2). The IATTC management objective for tuna stocks is to maintain or restore populations to levels capable of producing MSY.

The IATTC harvest strategy for tropical tunas, including yellowfin, is effectively set out in Resolutions C-16-02 and C-17-02 together with monitoring and assessment processes developed by IATTC to inform decision-making. Interim limit and target reference points were adopted by IATTC in 2014. Resolution C-16-02 details the HCR and the way in which scientific advice should be framed. The measures of C-17-02 were rolled over into C-20-06 in December 2020 (IATTC, 2020b). The status of yellowfin is estimated and relative to the defined reference points, with outcomes discussed at SAC meetings and at annual Commission meetings. The HCR requires that if the estimated fishing mortality is higher than F_{MSY} then it should be reduced to F_{MSY} (based on the F-multiplier). There are currently two management tools used by the IATTC, agreed among fishing nations and passed as IATTC Resolutions; these are season closures and mechanisms to limit fishing capacity.

Resolution C-17-02 outlined the specific measures in place for the 2018-2020 fishing years, with these measures rolled over into 2021 via C-20-06. In practice, the harvest strategy for yellowfin does not necessarily relate directly to the yellowfin stock status but rather depends on all tropical tuna stocks assessed, with resultant measures based on the worst case (as discussed in Section 6.7.3).

Stock assessments to support the harvest strategy are conducted regularly and the methods used are constantly tested and improved. Given the overlap of some stocks across the EPO and WCPO, liaison with the WCPFC is provided for explicitly in C-16-02. Monitoring to support the harvest strategy and provision of data for stock assessments is enhanced by 100% observer coverage of the purse seine fleet, supervised off-loading records and additional research data gathering.

The 2020 stock assessment found the EPO yellowfin stock to be not overfished and not subject to overfishing. As part of the recent yellowfin and bigeye tuna risk-based management approach, the consequence of varying durations of purse seine closures relative to the probability of exceeding the Resolution C-16-02 fishing mortality reference points was assessed (Aires-da-Silva et al., 2020). The analyses conducted in 2020 indicated the current closure period is appropriate in meeting management objectives.

Required elements of a harvest strategy are in place. The harvest strategy is expected to achieve management objectives reflected in PI 1.1.1 SG80, **meeting SG60 requirements**. The harvest strategy provides for a response to the state of the stock, with clear provisions in C-16-02 and evidence of management decisions being enacted through C-17-02 and subsequently C-20-06. The regular flow of information/data and undertaking of stock assessments (or use of indicators), together with adoption of measures, demonstrates that the elements of the harvest strategy work together to meet objectives. **SG80 requirements are met**.

Whilst the elements of the harvest strategy work together, there are multiple stock assessment uncertainties that are not yet resolved. As Maunder and Deriso (2016) indicate, the appropriateness of the HCR with respect to the limit reference points has not been thoroughly tested. Terms of reference for Management Strategy Evaluation (MSE) workshops and a workplan for MSE work have been agreed (IATTC, 2019d). **At this stage SG100 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

The major components of the harvest strategy are MSY-based limit and target reference points based on a conservative assumption on stock-recruitment steepness. The harvest strategy is implemented by restricting the fishing effort of the entire fishery for yellowfin, bigeye and skipjack. Resolution C-16-02 specifies the framework for the provision of scientific advice including how to react given assessed status in relation to the defined reference points and timeframes for recovery where warranted. The quality of monitoring and assessment, and history of measures already put in place indicate that **SG60 is met**, based both on prior experience and plausible argument.

Maunder and Deriso (2016) indicate that the appropriateness of the HCR with respect to the limit reference points has not been thoroughly tested. The harvest strategy for yellowfin itself has not been directly tested. However, the harvest strategy relies on the adoption of management measures based on the worst estimated status across the stocks and partial MSE testing on bigeye tuna (Maunder et al., 2015), though preliminary, is relevant to yellowfin which has similar productivity characteristics. Although there has been concern over the recent assessment of stock status and its implications for management, the harvest strategy has previously demonstrated its capacity to respond to available information to achieve its objectives. **SG80 is met.**

IATTC has committed to undertaking MSE for tropical tunas in its work plans, with an initial workshop held in December 2019 and terms of reference for MSE workshops being established in Resolution C-19-07 (IATTC, 2019d). Although the harvest strategy has previously provided evidence of achieving its objectives, its performance has not been fully evaluated. **SG100 requirements are not met.**

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

Rationale

There is a history of data collection to support various aspects of the harvest strategy. Resolution C-20-06 requires a range of reporting activities including collection of supervised off-loading records and additional research data. Monitoring is in place to support stock assessments which result in the provision of advice to the IATTC on a regular basis. Contracting parties are required to submit annual national reports on national compliance schemes and actions taken to implement agreed IATTC measures, including any controls on fleets and any Monitoring, Control and Surveillance (MCS) measures established. C-20-06 also requires that IATTC scientific staff will analyse the effects on the stocks of the implementation of these measures, and previous conservation and management measures, and will propose, if necessary, appropriate measures to be applied in future years. There is sufficient monitoring in place to determine whether the harvest strategy is working. **SG60 is met.**

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

Rationale

As indicated above, the harvest strategy comprises elements of monitoring, assessing, applying control rules, and management. Ongoing development of the harvest strategy is evident through the adoption of a HCR and limit and target reference points in recent years. Resolution C-20-06 includes explicit provision for evaluation of the effectiveness of all measures, with necessary evaluation (via monitoring and assessment) by scientific staff. There is annual review through assessment and advisory processes as well as in IATTC meetings and measures are updated regularly. A MSE has been initiated to evaluate the HCR; and alternative HCRs will be considered that include hard and soft limit reference points, that use reference points based on biomass, and that establish well-defined scientific management recommendations in the case that the reference points are exceeded.

The recent doubts over the suitability of 2018 and 2019 stock assessments of bigeye and yellowfin raised concerns over the ability of the harvest strategy to respond to this situation. Resolution C-17-02 and subsequently C-20-06 indicate that the results of the adopted measures “.....shall be evaluated in the context of the results of the stock assessments and of changes in the level of active capacity in the purse-seine fleet and, depending on the conclusions reached by the IATTC scientific staff, in consultation with the Scientific Advisory Committee, and based on such evaluation, the Commission shall take further actions including substantial extension of closure days for purse-seine vessels or equivalent measures, such as catch limits”. The updated 2020 stock assessment involved the identification of a set of reference models representing possible states of nature, the assignment of relative weights to the plausibility of the alternative hypotheses, and a risk analysis which includes a decision analysis to provide probability statements re exceeding the reference points established in the HCR (Aires-da-Silva et al., 2020). This change allows for formal implementation consideration of probabilistic outcomes as defined in Resolution C-16-02.

Based on the 2020 information, IATTC staff recommended additional precautionary measures to address potential increases in F caused by the floating-object fishery to prevent fishing mortality increasing beyond the status quo conditions associated with maintaining the 72-day closure. IATTC staff concluded that a limit on floating-object sets for all purse-seine vessels, combined with individual-vessel daily active FAD limits, would be the best option for maintaining the status quo to prevent an increase in F within a management cycle.

At the 95th meeting of the IATTC held in early December 2020, no agreement was reached on new management measures for 2021, putting management arrangements for 2021 in doubt. Subsequently, IATTC convened an extraordinary meeting, held by videoconference on 22 December 2020. At this meeting, it was agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06) and that they be reviewed for subsequent years no later than the annual meeting in 2021.

It is not clear at this stage that there has been sufficient review of the harvest strategy in response to the 2020 stock assessment and scientific advice. **SG100 is not met.**

e	Shark finning			
	Guide	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.

	post			
	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?	NA	NA	NA

Rationale

Yellowfin 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. *Inter alia*, Resolution C-20-06 requires all purse-seine vessels to first retain on board and land all bigeye, skipjack, and yellowfin tuna caught, except fish considered unfit for human consumption for reasons other than their size. Reported discards for yellowfin tuna are low. On average, about 0.6% (range: 0.1 to 1.5%) of the total purse-seine catch of yellowfin was discarded at sea during 2003-2017, with values less than 0.2 % in recent years (IATTC 2019a). Hawaii longline SAFE data for 2020 indicates a release rate of yellowfin of 2.2% (WPRFMC, 2020).

Available information suggests the scoring issue is not relevant, **although this requires confirming at the site visit.**

References

Aires-da-Silva et al. (2020); Maunder et al. (2015); Maunder and Deriso (2016); Minte-Vera et al. (2019a); Minte-Vera et al. (2020); IATTC_SAC (2020b); IATTC (2019b, 2019d); IATTC (2020b) and WPRFMC (2020)

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

Draft scoring range	≥80
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 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	Yes	No

Rationale

There is a well-defined HCR (see IATTC Resolution C-16-02) in place. Resolution C-16-02 HCR requires that :

- The scientific recommendations for establishing management measures in the fisheries for tropical tunas, such as closures, which can be established for multiple years, shall attempt to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management.
- If the probability that F will exceed the limit reference point (F_{LIMIT}) is greater than 10%, as soon as is practical management measures shall be established that have a probability of at least 50% of reducing F to the target level (F_{MSY}) or less, and a probability of less than 10% that F will exceed F_{LIMIT} .
- If the probability that the spawning biomass (S) is below the limit reference point (S_{LIMIT}) is greater than 10%, as soon as is practical management measures shall be established that have a probability of at least 50% of restoring S to the target level (dynamic S_{MSY}) or greater, and a probability of less than 10% that S will descend to below S_{LIMIT} in a period of two generations of the stock or five years, whichever is greater.

These measures are expected to keep the biomass above the adopted LRP, and above the PRI, **meeting requirements for SG60**.

Resolution 16-02 satisfies the SG80 requirements that the HCRs are well defined and are in place. Evidence of the implementation of the HCR is provided by the use of temporal closures based on the recommendations of the IATTC staff and SAC. SG80 also requires that the exploitation rate is reduced as the PRI is approached, the HCRs are expected to keep the stock fluctuating around a target level consistent with (or above) MSY. The C-16-02 elements outlined above indicate that measures must be taken if there is a

probability greater than 10% that the spawning stock is below the LRP (satisfying the requirement that the exploitation rate as the PRI is approached). The measures are also designed to ensure that the stock fluctuates around MSY by maintaining F at a rate corresponding to the MSY (F_{MSY}) for the species that requires the strictest management, in this case bigeye tuna. **Overall, SG80 requirements are met.**

IATTC has committed to undertaking MSE for tropical tunas in its work plans, with an initial workshop held in December 2019 and terms of reference for MSE workshops being established in Resolution C-19-07 (IATTC, 2019d). At this stage there is insufficient evidence to conclude that the HCR will keep the stock at or above a level consistent with MSY most of the time. **SG100 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?	Yes	No

Rationale

IATTC Resolution C-16-02 established an HCR for tropical tunas in the EPO. The performance of the harvest strategy has partially been evaluated using a preliminary management strategy evaluation on bigeye as an example (Maunder et al., 2015). The analysis aimed to investigate the effect of important uncertainties about the steepness in the stock recruitment relationship, asymptotic length and natural mortality. The analysis concluded that the combination of the control rule and the interim reference points under the investigated uncertainties “works effectively to manage the stock at the MSY level”. Simulations support the robustness of the HCR and the current purse seine closure period of 72 days will maintain the yellowfin and bigeye tuna stocks at or above target reference points; however, there is still a lack of direct evidence, and not all uncertainties have been evaluated (Aires-da-Silva et al., 2020). On this basis, the **requirements at the SG 80 level are met**. Given the problems with the updated bigeye assessment, the HCR may have to be re-evaluated. MSE is ongoing and, to date, the ecological role of the stock has not been included in the assessment process. **SG100 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	Yes	No
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Rationale

Tools and measures to implement the HCR are set out in Resolution C-17-02 and subsequently C-20-06. The primary tool is the seasonal closure of purse seine fisheries. These closures are adjusted to manage exploitation in reaction to status determination of stocks with respect to the agreed reference points and timeframes currently set out in C-16-02. C-20-06 also provides a cap on FAD numbers and closure to purse-seine vessels within the area of 96° and 110°W and between 4°N and 3°S, known as the “*corralito*”. C-16-02 does not specify a HCR that requires specific exploitation rates against which the effectiveness of tools can be evaluated, but provides a framework for providing advice on measures that will achieve outcomes. The primary evidence to judge whether tools are effective is therefore estimates of status from stock assessments.

The C-16-02 HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack) that requires the strictest management based on the current estimates of fishing mortality. Given the multispecies nature of the HCR, evidence needs to be considered for both yellowfin tuna and bigeye tuna. The duration of closures is intended to be adjusted according to the estimated F-multiplier (F_{MSY}/F_{recent}) and other factors (such as estimated increases in capacity). Although, as reflected in PI 1.1.1, there are uncertainties in the 2019 assessment, there is evidence appropriate exploitation levels have been maintained, **hence meeting SG60**.

In 2017, the closure period for 2017-2020 was extended to 72 days based on the F-multiplier adjusted for capacity increases. However, due to uncertainties in the relationship between exploitation and closure period, the duration of the closure period was not increased in 2018 as recommended by IATTC staff. The duration of the closure period was tested in 2020 as part of the benchmark assessments for yellowfin and bigeye tuna in the EPO and a procedure developed to assess the risk of a range of closure periods in meeting management objectives (from 0 to 100 days). Results indicated that the current closure period of 72 days meets the management objectives and IATTC staff recommended no additional closure days were required.

At the 95th meeting of the IATTC held in early December 2020, no agreement was reached on new management measures for 2021, putting management arrangements for 2021 in doubt. Subsequently, IATTC convened an extraordinary meeting, held by videoconference on 22 December 2020. At this meeting, it was agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06) and that they be reviewed for subsequent years no later than the annual meeting in 2021. On this basis **SG80 requirements are met**.

Under the newly adopted risk framework adopted for the 2020 updated assessments, there is not yet sufficient evidence to evaluate the application of the tools to the coming fishing seasons. **SG100 requirements are not met**.

References

IATTC (2018, 2019b, 2020a), Aires-da-Silva et al. (2020), IATTC_SAC (2020b), Maunder et al. (2015) and Minte-Vera 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)	

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	No

Rationale

The harvest strategy relies on yellowfin tuna stock assessments being regularly updated. The bigeye stock assessment is also relevant given the nature of the harvest strategy and HCR. The stock assessments require substantial information, including data on retained catches, discards, indices of abundance, and the size compositions of the catches of the various fleets fishing. The client fleet submits data in accordance with U.S. Federal requirements. The biology and life history of yellowfin are relatively well understood and sufficient for stock assessment, with some assumptions made about processes such as growth, recruitment and natural mortality. Results of tagging in the EPO are limited but some have suggested the possibility of movements restricted to relatively small areas (Schaefer, 2009). There is some evidence that yellowfin stocks may be more discrete than simply western/eastern Pacific, based on genetic information (Grewe et al., 2016), however the current designation of a single EPO stock is seen as sufficient for the assessment. IATTC has well established systems in place to gather, verify and analyse the required information and provide advice. Overall, there is sufficient relevant information to support the harvest strategy. **SG60 and SG80 are met.**

The updated 2020 assessment seeks to examine the impact uncertainties in information to a greater extent than before on the estimation of stock status (e.g. growth, recruitment, selectivity). However, uncertainties remain, and information is not considered comprehensive. **SG100 is not met.**

b	Monitoring
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	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

A substantial amount of information is collected to support the HCR, including data on retained catches, discards, indices of abundance, and the size composition of the catches of the various fisheries. There is an extensive amount of data gathered by observers and port technicians in most of the fishing operations of the yellowfin fishery. There is also good information on the biology of the species which has been historically obtained to get a reasonable understanding of the abundance and dynamics of the stock and the fishery. Port technicians complement the collection of information and verify the accuracy of the catch recorded by observers. Data are sufficient to undertake regular stock assessments and estimate quantities such as stock status relative to reference points, required for management in support of the HCR.

Various sources of data are used to monitor U.S. pelagic fisheries. The statistical data systems that collect and process fisheries data consist of logbooks and fish catch reports submitted by fishers, at-sea observers, and port samplers. The Hawaii longline fisheries are monitored using the NOAA Fisheries Western Pacific Daily Longline Fishing Logs for effort and resulting catch. The coverage of logbook data is assumed to be complete (100%). In Hawaii, fish sales records from the Hawaii Division of Aquatic Resources (DAR) Commercial Marine Dealer Report database are an important supplementary source of information, covering virtually 100% of the Hawaii-based longline landings.

SG60 and SG80 are met.

The main uncertainties are identified and their impact on management is evaluated in the stock assessment process. However, there is not a high degree of certainty about all information (e.g. sampling of species composition and length-frequency from purse seiners, as well as data to inform assumptions about stock structure). **SG100 requirements are not met.**

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

Met?	Yes
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Rationale

Monitoring of catches is sufficient for stock assessment. The stock assessment reports outline the data used in the assessment. Whilst these reports indicate that some assumptions are required in relation to delays in data availability from some parties, they do not highlight issues of data gaps that may impact the assessment. As well as information on retained catch, IATTC stock assessments include retained discard data for target species. These data are available from the extensive observer coverage. Measures to combat IUU fishing are discussed under Principle 3. There is no indication from the information available that IUU fishing is at a level which would impact stock assessment outcomes. **SG80 is met.**

References

Aires-da-Silva et al. (2020), Minte-Vera et al. (2020), Grewe et al. (2016) and Schaefer (2009)

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 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 integrated Stock Synthesis stock assessment methodology is well developed and has been used by IATTC for some years. The updated 2020 assessment of yellowfin tuna in the EPO represents a new approach. Previously, a ‘best assessment’ approach was used for the evaluation of stock status using a single ‘base-case’ model. The new approach incorporates the assessment modelling into a risk analysis, with several reference models used to represent various plausible states of nature (assumptions) about the biology of the fish, the productivity of the stocks, and/or the operation of the fisheries, and takes into account the different results, thus incorporating uncertainty into the formulation of management advice. This change represents a paradigm shift at IATTC, both for the staff’s work and for the Commission’s decision-making regarding the conservation of tropical tunas. The approach allows IATTC staff to evaluate explicitly the probability statements specified in the IATTC harvest control rule for tropical tunas established in Resolution C-16-02.

The approach is appropriate for the stock and for the harvest control rule because it enables the integration several sources of information and can be applied where data are limited. **SG80 requirements are met.**

The updated risk analysis approach allows for an improved consideration of uncertainty and explicitly evaluates stock status in a probabilistic way as defined by the latest version of the HCR of the Commission. IATTC has accepted this updated assessment approach to support management decisions. **SG100 is met.**

b	Assessment approach
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	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

IATTC has adopted MSY-related reference points for the major tuna species and the stock assessments regularly estimate stock status in relation to these values. The adopted reference points are MSY-related and are appropriate to the yellowfin stock. **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

The updated 2020 assessment approach in the EPO explicitly takes multiple sources of uncertainty into account in defining stock status and formulating management advice within a risk-based framework. A range of reference models are constructed to represent various plausible states of nature or assumptions about the biology of the fish, the productivity of the stocks, and/or the operation of the fisheries. The approach takes into account the different results, providing probabilistic statements and effectively incorporating uncertainty into the formulation of management advice. Although there are uncertainties that are to be further investigated, the fishery takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way. **This meets the requirements at SG60, SG80 and SG100.**

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

Rationale

The updated 2020 assessment considers uncertainties in relation to several assumptions and explicitly includes uncertainty in the evaluation of stock status and formulation of management advice (Aires-da-Silva et al., 2020). However, uncertainties such as the spatial and stock structure of EPO yellowfin remain. In addition, the new approach adopted in 2020 requires testing, particularly with regards to aspects such as the weights assigned to different assumptions. The **SG100 level 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	Yes

Rationale

Internal review of stock assessments is provided by the Scientific Advisory Committee each year. IATTC reports show extensive discussion on model inputs, output uncertainties, stock structure and data gaps. **SG80 is met**.

IATTC periodically convenes external expert panels to peer review stock assessments (Martell et al., 2013). The Commission also assembles external expert panels to peer review stock assessments, for example, the 2019 yellowfin stock assessment was externally peer reviewed in December 2019 (Cass-Calay et al., 2019), as was the 2018 bigeye assessment (Punt et al., 2019). Outcomes of the peer reviews were considered in the updated 2020 assessment approach. **SG100 is met**.

References

Aires-da-Silva et al. (2020); IATTC (2020a), Martell et al. (2013); Minte-Vera et al. (2019a); Minte-Vera et al. (2020); Cass-Calay et al. (2019); Punt et al. (2019).

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

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

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

Overall Performance Indicator score	
Condition number (if relevant)	

6.8 Principle 1: EPO bigeye tuna

6.8.1 Biology and ecology

Bigeye tuna are distributed throughout tropical and sub-tropical waters of the Pacific Ocean, 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. In tropical and sub-tropical waters 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. Bigeye tuna feed on a wide variety of fishes, cephalopods, and crustaceans during the day and at night. Bigeye tuna are not a key low trophic level species.

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. Bigeye reach about 2 m in length and weigh up to 180-200 kg. Estimating growth of EPO bigeye for stock assessment has been problematic. Age-at-length data derived from readings of daily increments on otoliths are only available for fish up to four years of age, although the species is estimated from tagging studies to have a lifespan of at least 15-16 years. Recent studies have updated bigeye age and growth estimates in the WCPO and examined growth of some specimens from the EPO (Farley et al., 2017, 2018). This work resulted in a new growth curve for bigeye being adopted for the WCPO bigeye assessment. The studies indicated differences in the growth rates of bigeye tuna across the Pacific, with greater length-at-age in the far east and far west of the area examined compared to the central longitudes. Otolith weight data suggest faster growth in the eastern part of the EPO.

Spawning takes place across most months of the year in tropical regions of the Pacific Ocean, becoming seasonal at higher latitudes when sea surface temperatures are above 24°C. Regional variation in maturity-at-length is suspected to occur, and bigeye tuna appear to reach maturity at larger sizes in the EPO than the WCPO. Recruitment of EPO bigeye is highly variable.

6.8.1.1 Stock structure

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 SPC and the IATTC. The majority of the tagging of bigeye tuna 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 tuna across the nominal WCPO/EPO boundary of 150°W (Figure 36). Nevertheless, stock assessments of bigeye tuna are routinely undertaken separately for the WCPO and EPO.

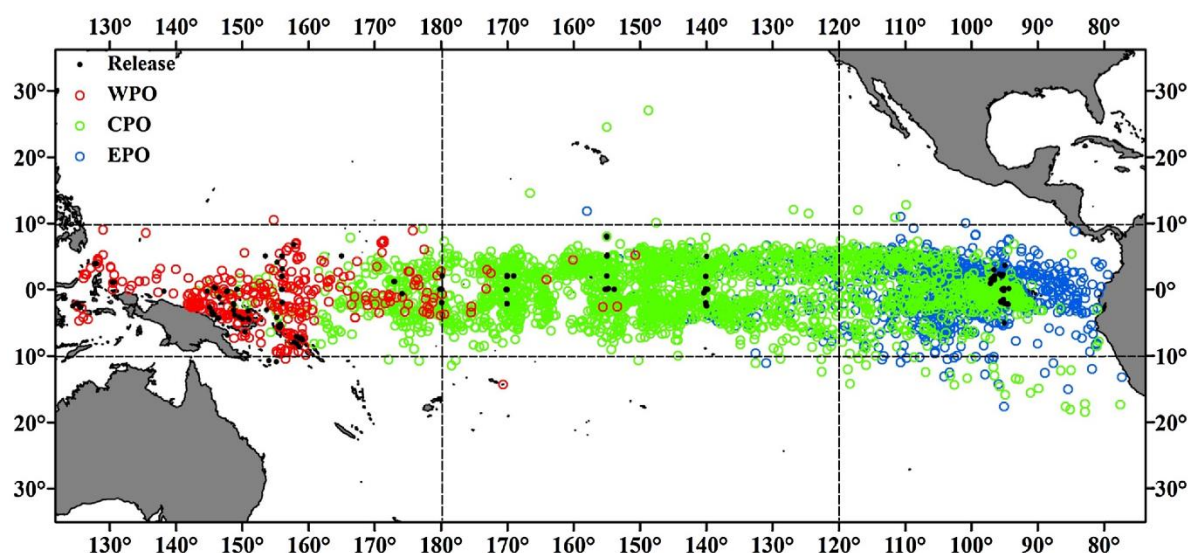


Figure 36. Tag release and recovery positions of bigeye tuna, at liberty for >30 days. Release locations (black) and recoveries released in the WPO (red), CPO (green) and EPO (blue) are shown. Source: Schaefer et al. (2015).

6.8.2 Stock assessment and information

Catches of bigeye over time and their distribution in 2018 are shown in Figure 37 and Figure 38, respectively. Since the late 1990s, purse seine has taken most of the bigeye catch. The majority of the bigeye catch in the EPO is made towards the eastern and western ends of the ocean basin. Bigeye are generally not caught by purse seiners north of 10°N in the EPO, whereas a substantial portion of the longline bigeye catch in the EPO is taken north of that parallel. Bigeye catches in 2018 were about 94,000 t, an 8% decrease from 2017.

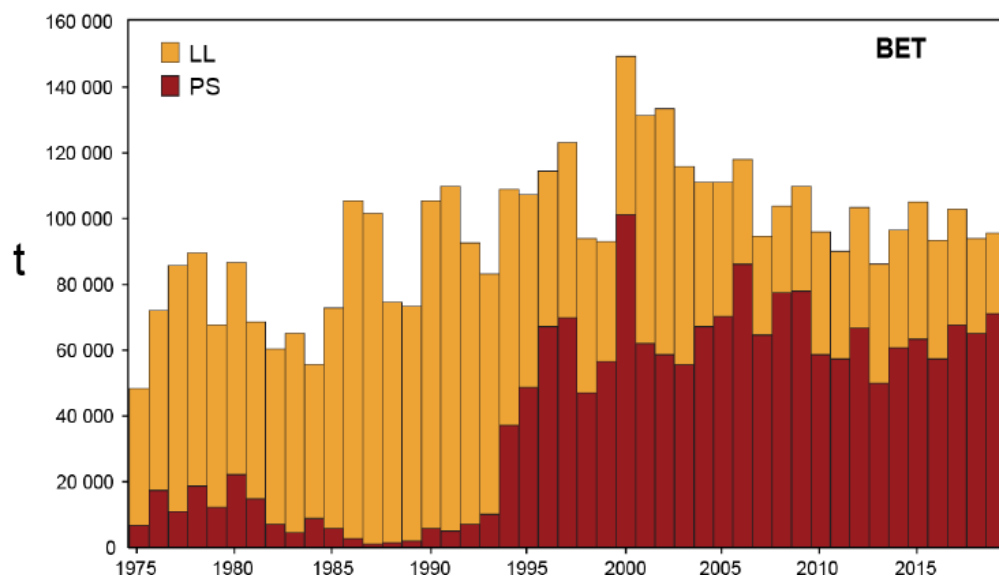


Figure 37. Total catches (retained catches plus discards) by the purse seine (PS) fisheries, and retained catches by the longline (LL) fisheries, of bigeye tuna in the eastern Pacific Ocean, 1975-2019. The purse seine catches are adjusted to the species composition estimate obtained from sampling the catches. 2019 data are preliminary. Source: IATTC (2020a).

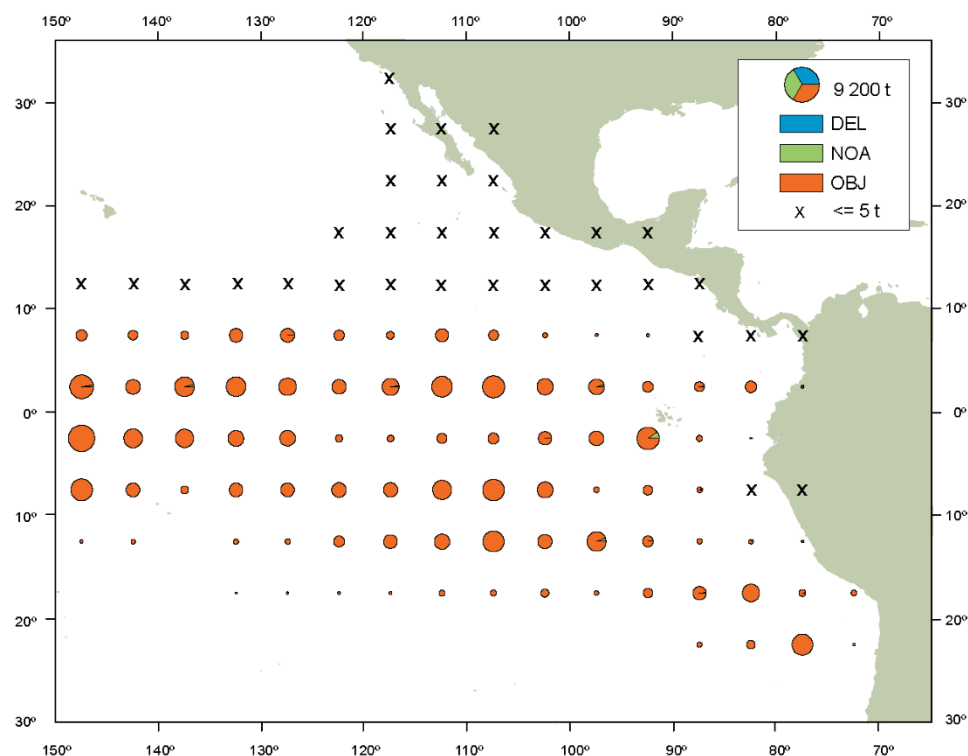


Figure 38. Annual distribution of the purse seine catches of bigeye, by set type, 2018. The sizes of the circles are proportional to the amount of bigeye caught in those 5° by 5° areas. Source: IATTC (2019b).

There have been several recent stock assessments of EPO bigeye. Data available for the assessments includes retained catch, discards, CPUE, and size compositions of the catches from several different fisheries. French Polynesia provides catch, effort and length-frequency data (from port sampling) to IATTC. Several assumptions regarding processes such as growth, recruitment, movement, natural mortality (M), and fishing mortality (F), are made.

Advice from the assessments has typically been based on a base case model, with the sensitivity of the model outputs to a wide range of uncertainty being considered, including age/sex specific mortality, nature of the stock-recruitment relationship, selectivity patterns and model structure. The assessment typically provides estimates of spawning biomass, yield per recruit, MSY and other parameters. Assessments can be a “full assessment” or “benchmark” assessment, in which all major assumptions are reviewed and revised if appropriate; or an “update assessment” whereby new and updated data are incorporated using the current assumptions.

A stock assessment was undertaken in 2018 (Xu et al., 2018). This was an update assessment, i.e. the new and updated information was used with same base case model as used in the previous (2016) assessment. The assessment defined 19 fisheries on the basis of gear (purse seine, pole-and-line and longline), set type for purse seine (floating objects, dolphin, unassociated), time period (when there are considered to be changes in catchability over time) and area. Survey data are also included. Abundance indices are provided by CPUE data for several of the longline fisheries.

6.8.2.1 2020 assessment

Prior to 2020, stock assessments were based on a ‘best assessment’ approach consisting of defining a single stock assessment model (the ‘base case’) for each of yellowfin and bigeye which IATTC staff believed represented the most plausible (‘best’) assumptions and data about the biology and fisheries

(IATTC_SAC, 2020b). As indicated above, in 2018 IATTC staff concluded that the results of its stock assessment of bigeye in the EPO were not reliable enough to be used as a basis for management advice to the Commission (in 2019 this conclusion was extended to the assessment of yellowfin; IATTC (2019c)). A major problem with these assessments is that their results became overly sensitive to the inclusion of new data, in particular recent observations for the indices of relative abundance from the longline fishery (IATTC_SAC, 2020b). A workplan was adopted to improve the stock assessments for tropical tunas, including external reviews of the assessments for bigeye and yellowfin which suggested a variety of alternatives to be considered.

In 2020, as a result of the workplan, a new benchmark assessment was produced for bigeye (Xu et al., 2020). Rather than the 'base case' approach of previous assessments, a 'risk analysis' approach was adopted in which reference models are adopted to represent alternative assumptions about the species' biology, stock productivity, and/or the operation of the fisheries (IATTC_SAC, 2020b).

IATTC (2020a) indicates the following elements of the updated approach:

- A benchmark stock assessment report for bigeye (Xu et al., 2020) presenting the results from all reference models (model fits, diagnostics, derived quantities, and estimated parameters that define stock status);
- A risk analysis (Maunder et al., 2020) which assesses current stock status and quantifies the probability (risk) of exceeding target and limit reference points specified in the IATTC harvest control rule, as well as the expected consequences of alternative management measures in terms of closure days;
- Stock status indicators (IATTC_SAC, 2020c) for all three tropical tuna species (yellowfin, bigeye, and skipjack); and
- Recommendations by the IATTC staff for the conservation of tropical tunas, based on the above.

The 2020 bigeye benchmark assessment included 14 reference models (each with 4 steepness assumptions of 0.7, 0.8, 0.9 and 1.0) developed within a hierarchical framework, consisting of components in combination that address three major uncertainties in the previous assessment: a) the apparent regime shift in recruitment, b) the misfit to the composition data for the longline fishery that is assumed to have asymptotic selectivity, and c) the steepness of the stock-recruitment relationship (Xu et al., 2020).

The risk analysis takes into consideration the weighted average across all 44 reference models investigated for bigeye, each representing a different hypothetical 'state of nature'. The risk analysis outcomes indicate a 50% probability that F_{MSY} has been exceeded and a 53% probability that S_{cur} is below S_{MSY} . The probabilities that the F and S limit reference points have been exceeded are not negligible ($P(F_{cur} > F_{LIMIT}) = 5\%$; $P(S_{cur} < S_{LIMIT}) = 6\%$) (IATTC_SAC, 2020b). The results separate into two distinct states, one 'pessimistic' and the other 'optimistic', which is reflected as a bimodal pattern in the statistical distributions of the management quantities in relation to reference levels (Figure 39 and Figure 40).

The outcomes of the assessment are subject to large uncertainty, as indicated by the wide confidence intervals around the most recent estimate in the Kobe plot (Figure 41).

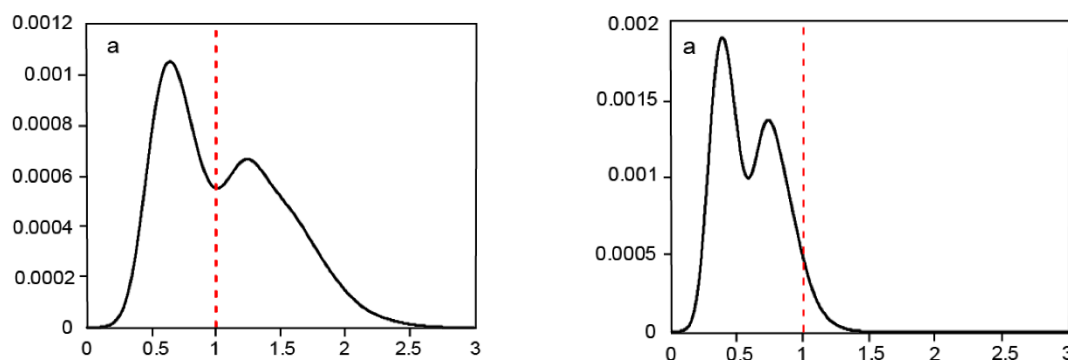


Figure 39. Bigeye probability density functions for F_{cur}/F_{MSY} (left) and F_{cur}/F_{limit} (right). Source: Aires-da-Silva et al. (2020).

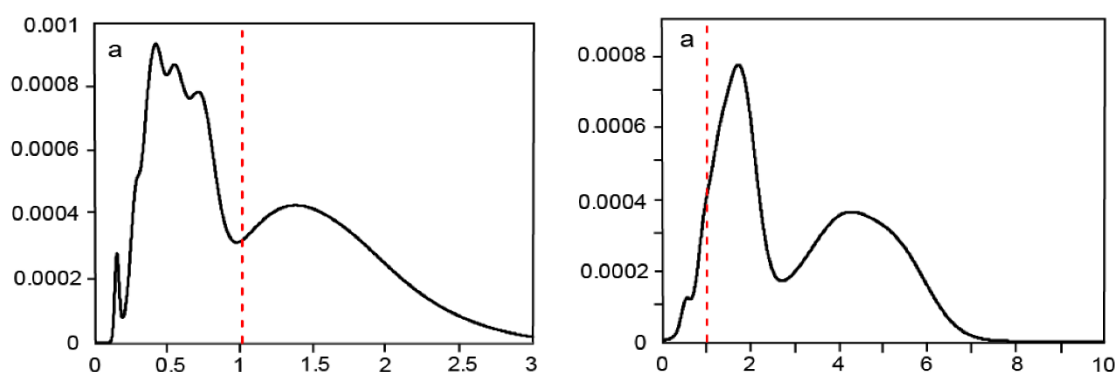


Figure 40. Bigeye probability density functions for S_{cur}/S_{MSY} (left) and S_{cur}/S_{limit} (right). Source: Aires-da-Silva et al. (2020).

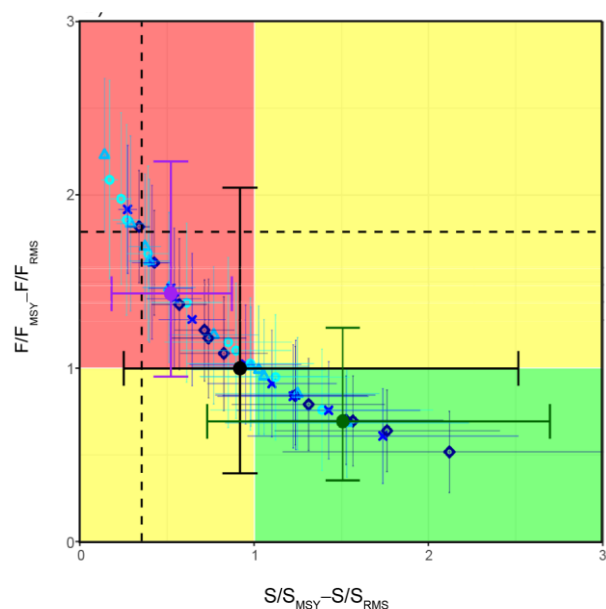


Figure 41. Kobe plot showing the current estimates of spawning stock size (S) and fishing mortality (F) of bigeye tuna relative to MSY reference points. The coloured panels are separated by the target reference points (S_{MSY} and F_{MSY}) and limit reference points (dashed lines). The centre point for each model indicates the current stock status, based on the average fishing mortality (F) over the last three years. The solid black circle represents all models combined. The purple and green solid circles represent, respectively, the stock status

for the ‘pessimistic’ and ‘optimistic’ states related to the bimodal pattern in the risk analysis. The lines around each estimate represent its approximate 95% confidence interval. Source: IATTC_SAC (2020b).

Given the lack of confidence in the 2018 assessment outcomes and questions over its usefulness for management, data-based stock status indicators (SSIs) have been developed to monitor the bigeye stock. The purse-seine-based indicators used include: number of sets by set type, closure-adjusted capacity, catch by set type, catch-per-set by set type, and average length of the fish in the retained catch by set type. The indicators are used for historical comparisons and to identify trends and can provide information that may be useful for stock management. The indicators are based on relative quantities; i.e. instead of comparing a value with a reference point based on the MSY of a species, it is compared with the distribution of its historical values (based on data from 2000 and using reference levels set at the 10% and 90% percentiles). IATTC_SAC (2020c) provides an update of the indicators for consideration in conjunction with the 2020 stock assessment. These indicators do not provide information on the state of the stock relative to the PRI but do provide additional information for consideration. An important feature of the indicators is an increasing trend in the number of purse seine floating-object sets over time. There has been a decrease in catch per set of bigeye in the floating object fishery since 2000. There has also been a decline in average length of bigeye in both the unassociated and floating-object fisheries. Longline catch has also decreased markedly since 2000. Bigeye CPUE has declined over time in the longline fishery (apart from an increase for 2020). Overall, IATTC staff conclude that the SSIs suggest that fishing mortality has increased for bigeye, yellowfin, and skipjack, mainly due to the increase in the number of floating-object sets.

6.8.3 Harvest strategy

Background information on the harvest strategy for yellowfin and bigeye is provided in Section 6.7.3.

The updated 2020 assessment approach has led to a change in the provision of management advice. The updated approach involves the identification of a set of reference models representing possible states of nature, the assignment of relative weights to the plausibility of the alternative hypotheses, and a risk analysis which includes a decision analysis to provide probability statements re exceeding the reference points established in the HCR (Aires-da-Silva et al., 2020). This change allows for formal of probabilistic outcomes as defined in Resolution C-16-02.

As indicated in the specification of the HCR, management action needs to be taken only if the probability of exceeding either the F or S limit reference point is greater than 10%. The overall results of the risk analysis for bigeye indicate that the probabilities that the F and S limit reference points have been exceeded are less than 10% (5% and 6%, respectively). Based on this information, IATTC staff recommended no changes to the current duration of the closure (72 days).

However, if the results of the group of pessimistic models are taken as the true state of nature, the limit reference points have been exceeded with a probability of, or slightly above, 10% (IATTC_SAC, 2020b). Most stock status indicators also suggest that the fishing mortality of all three species has increased, mainly due to the increase in the number of floating-object sets (IATTC_SAC, 2020c).

IATTC_SAC (2020b) notes that Resolution C-16-02 states that the ‘best available scientific information’ is used to operationalize the HCR, and that IATTC staff interprets this to mean, in this instance, the overall results of the risk analysis, including all models investigated, regardless of whether they are pessimistic or optimistic.

Due to the uncertainty, IATTC staff recommended additional precautionary measures to address potential increases in F caused by the floating-object fishery to prevent fishing mortality increasing

beyond the status quo conditions associated with maintaining the 72-day closure. Purse seine fishing is also prohibited in “corralito” 96°W to 110°W between 4°N and 3°S for a period considered equivalent to 3 days. IATTC staff concluded that a limit on floating-object sets for all purse seine vessels, combined with individual-vessel daily active FAD limits, would be the best option for maintaining the status quo to prevent an increase in F within a management cycle.

At the 95th meeting of the IATTC held in early December 2020, no agreement was reached on new management measures for 2021, putting management arrangements for 2021 in doubt. Subsequently, IATTC convened an extraordinary meeting, held by videoconference on 22 December 2020. At this meeting, it was agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06) and that they be reviewed for subsequent years no later than the annual meeting in 2021.

6.8.4 Principle 1 Performance Indicator scores and rationales: EPO bigeye

Scoring table 25. 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	No	No

Rationale

Uncertainty in the 2018 assessment outcomes led the IATTC Scientific Advisory Committee (SAC) to conclude that further work needed to be undertaken before being used as a basis for management advice. A workplan was adopted to address shortcomings, with an updated assessment to be completed in 2020. IATTC staff have developed an updated assessment. IATTC staff have made recommendations to the Commission based on the 2020 assessment (IATTC_SAC, 2020b). The approach taken in the 2020 assessment is discussed under PI 1.2.4. Two approaches in the 2020 assessment are a 'benchmark' stock assessment (Xu et al., 2020) and a 'risk analysis' (Aires-da-Silva et al., 2020) which examines the probability of exceeding target and limit reference points.

Interim target and limit reference points in terms of biomass and fishing mortality were defined in IATTC Resolution C-16-02. The S_{LIMIT} is the spawning biomass that produces half of the virgin recruitment ($SB_{0.5R0}$) assuming a Beverton-Holt stock-recruitment relationship with a steepness of 0.75. This spawning biomass is equal to 0.077 of the equilibrium virgin spawning biomass (Maunder and Deriso, 2014). The fishing mortality reference level (F_{LIMIT}) adopted is the fishing mortality rate that, under equilibrium conditions, maintains the spawning population level at S_{LIMIT} .

There were 44 converged reference model runs for the benchmark assessment (Xu et al., 2020). The spawning biomass of bigeye at the beginning of 2020 ranged from 51% to 532% of the spawning biomass at the limit level. Five of the 44 runs suggest that the spawning biomass of bigeye at the beginning of 2020 is lower than the limit reference level. Fishing mortality of bigeye in 2017-2019 ranged from 32% to 114% of the fishing mortality at the limit level. Three of the forty-four runs suggest that the fishing mortality of bigeye in 2017-2019 is higher than the limit reference level. For bigeye, the overall results of the risk analysis, which include 447 models, indicate that the probabilities that the F and S limit reference points have been exceeded are not negligible ($P(F_{cur} > F_{LIMIT}) = 5\%$; $P(S_{cur} < S_{LIMIT}) = 6\%$). Further, the results separate into two distinct states, one 'pessimistic' and the other 'optimistic', that cannot be discerned based on data, model valuation, or other criteria currently available. It is possible that either the

pessimistic or the optimistic scenario reflects reality. This is reflected as a bimodal pattern in the statistical distributions of the management quantities, indicating the relationship of the stock and the level of fishing to reference levels (Figure 39 and Figure 40). In particular, if the pessimistic scenario is correct, the probability of exceeding the limit reference points with the current adopted closure is 10%, or slightly higher (IATTC_SAC, 2020b).

Given the lack of confidence in the 2018 assessment outcomes and questions over its usefulness for management, data-based stock status indicators (SSIs) have been developed to monitor the bigeye stock. The purse-seine-based indicators used include: number of sets by set type, closure-adjusted capacity, catch by set type, catch-per-set by set type, and average length of the fish in the retained catch by set type. The indicators are used for historical comparisons and to identify trends and can provide information that may be useful for stock management. The indicators are based on relative quantities, i.e. instead of comparing a value with a reference point based on the MSY of a species, it is compared with the distribution of its historical values (based on data from 2000 and using reference levels set at the 10% and 90% percentiles). IATTC_SAC (2020c) provides an update of the indicators for consideration in conjunction with the 2020 stock assessment. These indicators do not provide information on the state of the stock relative to the PRI but do provide additional information for consideration. An important feature of the indicators is an increasing trend in the number of purse seine floating-object sets over time. There has been a decrease in catch-per-set of bigeye in the floating-object fishery since 2000. There has also been a decline in average length of bigeye in both the unassociated and floating-object fisheries. Longline catch has also decreased markedly since 2000. Bigeye CPUE has declined over time in the longline fishery (apart from an increase for 2020). Overall, IATTC staff conclude that the SSIs suggest that fishing mortality has increased for bigeye, yellowfin, and skipjack, mainly due to the increase in the number of floating-object sets.

As indicated above, the spawning biomass limit reference point is equal to 0.077 of the equilibrium virgin spawning biomass. This value is analytically determined and could be considered as the PRI for bigeye; however, it is a lower value than used for other MSC certified stocks. Where an analytically determined estimate for MSY is available and there is no analytical determination of the PRI, the MSC Guidance (GSA 2.2.3.1) suggests a more precautionary approach is the default MSC PRI of 20% S_0 or 75%B_{MSY} if B_{MSY}<27%B₀. The benchmark assessment and risk analysis indicate that is likely that $S_{current}$ is above the PRI, **meeting SG60 requirements**. However, the stock assessment does not provide probability outcome in relation to 20%B₀ or 75%B_{MSY}. Results are provided for $S_{current}/S_0$ for each of the model combinations. Weighted average values of the model outcomes for each of the steepness parameters used ($h=1.0, 0.9, 0.8, 0.7$) range from 0.21 to 0.25. However, as indicated above, if the pessimistic scenario is correct, the probability of exceeding the limit reference points with the current adopted closure is 10%, or slightly higher. Given this and the increasing fishing mortality over time evident in the SSIs, it is concluded that **SG80 and SG100 requirements are not 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?	No	No

Rationale

Interim target and limit reference points in terms of biomass and fishing mortality were defined in IATTC Resolution C-16-02. The spawning biomass target is the spawning biomass that produces MSY ($S_{cur}/S_{MSY} > 1$) the fishing mortality target is the fishing mortality rate that produces MSY ($F_{cur} < F_{MSY}$).

For bigeye, the overall results of the risk analysis, which include 447 models, indicate a 50% probability that F_{MSY} has been exceeded and a 53% probability that S_{cur} is below S_{MSY} . Again, conclusions on the stock level depend on consideration of the pessimistic vs optimistic outcomes of the risk analysis ((Figure 39 and Figure 40).

The probability distributions from the bigeye risk analysis for the management quantities of interest indicate that the stock is either well below or well above the S_{MSY} level. The different conclusions regarding the pessimistic vs optimistic outcomes are reflected in the Kobe plot, with the pessimistic outcomes suggesting the possibility that the stock is not at a level consistent with MSY (Figure 41). A precautionary conclusion is that **SG80 and SG100 are not met**.

References

Aires-da-Silva et al. (2020), IATTC_SAC (2020b, 2020c), Maunder and Deriso (2014), Xu et al. (2018)

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	IATTC limit reference point	$0.077S_0$	Prob $S_{cur} < S_{LIMIT} = 6\%$ across all runs (10% or higher for pessimistic outcomes)
	MSC default PRI (adopted based on GSA 2.2.3.1)	$20\%S_0 / 75\%B_{MSY}$	S_{cur}/S_0 from 0.04 to 0.41 across all runs
Reference point used in scoring stock relative to MSY (SIb)	S_{cur}/S_{MSY}	1	Prob $S_{cur} < S_{MSY} = 0.53$
			Prob $F_{cur} > F_{MSY} = 0.50$

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 stage

Overall Performance Indicator score	
Condition number (if relevant)	

Scoring table 26. 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?	Yes		No

Rationale

The need for a rebuilding plan has not yet been agreed by IATTC. As indicated under PI 1.1.1, updated stock assessments have been conducted in 2020 and IATTC consideration of these assessments is not yet complete. Nevertheless, MSC guidance indicates that PI 1.1.2 is to be scored if PI 1.1.1 scores below 80. IATTC Resolution C-16-02 requires that if the probability is greater than 10% that fishing mortality or spawning biomass do not meet limit reference levels, then as soon as is practical management measures shall be established that have a probability of at least 50% of restoring F or S to their respective target (MSY) levels. In addition, for F, measures shall have a probability of at least 50% of reducing F to F_{MSY} or less, and a probability of less than 10% that F will exceed F_{LIMIT} ; for S, a probability of at least 50% of restoring S to the target level (dynamic S_{MSY}) or greater, and a probability of less than 10% that S will descend to below S_{LIMIT} in a period of two generations of the stock or five years, whichever is greater.

As indicated under PI 1.1.1, the bigeye risk analysis outcomes fall into two possible states relative to reference points (optimistic and pessimistic). This bimodality complicates the evaluation of the status of the bigeye stock and the evaluation of the potential outcomes of management actions. The current management measure for tropical tuna in the EPO is a purse seine temporal closure period of 72 days. Aires-da-Silva et al. (2020) examines the utility of various closure periods (0, 36, 70, 72, 88, and 100 days). If the pessimistic models are assumed to be closer to the true state of nature, the risk of exceeding F_{LIMIT} under the current closure at 72 days is 10% (weighted average of the combined pessimistic models) (Aires-da-Silva et al., 2020). Therefore, any reduction of the 72-day closure would exceed the limit under the combined pessimistic models. Overall, the results of the risk analysis for bigeye indicate that, although the probabilities that the F and S limit reference points have been exceeded are not negligible ($P(F_{cur} > F_{LIMIT}) = 5\%$; $P(S_{cur} < S_{LIMIT}) = 6\%$), they are below the 10% threshold for triggering an action specified in Resolution C-16-02 (Aires-da-Silva et al., 2020).

Due to the uncertainty, IATTC staff recommended additional precautionary measures to address potential increases in F caused by the floating-object fishery to prevent fishing mortality increasing beyond the status quo conditions associated with maintaining the 72-day closure. IATTC staff concluded that a limit on floating-object sets for all

purse seine vessels, combined with individual vessel daily active FAD limits, would be the best option for maintaining the status quo to prevent an increase in F within a management cycle. To date, these changes have not been adopted. This does not represent an adopted formal rebuilding strategy, however the management measures in place are **sufficient to meet SG60 requirements. SG100 is not met.**

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is evidence that the rebuilding strategies are rebuilding stocks, or it is likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.	There is strong evidence that the rebuilding strategies are rebuilding stocks, or it is highly likely based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe.
	Met?	Yes	No	No

Rationale

Information used to support the harvest strategy is discussed under PI 1.2.3. There is an ongoing thorough data collection and stock assessment programme to support ongoing monitoring and evaluation of future trends and rebuilding of the stock. Although modelling undertaken suggests that the current 72-days closure is sufficient to meet Resolution C-16-02 requirements, the risk analysis assumed that the relationship between closure days and F was known without uncertainty. IATTC staff recommended additional precautionary measures to address potential increases in F caused by the floating-object fishery to prevent fishing mortality increasing beyond the status quo conditions associated with maintaining the 72-day closure. The 96th Meeting (Extraordinary) of the Commission held in December 2020 agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06). It was agreed that work should continue on the development of measures including, but not limited to, the improvement of the monitoring and management of FADs; however, recommended additional measures were not adopted and it is not clear that the current measures will rebuild the stock. **SG60 requirements are met. SG80 and SG100 are not met.**

References

Aires-da-Silva et al. (2020), IATTC_SAC (2020b, 2020c), Xu et al. (2020)

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

Draft scoring range	60-79
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Information gap indicator	Information sufficient to score PI
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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 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 a management procedure or a management procedure (implicit) and be tested by management strategy evaluation (MSC Vocabulary v1.2). The IATTC management objective for tuna stocks is to maintain or restore populations to levels capable of producing MSY.

The IATTC harvest strategy for tropical tunas, including bigeye, is effectively set out in Resolutions C-16-02 and C-17-02 (IATTC, 2019a) together with monitoring and assessment processes developed by IATTC to inform decision-making. Interim limit and target reference point were adopted by IATTC in 2014. Resolution C-16-02 details the HCR and the way in which scientific advice should be framed. The measures of C-17-02 were rolled over into C-20-06 in December 2020 (IATTC, 2020b). The status of bigeye is estimated, relative to the defined reference points, with outcomes discussed at Scientific Advisory Committee meetings and at annual Commission meetings. The HCR requires that if the estimated fishing mortality is higher than F_{MSY} then it should be reduced to F_{MSY} . If there is a 10% or greater probability of reaching the LRP for fishing mortality or spawning biomass, the HCR triggers the establishment of additional management measures to reduce fishing mortality. There are currently two management tools used by the IATTC, agreed among fishing nations and passed as IATTC Resolutions; these are season closures and mechanisms to limit fishing capacity.

The harvest strategy is implemented such that the aim of the HCR is to keep F from exceeding “the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management”. This concept implies that YFT, BET and skipjack are linked by identification of the stock that is in greatest need of protection, defining conservation actions for that stock and implementing the same management measures equally to all three species. The bimodality of the bigeye assessment outcome complicates the evaluation of the status of the bigeye stock and the evaluation of the potential outcomes of management actions (Aires-da-Silva et al., 2020; Xu et al., 2020). In addition, IATTC staff conclude that the SSIs suggest that fishing mortality has increased for bigeye, yellowfin and skipjack, mainly due to the increase

in the number of floating-object sets. Analysis of potential closure durations suggest the harvest strategy is expected to achieve stock management objectives, **meeting SG60**. Although the harvest strategy for bigeye tuna is the same as that for yellowfin, which has been scored as meeting SG80 requirements for this scoring issue, the stock status information provided by the 2020 stock assessment, as described at PI 1.1.1, leads to a conclusion that it is not apparent that the elements of the harvest strategy work together towards achieving stock management objectives. **SG80 and SG100 are not met**.

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

Rationale

The major components of the harvest strategy are MSY-based limit and target reference points based on a conservative assumption on stock-recruitment steepness. The harvest strategy is implemented by restricting the fishing effort of the entire fishery for yellowfin, bigeye and skipjack. Resolution C-16-02 specifies the framework for the provision of scientific advice including how to react given assessed status in relation to the defined reference points and timeframes for recovery where warranted. The quality of monitoring and assessment, and history of measures already put in place indicate that **SG60 is met**, based both on prior experience and plausible argument.

Maunder and Deriso (2016) indicate that the appropriateness of the HCR with respect to the limit reference points has not been thoroughly tested. There has been preliminary MSE testing of bigeye tuna finding that the management procedure applied in the study works effectively to manage the stock at the MSY level and avoid a high risk of recruitment being seriously impacted (Maunder et al., 2015). However, the bimodality of the 2020 assessment outcomes makes it difficult to assess the success of the harvest strategy in achieving objectives. The probability that S_{cur} is below S_{MSY} is greater than 50%.

The harvest strategy has demonstrated its capacity to respond to available information to achieve its objectives. However, at the 95th meeting of the IATTC held in early December 2020, no agreement was reached on new management measures for 2021, putting management arrangements for 2021 in doubt. Subsequently, IATTC convened an extraordinary meeting, held by videoconference on 22 December 2020. At this meeting, it was agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06) and that they be reviewed for subsequent years no later than the annual meeting in 2021. IATTC has committed to undertaking MSE for tropical tunas in its work plans, with an initial workshop held in December 2019 and terms of reference for MSE workshops being established in Resolution C-19-07 (IATTC, 2019d). However, it is not yet clear that there has been sufficient response to bigeye stock status advice to achieve management objectives. **SG80 and SG100 are not met**.

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

Rationale

There is a history of data collection to support various aspects of the harvest strategy. Resolution C-20-06 requires a range of reporting activities including collection of supervised off-loading records and additional research data. Monitoring is in place to support stock assessments which result in the provision of advice to the IATTC on a regular basis. Contracting parties are required to submit annual national reports on national compliance schemes and actions taken to implement agreed IATTC measures, including any controls on fleets and any MCS measures established. C-20-06 also requires that IATTC scientific staff will analyse the effects on the stocks of the implementation of these measures, and previous conservation and management measures, and will propose, if necessary, appropriate measures to be applied in future years. There is sufficient monitoring to support the current harvest strategy for bigeye. **SG60 is met.**

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

Rationale

As indicated above, the harvest strategy comprises elements of monitoring, assessing, applying control rules, and management. Ongoing development of the harvest strategy is evident through the adoption of a HCR and limit and target reference points in recent years. Resolution C-20-06 includes explicit provision for evaluation of the effectiveness of all measures, with necessary evaluation (via monitoring and assessment) by scientific staff. There is annual review through assessment and advisory processes as well as in IATTC meetings and measures are updated regularly. A management strategy evaluation has been initiated to evaluate the HCR; and alternative HCRs will be considered that include hard and soft limit reference points, that use reference points based on biomass, and that establish well-defined scientific management recommendations in the case that the reference points are exceeded. **SG100 requirements are potentially met but not scored due to SG80 not being met for other scoring issues.**

e	Shark finning	
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	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 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?	NA	NA	NA

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. *Inter alia*, Resolution C-17-02 requires all purse seine vessels to first retain on board and land all bigeye, skipjack, and yellowfin tuna caught, except fish considered unfit for human consumption for reasons other than their size. Reported discards for bigeye tuna are low. During 2000-2017, the percentage of the purse seine catch of bigeye discarded at sea steadily decreased, from 5% in 2000 to less than 1% in 2014 (IATTC 2019a). Hawaii longline SAFE data for 2020 indicates a release rate of yellowfin of 2.2% (WPRFMC, 2020).

Available information suggests the scoring issue is not relevant, **although this remains to be confirmed at the site visit.**

References

Aires-da-Silva et al. (2020), IATTC (2019a, 2019b, 2019d, 2020b), Maunder et al. (2015), Maunder and Deriso (2016), WPRFMC (2020), Xu et al. (2020)

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 to confirm that unwanted catch is not a relevant issue for the client fishery.

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 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	Yes	No

Rationale

There is a well-defined HCR (see IATTC Resolution C-16-02) in place. Resolution C-16-02 HCR requires that :

- The scientific recommendations for establishing management measures in the fisheries for tropical tunas, such as closures, which can be established for multiple years, shall attempt to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management.
- If the probability that F will exceed the limit reference point (F_{LIMIT}) is greater than 10%, as soon as is practical management measures shall be established that have a probability of at least 50% of reducing F to the target level (F_{MSY}) or less, and a probability of less than 10% that F will exceed F_{LIMIT} .
- If the probability that the spawning biomass (S) is below the limit reference point (S_{LIMIT}) is greater than 10%, as soon as is practical management measures shall be established that have a probability of at least 50% of restoring S to the target level (dynamic S_{MSY}) or greater, and a probability of less than 10% that S will descend to below S_{LIMIT} in a period of two generations of the stock or five years, whichever is greater.

These measures are expected to keep the biomass above the adopted LRP, and above the PRI, **meeting requirements for SG60**.

Resolution 16-02 satisfies the SG80 requirements that the HCRs are well defined and are in place. Evidence of the implementation of the HCR is provided by the use of temporal closures based on the recommendations of the IATTC staff and SAC. SG80 also requires that the exploitation rate is reduced as the PRI is approached, the HCRs are expected to

keep the stock fluctuating around a target level consistent with (or above) MSY. The C-16-02 elements outlined above indicate that measures must be taken if there is a probability greater than 10% that the spawning stock is below the LRP (satisfying the requirement that the exploitation rate as the PRI is approached). The measures are also designed to ensure that the stock fluctuates around MSY by maintaining F at a rate corresponding to the MSY (F_{MSY}) for the species that requires the strictest management, in this case bigeye tuna. Overall, **SG80 requirements are met**.

IATTC has committed to undertaking MSE for tropical tunas in its work plans, with an initial workshop held in December 2019 and terms of reference for MSE workshops being established in Resolution C-19-07. At this stage there is insufficient evidence to conclude that the HCR will keep the stock at or above a level consistent with MSY most of the time. **SG100 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?	Yes	No

Rationale

The performance of the harvest strategy has partially been evaluated using a preliminary management strategy evaluation on BET as an example (Maunder et al., 2015). The analysis aimed to investigate the effect of important uncertainties about the steepness in the stock recruitment relationship, asymptotic length and natural mortality. The analysis concluded that the combination of the control rule and the interim reference points under the investigated uncertainties “works effectively to manage the stock at the MSY level”. As indicated above, further MSE work has been initiated.

For this scoring issue, MSC guidance GSA2.5.2-2.5.5, states that teams are required to assess how well HCRs are likely to function when the unexpected happens in future. As indicated at PI 1.1.1, the updated 2020 bigeye assessment examined a wide range of uncertainties and simulations support a level of robustness of the HCR (Aires-da-Silva et al., 2020). **SG80 requirements are met**. However, the updated assessment has not resolved uncertainties to the extent required to meet SG100. **SG100 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

Tools and measures to implement the HCR are set out in Resolution C-17-02 and subsequently C-20-06. The primary tool is the seasonal closure of purse seine fisheries. These closures are adjusted to manage exploitation in reaction to status determination of stocks with respect to the agreed reference points and timeframes currently set out in C-16-02. C-16-02 does not specify a HCR that requires specific exploitation rates against which the effectiveness of tools can be evaluated but provides a framework for providing advice on measures that will achieve outcomes. The primary evidence to judge whether tools are effective is therefore estimates of status from stock assessments. **SG60 is met.**

The C-16-02 HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack) that requires the strictest management based on the current estimates of fishing mortality. Given the multispecies nature of the HCR, evidence needs to be considered for both yellowfin tuna and bigeye tuna. The duration of closures has been adjusted according to the estimated F-multiplier (F_{MSY}/F_{recent}) and other factors (such as estimated increases in capacity). Closures have been adjusted in response to in fishing capacity, for example, in 2017 the closure period for 2017-2020 was extended to 72 days. The duration of the closure period was tested in 2020 as part of the benchmark assessments for yellowfin and bigeye tuna in the EPO and a procedure was developed to assess the risk of a range of closure periods in meeting management objectives. Results indicated that the current closure period of 72 days meets the management objectives and IATTC recommended no additional closure days. At the 95th meeting of the IATTC held in early December 2020, no agreement was reached on new management measures for 2021, putting management arrangements for 2021 in doubt. Subsequently, IATTC convened an extraordinary meeting, held by videoconference on 22 December 2020. At this meeting, it was agreed that the measures in force in 2020 (reflected in C-17-02) would be carried over for one year (to be recorded as Resolution C-20-06) and that they be reviewed for subsequent years no later than the annual meeting in 2021. Although the recommended closure period of 72 days was accepted as being appropriate, MSC guidance on this scoring issue (GSA2.5.2 – 2.5.5) indicates that “....teams should justify how the current levels of fishing mortality are consistent with maintaining the stock fluctuating around a target level consistent with (or above) B_{MSY} ”. Given that the stock assessment does not support this position, **SG80 is not met.**

References

Aires-da-Silva et al. (2020); IATTC (2018, 2019b); Maunder et al. (2015)

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 29. 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 harvest strategy relies on bigeye tuna stock assessments being regularly updated. The stock assessments require substantial information, including data on retained catches, discards, indices of abundance, and the size compositions of the catches of the various fleets fishing. The biology and life history of bigeye are relatively well understood and sufficient for stock assessment, with some assumptions made about processes such as growth, recruitment and natural mortality. Recent tagging 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). However, the current designation of a single EPO bigeye stock is seen as sufficient for the assessment. IATTC has well-established systems in place to gather, verify and analyse the required information and provide advice. **SG60 requirements are met.**

The uncertainties of the 2018 bigeye assessment and the bimodality of the 2020 outcomes raise questions over the adequacy of the available information. There is sufficient information to support the current harvest strategy, **meeting SG80 but not SG100.**

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and at least one indicator is available and	Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty,

		monitored with sufficient frequency to support the harvest control rule.	rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	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

A substantial amount of information is collected to support the HCR, including data on retained catches, discards, indices of abundance (CPUE), and the size composition of the catches of the various fisheries. There is an extensive amount of data gathered by observers and port technicians in most of the fishing operations of the bigeye fishery. There is also good information on the biology of the species which has been historically obtained to get a reasonable understanding of the abundance and dynamics of the stock and the fishery. Port technicians complement the collection of information and verify the accuracy of the catch recorded by observers. Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.

Various sources of data are used to monitor U.S. pelagic fisheries. The statistical data systems that collect and process fisheries data consist of logbooks and fish catch reports submitted by fishers, at-sea observers, and port samplers. The Hawaii longline fisheries are monitored using the NOAA Fisheries Western Pacific Daily Longline Fishing Logs for effort and resulting catch. The coverage of logbook data is assumed to be complete (100%). In Hawaii, fish sales records from the Hawaii Division of Aquatic Resources (DAR) Commercial Marine Dealer Report database are an important supplementary source of information, covering virtually 100% of the Hawaii-based longline landings. **SG60 and SG80 are met.**

The main uncertainties are identified and understood, however further work is required to resolve some uncertainties and their impacts on management. There is not a high degree of certainty about all information and **the SG100 level is not met.**

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

Rationale

Monitoring of catches is sufficient for stock assessment. The stock assessment reports outline the data used in the assessment. Whilst these reports indicate that some assumptions are required in relation to delays in data availability from some parties, they do not highlight issues of data gaps that may impact the assessment. As well as information on retained catch by all gears, IATTC stock assessments include retained discard data for target species. These data are available from the extensive observer coverage of the purse seine fleet. Measures to combat IUU fishing are discussed under Principle 3. There is no indication from the information available that IUU fishing is at a level which would impact stock assessment outcomes. **SG80 is met.**

References

IATTC (2019a); Schaefer et al. (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 30. 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 integrated Stock Synthesis stock assessment methodology is well-developed and has been used by IATTC for some years. Following uncertainty in the 2018 assessment, a new approach was adopted. Previously, a ‘best assessment’ approach was used for the evaluation of stock status using a single ‘base case’ model. Rather than the ‘base case’ approach of previous assessments, a ‘risk analysis’ approach was adopted in which reference models are adopted to represent alternative assumptions about the species’ biology, stock productivity, and/or the operation of the fisheries (IATTC_SAC, 2020b). Two components of the 2020 assessment are a ‘benchmark’ stock assessment (Xu et al., 2020) and a ‘risk analysis’ (Aires-da-Silva et al., 2020) which examines the probability of exceeding target and limit reference points. This approach produces explicit probability statements relative to the IATTC harvest control rule for tropical tunas established in Resolution C-16-02. The risk analysis encompasses alternative hypotheses on the states of nature that address uncertainties and issues from previous assessments. The risk analysis takes into consideration the weighted average across 44 reference models investigated for bigeye, each representing a different hypothetical ‘state of nature’ (with 12 different model configurations, each with four different values of steepness: 0.7, 0.8, 0.9, 1.0).

The new approach improves what had previously been considered appropriate for the stock and for the harvest control rule. **SG80 requirements are met.**

IATTC has accepted this updated assessment approach to support management decisions. **SG100 is met.**

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

	Met?	Yes	Yes
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Rationale

IATTC has adopted MSY-related reference points for the major tuna species and the stock assessments regularly estimate stock status in relation to these values. **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 / No	Yes	No

Rationale

The new 2020 assessment approach for bigeye tuna in the EPO explicitly takes multiple sources of uncertainty into account in defining stock status and formulating management advice within a risk-based framework. Several reference models are constructed to represent various plausible states of nature (assumptions) about the biology of the fish, the productivity of the stocks, and/or the operation of the fisheries, effectively incorporating uncertainty into the formulation of management advice. Current status relative to reference points are calculated as a weighted average of the point estimates of the ratio from each of the alternative stock assessment models. The probability of exceeding reference levels for F and S is calculated for each of the alternative models. Decision tables provide management advice based on the probability that, given the overall uncertainty, alternative decisions may fail to meet the management goal. **SG60 and SG80 requirements are met.** However, important uncertainties such spatial structure and examination of the bimodality of outcomes need to be evaluated further. **The SG100 level is not 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

The stock assessment and risk analysis address uncertainties in relation to several assumptions. Uncertainty is explicitly included in the evaluation of stock status and formulation of management advice (Aires-da-Silva et al., 2020). However, other sources of uncertainty are identified as important and requiring future work, e.g. the spatial structure, growth and natural mortality (Xu et al., 2020). Although the new benchmark assessment has incorporated a wide range of uncertainties, the approach is new and requires testing, particularly in relation to issues such as the weights assigned to different assumptions. **The SG100 level 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	Yes

Rationale

Internal review of stock assessments is provided by the Scientific Advisory Committee each year. IATTC reports show extensive discussion on model inputs, output uncertainties, stock structure and data gaps. Results of the IATTC research are often published in peer reviewed journals, particularly those related to methodologies or the overall state of stocks and the fishery.

(https://www.iattc.org/Meetings/Meetings2019/IATTC-94/Docs/_English/IATTC-94-04_Staff%20activities%20and%20research%20plan.pdf).

IATTC periodically convenes external expert panels to peer review stock assessments (e.g. Martell et al. (2013)). An external expert panel reviewed the bigeye tuna assessment in March 2019 (Punt et al., 2019). **SG80 and SG100 requirements are met.**

References

Aires-da-Silva et al. (2020); Martell et al. (2013); Punt et al. (2019); Xu 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)	

6.9 Principle 2

6.9.1 Introduction

Principle 2 assesses the environmental impact of the UoA's fishing activities. The MSC Fisheries standard v2.01 requires fishing operations to allow for the maintenance of the structure, productivity, function, and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends. In this context, assessment teams are required to assess the fishery against five Principle 2 components. An overview of those five components, and a brief explanation of what is assessed within each component, is given below.

Primary species (MSC Component 2.1) are defined as follows:

- 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) are defined as follows:

- 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)

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

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

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

Habitats (MSC Component 2.4):

- Habitats impacted by the fishery, 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, including any commonly encountered habitats, Vulnerable Marine Ecosystems (VMEs) or minor habitats.

Ecosystem (MSC Component 2.5):

- Those key ecosystem elements considered most crucial to giving the ecosystem its characteristic nature and dynamics, to maintaining the integrity of its structure and functions, and the key determinants of the ecosystem resilience and productivity. The key ecosystem elements are considered relative to the scale and intensity of the UoA.

6.9.2 Primary species and secondary species

Primary and secondary species were identified on the basis of three datasets:

- The Western Pacific Daily Longline Fishing Logbook data, which when combined with fish sales records from the Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data, enable the weight of longline retained catch for both Hawaiian longline fleets to be estimated, as summarised in Table 11 for the 2015-20 period (Section 6.2.5.1).
- The second dataset is based on observer data from the Pacific Islands Region Observer Program (PIROP) which deploys NMFS observers at 100% coverage in shallow-set trips and 20% (or more) for deep-set trips (discussed in Section 6.2.5.2). The total annual catch for both fleets for 2015-20, together with overall species composition (in %) and P2 designations is given in Table 13 and Table 14 for the shallow- and deep-set fleets, respectively.
- The third dataset comprises HLA data on bait use per year for shallow-set trips and for deep-set trips for each species used for bait, and the country where the bait was sourced (Section 6.2.5.3, Table 18).

The 'main' primary and secondary species and stocks identified for each set-type fishery are listed in Table 25, together with an explanation for their designation.

Table 25. Main primary and secondary species identified for the Hawaiian shallow-set and deep-set longline fishery, together with the justification for 'main' and P2 species designation.

Species	Stock	Reason for main	Reason for P2 Primary/ Secondary designation	UoAs
Blue shark	North Pacific	> 5% total catch	Secondary: analytical stock assessment with reference points exists (ISC_SWG, 2017) but species is not managed against those reference points.	Deep-set Shallow-set
Bigeye thresher shark	Pacific	> 2% and less resilient species	Secondary: A sustainability risk assessment was carried out for this species (ABNJ, 2018) but species is not managed against reference points.	Deep-set
Shortfin mako shark	North Pacific	> 5% total catch	Secondary: analytical stock assessment with reference points exists (ISC_SWG, 2018) but species is not managed against those reference points.	Shallow-set

Species	Stock	Reason for main	Reason for P2 Primary/ Secondary designation	UoAs
Bigeye tuna (P1)	WCPO and EPO	> 5% total catch	Primary: analytical stock assessment and management against reference points (see Sections 6.5 and 6.8).	Deep-set Shallow-set
Yellowfin tuna (P1)	WCPO and EPO	> 5% total catch	Primary: analytical stock assessment and management against reference points (see Sections 6.6 and 6.7).	Deep-set
Moonfish	Not known	> 5% total catch	Secondary: no stock assessment or management in place.	Deep-set
Pacific mackerel (bait)	Taiwan EEZ	> 5% total catch	Primary: analytical stock assessment and management against reference points.	Shallow-set
Pacific saury (bait)	Taiwan EEZ	> 5% total catch	Primary: analytical stock assessment and management against reference points.	Deep-set

Further detail on the assessment of the primary and secondary species components is presented in the scoring tables (Section 6.9.7).

6.9.3 ETP species

The criteria for designating ETP species are set out in Section 6.9.1. The following regionally binding agreements and instruments were considered for the designation of ETP species:

- WCPFC Conservation and Management Measures:
 - CMM 2018-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds
 - CMM 2018-04 on sea turtles
 - CMM 2019-04 on sharks (with particular reference to oceanic whitetip shark and silky shark)
 - CMM 2019-05 on mobulid rays caught in association with fisheries in the WCPFC Convention Area.
- IATTC Resolutions:
 - C-19-05 and C-16-06 on silky shark
 - C-11-10 on oceanic whitetip shark
 - C-15-04 on mobulid rays
 - C-11-02 on seabirds
 - C-07-03 on sea turtles
- CITES appendix I listing
- ACAP listing

The above measures have been transposed into national U.S. law, with the following legal instruments used as the primary tool to identify ETP species in the context of this assessment:

- U.S. Endangered Species Act of 1973 (ESA): a key legislation for both domestic and international conservation. The Act aims to provide a framework to conserve and protect endangered and threatened species and their habitats⁶.
- Marine Mammal Protection Act of 1972 and subsequent amendments (MMPA): All marine mammals are protected under the MMPA. The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.⁷.
- Migratory Bird Treaty Act of 1918 and subsequent amendments (MBTA): The Act prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service⁸.

6.9.3.1 ESA consultations and Biological opinions

The ESA requires that any action authorized, funded, or carried out by a Federal agency ensures its implementation would not jeopardize the continued existence of listed species or adversely modify their critical habitat. ESA Section 7 consultations are conducted by NMFS and the U.S. Fish and Wildlife Service (USFWS)⁹ to ensure ongoing pelagic fishery operations are not jeopardizing the continued existence of any listed species or adversely modifying critical habitat.

If the agency determines that the action is not likely to adversely affect listed species or designated critical habitat, and the NMFS/USFWS agrees with that determination, they provide concurrence in writing and no further consultation is required. If the agency determines that the action is likely to adversely affect listed species and/or designated critical habitat, then it must request initiation of formal consultation.

From the date that formal consultation is initiated, NMFS/USFWS consult with the agency and submit a biological opinion (BiOp). The biological opinion is the document that states the opinion of NMFS/USFWS as to whether or not the action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Section 7 of the ESA provides for the exemption of incidental take of listed fish or wildlife species caused by Federal agency actions. The incidental take statement (ITS) expresses the amount or extent of anticipated "take" (e.g. death, injury, harm or harassment) of listed species caused by the proposed action and provides an exemption from the ESA Section 9 prohibitions on such take. The ITS is estimated by the NMFS/USFWS as part of a BiOp resulting from the Section 7 ESA consultations with the federal agencies. Reasonable and prudent measures, with their implementing terms and conditions, are then designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded for any of the species listed, NMFS must immediately reinstate formal consultation pursuant to the Section 7 ESA regulations.

⁶ <https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/endangered-species-act.html>

⁷ <https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/marine-mammal-protection-act.html>

⁸ <https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php>

⁹ The agencies share responsibility for some species that occur in both marine environments and freshwater or terrestrial habitats, such as sea turtles

Shallow-set fishery

Two valid BiOps document the effects of the shallow-set fishery on ESA-listed species:

- The 2012 BiOp on the effects of the Hawaii deep-set and shallow-set longline fisheries on ESA-listed seabirds; and
- The 2019 BiOp on the effects of the shallow-set fishery on ESA-listed marine species assesses 40 listed species and nine critical habitat designations within the fishery area. NMFS issued an ITS for the loggerhead, leatherback, green, olive ridley, Guadalupe fur seal, oceanic whitetip shark, and giant manta ray, which were derived from interaction predictions based on observer data. The BiOp determined that several reasonable and prudent measures are necessary and appropriate to minimize the impacts of the fishery on threatened and endangered species. These measures, and their associated terms and conditions, require NMFS to 1) develop a minimization measure, or a suite of minimization measures designed to reduce the incidental capture and mortality of leatherback and loggerhead turtles; and 2) to use temporal and spatial data to inform decision-making to reduce the incidental capture and mortality of oceanic whitetip sharks (NMFS_BiOp, 2019).

Note that the shallow-set fishery was closed in March 2019 (due to sea turtle interactions, see Section 6.9.3.3) and the ITS from the 2019 BiOp did not take effect until January 2020 when the fishery reopened. A summary of the ESA consultation outcomes is given in Table 26 with ITSs shown in Table 27.

Currently there are no take prohibitions in place for oceanic white tip sharks and giant manta ray, thus an ITS is not required to provide an exemption to the prohibition of take under Section 9 of the ESA for these two species. However, an ITS has been included to serve as a check on the no-jeopardy conclusion by providing a re-initiation trigger if the level of take analyzed in the biological opinion is exceeded (NMFS_BiOp, 2019).

Table 26. Summary of ESA consultations for the Hawaii shallow-set fishery. Source: WPRFMC (2020).

Species or DPS	Consultation Date	Consultation Type ^a	Outcome ^b
Loggerhead turtle, North Pacific DPS	2019-06-26	BiOp	LAA, non-jeopardy
Leatherback turtle	2019-06-26	BiOp	LAA, non-jeopardy
Olive ridley turtle	2019-06-26	BiOp	LAA, non-jeopardy
Green turtle	2019-06-26	BiOp	LAA, non-jeopardy
Hawksbill turtle	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Fin whale	2019-06-26	BiOp	NLAA
Blue whale	2019-06-26	BiOp	NLAA
North Pacific right whale	2019-06-26	BiOp	NLAA
Sei whale	2019-06-26	BiOp	NLAA
Sperm whale	2019-06-26	BiOp	NLAA
Hawaiian monk seal	2019-06-26	BiOp	NLAA
Guadalupe fur seal	2019-06-26	BiOp	LAA, non-jeopardy
Scalloped hammerhead shark, Eastern Pacific DPS	2019-06-26	BiOp	NLAA
Oceanic whitetip shark	2019-06-26	BiOp	LAA, non-jeopardy
Giant manta ray	2019-06-26	BiOp	LAA, non-jeopardy
Listed fish and invertebrate species ^c	2019-06-26	BiOp	NLAA
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat	Consultation Date	Consultation Type ^a	Outcome ^b
Hawaiian monk seal	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Leatherback turtle	2019-06-26	BiOp	NLAA
Steller sea lion	2019-06-26	BiOp	NLAA
Listed fish and invertebrate species ^d	2019-06-26	BiOp	NLAA

a BiOp = Biological Opinion.

b LAA = likely to adversely affect; NLAA = not likely to adversely affect.

c Listed fish and invertebrate species = Central California coast coho salmon, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, Central California coast steelhead, California coast steelhead, Southern North American green sturgeon, Black abalone, and White abalone.

d Listed fish and invertebrate species = Central California coast coho salmon, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, and Black abalone.

Table 27. Summary of Incidental Take Statements (ITS) for the Hawaii shallow-set longline fishery. Based on the 2019 BiOp dated June 26, 2019 (note: the fishery operated under the 2012 BiOp prior to and during 2019). Source: WPRFMC (2020).

Species	ITS Time Period	Takes	Mortalities
Loggerhead turtle (North Pacific DPS)	1-year	36	6
Leatherback turtle	1-year	21	3
Olive ridley turtle	1-year	5	1
Green turtle	1-year	5	1
Oceanic whitetip shark	1-year	102	32
Giant manta ray	1-year	13	4
Guadalupe fur seal	1-year	11	9
Short-tailed albatross	5-year	1 injury or death	

Deep-set fishery

The Hawaii deep-set longline fishery is covered under the following BiOps:

- The 2012 BiOp on the effects of the Hawaii deep-set and shallow-set longline fisheries on ESA-listed seabirds;
- The 2014 BiOp Biological Opinion on sea turtles, marine mammals, scalloped hammerhead sharks; and
- A 2017 Supplement to the 2014 BiOp for green, loggerhead, and olive ridley sea turtles due to exceedance of the ITS for these three species: Exceedance of the 3-year or 5-year ITSs requires re-initiation of consultation on the fishery under the ESA. The ITSs for green turtle and loggerhead turtles were exceeded in 2015 and the ITS for olive ridley turtles was exceeded during the first quarter of 2016, and re-consultation was completed on March 24, 2017.

On October 4, 2018, NMFS reinitiated ESA Section 7 consultation for the deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due to three re-initiation triggers: listing of the oceanic whitetip shark and giant manta ray; designation of MHI (Main Hawaiian Islands) insular false killer whale critical habitat; and exceeding the ITS for East Pacific green sea turtle Distinct Population Segment (DPS) in mid-2018. Until NMFS completes the Section 7 consultation and issues a new BiOp, the 2014 BiOp as supplemented (2017) remains valid.

As for oceanic whitetip shark and manta ray in the shallow-set fishery, an ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks due to the lack of take prohibition under ESA section 4(d), but NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a re-initiation trigger.

A summary of the ESA consultations is given in Table 28. An overview of the resulting ITSs is shown in Table 29.

Table 28. Summary of ESA consultations for the Hawaii deep-set longline fishery. Source: WPRFMC (2020).

Species	Consultation Date	Consultation Type ^a	Outcome ^b
Loggerhead turtle, North Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Leatherback turtle	2014-09-19	BiOp	LAA, non-jeopardy
Olive ridley turtle, Endangered Mexico and threatened eastern Pacific populations	2017-03-24	BiOp ^c	LAA, non-jeopardy
Olive ridley turtle, Threatened western Pacific population	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, East Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central North Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, East Indian-West Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Southwest Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central West Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central South Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Hawksbill turtle	2014-09-19	BiOp	NLAA
False killer whale, MHI insular DPS	2014-09-19	BiOp	LAA, non-jeopardy
Fin whale	2015-09-16	LOC	NLAA
Blue whale	2014-09-19	BiOp	NLAA
North Pacific right whale	2014-09-19	BiOp	NLAA
Sei whale	2014-09-19	BiOp	NLAA
Sperm whale	2014-09-19	BiOp	LAA, non-jeopardy
Hawaiian monk seal	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Eastern Pacific DPS	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2014-09-19	BiOp	LAA, non-jeopardy
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat: Hawaiian monk seal	2015-09-16	LOC	NLAA

a BiOp = Biological Opinion; LOC = Letter of Concurrence.

b LAA = likely to adversely affect; NLAA = not likely to adversely affect.

c Supplement to the 2014 BiOp.

Table 29. Summary of ITSs for the Hawaii deep-set longline fishery. Source: WPRFMC (2020).

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle, North Pacific DPS	3-year	18	13	NMFS 2017
Leatherback turtle	3-year	72	27	NMFS 2014
Olive ridley turtle, Endangered Mexico and threatened eastern Pacific populations	3-year	144	134	NMFS 2017
Olive ridley turtle, Threatened western Pacific population	3-year	42	40	NMFS 2017
Green turtle, East Pacific DPS	3-year	12	12	NMFS 2017
Green turtle, Central North Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, East Indian-West Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, Southwest Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, Central West Pacific DPS	3-year	3	3	NMFS 2017
Green turtle, Central South Pacific DPS	3-year	3	3	NMFS 2017
Sperm whale	3-year	9	6	NMFS 2014
False killer whale (MHI insular DPS)	3-year	1	0.74	NMFS 2014
Scalloped hammerhead shark (Indo-West Pacific DPS) ^a	3-year	6	3	NMFS 2014
Short-tailed albatross	5-year	2 injuries or deaths		USFWS 2012

6.9.3.2 Marine mammals

Under section 118 of the Marine Mammal Protection Act (MMPA), NMFS must publish, at least annually, a List of Fisheries that classifies U.S. commercial fisheries into one of three categories, based on the level of serious injury and mortality of marine mammals that occurs incidental to each fishery.

NMFS uses fishery classification criteria, which consist of a two-tiered, stock-specific approach. This two-tiered approach first addresses the total impact of all fisheries on each marine mammal stock and then addresses the impact of individual fisheries on each stock. This approach is based on the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals due to commercial fishing operations relative to a stock's Potential Biological Removal (PBR) level. The PBR level is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The PBR level is the product of the minimum population estimate of the stock, one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; and a recovery factor of between 0.1 and 1.0¹⁰. Fishery impacts to marine mammal stocks are primarily assessed and monitored through the Stock Assessment Reports (SARs) prepared by NOAA pursuant to the MMPA. The SARs include PBR estimates, bycatch estimates, and status. The most recent SARs are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stockassessment-reports-region>.

- Tier 1: If the total annual mortality and serious injury across all fisheries that interact with a stock is $\leq 10\%$ of the PBR level of this stock, all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to the next tier of analysis to determine their classification.
- Tier 2:
 - Category I: Annual mortality and serious injury of a stock in a given fishery is $\geq 50\%$ of the PBR level;
 - Category II: Annual mortality and serious injury of a stock in a given fishery is $> 1\%$ and $< 50\%$ of the PBR level.
 - Category III: Annual mortality and serious injury of a stock in a given fishery is $\leq 1\%$ of the PBR level.

In 2004, NMFS classified the Hawaii longline fishery from Category III to Category I under the MMPA primarily because of the level of incidental mortality and serious injury that occurs between this fishery and the Hawaiian stock of false killer whales. In 2008, NMFS separated the Hawaii longline fishery into two sectors: shallow-set and deep-set. The deep-set sector retained its Category I classification, while the shallow-set sector was reclassified as Category II (WPRFMC, 2009).

Under existing regulations, all fishers participating in Category I or II fisheries must register under the MMPA and obtain a Marine Mammal Authorization Program certificate.

Shallow-set fishery

The majority of observed interactions and mortalities over the last 5 years in the shallow-set fishery (at 100% observer coverage) involve small dolphin species, with Risso's dolphins having the highest rate of interactions over time, followed by bottlenose dolphins and striped dolphins. Since 2015,

¹⁰ <https://www.fisheries.noaa.gov/laws-and-policies/glossary-marine-mammal-protection-act>

observed interactions with small and large whales have included one Ginkgo-toothed beaked whale, one fin whale and one humpback whale (noting that the latter two did not result in injury or mortality). Interactions with pinnipeds, from 2015, have included a total of 4 Guadalupe fur seals, 5 interactions with unidentified pinnipeds and sea lions, all of which were taken outside of the EEZ offshore of California, while fishing under the Hawaii longline limited entry permit, and one unidentified seal interaction was documented in 2019 (WPRFMC, 2020). In summary, the following marine mammal scoring elements have been identified for the shallow-set fishery, based on the 2015-2019 data given in WPRFMC (2020):

- Marine mammals with PBR: bottlenose dolphin (*Tursiops aduncus*), Risso's dolphin (*Grampus griseus*), striped dolphin (*Stenella coeruleoalba*) and Guadalupe fur seal (*Arctocephalus townsendi*);
- Marine mammals without PBR: Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*); and
- Unidentified pinnipeds: sea lions and seals.

Marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean annual mortality and serious injury (M&SI) and the PBR for stocks relevant to the Hawaii shallow-set longline fishery is presented in Table 30. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawaii, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock. The mean annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries. For marine mammal stocks where the PBR is available, the mean annual M&SI for the shallow-set longline fishery inside the EEZ around Hawaii is well below the corresponding PBR in the time period covered by the current SAR.

Table 30. Summary of mean annual mortality and serious injury (M&SI) and potential biological removal (PBR) by marine mammal stocks with observed interactions in the Hawaii shallow-set longline fishery. Source: WPRFMC (2020).

Stock	Years Included in 2018 SARs	Outside EEZ ^a	Inside EEZ	
		Mean Annual M&SI	Mean Annual M&SI	PBR (Inside EEZ only) ^c
Bottlenose dolphin, HI Pelagic	2011-2015	2	0	140
Risso's dolphin, HI	2011-2015	3.2	0	82
Rough-toothed dolphin, HI	2011-2015	0	1	423
Striped dolphin, HI	2011-2015	0.6	0	449
Blainville's beaked whale, HI	2011-2015	0	0	10
False killer whale, HI Pelagic	2011-2015	0.1	0.1	9.3
Short-finned pilot whale, HI	2011-2015	0.1	0	106
<i>Kogia</i> spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Humpback whale, Central North Pacific	2013-2017 ^d	0 ^b		83 ^b
Fin whale, HI	2011-2015	0	0	0.1
Guadalupe fur seal, CA	2013-2017 ^d	0.4		1,062

a PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawaii, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

b PBR and M&SI for the Central North Pacific stock for humpback whales apply to the entire stock.

c PBR estimates for Hawaii stocks are only available for portions of the stock within the U.S. EEZ around Hawaii.

d Draft 2019 SAR.

Deep-set fishery

For the deep-set fishery, which operates at 20% observer coverage, observed take data are expanded by PIFSC to represent the estimated number of annual incidental takes for the entire fishery. According to data presented in WPRFMC (2020), the majority of observed interactions and observed mortalities over the last 5 years involved dolphin and small whale species. Observed interactions with false killer whales were most frequent, with the highest number of observed interactions occurring in 2019, followed by bottlenose dolphins and Risso's dolphins. Very few interactions were observed with short-finned pilot whales and rough-toothed dolphins. Over the most recent 5-year period, there were on average 13 observed interactions with unidentified cetaceans annually (extrapolated to fleet level). In summary, the following marine mammal scoring elements have been identified for the deep-set fishery, based on the 2015-2019 data:

- Marine mammals with PBR: false killer whale (*Pseudorca crassidens*), bottlenose dolphin (*Tursiops aduncus*), Risso's dolphin (*Grampus griseus*), short-finned pilot whale (*Globicephala macrorhynchus*) and rough-toothed dolphin (*Steno bredanensis*);
- Marine mammals without PBR: none; and
- Unidentified cetaceans including unidentified dolphins and unidentified beaked whales

As for the shallow-set fishery above, marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean estimated annual M&SI and the PBR for stocks relevant to the Hawaii deep-set longline fishery is presented in Table 31. For most marine mammal stocks where the PBR is available, the number of observed takes of marine mammal species in the deep-set longline fishery inside the EEZ around Hawaii is well below the PBR in the time period covered by the most current SAR. This is with the exception of false killer whale, discussed below.

The Hawaii deep-set longline fishery operates under the 3-year ITS in the 2014 Biological Opinion for all marine mammals protected under the ESA, which includes sperm whales and the MHI insular DPS of false killer whales. NMFS began monitoring the Hawaii deep-set longline fishery ITS in Quarter 3 of 2014 and uses a rolling 3-year period to track incidental take. NMFS uses M&SI determinations under the MMPA to calculate marine mammal mortality rates. Takes for these species are still under the 3-year ITS at this time (Table 32). Since the October 4, 2018 re-initiation, the deep-set fishery has not exceeded the ITS for the sperm or MHI insular false killer whale.

False killer whale: The M&SI interactions inside the Hawaii EEZ for the HI Pelagic stock of false killer whales previously exceeded the PBR for this stock. A False Killer Whale Take Reduction Team was formed in 2010 pursuant to the MMPA to address incidental takes of false killer whales in the Hawaii-permitted longline fisheries. NMFS implemented the False Killer Whale Take Reduction Plan in 2012. The objective of the plan is to reduce mortality and serious injury of false killer whales in the Hawaii-permitted longline fisheries and to carry out monitoring of false killer whale interactions in the MHI Insular and HI Pelagic stocks. The 2017 SAR reports a PBR of 9.3 pelagic false killer whales per year. With 20 % observer coverage in 2018 and 2019, the trigger is effectively two observed M&SI (i.e. two observed M&SI expands to 10, which exceeds the PBR of 9.3 - NMFS (2020c)). On February 22, 2019, the Southern Exclusion Zone (SEZ) was closed to deep-set longline fishing for vessels registered under the Hawaii longline limited access program, following two false killer whale M&SIs within the EEZ (WPRFMC, 2020). The fishery SEZ was then reopened in 2020, subject to one of the reopening criteria in the False Killer Whale Take Reduction Plan (50 CFR 229.37) being met (NMFS, 2020c). This is discussed further in the Scoring table for PI 2.3.1.

Table 31. Mean estimated annual M&SI and PBR by marine mammal stocks with observed interactions in the Hawaii deep-set longline fishery. Source: WPRFMC (2020).

Stock	Years Included in 2018 SAR	Outside EEZ ^a	Inside EEZ ^b	
		Mean Estimated Annual M&SI	Mean Estimated Annual M&SI	PBR (Inside EEZ only)
Bottlenose dolphin, HI Pelagic	2011-2015	2.2	0	140
Pantropical spotted dolphin, HI Pelagic	2011-2015	0	0	403
Rough-toothed dolphin, HI	2011-2015	0	1.1	423
Risso's dolphin, HI	2011-2015	1.9	0	82
Striped dolphin, HI	2011-2015	1.1	0	449
Blainville's beaked whale, HI	2011-2015	0	0	10
False killer whale, MHI Insular	2013-2015	N/A	0.0	0.3
False killer whale, HI Pelagic	2011-2015	15.2	7.5	9.3
False killer whale, NWHI	2011-2015	N/A	0.4	2.3
False killer whale, Palmyra Atoll	2006-2010	N/A	0.3	6.4
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Pygmy killer whale, HI	2011-2015	0	1.1	56
Short-finned pilot whale, HI	2011-2015	1.4	0.9	106
Humpback whale, Central North Pacific	2013-2017 ^d	0.9		83 ^c
Sperm whale, HI	2011-2015	0	0.7	14

a PBR estimates are not available for portions of the stock outside of the U.S. EEZ around Hawaii, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

b PBR estimates are only available for portions of the stock within the U.S. EEZ around Hawaii.

c PBR for the Central North Pacific stock for humpback whales apply to the entire stock.

d Draft 2019 SAR.

Table 32. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities (M) of cetaceans in the Hawaii deep-set longline fishery compared to the 3-year ITS in the 2014 Biological Opinion. Source: WPRFMC (2020).

Species	3-year ITS Interactions (M)	3-year Monitoring Period Interactions (M)	
		2016-2018	2017-2019
Sperm whale	9(3)	0	0
MHI insular false killer whale	1(0.74)	0.25(0.2)	2017: 0.07 (0.05) 2018: 0.10 (0.09) 2019: Data not yet available.

6.9.3.3 Sea turtles

Issues related to longline interactions with species protected by U.S. federal law, such as sea turtles, have significantly influenced the fishery over the last two decades. Swordfish directed effort was essentially eliminated in 2001 because of concerns over potential longline impacts on sea turtles. However, swordfish effort was reopened in 2004 on a limited basis and with measures put in place to insure Hawaii based longline vessels operate in a way to limit interactions with sea turtles (Svenarton and Beverly, 2004).

Shallow-set fishery

Table 33 summarizes the incidental take data of sea turtles from 2016 to 2020 in the Hawaii shallow-set longline fishery at 100% observer coverage. Nearly all sea turtles observed in the fishery were

released alive, with the exception of two loggerhead turtles released dead in 2018, and one olive ridley turtle released dead in 2019. The highest interaction rates involved both leatherback and loggerhead turtles, whereas interactions with greens and olive ridleys were much less frequent (WPRFMC, 2020). At the end of 2017, relatively higher numbers of interactions with loggerhead turtles were observed, with higher numbers continuing into 2018 and 2019. In total, 21, 33, and 20 loggerhead turtles were observed in 2017, 2018, 2019, respectively (Table 33). Note that the fishery was closed May-December 2018 due to a stipulated settlement (see further on), and March-December 2019 due to reaching the loggerhead hard cap (see further on), thus interaction rate data for these years are not directly comparable to other years in which the fishery operated throughout the year.

In summary, the following sea turtle scoring elements have been identified for the shallow-set fishery, based on the 2016-2020 data given in WPRFMC (2021b): green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles.

Table 33. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for sea turtles in the Hawaii shallow-set longline fishery based on interaction date for comparison with the shallow-set sea turtle hard caps, 2016-2020. Source: WPRFMC (2021b).

Year	Observer Coverage (%)	Sets	Hooks	Green		Leatherback		Loggerhead		Olive ridley	
				Takes	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2016	100	727	796,165	0	0.000	5	0.006	15	0.019	0	0.000
2017	100	1005	1,083,216	2	0.002	4	0.004	21(1)	0.019	4	0.004
2018	100	420	486,013	1	0.002	6	0.012	33(1)	0.068	1	0.002
2019	100	314	374,487	0	0.000	0	0.000	20	0.053	2(1)	0.005
2020	100	479	624,579	0	0.000	2	0.003	15(1)	0.024	0	0.000

As discussed in Section 6.9.3.1, an annual incidental take statement may be issued as a result of a BiOp carried out in the context of ESA Section 7 consultations. For sea turtles in the context of the Hawaiian shallow-set fishery, NMFS authorized the fishery to interact with up to 26 leatherback sea turtles and 34 North Pacific loggerhead sea turtles, consistent with a 2012 BiOp. For the species involved, this translates into an annual limit (hard cap) and if the fishery reaches either of the interaction limits in a given year, the regulations require NMFS to close the fishery for the remainder of the calendar year. In the U.S. District Court (District of Hawaii) several plaintiffs challenged the NMFS final rule that revised the annual sea turtle interaction limits; the Court ruled in favour of NMFS on all claims (see Turtle Island Restoration Network, et al. v. U.S. Dept. of Commerce, et al. – cited in US_Department_of_Commerce (2018)). In 2017, plaintiffs appealed the Court's decision and a U.S. Ninth Circuit Court of Appeals panel issued a split decision affirming the 2012 BiOp regarding leatherback sea turtles, but holding that NMFS was arbitrary and capricious in its no-jeopardy determination for North Pacific loggerhead turtles (US_Department_of_Commerce, 2018). All parties agreed to settle the case and as part of the agreement, the U.S. District Court (District of Hawaii) ordered NMFS to close the fishery for the remainder of the 2018 fishing year. On May 11, 2018, NMFS published a temporary rule closing the shallow-set longline fishery until December 31, 2018 (NMFS, 2018c). The Court Order also required NMFS to implement a new regulation that establishes the annual interaction limit for North Pacific loggerhead sea turtle at 17, effective on January 1, 2019 (NMFS, 2018d). The revised limit was consistent with the ITS from the previous 2004 BiOp and meant that in 2019, the fishery operated under hard caps of 26 leatherback and 17 loggerhead turtles (WPRFMC, 2020). As a consequence, in March 2019, NMFS again issued a temporary rule closing the

Hawaii shallow-set fishery for the remainder of the year as the annual limit of 17 physical interactions with North Pacific loggerhead sea turtles had been reached (NMFS, 2019e).

In June 2019, NMFS issued a new BiOp on the effects of the shallow-set fishery on marine species listed under the Endangered Species Act (ESA) and a new final rule which revises the annual fleet hard cap for leatherback sea turtles from 26 to 16¹¹. If the fleet reaches this limit, NMFS would close the fishery for the remainder of the calendar year. This rule also removes the annual fleet hard cap on North Pacific loggerhead turtle interactions because it was deemed not necessary at this time for the conservation of this species. If the fishery exceeds the ITS for any species in the current valid BiOp, NMFS would reinitiate ESA Section 7 consultation for that species. Finally, the rule establishes limits of two leatherback and five loggerhead turtles per vessel per individual fishing trip. If a vessel reaches either sea turtle limit during a fishing trip, it must immediately stop fishing and return to port, and may not resume shallow-setting until it meets certain requirements. Vessels that reach the per trip limit for either leatherback or loggerhead sea turtles twice in a calendar year are prohibited from shallow-set longline fishing for the remainder of the calendar year. NMFS requires any vessel that reaches a trip limit for either species twice in one calendar year to have an annual vessel limit of 2 leatherbacks or 5 loggerheads for the following year (NMFS_BiOp, 2019; NMFS, 2020d).

Table 34 summarizes the sea turtle interaction data based on interaction date to allow comparison with the ITS. Due to the fishery closure in March 2019, the Hawaii shallow-set longline fishery in 2019 operated solely under the ITSs in the 2012 BiOp. The ITS from the 2019 BiOp took effect in January 2020 when the fishery reopened. Under the 2019 BiOp, NMFS will monitor the ITSs for the Hawaii shallow-set longline fishery annually starting in January 2020 to track incidental take.

Table 34. Observed interactions and estimated total mortality (M) of sea turtles in the Hawaii shallow-set longline fishery compared to the 2-year ITS in the 2012 Biological Opinion. Takes are counted based on interaction date. Note: NMFS uses post-hooking mortality criteria as per Ryder et al. (2006) to calculate sea turtle mortality rates. Source: WPRFMC (2020).

Species	2-year ITS Interactions (M)	2-year Monitoring Period Interactions (M)						
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Green turtle	6(2)	0	1(0.25)	1(0.25)	0	2(0.10)	3(0.11)	1 (0)
Leatherback turtle	52(12)	18(3.05)	27(4.27)	21(4.07)	10(2.5)	9(2.35)	10(2.50)	6 (1.1)
Loggerhead turtle	68(14)	12(0.95)	21(2.31)	28(2.95)	28(3)	36(5.85)	54(9.42)	53 (8.4)
Olive ridley turtle	4(2)	0	1(0.05)	2(0.15)	1(0.1)	4(0.25)	5(0.75)	3 (1.1)

From 2012 to 2018, the fishery did not reach the annual hard cap for either leatherback or loggerhead turtles (26 and 34, respectively, based on the 2012 BiOp). The fishery was closed in May 2018 pursuant to the aforementioned settlement agreement. At the time of the closure, the fishery had 33 loggerhead interactions, thus the fishery was closed prior to reaching the annual hard cap limit of 34 turtles. In 2019, the fishery closed in March due to reaching the loggerhead hard cap limit of 17, and the fishery reopened on January 1, 2020.

In 2017-2019, loggerhead turtle interactions in the Hawaii shallow-set longline fishery were higher than levels previously observed since the fishery reopened in 2004. A total of 21 loggerhead interactions were observed in 2017, 33 loggerhead interactions observed from January 2018 to the fishery closure in May, and 20 loggerhead interactions observed from January 2019 to the fishery

¹¹ Note: this is a 25% reduction from the ITS of 21 leatherback sea turtles in Table 27, introduced as a precautionary measure under the 2019 BiOp.

closure in March. The increase in loggerhead interactions may be explained by the high reproductive output at their source nesting beaches in Japan where loggerhead turtle nest counts increased nearly an order of magnitude from 1997 to 2014 - most of the loggerhead turtles observed interacting with the fishery in 2017 and 2018 were in the range of 40-60 cm straight carapace length, which is estimated to be approximately 3-10 years in age and consistent with the period of high nesting in Japan (WPRFMC, 2020).

In response to the higher number of loggerhead turtle interactions in the shallow-set fishery, the Council took final action to amend the Pelagic Fishery Ecosystem Plan (FEP) to modify sea turtle mitigation measures as per the 2019 BiOp. Specifically, for the loggerhead sea turtle, the Council recommended not setting an annual fleet-wide hard cap limit on the number of North Pacific loggerhead turtle interactions but instead established individual trip interaction limits for loggerhead and leatherback turtles for the shallow-set fishery, which became effective on April 22, 2020. The new measure is paired with an annual review of the fishery's performance under the trip interaction limits in the Annual SAFE Report.

Deep-set fishery

Table 35 summarizes the incidental take data of sea turtles from 2016 to 2020 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in the SAFE report as "McCracken estimates - ME" WPRFMC (2020)). When ME are not available, a standard expansion factor estimate is used ($EF\ Est. = 100 / \% \text{ observer coverage} * \# \text{ takes}$). The most commonly observed sea turtle species was the olive ridley sea turtle, whereas interactions with leatherbacks, greens, and loggerheads were much less frequent.

The highest number of observed olive ridley interactions occurred in 2016 with 31 takes. This was followed by three years of high olive ridley interactions with 26, 18, and 29 interactions in 2017, 2018, and 2019, respectively. Due to the depth of the deep-set longline gear and the relatively smaller size of olive ridley turtles compared to leatherback turtles, most of the interactions result in mortalities. The higher level of olive ridley turtle interactions was considered in the 2017 Supplement to the 2014 BiOp, which concluded that the fishery is not likely to jeopardize olive ridley turtles after considering this higher level of interactions. The Council's Protected Species Advisory Committee at its 2017 meeting discussed the olive ridley turtle interaction trend and recommended evaluation of the increasing trend in conjunction with the previously recommended effort to evaluate ecosystem factors influencing bycatch in the longline fishery. Based on this recommendation, the Council and NMFS implemented an ecosystem-based fisheries management project using an ensemble random forest model. This model utilizes a suite of environmental, effort and species data to predict the chance of an interaction with an olive ridley sea turtle. Preliminary results suggest the highest ranked variables predicting an olive ridley interaction in the Hawaii deep-set longline fishery include temperature at the mixed layer, sea surface temperature, and current divergence. The model is still being tested in the spirit of developing a dynamic ocean management product to evaluate the efficacy of management strategies in the Hawaii and American Samoa longline fisheries. By modelling the effort redistribution and taking advantage of incorporating multiple species (target or bycatch species) into a dynamic ocean management product, it can be determined how avoiding one protected species will change the interaction probability with others (WPRFMC, 2020). **This should be discussed further at the site visit.**

In summary, the following sea turtle scoring elements have been identified for the deep-set fishery, based on the 2016-2020 data given in WPRFMC (2021b): green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles.

Table 35. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for sea turtles in the Hawaii deep-set longline fishery, 2016-2020.
Source: WPRFMC (2021b).

Year	Obs. Cov. (%)	Sets	Hooks	Green				Leatherback				Loggerhead				Olive ridley				Unidentified hard shell		
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks	
2016	20.1	3,880	9,872,439	1(1)	0.0001	-	5	3(1)	0.0003	-	15	2(1)	0.0002	-	7	31(28)	0.0031	-	162	1(1)	0.0001	5
2017	20.4	3,832	10,148,195	3(1)	0.0003	-	18	0	0.0000	-	0	3	0.0003	-	12	26(23)	0.0026	-	119	0	0.0000	-
2018	20.4	4,332	11,751,144	3(3)	0.0003	-	17	2	0.0002	-	12	1(1)	0.0001	-	4	18(16)	0.0015	-	96	0	0.0000	-
2019	20.5	4,697	12,948,077	2(2)	0.0002	-	12	3	0.0002	-	14	0	0.0000	-	0	29(28)	0.0022	-	138	0	0.0000	-
2020	15.25	3,131	8,738,011	2(2)	0.0002	13	-	4	0.0005	26	-	3(1)	0.0003	20	-	11(9)	0.0013	72	-	0	0.0000	-

The Hawaii deep-set longline fishery operates under the 3-year ITS in the 2014 BiOp for leatherback sea turtles, and in the 2017 Supplement to the 2014 BiOp for all other sea turtle species (Table 36). Unlike the shallow-set fishery, the deep-set fishery does not have hard caps and the ITS triggers re-initiation of consultation when exceeded. Since 2018, the ITSs for green sea turtle, North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle have been exceeded. On October 4, 2018, NMFS therefore reinitiated consultation for the deep-set fishery. Until NMFS completes the Section 7 consultation and issues a new BiOp, the 2014 BiOp as supplemented (2017) remains valid (WPRFMC, 2020).

Leatherback interactions, since the 2014 BiOp, remain below the ITS of 72 interactions over three years. The Council at its 165th Meeting in 2016 recommended continued monitoring of the interactions and further analysis to evaluate patterns of leatherback interactions in the Hawaii deep-set longline fishery. Leatherback turtle interactions in 2017-2019 were lower than in 2014-2015 (WPRFMC, 2020).

Table 36. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities (M) of sea turtles in the Hawaii deep-set longline fishery compared to the 3-year ITS in the 2014 Biological Opinion and in the 2017 Supplement to the 2014 Biological Opinion. Note: NMFS uses post-hooking mortality criteria as per Ryder et al. (2006) to calculate sea turtle mortality rates. Source: WPRFMC (2020).

2014 BiOp			
Species	3-year ITS Interactions (M)	Estimated Total Interactions and Mortalities Interactions (M)	
		2016-2018	2017-2019
Leatherback turtle	72(27)	21.12(8.6)	25.51 (4.43)
2017 Supp. BiOp			
Species	3-year ITS Interactions (M)	Estimated Total Interactions and Mortalities Interactions (M)	
		Q3 2016-Q4 2018	2017-2019
Green turtle	-	-	-
East Pacific DPS	12(12)	20.38(18.67)	21.63 (20.28)
Central North Pacific DPS	6(6)	3.49(3.19)	7.75 (7.27)
East Indian-west Pacific DPS	6(6)	2.33(2.13)	3.29 (3.09)
Southwest Pacific DPS	6(6)	2.04(1.87)	2.83 (2.65)
Central West Pacific DPS	3(3)	0.29(0.27)	1.09 (1.02)
Central South Pacific DPS	3(3)	0.29(0.27)	1.94 (1.82)
Loggerhead turtle	18(13)	15(9.5)	20 (12.64)
Olive ridley turtle	-	-	-
Endangered Mexico and threatened eastern Pacific populations	141(134)	179(168.09)	256.12 (244.31)
Threatened western Pacific populations	42(40)	53(49.77)	88.59 (84.5)

6.9.3.4 Seabirds

NMFS annually publishes the report *Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries* (e.g. NMFS_PIRO (2021)), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactionspelagic-longline-fishery>.

Shallow-set fishery

The majority of observed interactions in the shallow-set fishery involve Laysan albatrosses and black-footed albatrosses (Table 37). The short-tailed albatross ITS in the 2012 Biop is 1 incidental take every 5 years in the shallow-set fishery. Exceeding this number will lead to reinitiating consultation of the impact of this fishery on the species. Since there have been no observed takes of short-tailed albatrosses in the fishery, the ITS has not been exceeded as of the end of 2019 (WPRFMC, 2020).

Table 37. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for seabirds in the Hawaii shallow-set longline fishery, 2015-2019. Source: WPRFMC (2020).

Year	Obs. Cov. (%)	Sets	Hooks	Laysan Albatross		Black-footed Albatross	
				Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2015	100	1,178	1,286,628	45(6)	0.035	41(10)	0.032
2016	100	778	849,681	26(3)	0.031	40(12)	0.047
2017	100	973	1,051,426	6(1)	0.007	51(20)	0.049
2018	100	476	546,371	2	0.004	9(2)	0.017
2019	100	312	374,487	15(3)	0.048	19(5)	0.051

In summary, the following seabird scoring elements have been identified for the shallow-set fishery, based on the 2015-2019 data given in WPRFMC (2020): Laysan albatross (*Phoebastria immutabilis*) and black-footed albatross (*Phoebastria nigripes*).

Deep-set fishery

Table 38 and Table 39 summarize the incidental take data of seabirds from 2015 to 2019 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in the SAFE report as “McCracken estimates - ME” WPRFMC (2020)). When ME are not available, a standard expansion factor estimate is used (EF Est. = 100 / % observer coverage * # takes). The most common observed interactions involved black-footed albatrosses and Laysan albatrosses. Additional takes of unidentified shearwaters, sooty shearwaters, brown boobies and red-footed boobies have been observed. Most of the unidentified shearwaters have been identified as sooty shearwaters (NMFS, 2016 cited in WPRFMC (2020)). There have been no observed takes of short-tailed albatrosses by this fishery.

Interactions with black-footed albatrosses since 2015 have been substantially higher compared to previous years with the highest number observed in 2018. Expanded annual estimated takes for other seabird species suggested a high degree of variability from year to year. Interactions with sooty shearwaters and boobies are relatively infrequent.

In summary, the following seabird scoring elements have been identified for the deep-set fishery, based on the 2015-2019 data given in WPRFMC (2020): Laysan albatross (*Phoebastria immutabilis*),

black-footed albatross (*Phoebastria nigripes*), sooty shearwater (*Ardenna grisea*), red-footed booby (*Sula sula*) and brown booby (*S. leucogaster*).

Table 38. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for albatross species in the Hawaii deep-set longline fishery, 2015-19. Source: WPRFMC (2020).

Year	Obs. Cov. (%)	Sets	Hooks	Laysan albatross				Black-footed albatross			
				Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		
2015	20.6	3,728	9,393,234	24(22)	0.0026	-	119	107(92)	0.0114	-	541
2016	20.1	3,880	9,872,439	34(32)	0.0034	-	166	104(99)	0.0105	-	485
2017	20.4	3,832	10,148,195	38(38)	0.0037	-	226	97(85)	0.0096	-	471
2018	20.4	4,332	11,751,144	33(29)	0.0028	-	157	194(168)	0.0165	-	931
2019	20.5	4,697	12,948,077	45(44)	0.0035	220	-	146(139)	0.0113	712	-

Table 39. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for other seabird species in the Hawaii deep-set longline fishery, 2015-19. Source: WPRFMC (2020).

Year	Obs. Cov. (%)	Sets	Hooks	Booby species				Sooty shearwater			Unidentified shearwater			
				Observed		EF Est.	ME	Observed		EF Est.	Observed		EF Est.	ME
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		Takes (M)	Takes/ 1,000 hooks		
2015	20.6	3,728	9,393,234	1(1) ^g	0.0001	-	6	5(4)	0.0005	5	0	0.0000	-	21 ⁱ
2016	20.1	3,880	9,872,439	2(1) ^g	0.0002	-	12	4(4)	0.0004	20	0	0.0000	0	-
2017	20.4	3,832	10,148,195	0	0.0000	-	0	0	0.0000	0	0	0.0000	-	0
2018	20.4	4,332	11,751,144	2(2) ^h	0.0002	-	11	0	0.0000	0	10(10)	0.0009	-	40
2019	20.5	4,697	12,948,077	1(1) ⁱ	0.0001	5	-	0	0.0000	0	0	0.0000	0	-

g These birds were identified as red-footed boobies

h One of the booby species was identified as a red-footed booby and one was identified as a brown booby

i This animal was identified as a brown booby

6.9.3.5 Elasmobranchs

Shallow-set fishery

Table 40 summarizes the incidental take data of ESA-listed elasmobranchs from 2015 to 2019 in the Hawaii shallow-set longline fishery. There were no observed interactions with silky sharks, which are not an ESA-listed species, but are considered ETP as per WCPFC and IATTC management (Section 6.9.3).

Oceanic whitetip sharks constitute the majority of the interactions and the observed number of takes ranges between 1 and 32. Spatial distribution of shallow-set fishing effort typically overlaps with oceanic whitetip shark distribution (south of 30°N) in the summer months (WPRFMC, 2020). Most of the oceanic whitetip sharks that are caught in the shallow-set fishery are released alive. Giant manta ray interactions with this fishery are rare. There were no observed interactions with scalloped hammerheads in the shallow-set fishery since 2004 (WPRFMC, 2020).

In summary, the following elasmobranch scoring elements have been identified for the shallow-set fishery, based on the 2015-2019 data given in WPRFMC (2020): oceanic whitetip shark (*Carcharhinus longimanus*) and giant manta ray (*Mobula birostris*).

Table 40. Observed and estimated interactions with elasmobranchs in the Hawaii shallow-set longline fishery, 2004-2019. Source: WPRFMC (2020).

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark		Oceanic whitetip shark		Giant manta ray	
				Takes (M ^b)	Takes/ 1,000 hooks	Takes (M ^b)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2015	100	1,178	1,286,628	0	0.0000	22(2)	0.0171	0	0.0000
2016	100	778	849,681	0	0.0000	32(3)	0.0377	0	0.0000
2017	100	973	1,051,426	0	0.0000	29(1)	0.0276	2	0.0048
2018	100	476	546,371	0	0.0000	1	0.0018	0	0.0000
2019	100	312	374,487	0	0.0000	0	0.0000	0	0.0000

Deep-set fishery

Table 41 summarizes the incidental take data of ESA-listed elasmobranchs from 2015 to 2019 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in the SAFE report as “McCracken estimates - ME” WPRFMC (2020)). When ME are not available, a standard expansion factor estimate is used (EF Est. = 100 / % observer coverage * # takes).

The most common observed interactions were of oceanic whitetip sharks, with giant manta rays observed infrequently. There were no observed interactions with the Indo-west Pacific DPS of scalloped hammerhead sharks. The annual expanded interaction estimates range between 1,098 and 2,654 for oceanic whitetips, and 0 and 22 for giant manta rays.

As for non ESA-listed ETP sharks, 2015-20 total catch data for the deep-set fishery are shown in Table 14. Total annual catch (extrapolated from observed encounters by NMFS based on 20% observer coverage) for silky sharks averaged at 46,800 lbs or *ca.* 21 tonnes. No other ETP shark species were identified in the dataset.

In summary, the following elasmobranch scoring elements have been identified for the deep-set fishery, based on the 2015-2019 data given in WPRFMC (2020): oceanic whitetip shark (*Carcharhinus longimanus*), giant manta ray (*Mobula birostris*) and silky shark (*Carcharhinus falciformis*).

Table 41. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for ESA-listed elasmobranch species in the Hawaii deep-set longline fishery, 2015-2019. Source: WPRFMC (2020).

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark				Oceanic whitetip shark				Giant manta ray			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M ^b)	Takes/ 1,000 hooks			Takes (M ^b)	Takes/ 1,000 hooks			Takes (M ^b)	Takes/ 1,000 hooks		
2015	20.6	3,728	9,393,234	0	0.0000	-	0	531(139)	0.0565	-	2,654	2	0.0002	-	10
2016	20.1	3,880	9,872,439	0	0.0000	-	0	423(123)	0.0428	-	2,188	4	0.0004	-	22
2017	20.4	3,832	10,148,195	0	0.0000	-	0	242(57)	0.0238	-	1,257	0	0.0000	-	0
2018	20.4	4,332	11,751,144	0	0.0000	0		224(62)	0.0191	1,098		1	0.0001	5	
2019	20.5	4,697	12,948,077	0	0.0000	0		435(99)	0.0336	2,122		0	0.0000	0	

6.9.4 Habitats

This fishery is strictly a pelagic fishery and does not interact with benthic habitats. Further detail is provided in the Habitats Performance Indicator scoring tables (Section 6.9.7).

6.9.5 Ecosystem

Unless otherwise indicated, the information in this section was extracted from WPRFMC (2020).

The Hawaiian archipelago's position in the Pacific Ocean lies within the clockwise rotating North Pacific Subtropical Gyre (NPSG), extending from the northern portion of the North Equatorial Current into the region south of the Subtropical High, where the water moves eastward in the North Pacific Current (Figure 42). The NPSG is the largest contiguous ecosystem on earth.

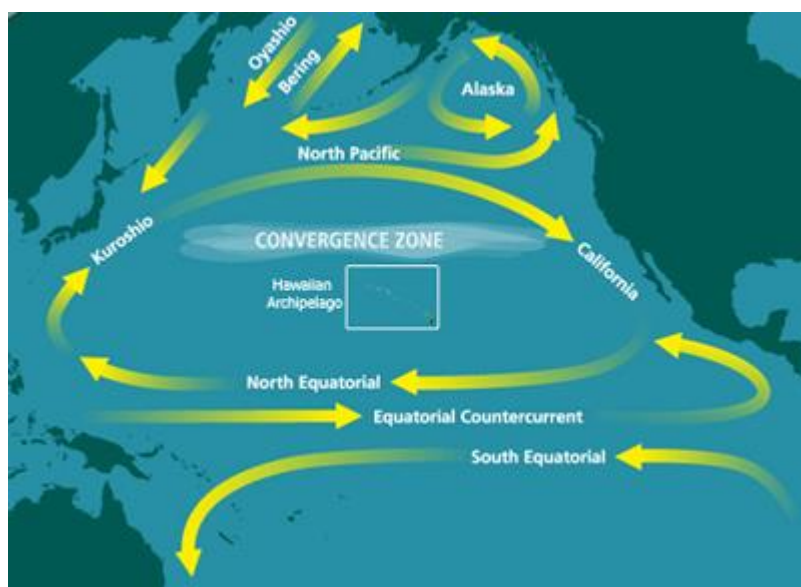


Figure 42. The main ocean currents involved with the North Pacific Gyre. Source: NOAA - <http://marinedebris.noaa.gov/info/patch.html>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=6808542>.

Sea surface temperatures around the Hawaiian Archipelago experience seasonal variability, but generally vary between 18° - 28° C with the colder waters occurring more often in the NWHI. A significant source of inter-annual physical and biological variation around Hawaii are El Niño Southern Oscillation (ENSO) events which can be one of three states: El Niño, Neutral or La Niña. During an El Niño, the normal easterly trade winds weaken, resulting in a weakening of the westward equatorial surface current and a deepening of the thermocline in the central and eastern equatorial Pacific. Water in the central and eastern equatorial Pacific becomes warmer and more vertically stratified with a substantial drop in surface chlorophyll. In 2019, the ENSO phase transitioned from a weak El Niño to neutral conditions.

Physical and biological oceanographic changes have also been observed on decadal time scales through the Pacific Decadal Oscillation (PDO) which reflects changes between periods of persistently warm or persistently cool temperatures, over periods of 20 to 30 years. In the 'warm' or 'positive' phase, the west Pacific Ocean becomes cool while an area in the east warms. A 'cool' phase occurred from 1947 to 1976 (29 years), and a 'warm' phase from 1977 to 1999 (22 years). However, more recently, the 'warm' and 'cold' phases have been much shorter. In 1999, there was a 'cold' phase for about 4 years (1999-2002) followed by a 'warm' phase that continued for 3 years. The phase was then neutral until 2007, when there was a 'cold' phase that lasted through 2013. The last PDO phase shift

was in 2014, when it turned strongly positive ('warm') (Figure 43)¹². These – usually - low frequency changes, termed regime shifts, can impact the entire ocean ecosystem. During the warm phase in the 1980's an ecosystem shift from high carrying capacity to low carrying capacity occurred in the NWHI. The ecosystem effects of this shift were observed in lower nutrient and productivity levels and decreased abundance of numerous species in the NWHI including the spiny lobster, the Hawaiian monk seal, various reef fish, the red-footed booby, and the red-tailed tropic bird.

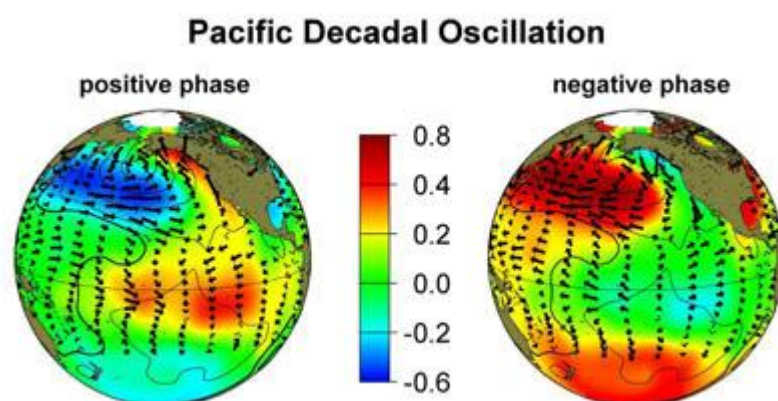


Figure 43. The Pacific Decadal Oscillation positive (warm) and negative (cool) phase. Source: <https://sealevel.jpl.nasa.gov/data/el-nino-la-nina-watch-and-pdo/pacific-decadal-oscillation-pdo/>

Variability in sea surface temperature (SST) impacts the marine ecosystem and pelagic fisheries. For example, warmer SSTs can lead to the subtropical front being farther north and vice versa, which in turn affects the distance fishers may need to travel to reach longline fishing grounds. In 2019, SST was above the long-term average across Hawaii's longline fishing grounds. Changes in phytoplankton abundance also have the potential to impact fish abundance, size, and catch. Increased phytoplankton production can lead to the transition zone chlorophyll front being farther south and vice versa, and changes in the location of this front particularly impact Hawaii's swordfish fishery. In 2019, surface chlorophyll was close to or just below average across much of the longline fishing grounds. The Transition Zone Chlorophyll Front, which is targeted by the swordfish fishery, was north of average across nearly the entire fishing grounds in the first quarter of the year. In 2019, average median phytoplankton size across the longline fishing grounds was below average. Changes to median phytoplankton can propagate through the food web and influence fish size structure, weight per unit effort, and the bigeye tuna recruitment index.

Understanding the effects of natural climate variability, like ENSO and the PDO, on the ocean, marine ecosystems, and the fishery is an active area of research. Over the past few years, the Council has incorporated climate change into the overall management of the fisheries over which it has jurisdiction. The annual SAFE report now includes a standard section on indicators of climate and oceanic conditions in the Western Pacific region. These indicators reflect both global climate variability and change, as well as trends in local oceanographic conditions.

The Hawaii-based tuna longline fishery (deep-set fishery) has shown steady increases in both effort (hooks) and catch over the past two decades, while swordfish fishing (shallow-set fishery) has experienced a steady downward trend during the same period, with 2019/20 the lowest years in terms of fleet size and effort (Figure 3, Section 6.2.1). Diminishing economic performance of shallow-set

¹² <https://sealevel.jpl.nasa.gov/data/el-nino-la-nina-watch-and-pdo/pacific-decadal-oscillation-pdo/>

fishing may have contributed to the overall decline of the shallow set fishery, in addition to regulatory measures in controlling sea turtle interactions within the fishery.

Woodworth-Jefcoats et al. (2019) examined the effects of climate change and fishing on Hawaii's deep-set longline fishery and its supporting ecosystem. The study used *therMizer*, a size-structured multi-species food-web model that includes both size and species resolution as well as the physiological effects of rising ocean temperatures through a range of future fishing scenarios over a 2006 – 2100 projection period, with F doubling from $F = 0.2$ to 0.4 , increasing five-fold to 1 , halving to 0.1 , and declining to one fifth or 0.04 (referred to in the study as $2F$, $5F$, $0.5F$, and $0.2F$, respectively). These scenarios were chosen based in part on trends in effort of Hawaii's deep-set longline fishery. Woodworth-Jefcoats et al. (2019) found that climate change, with constant F , acts to reduce bigeye biomass by 7% by 2050 and by 20% by 2100. Across all species modelled, these declines range from 3% (skipjack) to 14% (blue shark) by 2050 and from 7% (skipjack) to 37% (wahoo) by 2100. However, when changes in F are paired with climate change, reducing F can compensate the climate-driven biomass declines for all species: bigeye biomass increases to within 10–12% of what it would be in the absence of climate change by 2050 under the $0.5F$ + climate change and $0.2F$ + climate change scenarios. Across all species, this value ranges from 4 to 23% (Figure 44). By 2100, biomass of all species except wahoo more than doubles (bigeye biomass increases 136%) when climate change is incorporated into the $0.2F$ scenario. In contrast, climate change amplified the biomass declines seen under scenarios with increasing fishing mortality. Taken as individual stressors, the study supports the notion that climate change and increasing fishing mortality act to reduce fish biomass and size across all species in the ecosystem. Although fishing clearly has an impact on the ecosystem, for example by reducing the abundance of large high-trophic level predators (Ward and Myers, 2005), by increasing catch rates of smaller mesopredator species (Sibert et al., 2006; Polovina et al., 2009) and through potential simplification of oceanic systems by the removal of functional groups (Baum and Worm, 2009), reducing fishing mortality may somewhat offset the negative effects of climate change and increase ecosystem resilience (Woodworth-Jefcoats et al., 2019). This suggests that the effects of the fishery, in its current state, are reversible and that the UoA is therefore highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

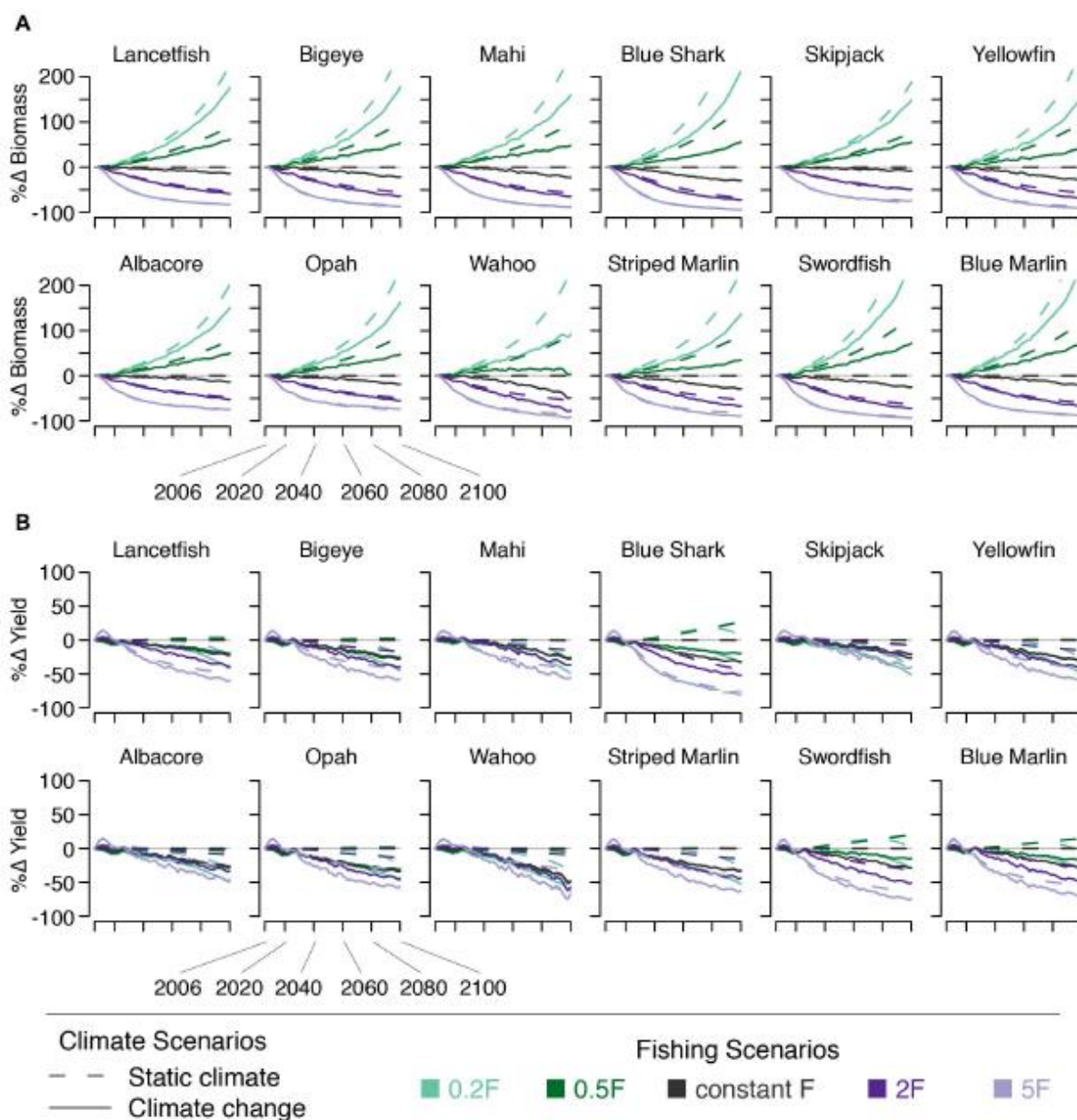


Figure 44. Percent change in species' (A) biomass and (B) yield under five fishing scenarios (indicated by line color) both with (solid lines) and without (dashed lines) climate change. Note: Declines in yield reflect declines in ecosystem biomass. Source: Woodworth-Jefcoats et al. (2019).

6.9.6 Scoring elements

Table 42. Principle 2 scoring elements

Component	UoA	Scoring elements	Designation	Data-deficient
Primary	Shallow-set	WCPO bigeye EPO bigeye Pacific Mackerel (Taiwan EEZ) - bait	Main	No
Primary	Shallow-set	WCPO yellowfin EPO yellowfin NP albacore NP striped marlin	Minor	No
Primary	Deep-set	WCPO bigeye (YFT and SWO UoAs) EPO bigeye (YFT and SWO UoAs)	Main	No

Component	UoA	Scoring elements	Designation	Data-deficient
		WCPO yellowfin (BET and SWO UoAs) EPO yellowfin (BET and SWO UoAs) Pacific Saury (Taiwan EEZ) - bait		
Primary	Deep-set	NP albacore NP striped marlin WCNPO swordfish Pacific saury (Japan EEZ) - bait Pacific sardines (Japan EEZ) - bait Pacific mackerel (Taiwan EEZ) - bait	Minor	No
Secondary	Shallow-set	NP blue shark NP mako shark	Main	No
Secondary	Shallow-set	Blue marlin Spearfish Mahi mahi Wahoo Moonfish Pomfrets	Minor	Yes. Most minor species do not have stock assessments or biologically-based limits. RBF not triggered for minor species
Secondary	Deep-set	NP blue shark Bigeye thresher Moonfish	Main	Yes (moonfish, RBF triggered)
Secondary	Deep-set	Blue marlin Pomfrets Wahoo Spearfish Mahi mahi	Minor	Yes. Most minor species do not have stock assessments or biologically-based limits. RBF not triggered for minor species
ETP species	Shallow-set	Bottlenose dolphin Risso's dolphin Striped dolphin Guadalupe fur seal Ginkgo-toothed beaked whale Green sea turtle Leatherback sea turtle Loggerhead sea turtle Olive ridley sea turtle Laysan albatross Black-footed albatross Oceanic whitetip shark Giant manta ray	N/a	No
ETP species	Deep-set	Bottlenose dolphin Risso's dolphin False killer whale Short-finned pilot whale Rough-toothed dolphin Green sea turtle Leatherback sea turtle Loggerhead sea turtle Olive ridley sea turtle Laysan albatross Black-footed albatross Sooty shearwater	N/a	No

Component	UoA	Scoring elements	Designation	Data-deficient
		Red-footed booby Brown booby Oceanic whitetip shark Giant manta ray Silky shark		
Habitats	All	Water column	Commonly encountered	No

6.9.7 Principle 2 Performance Indicator scores and rationales

Scoring table 31. 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	<p>Main primary species are likely to be above the PRI.</p> <p>OR</p> <p>If the species is below the PRI, the UoA has measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding.</p>	<p>Main primary species are highly likely to be above the PRI.</p> <p>OR</p> <p>If the species is below the PRI, there is either evidence of recovery or a demonstrably effective strategy in place between all MSC UoAs which categorise this species as main, to ensure that they collectively do not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that main primary species are above the PRI and are fluctuating around a level consistent with MSY.</p>
	Shallow-set (UoAs 1 - 5)	<p>WCPO bigeye – Yes</p> <p>EPO bigeye – Yes</p> <p>Pacific mackerel – Yes</p>	<p>WCPO bigeye – Yes</p> <p>EPO bigeye – No</p> <p>Pacific mackerel – Yes</p>	<p>WCPO bigeye – No</p> <p>EPO bigeye – No</p> <p>Pacific mackerel – No</p>
	Deep-set SWO (UoA 6)	<p>WCPO bigeye – Yes</p> <p>EPO bigeye – Yes</p> <p>WCPO yellowfin – Yes</p> <p>EPO yellowfin – Yes</p> <p>Pacific saury – Yes</p>	<p>WCPO bigeye – Yes</p> <p>EPO bigeye – No</p> <p>WCPO yellowfin – Yes</p> <p>EPO yellowfin – Yes</p> <p>Pacific saury – Yes</p>	<p>WCPO bigeye – No</p> <p>EPO bigeye – No</p> <p>WCPO yellowfin – Yes</p> <p>EPO yellowfin – No</p> <p>Pacific saury – No</p>

	Deep-set YFT (UoAs 8, 9)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – Yes	WCPO bigeye – Yes EPO bigeye – No Pacific saury – Yes	WCPO bigeye – No EPO bigeye – No Pacific saury – No
	Deep-set BET (UoAs 7, 10)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes	WCPO yellowfin – Yes EPO yellowfin – No Pacific saury – No

Rationale

As detailed in Section 6.9.2, the following main primary species were identified (note, all are P1 species – however outside their respective UoAs, P1 species should be assessed under P2):

- Shallow-set UoAs: WCPO bigeye, EPO bigeye, Pacific mackerel (Taiwan EEZ)
- Deep-set UoAs: WCPO bigeye, EPO bigeye (YFT and SWO UoAs only – 6, 8, 9); WCPO yellowfin, EPO yellowfin (BET and SWO UoAs only – 6, 7, 10), Pacific saury (Taiwan EEZ).

WCPO bigeye: There is a high degree of certainty that bigeye is above the PRI (see 1.1.1.a; Scoring table 7). **SG60, SG80 and the first part of SG100 are met.** However, 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 (Ducharme-Barth et al., 2020). In addition, $F > F_{MSY}$ for 3 of the 24 models in the assessment grid. **SG100 is not met in full.**

EPO bigeye: As indicated in PI 1.1.1 (Scoring table 25), the spawning biomass limit reference point is equal to 0.077 of the equilibrium virgin spawning biomass. This value is analytically determined and could be considered as the PRI for bigeye. However, this level of depletion is greater than is typically used for tuna stocks. A more precautionary approach is adopted here, the default MSC PRI of 20% S_0 . The benchmark assessment and risk analysis indicate that is likely (70th percentile) that $S_{current}$ is above the 20% S_0 PRI, **meeting SG60 requirements.** As indicated above, if the pessimistic scenario is correct, the probability of exceeding the limit reference point with the current adopted closure is 10%, or slightly higher. In addition, the estimated S_{cur}/S_0 is below 20% for several of the assessment runs. Given this and the increasing fishing mortality over time evident in the SSIs, it is concluded that **the first part of SG80 is not met.**

Therefore, to meet SG80, there should be 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. The following overlapping MSC UoAs were identified **at this ACDR stage** (landed catch is also shown):

- Northeastern Tropical Pacific Purse Seine yellowfin and skipjack tuna fishery: Fishery assessed against MSC Certification Requirements v1.3 (no harmonization needed)
- Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery: EPO BET is a Principle 1 species, no harmonization required.
- US Pacific Tuna Group Purse Seine FSC and FAD Set Fishery: data not found in ACDR
- AGAC four oceans Integral Purse Seine Tropical Tuna Fishery: 18,324t (2018) from PCDR
- Eastern Pacific Purse Seine Skipjack and Yellowfin tuna fishery (FSC and FAD set fishery): 679t (2018) from ACDR
- French Polynesia albacore and yellowfin longline fishery: 750t (2019) from Year 2 surveillance report
- This fishery (deep-set UoAs): 7456 t (2020) total catch (WCPO and EPO combined)
- This fishery (shallow-set UoAs): 44 t (2020) total catch (WCPO and EPO combined)

Total EPO bigeye catch 2020: 95,192 (from IATTC (2020a)).

Not including the TUNACONS fishery for which no data were available during this ACDR drafting, the MSC fisheries combined account for *ca.* 29% of the total EPO bigeye catch. Given that this estimate is based on landings only, and given the likely significant bigeye catches in the TUNACONS fishery, the team considered it appropriate to assume that MSC catches are likely to exceed the 30% threshold cited under GSA3.4.6, beyond which fisheries may be influential in hindering recovery of a given stock. **SG80 is therefore not met in full. Therefore, only SG60 is considered to be met.**

WCPO yellowfin: There is a high degree of certainty that yellowfin is above the PRI (see 1.1.1.a; Scoring table 13) and is fluctuating around a level consistent with MSY (see 1.1.1.b; Scoring table 13). **SG60, SG80 and SG100 are met.**

EPO yellowfin: As indicated in Scoring table 19, the spawning biomass limit reference point is equal to 0.077 of the equilibrium virgin spawning biomass. This value is analytically determined and could be considered as the PRI for yellowfin; however, it is a lower value than used for other MSC certified stocks. Where an analytically determined estimate for MSY is available and there is no analytical determination of the PRI, the MSC Guidance (GSA 2.2.3.1) suggests a more precautionary approach is to adopt a default PRI of 20% S_0 or 75%B_{MSY} if B_{MSY}<27%B₀. The assessors have adopted this approach. The assessment outcomes capture a range of states of nature and steepness combinations, encapsulating a wide range of uncertainties. It is highly likely that the stock is above the more precautionary MSC PRI (and well above the established LRP in the IATTC). However, the stock assessment does not provide probability outcome in relation to 20%B₀ or 75%B_{MSY}. Results are provided for $S_{current}/S_0$ for each of the model combinations. Weighted average values of the model outcomes for each of the steepness parameters used ($h=1.0, 0.9, 0.8, 0.7$) are 0.24, 0.23, 0.19 and 0.22 with an average of 0.22. This is interpreted as meeting highly likely requirements. **SG60 and SG80 requirements are met.** However, there are outcomes which suggest the stock is below 20% S_0 . **SG100 is not met.**

Pacific mackerel (Taiwan EEZ): The North Pacific Fisheries Commission (NPFC) considers chub mackerel that spawn in the waters off Taiwan to be part of the northwestern Pacific stock (NPFC, 2017). This stock is a straddling stock, fished predominantly by Japan, China, Russia and Korea and is managed by the NPFC. The NPFC's main fishing nations (Japan, Russia and China) have produced candidate stock assessment models and the NPFC has been progressing in selecting these candidate assessments for more appropriate benchmark or operating assessment, which are to be reviewed and tested by early 2022 (NPFC, 2021a). In the meantime, China's ASAP assessment suggests a poor stock status, with the stock being overfished and undergoing overfishing (Figure 45).

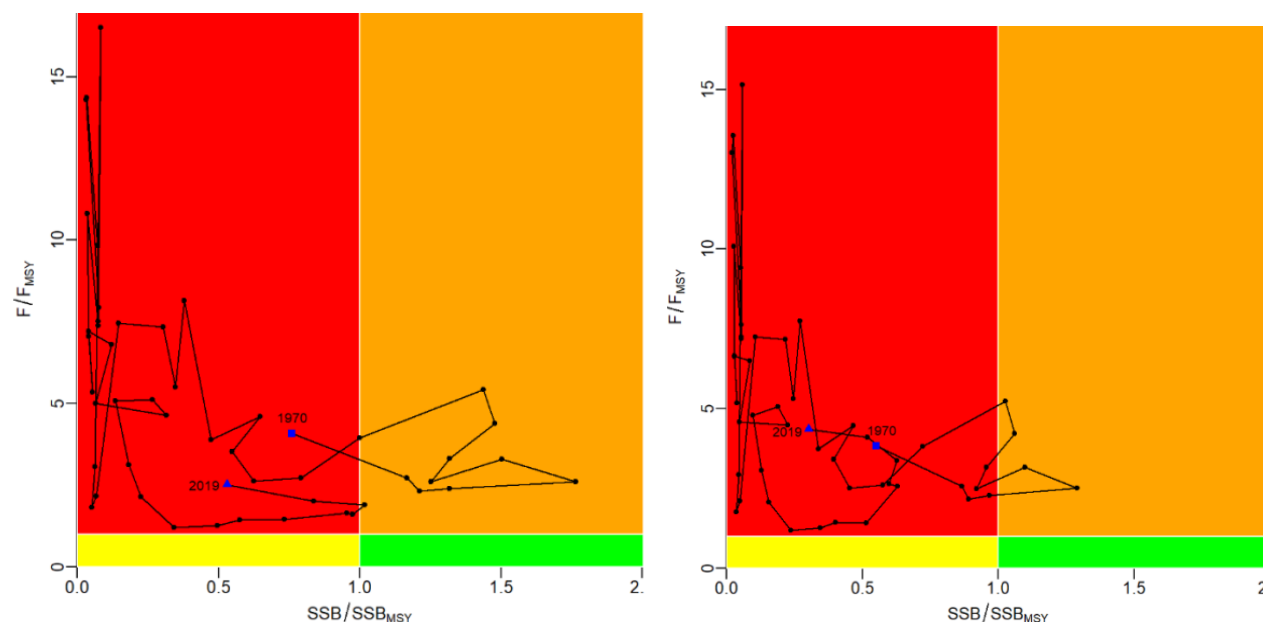


Figure 45. Kobe plot for years 1970-2019, based on China's ASAP Model 1 (Left Figure) and Model 2 (Right Figure). Source: NPFC (2020a).

However, there is considerable divergence of opinion on the stock structure of Pacific mackerel in the Northwest Pacific: although Cheng et al. (2018) suggest a high degree of genetic homogeneity between Northwest Pacific populations, Yan et al. (2015) suggest strong genetic divergence between Chinese and Japanese coastal populations, with a high gene flow within the Chinese population, and Zhang et al. (2019) suggest 'relatively high genetic homogeneity' among populations in the Taiwan Strait and adjacent waters. A recent stock assessment covering Taiwanese waters suggests a healthy population $B_{\text{end}}/K = 0.57$ (0.42 – 0.7) and $B/B_{\text{MSY}} = 1.13$ (0.83 = 1.4) (Ju et al., 2020).

Considering the contrasting information above, the team took the precautionary view to not consider the stock to be highly likely above the PRI. The first part of SG60 and SG80 is therefore not met. To meet SG60, the UoA should have measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding. To meet SG80, there should be 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 (this can be shown by demonstrating that the collective MSC UoA catch does not exceed 30% of total catches of the stock - GSA3.4.6). The following overlapping MSC UoA was identified [at this ACDR stage](#): the Pan Pacific yellowfin, bigeye and albacore longline fishery which sources mackerel as bait from Korea, representing 17 tonnes in 2016 (Jones et al., 2020). The Hawaii shallow-set fishery used 85 tonnes in 2019 (Table 18), amounting to a total of 102 tonnes.

2020 landings according to the NPFC for Russia, China and Japan combined were 446,121 tonnes. Therefore, known MSC UoAs on this species represent 0.02% of total NPFC reported landings¹³. On that basis, **SG60 and SG80 are met. SG100 is not met** because there is no high degree of certainty that the species is above the PRI.

Pacific saury (Taiwan EEZ): There is considered to be only one distinct stock of Pacific saury in the North Pacific (NPFC SC 2021). They are highly migratory, with their main spawning grounds in Japan's coastal waters to eastern offshore waters, in the Kuroshio-Oyashio region during autumn and spring and in the Kuroshio waters and Kuroshio Extension in the winter. The majority of fishing occurs in the northeastern Pacific, concentrated off northeastern Japan and offshore waters. Pacific saury are a straddling stock, targeted predominantly by China, Japan, Taiwan, and to lesser extents, Russia, Korea and Vanuatu. Because of its extensive distribution, the species has been managed by the NPFC since 2015 (Huang et al., 2019). According to its most recent assessment (NPFC, 2020b), the stock has been decreasing over time with Pacific saury stock biomass likely being "near a record low level in 2020" and nominal CPUE series corroborate this. Stock assessments produced by Japan, Taiwan, China were reviewed, concluding that median B was below B_{MSY} (median $B_{2017-2019}/B_{MSY} = 0.544$, 80%CI=0.376-0.803) and fishing mortality F was above F_{MSY} (median $F_{2017-2019}/F_{MSY} = 1.327$, 80%CI= 0.845-1.841) (Figure 46; NPFC (2020b)). Furthermore, the stock assessment suggest that the country assessments are not adequately considering recruitment and that biomass is very close to unexploitable biomass. On that basis, the first parts of SG60 and SG80 are not considered met. To meet SG60, the UoA should have measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding. In addition, to meet SG80, there should be 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 (this can be shown by demonstrating that the collective MSC UoA catch does not exceed 30% of total catches of the stock - GSA3.4.6). The following overlapping MSC UoAs were identified at **this ACDR stage**: Fiji Albacore, Yellowfin and Bigeye tuna Longline fishery (41.12 t - Akroyd and McLoughlin (2020)), and French Polynesia albacore and yellowfin longline fishery (242 tonnes - Sieben and McLoughlan (2021). Together with the deep-set fishery, these total 283.12 + 2804 tonnes (2019 in Table 18) or ca. 1% of the total TAC for the species in the NPFC convention area (NPFC, 2021b). On that basis, **SG60 and SG80 are met. SG100 is not met** because there is no high degree of certainty that the species is above the PRI.

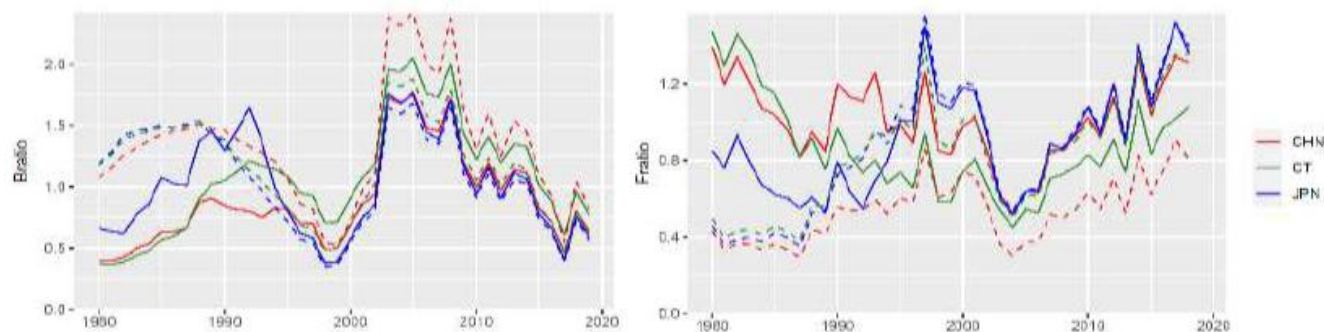


Figure 46. Time series of median estimated values of six runs for B-ratio (B/B_{MSY}) and F-ratio (F/F_{MSY}). The solid and shaded lines correspond to NB1 and NB2, respectively. The two base case scenarios differ in using Japanese early CPUE (base case NB1) or not (base case NB2). Source: NPFC (2020b).

¹³ [Summary Footprint of Chub Mackerel Fisheries | npfc](#)

In terms of unobserved mortality of primary species, the team considered ghost fishing due to gear loss as a factor. Radio buoys are spaced at regular intervals for each set. Therefore, should the line break, both ends can be retrieved. It is reportedly very rare for a whole longline to be lost. In the event the line breaks, the vessel will also want to harvest the fish which provides another incentive for retrieval. Under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Overall it is important to consider that lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The team considered that unobserved mortality through ghost fishing was unlikely to be a significant factor in the fishery's interactions with primary species to the extent that it will have stock-level effects.

b	Minor primary species stock status	
	Guide post	<p>Minor primary species are highly likely to be above the PRI.</p> <p>OR</p> <p>If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.</p>
	Met?	Not yet assessed

Rationale

As shown in Section 6.2.5.2, the following minor primary species have been identified:

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish, Pacific saury (Japan EEZ), Pacific sardines (Japan EEZ), Pacific mackerel (Taiwan EEZ)

At this ACDR stage, minor species have not yet been assessed.

References

Logbook and observer data for the Hawaiian shallow-set and deep-set longline fishery (Section 1.1.1)

Aires-da-Silva et al. (2020), Ducharme-Barth et al. (2020), Minte-Vera et al. (2020), Vincent et al. (2020), Xu et al. (2020), Macfadyen et al. (2009), Gilman (2015), Huang et al. (2019), Jones et al. (2020), Ju et al. (2020), NPFC (2017, 2020a, 2020b, 2021a), Yan et al. (2015), Zhang et al. (2019)

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

Draft scoring range	<p>Shallow-set (UoAs 1 - 5): 60 – 79</p> <p>Deep-set SWO (UoA 6): 60 – 79</p> <p>Deep-set YFT (UoAs 8, 9): 60 – 79</p> <p>Deep-set BET (UoAs 7, 10): ≥80</p>
Information gap indicator	More information sought on overlapping MSC UoAs for the bait species.

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 2.1.2 – 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.
	Shallow-set (UoAs 1 - 5)	WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – No Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – No Minor species – Not yet assessed
	Deep-set SWO (UoA 6)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Not yet assessed
	Deep-set YFT (UoAs 8, 9)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – Yes	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – No	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – No

		Minor species – Yes (default)	Minor species – Yes (default)	Minor species – Not yet assessed
	Deep-set BET (UoAs 7, 10)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Yes (default)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Not yet assessed

Rationale

See PI 2.1.1 for main and minor primary species by UoA.

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.

WCPO yellowfin and bigeye: CMM 2014-06 commits WCPFC to putting in place a formal harvest strategy for its key stocks (WCPO skipjack, yellowfin and bigeye, and South Pacific albacore), with an associated workplan, the latest version of which was drafted at WCPFC16 (December 2019). In the meantime, skipjack, yellowfin and bigeye are managed through CMM 2020-01, the objectives of which are as follows for yellowfin and bigeye: 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.

The elements of the WCPFC harvest strategy are therefore the following (see Principle 1 for detailed discussion):

- Data collection on the stock and fishery
- Stock assessment process
- Limit reference point ($20\%SB_{F=0}$) and management target ($SB_{2012-15}$; from CMM 2018-01/2020-01) (see Section 6.5.3);

- 'Available' HCR (see 1.2.2; Scoring table 10 and Scoring table 16), with some management tools set out in 2020-01 (described in Section 6.5.3), including the PNA purse seine vessel day scheme (VDS) which limits effort by setting an overall 'TAE' (total allowable effort) which is divided up for each of the parties to the agreement;
- Monitoring of implementation of CMM 2020-01 via data gathering and Part 1 and 2 reports to the Commission.

This management strategy is reviewed annually during the Commission meeting.

On the basis of the above, a strategy is in place from WCPO yellowfin and bigeye. **SG60, SG80 and SG100 are met.**

EPO yellowfin and bigeye: The IATTC harvest strategy for tropical tunas, including bigeye and yellowfin, is set out in Resolution C-17-02, which was carried over for the year 2021 through Resolutions C-20-05 and C-20-06. Interim limit and target reference point were adopted by IATTC in 2014. These were reaffirmed by Resolution C-16-02 which details the HCR and the way in which scientific advice should be framed. The status of bigeye and yellowfin is estimated, relative to the defined reference points, with outcomes discussed at Scientific Advisory Committee meetings and at annual Commission meetings. The HCR requires that if the estimated fishing mortality is higher than F_{MSY} then it should be reduced to F_{MSY} . There is a well-defined HCR in place intended to ensure that the exploitation rate is reduced if the stock falls below S_{MSY} or if fishing mortality exceeds F_{MSY} . IATTC Resolution C-16-02 provides the detail of the control rule adopted by the members of the Commission. The HCR is as follows:

- Multi-year management measures (closures are given as an example) will attempt to keep F below F_{MSY} for the species requiring the strictest management (i.e. the most vulnerable of the three tropical tuna species in terms of stock status);
- If the probability that $F > F_{lim}$ is $>10\%$, management measures shall be established such that there is at least a 50% probability that F will reduce to F_{MSY} or below, and a probability of $<10\%$ of $F > F_{lim}$;
- If the probability that $SB < SB_{lim}$ is $>10\%$, management measures shall be established such that there is at least a 50% probability that SB will recover to SB_{MSY} or above, and a probability of $<10\%$ that SB will decline to $<SB_{lim}$ within two generations or 5 years, whichever is greater.

Therefore, if there is a 10% or greater probability of reaching the LRP for fishing mortality or spawning biomass, the HCR triggers the establishment of additional management measures to reduce fishing mortality. There are currently two management tools used by the IATTC, agreed among fishing nations and passed as IATTC Resolutions: these are season closures and mechanisms to limit fishing capacity. The harvest strategy is implemented such that the aim of the HCR is to keep F from exceeding "the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management". This concept implies that yellowfin, bigeye and skipjack are linked by identification of the stock that is in greatest need of protection, defining conservation actions for that stock and implementing the same management measures equally to all three species. The team concludes that this meets the definition of a strategy under Principle 2. **SG60, SG80 and SG100 are met.**

Pacific mackerel and saury: The main international management in place for Pacific mackerel is through CMM 2019-07 (NPFC, 2021b) which requires that: the Scientific Committee will complete the stock assessment of chub mackerel as soon as practicable, there is a Technical Working Group on Chub Mackerel Stock Assessment (TWG CMSA); stipulates a cap on expansion of the fishing effort in the Convention area (unless a stock assessment permits further expansion); that measures should be applied to the high seas and NPFC members must share information on IUU fishing. Other international measures in place include CMM 2019-07-05 where members should use VMS. CMM 2019-07 06 stipulates data requirements for Pacific chub mackerel fisheries (NPFC, 2021b). While these measures are expected to maintain the stock at/to levels which are highly likely to be above

the PRI, it is recognised that international measures only cap effort and are not designed to minimise catch (NPFC, 2021c). The CMM in place is only a temporary measure designed to cap effort at the status quo until a complete stock assessment can provide insight on the appropriate measures needed to manage the stock.

Updated management measures for Pacific saury have recently been implemented at the NPFC following a recent stock assessment recommendation: “*The Commission should consider further measures to ensure the sustainability of the Pacific saury stock, taking into account current stock conditions and nominal CPUEs in 2020*” (NPFC_SC, 2021), due to its declining stock status (NPFC, 2020b). Regional management measures include CMM 2021-08 (entered into force 1 May 2021, replacing CMM 2019-08), which specifies that: NPFC members engaging in saury fishing (within or adjacent to the Convention area) shall refrain from fishery expansion; annual catch limits for 2021 and 2022 of 333,750 metric tonnes in and adjacent to the Convention area; in 2021 and 2022, an annual TAC of 198,000 tonnes in the Convention area; a provisional measure requiring members to reduce their 2021 and 2022 annual total catch by 40% of its reported 2018 catch; weekly electronic reporting of Convention area catches; communication by the Member state if it reaches 70% of its catch limit and closure upon reaching 100% of its catch limit; operation of VMS for all Member fishing vessels catching saury; retention of all saury catches (avoidance of discards); avoidance of fishing for saury in the areas east of 170°E from June to July to avoid juvenile cohorts; the Commission plans to establish a joint SC-TCC-COM Small Working Group in 2021 to implement a HCR and an MSE process for saury (NPFC, 2021b). National management in Taiwan is underpinned by the Regulations for Fishing Vessels Conducting Saury Fishery in North Pacific Ocean (20th January 2017) under paragraph 2 of the Act for Distant Water Fisheries. These Regulations consist of 48 Articles requiring that vessels fishing for saury in the north Pacific Ocean shall be limited to vessels registered as the main fishery listed as squid jigging registered on its fishing license that engages part-time in the saury stick-held net fishery; no fishing activity should be conducted in foreign jurisdictions unless there is prior agreement; the requirement for a distant water fisheries permit, requiring fishing vessel marking, reporting of vessel position, reporting of discards and electronic logbook use, and port designation and management for transshipment or landing and special measures for high-risk fishing vessels (FAOLex, 2017). Other legislation, such as Decree No. 1061336211 denote inspections, catch certificates and unloading requirements.

Overall, the management in place at stock level for both stocks, combined with the low UoA-level catch (see 2.1.1a), constitute measures that contribute to the UoA not having a significant impact on these stocks. 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, particularly considering the poor stock status for both species. The team therefore concludes that a partial strategy is not in place for the UoA that is expected to maintain or not hinder rebuilding of bait 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. SG80 is not met for the bait species for any of the UoAs. **This scoring remains provisional until site visit interviews can be held and team scoring discussions can take place after the site visit.**

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

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish

At this ACDR stage, minor species have not yet been assessed.

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.
Shallow-set (UoAs 1 - 5)	WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – Yes Minor species – Yes (default)	WCPO bigeye – No EPO bigeye – No Pacific mackerel – No Minor species – Not yet assessed
Deep-set SWO (UoA 6)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – No EPO bigeye – No WCPO yellowfin – No EPO yellowfin – No Pacific saury – No Minor species – Not yet assessed
Deep-set YFT (UoAs 8, 9)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – No EPO bigeye – No Pacific saury – No Minor species – Not yet assessed
Deep-set BET (UoAs 7, 10)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO yellowfin – No EPO yellowfin – No Pacific saury – No Minor species – Not yet assessed

Rationale

WCPO yellowfin: Yellowfin fishing mortality has always been below F_{MSY} , and the stock has never declined below the default target of SB_{MSY} . From this it can be inferred that while the harvest strategy may not have been fully tested, there is evidence that it is achieving its objectives; therefore, **SG60 and SG80 are met**. While projections suggest that the harvest strategy will continue to maintain the stock at appropriate levels under most circumstances (Section 6.6.2), **SG100 is not met** because these projections do not map onto the current management regime, and hence the harvest strategy cannot be fully evaluated.

WCPO bigeye: Stock status projections suggest that current management is precautionary in the short term. The stock assessment model based on the updated new growth curve, even with other sources of uncertainty remaining, suggests that the biomass will remain above the LRP with high probability, providing an objective basis for confidence that the strategy will work. **SG60 and SG80 are met**. The current harvest strategy is a stop-gap and has not been fully evaluated, although projections suggest that in the longer term, depending on recruitment, it risks increasing F to unsustainable levels (Section 6.5.2). **SG100 is not met**.

EPO yellowfin and bigeye: The harvest strategy is implemented such that the aim of the HCR is to keep F from exceeding “the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management”. This concept implies that yellowfin, bigeye and skipjack are linked by identification of the stock that is in greatest need of protection, defining conservation actions for that stock and implementing the same management measures equally to all three species. Although IATTC staff conclude that the SSIs suggest that fishing mortality has increased for bigeye, yellowfin and skipjack, mainly due to the increase in the number of floating object sets, and which therefore puts into question the overall efficacy of the strategy at stock level, it is important to note that this PI is scored at the UoA level: *GSA3.5: The intent of the P2 Species Management Pls (2.1.2, 2.2.2, 2.3.2) is to assess the arrangements in place to manage the impact that the UoA has on the P2 species to ensure that it does not pose a risk of serious or irreversible harm to them*. On that basis, the team considered the overall contribution of the UoA to catches of these stocks, corresponding to *ca.* 7.8% for EPO bigeye and 0.8% for EPO yellowfin (based on data presented in IATTC (2020a), for all UoAs combined and assuming that all bigeye and yellowfin landed is from the EPO stocks). These relatively low contributions provide some objective basis for confidence that the strategy will work at the UoA level for both stocks. **SG60 and SG80 are met**. **SG100 is not met** because this has not been tested specifically.

Pacific mackerel and saury: Given the minimal contribution of the UoA to the regional catches of these stocks, there is an objective basis for confidence that the partial strategy (mackerel) and strategy (saury) will work. **SG60 and SG80 are met**. **SG100 is not met** as this has not been specifically tested.

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

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish

At this ACDR stage, minor species have not yet been assessed.

c	Management strategy implementation
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	Guide post
	Shallow-set (UoAs 1 - 5)
	Deep-set SWO (UoA 6)
	Deep-set YFT (UoAs 8, 9)
	Deep-set BET (UoAs 7, 10)

Rationale

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).
WCPO bigeye – Yes EPO bigeye – Yes Pacific mackerel – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – No Minor species – Not yet assessed
WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Not yet assessed
WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO bigeye – Yes EPO bigeye – Yes Pacific saury – No Minor species – Not yet assessed
WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – Yes Minor species – Yes (default)	WCPO yellowfin – Yes EPO yellowfin – Yes Pacific saury – No Minor species – Not yet assessed

Evidence for implementation of the strategies at UoA level for all species includes VMS and observer data (at 100% coverage for the shallow-set fishery and 20% coverage for the deep-set fishery), logbook data, HDAR sales data and the MCS system as described under Principle 3, as well as a lack of systematic non-compliance by the UoAs (**to be confirmed during the site visit**). For the bait species, the quantity of bait used is known, as are total (estimated) landings from the source stocks for the main bait species. On that basis, **SG80 is met**. For the main primary species that are targeted by the fishery (and for which there is negligible unwanted catch – see discard rates in Table 17), logbooks (which provide 100% coverage) enable the impact of the UoA on these stocks to be evaluated with a high degree of certainty, providing clear evidence that the strategy is being implemented successfully and is achieving its overall objective at UoA level. **SG100 is met for WCPO and EPO yellowfin and bigeye**. For the **bait species**, in the absence of a partial strategy, **SG100 is not met**.

Minor species: Note that minor species are only considered at the SG100 level; **SG80 is therefore met by default**.

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish

At this ACDR stage, minor species have not yet been assessed.

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

None of the primary species are sharks; this scoring issue is not relevant.

e	Review of alternative measures			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.

	Shallow-set (UoAs 1 - 5)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Not yet assessed
	Deep-set SWO (UoA 6)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Not yet assessed
	Deep-set YFT (UoAs 8, 9)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Not yet assessed
	Deep-set BET (UoAs 7, 10)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Yes (default)	All main species – NA Minor species – Not yet assessed

Rationale

WCPO and EPO bigeye: based on the data shown in Table 17, discard rates for bigeye in the shallow- and deep-set fisheries are low (below 5%, although they were just above 5% in 2020 for the shallow-set fishery; to be discussed at the site visit). The same is true for yellowfin in the deep-set fishery. For the bait species, both Pacific mackerel and saury are targeted with no unwanted catch. There is no unwanted catch of the main primary species in these fisheries and this scoring issue is therefore **not relevant** – **this is to be verified at the site visit**.

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

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish

At this ACDR stage, minor species have not yet been assessed.

References

Logbook and observer data for the Hawaiian shallow-set and deep-set longline fishery (Section 1.1.1)

WCPFC CMM 2014-06 and associated workplan (WCPFC, 2020c)

CMM 2020-01 (WCPFC, 2020a)

IATTC Resolutions C-17-02, C-20-05, C-20-06: <https://www.iattc.org/ResolutionsENG.htm>

Aires-da-Silva et al. (2020), Ducharme-Barth et al. (2020), Minte-Vera et al. (2020), Vincent et al. (2020), Xu et al. (2020), FAOLex (2017), NPFC (2021b, 2021c), NPFC_SC (2021)

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

Draft scoring range	All UoAs: 60 - 79
Information gap indicator	<p>More information sought:</p> <ul style="list-style-type: none"> - Unwanted catch and discard rates to be discussed at the site visit. - Compliance with IATTC and WCPFC resolutions and CMMs to be verified. - Policy on bait sourcing if available

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 2.1.3 – 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.
	All UoAs	All main species – Yes	All main species – Yes	All main species – Yes

Rationale

Primary species were identified on the basis of three datasets:

- The Western Pacific Daily Longline Fishing Logbook data, which when combined with fish sales records from the Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data, enable the weight of longline retained catch for both Hawaiian longline fleets to be estimated, as summarised in Table 11 for the 2015-20 period (Section 6.2.5.1)
- The second dataset is based on observer data from the Pacific Islands Region Observer Program (PIROP) which deploys NMFS observers at 100% coverage in shallow-set trips and 20% (or more) for deep-set trips (discussed in Section 6.2.5.2). Although the Covid-19 pandemic caused a decline in coverage in 2020, the 15.2% coverage is still well above the WCPFC and IATTC minimum requirement of 5% (IATTC, 2019a; WCPFC, 2020a). The U.S. observer program does not collect weights data and interactions are reported in numbers only. For this assessment, the team estimated total catch weight based on the observed interactions (**extrapolated**)

by NMFS to fleet level in the case of the deep-set fishery) and average landed weight based on Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data. A summary of the total annual catch for both fleets for 2015-20 is given in Table 13 and Table 14 for the shallow- and deep-set fleets, respectively.

- The third dataset comprises HLA data on bait use per year for shallow-set trips and for deep-set trips for each species used for bait, and the country where the bait was sourced (Section 6.2.5.3, Table 18).

There is thus quantitative information on the catch of main primary species (landings, discards and bait use) from logbooks, observers and bait use statistics. Each of the main primary stocks has a stock assessment with a determination of likely status (see 2.1.1a), providing quantitative information on total landings and stock biomass. As the vast majority of main primary species are retained for sale (see Table 17), logbooks (which provide 100% coverage), together with observer data at comprehensive levels of coverage (see Table 12) enable the impact of the UoA on these stocks to be evaluated with a high degree of certainty. **SG60, SG80 and SG100 are met for the main species.**

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.
	All UoAs		Not yet assessed

Rationale

Minor species:

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish, Pacific saury (Japan EEZ), Pacific sardines (Japan EEZ), Pacific mackerel (Taiwan EEZ)

At this ACDR stage, minor species have not yet been assessed.

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.

All UoAs	All main species – Yes Minor species – Yes (default)	All main species – Yes Minor species – Yes (default)	All main species – Yes Minor species – Not yet assessed
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Rationale

Main species: The combination of stock assessments (with all the associated regional data inputs), UoA logbook data at 100% coverage and high levels of observer coverage (Table 12) and VMS data, means that the information is available and adequate to support a strategy to manage all main primary species and to determine with a high degree of certainty whether the strategy is achieving its objective at the UoA level. For the bait species, in particular, the information available (UoA bait use statistics, landings data, stock assessment) is sufficient to support a strategy, even though one is currently not in place. This, however, does not preclude SG100 from being met. **SG60, SG80 and S100 are met** for the main primary species.

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

- Shallow-set UoAs: WCPO yellowfin, EPO yellowfin, NP albacore, NP striped marlin
- Deep-set UoAs: NP albacore, NP striped marlin, WCNPO swordfish, Pacific saury (Japan EEZ), Pacific sardines (Japan EEZ), Pacific mackerel (Taiwan EEZ)

At this ACDR stage, minor species have not yet been assessed.

References

Logbook, observer data and bait use statistics for the Hawaiian shallow-set and deep-set longline fishery (Section 1.1.1)

Aires-da-Silva et al. (2020), Ducharme-Barth et al. (2020), Minte-Vera et al. (2020), Vincent et al. (2020) and Xu et al. (2020)

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	
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Condition number (if relevant)	
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Scoring table 34. 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	<p>Main secondary species are likely to be above biologically based limits.</p> <p>OR</p> <p>If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.</p>	<p>Main secondary species are highly likely to be above biologically based limits.</p> <p>OR</p> <p>If below biologically based limits, there is either evidence of recovery or a demonstrably effective partial strategy in place such that the UoA does not hinder recovery and rebuilding.</p> <p>AND</p> <p>Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.</p>	<p>There is a high degree of certainty that main secondary species are above biologically based limits.</p>
	Shallow-set (UoAs 1 - 5)	<p>North Pacific blue shark – Yes</p> <p>North Pacific shortfin mako shark – Yes</p>	<p>North Pacific blue shark – Yes</p> <p>North Pacific shortfin mako shark – Yes</p>	<p>North Pacific blue shark – No</p> <p>North Pacific shortfin mako shark – No</p>

	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF)	North Pacific blue shark – Yes Pacific bigeye thresher – No Moonfish – No (RBF)	North Pacific blue shark – No Pacific bigeye thresher – No Moonfish – No (RBF)
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Rationale

As detailed in Section 6.9.2, the following main secondary species were identified:

- Shallow-set UoAs: North Pacific blue shark and North Pacific shortfin mako shark
- Deep-set UoAs: North Pacific blue shark, Pacific bigeye thresher, moonfish

North Pacific blue shark: Blue shark are widely distributed throughout temperate and tropical waters of the Pacific Ocean. The ISC SHARKWG recognizes two stocks in the North and South Pacific, respectively, based on biological and fishery evidence. For North Pacific blue shark, a stock assessment was conducted by ISC in 2014 using Stock Synthesis (Rice et al., 2014) and updated in 2017 (ISC_SWG, 2017). Results of the reference case model showed that the spawning stock biomass was near a time-series high in the late 1970s, declined to its lowest level between 1990 to 1995, subsequently increased gradually to reach the time-series high again in 2005, and has since shown small fluctuations close to the time-series high. Recruitment has fluctuated around 37 million age-0 sharks annually with no apparent trend. Female spawning biomass in 2015 (SB₂₀₁₅) was 71% higher than at MSY and estimated to be 308,286t. The recent annual fishing mortality (F₂₀₁₂₋₂₀₁₄) was estimated to be well below F_{MSY} at approximately 37% of F_{MSY}. The reference run produced terminal conditions that were predominately in the green quadrant (not overfished and overfishing not occurring) of the Kobe plot (Figure 47). On that basis, North Pacific blue shark are highly likely to be above biologically based limits (**SG60 and SG80 are met**). Although the 2017 stock assessment estimates stock biomass to be above MSY, the assessment team considers the stock assessment to be too out-dated (the most recent year in the assessment is 2015) to provide a high degree of certainty (80th percentile) regarding its status against biologically based limits. **SG100 is not met.**

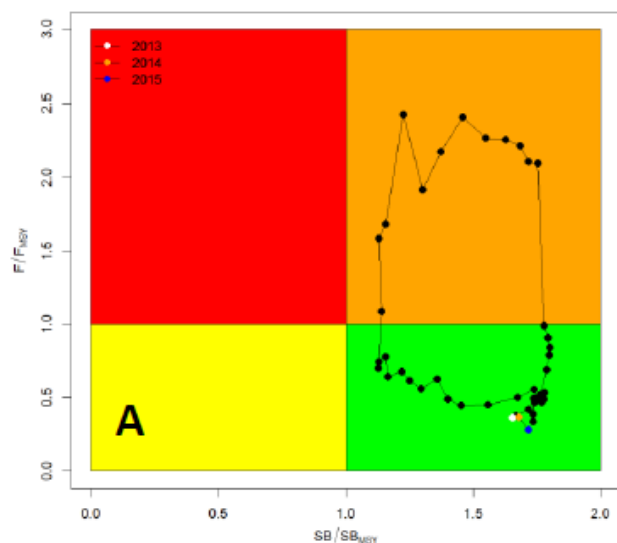


Figure 47. Kobe plot of the trends in estimates of relative fishing mortality and biomass of North Pacific blue shark between 1971-2015 for the reference case of the Stock Synthesis stock assessment model. Source: ISC_SWG (2017).

North Pacific shortfin mako shark: This species is generally discarded in the Hawaiian fishery, but is sometimes retained as it is considered a marketable consumer product (Hutchinson et al., 2021). Note: the following is from ISC_SWG (2018) unless otherwise indicated. Shortfin mako shark are distributed throughout the pelagic, temperate North Pacific Ocean (NPO). A single stock is assumed in the NPO based on evidence from genetics, tagging studies, and lower catch rates of this species near the equator, compared to temperate areas. However, within the NPO some regional substructure is apparent as the majority of tagged individuals have been recaptured within the same region where they were originally tagged, and examination of catch records by size and sex demonstrates some regional and seasonal segregation across the NPO. The first full stock assessment of shortfin mako shark in the North Pacific Ocean (NPO) was conducted by the ISC SHARKWG in 2018, incorporating time-series of catch, relative abundance, and sex-specific length composition from multiple fisheries into the modelling period (1975 – 2016). In addition, new biological information, and research into parameterization of the Beverton-Holt stock recruitment relationship enabled the development of a size-based, age-structured model using Stock Synthesis. However, the key uncertainties in this assessment were related to the catch time series, especially in the early period (1975-1993), the precision of the early Japan shallow-set CPUE index (1975-1993), initial conditions, and the stock-recruitment relationship. The total estimated catch of North Pacific shortfin mako reached a peak of 7,068 tonnes in 1981 and then declined in the early 1990s, with catches fluctuating between 1,948 t and 2,395 t since the early 1990s. Drift gill nets accounted for the highest catches of this species during the early period but the catches have been predominantly from longline fisheries since 1993. In this assessment, the reproductive capacity of this population was calculated as spawning abundance (SA; i.e. number of mature female sharks) rather than spawning biomass, because the size of mature female sharks did not appear to affect the number of pups produced (i.e. larger female sharks did not produce more pups). Spawning potential ratio (SPR) was used to describe the impact of fishing on this

stock. The SPR of this population is the ratio of SA per recruit under fishing to the SA per recruit under virgin (or unfished) conditions. Therefore, 1-SPR is the reduction in the SA per recruit due to fishing and can be used to describe the overall impact of fishing on a fish stock.

Recruitment was estimated on average to be 1.1 million age-0 sharks during the modelling timeframe (1975-2016). During the same period, the SA was estimated, on average, to be 910,000 sharks. The current SA (SA_{2016}) was estimated to be 860,200 sharks (CV=46%) and was 36% (CV=30%) higher than the estimated SA at MSY (SA_{MSY}). The recent annual fishing intensity ($1-SPR_{2013-2015}$) was estimated to be 0.16 (CV=38%) and was 62% (CV=38%) of fishing intensity at MSY ($1-SPR_{MSY}$; 0.26). The results from the base case model show that, relative to MSY, the North Pacific shortfin mako stock is likely (>50%) not in an overfished condition (i.e. $SA_{2016}/SA_{MSY} > 1$) and overfishing is likely (>50%) not occurring (i.e. $1-SPR_{2013-2015} / 1-SPR_{MSY} < 1$) (Figure 48). On that basis, North Pacific shortfin mako shark are highly likely to be above biologically based limits (**SG60 and SG80 are met**). Although the 2018 stock assessment estimates stock biomass to be above MSY, the assessment team considers the stock assessment to be too out-dated (the most recent year in the assessment is 2016) to provide a high degree of certainty (80th percentile) regarding its status against biologically based limits. **SG100 is not met**.

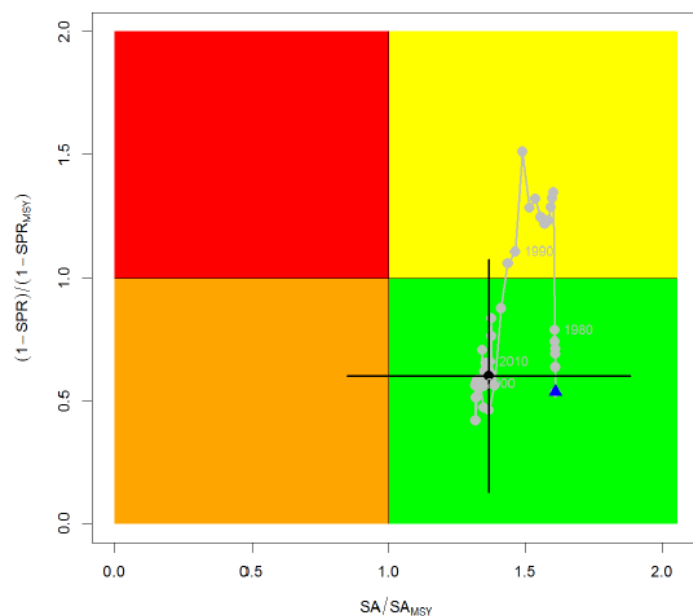


Figure 48. Kobe time series plot of shortfin mako sharks in the North Pacific Ocean indicating the ratio of spawning abundance (SA; number of mature female sharks) relative to SA at maximum sustainable yield (SA_{MSY}), and the ratio of fishing intensity ($1-SPR$) relative to fishing intensity at maximum sustainable yield ($1-SPR_{MSY}$) for the base case model. Values for the start (1975) and end (2016) years are indicated by the blue triangle and black circle, respectively. Black error bars indicate 95% confidence intervals. Gray numbers indicate selected years. Source: ISC_SWG (2018).

Pacific bigeye thresher: (the following is from ABNJ (2018) unless otherwise indicated). The bigeye thresher shark is the thresher species with the widest distribution and the most vulnerable of the three threshers to longline fishing. The bigeye thresher shark is characterised by high juvenile survival and year-round reproduction (i.e. there is no fixed mating or birthing season), but its low fecundity causes it to have low productivity compared to other pelagic sharks and to be highly vulnerable to fisheries that catch juveniles of this species. Bigeye thresher was categorized as being at “medium” ecological risk for both deep and shallow longline sets (Kirby and Hobday, 2007). In the Pacific, the bigeye thresher shark primarily occurs in tropical waters, however its habitat ranges as far north as central Japan and Baja California and as far south as the North Island of New Zealand and the southern coast of Peru. The species is found near the surface at night and makes deep dives to up to 500 m depth during the day. A sustainability risk assessment was carried out for this species using 1995–2014 data on longline logsheet commercial effort, SPC longline catch and effort from observer data, and US and Japanese observer data (the latter only covered the 2007 – 2015 period). This type of assessment was chosen as information gaps, and changes in reporting and observer coverage over time and space, made a more traditional stock assessment impractical. Instead, this study evaluated sustainability risk based on the ratio of current mortalities from fisheries (spatially-explicit and cumulative fishing mortality F) to a maximum impact sustainable threshold (MIST) reference point which is based on population productivity, and is equivalent to a limit reference point (LRP). The MIST was set at three alternative values: $0.5r = F_{msm}$, $0.75r = F_{lim}$, and $1.0r = F_{crash}$. These limit reference points, stated in terms of the instantaneous fishing mortality rate, are defined as follows:

- F_{msm} corresponds to the maximum rate at which fish in the population can be killed by fishing in the long term;
- F_{lim} corresponds to the limit biomass B_{lim} , where B_{lim} is half the biomass that supports F_{msm} (B_{msm}); and
- F_{crash} corresponds to the minimum unsustainable fishing mortality rate which, in theory, will lead to population extinction in the long term.

Sustainability status was determined relative to fishing mortality from pelagic longline fisheries in the Pacific over the period 2000–2014, and computed relative to the three alternative MIST values (F_{msm} , F_{lim} , and F_{crash}). The assessment is complex and the different scenarios have not been repeated here; however results indicate that total fishing mortalities from pelagic longline fisheries in the Pacific since 2000 have exceeded the minimum unsustainable fishing mortality rate for bigeye thresher in some years. The calculated probability that fishing mortalities exceed the F_{crash} MIST in the Assessment Area, given the uncertainty, averaged 0.34 (range 0.13–0.67 among years) for base case scenarios assuming 100% capture mortality, and 0.20 (range 0.06–0.43 among years) when accounting for the potential occurrence of post-capture survival. The equivalent values for the F_{msm} MIST were 0.77 (range 0.54–0.96 among years) assuming 100% capture mortality, and 0.54 (range 0.32–0.79 among years) when accounting for post-capture survival.

The 13th Scientific Committee (SC13) of the WCPFC noted that the results of the assessment indicate that assuming a range of longline post-capture survival rates of 30-70%, which likely reflects current fishing operations, some of the median F estimates exceeded two of the three indicative reference points (F_{msm} and F_{lim}). Across all 30-70% post-capture survivability scenarios, there is a >50% probability in most years that $F > \text{MIST}$ based on $0.5r$ (F_{msm}) and a >20% probability in most years that $F > \text{MIST}$ based on $0.75r$ (F_{lim}). SC13 also noted that CPUE increased in the calibration area (the Hawaii-based fleet) in the last year of the assessment. This may suggest an increase in biomass, but the reason for the CPUE increase is not understood (WCPFC_SC, 2020b).

In the Northwest Pacific, Tsai et al. (2019) developed and tested a Bayesian population model for the species, while Tsai et al. (2020) evaluated biological reference points for its conservation and management. The bigeye thresher shark in the Northwest Pacific was identified as one of the least productive and most vulnerable shark species, with a significantly low population increase rate, low intrinsic rate of population growth of 0.023 y^{-1} , and generation time of 19.63 years. These demographic factors arguably

make the bigeye thresher vulnerable to any level of exploitation, with simulations resulting in clear population declines under current conditions (Tsai et al., 2020). Tsai et al. (2019) found that the bigeye thresher experienced higher fishing pressure in years 2011–2016, with overfishing likely occurring.

Taking into account the above studies, and particularly the 0.34 probability of the F_{crash} MIST being exceeded (range 0.13–0.67 assuming 100% mortality, range 0.06–0.43 accounting for post-release survival), there is insufficient certainty to conclude that the Pacific bigeye thresher is likely (60th percentile) to be above biologically based limits. **The first part of SG60 is thus not met** and the second part is triggered, which requires that there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding of the species.

Based on the **available information at this ACDR stage**, it appears that bigeye threshers are retained in the deep-set fishery (see Table 11) although the majority are released according to observer data (see Table 17 for discard rates). The use of wire leaders is still a common occurrence, although the fishery is reportedly transitioning to monofilament leaders (Section 6.2.3). According to Patterson et al. (2014), the three most promising approaches to mitigating mortality of sharks from pelagic longline are hook type (circle), leader type (monofilament) and best practice handling at the vessel level. While circle hooks may increase pelagic shark catchability (Gilman et al., 2019), they are designed to increase the likelihood of hooking a fish in the mouth or jaw, rather than in the gut or oesophagus, and thus to promote easy hook removal and to limit injury (Cooke & Suski 2004 cited in Patterson et al. (2014)): when ingested, J-shaped hooks tend to hook deeply, in the esophagus and gut. Circle hooks with little or no offset tend to catch in the corner of the mouth. Having a less exposed point, circle hooks also have a lower probability of foul-hooking (i.e. hooking externally in the body) than J-shaped hooks. Organisms that are foul-hooked or hooked in the mouth have higher at-vessel survival rates and possibly higher probability of pre-catch and post-release survival than those that are deeply hooked in the esophagus and gut. Additionally, circle hooks' predominant hooking position in the mouth facilitates relatively easy access to remove all terminal tackle (hook, leader, weight, trailing branchline), potentially increasing post-release survival rates (Gilman et al. (2019) and references therein). **It is not clear, however, to what extent the latter applies to sharks which are more frequently cut off the line rather than de-hooked. Presumably, the use of wire leaders in the deep-set fishery will make this all the more difficult – this should be discussed further at the site visit.** Furthermore, a study in the South Pacific indicated that larger (>16/0) circle hooks vs. smaller (<16/0) circle hooks significantly reduced at vessel mortality of blue sharks. A study of the Hawaii-based longline fishery found a reduction in catch of blue shark (17.1%) and thresher (27.5%) when larger (18/0) circle hooks replaced the use of the smaller tuna hooks (see Curran (2014) and references therein). According to the HLA, the deep-set fishery uses 15/0 circle hooks with a 10 degree offset (see Section 6.2.3, Figure 6). Therefore, although it is possible that more can be done in terms of gear configuration to reduce thresher shark catches (e.g. through hook size and leader type), the high at-vessel release rates of thresher sharks combined with best practice handling and release techniques **(to be verified during the site visit)** and the use of circle hooks do constitute some measures expected to increase post-release survival, thus ensuring that the UoA does not hinder recovery and rebuilding of the species. On that basis, **SG60 is met**. However, **at this ACDR stage**, there is insufficient information to conclude that the second part of SG80 (which requires that there is a demonstrably effective strategy in place between all MSC UoAs that have considerable catches of the species) is also met. **SG80 is provisionally scored as not met.**

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. **At this ACDR stage, the RBF has not been conducted. This scoring element is not yet scored.**

In terms of unobserved mortality of secondary species, the team considered ghost fishing due to gear loss as a factor. Radio buoys are spaced at regular intervals for each set. Therefore, should the line break, both ends can be retrieved. It is reportedly very rare for a whole longline to be lost. In the event the line breaks, the vessel will also want to harvest the fish which provides another incentive for retrieval. Under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned

gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Overall it is important to consider that lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The team considered that unobserved mortality through ghost fishing was unlikely to be a significant factor in the fishery's interactions with secondary species to the extent that it will have stock-level effects.

b	Minor secondary species stock status	
	Guide post	<p>Minor secondary species are highly likely to be above biologically based limits.</p> <p>OR</p> <p>If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species</p>
	All UoAs	No

Rationale

Minor species:

- Shallow-set UoAs: blue marlin, spearfish, mahi mahi, wahoo, moonfish, pomfrets
- Deep-set UoAs: blue marlin, pomfrets, wahoo, spearfish, mahi mahi

Not all these minor species have biologically based limits available, which means that the RBF would be required for at least some of them (e.g. spearfish, mahi mahi, wahoo, pomfrets). The RBF was not applied for minor species, which caps the scoring of this PI at 80.

References

ABNJ (2018), Curran (2014), Kirby and Hobday (2007), Gilman et al. (2019), ISC_SWG (2017, 2018), Patterson et al. (2014), Rice et al. (2014), Tsai et al. (2019), Tsai et al. (2020), WCPFC_SC (2020b), Macfadyen et al. (2009) and Gilman (2015)

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

Draft scoring range	<p>Shallow-set (UoAs 1 - 5): ≥ 80</p> <p>Deep-set (UoAs 6 - 10): RBF – not yet scored</p>
Information gap indicator	<p>More information sought (deep-set UoAs only):</p> <ul style="list-style-type: none"> - RBF to be conducted for moonfish - Bigeye thresher shark bycatch mitigation measures to be discussed

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 2.2.2 – 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.
	Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – No
	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – No Moonfish – No (RBF) Minor species – No

Rationale

Blue shark, shortfin mako shark and bigeye thresher shark: none of these shark species have species-specific management measures associated with them. However, at national, regional and UoA levels, a series of measures apply to sharks as a group. These are as follows:

At national level, the United States Shark Conservation Act of 2010 prohibits any person from removing any of the fins of a shark at sea, possessing shark fins on board a fishing vessel unless they are naturally attached to the corresponding carcass, transferring or receiving fins from one vessel to another at sea unless the fins are naturally attached to the corresponding carcass, landing shark fins unless they are naturally attached to the corresponding carcass, or landing shark carcasses without their fins naturally attached. At State (Hawaii) level, 2013 Hawaii Revised Statutes (188-40.7) reinforces this ban after the point of landing, by making it unlawful for any person to possess, sell, offer for sale, trade, or distribute shark fins.

At regional, WCPFC level, CMM 2019-04 applies to all sharks, skates, rays and chimaeras and has the objective “through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of sharks” (WCPFC, 2020a). The CMM sets out the following:

- Requires implementation of FAO International Plan of Action for the Conservation and Management of Sharks (IPOA Sharks), with drafting of National Plans of Action by CCMs as required (to include measures to minimize waste and discards from shark catches and encourage the live release of incidental catches of sharks).
- Prohibition on shark finning: CCMs are required to ensure vessels land sharks with fins naturally attached, OR other options exist, none of which are relevant to this fishery as the U.S. prohibits shark finning outright.
- Minimizing bycatch and practicing safe release:
 - 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.
 - For longline fisheries targeting sharks, CCMs shall develop and report their management plans in their Part 2 Annual Report
 - 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 the Commission adopted guidelines for the safe release and handling of sharks (adopted at WCPFC15)
 - CCMs shall ensure that sharks that are caught and are not to be retained, are hauled alongside the vessel before being cut free in order to facilitate a species identification. This requirement shall only apply when an observer or electronic monitoring camera is present, and should only be implemented taking into consideration the safety of the crew and observer.
- Sets out annual reporting requirements for key shark species.
- WCPFC to provide appropriate assistance to developing State Members and participating Territories for the implementation of the IPOA and collection of data on retained and discarded shark catches.
- Subject to annual review by the SC, TCC and Commission.
- CCMs shall as appropriate, support research and development of strategies for the avoidance of unwanted shark captures, safe release guidelines, biology and ecology of sharks, identification of nursery grounds, gear selectivity, assessment methods and other priorities listed under the WCPFC Shark Research Plan.
- The SC shall periodically provide advice on the stock status of key shark species for assessment and maintain a WCPFC Shark Research Plan for the assessment of the status of these stocks.
- Implementation and effectiveness to be reviewed in 2023.

The 2021-2025 WCPFC Shark Research Plan was adopted at WCPFC17 (Brouwer and Hamer, 2020). The following interim objectives are proposed under four broad areas of work for the SRP:

- 1) Stock Assessment (a) Determine the stock status for WCPFC Key Sharks, (b) Develop reliable catch histories for WCPFC Key Sharks as far back in time as feasible, (c) Test and improve Medium and Data Poor assessment methods so that the results can inform management decisions. Key shark species include North Pacific blue shark, shortfin mako shark and Pacific bigeye thresher shark.

- 2) Mitigation (a) Provide advice on mitigation for WCPFC Key Sharks with non-retention policies and unwanted elasmobranchs, (b) Provide advice on safe release methods, their application rates, and post-release survival of WCPFC Key Sharks.
- 3) Biological data improvements (a) Increase the understanding of important biological parameters of WCPFC Key Sharks such as growth, reproduction, stock structure and natural mortality rates.
- 4) Observer data collection (a) Improve spatio-temporal observer data for informing scientific needs.

At regional, IATTC level, Resolutions C-16-04, C-16-05, C-05-03 set out the following:

- Each CPC should establish and implement a NPOA for conservation and management of shark stocks, in accordance with the FAO International Plan of Action for the Conservation and Management of Sharks
- CPCs shall take the measures necessary to require that their fishers fully utilize any retained catches of sharks. Full utilization is defined as retention by the fishing vessel of all parts of the shark excepting head, guts, and skins, to the point of first landing
- CPCs shall require their vessels to have onboard fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing. Note however that the U.S. prohibits shark finning outright.
- Fishing vessels are prohibited from retaining on board, transshipping, landing or trading in any fins harvested in contravention of this Resolution.
- In fisheries for tunas and tuna-like species that are not directed at sharks, CPCs shall encourage the release of live sharks, especially juveniles, to the extent practicable, that are caught incidentally and are not used for food and/or subsistence.
- The Commission shall consider appropriate assistance to developing CPCs for the collection of data on shark catches.
- Each CPC shall annually report data for catches, effort by gear type, landing and trade of sharks by species, where possible, in accordance with IATTC reporting procedures, including available historical data.
- CPCs shall, where possible, in cooperation with the IATTC scientific staff, undertake research to: a. identify ways to make fishing gears more selective, where appropriate, including research into alternative measures to prohibiting wire leaders; b. improve knowledge of key biological/ecological parameters, life-history and behavioural traits, and migration patterns of key shark species; c. identify key shark mating, pupping, and nursery areas; and d. improve handling practices for live sharks to maximise post-release survival.”
- CPCs shall prohibit longline vessels flying their flag and targeting tuna or swordfish in the Convention Area from using “shark lines” (individual lines attached to the floatline or to the floats directly, and used to target sharks

Note: although an IATTC research plan exists, none of the activities focus on the main species for this assessment – these are instead covered under the WCPFC research plan (see above).

Finally, at UoA level, shark bycatch mitigation mainly focuses on maximising post-release survival. Although blue shark, bigeye thresher (deep-set) and shortfin mako shark (shallow-set) are all retained, the majority are released as is evident from the observed discard rates in Table 17. The absence of the shark lines, the use of circle hooks (as

discussed above) and the application of best practice handling and release techniques (to be verified during the site visit) all constitute measures that make up a wider partial strategy, driven by national and regional regulations and by voluntary action (e.g. the use of circle hooks). The team therefore concludes that a partial strategy is in place of the shark species identified and that **SG60 and SG80 are met**. For North Pacific blue shark and shortfin mako shark, analytical stock assessments (ISC_SWG, 2017, 2018) further determine stock status and fishing mortality against reference points (confirming that neither stocks are overfished and that overfishing is not occurring). On that basis it can be argued that a full strategy is in place for both stocks and that **SG100 is met for blue shark and shortfin mako shark**. For Pacific bigeye thresher, a sustainability risk assessment (ABNJ, 2018) suggests that this species is likely overfished and would therefore benefit from more precautionary, species-specific management, none of which is in place at the UoA level. **A full strategy is therefore not in place for bigeye thresher shark and SG100 is not met.**

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. At this ACDR stage, the assessment team is not aware of any species-specific management at the UoA level, however general management measures apply to the fisheries that harvest opah. The degree to which management measures are required will be determined by the RBF outcome. **This scoring element is not yet scored.**

Minor species: Minor species are scored at SG100 only. **SG60 and S80 are therefore met by default**. Not all secondary minor species have a strategy in place. Using the all or nothing approach, **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 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.
	Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – No Minor species – No
	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – No Moonfish – No (RBF) Minor species – No

Rationale

North Pacific blue shark: as detailed under 2.2.1a, this stock is not overfished and is not experiencing overfishing. This provides some objective basis for confidence that the strategy is working/will work and **SG60 and SG80 are met**. Future projections from 2015 to 2024 were conducted on the reference case output assuming four harvest policies:

1. Low F scenario (average F for 2012-2014 – 20%). 2. F_{MSY} scenario (relative fishing mortality rate is sustained at MSY level). 3. High F scenario (average F for 2012-2014 + 20%). 4. Status-Quo F scenario (fishing mortality rate is maintained at average F for 2012- 2014). Time horizons of the projections were set at 5 and 10 years beginning with the terminal year (2015). The projections showed that maintaining current fishing mortality levels results in much higher levels of SB than SB_{MSY} throughout the future projection periods. Since F is currently much lower than F_{MSY} , increasing F to F_{MSY} results in a decreasing SB trend, as expected. Although this testing supports high confidence that the strategy will work, the team was concerned about the low post-release survival of blue sharks in a study of the Hawaiian longline fishery by Hutchinson et al. (2021) (discussed in more detail under scoring issue e). The low survival rates (estimated at 18%) are thought to be related to the length of trailing gear left when the sharks are cut off the line. For the Hawaiian fishery this is particularly pertinent as wire leaders are still in use (which means the line cannot be cut close to the hook). Subsequent to this study, however, the fishery has adopted a voluntary measure to only use monofilament leaders. As the fishery is still transitioning towards it, this new gear configuration could not yet be fully taken into account for scoring. Therefore, the team concludes that **SG100 is not met**.

North Pacific shortfin mako shark: as detailed under 2.2.1a, this stock is not overfished and is not experiencing overfishing. In the Hawaii fishery, this species was also characterised by relatively high at-vessel and post-release survivorship (Hutchinson et al., 2021). This provides some objective basis for confidence that the strategy is working/will work and **SG60 and SG80 are met**. Using the base case model in the assessment, future projections over a 10-year period (2017-2026) were performed under three constant fishing intensity scenarios: 1) average of 2013-2015 ($F_{2013-2015}$); 2) $F_{2013-2015} + 20\%$; and 3) $F_{2013-2015} - 20\%$. Based on these future projections the SA is expected to increase gradually under scenarios 1 and 3, however in scenario 2 SA drops in the final years of the projection. It should be noted that, given the uncertainty in fishery data and key biological processes within the model, especially the stock recruitment relationship, the models' ability to project into the future is highly uncertain (ISC_SWG, 2018). High confidence is therefore lacking and **SG100 is not met**.

Pacific bigeye thresher: As explained in 2.2.1a, the high at-vessel release rates of thresher sharks combined with best practice handling and release techniques (**to be verified during the site visit**) and the use of circle hooks which have been shown to promote easy hook removal and to limit injury, thus increasing the likelihood of post-release survival, provide some objective basis for confidence that the partial strategy will work. While not specific to the longline fishery, a recent study by Aalbers et al. (2021) on the post-release survival of bigeye thresher sharks in deep-set buoy gear (this is a new type of fishing gear used to catch swordfish off the coast of California, also with hook and line) used satellite tags to track 14 bigeye thresher sharks for 30 days to determine whether they survived following release from deep-set buoy gear. The study found that 12 of the sharks survived. Of the two remaining, one died immediately, and another was preyed upon six hours after its release. Using these data, the authors created two survivorship estimates. One assumed the predation was a result of the capture, resulting in an 86% survival rate. The second assumed the predation was unrelated, resulting in a 92% survival rate (Aalbers et al., 2021). Specific to the Hawaiian fishery, Hutchinson et al. (2021) demonstrated relatively high post-release survival rates (82%) for this species (see scoring issue e). The team therefore concludes that there is an objective basis for confidence that the partial strategy will work. **SG60 and SG80 are met**. The strategy has not been tested, however, and **SG100 is not met**.

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. At this ACDR stage, the assessment team is not aware of any species-specific management at the UoA level or whether this is indeed required – this will depend on the RBF outcome. **This scoring element is not yet scored**.

Minor species: Minor species are scored at SG100 only. **SG60 and S80 are therefore met by default**. Not all secondary minor species have a strategy/partial strategy that has been tested. Using the all or nothing approach, **SG100 is not met** for minor species overall.

c	Management strategy implementation
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	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).
	Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – No
	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – No Moonfish – No (RBF) Minor species – No

Rationale

Evidence for implementation of the strategies at UoA level for all species includes VMS and observer data (at 100% coverage for the shallow-set fishery and 20% coverage for the deep-set fishery), logbook data, HDAR sales data and the MCS system as described under Principle 3, as well as a lack of systematic non-compliance by the UoAs (to be confirmed during the site visit). On that basis, **SG80 is met for all species**. For the main shark species, the majority are discarded. The high levels of observer coverage, combined with the analytical stock assessments for blue shark and shortfin mako shark, which determined that neither stock is overfished and that overfishing is not occurring (ISC_SWG, 2017, 2018), mean that there is clear evidence that the strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a). **SG100 is met for North Pacific blue shark and shortfin mako shark**. For Pacific bigeye thresher shark, the sustainability risk assessment (ABNJ, 2018) and assessment for the Western Pacific area by Tsai et al. (2019) and Tsai et al. (2020) are more pessimistic, indicating that the species is likely overfished. The partial strategy is clearly not achieving its objective. **SG100 is not met for Pacific bigeye thresher shark**.

Note: In their study of shark post-release survivorship in the Hawaiian and American Samoa based longline fisheries, Hutchinson et al. (2021) found that most fishers (more than 80%) cut the branchline while the shark was still in the water leaving different quantities and compositions of trailing gear attached to discarded animals. However, other methods that were used less often included the following; bringing sharks onboard, or pulling them out of the water to get their hooks back, or using a drag line to drag the sharks behind the vessel until the hook pulled from the shark. Other handling methods observed that resulted in damage to the animal were gear removal with “Jaw Damage,” or “Part Removal.” Jaw damage occurred when fishers cut through the jaw’s cartilage to remove a hook. Part removal in sharks almost exclusively applied to the removal of tail-hooked thresher sharks from the gear. **The extent to which this applies to the UoA fishery should be discussed at the site visit with any implications for scoring considered at that point.**

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. At this ACDR stage, the assessment team is not aware of any species-specific management at the UoA level or whether this is indeed required – this will depend on the RBF outcome. **This scoring element is not yet scored.**

Minor species: Minor species are scored at SG100 only. **S80 is therefore met by default.** Not all secondary minor species have stock assessments that enable a determination of whether management is achieving its objective. Using the all or nothing approach, **SG100 is not met** for minor species overall.

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.
	Shallow-set (UoAs 1 - 5)	All shark species – Yes Other species – NA	All shark species – Yes Other species – NA	All shark species – Yes Other species – NA
	Deep-set (UoAs 6 - 10)	All shark species – Yes Other species – NA	All shark species – Yes Other species – NA	All shark species – No Other species – NA

Rationale

With regards to shark finning, the national U.S. and Hawaiian state-level regulations trump those in place at the regional WCPFC and IATTC levels. The United States Shark Conservation Act of 2010 prohibits any person from removing any of the fins of a shark at sea, possessing shark fins on board a fishing vessel unless they are naturally attached to the corresponding carcass, transferring or receiving fins from one vessel to another at sea unless the fins are naturally attached to the corresponding carcass, landing shark fins unless they are naturally attached to the corresponding carcass, or landing shark carcasses without their fins naturally attached. At State (Hawaii) level, 2013 Hawaii Revised Statutes (188-40.7) reinforces this ban after the point of landing, by making it unlawful for any person to possess, sell, offer for sale, trade, or distribute shark fins. The 100% observer coverage in the shallow-set fishery and lack of infractions identified (**to be verified at the site visit**), provide a high degree of certainty that shark finning is not taking place. **SG60, SG80 and SG100 are met for the shallow-set fishery.** The 20% observer coverage for the deep-set fishery provides ‘good external validation’ (GSA2.4.5), sufficient for **SG60 and SG80 to be met for the deep-set fishery**; however it is not sufficient to provide a high degree of certainty and **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.

	Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – No North Pacific shortfin mako shark – No Minor species – No
	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – NA Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – NA Minor species – Yes (default)	North Pacific blue shark – No Pacific bigeye thresher – No Moonfish – NA Minor species – No

Rationale

Curran and Bigelow (2011) tested the catch efficacy, fish size selectivity and survival on longline retrieval of large-size 18/0 circle hooks vs. Japanese style tuna hooks, size 3.6 sun and vs. size 9/0 “J” hooks aboard sixteen vessels within the deep-set Hawaii-based tuna longline fleet. The study concluded that in contrast to tuna hooks, large circle hooks have conservation potential, with catch rate reductions of 17.1–27.5% for sharks. As confirmed in Section 6.2.3, the entire HLA fishery now makes use of circle hooks (18/0 in the shallow-set fishery and 15/0 in the deep-set fishery). Furthermore, as already explained in 2.2.1a, circle hooks are designed to increase the likelihood of hooking a fish in the mouth or jaw, rather than in the gut or oesophagus, and thus to promote easy hook removal and to limit injury (Cooke & Suski 2004 cited in Patterson et al. (2014)), leading to higher at-vessel survival rates and possibly higher probability of pre-catch and post-release survival than those that are deeply hooked in the oesophagus and gut (Gilman et al., 2019). **Note: this information will be supplemented with a more complete review of the effects of hook type after the site visit.** Other mitigation measures have also been implemented in the fishery which have been shown to reduce shark catch rates, such as banning the use of shark lines and requiring the use of fish bait instead of squid bait: in the shallow-set swordfish longline fishery, shark catch rates (all species combined) dropped considerably following a prohibition on the use of squid for bait (Gilman et al., 2007b).

NMFS PIFSC conducted a study working with observer programs and fishermen to quantify post release mortality rates of blue (BSH), bigeye thresher (BTH), oceanic whitetip (OCS), silky sharks (FAL) and shortfin mako sharks that are incidentally captured in the Hawaii deep-set (HiDS) and American Samoa (AS) tuna target longline fisheries, using pop-off archival satellite tags (PAT). This study also assessed the effects that standard shark bycatch handling and discard practices utilized in these fisheries may have on the post release fate of discarded sharks that are alive at haul back of the longline gear. Observers collected shark condition and handling data on 19,572 incidental elasmobranchs captured during 148 fishing trips that occurred between January 2016 and June 2019 on 76 different vessels. During 111 of these trips, 148 sharks were tagged by observers and fishers with pop-off archival tags (PAT). The handling and damage data recorded by trained observers indicated that most sharks were released by cutting the branchline. In the Hawaii deep-set tuna fishery this means that most sharks were released with an average of 9.02 meters of trailing gear, typically composed of a stainless-steel hook, 0.5 m of braided wire leader, a 45-gram weighted swivel, and monofilament branchline ranging in length from 1.0–25.0 m. Results showed the following:

- At-vessel mortality average at 4% for BSH. Tagging data revealed that this species is highly susceptible to mortality post-release and had the lowest post-release survival rate (62%) of the 5 species tagged. Projections of survival rates, out to 360 days under the average interaction conditions, using the observed data set estimated only 18% of sharks survive. These estimates are alarming and may have broad impacts for population projections and should be integrated into future stock assessments. Other studies that have investigated PRS rates of blue sharks found relatively high post-release survival rates after longline fishery interactions; however, in these studies a proportion of

animals were brought on board for tagging and trailing gear was removed. In this study however, BSH were released with a wide range of trailing gear and sharks released with more gear had lower post-release survival.

- High post-release survival rates and low at-vessel mortality rates were observed for SMA in the HIDS. At-vessel mortality rates for this species in the PIROP dataset were low at 22.7%. Post-release survival rates for SMA that were discarded were estimated to be relatively high (94%) in this study with only 1 mortality observed out of 18 tags that reported.

- The at-vessel mortality rate for BTH was 21.5% in the PIROP dataset. This study has demonstrated relatively high post-release survival rates (82%) for BTH captured in the HIDS fishery. Hooking location (mouth vs. tail) and discard methods were very influential on post-release survival. Tail-hooked BTH are in poorer shape at the vessel than if they are mouth-hooked. Additionally tail-hooked animals are often subject to the “Part Removal” handling method where fishers cut the tip of the tail off to retain their hooks

Hutchinson et al. (2021) showed that leaving sharks in the water and removing as much trailing gear as possible by either using a dehooker or cutting the line had the best survival outcomes. Leaving large quantities of trailing gear is not only energetically costly for the animal, but may also introduce infection, present an entanglement hazard and increase susceptibility to predation. Because most sharks are released by cutting the line (~84%), fishers have the opportunity to make small changes in their operating procedure with significant impacts on bycatch survival. If they take time to remove as much trailing gear as possible, ideally leaving less than 1 m, survivorship can be improved by as much as 40% over 360 days.

Subsequent to this study, HLA have adopted a voluntary policy to change the deep-set fishery’s leaders from wire to monofilament in order to reduce shark catch rates and improve post-release survival rates. Although **this will be discussed further at the site visit**, provisionally, the team determines that there is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the main shark species, blue shark, shortfin mako shark and bigeye thresher shark. **SG60 and SG80 are scored as met**. There is insufficient evidence to indicate that this review is biennial, however, so **SG100 is not met**.

Moonfish: The observer discard rates in Table 17 indicate that there is negligible discarding of this species (1-2.6%) in the deep-set fishery. The team therefore concludes that there is no unwanted catch of moonfish and **this scoring issue is not relevant**.

Minor species: Minor species are scored at SG100 only. **SG60 and S80 are therefore met by default**. Not all secondary minor species are reviewed biennially so **SG100 is not met for minor species overall**.

References

Aalbers et al. (2021), ABNJ (2018), Brouwer and Hamer (2020), Curran and Bigelow (2011), Curran (2014), Gilman et al. (2007b), Gilman et al. (2019), ISC_SWG (2017, 2018), Patterson et al. (2014), Tsai et al. (2019), Tsai et al. (2020), WCPFC_SC (2020b)

United States Shark Conservation Act of 2010: <https://www.congress.gov/111/plaws/publ348/PLAW-111publ348.pdf>

2013 Hawaii Revised Statutes (188-40.7): <https://law.justia.com/codes/hawaii/2013/title-12/chapter-188/section-188-40.7/#:~:text=%C2%A7188%2D40.7%20Shark%20fins,trade%2C%20or%20distribute%20shark%20fins.>

WCPFC CMM 2019-04

IATTC Resolutions C-16-04, C-16-05, C-05-03

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

Draft scoring range	Shallow-set (UoAs 1 - 5): ≥80 Deep-set (UoAs 6 - 10): RBF – not yet scored
Information gap indicator	More information sought (deep-set UoAs only): - RBF to be conducted for moonfish - Shark bycatch mitigation measures to be discussed - Compliance with shark finning regulations

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 2.2.3 – 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.
	Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes	North Pacific blue shark – No North Pacific shortfin mako shark – No
	Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF)	North Pacific blue shark – No Pacific bigeye thresher – No Moonfish – No (RBF)

Rationale

Secondary species were identified on the basis of two datasets:

- The Western Pacific Daily Longline Fishing Logbook data, which when combined with fish sales records from the Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data, enable the weight of longline retained catch for both Hawaiian longline fleets to be estimated, as summarised in Table 11 for the 2015-20 period (Section 6.2.5.1)

- The second dataset is based on observer data from the Pacific Islands Region Observer Program (PIROP) which deploys NMFS observers at 100% coverage in shallow-set trips and 20% (or more) for deep-set trips (discussed in Section 6.2.5.2). Although the Covid-19 pandemic caused a decline in coverage in 2020, the 15.2% coverage is still well above the WCPFC and IATTC minimum requirement of 5% (IATTC, 2019a; WCPFC, 2020a). The U.S. observer program does not collect weights data and interactions are reported in numbers only. For this assessment, the team estimated total catch weight based on the observed interactions (**extrapolated by NMFS to fleet level in the case of the deep-set fishery**) and average landed weight based on Hawaii Division of Aquatic Resources (HDAR) Commercial Marine Dealer data. A summary of the total annual catch for both fleets for 2015-20 is given in Table 13 and Table 14 for the shallow- and deep-set fleets, respectively.

There is thus quantitative information on the catch of main secondary species (landings and discards) from logbooks and observers.

For North Pacific blue shark and shortfin mako, there is an analytical stock assessment against MSY-based reference points (see 2.1.1a) although both are relatively out of date (recent years in the assessment are 2015 and 2016, respectively - ISC_SWG (2017, 2018)). For Pacific bigeye thresher there is a sustainability risk assessment which derives a sustainability status for the species as the ratio of total impact to a maximum impact sustainable threshold (MIST) reference point (ABNJ, 2018). For all three species, the quantitative information available is adequate to assess the impact of the UoA on these species with respect to status; **SG60 and SG80 are met**. However, the assessment outcomes are not sufficiently robust (in the case of bigeye thresher) or up to date (in the case of blue shark and shortfin mako), to provide a high degree of certainty. **SG100 is not met**.

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. **At this ACDR stage, the RBF has not been conducted. This scoring element is not yet scored.**

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.
	All UoAs	Minor species – No

Rationale

Not all minor secondary species have a stock assessment to determine status. Using the all or nothing approach, **SG100 is not met** for minor species overall.

c	Information adequacy for management strategy
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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 .
Shallow-set (UoAs 1 - 5)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – Yes North Pacific shortfin mako shark – Yes Minor species – Yes (default)	North Pacific blue shark – No North Pacific shortfin mako shark – No Minor species – No
Deep-set (UoAs 6 - 10)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – Yes Pacific bigeye thresher – Yes Moonfish – No (RBF) Minor species – Yes (default)	North Pacific blue shark – No Pacific bigeye thresher – No Moonfish – No (RBF) Minor species – No

Rationale

North Pacific blue shark and shortfin mako shark: Both species have a strategy in place (see 2.2.2) which is informed by analytical stock assessments with reference points and at the UoA level, by comprehensive observer coverage (100% for the shallow-set fishery and 20% for the deep-set fishery). However, the stock assessments are relatively out of date (see scoring issue a). Therefore, although information is adequate to support a strategy for these species, there is no high degree of certainty whether the strategy is achieving its objective. **SG60 and SG80 are met but SG100 is not.**

Pacific bigeye thresher shark: As per 2.2.2, this species only has a partial strategy in place. This is supported by a sustainability risk assessment as well as comprehensive observer coverage at the UoA level (20% for the deep-set fishery); **SG60 and SG80 are therefore met**. In the absence of a full strategy, **SG100 is not met**.

Moonfish: Without biologically based limits available, derived either from analytical stock assessment or using empirical approaches, the risk-based framework is triggered for this species. **At this ACDR stage, the RBF has not been conducted. This scoring element is not yet scored.**

Minor species: Minor species are scored at SG100 only. **SG60 and SG80 are therefore met by default**. In the absence of a full strategy for all minor species, **SG100 is not met**.

References

Logbook and observer data for the Hawaiian shallow-set and deep-set longline fishery (Section 1.1.1)

ABNJ (2018), ISC_SWG (2017, 2018), Tsai et al. (2019), Tsai et al. (2020), WCPFC_SC (2020b)

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

Draft scoring range	Shallow-set (UoAs 1 - 5): ≥ 80 Deep-set (UoAs 6 - 10): < 60 (RBF – not yet scored)
Information gap indicator	More information sought (deep-set UoAs only): - RBF to be conducted for moonfish

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 2.3.1 – 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.
	Shallow-set (UoAs 1 - 5)	All marine mammal species with PBR – Yes All sea turtle species – Yes	All marine mammal species with PBR – Yes All sea turtle species – Yes	All marine mammal species with PBR – No All sea turtle species – Yes
	Deep-set (UoAs 6 - 10)	All marine mammal species with PBR – Yes Green, loggerhead and olive ridley sea turtle – No (more information needed) Leatherback sea turtle – Yes	All marine mammal species with PBR – Yes Green, loggerhead and olive ridley sea turtle – No (more information needed) Leatherback sea turtle – Yes	All marine mammal species with PBR – No Green, loggerhead and olive ridley sea turtle – No (more information needed) Leatherback sea turtle – No

Rationale

In the context of this assessment, species that have an ITS or PBR were considered as having 'limits'. **Note that this approach remains to be confirmed through harmonisation.** On that basis, the following scoring elements were identified for scoring under this SI:

Table 43. ETP species scoring elements with limits.

Species	Shallow-set	Deep-set
Marine mammals		
Bottlenose dolphin	x	x

Species	Shallow-set	Deep-set
Risso's dolphin	x	x
Striped dolphin	x	
Guadalupe fur seal	x	
False killer whale		x
Short-finned pilot whale		x
Rough-toothed dolphin		x
Sea turtles		
Green	x	x
Leatherback	x	x
Loggerhead	x	x
Olive ridley	x	x

Currently there are no-take prohibitions in place for oceanic whitetip sharks, giant manta ray and scalloped hammerhead sharks, thus an ITS is not required to provide an exemption to the prohibition of take under section 9 of the ESA for these two species. However, an ITS has been included to serve as a check on the no-jeopardy conclusion by providing a re-initiation trigger if the level of take analyzed in the biological opinion is exceeded (NMFS_BiOp, 2019). However, the team does not consider this to constitute a 'limit' in the context of the MSC standard. Oceanic whitetip shark, giant manta ray and scalloped hammerhead shark were therefore not assessed under this scoring issue.

No seabird scoring elements with ITSs were identified for any of the UoAs (Section 6.9.3.4).

Marine mammals

Marine mammal takes against the PBR are monitored through the NOAA Stock Assessment Reports (SARs). A summary of the current (as of the WPRFMC (2020) report) mean annual mortality and serious injury (M&SI) and the PBR for stocks relevant to the Hawaii shallow-set and deep-set longline fishery is presented in Table 30 and Table 31 respectively. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawaii, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock – however, no interactions resulting in injury or mortality were reported for that species during 2015-19. The mean annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries. For the shallow-set fishery alone, the mean annual M&SI for the shallow-set longline fishery outside and inside the EEZ around Hawaii is well below the corresponding PBRs for all scoring elements concerned. **SG60 is therefore met for the shallow-set UoAs for all marine mammal scoring elements in Table 43.**

For the deep-set UoAs, the number of observed takes of marine mammal species outside and inside the EEZ around Hawaii is well below the PBRs for the scoring elements concerned. This is, however, with the exception of the Hawaiian Islands (HI) Pelagic stock of **false killer whales**: The M&SI interactions inside the Hawaii EEZ for the HI Pelagic stock of false killer whales previously exceeded the PBR for this stock. A False Killer Whale Take Reduction Team was formed in 2010 pursuant to the MMPA to address incidental takes of false killer whales in the Hawaii-permitted longline fisheries. NMFS implemented the False Killer Whale Take Reduction Plan in 2012. The objective of the plan is to reduce mortality and serious injury of false killer whales in the Hawaii-permitted longline fisheries and to carry out monitoring of false killer whale interactions in the MHI Insular and HI Pelagic stocks. The 2017 SAR reports a PBR of 9.3 pelagic false killer whales per year. With 20 % observer coverage in 2018 and 2019, the trigger is effectively two observed M&SI (i.e. two observed M&SI expands to 10, which exceeds the PBR of 9.3 - NMFS (2020c)). On February 22, 2019, the Southern Exclusion Zone (SEZ) was closed to deep-set longline fishing for vessels registered under the Hawaii longline limited access program, following two false killer whale M&SIs within the EEZ (WPRFMC, 2020). The fishery SEZ was then reopened on the basis of the following: In June 2020, NMFS published NOAA Administrative Report H-20-06 - Oleson (2020), which provides updated abundance and M&SI information for the Hawaii pelagic stock of false killer whales. The current abundance estimate for the HI pelagic stock of false killer whales according to Oleson (2020) is 2,086 (CV = 0.35) individuals in the Hawaii EEZ. The minimum population abundance (Nmin), used for computation of PBR, is calculated as 1,567 animals, with a PBR of 16 pelagic false killer whales. The 5-year (2015-2019) average M&SI rate of pelagic false killer whales within the Hawaii EEZ incidental to the Hawaii longline deep-set fishery is 9.8 whales per year. Based on this information, NMFS has determined that in compliance with the False Killer Whale Take Reduction Plan (50 CFR 229.37), NMFS is reopening the SEZ to Hawaii deep-set longline fishing (NMFS, 2020c). **SG60 is therefore met for the deep-set UoAs for all marine mammal scoring elements in Table 43.**

Cumulatively, the deep-set and shallow-set M&SIs combined (Table 30 and Table 31) are less than the PBRs for the scoring elements concerned, including for the HI pelagic stock of false killer whale based on the latest Oleson (2020) assessment. The combined effects of the MSC UoAs on the stocks concerned are therefore known and highly likely to be within the PBR limits. **SG80 is therefore met for the shallow-set and deep-set UoAs for all marine mammal scoring elements in Table 43.** At 20% observer coverage for the deep-set UoAs, there is no high degree of certainty (90th %ile) for all MSC UoAs combined. **SG100 is not met.**

Sea turtles

Shallow-set fishery: Table 33 summarizes the incidental take data of sea turtles from 2016 to 2020 in the Hawaii shallow-set longline fishery at 100% observer coverage. Nearly all sea turtles observed in the fishery were released alive, with the exception of two loggerhead turtles released dead in 2018, and one olive ridley turtle released dead in 2019. The highest interaction rates involved both leatherback and loggerhead turtles, whereas interactions with greens and olive ridleys were much less frequent (WPRFMC, 2020). At the end of 2017, relatively higher numbers of interactions with loggerhead turtles were observed, with higher numbers continuing into 2018 and 2019. In total, 21, 33, and 20 loggerhead turtles were observed in 2017, 2018, 2019, respectively (Table 33). The increase in loggerhead interactions may be explained by the high reproductive output at their source nesting beaches in Japan where loggerhead turtle nest counts increased nearly an order of magnitude from 1997 to 2014 - most of the loggerhead turtles observed interacting with the fishery in 2017 and 2018 were in the range of 40-60 cm straight carapace length, which is estimated to be approximately 3-10 years in age and consistent with the period of high nesting in Japan (WPRFMC, 2020).

There have been several changes in the ITS and hard cap regulations for loggerhead and leatherback interactions in the shallow-set fishery since 2018. These changes are explained in detail in Section 6.9.3.3. Most recently, in June 2019, NMFS issued a new BiOp on the effects of the shallow-set fishery on marine species listed under the Endangered Species Act (ESA) and a new final rule which revises the annual fleet hard cap for leatherback sea turtles from 26 to 16 (Section 6.9.3.3). If the fleet reaches this limit, NMFS would close the fishery for the remainder of the calendar year. This rule also removes the annual fleet hard cap on North Pacific loggerhead turtle interactions

because it was deemed not necessary at this time for the conservation of this species. Finally, the rule establishes limits of two leatherback and five loggerhead turtles per vessel per individual fishing trip. If a vessel reaches either sea turtle limit during a fishing trip, it must immediately stop fishing and return to port, and may not resume shallow-setting until it meets certain requirements. Vessels that reach the per trip limit for either leatherback or loggerhead sea turtles twice in a calendar year are prohibited from shallow-set longline fishing for the remainder of the calendar year. NMFS requires any vessel that reaches a trip limit for either species twice in one calendar year to have an annual vessel limit of 2 leatherbacks or 5 loggerheads for the following year (NMFS_BiOp, 2019; NMFS, 2020d). The new measure became effective on April 22, 2020 and is paired with an annual review of the fishery's performance under the trip interaction limits in the Annual SAFE Report.

Table 34 summarizes the sea turtle interaction data based on interaction date to allow comparison with the ITS. Due to the fishery closure in March 2019, the Hawaii shallow-set longline fishery in 2019 operated solely under the ITSs in the 2012 BiOp. The ITS from the 2019 BiOp took effect in January 2020 when the fishery reopened (Section 6.9.3.3). Based on the 2-year ITSs, none of the limits of the sea turtle species concerned were exceeded in the last 5 years. This is with the exception of the loggerhead, for which the ITS and hard cap changed over the course of 2018-19 (see Section 6.9.3.3), but for which the ITS has since been increased to 36 (see Table 27) and for which the hard cap has since been removed, as a result of the 2019 BiOp (NMFS_BiOp, 2019). **As far as the team are aware**, this new ITS has not been exceeded and the shallow-set fishery remains open. Because each scoring element has their own ITS for the shallow-set and deep-set fishery, respectively, there are no other overlapping MSC UoAs to be considered. At 100% observer coverage, there is a high degree of certainty that the combined effects of the MSC UoAs are within these limits. **SG60, SG80 and SG100 are met for the shallow-set UoAs for all sea turtle scoring elements in Table 43.**

Deep-set fishery: Table 35 summarizes the incidental take data of sea turtles from 2016 to 2020 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (see Section 6.9.3.3 for method). The most commonly observed sea turtle species was the olive ridley sea turtle, whereas interactions with leatherbacks, greens, and loggerheads were much less frequent. The highest number of observed olive ridley interactions occurred in 2016 with 31 takes. This was followed by three years of high olive ridley interactions with 26, 18, and 29 interactions in 2017, 2018, and 2019, respectively. Due to the depth of the deep-set longline gear and the relatively smaller size of olive ridley turtles compared to leatherback turtles, most of the interactions result in mortalities. The higher level of olive ridley turtle interactions was considered in the 2017 Supplement to the 2014 BiOp, which concluded that the fishery is not likely to jeopardize olive ridley turtles after considering this higher level of interactions.

The Hawaii deep-set longline fishery operates under the 3-year ITS in the 2014 BiOp for leatherback sea turtles, and in the 2017 Supplement to the 2014 BiOp for all other sea turtle species (Table 36). Unlike the shallow-set fishery, the deep-set fishery does not have hard caps and the ITS triggers re-initiation of consultation when exceeded. Since 2018, the ITSs for green sea turtle, North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle have been exceeded. On October 4, 2018, NMFS therefore reinitiated consultation for the deep-set fishery. Until NMFS completes the Section 7 consultation and issues a new BiOp, the 2014 BiOp as supplemented (2017) remains valid (WPRFMC, 2020). **Until this can be discussed further at the site visit, SG60 is provisionally not met for the deep-set UoAs for green sea turtle, loggerhead turtle and olive ridley turtle.**

Leatherback interactions, since the 2014 BiOp, remain below the ITS of 72 interactions over three years. The Council at its 165th Meeting in 2016 recommended continued monitoring of the interactions and further analysis to evaluate patterns of leatherback interactions in the Hawaii deep-set longline fishery. Leatherback turtle interactions in 2017-2019 were lower than in 2014-2015 (WPRFMC, 2020). Because each scoring element has their own ITS for the shallow-set and deep-set fishery, respectively, there are no other overlapping MSC UoAs to be considered. On that basis, the combined effects of the MSC UoAs on the population are known and highly likely to be within the ITS limits. **SG60 and SG80 are met for the deep-set UoAs for leatherbacks.** At 20% observer coverage, there is no high degree of certainty and **SG100 is therefore not met.**

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.
	Shallow-set (UoAs 1 - 5)	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – Yes	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – Yes	All marine mammal species – No All sea turtle species – Yes All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – No
	Deep-set (UoAs 6 - 10)	All marine mammal species – Yes All sea turtle species – Yes Seabirds (Laysan albatross) – Yes Seabirds (black-footed albatross, sooty shearwater, red-footed booby, brown booby) – Yes All elasmobranch species – Yes	All marine mammal species – Yes All sea turtle species – Yes Seabirds (Laysan albatross) – No (more information needed) Seabirds (black-footed albatross, sooty shearwater, red-footed booby, brown booby) – Yes All elasmobranch species – Yes	All marine mammal species – No All sea turtle species – No Seabirds (Laysan albatross) – No Seabirds (black-footed albatross, sooty shearwater, red-footed booby, brown booby) – No All elasmobranch species – No

Rationale

All ETP species scoring elements should be scored here, even those with limits. A summary of the ETP species scoring elements, based on the information presented in Section 6.9.3, is given in Table 44.

Table 44. ETP species scoring elements.

Species	Shallow-set	Deep-set
Marine mammals		
Bottlenose dolphin	x	x
Risso's dolphin	x	x
Striped dolphin	x	

Species	Shallow-set	Deep-set
Guadalupe fur seal	x	
False killer whale		x
Short-finned pilot whale		x
Rough-toothed dolphin		x
Ginkgo-toothed beaked whale	x	
Sea turtles		
Green	x	x
Leatherback	x	x
Loggerhead	x	x
Olive ridley	x	x
Seabirds		
Laysan albatross	x	x
Black-footed albatross	x	x
Sooty shearwater		x
Red-footed booby		x
Brown booby		x
Elasmobranchs		
Oceanic whitetip shark	x	x
Giant manta ray	x	x
Silky shark		x

Marine mammals

Shallow-set fishery: As discussed in scoring issue a, all M&SI interactions of the shallow-set fishery with bottlenose dolphin, Risso's dolphin, striped dolphin and Guadalupe fur seal are well below the PBR levels presented in Table 30. For each species, the PBR is based on NOAA Annual Stock Assessment Reports, which are available here:

<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region> (see Pacific Region). It should be noted, however, that these PBRs only relate to the populations within the Hawaiian EEZ and not outside, although even when counting the M&SIs outside the EEZ, interaction levels remain well below the PBRs. The only species for which a PBR has not been determined is the ginkgo-toothed beaked whale, which is listed by IUCN as data-deficient with no population estimate available (Pitman and Brownell, 2020). However, given that the interaction concerned a single individual over the 2015-19 period (based on 100% observer coverage), it is highly unlikely that the direct effects of the UoA will hinder recovery of this species. On that basis, **SG60 and SG80 are met for all marine mammal species concerned. SG100 is not met** because the PBRs are relevant only to the populations inside the Hawaiian EEZ, and for the ginkgo-toothed beaked whale there is no stock assessment.

Note: The WPRFMC (2020) report makes reference to five interactions with unidentified seals and sea lions, all of which were taken outside of the EEZ offshore of California, while fishing under the Hawaii longline limited entry permit. **The likely species concerned will need to be discussed further at the site visit. If needed, the RBF may be launched at a later date.**

Deep-set fishery: As discussed in scoring issue a, all M&SI interactions of the deep-set fishery with bottlenose dolphin, Risso's dolphin, false killer whale, short-finned pilot whale and rough-toothed dolphin are below the PBR levels presented in Table 31 (and updated more recently for false killer whale – see Sla). For each species, the PBR is based on NOAA Annual Stock Assessment Reports, which are available here: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region> (see Pacific Region). It should be noted, however, that these PBRs only relate to the populations within the Hawaiian EEZ and not outside, although even when counting the M&SIs outside the EEZ, interaction levels remain well below the PBRs. The sole exception to this is the HI false killer whale stock where the combined M&SIs within and outside the Hawaiian EEZ are likely to exceed the PBR of 16 (at 15.2 + 7.5 M&SIs – see Table 31). However, taking into account the most recently available abundance estimates (*N est* in Table 45), the team concludes that it is highly unlikely that the direct effects of the deep-set fishery will hinder recovery of this species. On that basis, **SG60 and SG80 are met for all marine mammal species concerned. SG100 is not met** because the PBRs are relevant only to the populations inside the Hawaiian EEZ and observer coverage is, albeit high at 20%, not sufficient to provide a high degree of certainty.

Note: The WPRFMC (2020) report makes reference to an average of 13 observed interactions with unidentified cetaceans annually (extrapolated to fleet level and including unidentified dolphins and unidentified beaked whales). **The likely species concerned will need to be discussed further at the site visit. If needed, the RBF may be launched at a later date.**

Table 45. Overview of NOAA false killer whale reports for the Pacific Region. Reports revised in 2020 are highlighted. S=strategic stock, N=non-strategic stock. unk=unknown, undet=undetermined, n/a=not applicable. Source: <https://media.fisheries.noaa.gov/2021-07/Pacific%202020%20Summarytable.pdf?null%09>.

Species	Stock	N est	CV	N est	N min	R max	Fr	PBR	Total	Annual	Strategic	Recent	Abundance	Surveys	SAR
									Annual	Fishery					
									Mortality	Mortality					
									+ Serious	+ Serious					
Injury	Injury	Status	Revised												

False killer whale	NW Hawaiian Islands	477	1.71	178	0.04	0.4	1.4	0.01	0.01	N	2002	2010	2017	2020
False killer whale	Hawaii Pelagic	2,086	0.35	1,567	0.04	0.5	16	6.5	6.5	N	2002	2010	2017	2020
False killer whale	Palmyra Atoll	1,329	0.65	806	0.04	0.4	6.4	0.3	0.3	N			2005	2012
False killer whale	Main Hawaiian Islands Insular	167	0.14	149	0.04	0.1	0.30	0.0	0.03	S	2013	2014	2015	2020
False killer whale	American Samoa	unk	unk	unk	0.04	0.5	undet	unk	unk	unk	n/a	n/a	n/a	2010

Sea turtles

Shallow-set fishery: For the same reasoning given in scoring issue a, **SG60, SG80 and SG100 are met for the shallow-set UoAs for all sea turtle scoring elements in Table 44.**

Deep-set fishery: Table 35 summarizes the incidental take data of sea turtles from 2016 to 2020 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (see Section 6.9.3.3 for method). The most commonly observed sea turtle species was the olive ridley sea turtle, whereas interactions with leatherbacks, greens, and loggerheads were much less frequent. The highest number of observed olive ridley interactions occurred in 2016 with 31 takes. This was followed by three years of high olive ridley interactions with 26, 18, and 29 interactions in 2017, 2018, and 2019, respectively. Due to the depth of the deep-set longline gear and the relatively smaller size of olive ridley turtles compared to leatherback turtles, most of the interactions result in mortalities.

Olive ridley: There are two listed populations that occur in the fishery area; the endangered breeding colony populations on the Pacific coast of Mexico and the threatened populations from everywhere but the coast of Mexico endangered population. A weighted average of the yearly estimates of olive ridley abundance was 1.39 million (CI: 1.15 to 1.62 million), which is consistent with the increases seen on the eastern Pacific nesting beaches as a result of protection programs that began in the 1990s. Overall, olive ridley numbers are increasing since protections were implemented, but have not returned to historic levels. Large data gaps still exist in this species' demography, including age and sex distribution, growth, birth, and death rates, immigration, and emigration (see NMFS_BiOp (2019) and references therein). Applying the > 1 million ind. abundance estimate for olive ridley sea turtles (as per the 2019 BiOp for the shallow-set fishery), the interaction rate for the deep-set fishery (29 in 2019) is highly unlikely to hinder recovery of this species. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

Leatherback: Leatherback interactions, since the 2014 BiOp, remain below the ITS of 72 interactions over three years. The Council at its 165th Meeting in 2016 recommended continued monitoring of the interactions and further analysis to evaluate patterns of leatherback interactions in the Hawaii deep-set longline fishery. Leatherback turtle interactions in 2017-2019 were lower than in 2014-2015 (WPRFMC, 2020). **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

Green turtle: Based on analyses conducted by NMFS in the context of the 2019 biological opinion for the Hawaiian shallow-set fishery, the deep-set fishery may overlap with individuals from the following green sea turtle populations:

- Central North Pacific: Since initial nesting surveys began in 1973, there has been a marked increase in annual green turtle with an annual increase of 5.4%. In-water abundance of green turtles is consistent with the increase in nesting trends. In addition, there has been a dramatic increase in the number of basking turtles in the main Hawaiian Islands and throughout the Northwest Hawaiian Islands (NWHI), although more than 96% of nesting occurs at one site in the NWHI which is highly

vulnerable to threats (see NMFS_BiOp (2019) and references therein). In the 2019 BiOp for the Hawaiian shallow-set fishery, NMFS estimate an adult female population of about 4,000 Central North Pacific green sea turtles. At an annual average of 13 interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35), the UoA accounts for 0.32% of this estimate (assuming that all green sea turtles encountered come from this population). The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

- East Pacific: The East Pacific green sea turtle is listed as threatened and nesting has been steadily increasing at the primary nesting sites in Michoacán, Mexico, and in the Galapagos Islands since the 1990s. Nesting trends at Colola have continued to increase since 2000 with the overall Eastern Pacific green turtle population also increasing at other nesting beaches in the Galapagos and Costa Rica. The total for the entire Eastern Pacific green sea turtle population is estimated at 20,112 nesting females (see NMFS_BiOp (2019) and references therein). Assuming that all green sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 13 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.07% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

- Central South Pacific: The Central South Pacific green sea turtle is listed as endangered and population trends are poorly understood. NMFS_BiOp (2019) estimates that this population likely has fewer than 3,600 nesters. Again, assuming that all green sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 13 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.36% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

- Central West Pacific: The Central West Pacific green sea turtle is listed as endangered and there is insufficient long-term and standardized monitoring information to adequately describe abundance and population trends. The limited available information suggests a nesting population decrease in some areas like the Marshall Islands, or unknown trends in other areas such as Palau, Papua New Guinea, the Marianas, Solomon Islands, or the FSM. Currently, there are approximately 51 nesting sites and 6,518 nesting females in the Central West Pacific (see NMFS_BiOp (2019) and references therein). Assuming that all green sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 13 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.2% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

- Southwest Pacific: The Southwest Pacific green sea turtle is listed as threatened and nesting occurs in many islands throughout their range. NMFS_BiOp (2019) estimates that this population has more than 4,000 nesting females. Assuming that all green sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 13 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.32% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

- East Indian/West Pacific: The East Indian/West Pacific green sea turtle is listed as threatened, with a total abundance for this population estimated at 77,009 nesters. Assuming that all green sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 13 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.002% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

Loggerhead: Loggerheads from the North Pacific are listed as endangered and have faced declines of up to 90% since the 1950s and over the last two decades have had an oscillating trend of nester abundance. There are no estimates for the historical abundance but recent abundance estimates have estimated that there are approximately 341,071 North Pacific loggerhead sea turtles, with a median female abundance estimate for 2013-2015 of 3,652 (95% CI, 2976 to 4468) (see NMFS_BiOp (2019) and references therein). Assuming that all loggerhead sea turtle interactions in the deep-set fishery are with females of this population (which represents the worst-case scenario), the annual average of 9 UoA interactions in the deep-set fishery (based on observed encounters extrapolated to fleet level - Table 35) accounts for 0.25% of this estimate. The interaction rate for the deep-set fishery is therefore highly unlikely to hinder recovery of this population. **SG60 and SG80 are met. SG100 is not met** because at 20% observer coverage there is no high degree of certainty.

Seabirds

Shallow-set fishery: The following seabird scoring elements have been identified for the shallow-set fishery, based on the 2015-2019 data given in WPRFMC (2020): Laysan albatross and black-footed albatross. Laysan albatross takes ranged from 2 to 45 individuals per year; for the black-footed albatross this was 9 – 51 (see Table 37). The global population estimate for Laysan albatross is estimated to be more than *ca.* 800,000 breeding pairs, equivalent to *c.* 1,600,000 mature individuals (Arata et al. 2009 cited in Birdlife_International (2018a)); for the black-footed albatross, this is *ca.* 69,900 pairs, which equates to 139,800 mature individuals (ACAP 2017 cited in Birdlife_International (2020)). The relatively low level of encounters in the shallow-set fishery with both species, the majority of which did not lead to mortality (see Table 37), combined with the 100% observer coverage, means that there is a high degree of confidence that there are no significant detrimental direct effects of the shallow-set fishery on either ETP species. **SG60, SG80 and SG100 are met.**

Deep-set fishery: The following seabird scoring elements have been identified for the deep-set fishery, based on the 2015-2019 data given in WPRFMC (2020): Laysan albatross, black-footed albatross, sooty shearwater, red-footed booby and brown booby. An overview of the available data on population size, trends and UoA interactions is given in the following table, together with scoring conclusions.

Species	Population size	Population trends	UoA interactions (based on data in Table 38 and Table 39), extrapolated to fleet level	Scoring conclusion
Laysan albatross	The population is estimated to be more than <i>ca.</i> 800,000 breeding pairs, equivalent to	Data indicate a 32% decline during 1992-2002 in populations on Midway Atoll, Laysan Island and French Frigate Shoals in the Northwestern Hawaiian Islands, where 90% of the global population is found.	Average of 178 takes per annum.	UoA likely to not hinder recovery of this species. SG60 is met. More information is needed about

Species	Population size	Population trends	UoA interactions (based on data in Table 38 and Table 39), extrapolated to fleet level	Scoring conclusion
	c.1,600,000 mature individuals (Arata et al. 2009 cited in Birdlife_International (2018a)).	However, data from 2004 and 2005 indicate that the breeding population then rebounded, and that the overall population trend for 1992-2005 is stable. A population began nesting in Mexico in the 1980s and has been increasing since then. Considering number of documented threats, and the difficulty of predicting long-term trends for such a long-lived species, a decline of 20-29% over the period 1992-2078 is precautionarily estimated (see Birdlife_International (2018a) and references therein).		population trends in the UoA area to score SG80.
Black-footed albatross	Between 1995 and 2017, the average number of breeding pairs per season was ca. 69,900, which equates to 139,800 mature individuals (ACAP 2017 cited in Birdlife_International (2020)).	Future declines are projected to approach 60% over the next 66 years (three generations) due to bycatch in fisheries and risk to nesting habitat from sea-level rise modelled for Midway Atoll, site of the world's largest colony. The maximum PBR level for this species has been estimated at 8,850 birds per year and 10,000 birds per year (see Birdlife_International (2020) and references therein).	Average of 628 takes per annum.	UoA likely to not hinder recovery of this species. SG60 is met. The increase in interaction rates has been investigated with a population model for the species (see below this table), concluding that interactions at the Hawaiian fishery level are unlikely to significantly affect population growth. On that basis, SG80 is met. SG100 is not met as 20% observer coverage does not provide a high degree of confidence.
Sooty shearwater	4.4 million pairs, roughly equating to 19.0–23.6 million individuals (Newman et al. 2009, Waugh et al. 2013 cited in	There are persistent signs of a current decline in the global population. In North America and in New Zealand, the population trends were found to be decreasing. Though the rate of decline of the whole population has not been quantified, moderately rapid	Average of 17 takes per annum.	UoA highly likely to not hinder recovery of this species. SG60 and SG80 are met. SG100 is not met as 20% observer coverage does not provide a high degree of confidence.

Species	Population size	Population trends	UoA interactions (based on data in Table 38 and Table 39), extrapolated to fleet level	Scoring conclusion
	Birdlife_International (2019).	population declines are suspected (Birdlife_International, 2019).		
Red-footed booby	>1,000,000 individuals (del Hoyo et al. 1992 cited in BirdLife_International (2018a)).	Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (10% in ten years or three generations, or with a specified population structure) (BirdLife_International, 2018a).	Average of 7 takes per annum for booby species combined.	UoA highly likely to not hinder recovery of this species. SG60 and SG80 are met. SG100 is not met as 20% observer coverage does not provide a high degree of confidence.
Brown booby	> 200,000 individuals (del Hoyo et al. 1992 cited in BirdLife_International (2018b)).	Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size is very large, and hence does not approach the thresholds for Vulnerable under the population size criterion (10% in ten years or three generations, or with a specified population structure) (BirdLife_International, 2018b).	Average of 7 takes per annum for booby species combined.	UoA highly likely to not hinder recovery of this species. SG60 and SG80 are met. SG100 is not met as 20% observer coverage does not provide a high degree of confidence.

Note on black-footed albatross: The Council recommended research to be conducted on at-sea foraging behaviour of albatross species to improve understanding of interaction rates in the Hawaii longline fisheries. In response to the Council recommendation, a seabird workshop was convened in November 2017. The objectives of the workshop were to: 1) review recent increased albatross interactions in the Hawaii longline fishery; 2) explore possible factors responsible for this increase; 3) evaluate albatross population impacts; and 4) provide input for future data collection, analysis, and models. Information presented at the workshop strongly suggested that El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) influence albatross distribution by affecting wind patterns and ocean productivity. In years of positive ENSO and PDO, albatross distributions and longline fishing effort overlap more closely, resulting in increased albatross interaction rates. The workshop also identified albatross population dynamics, mesoscale oceanographic processes, and increased albatross attraction to vessels as other factors that may influence interaction rates. A black-footed

albatross population model indicated that the recent increase in albatross interactions is unlikely to significantly affect population growth as long as the increase is limited to the Hawaii longline fishery or is episodic (WPRFMC, 2020).

Elasmobranchs

Shallow-set fishery:

Table 40 summarizes the incidental take data of ESA-listed elasmobranchs from 2015 to 2019 in the Hawaii shallow-set longline fishery. There were no observed interactions with silky sharks, which are not an ESA-listed species, but are considered ETP as per WCPFC and IATTC management (Section 6.9.3).

Oceanic whitetip shark: Oceanic whitetip sharks constitute the majority of the interactions and the observed number of takes ranges between 1 and 32. Most of the oceanic whitetip sharks that are caught in the shallow-set fishery are released alive according to observer reports. A stock assessment was carried out for this species by Tremblay-Boyer et al. (2019). This is also the first stock assessment carried out since CMM 2011-04 became active in 2013, 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 previous stock assessment by Rice and Harley (2012), the stock 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, however, improved in the period since CMM 2011-04 became active, which covers the last 4 years of the assessment's time-span (2013–2016). 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 CMM2011-04 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 (Tremblay-Boyer et al., 2019). Applying the total catch for the longline and purse seine fleets combined, used for the diagnostic case by Tremblay-Boyer et al. (2019) (see Figure 19 in the report), 2015 catch levels were estimated at ca. 30,000 individuals to which the fishery would have contributed ~0.1 % per annum (worst-case). It is therefore highly likely that the direct effects of these UoAs do not hinder recovery of oceanic whitetip shark and **SG60 and SG80 are met**. Considering the 100% observer coverage in the fishery, the team concludes that there is a high degree of confidence that this is the case; **SG100 is also met**.

Giant manta ray: Giant manta ray interactions with this fishery are rare with only 2 takes observed in 2017 (based on 100% observer coverage). Croll et al. (2016) estimate an average annual capture of 7,817 mobulid rays per year in WCPO purse seine fisheries alone. The low level of UoA catch implies direct effects of the UoA are highly likely to not hinder recovery of Mobulidae species including manta rays. **SG60 and SG80 are met**. **SG100 is not met** due to lack of species-specific catch data and low confidence in WCPO data.

Deep-set fishery: Table 41 summarizes the incidental take data of EAS-listed elasmobranchs from 2015 to 2019 in the Hawaii deep-set longline fishery. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (see Section 6.9.3.5 for method).

Oceanic whitetip shark: The most common observed interactions were of oceanic whitetip sharks. The annual expanded interaction estimates range between 1,098 and 2,654 for oceanic whitetips, i.e. up to 9% of the 2015 catch levels estimated by Tremblay-Boyer et al. (2019). The majority of individuals are released, however, and post-release survival rates from this species tagged in both the Hawaiian deep-set and shallow-set fisheries have been estimated at 85%, with the combined at-vessel mortality for both fisheries estimated at 21.9% (Hutchinson et al., 2021). Applying these survival/mortality rates to the estimated interaction rates in the deep-set fishery, the UoA is calculated to account for the mortality of *ca.* 3% of the regional estimate by Tremblay-Boyer et al. (2019). On that basis, the direct effects of the UoA are highly likely to not hinder recovery of oceanic whitetip shark. **SG60 and SG80 are met. SG100 is not met** as 20% observer coverage does not provide a high degree of confidence.

Giant manta ray: Giant manta rays observed infrequently, averaging at *ca.* 8 interactions per annum (scaled up to fleet level). Croll et al. (2016) estimate an average annual capture of 7,817 mobulid rays per year in WCPO purse seine fisheries alone. The low level of UoA catch implies direct effects of the UoA are highly likely to not hinder recovery of Mobulidae species including manta rays. **SG60 and SG80 are met. SG100 is not met** due to lack of species-specific catch data and low confidence in WCPO data.

Silky shark: Total annual catch (extrapolated from observed encounters by NMFS based on 20% observer coverage) for silky sharks averaged at 46,800 lbs or *ca.* 21 tonnes (see Table 14). Silky shark are a circumtropical species found in tropical waters of the Pacific Ocean. Although the greatest impact on the stock is attributed to bycatch from the longline fishery, there are also significant impacts from the associated purse seine fishery which catches predominantly juvenile individuals. Clarke et al. (2018) attempted to carry out a Pacific-wide silky shark stock status assessment using data through 2016 and incorporating a long catch rate time series and large size composition datasets from the Eastern Pacific Ocean (EPO) (including the Hawaii deep-set longline fishery as an index of abundance). The analysis highlighted considerable conflicts between the key datasets; in particular, the models were unable to simultaneously fit the primary CPUE indices from the western and eastern Pacific regions and are not considered sufficiently robust to provide an assessment of stock status for silky sharks in the Pacific Ocean. The assessment estimated the total EPO catch of silky sharks at 341,100 individuals. Applying an average weight of about 200 lbs for sharks in the deep-set fishery (WPRFMC, 2021a), the 21 tonne annual average corresponds to 233 sharks, rounded up to 300 to be precautionary, or 0.09% of the regional catch estimate in the EPO. On that basis, the direct effects of the UoA are highly likely to not hinder recovery of silky shark. **SG60 and SG80 are met. SG100 is not met** as 20% observer coverage does not provide a high degree of confidence and there is no stock assessment for silky shark in the EPO.

In terms of unobserved mortality of ETP species, the team considered ghost fishing due to gear loss as a factor. Radio buoys are spaced at regular intervals for each set. Therefore, should the line break, both ends can be retrieved. It is reportedly very rare for a whole longline to be lost. In the event the line breaks, the vessel will also want to harvest the fish which provides another incentive for retrieval. Under the WCPFC Regional Observer Program, observers are required to report whether the vessel abandoned, lost or discarded any fishing gear, whether the vessel found abandoned gear from another vessel, and whether the vessel failed to report any lost or abandoned gear if required by the country in which waters the vessel was fishing (Gilman, 2015). Overall it is important to consider that lost pelagic longline gear is only likely to continue to fish as long as bait remains on the hooks. Bait tends to be stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is usually low (Macfadyen et al., 2009). The team considered that unobserved mortality through ghost fishing was unlikely to be a significant factor in the fishery's interactions with ETP species.

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.
	Shallow-set (UoAs 1 - 5)	All species – Yes	All species – No
	Deep-set (UoAs 6 - 10)	All species – Yes	All species – No

Rationale

Discard and post-release mortality is accounted for in the data cited above and is therefore not an indirect effect.

Potential indirect effects for the ETP species scoring elements considered in Sla above may include reduced availability of prey items due to their removal by the UoA; disturbance of nesting/roosting behaviour.

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 swordfish and tunas, would lead to unacceptable impacts on any of the ETP shark species through competition. Giant manta rays are planktivorous. The diet of sea turtles is restricted to algae, grasses and seaweeds, invertebrates and small fish. Baleen whales (e.g. fin whale) are planktivorous. Although the toothed whales (bottlenose dolphin, Risso's dolphin, striped dolphin, Ginkgo-toothed beaked whale, short-finned pilot whale and rough-toothed dolphin) do feed on tuna, they do not do so exclusively. Guadalupe fur seals eat a variety of fish, including lantern fish, mackerel, and fish in the myctophid family. Squid also constitute a major part of their diet. Trites et al. (1997) estimated the overlap between marine mammal diets and fishery catches and found that the most important prey items for marine mammals in the Pacific as a whole were squids and mesopelagic fishes, most of which are deep-water species not targeted by the UoA. Finally, none of the bird species considered feed on the target species in this fishery. At the scale of the UoAs it is highly unlikely that the fishery would lead to unacceptable impacts on the ETP species concerned through the removal of prey.

Disturbance of nesting / roosting behaviour:

The UoA fisheries take place far from any land masses and are therefore highly unlikely to disrupt any feeding/nesting grounds to the extent that there would be unacceptable impacts on the species involved.

Overall, indirect effects have been considered and the UoA is considered highly likely to not create unacceptable impacts on the ETP species identified. **SG80 is met**. There has been no dedicated research exploring likely indirect effects by the UoA and as such, **SG100 is not met**.

References

BirdLife_International (2021), BirdLife_International (2018a, 2018b, 2018c, 2019, 2020), ESA (1973), Hutchinson et al. (2021), NMFS (1972, 2018a, 2020b, 2020c, 2020d, 2020e, 2021, 2018b, 2018c, 2018d, 2019a, 2019b, 2019c, 2019e, 2020a), NMFS_BiOp (2019), NMFS_PIRO (2021), Oleson (2020), Pitman and Brownell (2020), Ryder et al. (2006), Swenarton and Beverly (2004), Tremblay-Boyer et al. (2019), US_Department_of_Commerce (2018), WPRFMC (2009, 2020, 2021a, 2021b), Macfadyen et al. (2009), Gilman (2015)

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

Draft scoring range	Shallow-set (UoAs 1 - 5): ≥80 Deep-set (UoAs 6 - 10): <60 (more information needed)
Information gap indicator	More information sought: <ul style="list-style-type: none"> - Harmonisation discussion on ITSs and to what extent they constitute 'limits' to be had. - Latest comparison of shallow-set interactions with sea turtles against ITSs - Update on latest deep-set BiOp and comparison of deep-set interactions with sea turtles against ITSs - Five interactions with unidentified seals and sea lions in shallow-set fishery to be discussed - 13 observed interactions with unidentified cetaceans annually (extrapolated to fleet level and including unidentified dolphins and unidentified beaked whales) in deep-set fishery to be discussed - More information is needed about Laysan population trends in the UoA area to complete SG80 scoring for the deep-set fishery

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 2.3.2 – ETP species management strategy

PI 2.3.2	<p>The UoA has in place precautionary management strategies designed to:</p> <p>meet national and international requirements;</p> <p>ensure the UoA does not hinder recovery of ETP species.</p> <p>Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species</p>		
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?	Yes	Yes	Yes

Rationale

At regional level, the following measures intervene in the management of the Hawaii longline fisheries on ETP species:

WCPFC Conservation and Management Measures:

- CMM 2018-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds
- CMM 2018-04 on sea turtles
- CMM 2019-04 on sharks (with particular reference to oceanic whitetip shark and silky shark)
- CMM 2019-05 on mobulid rays caught in association with fisheries in the WCPFC Convention Area.
- The U.S. participates in the Regional Observer Programme (ROP) which at a regional level aims to collect verified catch data, other scientific data, and additional information related to the fishery, including on the implementation of CMMs. CMM 2007-01 entered into force on 15 February 2008, and provides the basis of the rules and development of the WCPFC ROP and sets a minimum required national observer coverage of 5% for longline fisheries.

IATTC Resolutions:

- C-19-05 and C-16-06 on silky shark
- C-11-10 on oceanic whitetip shark
- C-15-04 on mobulid rays
- C-11-02 on seabirds
- C-07-03 on sea turtles
- C-11-08 on scientific observers for longline vessels, requiring that at least 5% of the fishing effort made by its longline fishing vessels greater than 20 metres length overall carry a scientific observer

The above measures have been translated into the management measures that are currently in force at UoA level, under the Pelagic Fishery Ecosystem Plan (FEP). These measures, including which UoA fishery and ETP species they apply to, are summarised in the following table:

Table 46. Summary of the current management measures at UoA level in force under the Pelagic Fishery Ecosystem Plan (FEP). Source: NMFS (2020e) and WPRFMC (2020).

Measure	Fishery	ETP species
Protected Species Workshop (PSW) Certificate: Each year, longline vessel owners and operators must complete a PSW and receive a certificate. The vessel owner must have a valid PSW certificate to renew a Hawaii longline limited entry permit. The vessel operator must have a valid PSW certificate on board the vessel while fishing. The workshop training includes: regulatory requirements, handling and release techniques, protected species identification (sea turtles, seabirds, marine mammals, sharks/ray, biology, and migration). The objective of the PSW certifications are to ensure that longline fishing vessel owners and operators are well-versed on the most up-to-date interaction mitigation techniques for protected species.	Both	All
Logbook for recording effort, catch, and other data.	Both	All
Vessel monitoring system: all vessels must have an operational NOAA Enforcement-owned and installed VMS unit on board whenever the vessel is at sea.	Both	All
The vessel owner, permit holder, designated agent, or operator must notify the NMFS Observer Program Contractor at least 72 hours before departure on a fishing trip, and declare the intended trip type (shallow-set or deep-set). Once a trip type has been declared and the fishing trip begins, the operator may make sets only of the declared type.	Both	All
Each fishing trip is required to have a fishery observer on board if requested by NMFS; NMFS places observers on every shallow-set trip, resulting in 100% coverage.	Shallow-set	All

Measure	Fishery	ETP species
Each fishing trip is required to have a fishery observer on board if requested by NMFS; NMFS places observers on at least 20% of deep-set trips.	Deep-set	All
Prohibited Areas in Hawaii: Northwestern Hawaiian Islands (NWHI) Longline Protected Species Zone, Main Hawaiian Islands Longline Fishing Prohibited Area; Papahānaumokuākea Marine National Monument: Commercial fishing is prohibited in the Monument, which has boundaries that align with the NWHI Longline Protected Species Zone.	Both	All
Marine Mammal Authorization Program Certificate.	Both	Marine mammals
Vessel owners or operator must submit the Marine Mammal Authorization Program (MMA) Mortality/Injury Reporting Form within 48 hours after the end of the fishing trip to NMFS to report injuries or mortalities of marine mammals.	Both	Marine mammals
Vessel owners and operators must follow the marine mammal handling guidelines provided at the PSW.	Both	Marine mammals
The False Killer Whale Take Reduction Plan adds requirements to the deep- and shallow-set longline fisheries. NMFS-approved marine mammal handling and release, and captain notification placards must be posted on every vessel. The crew must also notify the operator if a marine mammal interaction occurs, so the captain can supervise the handling and release.	Both	False killer whales
For the deep-set fishery, the False Killer Whale Take Reduction Plan stipulates that an area south of the main Hawaiian Islands, inside the EEZ, termed the Southern Exclusion Zone, may be closed to longline fishing if a specified number of interactions with false killer whales occur in the EEZ around Hawaii. In addition, there are hook and branch line requirements for the deep-set fishery. See the Compliance Guide Longline Fishing Requirements to Reduce Take of False Killer Whales: https://www.regulations.gov/document/NOAA-NMFS-2011-0042-0095	Deep-set	False killer whales
Vessel owners and operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds. Compliance Guide - Handling, Resuscitation, and Release of Sea Turtles: https://www.regulations.gov/document/NOAA-2005-0163-0002 Compliance Guide - Reducing and Mitigating Interactions between Seabirds and Hawaii-Based Longline Fishing: https://www.regulations.gov/document/NOAA-2005-0252-0002	Both	Seabirds and sea turtles

Measure	Fishery	ETP species
Vessel owners and operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.	Both	Seabirds and sea turtles
<u>Shark Finning and Landing:</u> - Vessels may possess and land shark fins only if the fins are naturally attached to the corresponding shark carcass, meaning attached to the carcass through some portion of uncut skin. - Vessels may land a shark carcass only if its fins are naturally attached. - Vessels may transfer or receive fins between vessels at sea only if the fins are naturally attached to the corresponding carcass. - While at sea, vessels may not remove any fins from a retained shark, including the tail.	Both	All sharks
<u>Silky and oceanic whitetip sharks in the WCPFC and IATTC¹⁴ Convention Areas:</u> - Any part of any silky shark or oceanic whitetip shark caught in the WCPFC Convention Area may not be retained or landed - A silky and oceanic whitetip shark must be released as soon as possible after catching it, taking reasonable steps for releasing it carefully without compromising human safety. - Vessels must allow and assist in collecting samples from these sharks if an observer requests it and if it is safe Compliance Guide: Fishing Restrictions related to Oceanic Whitetip, Silky and Whale Sharks (BD44) - 2021 Updated: https://www.regulations.gov/document/NOAA-NMFS-2014-0086-0048	Both	Oceanic whitetip shark and silky shark
<u>Deep-set gear requirements for Fishing North of the Equator (0° lat.):</u> - Each float line must be at least 20 m long. - At least 15 branch lines between two consecutive floats (basket gear - at least 10 branch lines). - No light sticks are allowed on the vessel. - Any nylon monofilament line used in a branch line or leader must have a diameter (thickness) of 2.0 mm or larger. Any other line material (e.g., wire) used in a branch line or leader must have a breaking strength of 400 lb or more.	Deep-set (north of equator)	All

¹⁴ Although the summary of the Hawaii longline fishery regulations only mentions the WCPFC shark measures, the actual regulations implement measures of both Pacific tuna RFMOs. See the code of federal regulations Part 300 – International Fisheries Regulations: <https://www.ecfr.gov/current/title-50/chapter-III/part-300>

Measure	Fishery	ETP species
<ul style="list-style-type: none"> - Use circle hooks with a maximum wire diameter of 4.5 mm. The hook shank must contain round wire that can be measured with a calliper. If the hook point is offset, it must be offset by no more than 10°. - Swordfish limits: If an observer is on board, there is no limit on the number of swordfish that may be kept or landed. If there is no observer on board, and if only circle hooks are used, the limit is 25 swordfish per trip 		
<u>Shallow-set fishing gear requirements:</u> <ul style="list-style-type: none"> - Use size 18/0 or larger circle hooks and, if the hook point is offset, it must be offset by no more than 10°. - Use mackerel-type fish bait only (sardines, sanma, mackerel) – squid may not be used as bait 	Shallow-set	Sea turtles
<u>Shallow-set fishing gear requirements</u> <u>Deep-set gear requirements for fishing North of 23° N. Lat</u> Longline vessel owners/operators can choose between side-setting or stern-setting longline gear with additional regulatory specifications to reduce seabird interactions (e.g., blue-dyed bait, weighted branch lines, strategic offal discards, using a “bird curtain”) – see Table 47 and Table 48.	Shallow-set Deep-set (north of 23° N)	Seabirds
<u>Gear Requirements for fishing South of the Equator:</u> To reduce interactions with sea turtles, a permitted U.S. longline vessel longer than 40 feet (12.2 meters) must meet the following conditions when fishing south of the Equator (Note, NMFS does not allow shallow-set fishing in the South Pacific). <ul style="list-style-type: none"> • Each float line must be at least 30 m long. • There must be at least 70 m of blank mainline (without hooks attached) before and after all deployed float lines. • When hooks are deployed, there must be at least 15 branch lines attached between two consecutive floats. • Each branch line must be at least 10 m long. • You may not keep or land more than 10 swordfish during a fishing trip. 	Both	Sea turtles
<u>Sea turtle interaction limits:</u> If a sea turtle interaction limit is reached, NMFS will close the shallow-set fishery for the remainder of the calendar year and notify vessel owners and operators of the closure. Sea turtle interactions	Shallow-set	Interaction limits are in place for: <ul style="list-style-type: none"> - leatherback sea turtles: 16 per year - limits of 2 leatherback and 5 loggerhead turtles per vessel per individual fishing trip

Measure	Fishery	ETP species
can be tracked via this website: https://www.fisheries.noaa.gov/pacific-islands/bycatch/sea-turtle-interactions-hawaii-shallow-set-longline-fishery		If a vessel reaches either sea turtle limit during a fishing trip, it must immediately stop fishing and return to port, and may not resume shallow-setting until it meets certain requirements. Vessels that reach the per trip limit for either leatherback or loggerhead sea turtles twice in a calendar year are prohibited from shallow-set longline fishing for the remainder of the calendar year. NMFS requires any vessel that reaches a trip limit for either species twice in one calendar year to have an annual vessel limit of 2 leatherbacks or 5 loggerheads for the following year (NMFS_BiOp, 2019; NMFS, 2020d)

For all species that have an ITS (see Section 6.9.3.1 for additional explanation on the ITS process, and Table 27 and Table 29 for a list of current ITSs), if the fishery exceeds the ITS for any species in the current valid BiOps, NMFS should reinitiate ESA Section 7 consultation for that species. In all cases, including for non-ITS or non-ESA-listed species, the annual SAFE reports (e.g. WPRFMC (2020, 2021b)) review the fishery's interactions against marine mammal, elasmobranch, seabird and sea turtle species. Where concerning trends are noted an investigation ensues and mitigation measures are introduced as required – this is further discussed in scoring issue e. On the basis of the above, the team concludes that a comprehensive strategy is in place for all ETP species. I.e. it is made up of linked monitoring through comprehensive observer coverage, annual analyses in the SAFE reports and where ITSs are exceeded detailed investigations through formal consultations and Biological Opinions under ESA Section 7, and where needed, management measures and responses are formulated. **SG60, SG80 and SG100 are met for all scoring elements.**

Table 47. Deep-set gear requirements as seabird bycatch mitigation for Fishing North of 23° N. Lat. Source: NMFS (2020e).

Stern Set	Side Set
Use line shooter to set the gear	Line shooter, if used, mounted as far forward on the port or starboard side of the vessel, and at least 1 m (3 ft 3 in) from stern
Branch lines with 45 g (1.6 oz) weight within 1 m (3 ft 3 in) of each hook	Branch lines with 45 g (1.6 oz) weight within 1 m (3 ft 3 in) of each hook
Blue-dyed bait: <ul style="list-style-type: none"> Bait completely-thawed Bait dyed to match NMFS blue color control card Keep at least two 1-lb cans of blue dye on the vessel 	Deploy bird curtain when setting gear on the same side of the vessel and aft of the line shooter or where the mainline is being deployed <ul style="list-style-type: none"> Bird curtain pole must be at least 3 m long with three streamers Streamers must have a diameter of 20 mm, with an allowable terminal end of 10 mm
Strategic offal discharge: <ul style="list-style-type: none"> When birds are present, discharge fish, fish parts, or spent bait while setting or hauling, on opposite side of the vessel from fishing gear Retain enough fish, fish parts, or spent bait between sets of longline gear for strategic offal discharge Remove hooks from fish, fish parts, or spent bait prior to strategic offal discharge Remove bill and liver from all swordfish, sever heads from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge 	Mainline set from port or starboard side, as far forward as possible, at least 1 m (3 ft 3 in) from stern
When using basket-style gear, ensure mainline is set slack	When seabirds are present, set gear so hooks remain underwater and do not rise to the surface

Table 48. Shallow-set gear requirements as seabird bycatch mitigation. Source: NMFS (2020e).

Stern Set	Side Set
Night set. Begin set at least 1 hr after sunset and finish setting before sunrise, using minimum vessel lights necessary for navigation and safety	Line shooter, if used, mounted as far forward on the port or starboard side of the vessel as possible, and at least 1 m (3 ft 3 in) from stern
When using basket-style gear north of 23° N., ensure the mainline is set slack	Branch lines with 45 g (1.6 oz) weight within 1 m (3 ft 3 in) of each hook
Blue-dyed bait: <ul style="list-style-type: none"> Bait completely-thawed Bait dyed to match NMFS blue color control card Keep at least two 1-lb cans of blue dye on the vessel 	Deploy bird curtain when setting gear on the same side of the vessel and aft of the line shooter or where the mainline is being deployed <ul style="list-style-type: none"> Bird curtain pole must be at least 3 m long with three streamers Streamers must have a diameter of 20 mm, with an allowable terminal end of 10 mm
Strategic offal discharge: <ul style="list-style-type: none"> When birds are present, discharge fish, fish parts, or spent bait while setting or hauling, on opposite side of the vessel from fishing gear Retain enough fish, fish parts, or spent bait between sets of longline gear for strategic offal discharge Remove hooks from fish, fish parts, or spent bait prior to strategic offal discharge Remove bill and liver from all swordfish, sever heads from trunk and split in half vertically, and periodically discharge butchered heads and livers for strategic offal discharge	When seabirds are present, set gear so hooks remain underwater and do not rise to the surface

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

Scoring issue should not be scored if requirements for protection or rebuilding are provided through national ETP legislation or international agreements. Not relevant.

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.
	Shallow-set (UoAs 1 - 5)	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – Yes	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – Yes	All marine mammal species – Yes All sea turtle species – No All seabird species – Yes Oceanic whitetip shark – Yes Giant manta ray – No
	Deep-set (UoAs 6 - 10)	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes All elasmobranch species – Yes	All marine mammal species – Yes All sea turtle species – No (more information needed) All seabird species – Yes All elasmobranch species – Yes	All marine mammal species – No All sea turtle species – No All seabird species – No All elasmobranch species – No

Rationale

Marine mammals

A marine mammal species or population stock that is listed as threatened or endangered under the ESA is, by definition, also considered depleted under the MMPA. The ESA allows takings of threatened and endangered marine mammals only if authorized by section 101(a)(5) of the MMPA. Section 101(a)(5)(E) of the Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et seq., has provisions for NOAA's National Marine Fisheries Service (NMFS), as delegated by the Secretary of Commerce, to issue permits for the taking of marine mammals designated as depleted because of their listing under the Endangered Species Act (ESA), 16 U.S.C. 1531 et seq., by U.S. vessels and those

vessels which have valid fishing permits issued by the Secretary in accordance with section 204(b) of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1824(b), for a period of up to 3 years. NMFS may issue the authorization to take ESA-listed marine mammals incidental to these commercial fisheries only after the agency has determined, after notice and opportunity for public comment, that:

- (1) the incidental mortality and serious injury from commercial fisheries will have a negligible impact on the affected species or stock;
- (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and
- (3) where required under section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock.

Further, when an action will result in incidental take of ESA-listed marine mammals, ESA section 7(b)(4) requires that such taking be authorized under the MMPA section 101(a)(5) before the Secretary can issue an ITS for ESA-listed marine mammals and that an ITS specify those measures that are necessary to comply with Section 101(a)(5) of the MMPA. Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS, including those specified as necessary to comply with the MMPA, Section 101(a)(5). Accordingly, the terms of an ITS and the exemption from Section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified (NMFS_BiOp, 2019).

Within this framework, NOAA Fisheries must establish monitoring (observer) programs to estimate stock-specific mortality and serious injury (M&SI) of marine mammals due to commercial fishing operations. A “Potential Biological Removal” (PBR) must be calculated for each marine mammal stock (based on annual Stock Assessment Reports - SARs). If the estimated human-caused M&SI (from all sources) exceeds the PBR, a Take Reduction Plan must be developed and implemented to reduce incidental fisheries M&SI to a level below PBR. This has been the case for the HI Pelagic stock of false killer whales where the deep-set fishery previously exceeded the PBR for this stock. Under the 2012 False Killer Whale Take Reduction Plan, management measures have ensured that interaction levels currently remain below the PBR (see 2.3.1a). This provides an objective basis for confidence that the strategy will work. **SG60 and SG80 are met for marine mammals for both set-type fisheries. For the shallow-set fishery, the 100% observer coverage provides high confidence that the strategy will work. SG100 is met. For the deep-set fishery, the 20% observer coverage precludes SG100 from being met.**

Sea turtles

Management measures in the **Hawaii shallow-set longline fishery** have been effective in reducing the number of sea turtle interactions. The introduction of sea turtle bycatch reduction measures for the fishery in 2004, such as switching from J-hooks to circle hooks, and from squid bait to mackerel bait, resulted in an 89% decrease in sea turtle interactions in 2004-2006 compared to interactions observed in 1994 through 2002. The rate of deeply hooked sea turtles, which is thought to result in higher mortality levels, also declined after those measures were implemented (Gilman et al., 2007a). In June 2019, NMFS issued a new BiOp on the effects of the shallow-set fishery on marine species listed under the Endangered Species Act (ESA) and a new final rule which revises the annual fleet hard cap for leatherback sea turtles from 26 to 16 (Section 6.9.3.3). If the fleet reaches this limit, NMFS would close the fishery for the remainder of the calendar year. This rule also removes the annual fleet hard cap on North Pacific loggerhead turtle interactions because it was deemed not necessary at this time for the conservation of this species. Finally, the rule establishes limits of leatherback and loggerhead

turtles per vessel per individual fishing trip. If a vessel reaches either sea turtle limit during a fishing trip, it must immediately stop fishing and return to port, and may not resume shallow-setting until it meets certain requirements (NMFS_BiOp, 2019; NMFS, 2020d). The new measure became effective on April 22, 2020 and is paired with an annual review of the fishery's performance under the trip interaction limits in the Annual SAFE Report. On that basis, the team concludes that there is an objective basis for confidence that the strategy will work for the shallow-set fishery. **SG60 and SG80 are met.** However, there have been several changes in the ITS and hard cap regulations for loggerhead and leatherback interactions in the shallow-set fishery since 2018 (following a court case and subsequent appeal in 2017/18 - see Section 6.9.3.3), reducing some of the confidence in the management system, at least for the time being. For this reason, **SG100 is not met.**

The **Hawaii deep-set longline fishery** operates under the 3-year ITS in the 2014 BiOp for leatherback sea turtles, and in the 2017 Supplement to the 2014 BiOp for all other sea turtle species (Table 36). Unlike the shallow-set fishery, the deep-set fishery does not have hard caps and the ITS triggers re-initiation of consultation when exceeded. Since 2018, the ITSs for green sea turtle, North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle have been exceeded. On October 4, 2018, NMFS therefore reinitiated consultation for the deep-set fishery. Until NMFS completes the Section 7 consultation and issues a new BiOp, the 2014 BiOp as supplemented (2017) remains valid (WPRFMC, 2020). While the measures are considered likely to work, based on plausible argument (i.e. the 2014/17 BiOp) and **SG60 is met**, it is not clear whether there is an objective basis for confidence at this ACDR stage. This should be **discussed further at the site visit**. For the time being, **SG80 is provisionally scored as not met.**

Seabirds

For the shallow-set fishery, PI 2.3.1b explains that there is a high degree of confidence that there are no significant detrimental direct effects of the shallow-set fishery on either ETP seabird species. At 100% observer coverage, this supports high confidence that the strategy will work. **SG60, SG80 and SG100 are met.**

Results from an analysis of seabird interaction rates in the **Hawaii deep-set longline fishery** (Gilman et al., 2016) was presented to the Protected Species Advisory Committee and Pelagic Plan Team in 2016. The analysis included data from October 2004 to May 2014. Results indicate that seabird interaction rates significantly increased as annual mean multivariate ENSO index values increased, meaning that decreasing ocean productivity may have contributed to the increasing trend in seabird catch rates. The analysis also showed a significant increasing trend in the number of albatrosses attending vessels, which may also be contributing to the increasing seabird catch rates. Both side setting and blue-dyed bait significantly reduced the seabird catch rate compared to stern setting and untreated bait, respectively. Of two options for meeting regulatory requirements, side setting had a significantly lower seabird catch rate than blue-dyed bait. The Council, at its 166th Meeting in June 2016, directed the Plan Team and the Protected Species Advisory Committee to continue monitoring interactions through the SAFE to detect any future changes in albatross interactions that may be attributed to fishing operations. The Council noted that current seabird measures implemented in the Hawaii longline fishery are effective and recent increase in seabird captures are driven by non-fishery factors at this time (WPRFMC, 2020). This provides an objective basis for confidence that the strategy will work **and SG60 and SG80 are met. The observer coverage at 20% for the deep-set fishery precludes SG100 from being met.**

Elasmobranchs

The majority of sharks in both fisheries are released. At-vessel and post-release survival studies of silky sharks and oceanic whitetip sharks in the Hawaiian longline fisheries were carried out by Hutchinson et al. (2021). Silky sharks had the highest at-vessel mortality rate (29.2%) and also the highest post-release survival rate (97%) compared to all other species examined in this study, although the authors indicate that the post-release survival rates are likely an optimistic estimate (given that all tagged sharks were

in good condition from the outset) and should be taken in consideration with similar studies that have been conducted on this species (see Hutchinson et al. (2021) and references therein). For oceanic whitetip, the study estimated post-release survival rates from tagged individuals in both the deep-set and shallow-set fisheries at 85%. The combined at-vessel mortality for both fisheries was 21.9% (Hutchinson et al., 2021). The high levels of observer coverage in both fisheries, combined with the relatively low level of UoA mortality compared to regional estimates (see 23.1b), provides some objective basis for confidence that the strategy will work. **SG60 and SG80 are met for all fishery set-types and ETP elasmobranch species.**

For oceanic whitetip in the shallow-set fishery, there is a high degree of certainty that the direct effects of these UoAs do not hinder recovery of oceanic whitetip shark (2.3.1b) and **SG100 is met** as well.

For giant manta ray in the same fishery, however, the lack of population estimate for this species in the UoA area means that **SG100 is not met**.

For the deep-set fishery, the 20% observer coverage **precludes SG100 from being met for all ETP elasmobranch species.**

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).
	Shallow-set (UoAs 1 - 5)		All ETP species – Yes	All ETP species – Yes
	Deep-set (UoAs 6 - 10)		All ETP species – Yes	All ETP species – No

Rationale

The comprehensive observer coverage in this fishery provides evidence that regulations are being complied with. The fishery closures related to false killer whale and sea turtle interactions also provide evidence that the strategy is being implemented successfully. Finally, compliance with closed areas is monitored through VMS data. For the shallow-set fishery, the fact that observer coverage is 100% and that the fishery meets SG80 for all ETP species scoring elements, provides clear evidence that the comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b). **SG80 and SG100 are met for the shallow-set fishery.** For the deep-set fishery, there is evidence that the strategy is being implemented for all scoring elements and that it is achieving its objective for most scoring elements (see 2.3.1). **SG80 is met for the deep-set fishery.** However, since 2018, the ITSs for green sea turtle, North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle have been exceeded. On October 4, 2018, NMFS therefore reinitiated consultation for the deep-set fishery, providing clear evidence that

the strategy is being implemented successfully and that the first part of SG100 is met. Until NMFS completes the Section 7 consultation and issues a new BiOp, however, it remains unclear whether the strategy is achieving its objective. **SG100 is not met in full for the deep-set fishery.**

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.
	All UoAs	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes All elasmobranch species – Yes	All marine mammal species – Yes All sea turtle species – Yes All seabird species – Yes All elasmobranch species – Yes	All marine mammal species – Yes All sea turtle species – No All seabird species – Yes All elasmobranch species – No

Rationale

For both the shallow- and deep-set fisheries, the annual SAFE reports issued by the Council monitor the status of protected species interactions including interaction trends over time, the effectiveness of FEP conservation measures, take levels compared to the incidental take statement (ITS) levels under the ESA, and take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable (WPRFMC, 2020).

Marine mammals

The Hawaii deep-set longline fishery is the most problematic for marine mammals in that it is depredated by false killer whales, exceeding the PBR for the Pelagic HI stock in some years (see 2.3.1a). Because of this, the fishery has a “Take Reduction Team,” (TRT) enacted in 2010 under the U.S. Marine Mammal Protection Act (MMPA), which is tasked to develop measures to reduce the bycatch of the species below statutory reference points. A TRT is a stakeholder group which includes members of the fishing industry, environmental groups, academic scientists, and government managers and scientists (Fader et al., 2021). Fader et al. (2021) reviewed how mitigation strategies have been considered, developed, and implemented by this team, noting that the developed gear and handling strategies depend critically on comprehensive observer coverage. The following measures were implemented under the Take Reduction Plan (TRP) (as per Fader et al. (2021)):

Regulatory measures:

- Weak hook requirements: circle hooks with maximum wire diameter of 4.5 mm, 10 degree offset or less, round wire
- Minimum 2.0 diameter for monofilament leaders and branchlines, with minimum breaking strength of 400 lbs (181 kg)

- Longline exclusion zone around the MHI closed year-round
- Expand existing, mandatory Protected Species Workshop to include marine mammal interaction mitigation techniques
- Informational placard on marine mammal handling and release posted on vessel
- Captain must supervise handling and release of any hooked or entangled marine mammal
- Require placard instructing crew to notify captain in event of MM interaction
- Establish “Southern Exclusion Zone” (SEZ) closed when takes of false killer whales meet thresholds

Non-regulatory measures:

- Increase precision of bycatch estimates
- Notify team of observed interactions
- Expedite process for species ID and injury determination
- Make changes to observer training and data collection
- Expedite processing 2010 HICEAS II survey data
- Reconvene Team at regular intervals

The Team has continued to meet regularly to assess progress toward goals, fishery compliance, and research outcomes since Plan implementation. NMFS initiated a weak hook experiment in early 2021 in the context of the TRP. Annual M&SI for the pelagic stock inside the EEZ initially dropped from 5-year average of 13.3 (2008–2012) to 4.92 (2013–2017). It is currently 9.8 (2015–2019) and thus remains below PBR (see Fader et al. (2021) and references therein). Given that the false killer whale is by far the most problematic species in both fisheries combined; and noting that fishery impacts on other marine mammal populations are monitored annually through the Council SAFE reports and the NOAA Fisheries Stock Assessment Reports (SARs), it can be concluded that 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. **SG60, SG80 and SG100 are met for marine mammals.**

Sea turtles

Management measures in the **shallow-set longline fishery** have been effective in reducing the number of sea turtle interactions. The introduction of sea turtle bycatch reduction measures for the fishery in 2004, such as switching from J-hooks to circle hooks, and from squid bait to mackerel bait, resulted in an 89% decrease in sea turtle interactions in 2004–2006 compared to interactions observed in 1994 through 2002. The rate of deeply hooked sea turtles, which is thought to result in higher mortality levels, also declined after those measures were implemented (Gilman et al., 2007a). In June 2019, NMFS issued a new BiOp on the effects of the shallow-set fishery on marine species listed under the Endangered Species Act (ESA) and a new final rule reducing the annual fleet hard cap for leatherback sea turtles, removing the annual fleet hard cap on North Pacific loggerhead turtle interactions (based on the latest population level data for the species) and introducing limits of leatherback and loggerhead turtles per vessel per individual fishing trip. The new measure became effective on April 22, 2020 and is paired with an annual review of the fishery’s performance under the trip interaction limits in the Annual SAFE Report. For the deep-set fishery, a similar BiOp is still ongoing after it was triggered by the ITSs for green sea turtle, North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle having been exceeded. Based on precedent in this fishery, there is no reason to assume that any “reasonable and prudent measures” put forward by the BiOp will not be implemented. There is therefore a regular review of the potential effectiveness and

practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate. **SG60, SG80 are met for sea turtles.** It is not clear to what extent this review is biennial, however, so **SG100 is not met.**

Seabirds

NMFS annually publishes the report *Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries* (e.g. NMFS_PIRO (2021)), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactions-pelagic-longline-fishery>.

Results from an analysis of seabird interaction rates in the Hawaii deep-set longline fishery (Gilman et al., 2016) was presented to the Protected Species Advisory Committee and Pelagic Plan Team in 2016. The analysis included data from October 2004 to May 2014. Results indicate that seabird interaction rates significantly increased as annual mean multivariate ENSO index values increased, meaning that decreasing ocean productivity may have contributed to the increasing trend in seabird catch rates. The analysis also showed a significant increasing trend in the number of albatrosses attending vessels, which may also be contributing to the increasing seabird catch rates. Both side setting and blue-dyed bait significantly reduced the seabird catch rate compared to stern setting and untreated bait, respectively. Of two options for meeting regulatory requirements, side setting had a significantly lower seabird catch rate than blue-dyed bait. The Council, at its 166th Meeting in June 2016, directed the Plan Team and the Protected Species Advisory Committee to continue monitoring interactions through the SAFE to detect any future changes in albatross interactions that may be attributed to fishing operations. The Council noted that current seabird measures implemented in the Hawaii longline fishery are effective and recent increase in seabird captures are driven by non-fishery factors at this time (WPRFMC, 2020).

At its 173rd Meeting, the Council directed staff to conduct a seabird workshop to review seabird mitigation requirements and the best scientific information available for Hawaii's pelagic longline fisheries, considering operational aspects of the fisheries, seasonal and spatial distributions of seabird interactions, alternative bycatch mitigation measures and findings from cost-benefit analyses. The workshop identified priority mitigation measures suitable for the Hawaii longline fishery, potential changes to seabird measures, and research needs to inform future changes to seabird measures (Gilman and Ishizaki, 2018). Specifically, workshop participants identified deterrents such as tori lines (also called streamer lines or bird scaring lines) and towed buoys, which are currently not required in the Hawaii longline fishery, to be a high priority for further research and development. Conversely, workshop participants identified blue-dyed bait as a candidate for removal from Hawaii's seabird requirements because of concerns with efficacy and practicality. Participants discussed that the requirement for using blue-dyed bait was intended to be used for squid bait, but currently only fish are used for bait in both Hawaii longline fisheries, and that blue-dyed fish bait may also be less effective at mitigating seabird catch risk than blue-dyed squid bait. Additionally, recent analysis of observer data indicate that side-setting is more effective than blue-dyed bait in the Hawaii deep-set longline fishery. The workshop also identified the importance of training and outreach, in light of possible captain effects showing higher interactions by a smaller number of captains in the fleet. The Council at its 174th Meeting in October 2018 received a report of the September 2018 Workshop and recommended:

- Enhancing outreach and training efforts to ensure proper application of existing seabird mitigation measure requirements;
- NMFS provide support for research and development for alternative measures with potential to replace blue-dyed bait, with high priority placed on identifying suitable designs for tori lines; and

- Encourage submission of Experimental Fishing Permit applications for testing alternative measures without the use of blue-dyed bait to allow comparison of measure effectiveness with and without blue-dyed bait.
- The Council additionally directed staff to prepare a discussion paper for the March 2019 Council Meeting to evaluate the effect of potential removal of blue-dyed bait without additional replacement measures on seabird interaction rates.

The Council, at its 176th meeting held in March 2019, endorsed additional strategies for identifying alternative measures and improving seabird measure effectiveness for the Hawaii deep-set longline fishery including addressing captain effects through strategic outreach, identifying tori line designs suitable for the Hawaii fishery, encouraging trials for making minor modifications to existing required measures, and progressing international bycatch assessments for North Pacific albatross species. In 2019, a cooperative research project by the Council, NMFS and the Hawaii Longline Association was initiated to conduct 1) demonstration and trial of tori lines in the Hawaii longline fishery to inform minimum standards specific to this fishery, 2) field trials of tori lines to collect data on operational practicality and effectiveness in using tori lines under commercial fishing operations (WPRFMC, 2020). The trials were carried out by Gilman et al. (2021), who found that tori lines were an effective management measure to mitigate albatross interactions in this fishery, and that neither offal discharge nor blue-dyed bait was helpful in reducing albatross interactions in this trial. It can thus be concluded that 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. **SG60, SG80 and SG100 are met for seabirds.**

Elasmobranchs

Curran and Bigelow (2011) tested the catch efficacy, fish size selectivity and survival on longline retrieval of large-size 18/0 circle hooks vs. Japanese style tuna hooks, size 3.6 sun and vs. size 9/0 “J” hooks aboard sixteen vessels within the deep-set Hawaii-based tuna longline fleet. The study concluded that in contrast to tuna hooks, large circle hooks have conservation potential, with catch rate reductions of 17.1–27.5% for sharks. As confirmed in Section 6.2.3, the entire HLA fishery now makes use of circle hooks (18/0 in the shallow-set fishery and 15/0 in the deep-set fishery). Furthermore, circle hooks are designed to increase the likelihood of hooking a fish in the mouth or jaw, rather than in the gut or oesophagus, and thus to promote easy hook removal and to limit injury (Cooke & Suski 2004 cited in Patterson et al. (2014)), leading to higher at-vessel survival rates and possibly higher probability of pre-catch and post-release survival than those that are deeply hooked in the oesophagus and gut (Gilman et al., 2019). Other mitigation measures have also been implemented in the fishery which have been shown to reduce shark catch rates, such as banning the use of shark lines and requiring the use of fish bait instead of squid bait: in the shallow-set swordfish longline fishery, shark catch rates (all species combined) dropped considerably following a prohibition on the use of squid for bait (Gilman et al., 2007b).

NMFS PIFSC conducted a study working with observer programs and fishermen to quantify post release mortality rates of blue (BSH), bigeye thresher (BTH), oceanic whitetip (OCS), silky sharks (FAL) and shortfin mako sharks that are incidentally captured in the Hawaii deep-set (HiDS) and American Samoa (AS) tuna target longline fisheries, using pop-off archival satellite tags (PAT) (Hutchinson et al., 2021). This study also assessed the effects that standard shark bycatch handling and discard practices utilized in these fisheries may have on the post release fate of discarded sharks that are alive at haul back of the longline gear. Observers collected shark condition and handling data on 19,572 incidental elasmobranchs captured during 148 fishing trips that occurred between January 2016 and June 2019 on 76 different vessels. During 111 of these trips, 148 sharks were tagged by observers and fishers with pop-off archival tags (PAT). The handling and damage data recorded by trained observers indicated that most sharks were released by cutting the branchline. In the Hawaii deep-set tuna fishery this means that most sharks were released with an average of 9.02 meters of trailing gear, typically composed of a stainless-steel hook, 0.5 m of braided wire leader, a 45-gram weighted swivel, and monofilament branchline ranging in length from 1.0–25.0 m. Hutchinson

et al. (2021) showed that leaving sharks in the water and removing as much trailing gear as possible by either using a dehooker or cutting the line had the best survival outcomes. Leaving large quantities of trailing gear is not only energetically costly for the animal, but may also introduce infection, present an entanglement hazard and increase susceptibility to predation. Because most sharks are released by cutting the line (~84%), fishers have the opportunity to make small changes in their operating procedure with significant impacts on bycatch survival. If they take time to remove as much trailing gear as possible, ideally leaving less than 1 m, survivorship can be improved by as much as 40% over 360 days. Subsequent to this study, HLA have adopted a voluntary policy to change the deep-set fishery's leaders from wire to monofilament in order to reduce shark catch rates and improve post-release survival rates. **This will be discussed further at the site visit.** It can thus be concluded that there is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate. **SG60, SG80 are met for elasmobranchs.** It is not clear to what extent this review is biennial, therefore, **SG100 is not met.**

References

Curran and Bigelow (2011), Fader et al. (2021), Gilman and Ishizaki (2018), Gilman et al. (2007a and b), Gilman et al. (2019), Gilman et al. (2021), Gilman et al. (2016), NMFS (2020d, 2020e), NMFS_PIRO (2021), Patterson et al. (2014), WPRFMC (2020)

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 on the latest implemented and planned changes in gear configuration.

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 2.3.3 – 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.	
All UoAs	All species – Yes	All species – Yes	All species – No	

Rationale

The following information is available to measure UoA impacts on ETP species:

- For both the shallow- and deep-set fisheries, the annual SAFE reports issued by the Council monitor the status of protected species interactions including interaction trends over time, the effectiveness of FEP conservation measures, take levels compared to the incidental take statement (ITS) levels under the ESA, and take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable (WPRFMC, 2020). Interaction levels with ETP species have been presented in Section 6.9.3 for both set-type fisheries separately.

- Fishery impacts to marine mammal stocks are primarily assessed and monitored through the Stock Assessment Reports (SARs) prepared by NOAA pursuant to the MMPA. The SARs include PBR estimates, bycatch estimates, and status. The most recent SARs are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stockassessment-reports-region>.

- If the level of incidental take (ITS) is exceeded for any of the species listed in Section 6.9.3.1, NMFS must immediately reinstate formal consultation pursuant to the section 7 ESA regulations. From the date that formal consultation is initiated, NMFS/U.S. Fish and Wildlife Service consult with the agency and submit a biological opinion (BiOp). The biological opinion is the document that states the opinion of NMFS/U.S. Fish and Wildlife Service as to whether or not the action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat, based on the latest scientific data available. A BiOp on the effects of the shallow-set fishery on marine species listed under the Endangered Species Act (ESA) was recently completed (see NMFS_BiOp (2019)) and a new BiOp is currently being undertaken for the deep-set fishery.

- NMFS annually publishes the report *Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries* (e.g. NMFS_PIRO (2021)), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactionspelagic-longline-fishery>.

- All the above reports incorporate data from the Pacific Islands Region Observer Program (PIROP) which deploys NMFS observers at 100% coverage in shallow-set trips and 20% (or more) for deep-set trips (discussed in Section 6.2.5.2). Although the Covid-19 pandemic caused a decline in coverage in 2020, the 15.2% coverage is still well above the WCPFC and IATTC minimum requirement of 5% (IATTC, 2019a; WCPFC, 2020a).

It is therefore clear that 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. **SG60 and SG80 is met for all set-type fisheries.** However, not all ETP species have stock assessments or recent population level data that would enable the fishery impact on their status to be determined with a high degree of confidence. **For this reason, SG100 is not met for any of the UoAs.**

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.
	All UoAs	All species – Yes	All species – Yes	All species – No

Rationale

As explained under 2.3.2a, there is a comprehensive strategy in place for both the shallow- and deep-set fishery, for all ETP species. The strategy relies on comprehensive observer coverage in both fisheries (100% for the shallow-set fishery, at least 20% for the deep-set fishery), with data considered annually in the SAFE, SAR and seabird bycatch reports, as well as in any Biological Opinions that in turn inform on any “reasonable and prudent measures” to mitigate impacts on ETP species. **This meets SG60 and SG80 for both set-type fisheries.** In the case of the shallow-set fishery, the fishery impact on most ETP species can be determined with a high degree of certainty thanks to 100% observer coverage, but this is not true for all ETP species, especially those that do not have stock/population assessments (see 2.3.1). **SG100 is therefore not met for the shallow-set fishery.** For the deep-set fishery, the 20% observer coverage, while clearly comprehensive, is not sufficient to meet the requirements for a ‘high degree of certainty’. **SG100 is also not met for the deep-set fishery.**

References

NMFS_BiOp (2019), NMFS_PIRO (2021), WPRFMC (2020, 2021b), IATTC (2019a) and WCPFC (2020a)

The most recent SARs are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stockassessment-reports-region>

Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactionspelagic-longline-fishery>

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 40. 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.
	All UoAs	Yes	Yes	Yes

Rationale

The longline fishery takes place in deep water and is highly unlikely to interact with benthic features. The gear impact on the water column (the commonly encountered habitat in this assessment) is considered negligible. Gear loss may consist of monofilament and/or hooks with lost gear only likely to continue to fish as long as bait remains on the hooks. Bait is stripped relatively quickly off the hooks and as such, the mortality rate associated to lost longlines is low (Macfadyen et al., 2009). **SG60, SG80 and SG100 are therefore met.**

b	VME habitat status			
	Guide post	The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	All UoAs	NA	NA	NA

Rationale

This fishery does not interact with VMEs. 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.
	All UoAs	NA

Rationale

No minor habitats have been identified. The fishery interacts with the water column alone. This scoring issue is **not relevant**.

References

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	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 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.
	All UoAs	Yes	Yes	No

Rationale

Considering that this fishery is extremely unlikely to impact benthic habitats, the term ‘if necessary’ applies here and management measures should not be required. **SG60 and SG80 are therefore met by default.** All vessels deploy radio buoys to track the location of the gear, and the gear must be marked with the vessel’s official number on every longline buoy and float. However there is no strategy specifically aimed at managing the impacts of the fishery on habitat types (either directly or through ghost fishing), as required by MSC for a score of 100. **SG100 is therefore not met.**

b	Management strategy evaluation			
	Guide post	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA and/or habitats involved.
	All UoAs	Yes	Yes	Yes

Rationale

The ‘partial strategy’ is the nature of the fishery (pelagic only); there is therefore high confidence that it works, based on information directly about the gear type and deployment. **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).
	All UoAs	Yes	Yes

Rationale

Quantitative evidence such as VMS tracks and compliance with the area closures (Section 6.2.4) (**to be discussed at the site visit**), demonstrates no impact on benthic habitats. **SG80 and SG100 are 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.
	All UoAs	NA	NA

Rationale

In the absence of interactions with VMEs (see PI 2.4.1), this scoring issue is not relevant.

References

Evidence to be provided at the site visit.

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 on UoA compliance with closed fishing areas

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 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	<p>The types and distribution of the main habitats are broadly understood.</p> <p>OR</p> <p>If CSA is used to score PI 2.4.1 for the UoA:</p> <p>Qualitative information is adequate to estimate the types and distribution of the main habitats.</p>	<p>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.</p> <p>OR</p> <p>If CSA is used to score PI 2.4.1 for the UoA:</p> <p>Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.</p>	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	All UoAs	Yes	Yes	No

Rationale

The commonly encountered habitat impacted by the fishery is the water column on which the effect of a pelagic longline is negligible. Knowledge of demersal habitats is not relevant to this fishery, so **SG60 and SG80 are met by default**. **SG100 is not met** because the SG requires the distribution of all habitats to be known, not just those that are 'relevant to the scale and intensity of the UoA'.

b	Information adequacy for assessment of impacts			
	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	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	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.	spatial extent of interaction and on the timing and location of use of the fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	All UoAs	Yes	Yes	No

Rationale

Since the gear does not interact with habitats, the (lack of) physical impacts on the main habitats are clear. **SG60 and SG80 are met. SG100 is not met** because the physical impacts of the gear on all habitats have not been quantified fully.

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.
	All UoAs		Yes	No

Rationale

The only commonly encountered habitat is the water column. VMS data and compliance with area closures enable any increase in risk to benthic features to be detected. **SG80 is met.** Because changes in all habitat distributions are not measured over time, **SG100 is not met.**

References

VMS data, **site visit interviews still to be carried out.**

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 on UoA compliance with closed fishing areas

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 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.
	All UoAs	Yes	Yes	No

Rationale

Tuna fishing (deep-set fishery) has shown steady increases in both effort (hooks) and catch over the past two decades, while swordfish fishing (shallow-set fishery) has experienced a steady downward trend during the same period (Pan 2014). Since its closure and reopening in the early 2000s, the shallow set fishery has yet to recover even halfway to levels during its historical peak in the early 1990s. Diminishing economic performance of shallow-set fishing may have contributed to the overall decline of the shallow set fishery, in addition to regulatory measures in controlling sea turtle interactions within the fishery.

A significant source of inter-annual physical and biological variation around Hawaii are El Niño Southern Oscillation (ENSO) events as well as changes on decadal time scales through the Pacific Decadal Oscillation (PDO) which reflects changes between periods of persistently warm or persistently cool temperatures, over periods of 20 to 30 years, or more frequently as has been shown in the last 2 decades (Section 6.9.5). Interannual variability in sea surface temperature (SST) impacts the marine ecosystem and pelagic fisheries and changes in phytoplankton abundance and size also have the potential to impact fish abundance, size, and catch. Understanding the effects of natural climate variability, like ENSO and the PDO as well as climate change, on the ocean, marine ecosystems, and the fishery is an active area of research. Over the past few years, the Council has incorporated climate change into the overall management of the fisheries over which it has jurisdiction and indicators are now being monitored that reflect both global climate variability and change, as well as trends in local oceanographic conditions.

The Hawaii-based tuna longline fishery (deep-set fishery) has shown steady increases in both effort (hooks) and catch over the past two decades, while swordfish fishing (shallow-set fishery) has experienced a steady downward trend during the same period, with 2019/20 the lowest years in terms of fleet size and effort (Figure 3, Section

6.2.1). Diminishing economic performance of shallow-set fishing may have contributed to the overall decline of the shallow set fishery, in addition to regulatory measures in controlling sea turtle interactions within the fishery.

Woodworth-Jefcoats et al. (2019) examined the effects of climate change and fishing on Hawaii's deep-set longline fishery and its supporting ecosystem. The study used therMizer, a size-structured multi-species food-web model that includes both size and species resolution as well as the physiological effects of rising ocean temperatures through a range of future fishing scenarios over a 2006 – 2100 projection period, with F doubling from F = 0.2 to 0.4, increasing five-fold to 1, halving to 0.1, and declining to one fifth or 0.04 (referred to in the study as 2F, 5F, 0.5F, and 0.2F, respectively). The results of the study are briefly discussed in Section 6.9.5. In conclusion, the authors found climate change amplified the biomass declines seen under scenarios with increasing fishing mortality. Taken as individual stressors, the study supports the notion that climate change and increasing fishing mortality act to reduce fish biomass and size across all species in the ecosystem. Although fishing clearly has an impact on the ecosystem, for example by reducing the abundance of large high-trophic level predators (Ward and Myers, 2005), by increasing catch rates of smaller mesopredator species (Sibert et al., 2006; Polovina et al., 2009) and through potential simplification of oceanic systems by the removal of functional groups (Baum and Worm, 2009), reducing fishing mortality may offset the negative effects of climate change and increase ecosystem resilience: i.e. when changes in F are paired with climate change, reducing F can compensate the climate-driven biomass declines for all species, with increases in biomass projected for all species by 2100 (Figure 44) (Woodworth-Jefcoats et al., 2019). This suggests that the effects of the fishery, in its current state, are reversible and that the UoA is therefore highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. Although this study applies to the deep-set fishery in particular, those conclusions should also apply to the shallow-set fishery which has significantly lower effort as already discussed. In addition, the fact that these fisheries account for less than 10% of the total regional catch of their respective target species annually (**deep-set bigeye: 2800 tonnes vs 95,192 t in the EPO; vs 130,363 t in the WCPO – shallow-set swordfish: 1,264 t vs ca. 7,000 t total WCNPO swordfish catch**) further supports this conclusion. On this basis, **SG60 and SG80 are met for both fisheries**. However, given the uncertainties that surround climate change and future trajectories of fishing pressure in the Hawaiian fisheries, it cannot be said that there is evidence, sufficient for SG100 to be met. **SG100 is not met.**

References

Baum and Worm (2009), Polovina et al. (2009), Sibert et al. (2006), Ward and Myers (2005), Woodworth-Jefcoats et al. (2019) and WPRFMC (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	
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Condition number (if relevant)	
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Scoring table 44. 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.
	All UoAs	Yes	Yes	Yes

Rationale

NOAA Fisheries strives for Ecosystem Based Fisheries Management (EBFM) in order to meet the sustainable fishery management goals under multiple mandates such as the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, Marine Mammal Protection Act and National Environmental Protection Act. NOAA Fisheries defines EBFM as “*a systematic approach to fisheries management in a geographically specified area that contributes to the resilience and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals*”. Effective EBFM requires linking comprehensive scientific research with management objectives (NMFS_PIFSC_PIRO, 2019). The EBFM Policy and Road Map (NMFS_Policy, 2016; NMFS_Procedure, 2016) describe how NOAA Fisheries implements EBFM based on six guiding principles¹⁵:

- Implement ecosystem-level planning.
- Advance understanding of ecosystem processes.
- Prioritize vulnerabilities and risks of ecosystems and their components.
- Explore and address trade-offs within an ecosystem.

¹⁵ <https://www.fisheries.noaa.gov/topic/ecosystems#ecosystem-based-fishery-management>

- Incorporate ecosystem considerations into management advice.
- Maintain resilient ecosystems.

The inter-relationships between NOAA Fisheries programs and plans that support EBFM are shown in Figure 49. NOAA Fisheries supports the use of Fishery Ecosystem Plans (FEPs) to describe and integrate ecosystem goals, objectives, and priorities for fisheries and ecosystem research, conservation, and management across multiple fisheries within an ecosystem. This includes facilitating continued participation of external federal, state (including territories), council, commission, tribal, industry, and other non-governmental partners in the EBFM process, and supporting the execution of FEPs that are used as umbrella strategic planning documents to guide coordination and trade-off. Once such example is the Pelagic FEP in the context of the Hawaiian longline fisheries (WPRFMC, 2009) which was approved in 2009 and codified in 2010 (US_Department_of_Commerce, 2010). The FEP and associated fishery regulations are dynamic and reflect the Council's adaptive management, which monitors and addresses changing conditions based on the best available information. The FEP and amendments can be found here: <https://www.wpcouncil.org/fishery-ecosystem-plans-amendments/>.

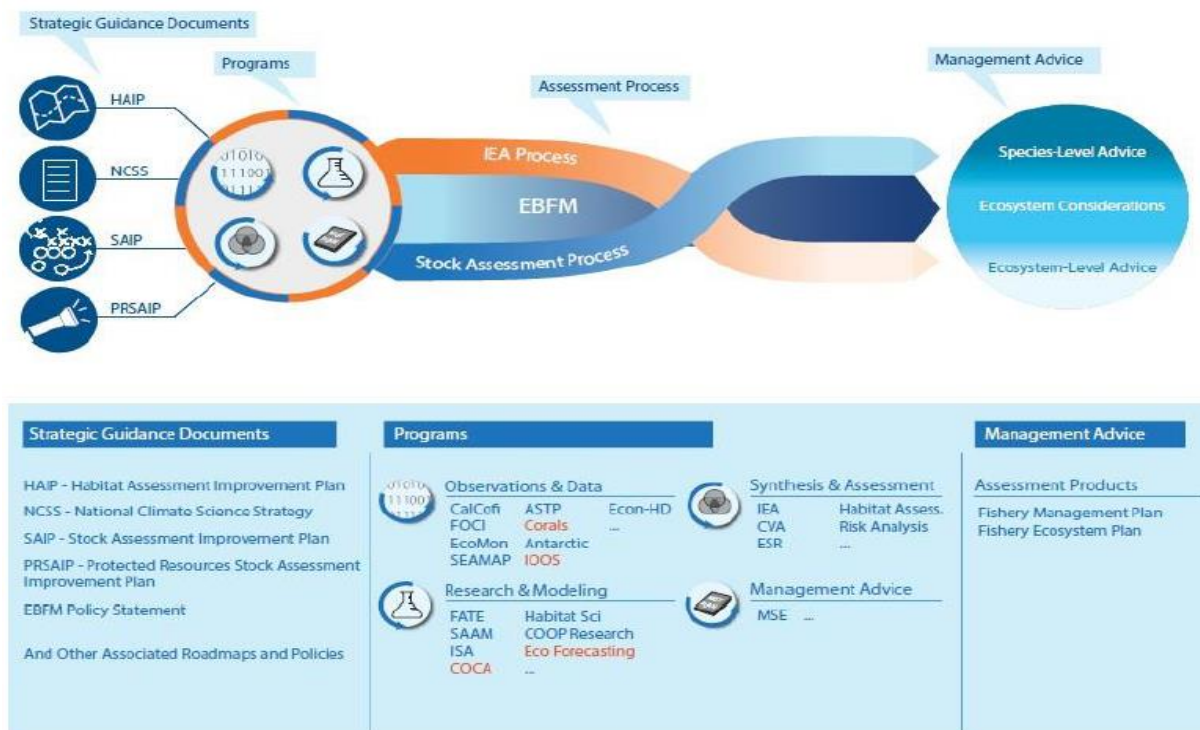


Figure 49. Inter-relationships between NOAA Fisheries programs and plans that support EBFM. See source for definitions. Source: NMFS_Procedure (2016).

The EBFM Roadmap also calls for the development of regional EBFM implementation plans to identify and coordinate priority EBFM activities across regional NOAA Fisheries science and management programs and with the cooperation of the associated the Regional Fishery Management Council. These implementation plans complement the work already underway by, in the case of this fishery, the Council and its Pelagic FEP. For the Hawaiian fisheries, the relevant implementation plan is the Pacific Islands Region Ecosystem-Based Fisheries Management Implementation Plan 2018–2022 (NMFS_PIFSC_PIRO, 2019) which builds on several existing strategic plans such as the Pacific Islands Regional Action Plan – Climate Science Strategy, PIRO Strategic plan 2016–2020, Fishery Ecosystem Plans, and the PIFSC Science Plan 2018–2022 (NMFS_PIFSC_PIRO, 2019). The plan identifies the actions required to achieve the guiding principles as per the Policy and Roadmap. The actions are too numerous to be repeated here but a selection relevant to the UoA fisheries is as follows:

- Develop regional engagement strategy. Amongst other things, an EBFM Workshop will seek to identify ecosystem-related information and monitoring needs, the science products available or in development that can address these needs, management needs, and the gaps;
- Define meaningful Large Marine Ecosystems (LMEs) for the U.S. Pacific Islands Region and evaluate the majority of main risks to the LMEs;
- Evaluate risk to managed species. Includes a Regional Habitat Assessment Prioritization for Pacific Islands Stocks, which developed a habitat assessment prioritization process to be carried out for regional fish stocks (completed January 2018);
- Develop a modelling framework for improving understanding of ecosystem factors influencing protected species interactions in the Hawaii longline fisheries, and model trade-offs;
- Develop functional system-level Management Strategy Evaluations (MSEs);
- Work toward understanding how the pelagic fleets, particularly the Hawaii longline fleet, change fishing practices in response to a shifting climate and how that changing climate impacts the ecology of the commercially exploited fish. Council and PIFSC continue to develop ecosystem indicators for the annual SAFE reports, which are revised and refined annually;
- Incorporate ecosystem level information into all assessments of living marine resources in the U.S. EEZ, including protected (marine mammals, sharks, and turtles) and commercially exploited (finfish and crustaceans) species;
- Complete annual SAFE Reports that include the Ecosystem Consideration Chapter and the Data Integration Chapter;
- Collaborate on improvements for the 5-year Essential Fish Habitat reviews and continue research on protected species within the ecosystem. Research in the near term will examine the use of coastal habitat by oceanic white tip shark, model the critical habitat of false killer whales, and the nesting behaviors of marine turtles nesting in remote island areas;
- Provide the annual statistical updates to the national bycatch report, as well as the data summaries and trend analyses for various fisheries and taxa based on the latest years of data. PIFSC, PIRO, and the Council will collaborate to develop a Regional Implementation Plan;
- Review long-term protected species recovery and rebuilding plans to ensure they account for the potential effects of near-term and long-term climate change, particularly relating to alterations to food web structure: includes inter alia the Hawaiian Islands Cetacean Ecosystem Assessment Survey (HICEAS) which sought to

understand the Pacific cetacean species and their associated ecosystem dependency, work toward understanding the ecology of the critically endangered Hawaiian monk seal, and studying marine turtles' use of their nearshore habitats and how they are impacted by climate change

The team therefore concludes that 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, as discussed under the preceding P2 components. On that basis, the team concludes **that SG60, SG80 and SG100 are 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.
	All UoAs	Yes	Yes	No

Rationale

Based on the individual component analyses (see primary, secondary, ETP species and habitats PIs), as well as Woodworth-Jefcoats et al. (2019)'s examination of the effects of climate change and fishing on Hawaii's deep-set longline fishery and its supporting ecosystem (see 2.5.1), there is some objective basis for confidence that the strategy will work. I.e. impacts and mitigation strategies are routinely assessed and reviewed and where adverse impacts are identified, the ESA Section 7 processes (through formal consultations and biological opinions), ensure that no action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (see Section 6.9.3.1). This provides some objective basis for confidence that the strategy will work. **SG60 and SG80 are met. SG100 is not met** because the strategy is clearly still under development (although some measures have already been implemented) and not all its impacts have been tested.

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).
	All UoAs		Yes	No

Rationale

At UoA level, the fishery's impacts are considered highly unlikely to hinder recovery of any of the ecosystem components considered. Compliance with gear regulations and area closure is monitored through comprehensive observer coverage at 100% for the shallow-set fishery and at least 20% for the deep-set fishery. **As far as the team are aware, compliance is reported to be good with no major infractions reported for the UoA – this should be discussed further at the site visit.** Therefore, there is some evidence that the partial strategy is being implemented successfully. **SG80 is met.** Clear evidence that the strategy is achieving its objective is lacking, however; particularly as it has not yet been fully implemented (see scoring issue a). **SG100 is not met.**

References

NMFS_PIFSC_PIRO (2019), NMFS_Policy (2016), NMFS_Procedure (2016), US_Department_of_Commerce (2010), Woodworth-Jefcoats et al. (2019), WPRFMC (2009, 2020, 2021b)

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 on UoA compliance with fishery regulations

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 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.	
	All UoAs	Yes	Yes	

Rationale

Over the past few years, the Council has incorporated climate change into the overall management of the fisheries over which it has jurisdiction. In addition to providing updates on the status of managed commercial species and protected species interactions including interaction trends over time, the annual SAFE report includes information on the following indicators: Atmospheric concentration of carbon dioxide, oceanic pH at Station ALOHA, El Niño Southern Oscillation (ENSO); Pacific Decadal Oscillation (PDO); tropical cyclones; sea surface temperature, ocean temperature at 200-300 m depth, ocean colour, North Pacific Subtropical Front (STF) and Transition Zone Chlorophyll Front (TZCF), estimated median phytoplankton size, fish community size structure, bigeye tuna weight-per-unit-effort, bigeye tuna recruitment index and bigeye tuna catch rate forecast.

The Bigeye Tuna (BET) Initiative is furthermore a PIFSC initiative launched in 2019 that focuses on science to support Essential Fish Habitat (EFH) delineation and EBFM for bigeye tuna in Hawaii. The BET Initiative is a cross-divisional effort to learn as much as possible about BET and the environment that supports them, an environment which is dynamic in both time and space, and may experience large geographic shifts in the face of global climate change. The initiative has multiple focus areas to advance BET and other pelagic research conducted at PIFSC:

- Delineate stock structure of BET caught in the Hawaii longline fishery;
- Identify spawning grounds and larval distributions of BET;
- Drivers of BET fishery ecosystem dynamics and forecasting future BET fishery performance
- Life history with an emphasis on age and growth
- Environmental linkage to BET recruitment into the Hawaii-based longline fishery
- Lancetfish (key prey item) project

- Network analysis for the Hawaii deep-set longline fishery
- Mesoscale features influencing longline catch
- Central equatorial Pacific BET CPUE and relationship to ENSO

Other proposed PIFSC research relevant to EFH includes using telemetry data to define pelagic habitat, projecting movement of the pelagic fishing fleet in response to climate change, developing automated underwater vehicle (AUV)-based sampling plans to understand and delineate the physiochemical parameters of major oceanic convergence zones, identifying key life history relationships and their responses to climate change, and mapping efforts to identify and integrate the influence of seamounts on pelagic reproduction, recruitment, and dispersal (WPRFMC, 2020).

Although this will be discussed further at the site visit, the information already available and which continues to be collected is 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.
	All UoAs	Yes	Yes	No

Rationale

As explained in scoring issue a, the SAFE reports include a wealth of indicators that are monitored on an annual basis and that enable trends in the key ecosystem elements to be measured and the main impacts of the UoAs on these ecosystem elements to be inferred. The fishery-dependent information in the SAFE reports is derived from PIROP observer reports which cover the UoAs at 100% for the shallow-set fishery and at least 20% for deep-set fishery. As already mentioned under 2.5.1, Woodworth-Jefcoats et al. (2019) examined the effects of climate change and fishing on Hawaii's deep-set longline fishery and its supporting ecosystem. The study used therMizer, a size-structured multi-species food-web model that includes both size and species resolution as well as the physiological effects of rising ocean temperatures through a range of future fishing scenarios over a 2006 – 2100 projection period, with F scenarios chosen based in part on trends in effort of Hawaii's deep-set longline fishery (see Section 6.9.5). Some of the main impacts of the UoA on the key ecosystem elements (e.g. on food web structure through changes in species biomass, abundance and size composition) have therefore been investigated in detail. **SG60 and SG80 are met. SG100 is not met** because it is not clear whether all main interactions have been investigated in detail.

c	Understanding of component functions			
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	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 .
	All UoAs	Yes	Yes

Rationale

Observer coverage is at least 20% in the deep-set fishery and 100% in the shallow-set fishery. The annual SAFE reports incorporate these data and monitor the status of managed commercial species and protected species interactions in the fisheries including interaction trends over time, as well as the effectiveness of FEP conservation measures, take levels compared to the incidental take statement (ITS) levels under the ESA, and take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable (WPRFMC, 2020). Impacts and mitigation strategies are routinely assessed and reviewed and where adverse impacts are identified, the ESA Section 7 processes (through formal consultations and biological opinions), ensure that no action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (see Section 6.9.3.1). The impacts of the UoA on P1 and P2 components are thus identified and the main functions of these components in the ecosystem are understood. **SG80 and SG100 are met.**

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.
	All UoAs	Yes	Yes

Rationale

As per scoring issues a and c, the fishery-dependent and independent indicators are monitored on an annual basis with information on the fishery stemming from a comprehensive at-sea observer programme.

Furthermore, in response to olive ridley turtle interaction trends observed in the Hawaii deep-set longline fishery (see PI 2.3.1) the Council's Protected Species Advisory Committee at its March 2017 meeting recommended evaluation of the increasing trend in conjunction with the previously recommended effort to evaluate ecosystem factors influencing bycatch in the longline fishery. Following this recommendation, the Council and NMFS implemented the ecosystem-based fisheries management (EBFM) project

for protected species impacts assessment for the Hawaii and American Samoa longline fishery. The project is a collaboration between PIFSC, Council, PIRO and University of Florida. In the first year of the initiative, the team developed methodologies to associate the spatiotemporal patterns of olive ridley turtle interactions with the Hawaii deep-set fishery primarily targeting bigeye tuna with static and dynamic environmental characteristics. However, the project quickly expanded looking not only across marine turtle species within the fisheries but across taxa as well. The project resulted in the development of a data compilation workflow linking the observer dataset with NOAA and other related oceanographic data products for the Hawaii deep-set observer data set as well as the shallow-set observer data. The resulting datasets were used to develop an Ensemble Random Forest model (Siders et al., 2020) to (i) predict the probability of fishery interactions with protected species including target and non-target catch; (ii) defining critical areas of interaction using quantile contouring over a range of temporal time frames; (iii) assessed the number of sets and interactions within the contours; and (iv) developing covariate response curves using Accumulated Local Effects. The team summarized the first year's effort into an accepted publication in the Endangered Species Research journal (Siders et al., 2020). The primary purposes of this publication were to test the model performance of the developed Ensemble Random Forests model against other existing approaches to handle rare events (e.g. bycatch), to demonstrate its performance on case studies of ESA-listed and protected species, and to Ensemble Random Forests as an intuitive extension of the Random Forest algorithm to handle rare event bias. In year 2, the Ensemble Random Forest approach will be expanded to investigate risk contours for a suite of species of interest. The relative importance of environmental covariates resulting from the Ensemble Random Forest approach can be used to establish recommendations similar in implementation to the existing TurtleWatch product for avoiding species of interest (e.g., leatherback and loggerhead turtles). The analysis will explore the potential benefit and impact of closures or voluntary avoidance of interaction hotspots on protected species bycatch of interest as well as on catch rates of primary and secondary target species in the fishery. The goal is to model how the redistribution of displaced effort may affect primary and secondary target catch rates as well as protected species interactions (WPRFMC, 2020).

Adequate information is thus available on the impacts of the UoA on the components and elements to allow the main consequences for the ecosystem to be inferred. **SG80 and SG100 are met.**

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.
	All UoAs	Yes	Yes

Rationale

As per scoring issues a and c, the fishery-dependent and independent indicators are monitored and reported on at an annual basis with information on the fishery stemming from a comprehensive at-sea observer programme. The information that is being collected and analysed through for example the Bigeye Tuna (BET) Initiative, the ecosystem-based fisheries management (EBFM) project and ad hoc ecosystem modelling (Woodworth-Jefcoats et al., 2019) is adequate to support the development of strategies to manage ecosystem impacts. **SG80 and SG100 are met.**

References

Siders et al. (2020), Woodworth-Jefcoats et al. (2019), WPRFMC (2020, 2021b)

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: ongoing modelling and research efforts to be discussed 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)	

6.10 Principle 3

6.10.1 Jurisdiction

The fishery under consideration operates within the Exclusive Economic Zone (EEZ) of Hawaii and other United States Territories and possessions¹⁶, in the Western and Central Pacific Ocean (WCPO), and in the Eastern Pacific Ocean (EPO), targeting mainly swordfish, bigeye tuna and yellowfin tuna, all of which are highly migratory fish stocks.

The following key components comprise the fishery-specific management system pertinent to this assessment:

- The entirety of the US EEZs in the Pacific are located in the WCPO (Figure 50) where the Western and Central Pacific Fisheries Commission (WCPFC) is the Regional Fishery Management Organisation (RFMO) responsible for managing tuna and other highly migratory fish stocks.
- As discussed in Section 6.2.4, a significant portion of the fishery takes place to the east of the 150°W boundary, in the EPO, where the Inter-American Tropical Tuna Commission (IATTC) is the relevant RFMO responsible for managing tuna and other marine resources; and
- At the national level: the management systems of the United States and the State of Hawaii. Note that a valid Hawaii longline limited entry permit is required for anyone using longline gear to fish for pelagic species within the EEZ around Hawaii or anyone landing or transshipping longline catch in Hawaii or within the EEZ around Hawaii. A Hawaii longline permit may also be used to fish with longline gear and land longline catch in Guam, the Northern Mariana Islands, and the Pacific Remote Island Areas. It may be used to fish outside the EEZ around American Samoa or land fish in American Samoa caught outside the EEZ around American Samoa, but may not be used to fish within the EEZ around American Samoa.

This P3 assessment must therefore consider all three levels of management when assessing the degree to which the Hawaii longline fishery meets the MSC Fisheries Standard for these UoAs. The common thread throughout the P3 assessment is the overarching regional management framework of the WCPFC and the IATTC. The associated commitments of Hawaii and the United States within its own EEZ also play an important role in the management of the fisheries in the region, especially when these vessels fish the high seas areas of both RFMOs. The overarching management of the fisheries in the region is, however, still underpinned by the United Nations Convention on the Law of the Sea 1982 (UNCLOS) and the UN Fish Stocks Agreement 1995 (UNFSA). Therefore, all States that are signatories in the area must also abide by these two international instruments. The MSC assessment of the Hawaii-based longline fishery for swordfish, bigeye and yellowfin is thus part of a complex fishery management system given the numerous overlapping governance regimes.

¹⁶ The U.S. possessions have the lowest legal and political status because these islands do not have permanent populations and do not seek self-determination and autonomy. These possessions include **Baker, Howland, Kingman Reef, Jarvis, Johnston, Midway, Palmyra, and Wake Islands**, which are collectively called Pacific Remote Insular (Island) Areas (PRIA)

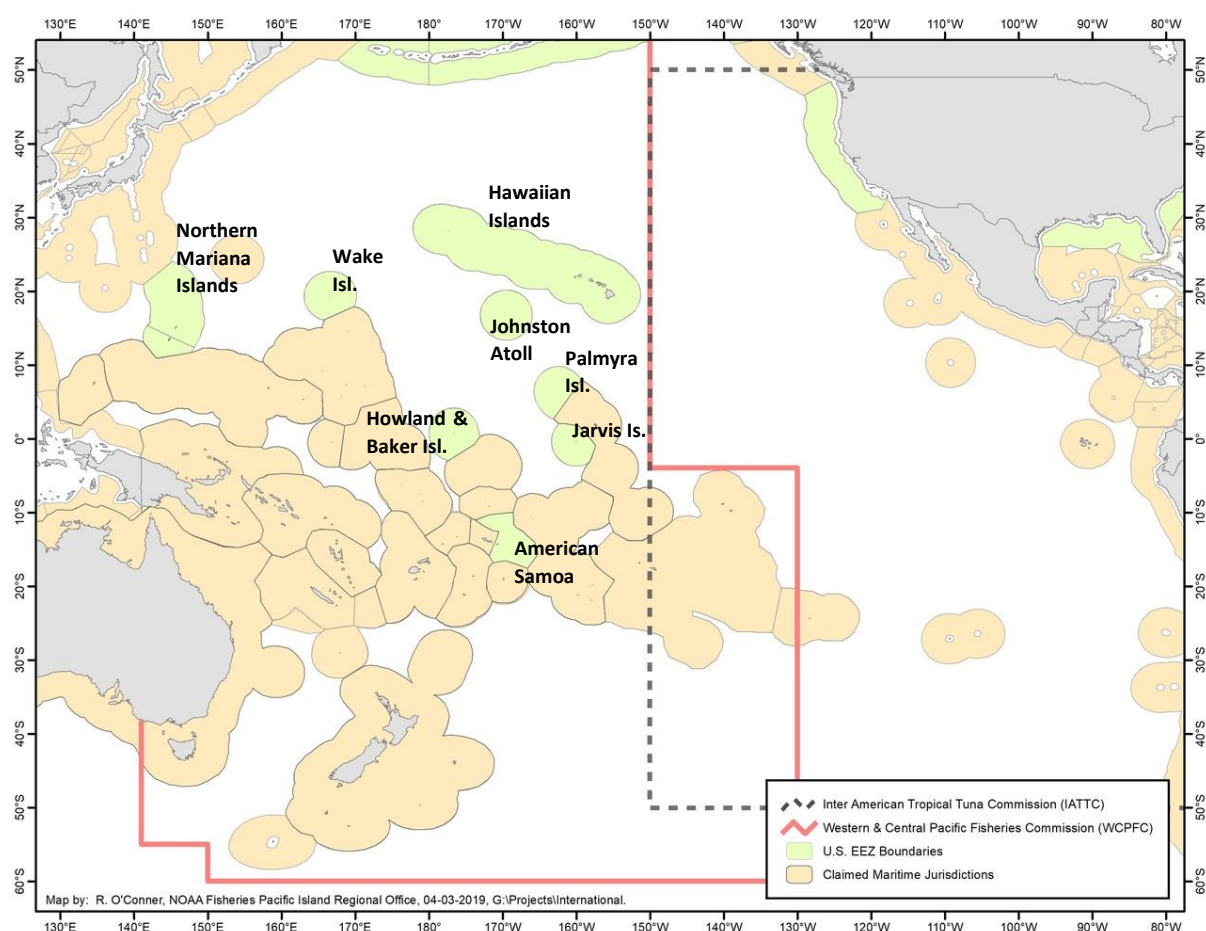


Figure 50. Area of WCPFC and IATTC jurisdiction in the Pacific Ocean, with EEZs of Hawaii and other United States Territories and possessions in green. Source: <https://www.fisheries.noaa.gov/resource/map/iattc-and-wcpfc-convention-area-map>.

6.10.2 Regional governance framework

6.10.2.1 Western and Central Pacific Fisheries Commission

The WCPFC is one of the two RFMOs responsible for the management of tunas, billfish, and associated species, as well as addressing the impacts of fishing on the wider ecosystem of the Pacific Ocean Basin, relevant to this assessment. The United States has signed the WCPFC Convention. The WCPFC was established under the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the WCPO (WCPFC 2000) and entered into force on June 19, 2004. It is a multilateral agreement having the primary objective of providing for the long-term conservation and sustainable use of highly migratory fish stocks in the WCPO. The WCPFC is the most recently established and largest of the tuna RFMOs, with over half of the world's tuna catch taken within the Convention Area. These stocks include tunas, billfish and associated fishes among the 17 "species" listed in Annex I of the 1982 UN Convention (UN 1982), but not sauries (see Art. 3.3 of the WCPFC Convention). The WCPFC Convention (WCPFC 2000) follows closely the provisions of the UNFSA, including in particular:

- The objective of ensuring the long-term conservation and sustainable use of highly migratory fish stocks (Article 2);

- The general principles of the UNFSA including the application of the precautionary approach, incorporating the UNFSA 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 7);
- Compatibility of measures established for the high seas and those adopted for areas under national jurisdiction (Article 8);
- Application of the dispute settlement provisions of the UN 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 for their food and livelihoods on tuna resources (Article 30).

The legal framework for fishery management in the WCPO has been analysed (Miller et al., 2014). The authors concluded that it provided the WCPFC with the tools to manage tuna and tuna-like species sustainably and is consistent with the current international fisheries law and standards for the management of highly migratory species (HMS) and ecosystems. The WCPFC has incorporated some of the most progressive provisions from other international treaties in its Convention, and it has adopted numerous CMMs based on the requirements of the Convention. The Commission has 26 Members, of which most are small island developing states (SIDS). All major coastal and fishing states in the WCPO are Members, except for Vietnam. Current members are Australia, Canada, People's Republic of China, Cook Islands, European Union, Federated States of Micronesia, Fiji, France, Indonesia, Japan, Kiribati, Republic of Korea, Republic of Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Chinese Taipei, Tonga, Tuvalu, United States of America, and Vanuatu. Participating Territories include American Samoa, Commonwealth of the Northern Mariana Islands, French Polynesia, Guam, New Caledonia, Tokelau and Wallis and Futuna. Several other states are granted cooperating non-member (CNM) status on an annual basis. As CNMs, they participate as observers and agree to comply with WCPFC measures in return for being authorised to allow their vessels to fish in the WCPO within set limits. CNM status applications for 2021 under WCPFC17-2020-07 were approved for Bahamas, Curaçao, Ecuador, El Salvador, Liberia, Nicaragua, Panama, Thailand, and Vietnam (WCPFC, 2021). The Compliance Monitoring Scheme for 2020 and 2021 (see CMM 2019-06) will remain in effect until 31st December 2021. Recently, RFMO compliance "best practices" were assessed (Koehler, 2021), and other Commission subsidiary bodies are regularly reviewed, and findings then considered at plenary meetings of the Commission. These reviews result in significant numbers of recommendations, many of which have now been addressed. The Executive Director's Annual Report at WCPFC17-2020-04 (WCPFC, 2021), which is a requirement under Rule 13 of the Commission's Rules of Procedure, was issued on 28 October 2020. This report outlines progress with addressing outstanding recommendations of the reviews, including the implementation of the Commission Strategic Plan (see WCPFC17-2020-10 – WCPFC (2021)) and the most recent Secretariat Corporate Plan 2020-2023 (see WCPFC16-2019 for details – WCPFC (2019)). An independent review of the Commission's management structure and performance was conducted in 2013 (Gillett, 2013), following a previous similar independent review of the Commission's science structure and functions (MRAG, 2009). This report resulted in overhauling the operation of the Scientific Committee, and adoption of a peer review process and other changes to the data and science functions.

The 16th Scientific Committee meeting (WCPFC_SC, 2020a) once again endorsed a process for a multi-year schedule for independent review of stock assessments. The subsidiary bodies of the Commission (see Figure 51) provide extensive, detailed reports to the Commission (see WCPFC_NC (2020),

WCPFC_SC (2020a) and WCPFC_TCC (2020a)), which include a range of specific advice and recommendations for full Commission consideration.

Decision-making is open, with the process, outcomes and basis for decisions recorded in detail in minutes of Commission sessions and publicly available papers. Consensus is the general rule for decision-making. If consensus cannot be reached, voting, grounds for appealing decisions, conciliation and review are all part of the established decision-making process, as described in Article 20 of the Convention. If a vote is invoked by the Chair, Participating Territories cannot participate. The roles and responsibilities of WCPFC members are clearly described in the Convention, especially Articles 23 and 24, the Commission Rules of Procedure, CMMs and other Commission rules and decisions, including the Rules for Scientific Data to be Provided to the Commission, and the Rules and Procedures for Access to and Dissemination of Data Compiled by the Commission. In addition to Member participation, the WCPFC allows participation by non-members and territories (Article 44 and Annex 1), with opportunities for CNMs, and allows observers to participate in meetings of the Commission and its subsidiary bodies, including the Scientific Committee (SC), the Technical and Compliance Committee and the Finance and Administration Committee (refer to Figure 51). As part of the conditions for cooperating non-member (CNM) status, applicants are required to annually provide “a commitment to cooperate fully in the implementation of conservation and management measures adopted by the Commission and to ensure that fishing vessels flying its flag and fishing in the Convention Area and, to the greatest extent possible, its nationals, comply with the provisions of the Convention and conservation and management measures adopted by the Commission.” (CMM-2019-01, para 2b). The composition, roles and functions of WCPFC subsidiary bodies are described in more detail in the sections that follow.

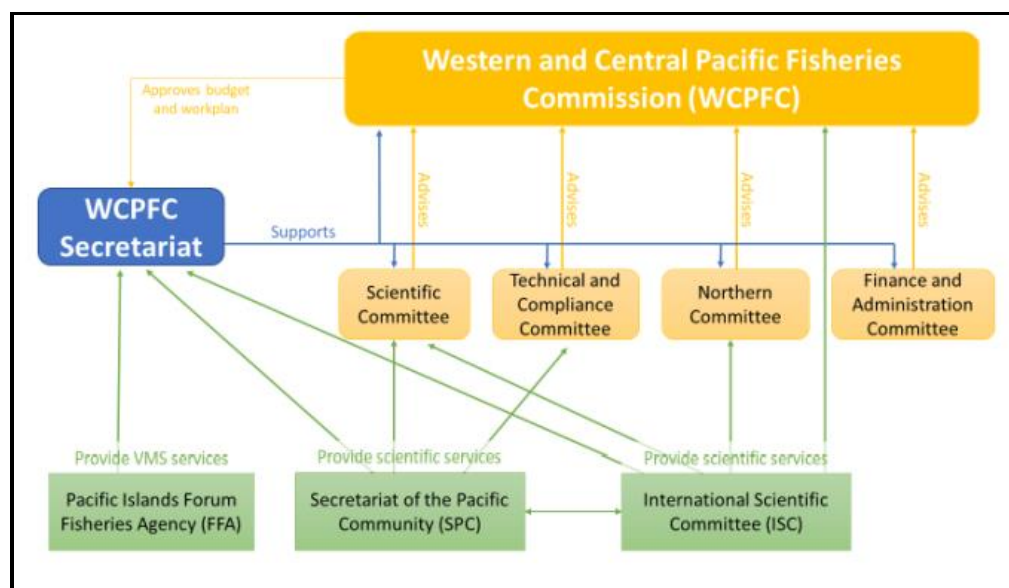


Figure 51. WCPFC Institutional Arrangements. Source: WCPFC (2019).

Publicly-accessible records of Commission meetings show that the Commission takes a wide range of advice and inputs from its subsidiary bodies, members and observers before implementing decisions, including the adoption of CMMs. These bodies include the Forum Fisheries Agency (FFA), International Scientific Committee (ISC) and the Pacific Community (SPC – formerly the Secretariat of the Pacific Community). Scientific advice clearly identifies the extent to which different sources of information have been considered. Successive records of the SC and the Commission provide a comprehensive record of the degree to which scientific advice has been incorporated into management decisions (e.g.

WCPFC17-2020 (WCPFC, 2021) which reported progress with implementing a new tropical tuna CMM 2020-01; basically, an extension of CMM 2018-1 to February 15, 2022).

The WCPFC is responsible for decision-making on key management measures which affect the swordfish, bigeye and yellowfin 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 UNFSA 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 how 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 at least starting to guide, decision-making is provided in various Commission reports and in CMMs. The Commission’s CMM 2020-01 for bigeye, yellowfin and skipjack has the objective to ensure that the fishing mortality rate is no greater than F_{MSY} . To meet this objective, the Commission’s CCMs continue to agree to take measures to not increase catches by their longline vessels of yellowfin. The CMM for swordfish (CMM 2009-03) recognises the need for both WCPFC and IATTC to adopt conservation and management measures to provide for the sustainable management of swordfish stocks across the Pacific Ocean. The Commission has also adopted a number of measures to protect the unintentional catch of marine mammals and other non-target species that include: managing North Pacific striped marlin (CMM 2010-01), Mitigating Impacts of Fishing on Seabirds (CMM 2018-03), Sea Turtles (CMM 2018-04), Sharks (CMM 2019-04), and rays (CMM 2019-05). An up to date list of WCPFC CMMs can be found here: <https://www.wcpfc.int/conservation-and-management-measures>. Commission reports indicate that explicit action is being undertaken through CMMs to support achievement of objectives. However, this is yet to result in limit and/or target reference points or harvest control rules and strategies being formulated for all managed stocks.

Scientific Committee (SC)

The WCPFC Convention requires the Scientific Committee (SC) 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”. At each meeting of the Committee (SC14 (2018), SC15 (2019), SC16 (2020) and SC17 (2021)) the Committee is charged with the development of the following years’ work programme and budget, with the latest work for 2021 and projections for 2022-2023 provisional work programme with a corresponding indicative budget. These Plans have been and still are substantially directed towards providing information to enable the Commission to avoid overfishing or depletion of targeted stocks and the application of an ecosystem approach, while continuing to improve 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.

Technical and Compliance Committee (TCC)

The Compliance Monitoring Scheme (CMM 2019-06) entered into effect for 2020 and was to remain in effect until the Commission meeting at WCPFC18, December 2021. The Technical and Compliance Committee (TCC) is the primary group responsible to the WCPFC for reporting and dealing with CCM

compliance with the WCPFC CMMs and allied measures. The purpose of the WCPFC Compliance Monitoring Scheme as outlined in CMM 2019-06, is: “to ensure that Members, Cooperating Non-Members and Participating Territories (CCMs) implement and comply with obligations arising under the Convention and conservation and management measures (CMMs) adopted by the Commission. The purpose of the CMS is also to assess flag CCM action in relation to alleged violations by its vessels, not to assess compliance by individual vessels.” The Compliance Monitoring Scheme (CMS) is designed 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 non-compliance, 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.

This current measure was reviewed in 2020 as determined by progress with the work plan outlined in this CMM, with a few refinements and adjustments as needed to reporting protocol and level of compliance definitions.

The TCC annual reports (e.g. WCPFC_TCC (2020a)) provide detailed breakdowns of the WCPFC compliance performance, referencing all pertinent CMMs and any other issues raised. Thus, the WCPFC recognises and uses information from its subsidiary bodies, members and observers before implementing decisions, including the adoption of CMMs. Scientific advice clearly identifies the extent to which different sources of information have been considered. These bodies also include the SPC and the FFA.

The Pacific Community (SPC)

Based in Noumea, New Caledonia, the Pacific Community or 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, bioeconomic modelling, and scientific input to national tuna management plans and support for national Ecosystem Approaches to Fishery Management (EAFM) analyses, tag-recapture database management. Confidential (to SPC and national governments) National Tuna Fisheries Status Reports are also produced.

The Pacific Islands Forum Fishery Agency (FFA)

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, especially their tuna resources, and participate in regional decision making on tuna management through organisations such as the WCPFC. The Pacific Islands FFA was established through an international treaty (FFA, 1979), with a mission “To drive regional cooperation to create and enable the maximum long term social and economic benefit from the sustainable use of our shared offshore fishery resources, with its governing body as the Forum Fisheries Committee (FFC)”. The FFC is comprised of one representative of each of the following 17 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 FFC meets annually, and again in special meetings held at other times of the year, according to its discretion and agenda. Meetings are closed to the public and attempt is made to reach decisions by consensus among member countries, although there is also the ability to take issues to a vote. Each party has one vote, and a two-thirds majority is required. In addition to the proposed FFA Work Programme and Budget, agenda items for FFC meetings may include items deferred or requested by previous Committees, items proposed by the FFA, and items proposed by members.

The FFA Secretariat, based in Honiara, Solomon Islands, is responsible, through the FFC, for updating and harmonising the Minimum Terms and Conditions (MTCs) for fisheries access throughout the Pacific region (FFA, 2019). MTCs are given national effect through vessel licensing conditions (FFA, 2020a) or by incorporation into national law as appropriate.

The FFA fisheries management programme is designed to assist its members in refining and maintaining 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 cooperation in fisheries management;
- Providing effective oversight, and where appropriate management of a regional vessel register, vessel monitoring system, and observer program (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:

1. The Regional Tuna Management and Development Strategy, and
2. The Regional Monitoring Control and Surveillance Strategy (MCS) (FFA 2018).

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 Vessel Monitoring System (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 also commissions independent external reviews of its performance, most recently through the Pacific Islands Regional Oceanscape Program (PROP) Mid-term Review (July 2019), to supplement (<https://www.ffa.int/system/files/FFA%20PROP%20MTR%20Final%20Report%2024%20July%202019.pdf>) the existing processes that the Forum Fisheries Committee (FFC) and its Audit Committee use to assess routine performance, project development efficiencies and to provide advice on future need. The FFC/FFA has also published a new Strategic Plan (2020 – 2025), celebrating 40 years (FFA, 2020b) of cooperation, which identifies and structures the ways for FFA to maintain sustainable tuna fisheries (<https://www.ffa.int/system/files/2020%202025%20Pacific%20Islands%20Forum%20Fisheries%20Agency%20Strategic%20Plan.pdf>).

6.10.2.2 International Science Committee

The International Scientific Committee (ISC) for Tuna and Tuna-Like Species in the North Pacific Ocean is an intergovernmental body established in 1995, dedicated to advancing fishery science of the North Pacific tuna and tuna-like fishes through cooperation and collaboration. Current ISC country Members are Canada, Chinese Taipei, Japan, Republic of Korea, Mexico, People's Republic of China and The United States of America. Non-Voting Member organisations are the Food and Agriculture Organization of the United Nations (FAO), the North Pacific Marine Science Organization (PICES - an intergovernmental science organization, established in 1992 to promote and coordinate marine research in the North Pacific and its adjacent seas. Its present members are Canada, Japan, People's Republic of China, Republic of Korea, the Russian Federation, and the United States of America), the Pacific Community (SPC), and the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC). The Inter-American Tropical Tuna Commission (IATTC – see below) is a Cooperating Non-Member.

Providing an historical timeline of ISC activities, in 1996, three species Working Groups (WG) (Bigeye Tuna Working Group, Pacific Bluefin Tuna Working Group, and Swordfish Working Group) and a Statistics Working Group were created. A fourth species Working Group, the Marlin Working Group, was established in 1999. In 2004, the Bigeye Tuna Working Group was dissolved, being replaced by a

Bycatch Working Group. Then in 2005, the North Pacific Albacore Workshop became the Albacore Working Group. In 2007, the Swordfish and Marlin Working Groups were merged into a Billfish Working Group. In 2010, the Bycatch Working Group was dissolved, and a Shark Working Group was established in its stead. Today in 2021, under Plenary session, there are now 5 working groups: an Albacore Working Group, a Billfish Working Group, a Pacific bluefin Tuna Working Group, a Shark Working Group, and the Statistics Working Group.

These Working Groups are subsidiary bodies of the Committee and report to the Committee. Each provide a separate forum for cooperation and collaboration in research by Member and Non-voting Member scientists as well as for focused consideration of technical matters assigned by the Committee. The species Working Groups' primary focus is on understanding the dynamics and ecology of highly migratory and associated-species populations such that accurate stock assessments can be conducted to determine each stock's condition and status. The Statistical Working Group focuses on collection, exchange and archiving of fishery, biological and other data needed for these stock assessments. The WG also monitors fishery developments, statistics, and bycatch. The work of these Working Groups is guided by multi-year work plans as determined by the Committee.

When the species Working Groups conduct stock assessments (both benchmark and updates) they are mandated to use the best scientific information available, which is provided through the Statistics WG. These stock assessments then provide scientific advice to resource managers on the current status and future trends in abundance and productivity of exploited marine resources. They also provide the technical basis for guiding establishment of fishery management measures in order to achieve optimum yield from the fishery while also avoiding overfishing and ecosystem harm.

Detailed information concerning ISC Rules and Procedures, Organizational Chart, Working Groups' makeup, Meetings Reports, Stock Status Reports and General Fisheries Statistics can readily be found on the ISC home page at www.isc.fra.go.jp.

6.10.2.3 Inter-American Tropical Tuna Commission

The Inter-American Tropical Tuna Commission (IATTC) was established by the Convention for the Establishment of an Inter-American Tropical Tuna Commission in 1949 but was replaced by the Antigua Convention (UN Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the Northeast Pacific – IATTC (2003)), which entered into force on August 27, 2010, was subsequently ratified by the United States in 2016. The Area of Competence extends over an area of approximately 55 million km² as follows for the area shown in Figure 50 above:

- The 50°N parallel from the coast of North America to its intersection with the 150°W meridian;
- The 150°W meridian to its intersection with the 50°N parallel; and
- The 50°S parallel to its intersection with the coast of South America.

IATTC is responsible for the conservation and management of the fisheries for tunas and other species taken by tuna-fishing vessels in the Eastern Pacific Ocean (EPO). The objective of the Antigua Convention is “to ensure the long-term conservation and sustainable use of the fish stocks covered by this Convention, in accordance with the relevant rules of international law”. The Antigua Convention also has an explicit provision under Article IV, paragraph 1 to apply the “precautionary approach, as described in the relevant provisions of the Code of Conduct and/or the UNFSA, for the conservation, management and sustainable use of fish stocks”. This is re-iterated in the functions of the Commission

under Article VII, along with the need to take an ecosystem approach to management. Current members are: Belize, Canada, China, Colombia, Costa Rica, Ecuador, El Salvador, the European Union, France, Guatemala, Japan, Kiribati, Korea, Mexico, Nicaragua, Panama, Peru, Chinese Taipei, United States, Vanuatu, and Venezuela. In addition, Bolivia, Honduras, Indonesia and Liberia are cooperating non-members. To ensure that the IATTC management framework is consistent with national laws, each contracting state must take the measures necessary for the implementation of and compliance with the Convention and related conservation and management measures including the adoption of the necessary national laws and regulations. IATTC ensures the long-term conservation and sustainable use of tuna, tuna-like and other species of fish caught in the EPO by fishing vessels (primarily purse seine and longline over 24 m) in accordance with the relevant rules of international law. The functions of the Commission (Article VII) and its subsidiary bodies (Article X and XI) are explicitly defined in the Convention text, and well-articulated in the Rules of Procedure of the Antigua Convention. The IATTC is closely linked to the WCPFC, formally recognised through a Memorandum of Understanding (WCPFC, 2009a) and two Memoranda of Cooperation (WCPFC, 2009b, 2011), clearly laying out the types and levels of such cooperation. In addition, beginning in 2007, there have been WCPFC-IATTC Consultative meetings and as of 2019 there are now annual WCPFC-IATTC Joint Working Group meetings which involve the Northern Committee of the WCPFC (refer to <https://meetings.wcpfc.int/meetings/type/17>).

The IATTC has a participatory consultative and decision-making process, including its subsidiary bodies, working groups and other scientists, the private sector, fisheries authorities, and non-governmental organizations from all member states. However, not all parties can vote on the adoption of resolutions and recommendations. The IATTC studies tunas and billfish biology in the EPO to determine the effects of fishing and natural factors on their abundance (see Figure 52). The data gathered are used to formulate appropriate management measures recommendations in order to promulgate IATTC Resolutions and then to collect information on compliance with such Resolutions. In addition, the IATTC maintains a program to study the effects of fishing mortality on other fish and marine organisms of the pelagic ecosystem. These IATTC-established subsidiary bodies meet annually:

- Committee on Administration and Finance;
- Scientific Advisory Committee;
- Committee on Compliance Review; and
- Working groups.

The composition, roles and functions of these subsidiary bodies are detailed in the sections below.

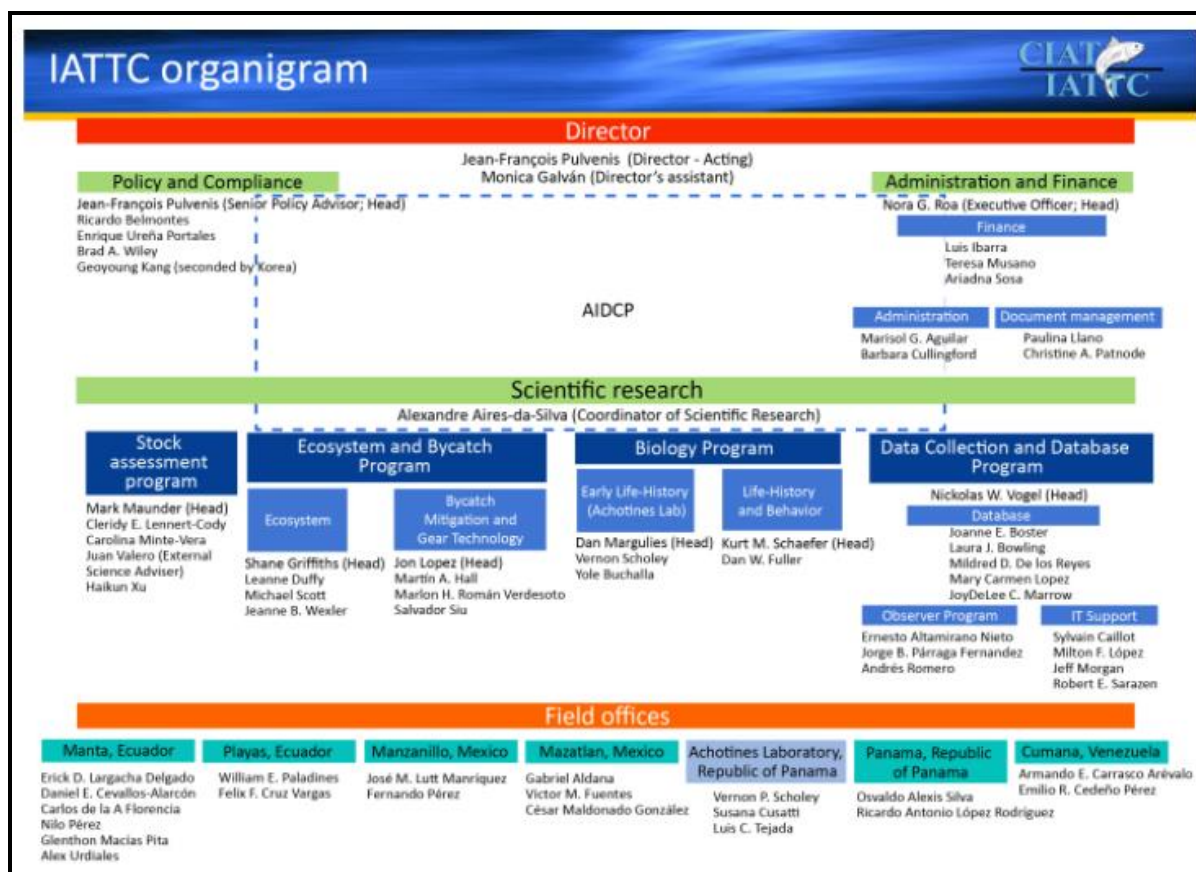


Figure 52. Organisational structure of the IATTC. Source: <https://www.iatcc.org/StaffENG.htm>

Rules for participation of observers at meetings are outlined in Annex 2 of the Convention. Annex 2 provides opportunity to become a Contracting Party or Co-operating Non-Contracting Party, open to all, including non-States. Like SPC and WCPFC, IATTC too has a special fund to strengthen the institutional capacity of developing countries to sustainably develop their fisheries so they can comply with IATTC Resolutions and Recommendations. An up-to-date list of IATTC Resolutions and Recommendations can be found at <https://www.iatcc.org/ResolutionsENG.htm>.

As with the WCPFC, all decisions are made by consensus (Article IX of the Antigua Convention), Resolutions become binding 45 days after their notification, barring an effective “veto” by dissension from any voting member. However, recommendations are non-binding. Decision-making is based on scientific advice and where there is consensus among members it leads to measures and strategies to achieve fishery-specific objectives. There is detailed reporting available to explain the decisions taken in relation to the management system. All meeting documents and minutes are uploaded to the website and publicly accessible, and also distributed to members, as outlined in the Rules of Procedure in Article IV.

Regulations approved by members, based on recommendations by IATTC staff or scientific committees, must be implemented by members and cooperating non-parties. To monitor compliance by members, the “Committee for the Review of Implementation of Measures Adopted by the Commission” (Antigua Convention, Annex 3) shares information on the actions taken by the Members to ensure compliance with measures agreed to under the Convention, by their vessels.

Committee on Administration and Finance

Resolution C-12-02 established a Committee on Administration and Finance in 2012, composed of representatives designated by each Member of the Commission, who may be accompanied by such experts and advisers as that Member may deem advisable. The functions of the Committee are to:

1. Examine the draft budget for the ensuing year and the subsequent year;
2. Alert the Commission, as appropriate, about any matter of an administrative or financial nature;
3. Prepare a report of each meeting of the Committee for transmission to the Commission, that includes advice and recommendations on matters related to the budget, finance, and administration of the Commission; and
4. Examine the financial audit reports.

Commission staff itself are to assist this Committee in collecting information necessary for the work of the Committee, in accordance with the procedures established by the Commission. Commission staff may also provide such analyses as the Committee deems necessary for carrying out its functions, prepare the reports for and records of the Committee meetings and distribute all pertinent information to the members of the Committee.

Scientific Advisory Committee (SAC)

Under the Antigua Convention (Article IX and Annex 4), a formal Scientific Advisory Committee was established by the Commission in 2003. It is composed of a representative designated by each member of the Commission, with appropriate qualifications or relevant experience, accompanied by such experts or advisers as deemed advisable by that member. The Commission may invite other organizations or persons with recognized scientific experience in matters related to the work of the Commission to participate in the work of the SAC.

The functions of the Committee are as follows:

- Review plans, proposals and research programs of the Commission, and provide the Commission appropriate scientific advice;
- Review relevant assessments, analyses, research or work, as well as recommendations to the Commission prepared by its scientific staff having such considered by the Commission itself, and provide additional information, advice and comments, as needed on these matters, to the Commission;
- Recommend items or specific issues to be addressed by the scientific staff, as part of its future work, to the Commission;
- In consultation with the Committee on Compliance Review, recommend to the Commission the priorities and objectives of the program for data collection and monitoring as established the Convention, and assess and evaluate the results of that program;
- Assist the Commission and the Director in locating sources of funding to conduct the research to be undertaken under this Convention;
- Develop and promote cooperation with members of the Commission's research institutions, to expand the knowledge base and understanding of fish stocks covered by this Convention;

- Promote and facilitate, as appropriate, the cooperation of the Commission with other national and international public or private organizations with similar objectives;
- Consider any matter referred to it by the Commission; and
- Perform such other functions and tasks as may be requested or assigned to it by the Commission.

As illustrated in Figure 52 above, there is a full IATTC Scientific Staff that operates under the supervision of the Director, and a Coordinator of Scientific Research. The Scientific Research Program has the following functions, which obviously gives priority to tunas and tuna-like species:

- Conduct scientific research projects and other activities approved by the Commission in accordance with the work plans adopted for this purpose;
- Provide the Commission Director, scientific advice and recommendations to support formulation of conservation and management measures and other relevant matters, following consultations with the Scientific Advisory Committee;
- Provide the Scientific Advisory Committee with the information necessary to carry out the functions of the SAC as specified above;
- Provide the Commission, through the Director, with recommendations for scientific research in support of the Commission's own functions;
- Collect and analyze data relating to current and past conditions and trends of the populations of the fish stocks covered by this Convention;
- Provide the Commission, through the Director, with proposed standards for collection, verification, and timely exchange and reporting of data concerning the fisheries for the relevant fish stocks covered by this Convention;
- Collect statistical data including, as appropriate, social and economic aspects, and catch reports of fish stocks covered by this Convention as well as relevant information concerning the operations of vessels in the Convention Area;
- Study and appraise information concerning methods and procedures for maintaining and increasing the fish stocks covered by this Convention; and
- Publish and disseminate findings reports within the scope of this Convention as well as scientific, statistical and other data relating to the fisheries for the fish stocks covered by this Convention, ensuring confidentiality in conformity with the provisions of this Convention.

Committee on Compliance Review

Formally called the Committee for the Review of the Implementation of the measures adopted by the Commission, the Committee on compliance Review was along with the SAC, created under the Antigua Convention. It is composed of representatives designated for that purpose by each member of the Commission, who may be accompanied by experts and advisors. The functions of the Committee established under Article X and Annex 3 of the Convention are as follows:

- To review and monitor compliance with conservation and management as well as cooperative measures adopted by the Commission, referred to in Article XVIII (Rights of States), paragraph 9 (concerning cooperation), of this Convention;

- To analyse information by flag or, when information by flag would not cover the relevant case, by vessel, and any other information necessary to carry out its functions;
- To provide the Commission with information, technical advice and recommendations relating to the implementation of, and compliance with, conservation and management measures;
- To recommend to the Commission means for promoting compatibility among the fisheries management measures of the members of the Commission;
- To recommend to the Commission means to promote the effective implementation of Article XVIII, paragraph 10 of the Convention (i.e., vessels in contravention of management measure(s) shall be deterred from such activities until such time as appropriate action is taken by the flag State to ensure that such vessels do not continue those activities);
- To recommend, in consultation with the SAC, priorities and objectives for the data collection and monitoring program to the Commission, as specified in the Convention (Article VII), and to assess and evaluate the results of that program; and
- To perform such other functions as the Commission may direct.

Working Groups

A working group is a group of experts working together to achieve specified goals and are domain-specific and focus on discussion or activity around a specific subject area. Under the rules of procedure of the IATTC and at the request of the Director, Scientific Staff or SAC, several working groups may be established to address specific questions or topics that require additional consideration, and then prepare documents for discussion at regularly convened committee meetings. Some working groups are permanent (e.g. the Permanent Working Group on Fleet Capacity) while others are *ad hoc* (e.g. the Ad Hoc Working Group on Resolutions or the Ad Hoc Working Group on FADs). Meetings are publicly announced, and records of meetings are available on the IATTC website (Refer to Meeting records at <https://www.iatcc.org/IATTC-WGsENG.htm>).

6.10.3 National governance framework

The original Magnuson Fishery Conservation and Management Act of 1976 was renamed the **Magnuson-Stevens** Fishery Conservation and Management Act (MSA) when amended in 1996 by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (Public Law P.L. 109-479 – see US_Department_of_Commerce (2007)). It is the main law governing the management of living marine resources in the United States, thereby establishing a U.S. exclusive economic zone (EEZ) between 3 and 200 miles offshore and creating eight regional fishery councils to manage the living marine resources within that area. The Act was initially passed to address heavy foreign fishing, promote the development of a domestic fleet and link fishing communities more directly to the management process. Under the MSA, the United States has exclusive fishery management authority over all fishery resources found within its EEZ. For the purposes of the MSA, the inner boundary of the U.S. EEZ extends from the seaward boundary of each coastal state to 200 nautical miles from the baseline from which the breadth of the territorial sea is measured. In the case of the State of Hawaii, the local government manages all marine resources within the waters 0-3 miles from its shorelines. The United States' rights and authority regarding fish and fishery resources in the MSA relevant to the Hawaii pelagic longline fishery are outlined in its Sections 101, 102, 301, 302, 303, 303a, 304, 312, 316, and 318.

6.10.3.1 Western Pacific Regional Fishery Management Council

The Western Pacific Regional Fishery Management Council (WPRFMC or Council) is one of eight regional fisheries management councils established under the MSA in 1976, to manage the offshore fisheries and the MSA guides nearly all the Council's actions. The Council has the authority over the fisheries based in and seaward of the territories of American Samoa and Guam, the State of Hawaii, the Commonwealth of the Northern Mariana Islands, and the U.S. Pacific Remote Insular Areas of Johnson, Midway, Palmyra, Wake Atolls, Baker, Howland and Jarvis Islands and Kingman Reef. This area of nearly 1.5 million square miles (see Figure 50) is the size of continental United States and constitutes half of the entire U.S. EEZ. The Council also manages the domestic fishery based in the Pacific Islands that operate in the high seas.

The MSA contains 10 National Standards that the Councils must follow when developing new management measures. The National Standards for conservation and management measures include:

1. Prevent overfishing while achieving optimum yield;
2. Be based on best scientific information available;
3. Manage individual stocks as a unit throughout their range, and to the extent practicable, interrelated stocks shall be managed as a unit or in close coordination;
4. No discrimination between residents of different states, any allocation of privileges must be fair and equitable;
5. Where practicable, promote efficiency, except that no measure shall have economic allocation as its sole purpose;
6. Take into account and allow for variations among the contingencies in fisheries, fisheries resources and catches;
7. Minimize costs and avoid duplication, where practicable;
8. Take into account the importance of fisheries resources of fishing communities to provide for sustained participation of, and to minimize impacts to, such communities consistent with conservation management;
9. Minimize bycatch and mortality from bycatch; and
10. Promote safety of human life at sea.

As already mentioned, the WCPFC Convention, signed by the United States, is consistent with the principles and provisions of the United Nations Law of the Sea (UNCLOS) and the UN Fish Stocks Agreement (FSA) and Highly Migratory Species (HMS) Agreement. The U.S. also adopted the Compliance Agreement (FAO, 1995). These treaties/agreements are consistent with the current international fisheries law and standards for the management of highly migratory species and ecosystems. As a member of WCPFC and IATTC, and party to the Conventions, the United States is thus legally bound to apply the precautionary approach for the sustainable management of highly migratory fish stocks and biodiversity conservation and has therefore adopted all relevant WCPFC Conservation and Management Measures (CMM) as well as IATTC Resolutions and Recommendations for this fishery.

The long-term objectives at the national level are clearly articulated in the MSA (under Title 50 of the Code of Federal Regulations (CFR) Part 600). Key objectives of the MSA are to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits and ensure a safe and

sustainable supply of seafood. The MSA authorizes fishery management councils to create fishery management plans to meet the objectives outlined in the Act. Accordingly, the Council has developed Fisheries Ecosystem Plans, consistent with the MSA and the National Standards for fishery conservation and management. The Council first established a Pelagic Fishery Management Plan (FMP) for federally managed pelagic fisheries of the Western Pacific Region in 1986 and then developed the Pacific Pelagic Fisheries Ecosystem Plan (FEP) in 2009 (WPRFMC, 2009). This FEP outlines the management of the fisheries for pelagic species in the EEZ waters of the Western Pacific Region and fisheries based in the Region that operate in the high seas. It details federal fishery regulations applicable under the Pacific Pelagics FEP and establishes appropriate management structures and guidelines for the Council and its Advisory Bodies or Panels. It also specifies the integration and implementation of ecosystem approaches into the management system. This is now a “place-based” rather than a “species-based” management scheme. The Council has adopted ten objectives for the Pelagics FEP:

- Objective 1. To maintain biological diverse and productive marine ecosystems and foster the long-term sustainable use of marine resources in an ecologically and culturally sensitive manner through the use of science-based ecosystem approach to resource management;
- Objective 2. To provide flexible and adaptive management systems that can rapidly address new scientific information and changes in environmental conditions or human use patterns;
- Objective 3. To improve public and government awareness and understanding of the marine environment in order to reduce unsustainable human impacts and foster support for responsible stewardship;
- Objective 4. To encourage and provide for the sustained and substantive participation of local communities in the exploration, development, conservation and management of marine resources;
- Objective 5. To minimize fishery bycatch and waste to the extent practicable;
- Objective 6. To manage and co-manage protected species, protected habitats and protected areas;
- Objective 7. To promote the safety of human life at sea;
- Objective 8. To encourage and support appropriate compliance and enforcement with all applicable local and federal fishery agencies;
- Objective 9. To increase collaboration with domestic and foreign regional fishery management and other government and nongovernment organisations, communities and the public at large to successfully manage marine ecosystems;
- Objective 10. To improve the quantity and quality of available information to support marine ecosystem management.

The Council and its Advisory Bodies (see Figure 53) have taken a series of management actions to conserve highly migratory fish stocks caught in the Western Pacific Region. Evidence of management measures taken to meet the MSA and the Pelagic FEP objectives include a limited entry system for pelagic longline vessels in the Hawaii fishery. The measures contained in the Pelagic FEP to meet its objectives concerning fishery bycatch and the protection of endangered species, protected habitats and protected areas are also consistent with the MSA’s National Standards and other applicable laws. National Standard 9 states the conservation and management measures shall, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. The Endangered Species Act (ESA (1973) – US Fish and Wildlife Service) ensures that species listed as

endangered or threatened are not jeopardized by ongoing pelagic fishery operations. The endangered species listed that have been observed or may occur, in the Western Pacific Region include all Pacific marine turtles, humpback whale, sperm whale, blue whale, fin whale and sei whale, and the short-tailed albatross. The Marine Mammal Protection Act (MMPA – NMFS (1972)), National Environmental Policy Act (NEPA, 1969), the Shark Finning Prohibition Act (2000 as amended) and the Shark Conservation Act (2010) both offered amendments to the MSA and thus obviously support the objectives the MSA and the WPRFMC Pelagic FEP.

The MSA requires that Councils establish annual catch limits (ACLs) and accountability measures for all stocks and stock complexes in its FEPs. Exceptions are made for species managed internationally. The MSA has been amended several times and since 1996, under the Sustainable Fisheries Act (Title I: Conservation and Management). The latter amended the Magnuson Fishery Conservation and Management Act (Magnuson Act) to modify the Act's purposes and declarations of congressional policies, has required Councils to base management measures on the best scientific information, reduce bycatch and consider the effect of management measures on communities and protect essential fish habitat.

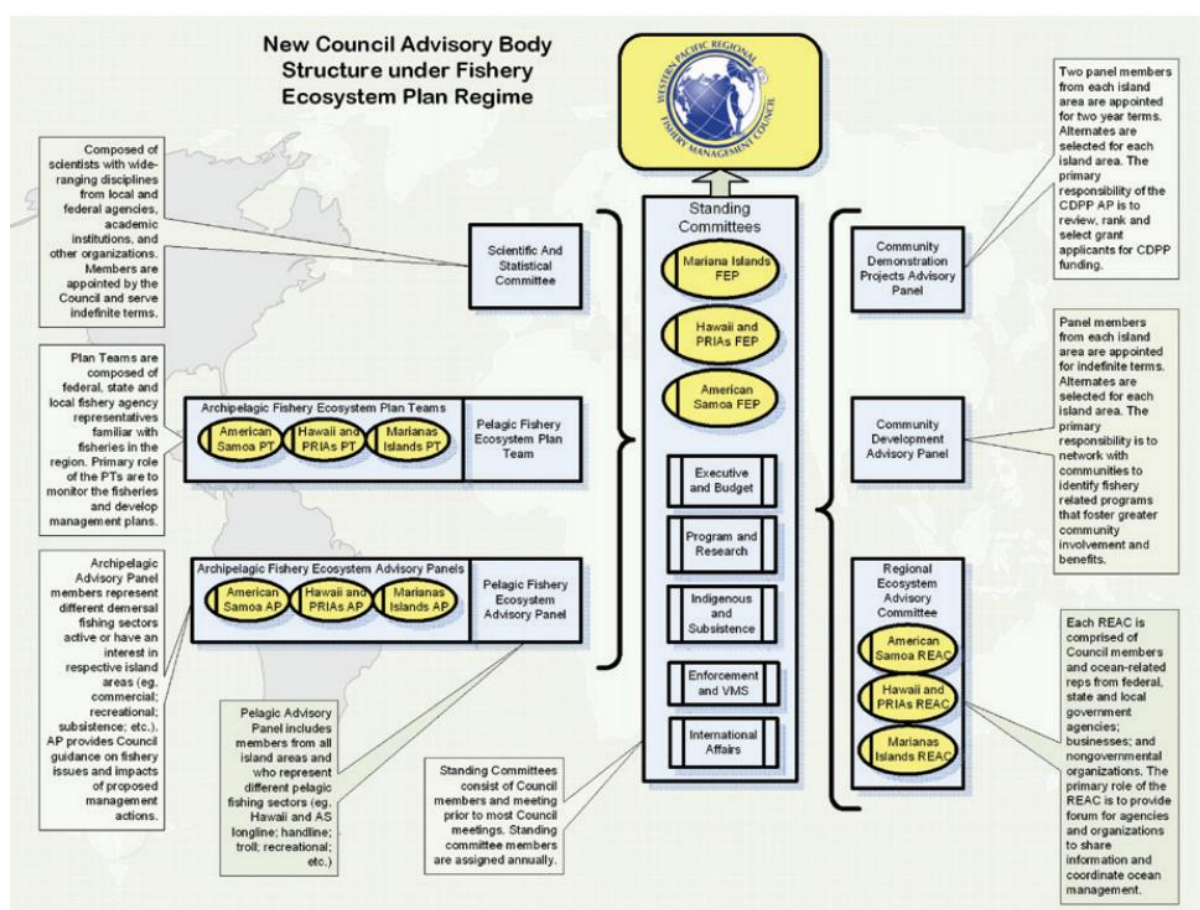


Figure 53. Western Pacific Regional Fishery Management Council advisory body structure under the ecosystem-based fishery management regime. Source: Martell and Spalding (2020).

This Council is, therefore, the management system's decision-making body and its primary role is to prepare, monitor and amend management plans for the offshore fisheries based in the Western Pacific Region (WPRFMC, 2019a). It is comprised of thirteen voting members and three non-voting members that include eight members who are appointed by the governors of Hawaii, Guam, American Samoa and CNMI and as appointed by the Secretary of Commerce, four designated states officials and

four designated federal officials. A chair and four vice-chairs (one from each island area) are elected annually by the Council members. They serve three-year terms and can serve up to three consecutive terms. The Council staff supports the fishery management decision-making process. The staff coordinates meetings and provides information to the Council, its advisory groups, fishermen and the public. The Council's executive director carries out the tasks assigned by the Council and, with the senior scientists and program officer, directs and oversees the technical and support staff. The technical staff analyses alternatives for regulatory measures for the Council's review with a focus on biology, economics, social science, ecosystems, and habitat. The technical staff also develops fishery management documents and regulations based on the Council's decisions. When reviewing potential regulatory changes, the Council also draws upon the services of knowledgeable people from local and federal agencies, universities, and the public, who serve on Council Advisory Bodies. The Advisory Bodies include the Scientific and Statistical Committee (SSC), the Regional Ecosystem Advisory Committees (REAC), the various Standing Committees, the Archipelagic and Pelagic Plan Teams and all the Advisory Panels (AP), and which provide comments, both written and oral, on relevant issues being considered by the Council. In making fisheries management decisions, the Council follows seven guiding principles (WPRFMC, 2019b):

1. Support quality research and obtain the most complete scientific information available to assess and manage fisheries;
2. Promote an ecosystem approach in fisheries management including reducing waste in fisheries and minimizing impacts on marine habitat and impacts on protected species;
3. Conduct education and outreach to foster good stewardship principles and broad and direct public participation in the Council's decision-making process;
4. Recognize the importance of island cultures and traditional fishing practices in managing fishery resources and foster opportunities for participation;
5. Promote environmentally responsible fishing and the utilization of sustainable fisheries that provide long-term economic growth and stability;
6. Promote regional cooperation to manage domestic and international fisheries; and
7. Encourage development of technologies and methods to achieve the most effective level of monitoring, control and surveillance and ensure safety at sea.

A more detailed outline of roles and responsibilities of the various advisory bodies to the Council follows.

Scientific and Statistical Committee

The SSC reviews the scientific and technical information of fisheries in the western Pacific Region and provides the Council with scientific advice for a science-based management decision. The SSC is a multi-disciplinary body comprised of oceanographers, resource economists, fishery biologists, social-scientist, population modelers and other knowledgeable experts. The Committee's role is to:

- Identify scientific resources required for the development of management plans and amendments and recommend resources for Plan Teams;
- Provide ongoing multi-disciplinary review of management plans or amendments and advise the Council on their scientific content, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield and achieving

rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures and sustainability of fishing practices;

- Assist the Council in the development, collection, evaluation and peer review of such statistical, biological, economic, social, and other scientific information as is relevant to the Council's activities, and recommend methods and means for the development and collection of such information;
- Recommend to the Council the composition of Plan Teams; and
- Meet in conjunction with the meetings of the Council, to the extent practicable. <https://www.wpcouncil.org/about-us/advisory-groups/scientific-and-statistical-committee/>.

Standing Committees

- Executive and Budget Committee: The functions of the Executive and Budget Committee are to determine policy, make rulings on administrative matters, determine what meetings and conferences should have Council representation and develop the Council budget and prepare long range programs.
- Program and Research Committee: The function of the Program and Research Committee is to review and identify program and research priorities to help achieve the Council's goals and objectives.
- Standing committee for each FEP: The function of these committees is to provide specialized review of annual reports and management issues, and to recommend Council action on such issues, related to their respective FEPs.
- Standing committees on Fishery Rights of Indigenous People, Enforcement/Vessel Monitoring System and International Affairs: These committees maintain continuing involvement in and make recommendations for Council action on their respective subject areas relative to FEPs or other issues.
- Ad Hoc Committees: The Council may establish Ad Hoc Committees to address issues not addressed by any of the Standing Committees described above. These Ad Hoc Committees will report to the Council as directed and will be dissolved by the Council once their purpose has been fulfilled.

FEP Plan Teams

The Council has teams of scientists, managers and industry representatives who make recommendations to the Council based on their annual review of the region's bottomfish and seamount groundfish, coral reef ecosystem, crustaceans, pelagics and precious coral fisheries (the SAFE Reports for example - WPRFMC (2020)). Plan Teams are working teams of Federal, State and non-government fishery scientists and management specialists. Members of the Plan Teams are appointed by the Council with the Chair of each Plan Team appointed by the Council Chair and meet as needed to annually review the performance of the fishery and management regime in their respective geographic areas. The Teams produce an Annual Report of the Fisheries, and the Chair will report its team's findings to the Council.

Regional Ecosystem Advisory Committee

The Council receives advice from the American Samoa, Hawaii and Mariana Archipelago Regional Ecosystem Advisory Committees (REACs). Each REAC brings together Council members and representatives from federal, state and local government agencies, businesses, and non-governmental organizations with responsibility and interest in land-based and non-fishing activities that potentially affect the marine ecosystem of the relevant archipelago. <https://www.wpcouncil.org/about-us/advisory-groups/regional-ecosystem-advisory-committees/>.

Other Advisory Bodies

The Council may establish other advisory bodies as necessary and appropriate to assist it in carrying out its statutory functions, as provided in MSA. Other Council advisory bodies may include:

- Regional Ecosystem Advisory Committee
- Fishing Industry Advisory Committee
- Social Science Research Committee
- Community Demonstration Projects Advisory Panel
- Community Development Program Advisory Panel
- Fishery Data Collection and Research Committee (working together with NOAA WPacFIN)
- Education Committee
- Non-Commercial Advisory Committee
- Bottomfish Advisory Review Board

When developing management measures, the Council reviews available information and considers public comments, Advisory Bodies' recommendations, the National Standards, and the Council's Guiding Principles. Federal Regulations are relevant to the management of the Hawaii pelagic longline fishery under Title 50 (Title 50, 1966) of the Code of U.S. Federal Regulations (CFR) Parts 229 (MMPA), 300 (International Fisheries Regulations), 600 (MSA), and 665 (Fisheries in the Western Pacific). Therefore, decisions must conform not only to the Magnuson-Stevens Fisheries Conservation and Management Act, but also the National Environmental Policy Act, the Marine Mammal Protection Act, Endangered Species Act, Regulatory Flexibility Act (RFA, 1980) and other applicable laws, including several executive orders. Final decisions go to the Secretary of Commerce for a second review, public comment, and final approval. Regulatory changes may take up to a year or longer to implement, particularly if complex or contentious. Once finalized and approved, they are implemented by the National Oceanic and Atmospheric Agency (NOAA) Fisheries National Marine Fisheries Service (NMFS). Management measures created by the Council and approved by the Secretary of Commerce are implemented by the NMFS Pacific Islands Regional Office and enforced by NOAA Office of Law Enforcement (OLE), the U.S. Coast Guard 14th District and local enforcement agencies. There is an active established framework for cooperation with other U.S. states and territories through participation in the Council's Advisory Bodies that include the Regional Ecosystem Advisory Committees, Science and Statistical Committee, Plan Teams, Advisory Panel and Marine Protected Area Advisory Committee, Fisheries Data Coordinating Committee, and Protected Species Advisory Committee.

6.10.3.2 NOAA Fisheries

In 1871, U.S. President Ulysses S. Grant created the United States Commission of Fish and Fisheries. It was the first federal agency focused on natural resource conservation, and its founding represents the genesis of today's NOAA Fisheries, also known as the National Marine Fisheries Service (USFWS, 2018). Today, it is an office of the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce. There are five regional offices, one for the Pacific Islands, six science centers, one also for the Pacific Islands, and more than 20 laboratories around the United States and U.S. territories. NOAA Fisheries is responsible for the stewardship of the nation's ocean resources and their habitat, backed by sound science and an ecosystem-based approach to management to:

- Ensure productive and sustainable fisheries;
- Provide safe sources of seafood;
- Recover and conserve protected resources; and
- Maintain healthy ecosystems.

Seafood harvested from federally-managed U.S. fisheries is mandated to be sustainable through the U.S. fishery management process. Using the MSA as the guide, NOAA Fisheries assesses and predicts the status of fish stocks, sets catch limits, ensures compliance with fisheries regulations, and reduces bycatch. In the western Pacific, the WPRFMC is the key partner in fishery management. And because resilience of marine ecosystems depends on all marine species being in good health, NOAA works to sustain not only fish stocks, but also protected species such as whales, sea turtles, corals, and others. Under the Marine Mammal Protection Act and the Endangered Species Act, NOAA Fisheries works to recover protected marine species while allowing economic and recreational opportunities.

Reflecting the vision of the Department of Commerce and NOAA to help the American economy grow, NOAA has put forward three Strategic Goals for 2020–2023 (NMFS, 2020f):

- To amplify the economic value of commercial and recreational fisheries while ensuring their sustainability;
- To conserve and recover protected species while supporting responsible fishing and resource development; and
- To improve organizational excellence and regulatory efficiency.

Pacific Islands Regional Office (PIRO)

Completed in 2015, the National Oceanic and Atmospheric Administration (NOAA) Daniel K. Inouye Regional Center (Laboratory and Office Complex) is located on historic Ford Island at Pearl Harbor, Honolulu, Hawaii. The facility consolidates NOAA's many Honolulu-area offices and labs into a single "campus", including pier facilities for NOAA's Hawaii-based research and fisheries enforcement vessels and other small boats. Facilities include office space, wet laboratories, marine animal tanks, and administration and support space for NOAA's research, conservation management and enforcement programs.

The Pacific Islands Regional Office works closely with the Pacific Islands Fisheries Science Center (PIFSC) to integrate cutting-edge science into policy and management decision-making, working together for the conservation and management of domestic and international marine resources (NMFS, 2020f). PIRO is organised under numerous Divisions:

1. Sustainable Fisheries Division: This unit reviews, recommends approval or disapproval, and implement approved fishery management plans for commercial and non-commercial fisheries in the U.S. Pacific Islands. The Western Pacific Fishery Management Council develops these plans with the goal of ending overfishing and maintaining sustainable fisheries. They also develop, implement, and administer a variety of fishery management activities, including fishing regulations, permits and authorizations, economic and environmental analyses, engagement with the recreational and non-commercial fishing community, support for offshore aquaculture, and education and training for fishermen.

2. Protected Resources Division: This Division is responsible for protecting marine mammals and recovering endangered and threatened species in the region. The survival, conservation and recovery of protected marine species is accomplished through management, involving public outreach and education.

Species stock status is evaluated to understand whether to list them as threatened or endangered under the Endangered Species Act. For listed species, this Division engages in recovery planning, critical habitat designation, and other conservation and management activities that promote species recovery through consultations with other federal agencies to ensure their activities don't jeopardize the continued existence of listed species. They also work closely with partners to achieve recovery for those species by implementing programs to conserve and protect populations of marine mammals in the Pacific Islands Region. This includes efforts to reduce the "take" of marine mammals in commercial fisheries, notably in the Hawaii longline fleet. The Division also maintains a Marine Mammal Health and Stranding Response Network.

3. Habitat Conservation Division: This unit serves to protect, restore, and promote stewardship of marine and coastal habitat that supports fisheries and conserves protected resources. The Pacific Islands Region encompasses a large percentage of the nation's coral reef ecosystems, so this Division supports management of complex coastal ecosystems through partnerships and technical assistance with stakeholders and other federal and local partners. In order to conserve essential fish habitat, they consult with any federal agency whose actions might impact habitats and provide recommendations on ways that federal actions can avoid, minimize, or mitigate adverse impacts.

Of interest to the longline fishery is that this Division is also involved in the co-management of marine resources in the NWHI (Papahānaumokuākea) Marine National Monument, Rose Atoll (American Samoa) Marine National Monument, Pacific Remote Islands (PRIA) Marine National Monument, and the Marianas Trench Marine National Monument (see Figure 10 in Section 6.2.4).

4. International Fisheries Division: This unit negotiates and implements provisions of international fisheries agreements in the Pacific Ocean. Responsible marine stewardship and sustainable fisheries management of highly migratory species is maintained by work at both WCPFC and IATTC. This unit is also instrumental in the administration of the South Pacific Tuna Treaty, and one of the nation's largest fisheries—the U.S. purse seine fishery - that also operates in the western and central Pacific Ocean along with the HI-based longline fishery.

5. Fisheries Observer Program: PIRO is responsible for deploying fisheries observers on U.S. longline fishing vessels to collect data on fishing effort and catch and the incidental take of ETP species, such as sea turtles, marine mammals, and seabirds. Regulations dictate 100% coverage of Hawai'i-based longline vessels targeting swordfish (shallow set) and 20% coverage of Hawai'i and American Samoa-based longline vessels targeting tunas (deep set). This program also provides support to FFA observers deployed on U.S. purse seine vessels, supports port sampling of U.S. purse seine vessels, and provides U.S. purse seine treaty data as well gathering other data on fisheries resources and protected species.

6. Operations, Management and Information Division: This division ensures that PIRO staff has available the most up-to-date, secure, and effective Information technology (IT) resources by providing all PIRO Divisions the facilities, administrative, human resource, budget execution, records management, contracting, and purchasing services needed for mission success. They also engage with a range of fisheries and conservation non-profits, governments, industry, and researchers through competitive and non-competitive grants and cooperative agreements to improve fishery management and conservation efforts throughout the Pacific.

7. The Directorate: Strategic support and regional priorities and activities are assured by upper management, to support agency missions. The Directorate ensures compliance with NEPA guidance, works to provide the latest and best geographic information system (GIS) data resources and communications in support of NOAA's mission through media and outreach and education opportunities.

Detailed information can be found at <https://www.fisheries.noaa.gov/about/pacific-islands-regional-office>.

Pacific Islands Fishery Science Center (PIFSC)

The Pacific Islands Fishery Science Center is located on the same NOAA “campus” as PIRO, includes federal and non-federal staff, and is aligned toward the achievement of NOAA’s three strategic goals for 2020-2023 as outlined above. PIFSC is organized into the various Divisions as follows:

1. Fisheries Research and Monitoring Division: Responsible for coordination of the Center’s programs for fisheries monitoring, fisheries data management, fisheries interactions, fish life history studies, and stock assessment for domestic and international fisheries.

2. Protected Species Division: Provides a scientific foundation for the conservation of protected species, notably cetaceans, Hawaiian monk seals, and sea turtles in the Pacific Islands, guided by the mandates of the MMPA, ESA, and international agreements. Includes a Cetacean Research Program, Hawaiian Monk Seal Research Program and Marine Turtle Biology and Assessment Program.

3. Ecosystem Sciences Division: Conducts multidisciplinary research, monitoring, and analysis of integrated environmental and living resource systems in coastal and offshore waters in the Pacific Ocean.

4. Science Operations Division: Provides support and logistical services for the Center’s scientific research activities, products, and publications to ensure their safety and success. It oversees all research resources and activities aboard NOAA ships, NOAA small boats, and charters, ensuring they are permitted and comply with federal, state, and local regulations. This Division is also responsible for maintaining the library, whose collections includes books, journals, maps and charts, reports, newsletters and other grey literature, reprints, and more than 800 Japanese-to-English translations for researchers and the public.

5. Operations, Management, and Information Division: Provides “customer service”, oversight, and technical tools necessary to help further the success of the PIFSC and NOAA mission, while ensuring compliance with agency policies and regulations.

6. Director’s Office: Provides Center-wide vision, guidance, and management in support of NOAA’s mission and PIFSC’s priorities and direction. The Directorate provides science direction and oversight of research activities as well as operational and administrative guidance of the activities that overall support stewardship of living marine resources.

An overarching feature of collaborative data management is coordinated through the Western Pacific Fishery Information Network (WPacFIN), housed and staffed by PIFSC (Figure 54). WPacFIN provides technical support, including hardware and software support, and governs the data storage and data sharing through various agreements. The WPacFIN system provides each island area with its unique and independent data system and brought about the standardization of datasets to allow for inter-jurisdictional comparisons. The WPacFIN developed the data entry software, computational capabilities and automated summarization of the data collected by each territory's fishery agencies. These summarizations are used to generate the Council's annual monitoring reports as well as the reporting for the Fisheries of the United States.

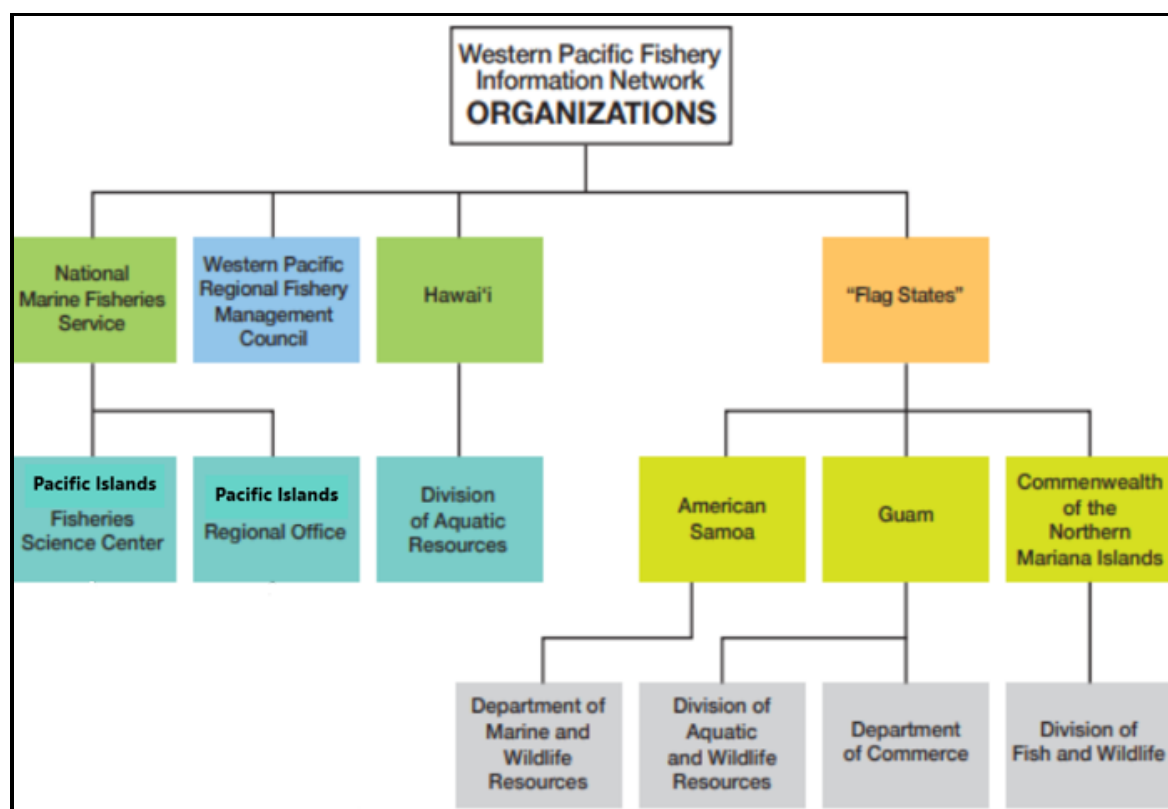


Figure 54. Organisations participating in the Western Pacific Fisheries Information Network (WPacFIN).
Source: Sabater (2021).

Office of General Council (Pacific Islands) - Office of Law Enforcement (OLE)

Also headquartered on the NOAA "campus", the Office of General Council's Pacific Islands Enforcement Section is responsible for not only the Western Pacific pelagic longline fishery, but also purse seine fisheries, bottomfish fisheries, issues concerning the Pacific Insular Areas (PRIA), marine mammals, endangered species, two national marine sanctuaries, and four marine national monuments. OLE itself directly supports the core mission mandates of NOAA Fisheries (NMFS, 2020f). Ensuring sustainable fisheries and protecting marine life is a joint effort between NOAA Fisheries PIRO and PIFSC. With U.S. EEZs in the Pacific Islands abutting the waters of nine other countries and territories in the Pacific (see Figure 50), the OLE is also actively engaged in the work of the WCPFC to ensure the long-term conservation and sustainable use of highly migratory fish stocks. Other than Hawaii, OLE also has field agents in Guam and American Samoa. In addition, the office works closely with the NMFS Office of General Council, the U.S. Coast Guard, and the U.S. Department of Justice to provide a strong enforcement response to any illegal fishing by foreign vessels in remote U.S. EEZ waters in the Pacific. This jurisdiction covers more than 1.7 million square nautical miles, accounting

for nearly half of the entire U.S. EEZ, and includes four Marine National Monuments (Papahānaumokuākea (NWHI), Marianas Trench, Pacific Remote Islands Areas, and Rose Atoll American Samoa)), as well as two Sanctuaries (Hawaiian Islands Humpback Whale National Marine Sanctuary and National Marine Sanctuary of American Samoa).

Therefore, NOAA's Office of Law Enforcement is charged with protecting marine wildlife and habitat by enforcing both domestic laws and supporting international treaty requirements. Enforcement activities are conducted through patrols both on and off the water as well as via VMS. OLE also conducts criminal and civil investigations, often in partnerships with state, tribal, federal, and nongovernmental organizations and provides outreach and compliance assistance to achieve sustainable fisheries and seafood, healthy marine ecosystems. More information can be found at: <https://www.gc.noaa.gov/enforce-office1.html> Enforcement Section Offices.

As described above, management measures created by the Council and approved by the Secretary of Commerce are implemented by the NMFS Pacific Islands Regional Office and enforced by NOAA Office of Law Enforcement (OLE). The following list is therefore, the result of the comprehensive legal framework for regulating the Hawaii-based pelagic longline fishery. PIRO's Sustainable Fisheries Division provided the guide to the Hawaii Pelagic Longline Fishing Regulations (NMFS, 2020e) in February 2020. This guide summarizes regulations for both the Hawaii shallow-set and deep-set pelagic longline fisheries, while the official regulations are published in the Code of Federal Regulations (CFR) under Title 50, Parts 229, 300, 404, 600, and 665. These regulations include:

- **Hawaii Longline Limited Access Permit:** A valid Hawaii longline limited access permit is required for using longline gear to fish for pelagic management unit species (PMUS) within the U.S. EEZ around Hawaii, or to land or transship PMUS shoreward of the outer boundary of the EEZ. A vessel must be registered to a valid permit. Expires on March 3rd of each calendar year.
- **State of Hawaii Commercial Marine License (CML):** The vessel operator and each crew member must have a current CML from the Hawaii Division of Aquatic Resources to take marine life for commercial purposes.
- **High Seas Fishing Compliance Act (HSFCA – 1995 and 2015) Permit:** A vessel must have an HSFCA permit to fish beyond the EEZ. Expires five years from date of issuance.
- **WCPFC Convention Area Endorsement:** A vessel fishing beyond the EEZ in the WCPFC Convention area must have this endorsement, which is a supplemental registration to the HSFCA permit. Expires when the associated HSFCA permit expires.
- **Marine Mammal Authorization Program (MMAP) Certificate:** A vessel registered to a Hawaii longline permit must carry on board an MMAP certificate issued by the Pacific Islands Regional Office (PIRO). Expires on March 3rd of each calendar year.
- **Protected Species Workshop (PSW) Certificate:** The owner and operator of a vessel registered to a Hawaii longline permit must have on board a PSW certificate issued by PIRO. Expires one year from date of issuance.
- **Western Pacific Receiving Vessel Permit:** A vessel must be registered to a valid receiving vessel permit if that vessel is used to land or transship, shoreward of the outer boundary of the EEZ around American Samoa, Hawaii, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), or Pacific Remote Island Areas (PRIA), any PMUS harvested with longline gear. Expires March 3rd of each calendar year.

- **NMFS Western Pacific Daily Longline Fishing Log:** The vessel operator must complete a paper or electronic logbook form within 24 hours of the end of each fishing day and maintain the logbook on board the vessel. The vessel operator must submit the completed and signed logbook to NMFS Pacific Islands Fisheries Science Center (PIFSC) within 72 hours of returning to port. These logbooks are available from PIFSC.
- **NMFS Pacific Transshipment Declaration Form:** The vessel operator with a Western Pacific Receiving Vessel Permit must submit a Pacific Transshipment Declaration Form for each day of transshipment activity to PIFSC within 24 hours after completion of the transshipment.
- **MMAP Mortality/Injury Reporting Form:** If a marine mammal interaction (hooking or entanglement) occurs on a fishing trip, the vessel operator must complete and submit a MMAP Mortality/Injury Reporting Form on paper or online to NMFS within 48 hours after the end of the trip.
- **Vessel Monitoring System (VMS):** A vessel must have an operational NOAA Enforcement-owned and installed VMS unit on board whenever the vessel is at sea.

6.10.4 Principle 3 Performance Indicator scores and rationales

Scoring table 46. 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

Specific provisions for straddling stocks and highly migratory fish stock are spelled out in UNCLOS (1982) in Articles 63 and 64. These require that “states cooperate directly or through appropriate international organisations with a view to ensuring conservation and promoting the objective of optimal utilisation...” of these stocks. Through Articles 118 and 119, States are also required to cooperate in conservation and management of high seas stocks, through development of catch limits, using the best available scientific evidence. Also recognised is the need to rebuild stocks determined to be overfished and to manage fishing impacts on non-target stocks. The SFA (1995 – entry into force 11 December 2001) is the implementing Agreement of UNCLOS and thus specifies roles, responsibilities, and requirements with respect to managing straddling and highly migratory fish stocks. Article 8 again requires States to cooperate “to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of the Convention is achieved”. The WCPFC is the first RFMO established after the FSA entered into force. As such, it extensively incorporates all key provisions of the FSA while still reflecting WCPO environmental, political, socio-

economic, and geographical specificities. Functioning of the 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 SC). Through the SPC, regionally (and sub-regionally) supported management initiatives are developed and promoted at the WCPFC level. Support for management outcomes is provided through:

- The collection and sharing of scientific data via an in-country logbook and observer programme;
- Regular stock assessments carried out by SPC;
- The development and consideration of scientific advice, primarily through the scientific committee of the WCPFC;
- Agreement on matters of common interest between states fishing for bigeye, yellowfin and swordfish, via the full WCPFC; and
- 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 overcomes capacity and resource constraints perhaps facing some Pacific Island Countries and Territories' (PICTS) national fisheries management authorities. There is also an agreement over the cross-endorsement of regional high-seas observer programmes between WCPFC and IATTC. Cooperation through SPC and the WCPFC has allowed for the development and to some extent implementation of sustainable management arrangements for the tuna fishery as required under the obligations of UNCLOS Articles 63(1 & 2), 64 and FSA Article 8. The work of SPC as the science provider, and the Commission as coordinating secretariat, provides a strong framework for cooperation as required under SFA Article 10 (in reference to RFMOs). Based on the above, there is an effective system and effective binding procedures for regional cooperation, such that **SG60, SG80 and SG100 are met**.

IATTC

The Antigua Convention of 2003 governs fishing for tuna and tuna-like species on the high seas and in zones of national jurisdiction (Medley et al., 2021) of the EPO, east of 150°W. The Antigua Convention, which modernizes the provisions of the original 1949 Convention between the United States of America and the Republic of Costa Rica for the establishment of an Inter-American Tropical Tuna Commission, entered into force in 2010. Akin to the WCPFC Convention, the Antigua Convention now explicitly recognizes the 1982 UNCLOS (especially the concept of EEZs), the FAO Code of Conduct for Responsible Fisheries (1995), including the 1993 FAO Compliance Agreement and International Plans of Action adopted by FAO within the framework of the Code of Conduct, and the 1995 UN Fish Stocks Agreement (UNFSA or SFA). IATTC was established to ensure the long-term conservation and sustainable use, via the precautionary approach (Article IV), of the fish stocks in the Convention area in accordance with the relevant rules of international law contained in the Convention. The IATTC is tasked to co-ordinate scientific research and to make recommendations designed to maintain populations of tuna at levels which will permit maximum sustainable yield. The Convention clearly promotes implementation of these international agreements within its area of jurisdiction to deliver management outcomes consistent with MSC Principles 1 and 2. The Antigua Convention further recognises the Rio Declaration on Environment and Development and Agenda 21 (UN 1992) on sustainable development, conservation of biodiversity and protection and management of oceans, and the follow-up Johannesburg Declaration and Plan of Implementation adopted by the World Summit on Sustainable Development (UN 2002). But WCPFC has

these prerequisites directly in its Article 8 already. Much like the WCPFC Resolutions, those for IATTC are also more “aspirational statements” on appropriate behaviour or actions, which may not necessarily be binding. However, Recommendations for management measures, agreed to by consensus and adopted by the Commission, are binding for all members forty-five (45) days after their notification (Article IX (7)) unless any member notifies the Director in writing before 45 days, that it cannot join such consensus, in which case the relevant decision or decisions shall have no effect, and the Commission shall seek to reach consensus at the earliest opportunity. Since the U.S. has agreed to abide by the IATTC Recommendations and Resolutions relevant to the fishery under assessment, **SG60, SG80 and SG100 are met.**

United States

At the national level, the Magnuson-Stevens Fishery Conservation and Management Act (as amended through 2007 - MSA) is the main law governing the management of living marine resources in the United States. Under the MSA the United States has exclusive fishery management authority over all fishery resources found within its EEZ. The Western Pacific Regional Fishery Management Council (WPRFMC or the Council) is one of eight regional fisheries management councils established under the MSA to manage the offshore fisheries and the MSA guides nearly all the Council’s actions. The Council has the authority over the fisheries based in and seaward of the territories of American Samoa and Guam, the State of Hawaii, the Commonwealth of the Northern Mariana Islands, and the U.S. Pacific Remote Island Areas of the Western Pacific Region. The MSA directs the Councils to base management measures on the best scientific information, reduce bycatch and consider the effect of management measures on communities and protect essential fish habitat. Management measures created by the Council and approved by the Secretary of Commerce are implemented by the National Marine Fisheries Service (NMFS) Pacific Islands Regional Office and enforced by NOAA Office of Law Enforcement (OLE), the U.S. Coast Guard 14th District and local enforcement agencies. There is an active established framework for cooperation with other U.S. states and territories through participation in the Council’s Advisory Bodies that include the Regional Ecosystem Advisory Committees, Science and Statistical Committee, Plan Teams, Advisory Panel and Marine Protected Area Advisory Committee, Fisheries Data Coordinating Committee, and Protected Species Advisory Committee. Since 2005, the Council recommended implementation of a Fishery Ecosystem Plan (FEP) for federally managed pelagic fisheries of the Western Pacific Region. The current Pelagics FEP (WPRFMC, 2009) details federal fishery regulations and establishes appropriate structures and guidelines for the Council and its Advisory Bodies to develop and implement management measures. The Pacific Pelagics FEP was implemented to ensure that management is ecologically sustainable and in accordance with the principles of ecological sustainable development and the precautionary approach. A comprehensive legal framework for regulating the longline fishery is provided through the Hawaii-based Pelagic Longline Fishing Regulations (revised in NMFS (2020e)). Federal Regulations that are also relevant to the management of the longline fishery are under Title 50 of the Code of Federal Regulations (CFR) Parts 229, 300, 404, 600, 665 and 816 (The CFR for Wildlife & Fisheries)).

The United States is an active participant in the development and implementation of international agreements regarding marine resources made by the IATTC and WCPFC conventions. The United States has ratified these Conventions, both of which are consistent with the principles and provisions of the United Nations Law of the Sea (UNCLOS) and the UN Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995) and follow international laws and protocols. As a member of WCPFC and IATTC and thus party to both Conventions, the United States is legally bound to apply the precautionary approach. Relevant to this assessment, The United States has adopted the WCPFC Conservation and Management Measure for bigeye, yellowfin and skipjack tuna (CMM 2020-01), the Conservation Management Measure for swordfish (CMM 2009-03) and IATTC Recommendations (C-03-01 for BET, C-05-02 and C-18-03 for N. Pacific albacore and C-20-05 for tropical tunas). The United States also cooperates in the development and recommendations for management of highly migratory stocks through regional and international fisheries organisations including the Pacific Community (SPC), WCPFC, FFA, and IATTC through the collection and sharing of catch and effort data, provision

of scientific and compliance advice, monitoring, control and surveillance initiatives (regional FFA monitoring system (VMS), record of fishing vessels in “good standing” at FFA/WCPFC and IATTC), and high seas boardings and inspection. Based on the above, **SG60, SG80 and SG100 are met.**

In conclusion, 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 most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.
	Met?	Yes	Yes	No

Rationale

WCPFC

There are three mechanisms for dealing with legal disputes at the international level. First, disputes can be dealt with at the WCPFC annual meeting of members through consultation or conciliation. Second, disputes might be resolved through a review panel, or third they might be resolved through either the International Court of Justice (ICJ) or the International Tribunal for the Law of the Sea (ITLOS). The dispute resolution mechanism is set out under Article 31 of the Convention and allows for a transparent process to occur. Essentially, this Article implements the dispute settlement arrangements established in the FSA and binds all WCPFC Members to those arrangements, whether they are Parties to the FSA or not. These arrangements are set out in Part VIII of the Agreement where Article 30 sets out the Procedures for the Settlement of Disputes. These arrangements mirror the provisions of Part XV of UNCLOS. The WCPFC has a consensus-based decision-making process, with provision for a two-chambered voting process (without voting rights for Participating Territories) requiring a 75% majority in both chambers if all efforts to reach a decision by consensus have been exhausted. Article 20 (with details in Annex 2) of the Convention allows for the establishment of a Panel to review decisions of the Commission in certain defined circumstances. These are:

- The decision is inconsistent with the provisions of this Convention, the Agreement or the 1982 Convention; or
- The decision unjustifiably discriminates in form or in fact against the member concerned.

This review process was recently invoked at WCPFC12 (2016) over implementation of a CMM which was blocked by only one member country (Japan), thus provoking the call for a vote, for the first time in Commission history. However, consensus was achieved at the 11th hour of the last day of the meeting. 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. According to Medley et al. (2021), the

Commission has yet to be subject to any court challenges. This suggests that the “prescribed” WCPFC dispute mechanism is transparent and is considered effective in dealing with most issues, such that **SG60 and SG80 are met**. The effectiveness of the other *informal* WCPFC mechanisms is unclear, and it is possible that some disputes are under suspension rather than resolved. Therefore, the available evidence indicates that resolution of legal disputes is appropriate but has yet to be tested and proven effective for fisheries under WCPFC management. It is deemed that **SG100 cannot be met**.

IATTC

Like the WCPFC, there are three mechanisms for dealing with legal disputes in the IATTC. First, Part VII Article XXV of the Antigua Convention establishes a non-prescriptive dispute resolution framework, outlining that dispute between or among members can be dealt with at the IATTC annual meetings of the Parties through consultation and conciliation. Second, if there are technical disputes, and if both parties agree, these may be resolved through an appropriately composed expert or technical panel without recourse to binding procedures to the settlements. As a last step, disputes might be resolved through either the ICJ or the ITLOS. The adoption of resolutions and recommendations proposed by IATTC members is transparent. Members and observers present at meetings can participate in informed discussions. Resolutions require consensus however, so members can “veto” decisions simply by not agreeing to a measure and there is no formal system of arbitration or conciliation when differences arise over recommendations (i.e. no voting mechanism as explained in PI 3.1.1a). This case was illustrated at 96th IATTC extraordinary meeting (IATTC, 2020b) held to address potential changes to resolution C-17-02 on the conservation and management measures for tropical tunas in 2021 discussed, without consensus, at the 95th IATTC meeting. Based on recommendations from the SAC 11, further actions to limit fishing mortality at appropriate levels and in particular to avoid increases of fishing mortality beyond the status quo conditions should be taken. However, the decision was adopted through Resolution C-20-05 such that the conservation and management measures established in Resolution C-17-02 were maintained for 2021, and commitments were established for consultations through various IATTC discussion bodies to strengthen the conservation and management measures for tunas over a three-year period. Therefore, Resolution C-20-06 for tropical tunas is now 2022 – 2024, and at the 97th IATTC extraordinary meeting (IATTC, 2021a) it was decided that further discussions on this subject will continue at the Annual Meeting in August 2021 (IATTC_SAC, 2021). According to Medley et al. (2021), there are no outstanding disputes among members for the relevant fisheries and no disputes have been referred to ICJ/ITLOS. This suggests that the IATTC mechanism prescribed under Part VII can be considered effective in dealing with most issues, and therefore **SG60 and SG80 are met**. As for WCPFC, the effectiveness of the other *informal* WCPFC mechanisms is unclear, and it is possible that some disputes are under suspension rather than resolved. However, the effectiveness of formal IATTC mechanisms have not been tested since no evidence could be found of disputes from the documentation available. Therefore, **SG100 is not met**.

United States

At the national level, the management system for the Hawaii-based pelagic longline fishery has well-established mechanisms for administrative and legal appeals of management decisions. Under the Magnuson-Stevens Fishery Conservation and Management Act, Section 308 (Civil Penalties and Permit Sanction):

- Assessment of Penalty – Any person who is found by the Secretary, after notice and opportunity for a hearing in accordance with Section 554 of Title 5, United States Code to have committed an act prohibited by Section 307 shall be liable to the United States for a civil penalty and

- Review of Civil Penalty – Any person against whom a civil penalty is assessed under subsection (a) or against whom a permit sanction is imposed under Section (g) may obtain a review thereof in the United States district court for the appropriate district by filing a complaint against the Secretary in such court within 30 days from the date of such order.

Decisions of the Council are made by a majority “show of hands” of the eligible voting members and minority opinions (if any) must be accepted and put in the meeting records. When duly authorized enforcement officers issue citations for any violations of any provisions in the MSA, whether civil or criminal, and under the presumption of innocence, the affected party or parties are advised of their rights to appeal, and of the processes involved for such appeal, via communications with the U.S. fisheries enforcement agencies. When reviewing potential regulatory changes, the Council draws upon the services of public and private stakeholders who serve on Council panels and committees. An example of legal dispute resolution under WPRFMC procedures relevant to the fishery under assessment, involved an appeal made by the client (HLA) against NMFS to overturn/revise an existing ruling which had the effect of closing swordfish fishing to the entire fleet due to “excessive” turtle interactions¹⁷. HLA sought, among other things, to have a Biological Opinion (BiOp) vacated and remanded to NMFS, to review and comment on the preparation of a new BiOp. Based on a recommendation of the Council and its Advisory Panel, NMFS issued a ruling which subsequently allowed these U.S. vessels to fish in certain areas within the designated Area. The dispute settlement mechanism outlined in Council SSOPs (WPRFMC, 2019a), as well as under MSA at Sections 308 to 310, allow for transparent processes to occur. Therefore, the mechanisms for dispute resolution are transparent and considered to be effective in dealing with most issues at the national level, and have been *tested and proven* to be effective in at least the specific case cited, such that **SG60, SG80 and SG100 are considered to be met.**

In conclusion, SG60 and SG80 are met at all levels of jurisdiction, but SG100 is not.

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

¹⁷ Hawaii Longline Association v. National Marine Fisheries Serv., 281 F. Supp. 2d 1 (D.D.C. 2003)

WCPFC

At the regional level, the WCPFC Convention provides for the recognition of the interests of small-scale and artisanal fishers with the overall framework for sustainability in the WCPFC Convention. For example, under Article 5, the Convention states that “in order to 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. Based on the above, 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. Therefore, **SG60, SG80 and SG100 are deemed met.**

IATTC

While there is no formal commitment from IATTC to ensure the management system considers the legal rights of customary fishing practices, the intention to take this into account in a manner consistent with MSC P1 and P2 can be found in the IATTC Antigua Convention (Part VI Article XXIII). This states that the Commission will adopt measures to assist developing countries to carry out their responsibilities and obligations under the Convention and will improve the capacity for fisheries development in national jurisdictions, as well as to enhance their ability to develop fisheries under their respective national jurisdictions and to participate in high seas fisheries on a sustainable basis. The intention to protect legal rights of those customary fishing is perhaps demonstrated by an absence of measures preventing catches by those dependent on fishing for food and livelihoods and exemptions under the current Resolution which appear designed to protect artisanal fleets. For example, longline vessels less than 24 metres in length are exempt from various measures designed to limit fishing activity on bigeye and yellowfin tuna stocks. It may also be assumed that customary rights are being addressed with the opening statement of the Convention “Taking into account the special circumstances and requirements of the developing countries of the region, particularly the coastal countries, in order to achieve the objective of the Convention” while also under Part IV Article XVII where “No provision of this Convention may be interpreted in such a way as to prejudice or undermine the sovereignty, sovereign rights, or jurisdiction exercised by any State in accordance with international law”. Fishing rights such as those allocated by IATTC for bigeye or on effort levels are broadly based on a Party’s track record in the fishery, thereby providing a certain measure of protection of traditional fishing rights in a manner consistent with the objectives of MSC Principles 1 and 2. Based on the above **SG60 and SG80 are met.** But, given there is no *formal commitment* under IATTC language, **SG100 is not considered met.**

United States

At the national level, Section 305(i)(2) of the MSA authorizes the Council and the Secretary of Commerce through NMFS to establish a Western Pacific Community Development Program. The intent of the program is to provide Western Pacific communities access to fisheries that they have traditionally depended upon but may not have the capabilities to support continued and sustainable participation in, possibly due to economic, regulatory, and other barriers. To be eligible to participate in the program a community must consist of residents descended from the aboriginal people indigenous to the area who conducted commercial and subsistence fishing using

traditional fishing practices in the waters of the Western Pacific Region and submit a Community Development Plan to the Council and Secretary. In addition, the Council is required to consider traditional indigenous fishing practices in preparing any fishery ecosystem management plan. Under the Sustainable Fisheries Act, Councils are directed to consider the effect of management measures on communities. On the basis of the above, **SG60, SG80 and SG100 are deemed met.**

In conclusion, SG60 and SG80 are met at all levels of jurisdiction, but SG100 is not.

References

Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995)

Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC Convention 2000)

Inter-American Tropical Tuna Commission Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established By The 1949 Convention Between the United States of America and the Republic of Costa-Rica ("Antigua Convention") 2003.

Magnuson-Stevens Fishery Conservation and Management Act (2007)

UNCLOS (Part V)

WCPFC CMM 2020-01 Conservation and Management Measure for bigeye, yellowfin and skipjack tuna in the Western and Central Pacific Ocean.

IATTC (1990, 2020c, 2021a, 2021b), Medley et al. (2020), Medley et al. (2021), WPRFMC (2009), IATTC_SAC (2021), NMFS (2020e) and WPRFMC (2019a)

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 47. 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

Functions, roles and responsibilities are explicitly defined within the WCPFC. Convention Articles 9 – 16, 23 – 24 and 44 provide information on the functions, roles and responsibilities of CCMs 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 also cooperates with all relevant sub-regional organisations; for example, the Forum Fishery Agency (FFA), International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), Secretariat for the Pacific Regional Environment Programme (SPREP), Indian Ocean Tuna Commission (IOTC), Inter-American Tropical Tuna Commission (IATTC). Although not relevant directly to the client fishery, WCPFC also cooperates with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the Agreement for the Conservation of Albatross and Petrels (ACAP) and North Pacific Anadromous Fish Commission (NPAFC)), whose roles are also well-defined and understood. The Offshore Fisheries Programme (OFP) of the Pacific Community (SPC) is the scientific service provider of the WCPFC and provides members with scientific support and advice on the status of tuna stocks and other related species. The FFA is an advisory body that provides expertise and technical assistance to member countries and facilitates effective regional cooperation and co-ordination on fisheries policy, management, legal frameworks and MCS and other operational activities. The roles and responsibilities of CCMs and the Commission Secretariat are explicitly defined within the WCPFC Convention, and, through the effective administration and outputs of the

various committees and other consultative arrangements administered by the Commission, there is clear evidence that roles and responsibilities are well understood such that SG60 and SG80 are met. However, Medley et al. (2021) deem that WCPFC still has problems with *some* Flag States that have not applied appropriate controls to all their vessels (the Hawaii-based/client fleet is not one of those) as it appears that not all vessels understand their responsibilities. In some cases, there appears to be conflicts between requirements for confidentiality and the responsibilities to provide information necessary for management. Part of the problem may be attributed to translation of the Convention text from English, into other languages. These problems are not in *key* areas and do not prevent WCPFC from completing its primary tasks. On the above evidence **SG60 and SG80 are considered to be met** but **SG100 is not met**.

IATTC

Functions, roles and responsibilities are explicitly defined within IATTC. The Antigua Convention explicitly defines decision-making processes (under Article IX) and the roles of the Commission (Article VII), the Committee for the Review of Implementation of Measures Adopted by the Commission (Article X), the Scientific Advisory Committee (Article XI), the Director (Article XII), the scientific staff and Flag States. The performance of the Secretariat is sound and well regarded as both efficient and effective by the Parties (Medley et al., 2021). IATTC is closely linked to the WCPFC, which is recognised through a Memorandum of Understanding (MOU) that clearly lays out the type and level of cooperation. The Parties to IATTC themselves may vary in their ability to perform their role, but the roles and responsibilities are nevertheless explicitly defined, at least at the national level for key areas. Key areas include providing catch and monitoring data to the Secretariat, taking part in various meetings, sharing and exchanging information and making decisions, meeting the requirements for conservation and other recommendations for IATTC and applying appropriate levels of MCS (Medley and Gascoigne, 2017). On this basis both **SG60 and SG80 are considered met**. However, according to Medley et al. (2021), roles and responsibilities are not necessarily well-understood for all areas, as IATTC continues to have issues with Flag States not applying appropriate controls to all their vessels and not submitting timely and correct data due to a lack of understanding of requirements, which undermines the overall effectiveness of IATTC, especially with regard to target species stock assessments being up to date. This last issue thus results in **SG100 not being met**.

United States

At the national level, NOAA Fisheries (aka the National Marine Fisheries Service (NMFS)), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce. Nation-wide it has five regional offices, six science centers and more than 20 laboratories around the United States. NOAA Fisheries is responsible for the stewardship of the nation's ocean resources and their habitat. Using the MSA as a guide, NOAA works in partnership with the Western Pacific Regional Fisheries Management Council (the Council) to assess and predict the status of the fish stocks, set catch limits, ensure compliance with the fisheries regulations, and reduce bycatch. The Council is made up of 16 Council members, the Council staff and several Council Advisory Bodies that include the Scientific and Statistical Committee (SSC), the Archipelagic and Pelagic Plan Teams, the Advisory Panel (AP), Regional Ecosystem Advisory Committees (REAC) and other committees. The Advisory Bodies provide comments, both written and oral, on relevant issues being considered by the Council. The Council's decisions are based on the best available scientific information provided largely by the Pacific Islands Fishery Science Center (PIFSC) and their Pelagic Fisheries Research Program and transmitted to the Secretary of Commerce for approval. Management measures created by the Council and approved by the Secretary of Commerce are implemented by the NMFS Pacific Islands Regional Office (PIRO) and enforced by the NOAA Office of Law Enforcement, the U.S. Coast Guard 14th District and local enforcement agencies. Based on the above, functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction; **SG60, SG80 and SG100 are met**.

In conclusion, SG60 and SG80 are met at all levels of jurisdiction, but SG100 is not.

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

At this regional level, there are extensive formal and informal consultation processes at the WCPFC that regularly seek and accept information from members and cooperating non-members specifically via Part 1 and Part 2 Country reports, including information on compliance, economics and social issues. The Commission is active in assisting and facilitating the regular and timely provision of fisheries data and information for assessment by the Commission secretariat and scientific providers, such as SPC. The Commission actively uses information from the fishery and its member states including use of “local knowledge”. At the international level this is assumed to refer to national information and experience, 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. However, what is not totally clear is how such information is selected/chosen for incorporation (or not) into such reports that are publicly available. At this regional level, **SG60, SG80 are met** but **SG100 is not deemed to be met**.

IATTC

Consultation processes and the generation of relevant information are formalised and regularly scheduled through the Commission and its subsidiary bodies. There are annual meetings of the Commission and specialist working groups (comprising scientists from contracting parties) as well as technical meetings. Information derived from these working groups and meetings are used by decision-makers and considered as part of the generation of management advice provided by IATTC. As is the case for the WCPFC, “local knowledge” as understood at IATTC is also assumed to refer to national information and experience (Medley et al., 2021). The IATTC management system demonstrates consideration of the information obtained, with scientific reports stating exactly what information is being used, how it is used and providing justification when information is rejected. However, information used by management other than the scientific information is not so clearly reported (Medley et al., 2021). Although

much of this information can be inferred from various sources, it is not necessarily clear how different sources of information on compliance, economics and social issues for instance, are selected for incorporation or not, into publicly available reports. Therefore, **SG60 and SG80 are met, SG100 is not met.**

United States

On a national level, the Council meets three times a year in open public access venues, to address fisheries management issues concerning the Western Pacific Region (WPRFMC, 2019a). The Council's Advisory Bodies participate in these meetings and are consulted to provide input into management measure decision-making. Its Pelagic Fishery Ecosystem Plan (FEP) Team oversees the on-going development and implementation of the Pacific Pelagics FEP and is responsible for reviewing information pertaining to the performance of all the fisheries and the status of the stocks managed under the Pelagics FEP. The Team meets at least once annually and is comprised of individuals from local and federal marine resource management agencies and non-government organisations. The Council's Science and Statistical Committee also meets three times annually in open public access venues, and is composed of scientists from local federal agencies, academic institutions, and other organisations. The role of the SSC is to identify scientific resources required for the development of FEPs and amendments, review management plans and amendments and advise the Council on their scientific content. The Advisory Panel (AP) comprised of commercial fishermen, buyers, consumers and others knowledgeable about fisheries in the region provide guidance and advice to the Council on industry-related issues. The Pacific Pelagics FEP Annual Reports (WPRFMC, 2020) are available on the wpcouncil.org website. The reports provide information on the status of the fish stocks and other components of the ecosystem. Also, information provided by the Council's Science and Statistical Committee and the Advisory panel is used for developing management and mitigation measures concerning the Hawaii longline fleet for endangered species including sea turtles, seabirds and marine mammals (NMFS, 2020e). **SG60, SG80 and SG100 are therefore met.**

In conclusion, SG60 and SG80 are met at all levels of jurisdiction, but SG100 is not.

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	Yes

Rationale

WCPFC

The WCPFC Secretariat facilitates effective engagement by stakeholders. Attendance at Commission and related meetings is comprehensive and logistic and financial support is provided to cooperating non-members to ensure attendance and meaningful involvement and interaction in the cooperative management of fisheries in the WCPO. NGOs can attend meetings as observers and may make statements, which are included in the official record. As several stocks and fisheries are shared with WCPFC

and IATTC, there is an MOU as well as two Memoranda of Cooperation in place which establish and maintain consultation, cooperation and collaboration in respect of matters of common interest, including the exchange of data and information, scientific research and conservation and management measures for stocks and species of mutual interest (Medley et al., 2021). The respective Secretariats also encourage representatives at each other's meetings where appropriate, as well as facilitate a WCPFC-IATTC consultative meeting. Additional services are provided to member States *sub-regionally* through the FFA and SPC as well. Based on information available from WPRFMC and Sub-regional meetings held by FFA, SPC and PNA for example, there is enough evidence to conclude that all interested parties have the opportunity and are encouraged to participate in consultation processes, with formal arrangements in place to facilitate engagement. As there is a formal consultation process at the regional and sub-regional level that provides opportunity and encouragement for all interested parties to be involved and facilitates their active engagement, **SG80 and SG100 are met.**

IATTC

Consultation at the international level is formalised and there are well-developed mechanisms for obtaining and using appropriate information. The opportunity to become a Contracting Party or Co-operating Non-Contracting Party is open to all, including non-States, without a *numerus clausus*. Article XVI 1b of the Antigua Convention *requires* the commission to "facilitate consultations with, and the effective participation of, non-governmental organizations, representatives of the fishing industry, particularly the fishing fleet, and other interested bodies and individuals". IATTC has a special fund to strengthen the institutional capacity of developing countries to sustainably develop their fisheries so they can comply with IATTC conservation and management measures (Resolution C-14-03). This includes sufficient capacity to collect, maintain and analyse relevant data and to participate at meetings (Medley et al., 2021). Interested NGOs also have an opportunity to observe at meetings, and participation by fishers is also encouraged. As noted above, an MOU as well as two Memoranda of Cooperation have been established that governs cooperation between the WCPFC and IATTC in relation to shared stocks. These instruments establish and maintain consultation, cooperation and collaboration in respect of matters of common interest, including the exchange of data and information, scientific research and conservation and management measures for stocks and species of mutual interest (Medley et al., 2021). The respective Secretariats also encourage representatives to participate at each other's meetings, where appropriate, as well as facilitate WCPFC-IATTC consultative meetings. On this basis **SG80 and SG100 are met.**

United States

The national management system provides regular and extensive opportunities for stakeholder groups to provide input to the management of the fishery. All Council meetings are open to the public. Agendas are posted on the Council's website and briefing materials are made available to the public during meetings. Public comments concerning the briefing materials for agenda items are considered by the Council. Minutes are taken for each meeting and are available to the public on the Council website. In developing management plans, the Council provides a public forum for decision-making and works closely with communities, local governments, federal agencies and local and international organisations. The HLA itself participates at both Council and WCPFC meetings, responding to issues and supporting the development of functional / practical measures. Communities and community members are involved in the Council's management process with explicit advisory roles, as sources of fishery data, and as stakeholders invited to participate in public meetings, hearings, and comment periods. In addition, cooperative research initiatives have resulted in joint research projects, especially dealing with bycatch mitigation technologies, where scientists and fishers work together to increase both groups' understanding of the interplay of humans and the marine environment. The Council convenes and solicits recommendations from a variety of committees as warranted, such as the Protected Species

Advisory Committee, Marine Protected Area Advisory Committee and Fisheries Data Coordinating Committee. Many NGOs regularly and actively participate in Council meetings concerning the management of the fishery. Given the above information, **SG80 and SG100 are met.**

In conclusion, SG80 and SG100 are met overall.

References

IATTC (2003, 2019a), IATTC_WCPFC (2006, 2009), WPRFMC (2009, 2019a, 2019b), WCPFC (2009a, 2009b, 2011)

Magnuson-Stevens Act (revised 2007)

WPRFMC website <http://www.wpcouncil.org>

WCPFC, SC and TCC meeting records

WCPFC Rules of Procedure

WCPFC website. <http://www.wcpfc.int>

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 48. 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 WCPO bigeye, yellowfin and NP swordfish stocks, the bycatch species and ecosystem (P2). Long-term objectives are explicit within the WCPFC Convention. 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 how 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 beginning 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. Nonetheless, target reference points, harvest strategies and harvest control rules still have not been formulated for all managed stocks. However, four Commission Management Objectives Workshops (MOWs) have been held on this issue (up to 2015) and SC along with Intersessional working groups continue to further these efforts. While the precautionary approach is a *stated* requirement for WCPFC, in practice it is less clear that the precautionary approach is applied uniformly or consistently across member decisions. Earlier stock assessments in 2010, 2011 and 2014 indicated that bigeye fishing mortality exceeded levels consistent with MSY. Thus, bigeye tuna was considered overfished from 2011-2017. Precautionary limit reference points were set and CMMs updated, clear precautionary action that sufficiently

reduced exploitation levels were not evident before an updated assessment (from 2017 onward) indicated that the stock was in fact not overfished and overfishing was no longer occurring, but without being able to reduce fishing mortality on the stock. 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. Long-term objectives are guiding decision-making and explicit actions are being undertaken to continue to develop and implement management arrangements that support achievement of the objectives. Based on the above, **SG60 and SG80 are met** for this regional system, but **SG100 is not**.

IATTC

The Antigua Convention provides clear, long-term objectives that guide decision-making under MSC P1 and P2. For example, the objective of the Antigua Convention under Article II is to “ensure the long-term conservation and sustainable use of the fish stocks by this Convention, in accordance with the relevant rules of international law.” The Antigua Convention also has an explicit provision under Article IV, paragraph 1 to apply the “precautionary approach, as described in the relevant provisions of the Code of Conduct and/or the FSA, for the conservation, management and sustainable use of fish stocks”. This is reiterated in the functions of the Commission under Article VII, along with the need to take an ecosystem approach to management. For example, under Article VII, paragraph 1(f), the Commission is required to “adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened.” Although the precautionary and ecosystem approaches to management are explicit in the Antigua Convention text, it is less clear that they are applied in all policy. Medley et al. (2021) suggest that reference points for bigeye tuna may be precautionary when considering scientific uncertainties, but decisions taken at the Commission level and implementation of those adopted regulations did little to prevent bigeye stock declining to current levels. Nonetheless, an analysis of progress in implementing Ecosystem-Based Fisheries Management in policy among tuna RFMOs, Juan-Jorda et al. (2017) stipulated that IATTC had made considerable progress within the ecological component of target species (through defining a long-term operational objective of MSY to tuna and tuna-like species), moderate progress in the ecological component of bycatch species as well as ecosystem properties and trophic relationships (through emphasizing its importance in Article VII of the Antigua Convention), but little progress in the habitat component. Based on this evidence, **SG60 and SG80 are met** as there are clear explicit objectives incorporating the precautionary approach and ecosystem-based management, but **SG100 is not**, as it is not clear that the precautionary approach and ecosystem approach to fisheries is required by management policy.

United States

The long-term objectives at the national level are clearly specified in the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Key objectives of the MSA are to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits and ensure a safe and sustainable supply of seafood. The MSA mandates and authorizes fishery management councils to create fishery management plans to meet the objectives outlined in the Act. Accordingly, the Council has developed Fisheries Ecosystem Plans, consistent with the MSA and the national standards for fishery conservation and management. The Pacific Pelagic Fisheries Ecosystem Plan (FEP) provides a framework under which the Council manages pelagic fishery resources in the Western Pacific Region and specifies the integration and implementation of ecosystem approaches into the management system. The MSA and FEP apply to the Hawaiian and other US Pacific Islands’ waters under the jurisdiction of the Council. The ecosystem approach of the Pelagics FEP is consistent with the MSC Principles and Criteria and application of the precautionary approach. Since the U.S. framework requires clear management plans to be developed with explicit objectives constituent with the legislation, **SG60, SG80 and SG100 are met**.

In conclusion, because the national management system meets SG100, but the regional ones only achieve SG80, a partial score of 85 is achieved.

References

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (“WCPFC Convention”)

Inter-American Tropical Tuna Commission Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established By The 1949 Convention Between the United States of America and the Republic of Costa-Rica (“Antigua Convention”)

Juan-Jorda et al. (2017), Medley et al. (2021), WCPFC_SC (2017), McKechnie et al. (2017a)

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 49. 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 overarching long-term objective of the WCPFC is “to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 UNCLOS and the 1995 UNFSA.” Regional fishery-specific objectives are set out in CMMs, which are reviewed regularly. Long-term objectives for WCPFC, already covered above in PIs 3.1.1, 3.1.2 and 3.1.3, also require that the specific management system be consistent with the fishery objectives (but not the strategies) for this PI. Objectives relating to MSC P1 and P2 outcomes are endorsed by each member and states as CMMs related to target fish stocks (CMM 2020-01 and 2009-03), sea turtles (CMM 2018-04), seabirds (CMM 2018-03), sharks and rays (CMM 2019-04 and 2019-05). More specifically, CMM 2020-01 for bigeye and yellowfin tuna still has the following explicit objectives, pending agreement on a target reference point; the spawning biomass depletion ratio ($SB/SB_{F=0}$) be maintained at or above the average $SB/SB_{F=0}$ for 2013-2015 for bigeye, and at or above the average $SB/SB_{F=0}$ for 2012-2015 for yellowfin. To meet these objectives, CCMs have agreed to take measures to not increase catches by their longline vessels of yellowfin and bigeye. Similarly, provisions for swordfish (CMM 2009-03) and other species are designed to maintain current exploitation with the objective for sustainable use, but do not address fisheries development. For the fishery under assessment, the target species' current stock status all indicate none are overfished nor is there overfishing occurring. Thus, while short and long-term objectives may not be explicitly stated they can certainly be inferred from results of application of the various CMM texts in practice. For CMMs addressing bycatch, such as turtles, the objective is to minimise bycatch in the relevant fisheries and return bycatch, if possible, alive, using “mandated” best handling practices. These objectives are assessed through the regional observer programme. Juan-Jorda et al. (2017) have noted that while there is a range of conservation and management measures within WCPFC to manage target species and mitigate effects of fishing on bycatch species, these are not yet linked to agreed-upon operational objectives, associated indicators, or reference

points, precluding them from being activated when such reference points are exceeded (assuming they will exist). Furthermore, while the WCPFC Convention captures the importance of addressing broader impacts of fishing on species belonging to the same ecosystem that are affected by fishing, no actual measures have been adopted to account for and minimise the impacts of fishing on the trophic relationships and food web structure of marine ecosystems or protection of habitats of special concern as required under an Ecosystem-based Management regime. Nonetheless, the fishery under consideration (longline method) may have a smaller “ecological footprint” aside from simply comparing total catches of target species between longline and purse seine fleets. This assertion has been tested (Allain et al., 2015) using computer simulations showing that the largest impacts of changes in purse seine and longline fishing effort are likely to be on the groups comprising long-lived, bycatch species with lower productivity, with increases in longline fishing resulting in greater mortality of sharks, opah and some billfish species. However, the negative impacts on shark mortality decreased by the implementation of current shark and the other bycatch mitigation measures. Therefore, because current CMMs in force contain reasonably explicit and specific intentions and objectives, and also allow evaluation of performance against these objectives, **SG60 and SG80 are met**. However, although broadly measurable (annual observer data from Part 1 country reports to SC), they are not necessarily well-defined from an all-inclusive ecosystem point of view for MSC P2, so **SG100 is not met**.

IATTC

As previously described in PI 3.1.3, there are well-defined, long-term objectives under the Antigua Convention in relation to target stocks and the ecosystem and which are considered when scientific advice is given in developing conservation and management measures. The Antigua Convention offers guidance and principles on which management plans can be developed. This includes objectives that apply to both target stocks (MSC P1) and the ecosystem (MSC P2). Each conservation and management measure has an explicit aim and intention, which allows for monitoring of performance against these objectives. Concerning target stocks, new benchmark assessments for yellowfin and bigeye tuna were presented at SAC11 (IATTC, 2020c) following an external review of assessment methodologies (Cass-Calay et al., 2019; Punt et al., 2019). For yellowfin, the overall results of the IATTC risk analysis, indicate only a 9% probability that the fishing mortality corresponding to the maximum sustainable yield (F_{MSY}) has been exceeded and that there is only a 12% probability that the spawning stock biomass corresponding to the maximum sustainable yield (S_{MSY}) has been breached. The probability that the F and S limit reference points as specified in the Harvest Control Rules have been exceeded is zero. Thus, the risk analysis unambiguously shows that the yellowfin stock in the EPO is healthy. For bigeye, the overall results of the risk analysis indicate a 50% probability that F_{MSY} has been exceeded and a 53% probability that $S_{current}$ is below S_{MSY} . So, the probabilities that the F and S limit reference points have been exceeded are not negligible as is the case for YFT. However, the combined probability distribution for the pessimistic models shows only a 10% probability of exceeding F_{LIMIT} for the current purse seine closure duration (72 days), indicating that it is unlikely that this limit has been exceeded. Therefore, a status quo harvest strategy is deemed appropriate in the short term. For WCNPO swordfish, as noted in Section 6.4.2 above, the 2018 catch was reported as approximately 9,900 t and the 2019 catch was 8,640 t (ISC_BWG, 2018a). Overall, longline gear has accounted for the vast majority of WCNPO swordfish catches since the 1970s, and the majority of the US Pacific swordfish catch comes from Hawaiian-based longline vessels – accounting for roughly 65 % of the total US North Pacific catch. So, as summarised in the ISC_BWG (2018a) assessment, there is no evidence of excess fishing mortality above F_{MSY} ($F_{2013-2015}$ is 45% of F_{MSY}) nor of substantial depletion of spawning potential (SSB_{2016} is 87% above SSB_{MSY}). Therefore, the WCNPO swordfish stock is not likely overfished and is not likely experiencing overfishing.

Therefore, there is a range of conservation and management measures within IATTC to manage target species and mitigate the effects of fishing on bycatch species, and these are beginning to be better linked to pre-agreed operational objectives, associated indicators and reference points, such that they can eventually be activated when pre-defined reference points are exceeded (Juan-Jorda et al., 2017). Furthermore, IATTC has adopted measures to account for and minimise the impacts of fishing on some

aspects of trophic relationships and food web structure of marine ecosystems but not necessarily the protection of habitats of special concern as required under Ecosystem-based Approach to Fisheries Management (EAFM). These include data gathering and analyses of fishery interactions with such species groups as marine mammals, sea turtles, seabirds, sharks, mobulid and other rays, other large bycatch fish species, and forage species. IATTC, through its SAC, has collected and analysed physical environmental indicators to inform their effects on the dynamics and catchability of target and bycatch species since 2007 (see IATTC_SAC (2021)). Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit. However, given some but not all objectives are well-defined and measurable, both **SG60 and SG80 can be awarded**, but **SG100 is not met**.

United States

For consideration of National MSC P1 objectives, the Council has adopted several short- and long-term objectives in the Pelagic FEP (WPRFMC, 2009) to improve the Council's abilities to realize the goals of the MSA through the incorporation of ecosystem science and principles. Objective 1 of The Pelagic FEP (2009) is to maintain biologically diverse and productive marine ecosystems and foster long-term sustainable use of marine resources in an ecological and culturally sensitive manner using a science-based ecosystem approach to resource management, while Objective 2 is to provide flexible and adoptive management systems that can rapidly address new scientific information and changes in environmental conditions or human use patterns. Both objectives are therefore consistent with MSC's Principle 1. Under the Pelagic FEP the Council has taken a series of management actions to conserve pelagic species caught in the Western Pacific Region to meet the MSA objectives, including a limited entry system for pelagic longline vessels in Hawaii (50 CFR 665.801), closure of waters within 50 and/or 75 nm around the Main Hawaiian Islands (50 CFR 665.806), and the Hawaii Pelagic Longline Fishing Regulations (NMFS, 2020e). The United States has adopted the WCPFC Conservation and Management Measure for bigeye, yellowfin and skipjack tuna (CMM 2020-01), the Conservation Management Measure for swordfish (CMM 2009-03) and IATTC Recommendations (C-03-01 for BET, C-05-02 and C-18-03 for N. Pacific albacore and C-20-05 for tropical tunas). For consideration of National MSC P2 objectives, on the advice the Ecosystem Principle Advisory Panel, the Council adopted an ecosystem approach to fisheries management and initiated the development of the Pacific Pelagics FEP. The objectives of the Pelagics FEP relevant to Principle 2 include: Objective 5 - to minimize fishery bycatch and Objective 6 - to manage and co-manage protected species, protected habitats and protected areas. The measures contained in the Pelagic FEP are consistent with the MSA's National Standards and other applicable laws. National Standard 9 states the conservation and management measures shall, to the extent practicable, minimize bycatch, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. The Endangered Species Act ensures that species listed as endangered or threatened are not jeopardized by ongoing pelagic fishery operations. The species listed that have been observed or may occur, in the Western Pacific Region include all Pacific marine turtles, humpback whale, sperm whale, blue whale, fin whale and sei whale, and the short-tailed albatross. The Marine Mammal Protection Act, National Environmental Policy Act and the Shark Finning Act (2000) are also relevant. Observer and logbook data indicate that these measures have reduced protected species interactions and mortalities with pelagic longline gear. These the objectives are well-defined and measurable via available observer data. Overall, long-term and short-term objectives are explicit, clearly defined, and measurable at the national level and thus **meet the requirements of SG60, SG80 and SG100**.

In conclusion, because the national management system meets SG100, but the regional ones only achieve SG80, a partial score of 85 is achieved.

References

Conservation and Management Measures (CMMs) and Resolutions of the Western Central Pacific Fisheries Commission (WCPFC) Compiled 3 May 2021

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (“WCPFC Convention”)

Inter-American Tropical Tuna Commission Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by The 1949 Convention Between the United States of America and the Republic of Costa-Rica (“Antigua Convention”)

Magnuson-Stevens Fishery Conservation and Management Act (last amended 2006)

Juan-Jorda et al. (2017), Medley et al. (2021), WPRFMC (2009), Allain et al. (2015), NMFS (2020e), IATTC_SAC (2021), ISC_BWG (2018a)

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 50. 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

Decision-making processes within the WCPFC 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). All CMMs are binding, but resolutions are non-binding on members. There is no opt out procedure, but members may request an independent review of a decision, to ensure it is consistent with the Convention and management objectives. All CMMs apply equally inside EEZs and on the high seas. Flag states enforce management measures on their own vessels and coastal States within their own EEZ. The decision-making processes have therefore resulted in a comprehensive set of CMMs and strategies to achieve the specific objectives for the longline fishery. These are well documented, and aspects of measures and strategies related to data collection and review, as well as the production and updating of stock assessments and relevant management measures and strategies to achieve fishery-specific objectives, are established. Therefore, both **SG60 as well as SG80 are met**.

IATTC

Decision-making processes within IATTC are explicitly defined in Article IX of the Antigua Convention and Rules of Procedure (IATTC, 2012). These are responsive and largely transparent (Medley et al., 2021). IATTC has a website (<https://www.iattc.org/ResolutionsActiveENG.htm>) where Resolutions, Recommendations and other materials used for decision-making are published (access to some information considered confidential requires registration, however). Decisions are made by consensus, so in theory, members can veto resolutions. And there is also a “no objection” or “opt out” procedure. However, there is no evidence that a lack of consensus has prevented necessary measures being adopted in the past, although the consensus model of governance has limitations that impact the Commission’s decision-making ability (Medley et al., 2021) in that the requirement for consensus could delay the adoption of appropriate conservation and management measures, while lengthy negotiations take place, since Resolutions are binding 45 days after their notification (recommendations however, are non-binding). Conservation and management measures apply equally inside EEZs and on the high seas, with Parties responsible for enforcing management measures within their own EEZ. Despite this, the decision-making processes in place do generally result in measures and strategies to achieve objectives, **thus meeting SG60 and SG80**.

United States

At the national level, WPRFMC has established decision-making processes that result in measures and strategies to achieve specific objectives. The Council decision-making processes, as specified under the MSA and the FEP (2009) for American Samoa, the Mariana Archipelago, Hawaii and the Pacific Remote Island Area (Baker, Jarvis, Wake and Howland Islands, Kingman Reef, and Johnson and Palmyra Atolls) have been promulgated. The place-based plan contains a suite of management regulations to achieve the objectives. Decision-making processes of the WPRFMC rely on the Council’s Scientific and Statistical Committee, Advisory Panels, Plan teams in addition to Working Groups. Public hearings identify issues of concern for fishery managers to address. As mandated by the MSA, the processes must be open and transparent, with supporting documents, minutes of meetings (audio and video recorded then transcribed), and with public testimony all published on the Council’s website. Therefore, **both SG60 and SG80 are met**.

SG60 and SG80 are met overall.

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	No	No

Rationale

WCPFC

WCPFC decision-making processes allow for appropriate consideration of serious and important issues through its committees (SC and TCC and other stakeholders) and at the Commission itself. The WCPFC responds to these regional or sub-regional level issues through CMMs and Resolutions and these provide transparent and adaptive responses to scientific, technical, social, and cultural issues (see Compendium - WCPFC (2020a)). The transparency in decision-making is a requirement of the Convention (Article 21). The system does 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, illustrated by the fact that a Harvest Strategy Workplan developed in 2015 in accordance with CMM 2014-06 (see Harvest Strategy Workplan as at Dec. 2020), is still delayed 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. Consequently, the Commission has yet to establish HCRs for bigeye and yellowfin tuna. Additionally, stock assessments (notably from SPC) and studies presented at the SC had identified overfishing of bigeye tuna from 2011 – 2017, at the regional level, using an older assessment model and life history parameters. However, since SC14 (2018), updated assessments have determined this stock to no longer have an overfished status, nor is overfishing occurring. These determinations were reaffirmed at SC16 (2020). On this basis **SG60 and SG80 are met**. However, **SG100 is not met** as it is not clear that all issues are dealt with in a timely manner.

IATTC

While outcomes of decision-making are transparent, with relevant information published online (e.g. Resolutions from annual meetings) and frequent feedback delivered, determining exactly how a decision was reached is not necessarily obvious (Medley and Gascoigne, 2017). There is no formal detailed explanation linking the information provided to the decision made, but there is enough information provided to show any discrepancy between the information being provided and the subsequent decision, which underlines the fact that Parties are fully informed of the issues under consideration and able to participate in decision-making (Medley et al., 2021). The Commission can be shown to react appropriately through the Resolutions and Recommendations it makes for stocks it is responsible for managing; however, the timeliness of such decision-making is less clear. The requirement for consensus can delay decision-making, but no such delay has actually been observed (or at least noted from documents available) to date. The IATTC staff's 2020 risk analysis (Aires-da-Silva et al., 2020) and recommendations at the 97th IATTC meeting (IATTC, 2021a) for the tropical tuna fishery in the EPO and again reviewed at 98th IATTC meeting (IATTC, 2021b), indicates that the recent management measures (C-17-02), which expired at the end of 2020 and were extended for 2021 (C-20-06), will be adequate within the recommended 3-year management cycle (2022-2024), as long as the status quo conditions are maintained, with data collection and analyses advancing according to the agreed-upon work plan. However, as seen in the scoring of 1.1.1 for EPO bigeye tuna, there is uncertainty in the status of this stock, with the potential that the stock is below the PRI. IATTC staff did recommend additional precautionary measures to address potential increases in fishing mortality caused by the floating-object fishery to prevent fishing mortality increasing beyond the status quo conditions associated with maintaining the current 72-day closure. They concluded that a limit on floating-object sets for all purse-seine vessels, combined with individual-vessel daily active FAD limits, would be the best option for maintaining the status quo to prevent an increase in fishing mortality within a management cycle. Despite these meetings, no agreement was reached on any additional measures. The assessment team, therefore, considers the lack of implementing any additional management action an important and serious issue needing to be resolved at IATTC and it remains unclear as to whether decision-making processes have responded to the important issues identified, sufficiently and in a timely manner. Therefore, **SG80 may not be met for the HI-based EPO longline fishery**. This scoring is harmonised with the latest scoring for the AGAC four oceans Integral Purse Seine Tropical Tuna Fishery (Eastern Pacific Ocean) and remains provisional until site visit interviews and team scoring discussions have taken place.

United States

The Council's primary role is to prepare, monitor and amend the Fishery Ecosystem Plan for Pacific Pelagic Fisheries of in the Western Pacific Region. The Council has an adaptive management approach, which monitors and addresses changing conditions based on the best available scientific information. In developing management plans the Council consults with its Advisory Bodies and provides a public forum for decision-making. The Pelagics FEP of 2009 is reviewed annually by the Council and its Advisory Bodies. Numerous amendments have been made to the plan since it was published, to address changing conditions of the pelagic fishery in the Western Pacific Region. The Hawaii-based pelagic longline fishery has adopted a number of regulations and other mitigation measures to address both target and bycatch issues. The regulations included the implementation of a longline limited-entry system, vessel prohibited areas around MHI, longline gear requirements, sea turtle, seabird and marine mammal safe handling and mitigation measures and a requirement for observer placement on both deep-set and shallow-set vessels. It is clear that at the national level there are quite sophisticated and comprehensive decision-making processes and extensive reporting requirements in place, but it is still not totally clear that *all* identified issues are responded to. Therefore, **SG60 and SG80 are met, but SG100 is not.**

In conclusion, SG60 is met at all levels of jurisdiction, but SG80 is not.

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. In all cases, decisions are required to be based on the best scientific information available. Evidence that WCPFC is attempting to apply the precautionary approach is found in the limitations on the expansion of south Pacific albacore tuna fishery, pending further development of management plans, even where the stock is evaluated to be above the MSY level. The evidence is less clear in the bigeye tuna fishery, where bycatch issues contributed from the purse seine sector were presumed to be hampering the fishery meeting its targets. However,

the most recent stock assessments have indicated that BET are no longer overfished, and that overfishing is no longer occurring. Therefore, there is sufficient information to conclude that decision-making processes are based on the best available information and the precautionary approach. There is, however, sufficient information to conclude that decision-making processes for WCPFC are based on the best available information and the precautionary approach, **meeting SG80**.

IATTC

Article IV of the Antigua Convention requires Commission members apply the precautionary approach directly and through the Commission. Specifically, Article IV, paragraph 2 requires members to “be more cautious when information is uncertain, unreliable or inadequate” and an absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.” Furthermore, under Article VII of the Antigua Convention, a function of the Commission is to “adopt measures that are based on the best scientific evidence available to ensure the long-term conservation and sustainable use of fish stocks.” According to Medley et al. (2021), the large number of meetings that have been conducted, and reports written for the Commission (and readily available), indicate that analyses and advice given have arisen from the requirement to use the best scientific information **meeting SG80**.

United States

While the MSA (US_Department_of_Commerce, 2007) does not explicitly use the term “precautionary approach”, the concept is implicitly expressed under Public Law Section 2 at 104-297 (6), to ensure that compliance with measures to prevent overfishing are satisfied and reads: “A national program for the conservation and management of the fishery resources of the United States is necessary to prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources.” Technical guidance is given to assist fishery scientists and managers in providing advice that appropriately considers risk and available scientific information, so that meaningful protection is afforded to marine stocks. Such protection extends not only to consideration of stock recruitment, but also to maintenance of sustainable levels of stock biomass and diversity. Decisions by the Council and its Advisory Bodies in revising and amending the Pelagics FEP must conform to the SFA and its precautionary concepts to prevent overfishing. The Council's Scientific and Statistical Committee (SSC), in providing advice for fishery management decisions, is required to implement the Precautionary Approach and the best scientific information available. In any case, whether specifically written or not, since the US is signatory to the above two RFMOs, it must adopt application of the precautionary approach to national management decision-making. Therefore, **SG80 is met**.

In conclusion, SG80 is met overall.

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	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

			research, monitoring, evaluation and review activity.	recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Yes	Yes	No

Rationale

WCPFC

The WCPFC maintains a publicly accessible website where meeting minutes, reports and scientific reports from the Commission and subsidiary bodies are posted and available for download. However, TCC management and compliance issues in country reports remain confidential; only annual summary reports are available. However, 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. This level of reporting represents good practice. Nonetheless, while reports are available, some sub-regional groups/organisations still believe that how all information is used in the decision-making is not reported, but it is difficult to see how the current system could be improved in this respect. Even where doubt is expressed as to how a decision is reached, all information available for the decision-making is published, allowing any stakeholder to draw their own conclusions, and there is frequent feedback from NGOs, scientists and other stakeholders. There is no formal, detailed explanation linking the information provided to the decisions that result (Medley et al., 2021). In an international context, it is recognised 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. With detailed formal public reporting of decisions and information on which those decisions are based, the WCPFC **meets SG60 and SG80**. However, this falls short of a formal justification that can be clearly linked to all information available, so **SG100 is not met**

IATTC

IATTC decision-making is by consensus and in Article XVI of the Antigua convention it clearly stipulates transparency in all dealings at the Commission. No evidence could be found to suggest that any decisions were either not transparent or lacked accountability. IATTC officially publishes the recommendations of research, monitoring, evaluation, and performance review on its searchable website. Also, the reports of the plenary sessions of the meetings are officially published and available to the public. Even when doubts are expressed about how a decision was reached (or not), available information is published for such decision-making, allowing any interested party to draw their own conclusions. NGOs, scientists and other stakeholders often give their opinion and can also become part of the written record for meetings. However, while reports are available, it is not clear that they represent all the information that is used. There is no formal, detailed explanation linking the information provided with the resulting decision (Medley et al., 2021). Decisions are presented in resolutions as outcomes, with minimal justification. With formal and detailed public reporting of decisions and the information on which those decisions are based, IATTC **fisheries comply with SG60 and SG80**. However, since there is no formal information link to decisions, **SG100 is not met**.

United States

NOAA Fisheries through its Pacific Island Regional Office (PIRO) as well as the Council and its subsidiary bodies maintain publicly accessible websites where all meeting minutes, scientific reports and detailed general information concerning the management of fishery resources in the Western Pacific Region are posted and freely available. Because the WPRFMC is a quasi-governmental agency, it is subject to the Sunshine Law of 1976 (see 29 CFR Part 1612), which entitles the public to the fullest practicable information regarding the decision-making processes of the Council. And except under very specific circumstances regarding confidentiality, every portion of every meeting shall be open to public observation. Guides for stakeholders unfamiliar with fisheries management processes and procedures are also posted on the websites. These national 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. All Council (and associated Committee and Advisory Panels) meetings are subject to prior Official Register Notification. Additionally, the Council is mandated to produce an annual SAFE report on the pelagic fishery under its management (e.g. WPRFMC (2020)), with among other contents, provides an assessment of the fishery's management performance. Because of the above, **SG60 and SG80 are met**. However, since there does not appear, at this time, to be an obvious formal information link to decisions made by the Council, **SG100 is not met**.

In conclusion, SG60 and SG80 are met overall, 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	Yes

Rationale

WCPFC

Peaceful settlement of disputes (Articles 30 & 31) of the WCPFC ultimately also involves Article 20 of the Convention. And under Article 20, the WCPFC has a consensus-based decision-making process, with 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, provided that such majority includes a three-fourths majority of the members of the South Pacific Forum Fisheries Agency (FFA) present and voting, and a three-fourths majority of non-members of the FFA present and voting, and provided further that in no circumstances shall a proposal be defeated by two or fewer votes in either chamber. WCPFC has not been subject to any court challenges based on the latest available records of meetings where any such challenges might be noted as being filed, for Plenary (WCPFC, 2021), Scientific Committee (WCPFC_SC, 2020a) and TCC (WCPFC_TCC, 2020a). Parties seem to have pro-actively avoided legal disputes by resolving them through WCPFC meetings since they are members of this Commission and agree to abide by its provisions. There is no evidence that other

entities flout the law, with the notable exception of particular fishing companies and fishing vessels, which may be listed on the IUU fishing list (which does not include any client vessels – see meeting records of WCPFC17 and TCC16). From the above, **SG60, SG80 and SG100 are met.**

IATTC

The IATTC has not been subject to any court challenges, based on records available where such legal challenges might be noted as registered, up to 2021 (IATTC 2021e). Records also do not indicate any disrespect or defiance of the law through repeated violations. There is no evidence that other entities flout the law, with the notable exception of particular fishing companies and fishing vessels, which are listed on the IATTC IUU fishing list (which do not include any client vessels) established at its 95th meeting on 04 December 2020, in compliance with the 2019 Resolution on IUU fishing (IATTC, 2021c). Therefore, excluding these, IATTC and its Parties **meet SG60**. It would appear that Parties have pro-actively avoided legal challenges by resolving disputes through IATTC meetings since they are members of IATTC and agree to abide by IATTC provisions. Given that there are no current outstanding judicial disputes and that to date, members have not used international law to settle disputes, the management system **meets SG80 and SG100**.

United States

At the national level, there is no evidence available to suggest that NOAA Fisheries or the Council are disrespectful to, or defiant of federal or local laws, or legally binding agreements reached at the international level. As outlined in PI 3.1.1 above, NOAA Fisheries and the Council have well-established mechanisms and frameworks for addressing legal disputes concerning the fishery. NOAA Fisheries and the Council along with its Advisory Bodies attempt to curtail disputes by consulting with the industry through Council meetings, which allows the public and other stakeholders to raise grievances and provide input into potential amendments of management measures and/or policy. These consultative processes enable NOAA Fisheries and the Council to minimize disputes and respond to judicial decisions in a reasonably timely fashion. As mentioned in PI 3.1.1b above, legal dispute resolution under WPRFMC procedures has involved a legal challenge to and an appeal of a regulation, made by the client (HLA) against NMFS to overturn/revise an existing ruling which had the effect of closing swordfish fishing to the entire fleet due to “excessive” turtle interactions¹⁸. HLA sought, among other things, to have a Biological Opinion (BiOp) vacated and remanded to NMFS, to review and comment on the preparation of a new BiOp. Of course, other opportunities have been afforded to and taken by various NGOs to challenge numerous rules and regulations in the courts over the last several years, often invoking the Freedom of Information Act (FOIA, 2016) as the basis. This Act generally states that any person has the right to request access to federal agency records or information (in this case the Council) except where such records are protected by certain exceptions, in a timely fashion. These challenges are handled through the NOAA Office of Legal Counsel. Based on the above, **SG60, SG80 and SG100 are met.**

In conclusion, SG60, SG80 and SG100 are met overall.

References

¹⁸ Hawaii Longline Association v. National Marine Fisheries Serv., 281 F. Supp. 2d 1 (D.D.C. 2003)

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (“WCPFC Convention”)
 Inter-American Tropical Tuna Commission Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by The 1949
 Convention Between the United States of America and the Republic of Costa-Rica (“Antigua Convention”)
 Magnuson-Stevens Fishery Conservation and Management Act (last amended 2006)
 Meeting records of WCPFC17 and TCC16. <https://meetings.wcpfc.int/meetings/type/>
 Medley et al. (2021), WPRFMC (2009, 2020), FOIA (2016), IATTC (2021c), WCPFC_SC (2020a), WCPFC_TCC (2020b), US_Department_of_Commerce (2007)

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 51. 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 (more information needed)

Rationale

Note: scoring for this PI considers each jurisdiction but is scored at the fishery level. Therefore, only a single score is provided.

WCPFC

The WCPFC aims to ensure compliance through VMS (CMM 2014-02), an IUU vessel list (CMM 2019-07), port state controls, observers (and e-monitoring) (CMM 2017-02), logbooks (plus e-reporting), a record of fishing vessels (CMM 2014-03) and transshipment monitoring (CMM 2009-06). The WCPFC TCC has codified chartering arrangements (CMM 2019-08), catch/statistical documentation, the control of nationals, and compliance monitoring and reporting. The WCPFC relies largely on the IUU vessel listing process as an incentive for compliance. WCPFC has a well-established Compliance Monitoring Scheme (CMS) under CMM 2019-06, which is largely dependent on the submission by members of information in annual TCC 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.

Regional monitoring, control and surveillance (MCS) is supported by the Quadrilateral (QUAD) Defence Operational Working Group. This group comprises the aerial and naval arms of Australia, France, New Zealand and the U.S. which provide military assets to assist regional surveillance and participate in 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. Client fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery. WCPFC continues to refine its developing Catch Documentation Scheme, which should reduce IUU fishing and complement the vessel register. Port State Measures are in the process of being fully implemented by all WCPFC members through CMM 2017-02 (Conservation and Management Measure on Minimum standards for Port State Measures), and therefore also at the U.S. national level. At-sea observer coverage requirements under CMM 2018-05 are 5% for longline vessels operating in high seas areas *and in more than one* jurisdiction, which historically has been difficult to achieve for many States but is certainly beginning to improve everywhere, especially with increasing awareness of perhaps using electronic monitoring (EM) so supplement the human observer programmes. Ultimately, it is the Flag State's responsibility for any failure to ensure that WCPFC conservation and management measures are implemented and for the resulting violations of those measures by that State's vessels. However, according to Medley et al. (2021) problems continue over the failure of certain Flag States (client fleet not involved) to exercise effective control over vessels.

IATTC

To improve compliance with its requirements and procedures, IATTC focuses on vessel registration but also monitors catch and effort. This Commission also uses diplomatic and other pressures on nation states (Medley et al., 2021), especially the threat of IUU listing, information which is shared with other RFMOs. While there is a regional observer programme for purse-seine vessels coordinated by the Secretariat, a similar regional programme for longline fisheries does not exist. IATTC does however still require each member and cooperating non-member to ensure at least 5% coverage for longline vessels greater than 20 meters in length, which may be supplemented by electronic monitoring systems (EMS – see Resolution C-19-08). Some members do have national programmes for longliners (as does the client fishery) while a private company, MRAG Americas has been the observer provider for the IATTC longline transshipment observer programme since 2008. All vessels over 24 m length catching tuna within the region must also have VMS (Resolution C-14-02). IATTC uses its longline vessel register to establish a 'positive list' (C-11-05) and identify IUU vessels under the AIDCP (A-04-07). Vessels not entered into the record are deemed to be unauthorised to fish for, retain on board, transship, or land tuna and tuna-like species, although these lists do not indicate if and where a particular vessel is active in other RFMOs. IATTC implements some port state measures with a specific bigeye tuna catch documentation scheme. Landings and transshipments are monitored and data collected. There are systems for verifying compliance with management measures and other information. Unfortunately, there are still gaps in implementing procedures across the region since there is limited information sharing re IUU activities and a lack of measures against IUU vessels' use of port facilities in the region (Medley et al., 2021). IATTC members are to submit annual landings and other data to the Commission in a timely manner. Compliance information is then reviewed by the Committee for the Review of Implementation of Measures Adopted by the Commission. Ultimately, it's

a Flag State responsibility for any failure to ensure that IATTC Resolutions and Recommendations are implemented and for the resulting violations of those measures by that State's vessels.

United States

At the national level, NOAA works in partnership with the Council and other U.S. Government agencies, foreign governments, international organisations, non-government organisations and private sector to effectively combat IUU fishing. It has implemented measures to restrict port entry and access to port services of vessels included in all RFMO IUU lists and works with other nations to strengthen enforcement and data programs aimed at curtailing IUU fishing. A US IUU Task Force (IUU, 2014), which *de facto* acted to strengthen the Lacey Act (see 16 U.S.C. §§ 3371 – 3378 as amended), and included the NOAA OLE and other government agencies, was formed under presidential Declaration to develop an action plan to strengthen enforcement, create and expand partnerships and create a risk-based traceability program to track seafood from harvest to entry into the United States. The action plan highlights several recommendations to combat IUU fishing, which included the implementation of legislation for the Port State Measures Act, development of best practices for catch documentation and data tracking, high seas boarding and inspection, and monitoring, control and surveillance measures (including observer programs, vessel tracking systems, authorized vessels lists). Together, the IUU Fishing Enforcement Act (IUU, 2015) and the Port State Measures Agreement (FAO, 2016) protect domestic fishermen from unfair competition and ensure consumer confidence in the seafood supply chain. NOAA Fisheries and the U.S. Coast Guard have a comprehensive range of MCS requirements and activities that include:

- Monitoring catch and effort through requiring vessel operators to complete the NMFS Western Pacific Daily Longline Fishing Log within 24 hours of each fishing day and submit it to NMFS within 72 hours of returning to port.
- Interactions with marine mammals require the vessel operator to complete a Marine Mammal Authorization Mortality/Injury Reporting form that is submitted to NMFS with 48 hours of returning to port.
- Vessels longer than 50 ft. (15.2 m) must carry an operational Vessel Monitoring System (VMS) unit owned and installed by NMFS.
- Vessels larger than 40 ft. (12.2 m) are required to carry a NMFS observer if requested by PIRO.
- Observer logbooks must be submitted to NMFS, which help verify the vessel operator logbooks and provide relevant fishery management data. The NMFS observer program targets approximately 20% of all fishing effort for the deep-set sector but mandates 100% coverage for the shallow-set fishery.
- Vessels and fishing gear must display the vessel's official number.
- U.S. Coast Guard and OLE enforcement officers conduct periodic port-side and at-sea inspections to ensure vessels and vessel operators are following the regulations for the fishery.

There is, therefore, evidence that the national compliance program is working effectively, with VMS compliance rates of 100%, observer coverage of 20% on the deep-set and 100% on the shallow-set pelagic longline vessels compared to less than 5% in many other countries, with a high level of compliance of vessel operators with the regulations.

Therefore, **overall SG60 and SG80 are met**, but because of existing gaps in some port states' controls and persistent problems over failure of certain Flag States to exercise effective control over vessels (Medley et al. 2021), it cannot be demonstrated that all MCS have the ability to consistently enforce relevant CMMs, therefore failing to meet SG 100, except provisionally for the National system as applied to the client fishery. **On a provisional basis, SG100 is scored as not met but this will be discussed further at the site visit.**

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 (more information needed)

Rationale

WCPFC

Conservation measures are set by WCPFC, but their enforcement falls to member States. The WCPFC relies largely on the IUU vessel listing process (CMM 2019-07) as an incentive for compliance along with port state controls, at-sea observers, logbooks and transshipment monitoring. Compliance failures by vessels are addressed by the application of the WCPFC IUU listing procedure. Compliance failures by member States, rather than vessels, are currently addressed through Commission processes of monitoring, reporting and accountability under the Compliance Monitoring Scheme (CMM 2017-07), but sanctions are applied only to fishing entities (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 should order to withdraw from the Commission Area. Sanctions appear to be consistently applied and provide effective deterrence in relation to proven IUU fishing. Compliance issues based on available information on infringements from observers and other sources are discussed at WCPFC TCC meetings. Responses to reported non-compliance are considered at the TCC and reported to the Commission plenary in the Compliance Monitoring (CMS) Report. The compliance monitoring scheme (CMM 2019-06) has recently undergone an independent review (Koehler, 2021) and this CMM now has a work plan for 2020-2021 to:

- develop a risk-based assessment framework to inform compliance assessments and ensure obligations are meeting the objectives of the Commission;
- develop corrective actions to encourage and incentivise CCMs' compliance with the Commission's obligations, where non-compliance is identified; and
- to develop guidelines for participation of observers in closed meetings of the Commission and its subsidiary bodies which consider the Compliance Monitoring Report.

The outcomes and recommendations from the CMS work plan will be put before plenary for consideration at WCPFC18 (December 2021). In summary, each annual TCC report provides a matrix of each CCM's and Participating non-members compliance performance with CMMs. And, while progress towards transparency in reporting on

Flag State compliance continues, TCC reports still do not provide sufficient information on outcomes of investigations into non-compliance, nor any specific cases, such that effective deterrence can be demonstrated. Nonetheless, the client fleet is not concerned with any reported non-compliance notification from WCPFC.

IATTC

Sanctions exist and are applied, but only to fishing entities by way of listing IUU vessels and vessels detected as being non-compliant with resolutions. Much the same as with WCPFC, IATTC notifies Flag States of non-compliant vessels, which the Flag States then should order to withdraw activity from the Commission Fishing Area. The HI-based longline fleet is certainly subject to sanctions including penalties and loss of fishing license if the U.S., as party to this Convention, is notified that one of its flag vessels has been found in non-compliance. Compliance information is reviewed at annual IATTC meetings (under the “Committee for the Review of Implementation of Measures Adopted by the Commission”) and these Compliance Measures should be deterrents to any contracting party to IATTC. And other than IUU listings, the only sanction would potentially be loss of membership to the Convention. Medley et al. (2021) note that some non-compliance is still being detected by the observer programmes. However, it should be noted that observers are not fishery enforcement officers, so information they provide cannot be used for enforcement or sanction purposes. Their reports are therefore used in the MCS to only review compliance with IATTC management measures. Information on non-compliance with IATTC measures is available but is limited. There is also some evidence that where port state measures are better enforced, catch documentation relating to BET via C-03-01 (IATTC bigeye tuna statistical document program) is beginning to show positive trends in helping to reduce IUU fishing of BET, thus providing some degree of effective deterrence. There are no indications that non-compliance is systematic, but no records are available to show that sanctions have been applied to *demonstrably* provide evidence of effective deterrence.

United States

Officers and agents of NOAA OLE, US Coast Guard, Customs and Border Protection, Immigration and Customs, U.S. Fish and Wildlife Service and State officers are individually and together authorized under Cooperative Enforcement Agreements, to monitor compliance and investigate potential violations of statutes and regulations enforced by NOAA (NOAA_OGC, 2019). Potential penalties include fines of up to a statutory maximum of \$189,427 per violation of the MSA and imprisonment for up to one year per violation for instance. Where a violation is less significant or is merely technical having little or no impact, the agent may provide a verbal or written warning, which provides the alleged violator with the opportunity to correct the violation within a certain amount of time. For certain less significant violations, the agent may issue a “summary settlement notice”, where the alleged violator receives a document explaining the alleged violation and the alleged violator may resolve the matter by paying a penalty. Where the alleged violation is significant, the agent may refer the case to the NOAA General Counsel’s Office for Enforcement and Litigation for further civil action. As detailed in NOAA_OGC (2019) two factors are considered in determining the penalty and sanction amount for a violation (1) the gravity of the prohibited act that has been committed and (2) the alleged violator’s degree of culpability. A penalty matrix using these two factors that constitute the seriousness of the violation as well as schedules that provide guidance in determining the gravity of the violation have been developed to assist in determining appropriate sanctions. For each matrix two factors - gravity of violation and degree of culpability - form the two axis of the matrix. The vertical “gravity of offence” axis is split into four to six different “offence levels”, depending on the applicable statute, with increasing penalties as the gravity of the offence becomes more significant. This graduated scheme provides for a fair base penalty assessment considering the seriousness of the violation. These penalties and sanctions are consistently applied and there are numerous examples of penalties and sanctions being given for violations of statutes and regulations enforced by NOAA. Evidence of the effective deterrence of the penalties and sanctions is demonstrated by reasonably high level of compliance of the Hawaii-based client pelagic longline fleet to the statutes and regulations enforced by NOAA.

Therefore, from the above information it is deemed that sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence. **SG60 and SG 80 are met overall. However, data on recent violations and/or sanctions will need to be evaluated during the site visit, specifically concerning the client fishery being assessed to ascertain whether SG100 could be provisionally 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 (more information needed)

Rationale

WCPFC

WCPFC aims to ensure compliance through VMS, IUU vessel listing, port state controls, observers, logbooks and transshipment monitoring. WCPFC TCC has a permanent 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 measures, addressing matters related to compliance with fisheries management measures, analyse information on compliance and report the findings to the WCPFC, which will in turn inform the members and non-members (Medley et al., 2021). An annual report is produced as part of the compliance review. Identified infringements are reported but not all fisheries comply and clearly there is some non-compliance issues with some vessels and Flag States, as reported by the TCC. WCPFC has a comprehensive MCS system in place, supported by at-sea monitoring coordinated through the FFA (Operation Island Chief), and allows an assessment of relative compliance with the management system, at least over a short snapshot in time of fishing activity in the WCPFC zone. Recent Operation Island Chief (OPIC 2019, from 8-23 August and OPIC 2020), have involved eight Pacific patrol boats and 9 aircraft from the following participating countries: Australia, Fiji, Federated States of Micronesia, Kiribati, Nauru, Papua New Guinea, Republic of Marshall Islands, Solomon Islands, Timor Leste and Vanuatu, along with the Quadrilateral Defence Coordination Group (QUAD – Operation Nasse) – Australia, New Zealand, France and the United States. For the 2019 operation, of the 272 vessels sighted during the Operation, there were 126 boardings at sea and in port, and a total of 90 days in total at sea and included 137 hours of air surveillance. Over the period of 2017 to 2020 (OPIC 2021 which closed on 6th August 2021 – see FFA (2021)) most infringements centred around non-reporting or misreporting of critical information or having unmarked gear. A relatively low 3.5% non-compliance rate as documented in the Operation Reports in the available reports from these joint surveillance operations, provides some evidence that a majority of fishers comply with WCPFC management systems. However, there are sufficient gaps reported in data submission

timeliness and quality (from data in TCC 2019 and 2020 summary compliance data) to prevent there being a high degree of confidence that fishers in the WCPFC fishing area comply.

IATTC

IATTC has a permanent working group that reviews and monitors compliance with IATTC conservation and management measures, the Committee for the Review of Implementation of Measures Adopted by the Commission. The annual report minutes (available for 2019 on the IATTC website) are produced as part of the compliance review on observed infringements, but details of infractions and any potential resulting sanctions are difficult to access publicly, due to their deemed confidential nature (see <https://www.iattc.org/complianceq2/Login.aspx?ReturnUrl=%2fcomplianceq2>). In any case, according to Medley et al. (2021), not all fisheries comply and there is some non-compliance by vessels. However, compliance appears adequate and while issues have been identified, they do not appear widespread or systematic, and none for the issues involve the client fishery. Because the United States and thus the client fishery must share data submission to both IATTC and WCPFC, catch data and other information will still be publicly available when fishing activity is in the EPO. Consequently, available information suggests there is evidence to demonstrate fishers comply with the management system. However, the confidential nature of much of this sort of information at IATTC means it is difficult to have any high degree of confidence in relation to compliance.

United states

At the national level, there is sufficient evidence that the Hawaii-based longline fishers comply with the management system. Vessel operators provide information of importance to ensure the effective management of the fishery through vessel operator daily logbooks, catch disposal records, assisting and participating in research and collection of research data, and agreeing to carry observers. The high level of longline observer coverage (at least 20% from at least 2016 onward for deep-set and 100% for shallow-set), which is significantly higher than the 5% WCPFC and IATTC regional targets, provides a relatively high degree of confidence that vessel operators comply with the management system. In addition, the observer data can be checked against the vessel operators' daily logbook data to verify credibility. With increased use of electronic reporting, plus electronic monitoring, NOAA considers the data collected from the vessel operators' daily logbooks and observers' reports to be robust and reliable. The Council receives regular reports from the U.S. Coast Guard and NOAA Fisheries OLE regarding MCS activities and status of fisheries violations. The high frequency of port inspections in Honolulu (some vessels may occasionally also be inspected in Pago Pago), where the catch is landed, is an important element of the effective compliance of the vessel operators. **Suggestions that non-compliance of the vessel operators is very low, with only minor violations evident for lack of up-dated sea safety equipment and failure to submit logbooks and reports within the prescribed timeframe as required is better verified at the site visit in discussions with enforcement authorities.** The lack of any significant breaches of regulation provides a reasonable degree of confidence that vessel operators are complying with the management system under assessment

Given the above, the overall score would be that at **least SG60 and SG80 are met for this SI.** **On a provisional basis, SG100 is scored as not met but this will be discussed further at the site visit.**

d	Systematic non-compliance
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	Guide post	There is no evidence of systematic non-compliance.
	Met?	Yes

Rationale

WCPFC

By reviewing publicly-available summary reports and meeting documents of the annual meetings of Commission Plenary (WCPFC, 2020b, 2021) and the Technical Compliance Committee (WCPFC_TCC, 2020a), as well as data from observer reports under Country Report 1 to the Science Committee (WCPFC_SC, 2018, 2020a; WCPFC, 2021), there is no evidence of systematic non-compliance. When non-compliance does occur, offences vary from minor (e.g. late submissions of reports) to more serious issues, such as not complying with the conditions of FAD closures or not fully complying with the regional observer programme (e.g. at least 5 % mandatory observer coverage for longline vessels and 100% for purse seine vessels). Overall, however, there is no evidence of systematic non-compliance with CMMs that would impede the Commission in performing its management functions.

IATTC

There is some evidence of non-compliance with conservation measures from meetings of the IATTC Committee for the Review of Implementation of Measures Adopted by the Commission, however this does not suggest systematic non-compliance. There is a high level of monitoring of the fishery (100% purse seine coverage and 5% longline coverage, although the client fishery has at least 20% coverage) and although there is evidence of potential infractions, there is no evidence of systematic non-compliance.

United States

There is no evidence of systematic non-compliance that can be found using all available information. **Although this should be discussed further at the site visit.**

SG80 is provisionally scored as met.

References

Inter-American Tropical Tuna Commission Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by The 1949 Convention Between the United States of America and the Republic of Costa-Rica ("Antigua Convention")

Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean ("WCPFC Convention")

Magnuson-Stevens Fishery Conservation and Management Act (last amended 2006)

IATTC Meetings Records. <https://www.iattc.org/MeetingsENG.htm>, <https://www.iattc.org/IATTC-CORENG.htm>

Meeting records of WCPFC17 and TCC16. <https://meetings.wcpfc.int/meetings/type/>

OPIC: <http://www.tunapacific.org/tag/operation-island-chief>

WPRFMC (2009), IATTC (2019a), Koehler (2021), Medley et al. (2021), WCPFC_TCC (2020b), WCPFC (2020a), IATTC (2021b), FFA (2021)

97th IATTC Meetings Extraordinary (by videoconference), June 7-10, 2021: [https://www.iattc.org/Meetings/Meetings2021/IATTC-97/Docs/_English/IATTC-97-MINS_97th%20Meeting%20\(Extraordinary\)%20of%20the%20IATTC.pdf](https://www.iattc.org/Meetings/Meetings2021/IATTC-97/Docs/_English/IATTC-97-MINS_97th%20Meeting%20(Extraordinary)%20of%20the%20IATTC.pdf)

95th Meeting of the IATTC (by video conference). November 30 to 4 December 2020, La Jolla, CA. https://www.iattc.org/Meetings/Meetings2020/IATTC-95/Docs/_English/IATTC-95-MINS_95th%20Meeting%20of%20the%20IATTC.pdf

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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 52. 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 2019-06). 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 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 (SC):

- 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.

On the other hand, the Technical and Compliance Committee (TCC):

- 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.

In addition, there was an overall performance review of the WCPFC in 2012 (WCPFC, 2012). Based on the above information, mechanisms exist to evaluate “all” and not just the key parts of the management system, thus showing that **SG60, SG80 and SG100 are deemed met**.

IATTC

IATTC has extensive *mechanisms* in place to evaluate the management system as demonstrated by the various committees and working groups of IATTC that meet regularly and report their findings to the Commission. As well as the annual Commission meetings, regular meetings include those for the Scientific Advisory Committee, the Committee for the Review of Implementation Measures and the International Review Panel, as well as an overall performance review in 2016 (Moss-Adams LLP 2016). Reports from meetings of the various groups are available on the IATTC website. While the purse seine fishery is the major component of overall fishing in the EPO and receives a strong focus in IATTC processes, the longline sector is less well served in the attention given to its management. Nonetheless, all aspects of fishing activity and their relative effects on target species stocks are taken into consideration when implementing Harvest Control Rules (Resolution C-16-02) once fully agreed to. These have recently been evaluated during Management Strategy workshops (IATTC, 2019e, 2021d). So, mechanisms do *exist* to evaluate most of the key elements of the management system, thus **meeting SG60 and SG80 requirements**. However, **SG100 is deemed not met** because, although Harvest Control rules exist, their final mechanisms for implementation are still under discussion and therefore cannot be fully evaluated yet, thus not meeting the “all parts” criterion.

United States

At the national level, there are mechanisms in place to evaluate all parts of the management system. The Pelagics FEP (which superseded the original Fishery Management Plan for Pelagic Fisheries first published in 1986) is the Council’s main document for controlling harvests of pelagic resources. Numerous amendments to the earlier Plan (18 in total), and now to the Pelagics FEP, have been implemented. In fact, an Amendment 9 (dated June 24, 2021) to the current FEP version of September 24, 2009, is now under review until August 30, 2021, deadline for public comments. As the Council is responsible for the implementation of the Pelagics FEP and its management measures, consultations are held with its Advisory Bodies to review and evaluate the effectiveness of the management system. The FEP Advisory Panel reviews and provides

advice on the content and likely effects of all management plans, amendments, and management measures. The Pelagics FEP Plan Team oversees the on-going development and implementation of the Pelagics FEP and is responsible for reviewing the information pertaining to the performance of all the fisheries and the status of all the stocks managed under the Pelagics FEP. The Scientific and Statistical Committee (SSC) is required to evaluate and review the management plans and amendments and advise on their scientific content. The SSC also evaluates the “best available” statistical, biological, economic, social and other scientific information relevant to the Pelagics FEP and the Council’s activities. The Council’s FEP Standing Committees review and evaluate all relevant information and data, including the recommendations of the FEP Advisory Panels, the Pelagic Plan Teams and the SSC. On the basis of the above, **SG60, SG80 and SG100 are met**.

In conclusion, SG60 and SG80 are met, but SG100 is not met in full.

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 different recommendations of the reports, which can be found on the WCPFC website. Also, independent reviews (MRAG, 2009; MRAG_Asia_Pacific, 2016) have also been conducted of the Commission’s science and TCC structure and functions, resulting in overhauling of their operations and adoption of review processes and other changes to the data submissions and science functions. There have also been Independent Reviews of the Compliance Monitoring Scheme (MacKay et al., 2018; Koehler, 2021) 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 and responded to non-compliance through remedial options. The WCPFC does however, have a regular programme of internal review. For example, CMS is reviewed and updated as per a pre-determined review schedule (e.g., CMM 2019-06), which is not limited to specific parts but can include all aspects of the management system (e.g., compliance, science, management). Evidence presented to support this process include the submission of the WCPFC Secretariat reports on compliance (and IUU) of its members with the reporting provisions of the Commission (CMM 2019-06). WCPFC has been subject to occasional external review of the methodologies used by the science service provider (SPC) for their stock assessments as well as overall management performance (see Medley et al., 2021), there is no clear commitment to regular external performance reviews at WCPFC. Therefore, **SG60 and SG80 are met, but SG100 is not met**.

IATTC

IATTC performance has also been reviewed relative to other Tuna RFMOs (FAO, 2015; Medley et al., 2021). The IATTC Commission and its various committees and working groups do meet regularly. Discussions and scientific documents relating to stock assessments have well-established processes for review. Thus, IATTC has several subsidiary bodies that also meet annually:

- 1) The Committee on Administration and Finance,
- 2) The Scientific Advisory Committee,
- 3) The Committee on Compliance Review (including Review of Implementation Measures) as well as,
- 4) An International Review Panel, including the AIDCP, which is administered by IATTC.

IATTC therefore, has a regular and systematic process relating to each of its main components – Science, Policy, Compliance, Administration and Finance. The scientific advisory committee (SAC) undergoes a rigorous scientific process that includes assessments of stock status, including external reviews of assessment methodologies (Cass-Calay et al., 2019; Punt et al., 2019), as well as Management Strategy Evaluation (MSE). Administration components have also been included in the performance reviews (Moss-Adams, 2016). These reviews demonstrate that IATTC has mechanisms in place to evaluate the fishery-specific management system occasionally. Therefore, **SG60 and SG80 are considered met**, but since external reviews appear to be mostly *ad hoc*, **SG100 is not met**

United States

At the national level, the Council has periodic external reviews on its performance, both at the institutional level but also at a fishery-specific level (e.g. for blue marlin (Maguire, 2014)). As outlined in scoring element (a) above, the Pelagics FEP, which is the main document for controlling of harvests of pelagic marine resources and conserving the ecosystem in which harvests occur, has regular internal reviews of the management measures and strategies by the Council and its Advisory Bodies. Since the Pelagics FEP was implemented in 2010, the Council has generated an annual report that provides fishery performance data on landings, value of the fishery, and catch rates, for each of the areas the Council manages. Then, in 2013, NMFS issued a final rule (78 FR 43066, July 19, 2013) amending National Standard 2 guidelines of MSA clarifying the content and purpose of the Stock Assessment and Fishery Evaluation (SAFE) report such that fisheries were now to be managed using of the best scientific information available (see Title 50 Code of Federal Regulations [CFR] Part 600.315). In 2015, the Council, in partnership with PIFSC, local fishery resource management agencies, and PIRO, agreed to revise and expand the contents of these annual reports to include the range of ecosystem elements, including protected species interactions, oceanographic parameters, essential fish habitat review, and marine planning activities. On this basis, **SG60 and SG80 are met**, but in the absence of a clearly mandated schedule for external review, **SG100 is not deemed met**.

In conclusion, SG60 and SG80 are met but SG100 is not.

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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)	

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8 Appendices

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	< 5% - see Appendix 11	0%

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 49.

Table 49. List of attendees at the on-site meetings.

Name	Position	Type of consultation
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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:

- The plan for RBF activities that the team will undertake at the site visit.
- The justification for using the RBF, which can be copied from previous RBF announcements, and stakeholder comments on its use.
- The RBF stakeholder consultation strategy to ensure effective participation from a range of stakeholders including any participatory tools used.
- 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:

- A summary of the information obtained from the stakeholder meetings including the range of opinions.
- 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

Appendix 3 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

Appendix 4 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

Appendix 5 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 50. 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 <input type="checkbox"/>	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 <input type="checkbox"/>	<p>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).</p> <p>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.</p>
Related condition <input type="checkbox"/>	<p>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.</p> <p>Include a justification – why is a related condition being raised? (FCP v2.2 7.30.6 & G7.30.6).</p>
Condition rewritten <input type="checkbox"/>	Check the box if the condition has been rewritten. Include a justification (FCP v2.2 7.30.5.3).

Appendix 6 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.	

Appendix 7 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 51. 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 52. 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 53. 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.

Appendix 8 Risk-Based Framework outputs

To be drafted at Client and Peer Review Draft Report stage

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).

Appendix 9.1 Principle 1

For WCPO/EPO bigeye and yellowfin, Principle 1 has been harmonised with the fisheries listed in Table 54 to Table 57. 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).

For WCNPO swordfish, no overlapping fisheries have been identified.

Table 54. 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	>80	N/a		60-70	60-70	>80	>80
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery	2.0	>80	N/a		60-70	60-70	>80	>80
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		60-70	60-70	>80	>80

Table 55. Comparison of Principle 1 scores between this assessment and other WCPO bigeye fisheries.

Fishery	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	100	N/a	70	60	90	100
SZLC CSFC & FZLC FSM EEZ Longline Yellowfin and Bigeye Tuna	90	N/a	70	60	90	90
MIFV RMI EEZ Longline Yellowfin and Bigeye Tuna	90	N/a	70	60	90	90
Kiribati albacore, bigeye and yellowfin tuna longline fishery	100	N/a	70	60	90	95
Fiji Albacore, Yellowfin and Bigeye Tuna longline	100	N/a	70	60	90	95
Australian Eastern Tuna and Billfish Fishery (albacore tuna, yellowfin tuna, bigeye tuna and swordfish)	100	N/a	70	60	90	95
SZLC, CSFC & FZLC Cook Islands EEZ South Pacific albacore, yellowfin and bigeye longline	100	N/a	70	60	90	100
Owasebussan Co. Ltd. North Pacific Longline Fishery for Albacore, Yellowfin, & Bigeye Tuna	100	N/a	70	60	90	95
Micronesia Skipjack, Yellowfin and Bigeye Tuna Purse Seine Fishery	90	N/a	70	60	90	90
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery	>80	N/a	60-79	60-79	>80	>80
PNA Western and Central Pacific skipjack, yellowfin and bigeye tuna purse seine fishery (FAD and non-FAD sets)	90	N/a	70	60	90	90
This assessment	>80	N/a		60-70	60-70	>80

Table 56. Comparison of Principle 1 scores between this assessment and other EPO yellowfin fisheries.

Fishery	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)
Northeastern Tropical Pacific Purse Seine yellowfin and skipjack tuna fishery	100	N/a	95	80	80	95
Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery (ACDR)	≥80	N/a	≥80	≥80	≥80	≥80
US Pacific Tuna Group Purse Seine FSC and FAD Set Fishery (ACDR)	≥80	N/a	≥80	≥80	≥80	≥80
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery (ACDR)	80	N/a	80	80	80	90
Eastern Pacific Purse Seine Skipjack and Yellowfin tuna fishery (FSC and FAD set fishery)	≥80	N/a	≥80	≥80	≥80	≥80
French Polynesia albacore and yellowfin longline fishery	80	N/a	80	80	80	90
This assessment	≥80	N/a	≥80	≥80	≥80	≥80

Table 57. Comparison of Principle 1 scores between this assessment and other EPO bigeye fisheries.

Fishery	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)
Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery (ACDR)	≥80	N/a	≥80	≥80	≥80	≥80
AGAC four oceans Integral Purse Seine Tropical Tuna Fishery (ACDR)	60	70	60	80	80	85
This assessment	60 – 79	60 – 79	60 – 79	≥80	≥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 summarised in Table 58

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.

Table 58. Overview of Principle 2 harmonisation activities.

PI	Harmonisation outcome	Overlapping fisheries with which harmonisation is required
2.1.1	Cumulative impacts were triggered for EPO bigeye, Pacific mackerel (shallow-set UoA) and Pacific saury (deep-set UoA) – see PI 2.1.1a.	US Pacific Tuna Group Purse Seine FSC and FAD Set Fishery, AGAC four oceans Integral Purse Seine Tropical Tuna Fishery, Eastern Pacific Purse Seine Skipjack and Yellowfin tuna fishery (FSC and FAD set fishery), French Polynesia albacore and yellowfin longline fishery (EPO bigeye) Pan Pacific yellowfin, bigeye and albacore longline fishery (mackerel) Fiji Albacore, Yellowfin and Bigeye Tuna longline, French Polynesia albacore and yellowfin longline fishery (saury)
2.2.1	Cumulative impacts not triggered	N/a
2.3.1	Cumulative impacts not triggered (only within this fishery as any limits apply to the Hawaiian zone only)	N/a
2.4.1	No VMEs identified	

PI	Harmonisation outcome	Overlapping fisheries with which harmonisation is required
2.4.2	No benthic habitat impacts – not relevant	

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 level, i.e. in terms of the WCPFC and IATTC jurisdictions.

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

Appendix 11 UoA vessel list at time of ACDR drafting

No.	VESSEL NAME	PERMIT NUMBER	VESSEL CALL SIGN	VESSEL LENGHT (ft)
1	3 Brothers	992625	WDJ2190	75
2	Alana	1250644	WDH2943	77
3	Aolani	1250647	WDH2942	77
4	Apsara	1026555	WDJ2677	83.3
5	Autumn	543021	WDJ9851	68.4
6	Azure	687578	WDH6574	79
7	Blue Dragon	969350	WDJ8525	85.2
8	Blue Dragon II	546106	WCZ2349	98
9	Blue Sky	695186	WCF3666	62
10	Capt Andy	921769	WDF4259	75
11	Capt Davis	1048002	WDJ8255	72
12	Capt Greg	602871	WTC4742	66.4
13	Capt K	1045090	WDI5410	82.6
14	Capt Kenneth	991059	WDJ8134	77
15	Capt Kevin	928327	WDJ7935	83.3
16	Capt Millions III	962709	WDI7869	83.3
17	Capt Remo	1101877	WDI8954	78.7
18	Capt Silver	696011	WDK3177	63
19	Captain Alex	638772	WDJ2055	57.5
20	Captain J 3	1045208	WDD9332	81
21	Captain Jayden	910805	WDJ7133	72
22	Captain Minh	927418	WDF6917	76.9
23	Captain Paxton	912794	WDJ8561	66
24	Caroleigh	1148460	WDB5462	78
25	Christine N	597552	WDD2133	56
26	Commander	551566	WDG6356	73.5
27	Commander 1	639570	WDJ2400	49.7
28	Cumberland Trail	512654	WDK7616	68.5
29	Double D	944985	WDE8311	70
30	Edward G.	927505	WTC 4737	77.9
31	Finback	557678	WDJ6627	52.1
32	Gail Ann	939087	WAK2110	92.7
33	Golden Dragon	1120346	WDG6930	88.4
34	Golden Eagle	1048418	WDD3538	79.2

No.	VESSEL NAME	PERMIT NUMBER	VESSEL CALL SIGN	VESSEL LENGHT (ft)
35	Golden Eagle II	963497	WDF6942	72.3
36	Golden Phoenix	1041265	WDI6495	82.3
37	Green Mountain	916945	WDI7875	72
38	Gutsy Lady 4	1120347	WDG7854	85.8
39	Hailey	1087644	WDL9623	74.6
40	Hawaii Ocean	969226	WDH2830	84.3
41	Helen	626560	WDJ9429	49
42	Iron Lady	690722	WDH9145	63.1
43	Itasca	923560	WDL5491	80.5
44	Janthina	978287	WDD5640	79.2
45	Jennifer	946383	WDH7003	54
46	Jenny	615433	WDE6871	58.5
47	Kaimi	615207	WDJ8647	55
48	Kalani	576129	WDJ2879	54.7
49	Kami M	690307	WDD5030	73.2
50	Katherine II	912433	WDJ7988	66
51	Katy Mary	934489	WCX2232	74.9
52	Kaua'i	655545	WDI7508	78.9
53	Kawika	1113224	WDA6034	72
54	Kelly Ann	929284	WBO9234	77.9
55	Kilauea	518306	WDF4959	72
56	Kimmy I	929589	WCJ8123	78.5
57	Lady Alice	594346	WDJ2118	84
58	Lady Ann Margaret	910974	WDF3424	71
59	Lady Anna	943337	WDD4295	78
60	Lady Annie	913939	WDF7010	73
61	Lady Betty	682407	WCQ4711	62
62	Lady Christine I	1139848	WDE5097	82.6
63	Lady Cindy	1135654	WDJ6880	68
64	Lady J3	909004	WDF8205	70
65	Lady Jackie	1040833	WDG6373	78.5
66	Lady Karen	1089736	WDI5313	74.6
67	Lady Karen II	616365	WDG8523	68.9
68	Lady Luck	905580	WDI2728	72.8
69	Lady Maria	512767	WDL5027	72.8

No.	VESSEL NAME	PERMIT NUMBER	VESSEL CALL SIGN	VESSEL LENGHT (ft)
70	Lady Mocha I	697292	WDG9696	66
71	Lady Mocha II	577621	WDI5732	57
72	Lady of the Sea	909535	WDG8406	68
73	Lady of the Sea II	910809	WDI5126	68
74	Lady Pauline	545581	WDH7134	77
75	Lanikai	1029712	WDJ2257	76
76	Laura Ann	672662	WDH6391	69
77	Lucky TJ	570715	WDH4162	71.3
78	Mariah	952622	WCX8862	69.7
79	Marie M	509968	WX9744	65.7
80	Marine Star	537893	WYZ6767	68
81	Mighty Joe	985031	WDJ6928	81.6
82	Mikette	622875	WDE2331	84.7
83	Miss Ellen	612418	WDI6845	67
84	Miss Julie	925847	WCW6964	68.7
85	Miss Myaa	559485	WDL2740	69.1
86	Miss Quinn	1094947	WDJ9341	74
87	Miss Renee	611010	WDG3231	49.8
88	Miss Thuy Tien	984166	WDL3771	77
89	Nahoa	910157	WDJ4715	74.8
90	Nahoa II	944388	WDH3493	78.4
91	OKAY	630817	WDH8890	58.9
92	Pacific Dragon	1021265	WDH9397	81.5
93	Pacific Star	970935	WDI6188	82.3
94	Pacific Sun	615432	WDB6251	58.5
95	Paradise 2001	1081225	WDF3412	75
96	Paradise 2002	1081227	WDF3629	75
97	Pauline II	598973	WDJ6532	62.3
98	Princess Jasmine	1048217	WDC5729	83.8
99	Princess Jasmine II	1050806	WDC5730	78
100	Princess Kelli	1027010	WDK4266	74.4
101	Princess Pearla	945193	WDJ8073	77
102	Queen Alina	1045268	WDE3945	80.8
103	Queen Diamond	964927	WDD2346	76.3
104	Queen Diamond II	949947	WDF7980	76

No.	VESSEL NAME	PERMIT NUMBER	VESSEL CALL SIGN	VESSEL LENGHT (ft)
105	Rainbows	511130	WDK6055	68.5
106	Rising Phoenix	615617	WDH2941	74.3
107	Rising Phoenix II	1107128	WDH3125	84.6
108	Robin II	907207	WDF9642	62
109	Sapphire	905883	WDH6467	71
110	Sapphire II	697292	WDH6468	76
111	Sapphire III	964929	WDJ5613	83.3
112	Sea Diamond	910973	WDK5298	71
113	Sea Dragon	916874	WUV5035	72
114	Sea Dragon II	1089137	WZC5821	74.6
115	Sea Dragon III	1051110	WDI9669	74.4
116	Sea Falcon	649608	WDH6598	84.3
117	Sea Goddess	929439	WDJ4426	83.6
118	Sea Hawk	513575	WDH9345	54.8
119	Sea Moon I	927176	WDI3527	76.9
120	Sea Pearl	982518	WDE5691	87.3
121	Sea Queen II	939008	WDE5203	78.7
122	Sea Queen IIA	1110939	WDH2007	83.2
123	Sea Smile	542088	WDJ7028	52.7
124	Seaspray	609841	WDJ8302	48.9
125	Second Andy	1168403	WDI2818	74
126	Serenity	916657	WDJ5013	91.4
127	Seven Star	593762	WDJ4329	72.1
128	Sky Moon	559024	WDB7145	71.2
129	St Damien	509600	WDG7604	63
130	St. Marianne	583780	WDJ2093	77
131	St. Martin	689668	WDF7256	74
132	St. Peter	911298	WDF5798	72
133	Sylvia	686609	WDE3606	72
134	The Seeker II	588768	WDJ8717	77
135	Triple Andy	968001	WDJ2903	84.8
136	Triple Dragon	913733	WCY7734	78
137	VAK 1	909782	WDJ9511	68
138	VAK 2	909147	WDE9960	70
139	VAK 3	910988	WDF6735	66

No.	VESSEL NAME	PERMIT NUMBER	VESSEL CALL SIGN	VESSEL LENGHT (ft)
140	Vui Vui	930207	WDJ3471	75
141	Vui Vui II	914121	WDJ6947	79.5

Appendix 12 Species list

English Common name	Scientific name
Albacore	<i>Thunnus alalunga</i>
Bigeye thresher shark	<i>Alopias superciliosus</i>
Bigeye tuna	<i>Thunnus obesus</i>
Black marlin	<i>Istiompax indica</i>
Black-footed albatross	<i>Phoebastria nigripes</i>
Blue shark	<i>Prionace glauca</i>
Brown booby	<i>Sula leucogaster</i>
Common thresher shark	<i>Alopias vulpinus</i>
False killer whale	<i>Pseudorca crassidens</i>
Giant manta ray	<i>Mobula birostris</i>
Ginkgo-toothed beaked whale	<i>Mesoplodon ginkgodens</i>
Green sea turtle	<i>Chelonia mydas</i>
Guadalupe fur seal	<i>Arctocephalus townsendi</i>
Indo-Pacific blue marlin	<i>Makaira mazara (nigricans)</i>
Indo-Pacific bottlenose dolphin	<i>Tursiops aduncus</i>
Kawakawa	<i>Euthynnus affinis</i>
Laysan albatross	<i>Phoebastria immutabilis</i>
Leatherback sea turtle	<i>Dermochelys coriacea</i>
Loggerhead sea turtle	<i>Caretta caretta</i>
Longfin mako shark	<i>Isurus paucus</i>
Mahi mahi	<i>Coryphaena</i> spp.
Milkfish	<i>Chanos chanos</i>
Moonfish	<i>Lampris</i> spp.
Northern bluefin tuna	<i>Thunnus thynnus</i>
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>
Oilfish	Gempylidae
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>
Other tuna relatives	<i>Auxis</i> spp. <i>Scromber</i> spp.; <i>Allothunus</i> spp.
Pacific mackerel	<i>Scomber japonicus</i>
Pacific sardine	<i>Sardinops sagax</i>
Pacific saury	<i>Cololabis saira</i>
Pelagic thresher shark	<i>Alopias pelagicus</i>
Pomfret	Bramidae
Purple flying squid	<i>Stenoteuthis oualaniensis</i>
Red-footed booby	<i>Sula sula</i>
Risso's dolphin	<i>Grampus griseus</i>
Rough-toothed dolphin	<i>Steno bredanensis</i>
Sailfish	<i>Istiophorus platypterus</i>
Shortbill spearfish	<i>Tetrapturus angustirostris</i>
Shortfin mako shark	<i>Isurus oxyrinchus</i>
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>
Silky shark	<i>Carcharhinus falciformis</i>
Skipjack tuna	<i>Katsuwonus pelamis</i>
Sooty shearwater	<i>Ardenna grisea</i>
Striped dolphin	<i>Stenella coeruleoalba</i>

English Common name**Striped marlin****Swordfish****Wahoo/ ono****Yellowfin tuna****Scientific name***Kajikia audax**Xiphias gladius**Acanthocybium solandri**Thunnus albacares*