NORTHERN COMMITTEE
FIFTEENTH REGULAR SESSION

Portland, Oregon, USA
3-6 September 2019

Report of the Nineteenth Meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

WCPFC-NC15-2019/IP-01

ISC[1]

[1] International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

REPORT OF THE NINETEENTH MEETING OF THE INTERNATIONAL SCIENTIFIC COMMITTEE FOR TUNA AND TUNA-LIKE SPECIES IN THE NORTH PACIFIC OCEAN

PLENARY SESSION

July 11-15, 2019
Taipei City
Taiwan

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ACRONYMS AND ABBERVIATIONS

Names and FAO Codes of ISC Species of Interest in the North Pacific Ocean

FAO Code	Common English Name	Scientific Name
	TUNAS	
ALB	Albacore	*Thunnus alalunga*
BET	Bigeye tuna	*Thunnus obesus*
PBF	Pacific bluefin tuna	*Thunnus orientalis*
SKJ	Skipjack tuna	*Katsuwonus pelamis*
YFT	Yellowfin tuna	*Thunnus albacares*
	BILLFISHES	
BIL	Other billfish	Family *Istiophoridae*
BLM	Black marlin	*Makaira indica*
BUM	Blue marlin	*Makaira nigricans*
MLS	Striped marlin	*Kajikia audax*
SFA	Sailfish	*Istiophorus platypterus*
SSP	Shortbill spearfish	*Tetrapturus angustirostris*
SWO	Swordfish	*Xiphias gladius*
	SHARKS	
ALV	Common thresher shark	*Alopias vulpinus*
BSH	Blue shark	*Prionace glauca*
BTH	Bigeye thresher shark	*Alopias superciliosus*
FAL	Silky shark	*Carcharhinus falciformis*
LMA	Longfin mako	*Isurus paucus*
LMD	Salmon shark	*Lamna ditropis*
OCS	Oceanic whitetip shark	*Carcharhinus longimanus*
PSK	Crocodile shark	*Pseudocarcharias kamonharai*
PTH	Pelagic thresher shark	*Alopias pelagicus*
SMA	Shortfin mako shark	*Isurus oxyrinchus*
SPN	Hammerhead spp.	*Sphyrna* spp.

ISC Working Groups

Acronym	Name	Chair
ALBWG	Albacore Working Group	Hidetada Kiyofuji (Japan)
BILLWG	Billfish Working Group	Jon Brodziak (U.S.A.)
PBFWG	Pacific Bluefin Working Group	Shuya Nakatsuka (Japan)
SHARKWG	Shark Working Group	Mikihiko Kai (Japan)
STATWG	Statistics Working Group	John Holmes (Canada)

Other Abbreviations and Acronyms Used in the Report

CDS	Catch documentation scheme
CIE	Center for Independent Experts
CKMR	Close-kin mark-recapture
CMM	Conservation and Management Measure
CPUE	Catch-per-unit-of-effort
DWLL	Distant-water longline
EEZ	Exclusive economic zone
EPO	Eastern Pacific Ocean
F	Fishing mortality rate
FAO	Fisheries and Agriculture Organization of the United Nations
FL	Fork length
GRT	Gross registered tons
HMS	Highly migratory species
H_{MSY}	Harvest rate at MSY
IATTC	Inter-American Tropical Tuna Commission
ISC	International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean
LTLL	Large-scale tuna longline
LRP	Limit reference point
MSE	Management strategy evaluation
MSY	Maximum sustainable yield
NC	Northern Committee (WCPFC)
NPO	North Pacific Ocean
NRIFSF	National Research Institute of Far Seas Fisheries (Japan)
PICES	North Pacific Marine Science Organization
RFMO	Regional Fishery Management Organization
SC	Scientific Committee (WCPFC)
SPO	South Pacific Ocean
SPR	Spawning potential ratio, spawner per recruit
SSB	Spawning stock biomass
$SSB_{F=0}$	Spawning stock biomass at a hypothetical unfished level
$SSB_{CURRENT}$	Current spawning stock biomass
SSB_{MSY}	Spawning stock biomass at maximum sustainable yield
SPO	South Pacific Ocean
STLL	Small-scale tuna longline
t, mt	Metric tons, tonnes
WCNPO	Western Central and North Pacific Ocean
WCPFC	Western and Central Pacific Fisheries Commission
WWF	World Wildlife Fund for Nature - Japan

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Highlights of the ISC19 Plenary Meeting

The 19th ISC Plenary, held in Taipei, Taiwan, July 11-15, 2019 was attended by Members from Canada, Japan, Korea, Taiwan, and the United States as well as the Western and Central Pacific Fisheries Commission (WCPFC). Observers from Monterey Bay Aquarium and the Western Pacific Fisheries Management Council (WPFMC) also attended the ISC19 Plenary session. The Plenary reviewed results, conclusions, new data, and updated analyses of the Billfish, Albacore, Shark and Pacific Bluefin tuna Working Groups. The Plenary endorsed the findings that the Western and Central North Pacific Ocean (WCNPO) striped marlin stock (MLS) is overfished and that overfishing is occurring relative to MSY-based reference points and considers the WCNPO MLS stock assessment to be the best available scientific information on the stock. The Plenary also notes that limit and target reference points have not been established for the WCNPO MLS stock by the WCPFC, in whose convention area the range of this stock lies. The ISC Plenary re-iterated stock status and conservation information provided at ISC18 for North Pacific albacore (ALB), Pacific bluefin tuna (PBF), North Pacific blue shark (BSH), North Pacific shortfin mako shark (SMA), WCNPO Swordfish (SWO), Eastern Pacific Ocean Swordfish (EPO SWO) and Pacific blue marlin (BUM). The results of preliminary management strategy evaluation (MSE) for ALB were reviewed and input from the second management strategy evaluation workshop for PBF was discussed. The ISC Plenary also reviewed recommendations from the peer review report of stock assessment function that it commissioned and agreed that independent expert reviews could improve the quality and transparency of its stock assessments. A report of the Ad-hoc Workshop on the PBF Close-kin mark-recapture project was reviewed and it is noted that several years might be needed for each country to extract DNA from its samples and complete marker development. The ISC work plan for 2019-20 includes conducting benchmark stock assessments of ALB and PBF, updating information on biological reference points for ISC species of interest, improving catch and CPUE time series and advancing biological information for shark species, moving the MSE processes for ALB and PBF forward and enhancing database and website management. Shuya Nakatsuka (Japan) and Hirotaka Ijima (Japan) were elected for three-year terms as the Chairs of the PBFWG and BILLWG, respectively. The next ISC Plenary will be held in the United States of America in July 2020.

1 INTRODUCTION AND OPENING OF THE MEETING

1.1 Introduction

The ISC was established in 1995 through an intergovernmental agreement between Japan and the United States (U.S.A.). Since its establishment and first meeting in 1996, the ISC has undergone a number of changes to its charter and name (from the Interim Scientific Committee to the International Scientific Committee) and has adopted a number of guidelines for its operations. The two main goals of the ISC are (1) to enhance scientific research and cooperation for conservation and rational utilization of the species of tuna and tuna-like fishes that inhabit the North Pacific Ocean (NPO) during a part or all of their life cycle; and (2) to establish the scientific groundwork for the conservation and rational utilization of these species in this region. The ISC is made up of voting Members from coastal states and fishing entities of the region as well as coastal states and fishing entities with vessels fishing for highly migratory species in the region, and non-voting Members from relevant intergovernmental fishery and marine science organizations, recognized by all voting Members.

The ISC provides scientific advice on the stocks and fisheries of tuna and tuna-like species in the NPO to the Member governments and regional fisheries management organizations. Fishery data tabulated by ISC Members and peer-reviewed by the species and statistics Working Groups (WGs) form the basis for research conducted by the ISC. Although some data for the most recent years are incomplete and provisional, the total catch of highly migratory species (HMS) by ISC Members estimated from available information is in excess of 500,000 metric tons (t) annually and dominated by the tropical tuna species. Catches of priority species monitored by ISC Member countries in 2018 were 49,300 t of NPO albacore tuna (ALB, *Thunnus alalunga*), 10,148 t of Pacific bluefin tuna (PBF, *T. orientalis*), 11,960 t of NPO swordfish (SWO, *Xiphias gladius*), 2,536 t of NPO striped marlin (MLS, *Kajikia audax*), 7,079 t of Pacific blue marlin (BUM, *Makaira nigicans*), 1,144 t of NPO shortfin mako shark (SMA, *Isurus oxyrinchus*) and 27,308 t of NPO blue shark (BSH, *Prionace glauca*).[1] The total estimated catch of these seven species is 109,475 t, or approximately 104% of the 2017 total estimated catch of 104,975 t. Annual catches of priority stocks throughout their ranges reported by ISC Members are shown in Table 15-1 through Table 15-7.

1.2 Opening of the Meeting

The Nineteenth Plenary session of the ISC (ISC19) was convened in Taipei City, Taiwan, at 0900 on July 11, 2019 by the ISC Chairman, J. Holmes. A roll call confirmed the presence of delegates from Canada, Japan, Republic of Korea, Taiwan, and U.S.A. (**ISC/18/ANNEX/01**). A representative from the Western and Central Pacific Fisheries Commission (WCPFC) was also present. Monterey Bay Aquarium and the Western Pacific Fisheries Management Council were present as observers.

ISC Members China and Mexico, as well as non-voting Members the Secretariat of the Pacific Community (SPC), the Fisheries and Agriculture Organization of the United Nations (FAO), the

[1] FAO three-letter species codes are used throughout this report interchangeably with common names.

North Pacific Marine Science Organization (PICES), and the Inter-American Tropical Tuna Commission (IATTC), while extended an invitation, did not attend the Plenary.

J. Holmes introduced Mr. Tain-Shou Chen (陳添壽), Deputy Minister of the Council of Agriculture, Executive Yuan, who gave the welcome address for the meeting.

2 ADOPTION OF AGENDA

The proposed agenda for the session (**ISC/19/ANNEX/02**) was considered and adopted. C. Dahl was assigned lead rapporteur duties. A list of meeting documents is contained in **ISC/19/ANNEX/03**.

3 REPORT OF THE CHAIRMAN

ISC scientists have been busy since the ISC Plenary last met in Yesou, Republic of Korea, in July 2018. The year was spent completing a benchmark assessment of WCNPO MLS, completing a research collaboration with PICES, the management strategy evaluation (MSE) processes for ALB and PBF, and an ad-hoc PBF close-kin mark recapture workshop. The catalogue and inventory of the ISC database, and development of the website and data enterprise system continue to be advanced under the leadership of the STATWG Chair and Vice-Chair.

While the ISC continues to advance its scientific mission on many fronts, we cannot afford to waiver from the goal of providing the best available scientific information on northern stocks of highly migratory species. The ISC is an independent science-focused organization that continuously seeks to improve its scientific excellence. During the past year, the second peer review of the ISC function on stock assessment was completed. The report contains recommendations to improve stock assessment practices that will be discussed at ISC19 to identify a way forward. This report contributes to the development by the ISC of best practices and improved scientific reporting procedures. An important step in this evolution is the template for stock status and conservation information adopted at ISC19 and is intended to produce greater consistency in the information presented and to facilitate ISC Plenary deliberations on stock status and conservation information. Additionally, providing this information in a more consistent manner should assist resource managers in interpreting the advice and information provided to them by the ISC.

Five workshops and several conference calls/webinars were held to facilitate collaboration among Member scientists in implementing ISC work plans and coordinating research on northern stocks. In addition, the ISC convened two MSE workshops in Yokohama, Japan, for ALB, and San Diego, U.S.A., for PBF. Shuya Nakatsuka was elected for his first three-year term as Chair of the PBFWG and Jon Brodziak (U.S.A.) has completed his final term as Chair of the BILLWG.

The process to formalize the structure/existence of the ISC is continuing, but it is not a quick process. Managing ISC activities continues to be challenging, because the ISC relies on in-kind contributions from its Members rather than monetary contributions to support a “Secretariat” to oversee day-to-day operations of the organization. While the Office of the Chair takes on the role

of a Secretariat, owing to undefined funding it cannot provide full support. The Working Groups depend on in-kind contributions from Members who elect to participate in specific Working Groups, particularly those Members who serve as Chairs and Vice-Chairs. Day-to-day operations of the Office of the Chair have been supported by the U.S., and to a lesser extent Canada, and Japan has supported the operations of the ISC website and database. Member countries with scientists serving as chairpersons of the Working Groups have contributed to supporting administrative services of the Working Groups. This support is vital to the ability of the ISC to deliver its scientific mandate and is greatly appreciated.

I am deeply grateful to Gerard DiNardo, for his efforts to significantly increase the scientific stature, commitment, and competency of ISC. The current ISC leadership team of John Holmes (Chair) and Shui-Kai Chang (Vice-Chair) has relied heavily on Gerard for support and advice on ISC operations and the delivery of oversight functions at critical events. We wish him well in the future now that he has stepped away from the ISC. The ISC as it presently exists is in large part a testament to the success of those efforts and the unwavering dedication and integrity of ISC scientists. At the same time, the breadth and scope of our research, scientific partnerships, and visibility are expanding and will continue to do so in the coming years.

My second year as ISC Chair has come and gone. I close this report by thanking all my colleagues who have worked on ISC tasks and who have provided the support to ISC and the Office of the Chair in advancing the objectives and purpose of the organization. The support of Shui-Kai Chang, Vice-Chair, for his advice, and gentle prodding to do things is appreciated, as well as the services of Freddie Logan and Stephanie Flores (USA). Special thanks and appreciation are owed to the Chairs and Vice-Chairs of the working groups, namely Jon Brodziak, Hidetada Kiyofuji and Steve Teo, Shuya Nakatsuka, and Mikihiko Kai, who provided unselfish leadership in guiding the work of the Working Groups. In addition, the leadership role of Hiroaki Okamoto in guiding the Data Administrator and Webmaster, Kirara Nishikawa, is appreciated. Finally, I acknowledge the professional assistance and dedicated service of Tarah Sullivan to the ISC in ensuring that I completed tasks assigned to me and as a point of contact for the Office of the Chair. She responded to inquiries, coordinated the editing, and assembled technical information required for the meeting agenda and kept me apprised of ongoing preparations and work of the ISC. Thanks to all of you for contributing to another successful year for ISC and for your support and service.

4 DELEGATION REPORTS ON FISHERY MONITORING, DATA COLLECTION AND RESEARCH

4.1 Canada

Z. Zhang presented the National Report of Canada (**ISC/19/PLENARY/04**). Canada has one fishery for highly migratory species in the Pacific Ocean, a troll fishery targeting juvenile NPO ALB (*Thunnus alalunga*). The Canadian 2018 ALB troll fleet consisted of 121 fishing vessels just as in 2017, well below the average participation rate of 168 vessels since 2003. The fishing season was between June and October. Fishing effort was predominantly distributed in the Canadian and the U.S. exclusive economic zones (EEZ) in 2018.

Estimated ALB catch and fishing effort were 2,717 t and 4,196 vessel-days, respectively, which represent a 48.5% increase in catch and a 15.8% decrease in fishing effort relative to 2017. Catch and catch per unit of effort (CPUE) increased substantially in the Canadian exclusive economic zone (EEZ) relative to 2017. Catch increased by 308.3% in the Canadian EEZ in contrast to a 36.4% in the U.S. EEZ, and CPUE increased by 185% in the Canadian EEZ in contrast to 75% in the U.S. EEZ. Fishing effort in 2018 increased by 43.3% in the Canadian EEZ, but decreased by 22.2% in the U.S. EEZ relative to 2017. ALB were caught in waters with sea surface temperatures between 11 and 21 °C, and 93% of the ALB were harvested in waters within the 16-18 °C temperature band in 2018. Fork length measurements were recorded from 9,401 ALB, which ranged from 48 to 94 cm. The length distribution was dominated by a mode around 67 cm fork length (FL). There was an extraordinarily high number (5,508) of small ALB, which were captured and released in 2018. The number of released ALB is more than 10 times as high as in 2017.

Discussion

Noting the report of two seabirds taken in the ALB troll fishery, interest in better accounting for seabird bycatch is partly due to the existence of a National Wildlife Area for seabirds at the northwest tip of Vancouver Island. Some regionally and globally rare seabirds either nest of feed in this area. Currently, ALB fishermen do not have sufficient training to identify seabird bycatch by species but a large nesting colony of rhinoceros auklets and other regionally important species are known to occur in the reserve.

The number of small ALB released because they were too small to be marketable increased in 2018 relative to 2017. It was noted that the release of small ALB presented an opportunity to collect otoliths from a poorly sampled age group (1 year olds) in the EPO. In response, it was thought to be unnecessary, because the size and age relationship for these fish is well understood.

The decline in fishing effort in 2018, despite the increase in average catch rate, is likely due to the poor catch rate of marketable fish in 2017, prompting participants with licenses for species to decide not to participate in 2018. Fishing effort was more focused in areas within the EEZs of Canada and the United States in 2018 than 2017.

Although, as reported at ISC18, catch has been correlated with environmental conditions (measured by the North Pacific Gyre Oscillation), 2018 Canadian catches are not consistent with this relationship.

4.2 Chinese-Taipei

H. Liu presented the Chinese-Taipei National Report (**ISC/19/PLENARY/05**). There are two principal Chinese-Taipei tuna fisheries operating in the NPO, namely the tuna longline fishery and the distant water purse seine fishery; other offshore and coastal fisheries include the harpoon, set-net, and gillnet fisheries accounting for a small proportion of overall tuna and tuna-like species catch. The catches of longline and purse seine fisheries accounted for 99% of the total tuna and tuna-like species caught by Chinese-Taipei in the NPO. Longline fisheries are composed of the large-scale tuna longline (LTLL, vessels larger than 100 gross registered tons, GRT) and small-scale tuna longline (STLL, vessels less than 100 GRT) fleets. The total catch of tunas and billfish

(including SWO, MLS, BUM, BLM, and SFA) by the LTLL and STLL fleets in the NPO was 28,993 t in 2018. Total catch in the purse seine fishery in the entire Pacific Ocean was 193,682 t in 2018.

In recent years, Category I data for the LTLL fishery have been estimated using electronic logbook data and landing data from individual fishing vessels. Category II and III data are compiled from electronic logbook data. The estimation of Category I data for the STLL is also based on the electronic logbook data and landing data, but Category III data are sampled at domestic fishing ports. All purse seine fishery data are compiled from logbooks.

A catch documentation scheme (CDS) has been established and implemented for vessels fishing for PBF since 2010, with prior authorization by every vessel and notification and tagging of every PBF caught. Moreover, port samplers are dispatched to measure length and weight of each PBF landed. Chinese-Taipei collected 798 PBF tissue samples in 2018 for the Close-Kin Mark Recapture project.

The observer program has gradually expanded in recent years with more observers recruited. Seventy-six observers were deployed on longline vessels operating in the NPO in 2018, including 11 observers for LTLL vessels and 65 observers for STLL vessels. This level of observer coverage exceeds the target of 5% coverage of the effort in fisheries for fresh fish in the North Pacific Ocean in WCPFC CMM 2012-03.

Discussion

The decline in the number of STLL vessels participating in the fishery in 2018 is primarily related to a reclassification of vessels into coastal fishery categories while the increase in catch by STLL vessels is a result of their capacity to fish throughout the Pacific Ocean. The catch of yellowfin tuna was higher in the NPO than the SPO in the past two years. It was noted that the number of tabulated purse seine vessels from 2017 to 2018 were active vessels while the number in previous years were the authorized number.

While effort in 2018 were comparable to 2017, catch of ALB declined while YFT catch increased for unknown reasons.

4.3 Japan

H. Okamoto presented the Japan National Report (**ISC/19/PLENARY/06**). Japanese tuna fisheries consist of three major fleets (longline, purse seine, and pole-and-line) and other miscellaneous fisheries including troll, drift-net, and set-net fisheries. The number of active longline vessels in the NPO shows a declining trend in all size categories, with 300 vessels in 2018, 62% of the number active in 2006. The number of purse seiners is relatively stable, at around 70 vessels. The number of pole and line vessels in the 50-200 GRT size category is declining, with a total of 69 vessels active in 2018, 61% of the active vessels in 2006. The distribution of fishing effort did not show a remarkable difference between 2017 and 2018 in the three main fisheries. The total catch of tunas (excluding skipjack) caught by Japanese fisheries in the NPO was 102,124 t in 2017 and 109,505 t in 2018. The total catch of tunas (including skipjack) caught by Japanese fisheries in the NPO was 259,195 t in 2017 and 304,562 t in 2018. The total catch of SWO and MLS was 9,086 t in 2017 and 9,457 t in 2018.

In addition to these fisheries descriptions, the report briefly introduced Japanese research activities on tuna and tuna-like species in the Pacific Ocean in 2018. An important research outcome is the discovery during the larvae/juveniles research cruise by R/V *Shunyo-maru* of a potential third PBF spawning ground off of the northeastern Pacific coast of Japan.

Discussion

Data from pop-up tags on NP BSH has enabled a better understanding of migratory patterns, which will be reported in a forthcoming scientific paper.

While in the past the government has implemented programs to reduce the number of distant water longline vessels, the further decline in the past decade is due to economic factors including a shortage of crew.

Offshore and distant water longline vessels have similar operational areas at present in the Western and Central Pacific Ocean only.

Interest was expressed in seeing the results of the close-kin analysis of PBF being conducted by Japan and Japan indicated that they will share these findings when possible.

The survey of the spatial distribution of PBF spawning in waters surrounding Japan will continue, which could help in understanding how each spawning area contributes to recruitment and further support preliminary findings of a third spawning area.

Participation in the coastal troll fishery for PBF is declining as the supply of stock to fish farms is increasingly coming from catches in the purse seine fishery. This change has increased uncertainty in the recruitment index, which is based on monitoring of the troll fishery.

4.4 Republic of Korea

D. Kim presented the Korean National Report (**ISC/19/PLENARY/07**). Korean distant water fisheries for tuna and tuna-like species operating in the NPO use two types of fishing gears, purse seine and longline. In 2018, 96 longline vessels were active, which is the lowest level since the 1990s while 26 purse seine vessels were active, the same number as 2017. Total catch of tuna and tuna-like species caught in the NPO was 90,557 t in 2018. Total catch by the longline fishery was 16,912 t, which was similar to the 2017 catch. In contrast, purse seine fishery catch was 73,645 t, more than double the 2017 catch. The dominant species in the longline fishery catch were BET (64.1% of total catch), YFT (20.3% of total catch), and BUM (7.9% of total catch). Dominant species in the purse seine fishery were SKJ tuna (80.8% of total catch), YFT (17.4% of total catch), and BET (1.8% of total catch). The offshore large purse seine fishery caught 523 t of PBF in the Korean EEZ in 2018 while the total PBF catch was 535 t. The PBF catch was mainly distributed around Jeju Island. Catch of large PBF (≥30kg) was 5% of the total PBF catch. To support close-kin research for PBF, 245 individuals were sampled in 2018.

Discussion

Support for the ongoing efforts by Korea to reconstruct ALB catch in the high seas drift net fishery in the late 1980s and early 1990s was noted; these data will strengthen future stock

assessments. A number of potential sources for these data were discussed as Korea has not been able to locate operational data from the fleet at present. However, Korea is making efforts to reconstruct these data and they will be provided once the reconstruction has been completed.

The apparent increase in Korean purse seine catch in 2018 was a function of a shift in fishing effort to the NPO from the SPO, the area for which catches are reported.

4.5 U.S.A.

K. Koch presented the United States National Report to the Plenary (**ISC/19/PLENARY/09**). The Pacific Ocean produces about 71% of the global tuna catch and about 78% of the tuna catch in the Pacific Ocean is from the Western Pacific. U.S.A. catch of major tuna species in the NPO was 90,812 t in 2018. This catch was composed of SKJ (62%), YFT (15%), BET (14%) and ALB (9%). The U.S.A. purse seine fishery in the NPO accounted for 78% of the tuna catch, followed by the longline fishery (11%) and ALB troll fishery (9%). There were 46 U.S.A. purse seine vessels that caught 71,017 t of which 78% was SKJ in 2018 compared to 41 vessels that caught 60,542 t in 2017. The 2015-2018 purse seine catches are considered preliminary because the species composition of juvenile YFT and BET have not been adjusted. In 2018, 145 U.S.A. longline vessels fishing in the NPO caught 12,779 t of tuna, billfish, and other pelagic species. NPO longline BET and SWO catches were 7,572 t and 1,053 t, respectively in 2018. Longline catches have remained stable since 2015. There were only 452 U.S.A. ALB troll vessels in the NPO, the fewest since 1995 when there were 471 vessels. The 2018 ALB troll catch was 7,737 t composed exclusively of ALB. ALB catches were low in the two most recent years. Research highlights were provided on PBF recruitment prediction, distribution, foraging ecology, recreational size sampling efforts, and reproductive biology as well as ALB distribution and a nocturnal visual SCUBA survey. Additionally, research on multi-stage recruitment models and assessing the status of pelagic sharks using simple fishery indicators was presented.

Discussion

U.S.A. researchers were encouraged to publish sampling results showing that PBF in the Eastern Pacific Ocean (EPO) are not sexually mature.

It was noted that PBF length-weight data from sampling of the U.S.A. recreational fishery would be a useful supplement to data being used by the PBFWG.

5 INTERACTIONS WITH REGIONAL ORGANIZATIONS

5.1 WCPFC

The WCPFC Science Manager S.K. Soh described interactions between ISC and WCPFC in 2018, based on the MOU, which has been in effect since December 2005. He highlighted responses of the Scientific Committee (SC) and Northern Committee (NC) to the provision of ISC's information, especially the stock status and conservation information for PBF, NPO SWO, and NPO SMA. Details are recorded in the SC14 and NC14 summary reports, and NC14 noted the cooperation with ISC as "critical" for the advance of the tasks of NC.

The Commission also highlighted key activities of the ISC through the Annual Report of the Executive Director to the Commission at WCPFC15 in December 2018 (Paragraphs 46 – 48, Doc. WCPFC15-2018-04). Based on the ISC's scientific advice and NC14's recommendation, WCPFC15 adopted a revised PBF conservation measure (CMM 2018-02), and strongly encouraged Members to submit a draft rebuilding plan to update the NPO MLS conservation measure (CMM 2010-01). The request to designate WCNPO MLS and WCNPO BSH as northern stocks was not agreed to by the Commission.

Discussion

It was clarified that WCPFC data holdings for China may be incomplete and had to be obtained from the IATTC and SPC separately.

5.2 PICES

K. Koch presented information on the third meeting of the Joint PICES/ISC Working Group on Ocean Conditions and the Distribution and Productivity of Highly Migratory Fish (**ISC/19/INFODOC/12**). This WG meeting was held October 2018 in Yokohama, Japan, under the chairmanship of Dr. Gerard DiNardo (U.S.A.) and Dr. Chi-Lu Sun (ISC/Chinese-Taipei). The meeting focused on consideration of the role of external drivers and integrating ecosystem considerations into scientific advice. They also discussed progress and future plans for the WG, including potential topic session proposals for the 2019 meeting to be held in Victoria, Canada. The overall aim of the WG was to incorporate climate variability into stock assessments and management decision making, via collaborations between scientists from PICES and the ISC. The initial focus of the WG was on ALB, but WG activities have since broadened to include other HMS. Although the WG planned to hold two workshops through PICES, and one through the ISC, the latter proved too difficult with travel restrictions, and so all meetings were conducted through PICES. Two workshops (2016 and 2017), and one topic session (2018) were held at PICES annual meetings. A one-year extension of the WG was granted, extending group activities through October 2019. The topic for the 2019 meeting of the WG will be "Application of ecosystem-based fisheries management in the 21st century: progress and challenges in pelagic systems." Dr. Barb Muhling of NOAA Fisheries (U.S.A.) will chair. It is expected that the WG will sunset after the 2019 meeting.

Discussion

After Plenary discussion the ISC Chair concluded that the work of the WG has evolved beyond the scope of ISC's responsibilities and supported its planned dissolution at the end of this year. The ISC may review the working group's final report next year and then discuss options for carrying on this work in a different capacity.

6 REPORT OF SPECIES WORKING GROUPS AND REVIEW OF ASSIGNMENTS

6.1 Albacore

H. Kiyofuji reported on the activities of the ALBWG over the past year (**ISC/19/ANNEX/06, 12**). ALBWG workshops were held 26 February – 4 March, 2019, in Shimizu, Shizuoka, Japan

to 1) review progress of the MSE process, 2) review preliminary MSE results, 3) prepare a draft executive summary of the MSE progress report for the Fourth MSE Workshop in Yokohama and ISC19 Plenary, 4) review progress on model improvements for 2020 assessment, and 5) review the timeline and work plan for the MSE and the 2020 assessment. The ALBWG supported the five main results of the MSE and recommended that the limitations of the current MSE be communicated to the managers and stakeholders at the Fourth ISC ALB MSE workshop in Yokohama. The ALBWG also recommended that a document summarizing the MSE results in less technical language be provided at the Fourth ISC ALB MSE workshop in Yokohama. Research priorities in preparation for the 2020 assessment were identified by the ALBWG.

The Fourth ISC MSE workshop 4 – 7 March 2019 in Yokohama, Japan, had 25 participants including managers, stakeholders, NGOs, and scientists from five countries and four different organizations (**ISC/19/ANNEX/06**). Primary objectives of this workshop were to 1) examine the preliminary results of the initial round of the MSE for NPALB with managers and stakeholders, 2) collate feedback from managers and stakeholders on future MSE improvements, and 3) develop recommendations for the WCPFC NC and IATTC. While no management recommendations for the WCPFC NC and IATTC were developed by workshop participants, future improvements to the MSE were identified (**ISC/19/ANNEX/06**). The workshop participants recommended that the ALBWG continue working on the MSE process for a second round because the results presented at the Fourth ISC ALB MSE Workshop were useful for understanding the tradeoffs and potential performance of candidate reference points and harvest control rules.

The ALBWG proposed the following 2019-2020 meeting schedule:

Date	Location	Task/Event
Aug 12-20, 2019	Pohnpei, FSM	ALBWG Chair attends 15th WCPFC-SC
Sep 2-6, 2019	Portland, OR, U.S.A.	ALBWG Chair attends 15th WCPFC-NC
Nov 12-18, 2019	Shimizu, Japan	ALBWG: data preparatory workshop
March 16-23, 2020	La Jolla, CA, U.S.A.	ALBWG: stock assessment workshop
July 2020	U.S.A.	½ day in advance of ISC20
Late 2020	To be determined	ALBWG: 5th ISC MSE workshop to review results from 2nd round of MSE

Discussion

Plans for changes in the MSE operating model were discussed, specifically in relation to the completion of the next benchmark assessment in 2020. These changes could prompt changes in the preliminary MSE conclusions reported for the current round of the MSE. Several operating models were developed but it was noted that the ALBWG did not assign weights to alternative operating models so results represent an average of model outcomes.

The use of spider plots to report results was discussed; it was noted that based on feedback from managers and stakeholders spider plots will not be used in future reporting, although some

observed that this type of plot provides a useful visual summary of the characteristics of different harvest strategies in achieving management objectives.

The ISC Chair noted that the stock assessment is the ISC's highest priority for ALB in the near term and suggested that the MSE work should be completed between assessments. The ISC Plenary agreed with and endorsed the WG's decision to prioritize the assessment over the MSE, considering the workload of the WG. The ISC Plenary endorsed the MSE results presented by the ALBWG Chair. It was noted that the ALBWG Chair will report on the MSE at the upcoming NC meeting, after an introductory overview by the ISC Chair.

The U.S. noted the importance of the work on genetic sex identification of ALB by Japan. The U.S. expressed strong support for the work and encouraged Japan to share the material as soon as possible for more testing.

6.2 Pacific Bluefin Tuna

S. Nakatsuka reported on the activities of PBFWG over the past year (**ISC/19/ANNEX/08**). The WG held a workshop on 18-22 March 2019 in Jeju, Korea. The PBFWG has been tasked by the Joint NC-IATTC PBF Working Group with completing a benchmark stock assessment in 2020. As such, the primary objective of this year's workshop was to review the current assessment model and discuss possible improvements for the upcoming benchmark assessment. The PBFWG also reviewed the latest fishery information and evaluated whether unexpected changes in recruitment or biomass were occurring in the PBF stock. In addition, the WG developed responses to two additional requests from the Joint NC-IATTC PBF Working Group.

In the workshop, the WG reviewed the current assessment model in detail and developed a list of potential improvements and work plan (**ISC/19/ANNEX/08**, Appendix 5). The WG also reviewed the latest stock information as requested by the Joint NC-IATTC PBF Working Group and concluded that the Conservation Information in 2018 should be maintained. In addition, the WG conducted projections based on the 2018 assessment under additional harvest scenarios, in accordance with the requests from the Joint NC-IATTC PBF Working Group. The recommended responses to these requests are compiled in **ISC/19/ANNEX/08**, Appendix 6, which will be provided during the IATTC – WCPFC NC Joint Working Group meeting in September. The WG also updated the list of candidate reference points provided in 2010 based on the 2018 assessment results, which is attached to the PBFWG report **(ISC/19/ANNEX/08**, Appendix 4).

S. Nakatsuka was elected as the Chair of the PBFWG. The Vice-Chair seat is currently vacant.

The PBFWG proposed schedule for 2019/20 is as follows:

Meeting	Dates	Location	Goals
WCPFC SC15	10-20 Aug	Pohnpei, FSM	Update activities of PBFWG
WCPFC NC15	3-6, Sep	Portland, U.S.A.	Provide response to requests and update results of MSE Workshop
WG Workshop	18-23 Nov	La Jolla, U.S.A.	Data preparatory meeting
WG Workshop	March 2020	Japan	Benchmark stock assessment
ISC20	½ day	U.S.A., TBD	Review assessment presentation

Discussion

The ISC Plenary endorsed the recommended responses to the Joint Working Group requests developed by the PBFWG and the workplan for conducting the benchmark assessment in 2020.

6.2.1 Second Management Strategy Evaluation Meeting

K. Koch presented the summary report of the second PBF MSE stakeholder workshop (**ISC/19/ANNEX/10**), which occurred 20-21 May 2019 in San Diego, CA and was co-chaired by Dr. Mark Maunder (IATTC) and Dr. Shuya Nakatsuka (Japan and ISC). The objectives of the workshop were to enhance stakeholders' understanding of MSE and promote their involvement, and to further develop the discussion of the PBF MSE based on the results of the first Workshop and ISC's work thereafter. Approximately 70 stakeholders from six countries participated in the event, including resource managers, scientists, industry, representatives from Pacific Ocean tuna RFMOs, environmental organizations, and other stakeholders interested in PBF. Due to the large number of new participants to the process and discussion, much of the time was spent reviewing the concepts of harvest strategies and reference points, defining MSE, and explaining how to interpret results. Discussions were aimed at clarifying the purpose of the MSE, defining how stakeholders provide input and participate in the MSE process, possible management objectives, potential performance metrics, and the process for decision making. The approach for incorporating stakeholder input into the MSE and decisions on performance metrics, for example, were also discussed. It was clear that the process needs to be transparent with stakeholder involvement and well organized. While ISC-hosted workshops have functioned as the principal means for providing stakeholder input into the ALB MSE, such an approach will be more challenging for the PBF MSE due to more diverse fisheries and an unclear input mechanism. Several issues noted were: the process for stakeholder input and decision making regarding MSE inputs needs clarity, a forum for formal decision-making for MSE needs to be identified and empowered, and a framework to secure stakeholder participation also needs to be considered. One suggestion for supporting decision-making and stakeholder input was to appoint an individual who would coordinate stakeholder meetings and liaise between the ISC and the Joint Working Group. Finally, it was noted that the complex management structure will also influence the PBF MSE and that support for the scientific resources to conduct the MSE are still needed.

Discussion

After a broad discussion of the PBF MSE by the Plenary, the Chair summarized the main points that had emerged, which will form the basis for the ISC Chair's report to the NC. He noted that two workshops were conducted in 2018-2019 and that Japan has recruited one analyst to support MSE modeling work but a second analyst still needs to be identified to provide needed support. To continue the MSE, the NC-IATTC Joint Working Group on PBF must identify 1) management objectives, 2) purpose, 3) terms of reference, and 4) candidate reference points and harvest control rules to evaluate. Methods for fostering simultaneous participation need to be developed for engaging stakeholders on both sides of the Pacific Ocean. The timing of the MSE process, including the delivery of results, needs to be specified, recognizing workload tradeoffs implied by the stock assessment schedule. Finally, an overall governance structure to manage the MSE process needs to be developed and implemented. It was also noted that the PBFWG

considered that it might be premature to set a target reference point given the current low stock level.

6.3 Billfish

J. Brodziak provided the BILLWG Report (**ISC/19/ANNEX/07/05/09**). The BILLWG held three meetings during the work cycle for providing assessment information and conservation recommendations to ISC19.

First, the BILLWG held a Data Preparation Workshop in Honolulu, HI, U.S.A., for the benchmark WCNPO MLS stock assessment in January 2019. Participants came from Chinese-Taipei, Japan, and the U.S.A. The goal of this workshop was to prepare fishery data for the stock assessment of WCNPO MLS in 2019 including catch by quarter data, standardized catch-per-unit effort data, size composition by quarter data, tagging data, and life history parameters.

The BILLWG work assignments addressed at the January 2019 workshop were:

1. Submit all outstanding catch, CPUE, and size composition data for the WCNPO MLS stock assessment to the BILLWG Chair;
2. Provide draft working papers, noting that all working papers submitted at this meeting (n=12) will need to be finalized by February 15, 2019; and
3. Prepare information, as needed, to make any corrections to the WCNPO MLS catch, CPUE, and size composition data table for the May 2019 BILLWG stock assessment meeting.

The BILLWG Chair reported that the assignments were mostly completed, to the extent practicable, through working paper presentations and personal communications.

The WG agreed to accept the new fishery definitions for the Japanese longline fleets that captured MLS in the WCNPO area and adjusted the stock range so that it was consistent with the WCPFC Convention Area, i.e., west of 150°W longitude and north of the equator.

The WG concluded that the base case SS 3.30 model for WCNPO MLS would incorporate the following features:

- Use a one-area model with areas-as-fleets to estimate fishery selectivity by fleet;
- Use a one-gender model;
- Use a four-season model to account for seasonal variation in size composition & spatial distribution;
- Use the best available catch data through 2017;
- Use the best available standardized CPUE through 2017;
- Use the best available size composition data through 2017; and
- Use best available life history parameters.

The WG agreed to conduct a set of sensitivity analyses similar to those used in the BUM and WCNPO SWO stock assessments:

1. Sensitivity to natural mortality rate;

2. Sensitivity to stock-recruitment resilience;
3. Sensitivity to growth rate;
4. Sensitivity to maturation rate; and
5. Sensitivity to uncertainty in the Japanese drift gillnet catch.

The WG agreed to conduct stochastic projections for the 2019 benchmark WCNPO MLS stock assessment to better inform fishery stakeholders about the risk of alternative harvest rates. Five future harvest scenarios were analyzed:

1. F Status Quo Scenario with F = $F_{2015\text{-}2017}$;
2. F at MSY Scenario with F = F_{MSY};
3. F at Tropical Tuna Limit Reference Point Scenario with F = $F_{20\%SSB(F=0)}$;
4. F High Scenario with F = Highest 3-Year F; and
5. F Low Scenario with F = $F_{30\%}$.

The WG also agreed to conduct stochastic projections to address the WCPFC NC14 request (see NC14 Report) for quota-based projections to rebuild the stock to $0.2*SSB_0$ = 3,610 t with a probability of at least 60%.

- These projections were based on the CMM2010-01 catch quota of 3,397 t and 10% to 90% decreases.
- Projections used a timeline of 20 years.
- Projections were conducted under two future recruitment scenarios:
    - Resample empirical cumulative distribution function (CDF) of short-term recruitment (most recent 5 years)
    - Resample empirical CDF of long-term recruitment (43 years)

Second, the BILLWG held an Assessment Modeling Workshop in Honolulu, U.S.A., for the 2019 benchmark WCNPO MLS stock assessment in May 2019. Participants came from Taiwan, Japan, and the U.S.A. Four working papers were provided, reviewed, and finalized. The goal of this workshop was to conduct modeling analyses for a benchmark stock assessment of the WCNPO MLS stock. These analyses included developing and fitting the base case Stock Synthesis model, running sensitivity analyses and conducting stock projections, including addressing the NC 14 request for quota-based projections to rebuild the stock. The primary work assignment to be addressed at the May 2019 workshop were defined in the January 2019 BILLWG workshop report was: The WG will use the fishery statistics information and the life history information from the 2019 data preparation meeting report to construct the base case WCNPO MLS stock assessment using the Stock Synthesis model version 3.30. Other work assignments to be addressed at the May 2019 workshop were:

- Adjust the U.S.A. MLS catches during 2010-2017 to account for discards and species misidentifications;
- Estimate the quarterly distribution of Japanese drift net catches of MLS; and
- Obtain MLS catch data and size composition data from the WCPFC.

Third, the BILLWG held a preparation workshop for the ISC19 Plenary Workshop in Taipei, Taiwan in July 2019. Participants came from Taiwan, Korea, Japan, and the U.S.A. The BILLWG work assignments addressed at the July 2018 workshop included:

1. Review and finalize the stock assessment report for the WCNPO MLS stock;
2. Review and revise the draft ISC 19 conservation information for the WCNPO MLS stock;
3. Review and revise BUM and WCNPO SWO conservation information, as needed;
4. Plan future research for the BILLWG; and
5. Elect a new Chair and Vice Chair for the BILLWG.

The BILLWG Work Plan for 2019-2021 is to:

- Conduct basic billfish research in 2020;
- Meet in Taipei in January 2020 and link research to Center for the Advancement of Population Assessment Methodology (CAPAM) 2020 meeting on the topic of natural mortality; and
- Conduct a benchmark stock assessment for BUM in 2021 that incorporates new information on BUM growth and other life history parameters

Last, it was noted that the BILLWG elections were successfully completed at the July 2019 meeting. The new BILLWG Chair is Dr. Hirotaka Ijima of National Research Institute of Far Seas Fisheries (NRIFSF) and the new Vice Chair is Dr. Yi-Jay Chang of National Taiwan University.

Discussion

The U.S.A. requested that the ISC consider conducting a stock assessment for EPO SWO and, if possible, EPO MLS. It was noted that for SWO stock structure in the NPO is uncertain and there is little life history information for a stock occurring in the EPO. It was recommended that a single EPO stock north of the equator be considered with the boundary between the two Pacific RFMOs (150°W longitude) used to define the western stock boundary. Given the limited life history information available, a fully integrated stock assessment could not be conducted but a production model based assessment may be feasible. The ISC Plenary requested that the BILLWG explore the feasibility a collaborative assessment of EPO SWO with IATTC scientific staff based on these parameters. The BILLWG should report back to ISC20 on progress, considering this EPO SWO assessment within the context of its review of the current billfish assessment schedule and priorities. The Plenary concluded that an EPO MLS stock assessment is outside the ISC purview and requested that the BILLWG to report back with any information on the IATTC's plan to assess this stock.

6.4 Shark

M. Kai, SHARKWG Chair, provided a summary of SHARKWG activities over the past year (**ISC/19/ANNEX/04**). The focus of the SHARKWG was mainly on BSH and SMA in the NPO with the goal of improving fishery data, biological parameters, and modelling approach. In addition, future work plans, including new modeling approaches, were listed and the details were

discussed to enhance accuracy of the next stock assessments. One full meeting of the SHARKWG has been held since ISC18, in Kaohsiung, Taiwan. Chinese-Taipei, Japan, Mexico, and U.S.A. scientists actively participated in this SHARKWG meeting.

Highlights of the meetings were briefly presented. The SHARKWG Chair expressed appreciation to Chinese-Taipei scientists for hosting the SHARKWG meeting. Through the hard work of SHARKWG members, the SHARKWG improved data for pelagic sharks and had fruitful discussions on future work plans. The SHARKWG listed 15 future collaborative studies on BSH and SMA among ISC Members that it would like to pursue including meta-analysis of biological parameters, isotope analysis for migration, study on parasites for migration, clustering analysis for area definition, and a spatio-temporal modeling approach. The SHARKWG also discussed concerns about the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing proposal for SMA.

The SHARKWG established the following tentative meeting schedule, but the SHARKWG also plans to discuss a change in the assessment schedule from three years to five years for both species in a webinar prior to the meeting.

Date, Location	Goals
November 2019, Webinar	• Look at the schedule and frequency of assessments • Final decision on conducting BSH stock assessment in 2020
4-10 December 2019, Shimizu, Japan	• Convene a data preparatory meeting for the stock assessment of BSH • Finalize the schedule of the stock assessment for BSH
Spring 2020	• BSH stock assessment (tentative depending on the outcome of the November webinar)

Discussion

The status of reported work on isotope analysis and the parasite study was discussed. For the isotope analysis Japan has already started collecting samples and is developing analytical techniques but there is a need to collect samples more globally.

The WG intends to apply a spatio-temporal model to future stock assessments although currently it is limited to northwest Pacific Ocean and under-reporting of catches may hamper its utility.

It was noted that the CITES listing proposal for SMA is based primarily on the status of Atlantic SMA, but includes North Pacific SMA, which the ISC concluded is likely (>50%) not in an overfished condition and overfishing is likely (>50%) not occurring relative to MSY-based reference points (reference points have not been established for Pacific Ocean pelagic sharks by either RFMO). The SHARKWG plans to review the CITES listing proposal for SMA and submit information and stock projections that support not listing NPO SMA in the form of a journal

paper. The Office of the Chair requested a copy of the manuscript submitted for journal publication.

The SHARKWG is considering a proposal to change the stock assessment cycles for BSH and SMA to five years. It was noted that all WGs will be tasked by the ISC Chair with reviewing their stock assessment schedules and report any proposed changes at ISC20. In moving to a longer assessment cycle, the SHARKWG needs to identify a process for providing stock status updates between the proposed five-year benchmark assessments. The SHARKWG will convene a conference call/webinar before their planned December 2020 meeting to further develop the details of the proposed assessment schedule and update assessments. The recommended process will be reported at ISC20.

7 STOCK STATUS AND CONSERVATION INFORMATION

7.1 North Pacific Albacore

H. Kiyofuji, ALBWG Chair, reported that the ALBWG found a minor error in the catch data used in the 2017 stock assessment for one of the fleets. Subsequently, the ALBWG used the 2017 base case model with the corrected catch data and compared the model results with the results from 2017. The impact of the error was relatively minor and did not affect the conclusions of the 2017 ALB assessment (Table 7-1 and Figure 7-1). Therefore, the ALBWG recommended no changes to the stock status and conservation information provided by ISC17.

Discussion

The most recent stock assessment for ALB was completed in 2017 and adopted for management by ISC17. The Plenary reviewed and agreed to forward the same stock status and conservation information that was adopted by ISC17 (see Section 7.1, pp. 31-40 in the ISC17 Plenary Report) with the addition of updated female spawning stock biomass (Figure 7-1) and management quantities (Table 7-1) from the model with corrected catch data and slight clarifying modifications.

Stock Status and Conservation Information

The stock status and conservation information adopted by the ISC17 Plenary was endorsed and is reproduced below.

Stock Status

The following information on the status of the ALB stock is provided:

1. **The stock is likely not overfished relative to the limit reference point adopted by the Western and Central Pacific Fisheries Commission ($20\%SSB_{current\ F=0}$);**
2. **No F-based reference points have been adopted to evaluate overfishing. Stock status was evaluated against seven potential reference points. Current fishing intensity ($F_{2012-2014}$) is below six of the seven potential reference points (see Table 7-1), except $F_{50\%}$.**

Conservation Information

1. **If a constant fishing intensity ($F_{2012\text{-}2014}$) is applied to the stock, then median female spawning biomass is expected to undergo a moderate decline, with a < 0.01% probability of falling below the limit reference point established by the WCPFC by 2025. However, expected catches in this scenario will be below the recent average catch level for this stock.[2]**
2. **If a constant average catch ($C_{2010\text{-}2014}$ = 82,432 t) is removed from the stock in the future,[3] then the decline in median female spawning biomass will be greater than in the constant F intensity scenario and the probability that SSB falls below the limit reference point (LRP) will be greater by 2025 (30%). Additionally, the estimated fishing intensity will double relative to the current level ($F_{2012\text{-}2014}$) by 2025 as spawning biomass declines.**

Table 7-1. Estimates of maximum sustainable yield (MSY), female spawning biomass (SSB) quantities, and fishing intensity (F) based reference point ratios for ALB tuna for the 2017 base case model and the same model with the corrected catch. SSB_0 and SSB_{MSY} are the unfished biomass of mature female fish and at MSY, respectively. The Fs in this table are indicators of fishing intensity based on SPR and calculated as 1-SPR so that the Fs reflects changes in fishing mortality. SPR is the equilibrium SSB per recruit that would result from the current year's pattern and intensity of fishing mortality. Current fishing intensity is based on the average fishing intensity during 2012-2014 ($F_{2012\text{-}2014}$).

Quantity	2017 Base Case	2017 Base Case with Corrected Catch
MSY (t) [A]	132,072	129,524
SSB_{MSY} (t) [B]	24,770	23,795
SSB_0 (t) [B]	171,869	168,656
SSB_{2015} (t) [B]	80,618	78,240
$SSB_{2015}/20\%SSB_{current,\ F=0}$ [B]	2.47	2.44
$F_{2012\text{-}2014}$	0.51	0.51
$F_{2012\text{-}2014}/F_{MSY}$	0.61	0.61
$F_{2012\text{-}2014}/F_{0.1}$	0.58	0.58
$F_{2012\text{-}2014}/F_{10\%}$	0.56	0.57
$F_{2012\text{-}2014}/F_{20\%}$	0.63	0.64
$F_{2012\text{-}2014}/F_{30\%}$	0.72	0.73
$F_{2012\text{-}2014}/F_{40\%}$	0.85	0.85
$F_{2012\text{-}2014}/F_{50\%}$	1.01	1.02

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

[2] Median future catch for the constant F scenario is expected to be below the average catch level for 2010- 2014 (82,432 t). This result is likely due to low estimated recruitment in 2011, which is expected to reduce female SSB beginning in 2015, the first year of the projection period.

[3] It should be noted that the constant catch scenario is inconsistent with current management approaches for ALB adopted by the IATTC and the WCPFC.

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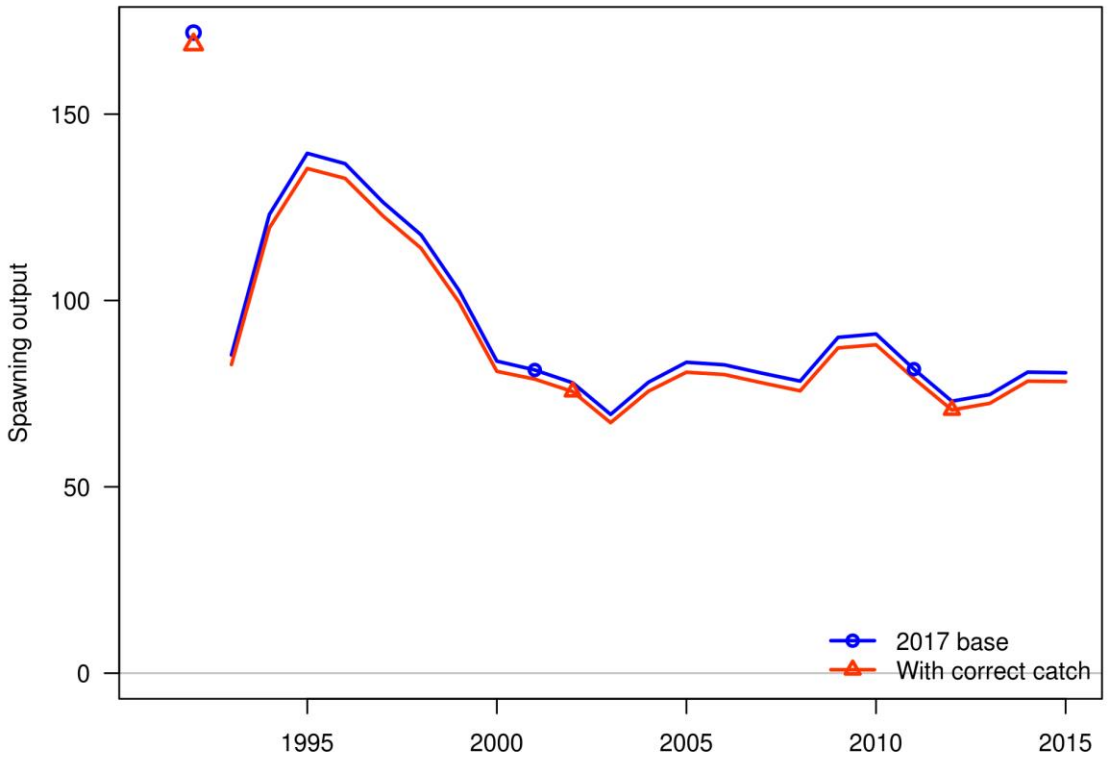


Figure 7-1. Comparison of estimated female spawning stock biomass of the 2017 ALB base case model (blue) with a model containing a corrected time series of catch (red).

7.2 North Pacific Shortfin Mako Shark

M. Kai, Chair of the SHARKWG, noted that the most recent stock assessment for SMA was completed in 2018 and adopted for management by ISC18.

Discussion

The Plenary reviewed and agreed to forward the same stock status and conservation information that was adopted by ISC18 (see Section 6.2, pp. 26-27 in the ISC18 Plenary Report) except for the omission of accompanying figures and tables and slight clarifying modifications. No new research needs were identified by ISC19.

Stock Status and Conservation Information

The reproductive capacity of the North Pacific SMA stock was calculated as spawning abundance (SA; i.e., number of mature female sharks) rather than spawning biomass, because the number of pups produced is not related to female size (i.e., larger female sharks do 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.

Stock Status

1. **Target and limit reference points have not been established for pelagic sharks in the Pacific Ocean. Stock status is reported in relation to MSY-based reference points.**
2. **The results from the base case model show that the NPO shortfin mako stock is likely (>50%) not in an overfished condition and overfishing is likely (>50%) not occurring relative to MSY-based abundance and fishing intensity reference points.**

Stock status was also examined under six alternative states of nature that represented the most important sources of uncertainty in the assessment. Results of these models with alternative states of nature were consistent with the base case model and showed that, relative to MSY, the stock is likely (>50%) not in an overfished condition and overfishing is likely (>50%) not occurring.

Conservation Information

Stock projections of biomass and catch of NPO SMA from 2017 to 2026 were performed assuming three alternative constant fishing mortality scenarios: 1) status quo, average of 2013-2015 ($F_{2013\text{-}2015}$); 2) $F_{2013\text{-}2015}$ + 20%; and 3) $F_{2013\text{-}2015}$ - 20%.

Based on these future projections, the following conservation information is provided:

1. **If fishing mortality remains constant at $F_{2013\text{-}15}$ or is decreased 20%, then the SA is expected to increase gradually;**
2. **If fishing mortality is increased 20% relative to $F_{2013\text{-}2015}$, then the SA is expected to decrease in the final years of the projection;**
3. **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.**

7.3 North Pacific Blue shark

M. Kai, Chair of the SHARKWG, noted that NPO BSH was last assessed in 2017 (**ISC/17/ANNEX13**).

Discussion

The ISC Plenary reviewed and agreed to forward the stock status and conservation information adopted at ISC18 for NPO BSH (section 6.3 p. 32-33, ISC18 Plenary Report), except for the omission of accompanying figures and tables and slight clarification modifications if necessary. This is reproduced below.

Stock Status and Conservation Information

Target and limit reference points have not yet been established for pelagic sharks in the Pacific Ocean by either the WCPFC or the IATTC. Stock status is reported in relation to MSY-based reference points. The following information on the status of NP BSH is provided.

Stock Status

1. **Female spawning biomass in 2015 (SSB_{2015}) was 69% higher than at MSY and estimated to be 295,774 t;**
2. **The recent annual fishing mortality ($F_{2012\text{-}2014}$) was estimated to be well below F_{MSY} at approximately 38% of F_{MSY};**
3. **The reference run produced terminal conditions that were predominately in the lower right quadrant of the Kobe plot (not overfished and overfishing not occurring).**

Conservation Information

Future projections under different fishing mortality (F) harvest policies (status quo, +20%, -20%, F_{MSY}) show that median BSH spawning biomass in the NPO will likely remain above SSB_{MSY} in the foreseeable future. Other potential reference points were not considered in these evaluations.

7.4 Western and Central North Pacific Striped Marlin

J. Brodziak, Chair of the BILLWG, presented the benchmark stock assessment for the WCNPO MLS stock conducted in 2019 (**ISC/19/ANNEX/11**). The 2019 assessment consisted of applying a Stock Synthesis model with the best available catch, abundance index, and length composition data for 1975-2017.

Stock Identification and Distribution: The WCNPO MLS stock area consisted of waters of the NPO within the Western and Central Pacific Fisheries Commission management area bounded by the equator and 150°W. All available fishery data from this area were used for the stock assessment. It was assumed that there was an instantaneous mixing of fish throughout the stock area on a quarterly basis for the purpose of modeling observations of CPUE and size composition data,

Catches: MLS catches in the NPO were high from the 1970s to the 1990s, but have decreased to the present. The catch by Japanese fleets have decreased and catch from the US and Chinese-Taipei has varied without trend, while the catch by other WCPFC countries has decreased (Figure 7-2). Overall, longline gear has accounted for the majority of WCNPO MLS catches since the 1990s and the driftnet catch dominated from 1975 to 1993.

Data and Assessment: Catch and size composition data were collected from ISC countries (Japan, Chinese-Taipei, and U.S.A.) and the WCPFC. Standardized CPUE data used to measure trends in relative abundance were provided by Japan, U.S.A., and Chinese-Taipei. The WCNPO MLS stock was assessed using an age- and length-structured Stock Synthesis model fit to time series of standardized CPUE and size composition data. The value for stock-recruitment

steepness used for the base case model was h = 0.87. 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. 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, as well as uncertainty in the input data and model structure.

Status of Stock: Estimates of population biomass of the WCNPO MLS fluctuated without trend between 1975 and 1993. The population deceased substantially in 1994 and fluctuated without trend until the present year. Population biomass (age-1 and older) averaged roughly 17,969 t, or 54% below unfished biomass during the 1975-1993 period and declined to 4,508 t, or 89% below unfished biomass by 2008. The minimum spawning stock biomass was estimated to be 618 t in 2011 (76% below SSB_{MSY}, the spawning stock biomass to produce MSY, Figure 7-3a). In 2017, SSB = 981 t and SSB/SSB_{MSY} = 0.38. Fishing mortality on the stock (average F on ages 3-12) has been around F_{MSY} since 2014 (Figure 7-3b). It averaged roughly 0.64 yr^{-1} during 2015-2017, or 7% above F_{MSY} and in 2017, F=0.80 yr^{-1} with a relative fishing mortality of F/F_{MSY} = 1.33 (Table 7-3). Fishing mortality has been above F_{MSY} in every year except 1984, 1992, and 2016. The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is estimated to be $SPR_{2015\text{-}2017}$ = 17% and is approximately equal to the SPR required to produce MSY. Recruitment averaged about 263,000 age-0 recruits between 1994 and 2017, which was 34% below the 1975-2017 average. No target or limit reference points have been established for the WCNPO MLS stock under the auspices of the WCPFC. Despite the relatively large L_{50}/L_{inf} ratio for WCNPO MLS, the stock is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential. Recent recruitments have been lower than expected and have been below the long-term trend since 2005. Although fishing mortality has decreased since 2000, due to the prolonged low recruitment and landings of immature fish, the biomass of the stock has remained below MSY. When the status of WCNPO MLS is evaluated relative to MSY-based reference points, the 2017 spawning stock biomass of 981 mt is 62% below SSB_{MSY} (2,604 t) and the 2015-2017 fishing mortality exceeds F_{MSY} by 7%. Therefore, relative to MSY-based reference points, overfishing is occurring and the WCNPO MLS stock is overfished (Figure 7-4).

Biological Reference Points: Biological reference points were computed for the base case model with Stock Synthesis (Table 7-2 and Table 7-3). The point estimate of maximum sustainable yield (MSY) was 4,946 t. The point estimate of the spawning biomass to produce MSY (adult female biomass, SSB_{MSY}) was 2,604 t. The point estimate of F_{MSY}, the fishing

mortality rate to produce MSY (average fishing mortality on ages 3 – 12) was 0.60 and the corresponding equilibrium value of spawning potential ratio at MSY was SPR_{MSY} = 18%.

Projections: Stock projections for WCNPO MLS were conducted using the age-structured projection model software AGEPRO. Stochastic projections were conducted using results from the base case model to evaluate the probable impacts of alternative fishing intensities or constant catch quotas on future spawning stock biomass and yield for MLS in the WCNPO. For fishing mortality projections, a standard set of F-based projections were conducted. For catch quota projections, the set of rebuilding projection analyses requested by NC14 were conducted. Two future recruitment scenarios were evaluated (Figure 7-6 and Figure 7-7): (1) a short-term recruitment scenario based on resampling the empirical cumulative distribution function of recruitment observed during 2012-2016 and (2) a long-term recruitment scenario based on resampling the empirical cumulative distribution function of recruitment observed during 1975-2016. The short-term recruitment scenario had an average recruitment of 134,020 age-0 fish and the long-term recruitment mean was 306,989 age-0 fish. The stochastic projections employed model estimates of the multi-fleet, multi-season, size- and age-selectivity, and structural complexity in the assessment model to produce consistent results. Fishing mortality-based projections started in 2018 and continued through 2037 under five levels of fishing mortality and the two recruitment scenarios. The five fishing mortality stock projection scenarios were: 1) F status quo (average F during 2015-2017), 2) F_{MSY}, 3) F at $0.2 \cdot SSB_0$, 4) F_{High} at the highest 3-year average during 1975-2017, and 5) F_{Low} at $F_{30\%}$. For the F-based scenarios, fishing mortality in 2018-2019 was set to be F status quo (0.64) and fishing mortality during 2020-2037 was set to the projected level of F. Catch-based projections also ran from 2018 to 2037 and included seven levels of constant catch for the long-term recruitment scenario and 10 levels of catch for the short-term recruitment scenario. For the catch-based scenarios, catch biomass in 2018-2019 was set to be the status quo catch during 2015-2017 (2,151 t) and annual catches during 2020-2037 were set to the projected catch quota. The ten constant catch stock projection scenarios were: 1) Quota based upon WCPFC CMM10-01, 2) 90% of the quota, 3) 80% of the quota, 4) 70% of the quota, 5) 60% of the quota, 6) 50% of the quota, 7) 40% of the quota, 8) 30% of the quota, 9) 20% of the quota, and 10) 10% of the quota. Results show the projected female spawning stock biomasses and the catch biomasses under each of the scenarios (Table 7-4, Figure 7-6 and Figure 7-7).

Discussion

It was noted that the projections used average unfished biomass (SSB_0) while a dynamic B_0 ($SSB_{F=0}$) may be a more appropriate benchmark for the recent recruitment scenario. It was agreed that calculating dynamic B_0 might be a useful area to explore in future assessments.

The major sources of uncertainty identified in the assessment and how they were addressed through sensitivity analyses were discussed. An important source of uncertainty is the relative importance of environmental drivers versus maternal effects on stock productivity and resulting abundance. Nonetheless, it is clear that the stock is depleted and the harvest rate would have to be reduced substantiality for it to recover to the target level.

It was pointed out that the terminal year recruitment estimate was derived from the stock-recruit relationship.

Data that were included or excluded from the stock assessment model were discussed including CPUE indices and the catch time series.

It was noted that the eastern boundary of the assessed WCNPO stock was changed from the previous assessment 140°W longitude to 150°W longitude based on genetic studies informing stock structure.

The ISC Plenary endorsed the WCNPO MLS stock assessment and considers it to be the best available scientific information on the stock, noting the concerns expressed by the BILLWG in their special comments (ISC/19/ANNEX/11) and reproduced below.

Stock Status and Conservation Information

Stock Status

Biomass (age 1 and older) for the WCNPO MLS stock decreased from 17,000 t in 1975 to 6,000 t in 2017. Estimated fishing mortality averaged F=0.97 yr^{-1} during the 1975-1994 period with a range of 0.60 to 1.59 yr^{-1}, peaked at F=1.71 $year^{-1}$ in 2001, and declined sharply to F=0.64 yr^{-1} in the most recent years (2015-2017). Fishing mortality has fluctuated around F_{MSY} since 2013. Compared to MSY-based reference points, the current spawning biomass (average for 2015-2017) was 76% below SSB_{MSY} and the current fishing mortality (average for ages 3 – 12 in 2015-2017) was 7% above F_{MSY}.

Based on these findings, the following information on the status of the WCNPO MLS stock is provided:

1. **There are no established reference points for WCNPO MLS;**
2. **Results from the base case assessment model show that under current conditions the WCNPO MLS stock is overfished and is subject to overfishing relative to MSY-based reference points (Table 7-2, Table 7-3, and Figure 7-3).**

Conservation Information

The status of the WCNPO MLS stock shows evidence of substantial depletion of spawning potential (SSB_{2017} is 62% below SSB_{MSY}), however fishing mortality has fluctuated around F_{MSY} in the last four years. The WCNPO MLS stock has produced average annual yields of around 2,100 t per year since 2012, or about 40% of the MSY catch amount. However the majority of the catch are likely immature fish. All of the projections show an increasing trend in spawning stock biomass during the 2018-2020 period, with the exception of the high F scenario under the short-term recruitment scenario. This increasing trend in SSB is due to the 2017 year class, which is estimated from the stock-recruitment curve and is more than twice as large as recent average recruitment.

Based on these findings, the following conservation information is provided:

1. **Projection results under the long-term recruitment scenario show that the stock has at least a 60% probability of rebuilding to 20%SSB_0, the rebuilding target specified**

by NC14, by 2022 for all harvest scenarios, with the exception of the highest F scenario (Average F 1975-1977);

2. **However, if the stock continues to experience recruitment consistent with the short-term recruitment scenario (2012-2016), catches must be reduced to 60% of the WCPFC catch quota from CMM 2010-01 (3,397 t) to 1,359 t in order to achieve a 60% probability of rebuilding to 20%SSB_0=3,610 t[4] by 2022. This corresponds to a reduction of roughly 37% from the recent average yield of 2,151 t;**
3. **For the constant catch projection scenarios that were tested, it was notable that all of the projections under the long-term recruitment scenario would be expected to achieve the spawning biomass target by 2020 with probabilities ranging from 61% to 73% and corresponding catch quotas ranging from 3,397 to 1,359 t (Table 7-4).**

It was also noted that retrospective analyses show that the assessment model appears to overestimate spawning potential in recent years, which may mean the projection results are ecologically optimistic.

Special Comments

The WG achieved a base-case model using the best available data and biological information. However, the WG recognized uncertainty in some assessment inputs including drift gillnet catches and initial catch amounts, life history parameters such as maturation and growth, and stock structure.

Overall, the base case model diagnostics and sensitivity runs show that that there are some conflicts in the data (**ISC/19/ANNEX/11**). When developing a conservation and management measure to rebuild the resource, it is recommended that these issues be recognized and carefully considered, because they affect the perceived stock status and the probabilities and time frame for rebuilding of the WCNPO MLS stock.

Research Needs

To improve the stock assessment, the WG recommends continuing model development work, to reduce data conflicts and modeling uncertainties, and reevaluating and improving input assessment data.

[4] The rebuilding target, 20% SSB_0, is estimated from the stock recruitment curve.

Table 7-2. Reported catch (t) used in the stock assessment along with annual estimates of population biomass (age-1 and older, t), female spawning biomass (t), relative female spawning biomass (SSB/SSB_{MSY}), recruitment (thousands of age-0 fish), fishing mortality (average F, ages-3 – 12), relative fishing mortality (F/F_{MSY}), and spawning potential ratio of WCNPO MLS.

Year	2011	2012	2013	2014	2015	2016	2017[2]	Mean[1]	Min[1]	Max[1]
Reported Catch	2,690	2,757	2,534	1,879	2,072	1,892	2,487	5,643	1,879	10,862
Population Biomass	5,874	6,057	4,937	6,241	5,745	5,832	6,196	12,153	4,509	22,303
Spawning Biomass	618	809	743	864	1,073	1,185	981	1,765	618	3,999
Relative Spawning Biomass	0.24	0.31	0.29	0.33	0.41	0.46	0.38	0.68	0.24	1.54
Recruitment (age 0)	196,590	87,956	330,550	77,274	185,438	195,069	354,391	396,218	77,274	1,049,460
Fishing Mortality	1.11	1.06	0.86	0.63	0.62	0.51	0.80	1.06	0.51	1.71
Relative Fishing Mortality	1.85	1.76	1.42	1.05	1.03	0.85	1.33	1.76	0.85	2.85
Spawning Potential Ratio	9%	11%	11%	16%	17%	20%	14%	12%	20%	6%

[1] During 1975-2017

[2] Recruitment in 2017 is estimated from the stock recruitment curve.

Table 7-3. 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 MLS, derived from the base case model assessment model, where "MSY" indicates reference points based on maximum sustainable yield.

Reference Point	Estimate
F_{MSY} (age 3-12)	0.60
F_{2017} (age 3-12)	0.80
$F_{20\%SSB(F=0)}$	0.47
SSB_{MSY}	2,604 t
SSB_{2017}	981 t
$20\%SSB_0$	3,610 t
MSY	4,946 t
$C_{2015\text{-}2017}$	2,151 t
SPR_{MSY}	18%
SPR_{2017}	14%
$SPR_{20\%SSB(F=0)}$	23%

Table 7-4. Projected median values of WCNPO MLS spawning stock biomass (SSB, t), catch (t), and probability of reaching 20%SSB_0 under five constant fishing mortality rate (F) and ten constant catch scenarios during 2018-2037. For scenarios which have a 60% probability of reaching the target of 20%$SSB_{F=0}$, the year in which this occurs is provided; NA indicates projections that did not meet this criterion. Note that 20%$SSB_{F=0}$ is 3,610 t and SSB_{MSY} is 2,604 t.

Year	2018	2019	2020	2021	2022	2027	2037	Year when target achieved with 60% probability
Scenario 1: $F_{status\ quo}$; Long-Term Recruitment								
SSB	1931.3	2605.3	3591	4288.3	4639.4	4893.4	4884.4	
Catch	2229.8	3089.8	3911.6	4412.8	4644.9	4797.2	4790.9	
Probability of reaching 20% SSB	0%	4%	44%	70%	79%	84%	84%	2021
Scenario 2: $F_{status\ quo}$; Short-Term Recruitment								
SSB	1932.4	2556.5	3080	2786.9	2422.3	2071.4	2072.1	
Catch	2224.6	2827	2871.7	2535.9	2260.7	2029.6	2030.4	
Probability of reaching 20% SSB	0%	4%	21%	9%	2%	<0.5%	<0.5%	NA
Scenario 3: FMSY; Long-Term Recruitment								
SSB	1935.1	2611.8	3650.5	4444	4860.6	5158.9	5203.5	
Catch	2228.1	3092.7	3705.2	4241.6	4498.9	4666.4	4711.5	
Probability of reaching 20% SSB	0%	4%	47%	75%	83%	89%	89%	2021
Scenario 4: FMSY; Short-Term Recruitment								
SSB	1932.9	2557.7	3126.3	2895.5	2552.2	2207	2197	
Catch	2230.8	2829.6	2724.6	2450.7	2209.9	1994.1	1984.9	
Probability of reaching 20% SSB	0%	4%	23%	12%	4%	<0.5%	<0.5%	NA
Scenario 5: F 20%$SSB_{F=0}$; Long-Term Recruitment								
SSB	1933.7	2611.9	3813.4	4943.7	5631	6358.1	6348.5	
Catch	2227.6	3091.3	2996.4	3588.7	3933.2	4271.7	4266.7	
Probability of reaching 20% SSB	0%	4%	55%	85%	93%	97%	98%	2021
Scenario 6: F 20%$SSB_{F=0}$; Short-Term Recruitment								
SSB	1934	2560.5	3276.3	3274.8	3030.2	2697	2690.2	
Catch	2224.9	2828.8	2211.6	2115.4	1969.7	1809.1	1804.7	
Probability of reaching 20% SSB	0%	4%	29%	28%	17%	6%	7%	NA
Scenario 7: Highest F (Average F 1975-1977); Long-Term Recruitment								
SSB	1932.8	2611.8	2739.8	2299.1	2102	2028.4	2036.2	
Catch	2226.4	3088.5	7520.7	6557.5	6184.4	6058	6084.1	

Year	2018	2019	2020	2021	2022	2027	2037	Year when target achieved with 60% probability
Probability of reaching 20% SSB	0%	4%	9%	4%	2%	1%	1%	NA
Scenario 8: Highest F (Average F 1975-1977); Short-Term Recruitment								
SSB	1933.5	2559.4	2289.2	1330.7	968.3	858.7	859.2	
Catch	2225.9	2827.6	5362.9	3399.3	2751.6	2564.6	2570.9	
Probability of reaching 20% SSB	0%	3%	2%	<0.5%	0%	0%	0%	NA
Scenario 9: Low F ($F_{30\%}$); Long-Term Recruitment								
SSB	1933.6	2612.5	4009.5	5603.2	6742.4	8287.5	8353	
Catch	2228.6	3093.5	2117.6	2693.6	3075	3558.2	3577.8	
Probability of reaching 20% SSB	0%	4%	63%	93%	98%	>99.5%	>99.5%	2020
Scenario 10: Low F ($F_{30\%}$); Short-Term Recruitment								
SSB	1932.5	2555.6	3453.8	3788.4	3747.4	3537.4	3525.3	
Catch	2228.4	2832	1572.9	1623.8	1589	1515.8	1511.6	
Probability of reaching 20% SSB	0%	4%	37%	54%	54%	44%	42%	NA
Scenario 11: Current Quota; Long-Term Recruitment								
SSB	1946.7	2823	4141.1	5220.9	6074.7	8147.5	8715.3	
Catch	2150.6	2150.6	3396.8	3396.7	3396.3	3396.1	3396.8	
Probability of reaching 20% SSB	<0.5%	17%	61%	76%	83%	93%	95%	2020
Scenario 12: Current Quota; Short-Term Recruitment								
SSB	1948.8	2737.1	3279.8	2592.9	1781.9	524.2	436.7	
Catch	2150.6	2150.6	3393.7	3377.1	3319.7	2954.7	2903	
Probability of reaching 20% SSB	<0.5%	15%	36%	20%	7%	<0.5%	<0.5%	NA
Scenario 13: 10% Reduction; Long-Term Recruitment								
SSB	1947.9	2826.1	4225.3	5467.3	6492.5	9096.5	9798.7	
Catch	2150.6	2150.6	3057.1	3057.1	3056.8	3057.1	3057.1	
Probability of reaching 20% SSB	<0.5%	17%	63%	81%	87%	96%	97%	2020
Scenario 14: 10% Reduction; Short-Term Recruitment								
SSB	1948.6	2738	3390.9	2886.8	2162.9	763	587	
Catch	2150.6	2150.6	3054.6	3052.8	3032.5	2846.7	2780.1	
Probability of reaching 20% SSB	<0.5%	15%	40%	26%	12%	<0.5%	<0.5%	NA
Scenario 15: 20% Reduction; Long-Term Recruitment								
SSB	1949.9	2829.1	4317.7	5750.4	6954.1	9928.4	10806.2	
Catch	2150.6	2150.6	2717.4	2717.4	2717.4	2717.4	2717.4	
Probability of reaching 20% SSB	<0.5%	18%	65%	84%	90%	98%	99%	2020
Scenario 16: 20% Reduction; Short-Term Recruitment								
SSB	1949.3	2739.2	3495.1	3176.4	2570.8	1175.5	883.3	
Catch	2150.6	2150.6	2716.8	2714.3	2710.8	2648.8	2610.7	
Probability of reaching 20% SSB	<0.5%	15%	43%	34%	19%	1%	<0.5%	NA

Year	2018	2019	2020	2021	2022	2027	2037	Year when target achieved with 60% probability
Scenario 17: 30% Reduction; Long-Term Recruitment								
SSB	1947.6	2824.5	4381.5	5981.7	7356.2	10856.1	11783.5	
Catch	2150.6	2150.6	2377.8	2377.8	2377.8	2377.8	2377.8	
Probability of reaching 20% SSB	<0.5%	17%	67%	87%	94%	99%	>99.5%	2020
Scenario 18: 30% Reduction; Short-Term Recruitment								
SSB	1947.4	2733.8	3594	3479.2	3018.1	1736.6	1383.5	
Catch	2150.6	2150.6	2377.8	2377.1	2377.1	2365.6	2355.3	
Probability of reaching 20% SSB	<0.5%	15%	45%	42%	29%	5%	2%	NA
Scenario 19: 40% Reduction; Long-Term Recruitment								
SSB	1949.2	2831.8	4486.8	6295.8	7868.9	11749.2	12851.3	
Catch	2150.6	2150.6	2038.1	2038.1	2038.1	2038.1	2038.1	
Probability of reaching 20% SSB	<0.5%	18%	70%	90%	95%	>99.5%	>99.5%	2020
Scenario 20: 40% Reduction; Short-Term Recruitment								
SSB	1949.9	2737.3	3689.5	3756	3445.9	2444.2	2124.2	
Catch	2150.6	2150.6	2038.1	2038.1	2037.9	2037.6	2036.4	
Probability of reaching 20% SSB	<0.5%	15%	48%	49%	41%	16%	10%	NA
Scenario 21: 50% Reduction; Long-Term Recruitment								
SSB	1950.4	2829.7	4548.9	6512.1	8259.1	12654	13799.3	
Catch	2150.6	2150.6	1698.4	1698.4	1698.4	1698.4	1698.4	
Probability of reaching 20% SSB	<0.5%	17%	71%	92%	97%	>99.5%	>99.5%	2020
Scenario 22: 50% Reduction; Short-Term Recruitment								
SSB	1949.1	2737.4	3791.4	4065.7	3916.3	3214.4	3021.3	
Catch	2150.6	2150.6	1698.4	1698.4	1698.4	1698.4	1698.4	
Probability of reaching 20% SSB	<0.5%	15%	51%	57%	53%	35%	29%	NA
Scenario 23: 60% Reduction; Long-Term Recruitment								
SSB	1949.9	2829.1	4631.3	6798.1	8741.1	13605.2	14857.1	
Catch	2150.6	2150.6	1358.7	1358.7	1358.7	1358.7	1358.7	
Probability of reaching 20% SSB	<0.5%	18%	73%	94%	98%	>99.5%	>99.5%	2020
Scenario 24: 60% Reduction; Short-Term Recruitment								
SSB	1948.6	2737.7	3888.1	4364.3	4396.6	4110.1	3970.5	
Catch	2150.6	2150.6	1358.7	1358.7	1358.7	1358.7	1358.7	
Probability of reaching 20% SSB	<0.5%	15%	53%	65%	67%	63%	59%	2021*
Scenario 25: 70% Reduction; Short-Term Recruitment								
SSB	1948.7	2736.4	3979.8	4667.7	4886	4960.9	4977	
Catch	2150.6	2150.6	1019	1019	1019	1019	1019	
Probability of reaching 20% SSB	<0.5%	15%	56%	72%	78%	85%	86%	2021

Year	2018	2019	2020	2021	2022	2027	2037	Year when target achieved with 60% probability
Scenario 26: 80% Reduction; Short-Term Recruitment								
SSB	1948.7	2736.2	4071.1	4971.3	5380.3	5909.1	5977.5	
Catch	2150.6	2150.6	679.4	679.4	679.4	679.4	679.4	
Probability of reaching 20% SSB	<0.5%	15%	58%	79%	88%	97%	97%	2021
Scenario 27: 90% Reduction; Short-Term Recruitment								
SSB	1950.6	2740.5	4170.3	5284.1	5881.7	6836.7	7009.4	
Catch	2150.6	2150.6	339.7	339.7	339.7	339.7	339.7	
Probability of reaching 20% SSB	<0.5%	15%	61%	85%	94%	>99.5%	>99.5%	2020

* This scenario has a 60% probability of being at or above 20%$SSB_{F=0}$ in 2020 but drops slightly below 60% starting in 2035.

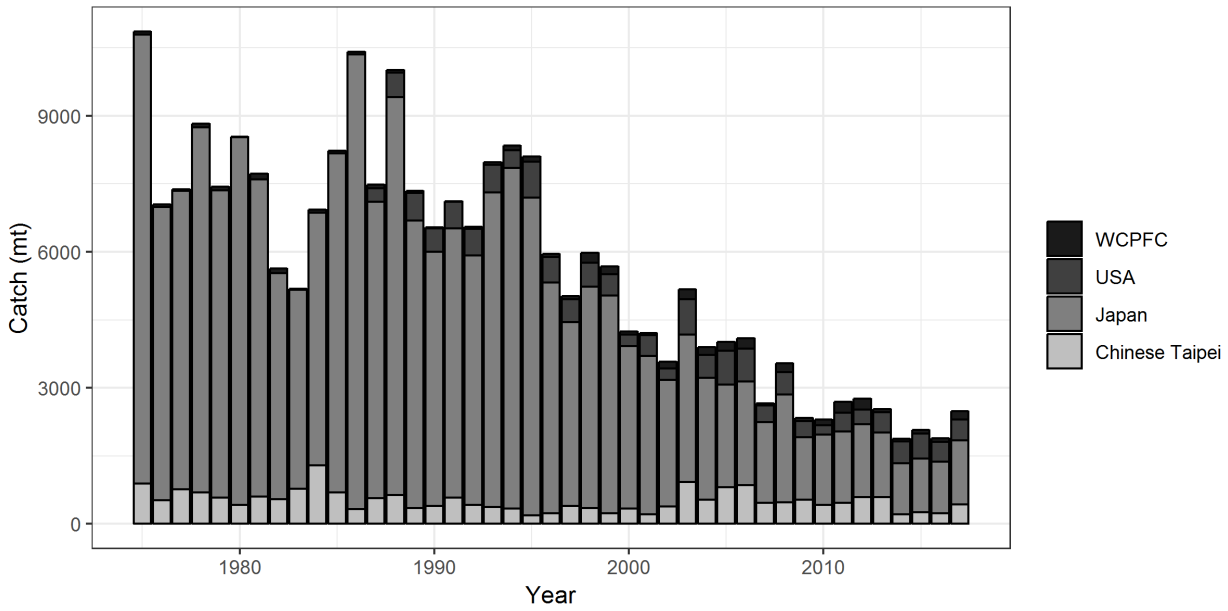


Figure 7-2. Annual catch biomass (t) of WCNPO MLS by country for Japan, Chinese-Taipei, the U.S.A., and all other countries during the 1975-2017 period.

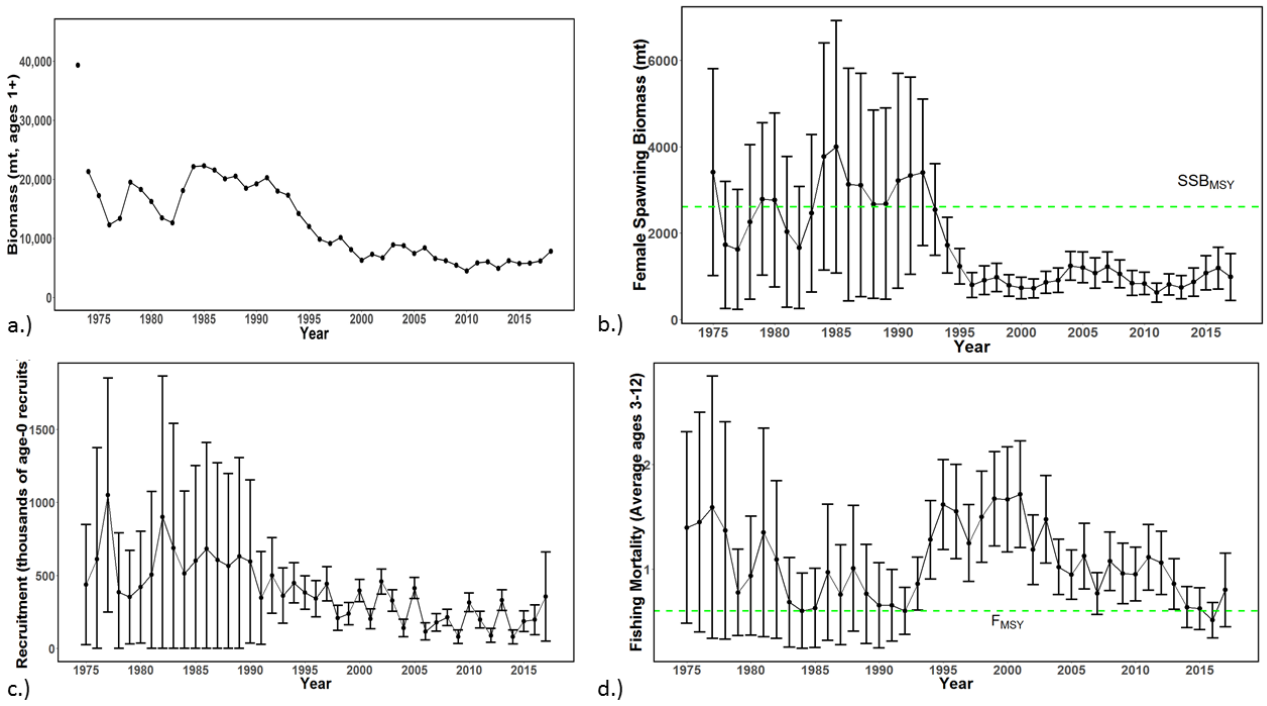


Figure 7-3. Time series of estimates of (a) population biomass (age 1+), (b) spawning biomass, (c) recruitment (age-0 fish), and (d) instantaneous fishing mortality (average for age 3-12, year^{-1}) for WCNPO MLS (derived from the 2019 stock assessment. The circles represent the maximum likelihood estimates by year for each quantity and the error bars represent the uncertainty of the estimates (95% confidence intervals), green dashed lines indicate SSB$_{MSY}$ and F$_{MSY}$.

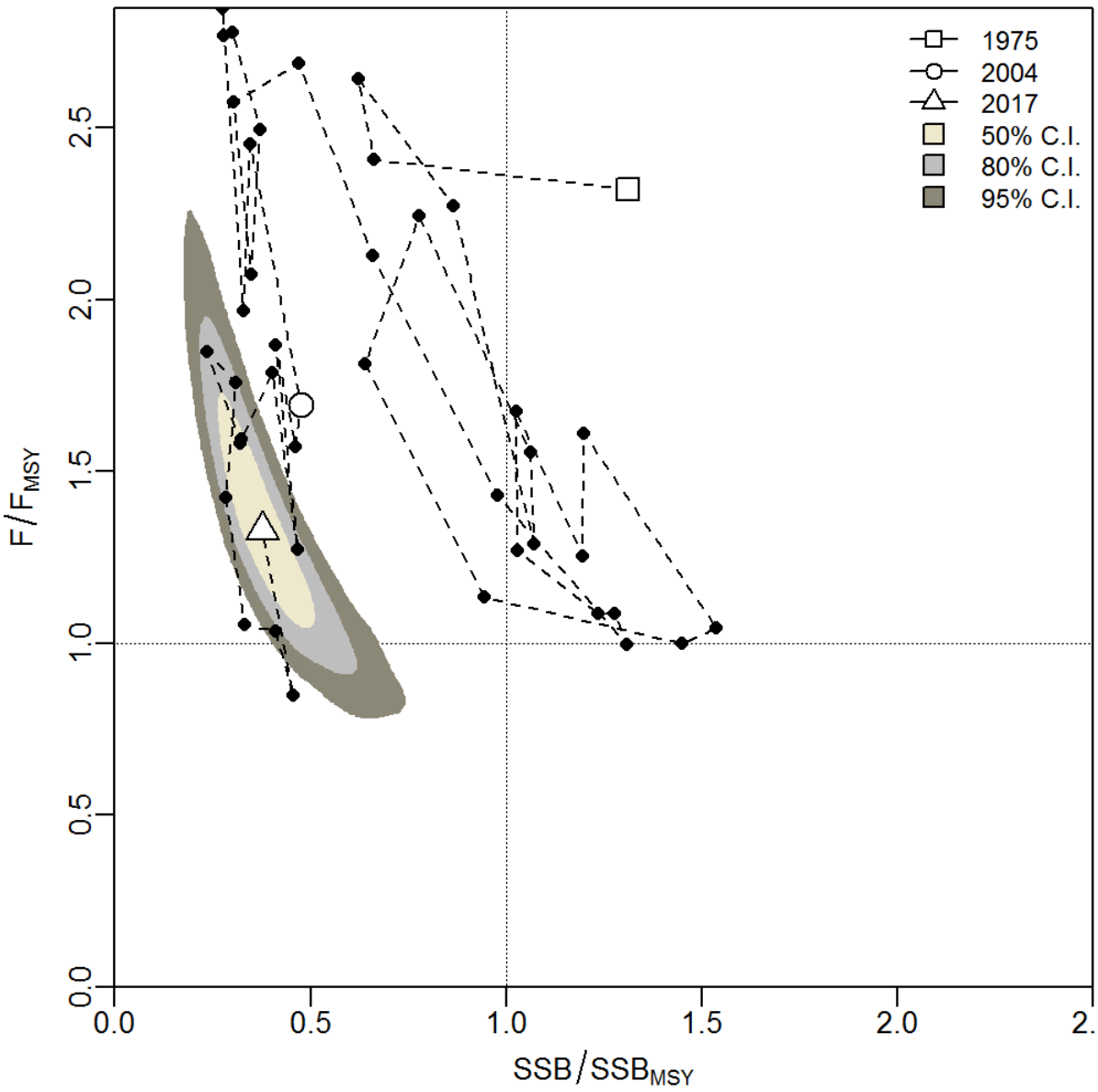


Figure 7-4. Kobe plot of the time series of estimates of relative fishing mortality (average of age 3-12) and relative spawning stock biomass of WCNPO MLS during 1975-2017. The white square denotes the first year (1975) of the assessment, the white circle denotes 2004, and the white triangle denotes the last year (2017) of the assessment.

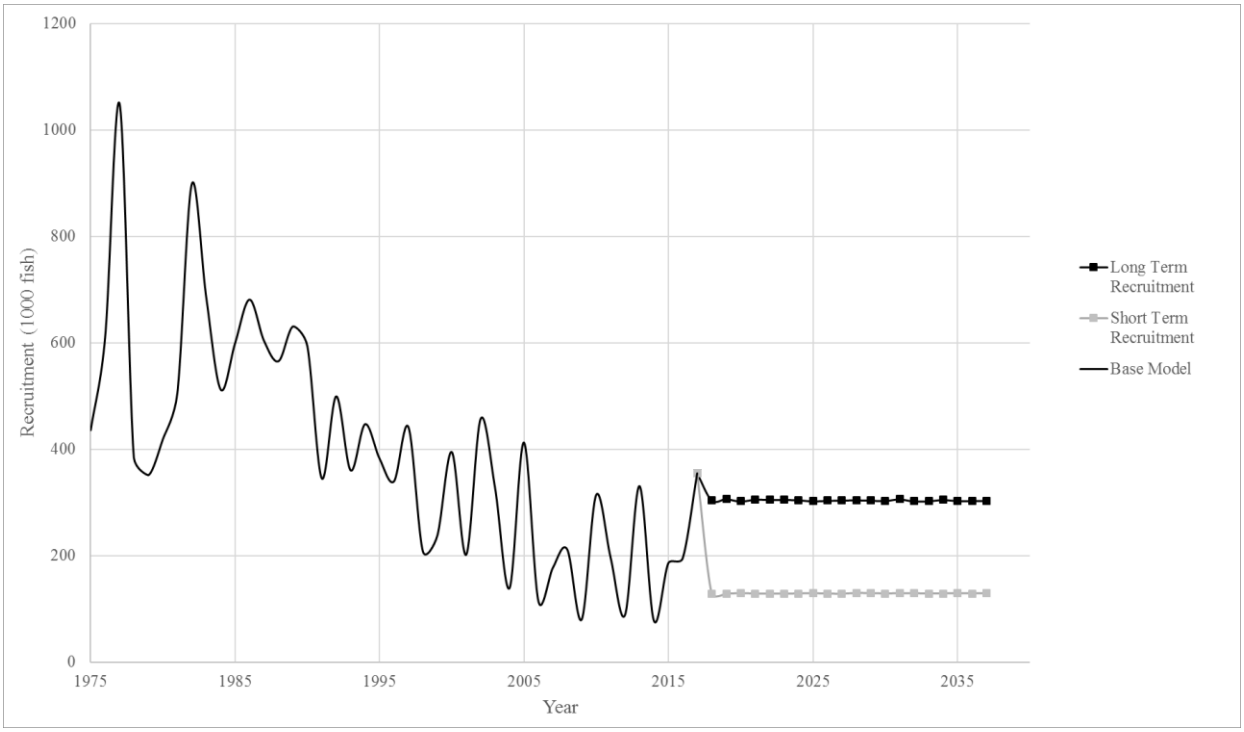
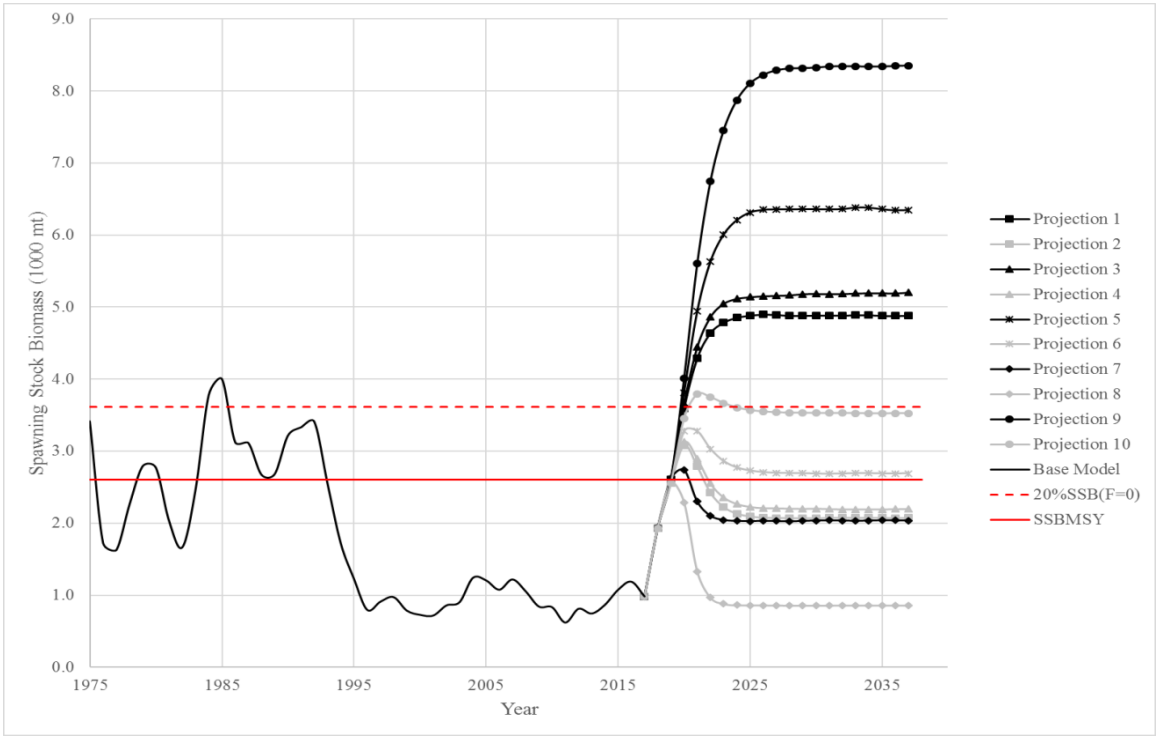


Figure 7-5. Recruitment trajectories used in the projections: Average short-term recruitment estimates (grey squares); average long-term recruitment estimates (black squares); and base-case model estimated recruitment (black solid line).

a.)



b.)

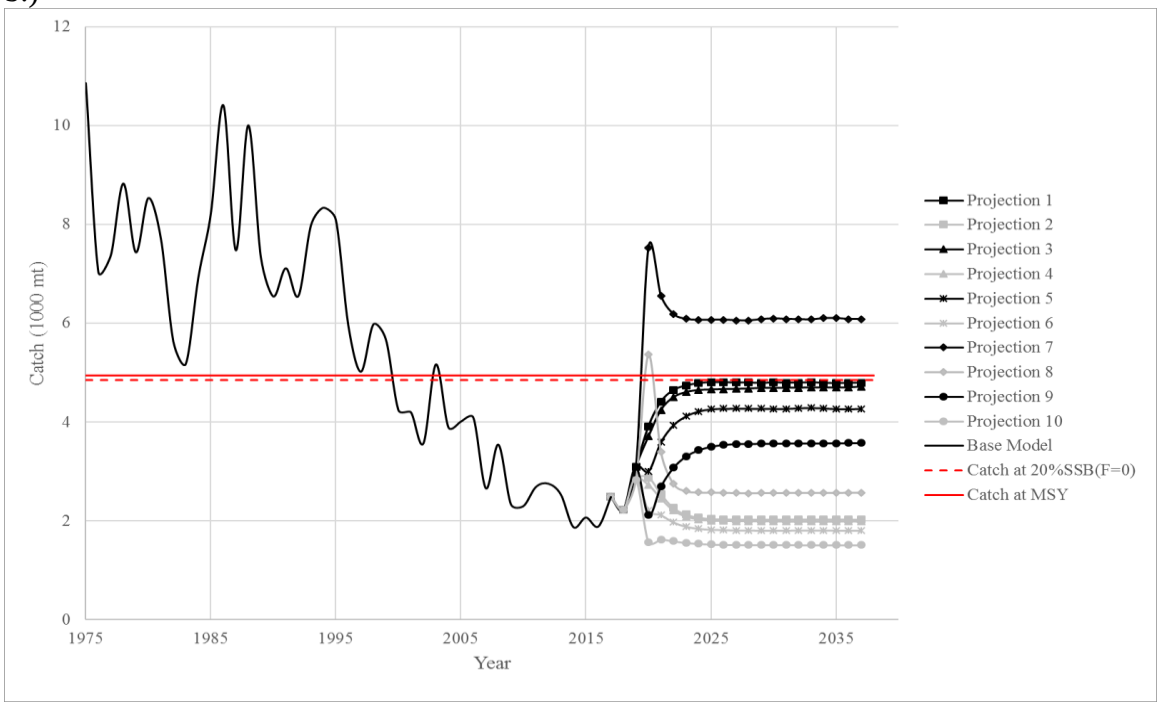
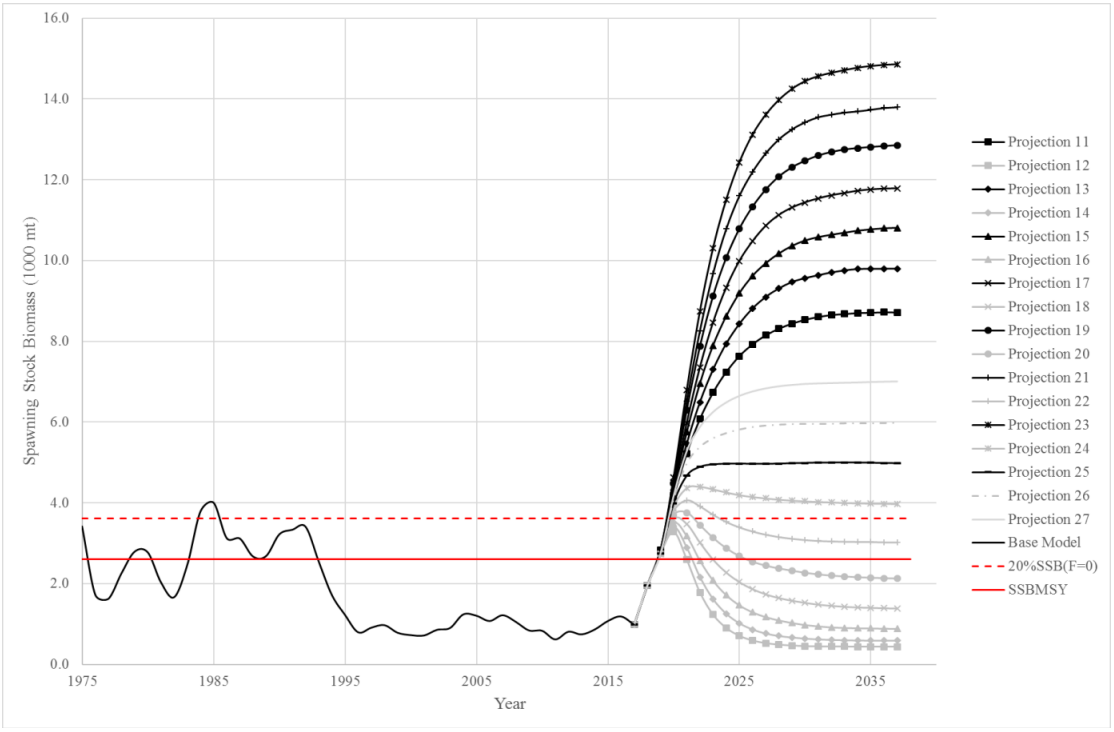


Figure 7-6. Historical and projected trajectories of spawning biomass and total catch from the WCNPO MLS base case model based upon F scenarios (projection 1-10): (a) projected spawning biomass and (b) projected catch.

a.)



b.)

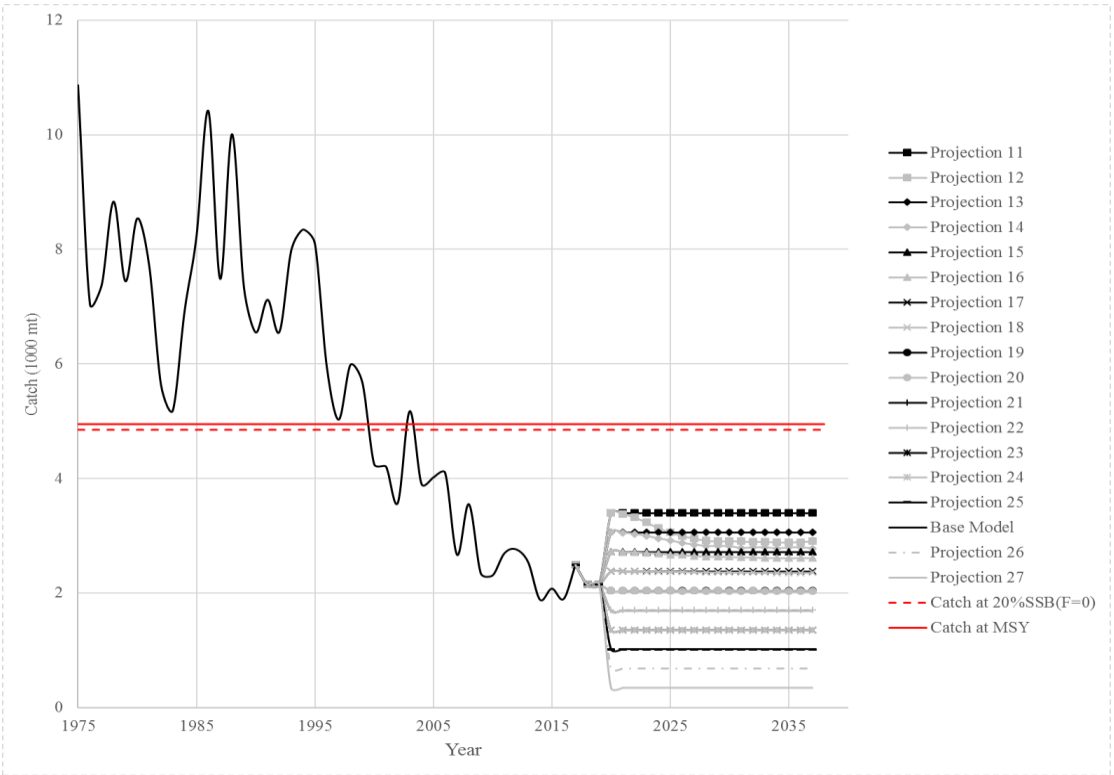


Figure 7-7. Historical and projected trajectories of spawning biomass and total catch from the WCNPO MLS base case model based upon constant catch scenarios (projections 11-15): (a) projected spawning biomass; and (b) projected catch.

Note on Figure 7-6 and Figure 7-7: Black lines are the long-term recruitment scenario results; grey lines show the short-term recruitment scenario results. The red dashed line shows the catch or spawning stock biomass at 20%SSB_0 and the solid red line is the catch or spawning stock biomass at SSB_{MSY}. The list of projection scenarios can be found in Table 7-4.

7.5 Western and Central North Pacific Swordfish

J. Brodziak, Chair of the BILLWG, noted that WCNPO SWO last assessed in 2018.

Discussion

The Plenary reviewed and agreed to forward the stock status and conservation information adopted at ISC18 (see Section 6.4, pp. 33-41 in the ISC18 Plenary Report) unchanged, except for the omission of accompanying figures and tables and slight clarifying modifications.

Stock Status and Conservation Information

Stock Status

Estimates of total stock biomass show a relatively stable population, with a slight decline until the mid-1990s followed by a slight increase since 2000. Population biomass (age-1 and older) averaged roughly 97,919 t in 1974-1978, the first 5 years of the assessment time frame, and has declined by only 20% to 71,979 t in 2016. Female spawning stock biomass was estimated to be 29,403 t in 2016, or about 90% above SSB_{MSY}. Fishing mortality on the stock (average F, ages 1 – 10) averaged roughly F = 0.08 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. Overall, the time series of spawning stock biomass and recruitment estimates indicate a stable spawning stock biomass and suggest a fluctuating pattern without trend for recruitment. The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model 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.

Biomass status is based on female spawning stock biomass in the 2018 benchmark assessment, whereas biomass status was based on exploitable biomass (effectively age-2+ biomass) in the 2014 update assessment, It is also important to note that there are no currently agreed upon reference points for the WCNPO SWO stock and that retrospective analyses show that the assessment model appears to underestimate spawning stock biomass in recent years.

Based on these findings, the following information on the status of the WCNPO SWO stock is provided:

1. **The WCNPO SWO stock has produced annual yields of around 10,200 t per year since 2012, or about 2/3 of the MSY catch amount;**
2. **There is no evidence of excess fishing mortality above F_{MSY} ($F_{2013\text{-}2015}$ is 45% of F_{MSY}) or substantial depletion of spawning potential (SSB_{2016} is 87% above SSB_{MSY});**

3. **Overall, the WCNPO SWO stock is not likely overfished and is not likely experiencing overfishing relative to MSY-based or 20% of unfished spawning biomass-based reference points.**

Conservation Information

Stock projections were conducted using a two-gender projection model. The five stock projection scenarios were: (1) F status quo, (2) F_{MSY}, (3) F at $0.2*SSB_{(F=0)}$, (4) $F_{20\%}$, and (5) $F_{50\%}$. These 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 SWO in the WCNPO. 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 findings, the following conservation information is provided:

1. **The results show that projected female spawning biomasses is expected to increase under all of the harvest scenarios, with greater increases expected under lower fishing mortality rates;**
2. **Similarly, projected catch is expected to increase under each of the five harvest scenarios, with greater increases expected under higher fishing mortality rates.**

7.6 Eastern Pacific Ocean Swordfish

J. Brodziak, Chair of the BILLWG, noted that the eastern Pacific Ocean (EPO) SWO stock was last assessed in 2014.

Discussion

The Plenary reviewed and agreed to forward the stock status and conservation information adopted at ISC18 (see Section 6.5, pp. 41-43 in the ISC18 Plenary Report) unchanged, except for the omission of accompanying figures and tables and slight clarifying modifications.

Stock Status and Conservation Information

Stock Status

Exploitable biomass (age 2+) of the EPO stock decreased during the 1969-1995 period and increased from 31,000 t in 1995 to over 60,000 t by 2010, generally remaining above B_{MSY}. Harvest rates were initially low, have had a long-term increasing trend, and likely exceeded H_{MSY} in 1998, 2002, 2003, as well as in 2012, the terminal year of the last stock assessment.

Based on these findings, the following information on the status of the EPO SWO stock is provided:

1. **No target or limit reference points have been established for the EPO SWO stock under the auspices of the IATTC. Stock status is assessed relative to MSY-based reference points;**
2. **The Kobe plot shows that overfishing likely occurred (>50%) in a few years relative to MSY-based reference points, but may have occurred (<50%) from 2010 to 2012;**
3. **There was a 55% probability that overfishing occurred in 2012, but there was a less than a 1% probability that the stock was overfished relative to MSY-based reference points.**

Conservation Information

Stochastic projections for the EPO SWO stock show that exploitable biomass will likely have a decreasing trajectory during 2014-2016 under the eight harvest scenarios examined. Under the high harvest rate scenarios (status quo catch, maximum observed harvest rate, 150% of H_{MSY}), exploitable biomass was projected to decline to 31,170 t (B_{MSY}) by 2016 with corresponding harvest rates above H_{MSY}. In comparison, under the status quo harvest rate scenario, exploitable biomass was projected to decline to 40,000 t by 2016, well above the B_{MSY} level. Overall, the projections showed that if recent high catch levels (9,700 t) persist, exploitable biomass will decrease and a moderate risk (50%) of overfishing will continue to occur.

The risk analyses for harvesting a constant catch of EPO SWO during 2014-2016 showed that the probabilities of overfishing and becoming overfished increased as projected catch increased in the future. Maintaining the current (2010-2012) catch of EPO SWO of approximately 9,700 t would lead to a 50% probability of overfishing in 2016 and a less than 1% probability of the stock being overfished in 2016.

Based on these findings, the following conservation information is provided:

1. **For the EPO SWO stock, overfishing may have occurred (<50%) from 2010 to 2012, and the average yield of roughly 10,000 t in those years, or almost two times higher than the estimated MSY, is not likely to be sustainable in the long term;**
2. **While biomass of the EPO stock appears to be nearly twice B_{MSY}, any increases in catch above recent (3-year average 2010-2012) levels should consider the uncertainty in stock structure and unreported catch.**

7.7 Pacific Blue Marlin

J. Brodziak noted that a BUM stock assessment was not conducted by the BILLWG in 2018-2019.

Discussion

The Plenary reviewed and agreed to forward the stock status and conservation information statements adopted at ISC18 for BUM (see Section 6.7, pp. 44-45 in the ISC18 Plenary Report), except for the omission of accompanying figures and tables, and slight clarifications if needed.

Stock Status and Conservation Information

Stock Status

Estimates of total BUM stock biomass show a long term decline. Population biomass (age-1 and older) averaged roughly 130,965 t in 1971-1975, the first five years of the assessment time frame, and has declined by approximately 40% to 78,082 t in 2014. Female spawning biomass was estimated to be 24,809 t in 2014, or about 25% above SSB_{MSY}. Fishing mortality on the stock (average F, ages 2 and older) averaged roughly F = 0.28 during 2012-2014, or about 12% below F_{MSY}. The estimated SPR of the stock (the predicted spawning output at the current F as a fraction of unfished spawning output) is currently $SPR_{2012\text{-}2014}$ = 21%. Annual recruitment averaged about 897,000 recruits during 2008-2014, and no long-term trend in recruitment was apparent. Overall, the time series of spawning stock biomass and recruitment estimates show a long-term decline in spawning stock biomass and a fluctuating pattern without trend for recruitment. The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model and shows that spawning stock biomass decreased to roughly the MSY level in the mid-2000s, and has increased slightly in recent years.

Based on these findings, the following information on the status of the BUM stock is provided:

1. **No target or limit reference points have been established for the BUM stock;**
2. **The Pacific BUM stock is not currently overfished and is not experiencing overfishing relative to MSY-based reference points;**
3. **Because Pacific BUM is mainly caught as bycatch, direct control of the annual catch amount through the setting of a total allowable catch may be difficult.**

Conservation Information

Since the stock is near full exploitation, the ISC recommends that fishing mortality remain at or below the most recent levels estimated in the 2016 assessment (average 2012-2014).

7.8 Pacific Bluefin Tuna

S. Nakatsuka noted that the last assessment of PBF was conducted in 2018 and no assessment was conducted in 2019. The PBFWG reviewed the latest information on PBF recruitment and recommends maintaining the conservation information provided in 2018 (see Appendix 6, **ISC/19/ANNEX/08**).

The ISC Plenary reviewed and agreed to forward the stock status and conservation information adopted at ISC18 for PBF (section 6.8, p. 45-57; ISC18 Plenary Report), except for the omission of accompanying figures and tables and slight clarification modifications if necessary. The ISC Plenary endorsed the recommended responses to requests made by IATTC-WCPFC NC PBF Joint Working Group at its September 2018 meeting (see Appendix 6 in **ISC/19/ANNEX/08**), which will be discussed at the upcoming meeting of IATTC-WCPFC NC Joint PBF Working Group in September 2019.

Stock Status and Conservation Information

The stock status and conservation information adopted by the ISC18 Plenary was endorsed and is reproduced below.

Stock Status

1. **No biomass-based limit or target reference points have been adopted to evaluate the overfished status for PBF. However, the PBF stock is overfished relative to the potential biomass-based reference points evaluated (SSB_{MED} and $20\%SSB_{F=0}$, Table 6-7 and Figure 6-12 of ISC18 Report).**
2. **No fishing intensity-based limit or target reference points have been adopted to evaluate overfishing for PBF. However, the PBF stock is subject to overfishing relative to most potential fishing intensity-based reference points evaluated (Table 6-7 and Figure 6-12 of ISC18 Report).**

Conservation Information

After the steady decline in SSB from 1995 to the historical low level in 2010, the PBF stock appears to have started recovering slowly. The 2016 stock biomass is below the two biomass rebuilding targets adopted by the WCPFC while the 2015-16 fishing intensity (spawning potential ratio) is at a level corresponding to the initial rebuilding target.

The 2018 base case assessment results are consistent with the 2016 model results. However, the 2018 projection results are more optimistic than the 2016 projections, mainly due to the inclusion of the relatively good recruitment in 2016, which is above the historical average level (119%) and twice as high as the median of the low recruitment scenario (which occurred 1980-1989).

Based on these results, the following conservation information is provided:

1. **The projection based on the base-case model mimicking the current management measures by the WCPFC (CMM 2017-08) and IATTC (C-16-08) under the low recruitment scenario resulted in an estimated 98% probability of achieving the initial biomass rebuilding target ($6.7\%SSB_{F=0}$) by 2024. This estimated probability is above the threshold (75% or above in 2024) prescribed by the WCPFC Harvest Strategy (Harvest Strategy 2017-02) (scenario 0 of Table 6-8 to Table 6-10; see also Figure 6-14 and Figure 6-15 of the ISC18 Report). The low recruitment scenario is more precautionary than the recent 10 years recruitment scenario;**
2. **The Harvest Strategy specifies that recruitment switches from the low recruitment scenario to the average recruitment scenario beginning in the year after achieving the initial rebuilding target. The estimated probability of achieving the second biomass rebuilding target ($20\%SSB_{F=0}$) 10 years after the achievement of the initial rebuilding target or by 2034, whichever is earlier, is 96% (scenario 1 of Tables Table 6-7, Table 6-8, and Table 6-9; Figure 6-14 and Figure 6-15 of the ISC18 Report). This estimate is above the threshold (60% or above in 2034) prescribed by the WCPFC Harvest Strategy. However, it should be recognized that these projection results are strongly influenced by the inclusion of the relatively high, but uncertain recruitment estimate for 2016.**

8 REVIEW OF STOCK STATUS OF SECONDARY STOCKS

8.1 WCPO Stocks

S.K. Soh reviewed WCPO tuna catch and reported on the status of secondary stocks such as bigeye, yellowfin, skipjack, SP ALB, FAL, whale shark (*Rhincodon typus*), and SPO BSH. The total WCPO tuna catch in 2018 is the second highest catch on record (2014 is the highest catch), and purse seine catch also showed the second highest catch and high catch rate.

The following issues were highlighted by species:

- Bigeye tuna – Until 2016, the stock was in an overfished state ($SB_{recent}/SB_{F=0} = 0.20$) and overfishing ($F_{recent}/F_{MSY} = 1.57$) was occurring. However, the 2017 stock assessment showed that the stock was above the LRP ($SB_{recent}/SB_{F=0} = 0.32$) mainly due to the use of a new growth curve, new regional assessment structure, and high recruitment in recent years. An update bigeye stock assessment in 2018, using the revised growth curve, also produced similar results ($SB_{recent}/SB_{F=0} = 0.358$; Median ($F_{recent}/F_{MSY}$) = 0.813).
- Yellowfin tuna – The age and growth estimates, which are to be presented at SC15, will be considered for future stock assessments.
- Skipjack tuna – A full stock assessment will be presented at SC15, using eight regions as an alternative regional structure.
- SPO ALB – The 2018 stock assessment showed that the stock is not in an overfished state and overfishing is not taking place, where median $SSB_{2016} / SSB_{F=0} = 0.52$ and median $F_{2013\text{-}2016} / F_{MSY} = 0.20$. The Commission agreed on an interim target reference point for SPO ALB at 0.56 $SSB_{F=0}$ with the objective of achieving an 8% increase in CPUE for the southern longline fishery as compared to 2013 levels.
- FAL – The 2018 stock assessment showed that the stock is not in an overfished state, though overfishing is occurring. SC14 recommended, given the WCPO FAL stock continues to be subject to overfishing, that CMM 2013-08 be maintained as a precautionary measure.
- Whale shark – The risk assessment model results show that the risk from Pacific Ocean fisheries alone is moderate to low.
- SPO BSH – The last assessment was in 2016. Because of poor data, the assessment was considered preliminary, and cannot be used for stock status and management advice.

Discussion

It was noted that the choice of an interim target reference point for SPO ALB was based on work conducted principally by interested Pacific Island countries with support from the SPC. Through its harvest strategy framework, the WCPFC will conduct an MSE for SPO ALB, together with an MSE for SKJ. It was observed that current SPO ALB spawning biomass is close to the interim target reference point.

9 ISC PEER REVIEW OF STOCK ASSESSMENT

J. Holmes reviewed the final peer review team report on ISC stock assessments (**ISC/19/PLENARY/11**). He noted that terms of reference for the review contained nine

questions centered on mechanisms in the ISC stock assessment process to determine the quality of quantitative stock assessments, and methods to ensure that management decision-making for ISC fisheries is based on best available scientific information (BASI). The Peer Review Team observed two stock assessment processes (BILLWG, PBFWG) and provided preliminary conclusions at ISC18 (see ISC18 Plenary Report). It was noted that the ISC commissioned this report and that therefore the ISC Plenary needed to consider the implementation of some or all recommendations. Four recommendations were noted for discussion by the Plenary:

1. The ISC should establish data criteria for the choice of candidate stock assessment model(s) and projection methods since these choices are based on available data;
2. The ISC develop a standard set of projections as guidance for future WG efforts;
3. The ISC should consider developing a forward-looking ecosystem-based research science framework to accommodate data and models on climate, ocean, space, fish and fisheries; and
4. The ISC should consider the use of independent expert reviewers to improve the quality and transparency of the stock assessments that it produces.

Discussion

The U.S.A. emphasized the importance of a rigorous and formalized peer review process that goes beyond a desktop review and involves active participation in the stock assessment process. To that end, it suggested an in-person review of a benchmark assessment approximately every three years and offered to provide support through the Center for Independent Experts or alternatively, to secure funding to contract independent experts to participate in benchmark assessments. This prompted discussion by the Plenary of some of the challenges with integrating review into ISC assessment processes.

In response, the Chair agreed to identify alternative ways to integrate peer reviews into the stock assessment process and associated costs, working with the Vice Chair, and report back at ISC20.

There was interest in incorporating some sort of review function into one or both of the upcoming benchmark stock assessments (ALB, PBF), rather than waiting until after ISC20 to consider implementation. The Plenary agreed to pursue contracting an independent expert to participate in an upcoming stock assessment, beginning with the data preparation meeting in November 2019. To accomplish this task, it will be important to draft appropriate terms of reference and ensure that the individual carrying out this review function have the requisite expertise. Draft terms of reference are available from previous Center for Independent Expert (CIE) desktop reviews of ALB and PBF assessments, and could form the basis for a new terms of reference (TOR). The ISC Chair will work with the U.S.A. to secure reviewer(s) and will circulate a draft TOR to the Members. The ISC Chair will work with the WGs to make a final determination of which assessment will be reviewed and finalize the TOR for the review.

10 REVIEW OF STATISTICS AND DATABASE ISSUES

10.1 STATWG Report

S. Chang, ISC Vice Chair, provided a summary of STATWG activities since ISC18 (**ISC/19/ANNEX/13**). The STATWG meeting was held in July 9, 2019 with the ISC Chair running the meeting and 22 participants from Canada, Taiwan, Japan, Korea, U.S.A., and the WCPFC. Regarding the status of the STATWG, four of the seven items in the 2018-2019 workplan were completed. The other three items either will be completed in August of 2019, were not completed due to absence of an elected STATWG Chair, or were considered not necessary to complete. The server housing the ISC dataset is scheduled to be closed down in February 2021 and the database will be transferred to a new server by the end of March 2020. The look of the Species WG webpages was simplified last year and the Chairs of each species WG were asked to review the text on these webpages. It was agreed to add Information on the MSE process to the ALBWG and PBFWG webpages.

All ISC Members except China have submitted their Category I and II data and metadata. Discrepancies noted from cross-comparisons between the data submitted by Members and the data in their national reports will be distributed to Members for confirmation and correction. Japan has submitted revisions to the historical catch time series (1994-2017) for NPO BSH and NPO SMA (**ISC19/STATWG/WP/01**). These improved estimation methods and the resulting catches have been reviewed and approved by the Shark WG.

Species WGs are requested to submit stock assessment data files by November 1 each year for archiving purposes the goal is to increase transparency and published the files on researchers' website, which has controlled access. Extending accessibility from current WG chairs, members, and the DA to external data requesters was discussed and the Plenary concluded that a non-disclosure/confidentiality agreement and a standard protocol must be established for this purpose.

Considering the need and convenience for WGs to have a confidential file-sharing space for meeting participants, the STATWG agreed that a specific working and file-sharing space should be created for each species WG, on the condition that 1) files uploaded to the working space must be relevant to WG as determined by the WG Chair; 2) the WG Chair needs to confirm annually that uploaded files are still necessary, and remove them when they are no longer required; and 3) the space will be accessible only to members of the WG.

The function of STATWG was discussed and members agreed that the STATWG is needed to (1) maintain the ISC database and the quality of data submitted by members, (2) maintain the proper function of ISC website, and (3) coordinate internal data sharing and develop protocols for answering external data requests, the STATWG is responsible for overseeing these functions in cooperation with WG chairs and members, providing a link to the ISC Plenary, and recommending appropriate actions when needed.

Based on discussion at the meeting, the STATWG developed a work plan for 2019-2020 with 11 items (**ISC/19/ANNEX/13 Attachment 4**). The STATWG makes the following recommendations to the Plenary:

1. The DA proactively move the ISC database to a new server as planned by March 2020 to ensure the security of those data and turn the old server off after ISC20;
2. Approve the data revisions to BSH and SMA catches presented by Japan;
3. Direct species WG chairs to review the species pages on the ISC website and update information if necessary,
4. Direct the webmaster to add links to ALB and PBF MSE meeting documents to the respective species pages, and make some minor name changes to lower-level pages in the Working Group tab;
5. The ISC develop a protocol for sharing stock assessment files with external parties for the purpose of transparency, which should include a non-disclosure agreement and rules governing the use of shared files; and,
6. The next STATWG meeting be scheduled for 1.5 days in advance of the ISC20 Plenary.

Discussion

The U.S.A. proposed that the ISC discontinue the practice of annual submissions of Category II and III data because it duplicates submissions to the WCPFC and IATTC. However, Members saw continuing value in having these data as part of the ISC repository. The U.S.A. noted that the need to reformat data for submission to the ISC can be tedious. In response, the ISC Chair recommended that the STATWG pursue harmonizing data submission formats with those used by the WCPFC and IATTC.

The ALBWG Vice Chair asked about archiving the data files from the MSE process, noting that this exercise produced a very large volume of files. The STATWG will need to consider how to proceed with archiving these data at their next steering committee meeting and provide a recommendation.

It was noted that the species WGs had been receiving catch information of relevant species by non-ISC member countries from WCPFC through the STATWG Chair but these data were not acquired in 2019. The Plenary requested that the STATWG Chair to resume the practice in 2020.

The ISC Chair will continue to search for a chair for the STATWG with the intent of having the office filled by ISC20.

10.2 Total catch tables

K. Nishikawa, the Database Administrator, presented the annual catch tables for ISC Member countries for 2017-2018. The catch tables were prepared for the following ISC species of interest: ALB, PBF, SWO, MLS, BUM, BSH, and SMA in the NPO. The catch tables were generated from the ISC database, and are based on Category I data (retained catch and released catch, when available) submitted by National Data Correspondents for the major fisheries in the NPO of the Members. Graphs of the historical catch by country were also presented for each species. Statistics for mean, minimum and maximum catch were also presented for each species for the latest five years. The complete catch tables are included in the ISC Plenary Report (Table 15-1 through Table 15-7) and serve as the official ISC catch tables.

11 REVIEW OF MEETING SCHEDULE

11.1 Time and Place of ISC20

The U.S.A. offered to host ISC20, 15-20 July 2020, with the precise location to be determined.

The Plenary discussed the timing of the ISC meeting in relation to RFMO actions on PBF stemming from the planned benchmark assessment to be completed in 2020. It was noted that the NC may request a change in the ISC meeting dates for this reason; however, accommodating such a request may not be feasible considering the long lead time needed for securing a meeting venue and the timelines needed by other WGs to complete their stock assessments.

11.2 Time and Place of Working Group Intercessional Meetings

A draft schedule of proposed intersessional meetings was reviewed and amended. Proposed ISC WG and RFMO meetings are shown below. The Plenary discussed the possibility of reducing the number of face-to-face WG meetings by using webinars and related technologies. WGs were asked to review their meeting schedules and report back at ISC20 on options for reducing face-to-face meetings.

		ALBWG	BILLWG	PBFWG	SHARKWG	STATWG	ISC PLENARY	WCPFC	IATTC
2019	Aug							SC15, Aug 12-20, Pohnpei, FSM	
	Sept							NC15, Sept 2-6, Portland, USA	
	Oct							25 Sept - 1 Oct, TC15, Pohnpei, FSM	
	Nov	12-18 Nov, Shimizu, Data Prep		18-23 Nov, La Jolla, Data Prep	Webinar - Review Assessment Schedule				
	Dec				Dec 4-11, Shimizu, Data Prep for BSH			WCPFC16, Dec 5-11, Port Moresby, PNG	
2020	Jan		Jan - Taipei, Research, Data Prep BUM 2021			Late Jan, Steering Comm., Shimizu or webinar			
	Feb								
	Mar	16-23 Mar, La Jolla, Stock Assessment		Mar (up to 10 d), Shimizu, Stock Assessment					
	Apr				BSH Assess - pending outcome of Nov review				
	May								Science Advisory Committee, 2nd Week of May
	June								
	July	ISC20, 0.5 day, USA		ISC20, 0.5 day, USA	ISC20, 0.5 day, USA	ISC20, 1.5 days, USA	ISC20, July 15-20, USA		

12 ADMINISTRATIVE MATTERS

12.1 Formalization of ISC

The U.S.A. has taken the lead on developing a memorandum of understanding (MOU) among Members to formalize the ISC structure and function. It reported on progress working with the U.S. Department of State to finalize the MOU. Formalization is on track but the U.S. recommends separating the issue of financial contributions by Members from the MOU process in order to remove a potential roadblock to formalization. It was noted that the finalization of the MOU may need to account for requests by other countries to become ISC Members, because as currently drafted it reflects the current membership. The Plenary agreed to move forward with finalizing the MOU without a financial contribution dimension and address membership issues as needed by email. The U.S.A. will continue to lead the process.

12.2 Ad-hoc PBF Close-Kin Workshop

S. Nakatsuka reported the results of ad-hoc PBF close-kin Workshop as the chair of the workshop was not available **(ISC/19/ANNEX/07**). The workshop was held in March 16-17, 2019 in Jeju, Korea. The purpose of the workshop was for ISC Members to share progress on close-kin genetics in PBF including sample collection, marker development, and modelling, as well as to discuss ways forward for this collaborative effort to use the close-kin mark recapture (CKMR) technique to develop an independent estimate of PBF abundance. Members reported the progress of domestic work on the CKMR project and it was noted that the degree of progress differs substantially. Though having a single institution to analyze DNA samples would be an advantage in proceeding with an ISC CKMR program, no viable option to achieve this objective was developed. Because of differences in progress, no future work plan for the ISC CKMR project was established and the workshop concluded that the best way forward was for each country to perform DNA extraction on samples collected to assess DNA quality and wait for any genotyping methodologies to be published for future analysis.

Discussion

The value of transparency and close cooperation for the success of the CKMR program was noted. However, it was acknowledged that the original objective of analysis of genetic material at a single lab does not appear viable, because of countries' desire to manage any intellectual property developed as part of the effort.

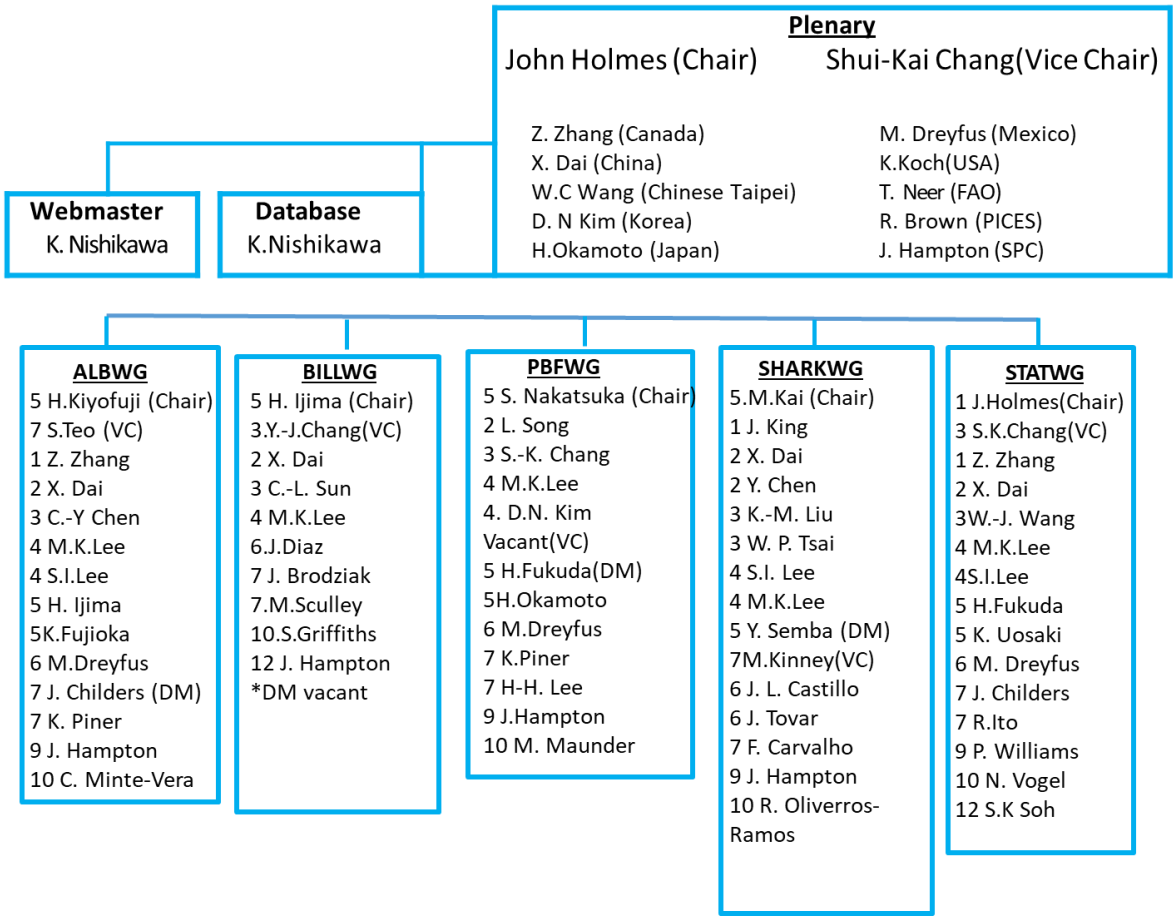
The Plenary expressed concern that without clear guidelines, a large proportion of genetic samples have been unusable. In response, the ISC Chair will prepare a document with guidance on sample collection and handling methods to be completed in the coming year.

The Plenary requested that heads of delegation report on each Member's progress with their CKMR work at ISC20. At that point the Plenary will need to develop clear guidance to ensure progress on this project, especially in terms of transitioning the CKMR results into the conventional stock assessment framework managed by the PBFWG.

12.3 Updated Organizational Chart

It was noted that no Data Manager (DM) was identified for the BILLWG. The WG Chair was asked to identify the DM for ISC20. The ISC organizational chart was reviewed for completeness. The updated chart is reproduced below (**ISC/19/PLENARY/03**).

ISC Organizational Chart (July 2019)



Working Group Key:
1 Canada 2 China 3 Chinese-Taipei 4 Korea 5 Japan 6 Mexico 7 USA 8 PICES 9 SPC 10 IATTC 11 FAO 12 WCPFC
VC Vice Chair DM Database Manager

This is not a comprehensive list but the main points of contact.

12.4 PICES Annual General Meeting Observer

J. Holmes (ISC Chair) will fill the observer function for the next PICES annual general meeting, October 16-27, 2019 in Victoria, Canada.

12.5 Other

J. Holmes, ISC Chair, raised three points regarding future meetings:

1. Presenters will be asked to submit a copy of their presentation to the Office of the Chair a day in advance for distribution to Plenary participants. The intent is to foster greater discussion and communication of the materials that the ISC Plenary reviews. This process will be implemented at ISC20;
2. Working groups should review their assessment schedules intersessionally and report to ISC20 on the appropriate frequency of assessments (length of time between assessments) based on the characteristics of the stock and other considerations, The WGs will also review the frequency of intersessional face-to-face meetings with the objective of minimizing the number of meetings as practical and use alternative collaboration tools such as webinars, Google Hangouts, etc.; and
3. WGs should update the information on biological reference points presented at ISC10 (**ISC/10/PLENARY/04**) intersessionally for presentation and discussion at the ISC20 Plenary.

The ALBWG requested that it be exempted from the assignment to identify and evaluate candidate biological reference points, because a suite of candidate reference points has already been adopted for evaluation in the MSE process. The Plenary agreed to this exemption for the coming year.

13 ADOPTION OF REPORT

The Report of the Meeting was adopted.

14 CLOSE OF MEETING

The meeting was closed at 12:10 PM 15 July 2019.

15 CATCH TABLES

Table 15-1. North Pacific albacore catches (in metric tons) for fisheries monitored by ISC for assessments of North Pacific Ocean stocks. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	CAN		JPN							KOR		MEX			TWN					
		Troll	CAN Total	Set-net	Drift gill-net	Longline	Pole and line	Troll	Others	Purse seine	JPN Total	Longline	KOR Total	Others	Purse seine	MEX Total	Set-net	Gill-net (not specified)	Longline	Others	Purse seine	TWN Total
Retained	1936																					
	1937																					
	1938																					
	1939	129	129																			
	1940	2	2																			
	1941	35	35																			
	1942																					
	1943	13	13																			
	1944	210	210																			
	1945	648	648																			
	1946	196	196																			
	1947	36	36																			
	1948	984	984																			
	1949	1,012	1,012																			
	1950	961	961																			
	1951	86	86																			
	1952	71	71	55	-	26,687	41,787	-	237	154	68,920			-	-	-						
	1953	5	5	88	-	27,777	32,921	-	132	38	60,956			-	-	-						
	1954			6	-	20,958	28,069	-	38	23	49,094			-	-	-						
	1955			28	-	16,277	24,236	-	136	8	40,685			-	-	-						
	1956			23	-	14,341	42,810	-	57	-	57,231			-	-	-						
	1957			13	-	21,053	49,500	-	151	83	70,800			-	-	-						
	1958	17	17	38	-	18,432	22,175	-	124	8	40,777			-	-	-						
	1959	8	8	48	-	15,802	14,252	-	67	-	30,169			-	-	-						
	1960	74	74	23	-	17,369	25,156	-	76	-	42,624			-	-	-						
	1961	212	212	111	-	17,437	18,639	-	268	7	36,462			39	2	41						
	1962	141	141	20	-	15,764	8,729	-	191	53	24,757			0	0	0						
	1963	4	4	4	-	13,464	26,420	-	218	59	40,165			0	31	31						
	1964	1	1	50	-	15,458	23,858	-	319	128	39,813			-	0	-						
	1965	5	5	70	-	13,701	41,491	-	121	11	55,394			-	0	-						
	1966	3	3	64	-	25,050	22,830	-	585	111	48,640			-	0	-						
	1967	15	15	43	-	28,869	30,481	-	520	89	60,002			-	-	-	-	-	330	189		519
	1968	44	44	58	-	23,961	16,597	-	1,109	267	41,992			-	-	-	-	-	216	283		499
	1969	161	161	34	-	18,006	31,912	-	925	521	51,398			-	0	-	-	-	65	423		488
	1970	1,028	1,028	19	-	16,222	24,263	-	498	317	41,319			-	0	-	-	-	34	59		93
	1971	1,365	1,365	5	-	11,473	52,957	-	354	902	65,691	0	0	-	0	-	-	-	20	52		72
	1972	390	390	6	1	13,022	60,569	-	638	277	74,513	0	0	0	100	100	-	-	187	-		187
	1973	1,746	1,746	44	39	16,760	68,767	-	486	1,353	87,449	4	4	-	0	-	-	-	-	-		-
	1974	3,921	3,921	13	224	13,384	73,564	-	891	161	88,237	91	91	0	1	1	-	-	486	-		486
	1975	1,400	1,400	13	166	10,303	52,152	-	230	159	63,023	7,050	7,050	0	1	1	-	-	1,240	-		1,240
	1976	1,331	1,331	15	1,070	15,812	85,336	-	270	1,109	103,612	2,212	2,212	5	36	41	-	-	686	-		686
	1977	111	111	5	688	15,681	31,934	-	365	669	49,342	500	500	0	3	3	-	-	572	-		572
	1978	278	278	21	4,029	13,007	59,877	-	2,073	1,115	80,122	669	669	0	1	1	-	-	6	-		6
	1979	53	53	16	2,856	14,186	44,662	-	1,139	125	62,984	0	0	0	1	1	-	-	81	-		81
	1980	23	23	10	2,986	14,681	46,742	-	1,177	329	65,925	592	592	0	31	31	-	1	249	20		270
	1981	521	521	8	10,348	17,878	27,426	-	699	252	56,611	0	0	0	8	8	1	-	143	12		156
	1982	212	212	11	12,511	16,714	29,614	-	482	561	59,893	4,874	4,874	0	0	0	-	-	38	9		47
	1983	200	200	22	6,852	15,094	21,098	-	99	350	43,515	366	366	0	0	0	-	-	8	1		9
	1984	104	104	24	8,988	15,053	26,013	-	494	3,380	53,952	1,925	1,925	6	107	113	-	1	-	-		1
	1985	225	225	68	11,204	14,249	20,714	-	339	1,533	48,107	2,789	2,789	35	14	49	1	-	-	2		3
	1986	50	50	15	7,813	12,899	16,096	-	640	1,542	39,005	3,833	3,833	0	3	3	-	-	-	-		-
	1987	56	56	16	6,698	14,668	19,082	-	173	1,205	41,842	1,624	1,624	0	7	7	2	2,514	-	-		2,516
	1988	30	30	7	9,074	14,688	6,216	-	170	1,208	31,363	799	799	0	15	15	6	7,389	-	-		7,395
	1989	104	104	33	7,437	13,031	8,629	-	433	2,521	32,084	561	561	0	2	2	-	8,350	40	-		8,390
	1990	155	155	5	6,064	15,785	8,532	-	248	1,995	32,629	29	29	0	2	2	-	16,701	4	39		16,744
	1991	140	140	4	3,401	17,039	7,103	-	395	2,652	30,594	4	4	0	2	2	-	3,398	12	-		3,410
	1992	302	302	12	2,721	19,042	13,888	-	1,522	4,104	41,289	1	1	0	10	10	-	7,866	-	-		7,866
	1993	139	139	3	287	29,933	12,797	-	897	2,889	46,806	2	2	0	11	11	-	-	5	-		5
	1994	1,998	1,998	11	263	29,565	26,389	-	823	2,026	59,077	2	2	0	6	6	-	-	83	-		83
	1995	1,761	1,761	28	282	29,050	20,981	856	78	1,177	52,452	13	13	0	5	5	-	-	4,280	-		4,280
	1996	3,321	3,321	43	116	32,440	20,272	815	127	581	54,394	157	157	0	21	21	-	-	7,596	-	-	7,596
	1997	2,166	2,166	40	359	38,899	32,238	1,585	135	1,068	74,324	404	404	0	53	53	-	-	9,456	-	-	9,456
	1998	4,177	4,177	41	206	35,755	22,926	1,190	104	1,554	61,776	225	225	0	8	8	-	-	8,810	-	-	8,810
	1999	2,734	2,734	90	289	33,339	50,369	891	62	6,872	91,912	98	98	57	0	57	-	-	8,393	-	-	8,393
	2000	4,531	4,531	136	67	29,995	21,550	645	86	2,408	54,887	15	15	33	70	103	-	-	8,842	-	-	8,842
	2001	5,248	5,248	78	117	28,801	29,430	416	35	974	59,851	63	63	18	0	18	-	1	8,684	+	-	8,685
	2002	5,379	5,379	109	332	23,585	48,454	787	85	3,303	76,655	111	111	0	28	28	-	-	7,965	-	-	7,965
	2003	6,847	6,847	69	126	20,907	36,114	922	85	627	58,850	146	146	0	29	29	-	-	7,166	-	-	7,166
	2004	7,857	7,857	30	61	17,341	32,255	772	54	7,200	57,713	77	77	0	104	104	-	-	4,988	-	-	4,988
	2005	4,829	4,829	97	154	20,465	16,133	665	234	850	38,598	419	419	0	0	0	-	-	4,472	-	-	4,472
	2006	5,833	5,833	55	221	21,168	15,400	460	42	364	37,710	134	134	0	109	109	-	-	4,317	-	-	4,317
	2007	6,040	6,040	30	226	22,381	37,768	519	44	5,682	66,650	136	136	0	40	40	-	+	2,916	-	-	2,916
	2008	5,464	5,464	101	1,531	19,092	19,060	549	34	825	41,192	400	400	-	10	10	-	-	3,069	-	-	3,069
	2009	5,693	5,693	33	149	21,995	31,172	410	43	2,076	55,878	95	95	-	17	17	-	-	2,378	-	-	2,378
	2010	6,527	6,527	42	24	21,167	19,561	588	37	330	41,749	107	107	-	25	25	+	-	2,818	-	-	2,818
	2011	5,385	5,385	50	12	20,956	25,704	443	78	480	47,723	78	78	-	0	-	+	1	3,434	2	0	3,437
	2012	2,484	2,484	48	26	22,828	33,742	610	129	4,193	61,576	156	156	0	0	0	2	2	2,643	0	0	2,647
	2013	5,088	5,088	36	14	19,839	33,568	302	211	1,988	55,958	173	173		0	0	1	+	4,427	0	0	4,428
	2014	4,780	4,780	24	11	19,973	29,433	197	197	2,009	51,844	116	116		0	0	1	1	2,617	+	0	2,619
	2015	4,391	4,391	17	138	21,013	21,294	239	170	1,072	43,943	38	38		0	0	1	2	3,020	4	0	3,027
	2016	2,842	2,842	28	19	16,549	14,435	148	128	3,679	34,986	56	56		0	0	+	+	3,406	0	0	3,406
	2017	1,831	1,831	48	40	17,309	20,891	107	119	1,250	39,764	202	202		0	0	0	5	4,333	0	0	4,338
	2018	2,717	2,717	0	0	13,248	17,600	100	2	3,000	33,950	101	101		0	0	(0)	(5)	(4514)	(0)	(0)	4,519
Retain catch total		**128,880**	**128,880**	**2,455**	**110,240**	**1,318,670**	**1,996,633**	**14,216**	**23,128**	**87,856**	**3,553,198**	**31,447**	**31,447**	**193**	**913**	**1,106**	**15**	**46,237**	**129,049**	**1,095**	**0**	**176,396**
Released	2013	1	1																			
	2014	7	7																			
	2015	14	14																			
	2016	2	2																			
	2017	2	2																			
	2018	18	18									+	+									
Release total		**44**	**44**									**+**	**+**									
Total		**128,924**	**128,924**	**2,455**	**110,240**	**1,318,670**	**1,996,633**	**14,216**	**23,128**	**87,856**	**3,553,198**	**31,447**	**31,447**	**193**	**913**	**1,106**	**(15)**	**(46,226)**	**(129,049)**	**(1,091)**	**-**	**(176,396)**

Table 15-1. Continued.

Catch disposition	Year	USA									Total
		Drift gill-net	Handline	Longline	Pole and line	Troll	Others	Purse seine	Sport	USA Total	
Retained	1936					442				442	**442**
	1937					1,681				1,681	**1,681**
	1938					8,594				8,594	**8,594**
	1939					8,586				8,586	**8,715**
	1940					6,603				6,603	**6,605**
	1941					5,412				5,412	**5,447**
	1942					10,678				10,678	**10,678**
	1943					17,071				17,071	**17,084**
	1944					23,957				23,957	**24,167**
	1945					17,886				17,886	**18,534**
	1946					10,955				10,955	**11,151**
	1947					12,235				12,235	**12,271**
	1948			45		22,457				22,502	**23,486**
	1949			33		24,901				24,934	**25,946**
	1950			27		32,746				32,773	**33,734**
	1951			24		15,629				15,653	**15,739**
	1952			46		23,843			1,373	25,262	**94,253**
	1953			23		15,740			171	15,934	**76,895**
	1954			13		12,246			147	12,406	**61,500**
	1955			9		13,264			577	13,850	**54,535**
	1956			6		18,751			482	19,239	**76,470**
	1957			4		21,165			304	21,473	**92,273**
	1958			7		14,855			48	14,910	**55,704**
	1959			5		20,990			+	20,995	**51,172**
	1960			4		20,100			557	20,661	**63,359**
	1961			5	2,837	12,055	1		1,355	16,253	**52,968**
	1962			7	1,085	19,752	1		1,681	22,526	**47,424**
	1963			7	2,432	25,140			1,161	28,740	**68,940**
	1964			4	3,411	18,388			824	22,627	**62,441**
	1965			3	417	16,542	1		731	17,694	**73,093**
	1966			8	1,600	15,333			588	17,529	**66,172**
	1967			12	4,113	17,814			707	22,646	**83,182**
	1968			11	4,906	20,434			951	26,302	**68,837**
	1969			14	2,996	18,827			358	22,195	**74,242**
	1970			9	4,416	21,032			822	26,279	**68,719**
	1971			11	2,071	20,526			1,175	23,783	**90,911**
	1972			8	3,750	23,600			637	27,995	**103,185**
	1973			14	2,236	15,653			84	17,987	**107,186**
	1974			9	4,777	20,178			94	25,058	**117,794**
	1975			33	3,243	18,932	10		640	22,858	**95,572**
	1976			23	2,700	15,905	4		713	19,345	**127,227**
	1977			37	1,497	9,969			537	12,040	**62,568**
	1978			54	950	16,613	15		810	18,442	**99,518**
	1979				303	6,781			74	7,158	**70,277**
	1980				382	7,556			168	8,106	**74,947**
	1981			25	748	12,637			195	13,605	**70,901**
	1982			105	425	6,609	21		257	7,417	**72,443**
	1983			6	607	9,359			87	10,059	**54,149**
	1984			2	1,030	9,304		3,728	1,427	15,491	**71,586**
	1985	2				6,422	118	26	1,176	7,744	**58,917**
	1986	3				4,713	66	47	196	5,025	**47,916**
	1987	5		150		2,772	139	1	74	3,141	**49,186**
	1988	15		307		4,221	76	17	64	4,700	**44,302**
	1989	4		248		1,896	10	1	160	2,319	**43,460**
	1990	29		177		2,733	20	71	24	3,054	**52,613**
	1991	17		312		1,917	20		6	2,272	**36,422**
	1992			334		4,626	40		2	5,002	**54,470**
	1993			438		6,325	194		25	6,982	**53,945**
	1994	38		544		11,068	66		106	11,822	**72,988**
	1995	52		882		8,302	4		102	9,342	**67,853**
	1996	83		1,185		17,150	10	11	88	18,527	**84,016**
	1997	60		1,653		14,458	12	2	1,018	17,203	**103,606**
	1998	80		1,120		14,577	15	33	1,208	17,033	**92,029**
	1999	149		1,542		10,451	61	48	3,621	15,872	**119,066**
	2000	55		940		9,834	24	4	1,798	12,655	**81,033**
	2001	94		1,295		11,543	39	51	1,635	14,657	**88,522**
	2002	30		525		11,003	13	4	2,357	13,932	**104,070**
	2003	16		524		14,246	8	44	2,214	17,052	**90,090**
	2004	12		361		13,630	3	1	1,506	15,513	**86,252**
	2005	20		296		8,654	1		1,719	10,690	**59,008**
	2006	3		270		12,642	+		385	13,300	**61,403**
	2007	4	94	250		11,911	+	77	461	12,797	**88,579**
	2008	1	28	354		11,762	+		418	12,563	**62,698**
	2009	4	97	203		12,343	+	31	944	13,622	**77,683**
	2010	5	53	421		11,691	0		862	13,032	**64,258**
	2011	5	84	708		10,147	0		421	11,365	**67,988**
	2012	8	253	660		14,152	2		1,212	16,287	**83,150**
	2013	5	46	317		12,312	0		839	13,519	**79,166**
	2014	0	49	209		13,401			1,042	14,701	**74,060**
	2015	1	62	243		11,597	2		932	12,836	**64,235**
	2016	1	24	248		10,778	0		675	11,727	**53,017**
	2017		35	95		7,430	14		372	7,946	**54,081**
	2018		20	86		7,738			170	8,013	**49,300**
Retain catch total		**800**	**845**	**17,549**	**52,932**	**1,088,171**	**1,010**	**4,197**	**47,566**	**1,213,071**	**5,104,098**
Released	2013										**1**
	2014										**7**
	2015										**14**
	2016										**2**
	2017										**2**
	2018										**18**
Release total											**44**
Total		**800**	**845**	**17,549**	**52,932**	**1,088,171**	**1,010**	**4,197**	**47,566**	**1,213,071**	**5,104,142**

Table 15-2. Pacific bluefin tuna catches (in metric tons) for fisheries monitored by ISC for assessments of North Pacific Ocean stocks. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN							KOR						MEX		
		Set-net	Longline[1]	Pole and line	Troll[2]	Others	Purse seine	JPN Total	Set-net	Longline	Purse seine	Trawl	Troll	KOR Total[3]	Others	Purse seine	MEX Total
Retain catch	1952	2,145	2,694	2,198	667	1,700	7,680	17,084							-	-	-
	1953	2,335	3,040	3,052	1,472	160	5,570	15,629							-	-	-
	1954	5,579	3,088	3,044	1,656	266	5,366	18,999							-	-	-
	1955	3,256	2,951	2,841	1,507	1,151	14,016	25,722							-	-	-
	1956	4,170	2,672	4,060	1,763	385	20,979	34,029							-	-	-
	1957	2,822	1,685	1,795	2,392	414	18,147	27,255							-	-	-
	1958	1,187	818	2,337	1,497	215	8,586	14,640							-	-	-
	1959	1,575	3,136	586	736	167	9,996	16,196							32	171	203
	1960	2,032	5,910	600	1,885	369	10,541	21,337							-	-	-
	1961	2,710	6,364	662	3,193	599	9,124	22,652							-	130	130
	1962	2,545	5,769	747	1,683	293	10,657	21,694							-	294	294
	1963	2,797	6,077	1,256	2,542	294	9,786	22,752							-	412	412
	1964	1,475	3,140	1,037	2,784	1,884	8,973	19,293							-	131	131
	1965	2,121	2,569	831	1,963	1,106	11,496	20,086							-	289	289
	1966	1,261	1,370	613	1,614	129	10,082	15,069							-	435	435
	1967	2,603	878	1,210	3,273	302	6,462	14,728							-	371	371
	1968	3,058	500	983	1,568	217	9,268	15,594							-	195	195
	1969	2,187	878	721	2,219	195	3,236	9,436							-	260	260
	1970	1,779	607	723	1,198	224	2,907	7,438							-	92	92
	1971	1,555	697	938	1,492	317	3,721	8,720		0				0	-	555	555
	1972	1,107	512	944	842	197	4,212	7,814		0				0	-	1,646	1,646
	1973	2,351	838	526	2,108	636	2,266	8,725		0				0	-	1,084	1,084
	1974	6,019	1,177	1,192	1,656	754	4,106	14,904		0				0	-	344	344
	1975	2,433	1,061	1,401	1,031	808	4,491	11,225		3				3	-	2,145	2,145
	1976	2,996	320	1,082	830	1,237	2,148	8,613		5				5	-	1,968	1,968
	1977	2,257	338	2,256	2,166	1,052	5,110	13,179		0				0	-	2,186	2,186
	1978	2,546	648	1,154	4,517	2,276	10,427	21,568		3				3	-	545	545
	1979	4,558	729	1,250	2,655	2,429	13,881	25,502		0				0	-	213	213
	1980	2,521	811	1,392	1,531	1,953	11,327	19,535		0				0	-	582	582
	1981	2,129	590	754	1,777	2,653	25,422	33,325		0				0	-	218	218
	1982	1,667	718	1,777	864	1,709	19,234	25,969		0	31			31	-	506	506
	1983	972	217	356	2,028	1,117	14,774	19,464		0	13			13	-	214	214
	1984	2,234	142	587	1,874	868	4,433	10,138		1	4			5	-	166	166
	1985	2,562	105	1,817	1,850	1,175	4,154	11,663		0	1			1	-	676	676
	1986	2,914	102	1,086	1,467	719	7,412	13,700		0	344			344	-	189	189
	1987	2,198	211	1,565	880	445	8,653	13,952		13	89			102	-	119	119
	1988	843	157	907	1,124	498	3,605	7,134		0	32			32	1	447	448
	1989	748	209	754	903	283	6,190	9,087		0	71			71	-	57	57
	1990	716	309	536	1,250	455	2,989	6,255		0	132			132	-	50	50
	1991	1,485	218	286	2,069	650	9,808	14,516		0	265			265	-	9	9
	1992	1,208	513	166	915	1,081	7,162	11,045		0	288			288	-	0	0
	1993	848	812	129	546	365	6,600	9,300		0	40			40	-	-	-
	1994	1,158	1,206	162	4,111	398	8,131	15,166		0	50			50	2	63	65
	1995	1,859	678	270	4,778	586	18,909	27,080		0	821			821	-	11	11
	1996	1,149	901	94	3,640	570	7,644	13,998		0	102			102	-	3,700	3,700
	1997	803	1,300	34	2,740	811	13,152	18,840		0	1,054			1,054	-	367	367
	1998	874	1,255	85	2,876	700	5,391	11,181		0	188			188	0	1	1
	1999	1,097	1,157	35	3,440	709	16,173	22,611		0	256			256	35	2,369	2,404
	2000	1,125	953	102	5,217	689	16,486	24,572		0	2,401	0		2,401	99	3,019	3,118
	2001	1,366	791	180	3,466	782	7,620	14,205		0	1,176	10		1,186	-	863	863
	2002	1,100	841	99	2,607	631	8,903	14,181		0	932	1		933	2	1,708	1,710
	2003	839	1,237	44	2,060	446	5,768	10,394		0	2,601	0		2,601	43	3,211	3,254
	2004	896	1,847	132	2,445	514	8,257	14,091		0	773	0		773	14	8,880	8,894
	2005	2,182	1,925	549	3,633	548	12,817	21,654		0	1,318	9		1,327	-	4,542	4,542
	2006	1,421	1,121	108	1,860	777	8,880	14,167		0	1,012	3		1,015	-	9,806	9,806
	2007	1,503	1,762	236	2,823	657	6,840	13,821		0	1,281	4		1,285	-	4,147	4,147
	2008	2,358	1,390	64	2,377	770	10,221	17,180		0	1,866	10		1,876	15	4,407	4,422
	2009	2,236	1,080	50	2,003	575	8,077	14,021		0	936	4		940	-	3,019	3,019
	2010	1,603	890	83	1,583	495	3,742	8,396		0	1,196	16		1,212	-	7,746	7,746
	2011	1,651	837	63	1,820	283	8,340	12,994		0	670	14	+	684	1	2,731	2,732
	2012	1,932	673	113	570	343	2,462	6,093		0	1,421	2		1,423	1	6,668	6,669
	2013	1,415[4]	784	8	904	529	2,771	6,411	1	0	604	0	+	605		3,154	3,154
	2014	1,907	683	5	1,023	499	5,456	9,573	6		1,305	0	0	1,311		4,862	4,862
	2015	1,242	619	8	412.64	432	3,645	6,358	1		676		0	677		3,082	3,082
	2016	1,227	657	44	777.81	508	5,095	8,310	3		1,024	2	0	1,030		2,709	2,709
	2017	2,255	901	86	602.67	665	4,540	9,049	3		734	6		743		3,643	3,643
	2018	645	(698)	8	372	431	4,050	6,204	7		523	5		535		2,482	2,482
Retain catch total		**132,347**	**91,767**	**54,812**	**130,128**	**48,096**	**568,366**	**(1,025,516)**	**22**	**25**	**26,231**	**86**	**0**	**26,363**	**245**	**103,889**	**104,134**
Total		**132,347**	**(91,767)**	**54,812**	**130,128**	**48,096**	**568,366**	**(1,025,516)**	**22**	**25**	**26,231**	**86**	**0**	**26,363**	**245**	**103,889**	**104,134**

1) Japanese coastal longline and others catch data from 2007 to 2013 was revised as a result of deleting double counting and changing the data source (ISC15/STATWG/WP-4).
2) Japanese troll catch since 1998 includes catch from farming.
3) Catch statistics of Korea were derived from Japanese Import statistics for 1982-1999.
4) Catch of set net in 2013 were updated based on the Japanese official statistics of annual catch.
5) Catch of Japanese coastal longline in 2018 is provisional value.
6) USA in 1952-1958 contains catch from other countries - primarily Mexico. Other includes catches from gillnet, troll, pole-and-line, and longline.

Table 15-2. Continued.

Catch disposition	Year	TWN							USA									Total
		Set-net	Gill-net (not	Drift gill-net	Longline	Others	Purse seine	TWN Total	Drift gill-net	Longline	Pole and line	Troll	Hook and Line	Others	Purse seine	Sport	USA Total[6]	
Retain catch	1952														2,076	2	2,078	**19,162**
	1953														4,433	48	4,481	**20,110**
	1954														9,537	11	9,548	**28,547**
	1955														6,173	93	6,266	**31,988**
	1956														5,727	388	6,115	**40,144**
	1957														9,215	73	9,288	**36,543**
	1958														13,934	10	13,944	**28,584**
	1959										56				3,506	13	3,575	**19,974**
	1960										+				4,547	1	4,548	**25,885**
	1961										16				7,989	23	8,028	**30,810**
	1962										+				10,769	25	10,794	**32,782**
	1963										28				11,832	7	11,867	**35,031**
	1964										39				9,047	7	9,093	**28,517**
	1965				54			54			11	+		66	6,523	1	6,601	**27,030**
	1966				-			-			12				15,450	20	15,482	**30,986**
	1967				53			53			+				5,517	32	5,549	**20,701**
	1968				33			33			8				5,773	12	5,793	**21,615**
	1969				23			23			9				6,657	15	6,681	**16,400**
	1970				-			-			+				3,873	19	3,892	**11,422**
	1971				1			1			+				7,804	8	7,812	**17,088**
	1972				14			14			3			42	11,656	15	11,716	**21,190**
	1973				33			33			5	+		20	9,639	54	9,718	**19,560**
	1974				47	15		62			+	+		30	5,243	58	5,331	**20,641**
	1975				61	5		66			83			1	7,353	34	7,471	**20,910**
	1976				17	2		19			22	+		3	8,652	21	8,698	**19,303**
	1977				131	2		133			10			3	3,259	19	3,291	**18,789**
	1978				66	2		68			4			2	4,663	5	4,674	**26,858**
	1979				58	-		58			5			1	5,889	11	5,906	**31,679**
	1980				114	5		119			+			24	2,327	7	2,358	**22,594**
	1981				179	-		179	4		+	10		+	867	9	890	**34,612**
	1982			2	207	-		209	9		1			+	2,639	11	2,660	**29,375**
	1983			2	175	-	9	186	31		59			2	629	33	754	**20,631**
	1984			-	477	8	5	490	6	1	5			18	673	49	752	**11,551**
	1985			11	210	-	80	301	8					20	3,320	89	3,437	**16,078**
	1986			13	70	-	16	99	16					41	4,851	12	4,920	**19,252**
	1987			14	365	-	21	400	2					18	861	34	915	**15,488**
	1988			37	108	25	197	367	4					46	923	6	979	**8,960**
	1989			51	205	3	259	518	3					18	1,046	112	1,179	**10,912**
	1990			299	189	16	149	653	11					81	1,380	65	1,537	**8,627**
	1991			107	342	12	-	461	4	2				+	410	92	508	**15,759**
	1992			3	464	5	73	545	9	38				14	1,928	110	2,099	**13,977**
	1993				471	3	1	475	32	42				29	580	283	966	**10,781**
	1994				559	-		559	28	30				1	906	86	1,051	**16,891**
	1995				335	2		337	20	29				+	657	245	951	**29,200**
	1996	-	-		956	-	-	956	43	25		2		+	4,639	40	4,749	**23,505**
	1997	-	-		1,814	-	-	1,814	58	26		1		48	2,240	131	2,504	**24,579**
	1998	-	-		1,910	-	-	1,910	40	54		128		59	1,771	422	2,474	**15,754**
	1999	-	-		3,089	-	-	3,089	22	54		20		88	184	408	776	**29,136**
	2000	-	1		2,780	1	-	2,782	30	19		1		11	693	319	1,073	**33,946**
	2001	-	2		1,839	2	-	1,843	35	6		6		1	292	344	684	**18,781**
	2002	-	3		1,523	1	-	1,527	7	2		1		2	50	613	675	**19,026**
	2003	-	10		1,863	11	-	1,884	14	1				3	22	355	395	**18,528**
	2004	-	1		1,714	2	-	1,717	10	1				+		50	61	**25,536**
	2005	1	-		1,368	1	-	1,370	5	1				1	201	73	281	**29,174**
	2006	1	-		1,149	-	-	1,150	1	1				+		94	96	**26,234**
	2007	2	8		1,401	-	-	1,411	2	+				+	42	12	56	**20,720**
	2008	1	1		979	-	-	981	1	+				+		63	64	**24,523**
	2009	1	10		877	-	-	888	3	1		0		2	410	156	572	**19,440**
	2010	29	7		373	-	-	409	1	0				0		88	89	**17,852**
	2011	16	7		292	1	0	316	18	0		0		100		225	343	**17,069**
	2012	2	0		210	2	-	214	4	0		0		38		400	442	**14,841**
	2013	2	1		331	0	0	334	7	1		0		3		809	820	**11,324**
	2014	38	4		483	0	0	525	5	0		0	2	0	401	420	828	**17,099**
	2015	25	1		552	0	0	578	4	0		0	7	0	86	399	498	**11,192**
	2016	0	+		454	0	0	454	9	0		0	31	0	316	368	724	**13,227**
	2017	0	0		415	+	0	415	1	2		0	18	0	466	450	937	**14,788**
	2018	0	0		381	0	0	381	19	1		0	30		12	484	546	**10,148**
Retain catch total		**118**	**56**	**539**	**31,814**	**126**	**810**	**33,463**	**527**	**337**	**376**	**169**	**88**	**837**	**242,558**	**8,991**	**252,400**	**(1,443,358)**
Total		**118**	**56**	**539**	**31,814**	**126**	**810**	**33,463**	**527**	**337**	**376**	**169**	**88**	**837**	**242,558**	**8,991**	**252,400**	**(1,443,358)**

1) Japanese coastal longline and others catch data from 2007 to 2013 was revised as a result of deleting double counting and changing the data source (ISC15/STATWG/WP-4).
2) Japanese troll catch since 1998 includes catch from farming.
3) Catch statistics of Korea were derived from Japanese Import statistics for 1982-1999.
4) Catch of set net in 2013 were updated based on the Japanese official statistics of annual catch.
5) Catch of Japanese coastal longline in 2018 is provisional value.
6) USA in 1952-1958 contains catch from other countries - primarily Mexico. Other includes catches from gillnet, troll, pole-and-line, and longline.

Table 15-3. Annual catch of swordfish (*Xiphias gladius*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks. "0"; Fishing effort was reported but no catch. "+"; Bellow 499kg catch. "-"; Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN						KOR		MEX		
		Set-net	Drift gill-net	Longline	Others	Not	JPN Total	Longline	KOR	Others	Sport	MEX
Retain catch	1951	78	10	7,246	4,246	98	11,678					
	1952	68	-	8,890	2,721	12	11,691					
	1953	21	-	10,796	1,484	107	12,408					
	1954	18	-	12,563	909	121	13,611					
	1955	37	-	13,064	850	160	14,111					
	1956	31	-	14,596	786	73	15,486					
	1957	18	-	14,268	895	70	15,251					
	1958	31	-	18,525	1,111	67	19,734					
	1959	31	-	17,236	956	44	18,267					
	1960	67	1	20,058	1,243	30	21,399					
	1961	15	2	19,715	1,386	30	21,148					
	1962	15	-	10,607	1,449	44	12,115					
	1963	17	-	10,322	845	59	11,243					
	1964	16	4	7,669	1,097	66	8,852					
	1965	14	0	8,742	2,027	208	10,991					
	1966	11	0	9,866	1,841	45	11,763					
	1967	12	0	10,883	1,075	38	12,008					
	1968	14	0	9,810	1,775	50	11,649					
	1969	11	0	9,702	1,567	56	11,336					
	1970	9	0	7,715	1,784	39	9,547					
	1971	37	1	7,369	491	48	7,946	0	0			
	1972	1	55	7,316	293	22	7,687	0	0			
	1973	23	720	7,564	131	29	8,467	0	0			
	1974	16	1,304	6,523	336	29	8,208	0	0			
	1975	18	2,672	7,659	223	60	10,632	0	0			
	1976	14	3,488	8,786	372	182	12,842	0	0			
	1977	7	2,344	9,255	247	73	11,926	0	0			
	1978	22	2,475	9,022	177	111	11,807	0	0			
	1979	15	983	9,627	226	49	10,900	0	0			
	1980	15	1,746	6,873	423	30	9,087	135	135			
	1981	9	1,848	7,789	181	61	9,888	0	0			
	1982	7	1,257	6,963	230	59	8,516	166	166			
	1983	9	1,033	8,708	210	32	9,992	47	47			
	1984	13	1,053	8,375	153	98	9,692	27	27			
	1985	10	1,133	10,368	210	69	11,790	12	12			
	1986	9	1,264	9,738	200	47	11,258	18	18			
	1987	11	1,051	10,370	128	45	11,605	50	50			
	1988	8	1,234	9,304	186	19	10,751	27	27			
	1989	10	1,596	7,482	372	21	9,481	7	7			
	1990	4	1,074	6,595	131	13	7,817	46	46		-	-
	1991	5	498	5,682	161	20	6,366	37	37		-	-
	1992	6	887	8,497	389	16	9,795	32	32		-	-
	1993	4	292	9,777	309	44	10,426	27	27		-	-
	1994	4	421	8,723	308	37	9,493	4	4		-	-
	1995	7	561	7,808	424	34	8,834	9	9		-	-
	1996	4	428	7,979	601	45	9,057	15	15		-	-
	1997	5	365	8,215	347	62	8,994	99	99		-	-
	1998	2	471	7,419	480	68	8,440	153	153		-	-
	1999	5	724	6,604	418	47	7,798	131	131		-	-
	2000	5	808	7,292	506	49	8,660	202	202	602	-	602
	2001	15	732	7,831	239	30	8,847	438	438	516	-	516
	2002	11	1,164	7,185	211	29	8,600	438	438	215	-	215
	2003	4	1,198	6,434	154	28	7,818	380	380	237	-	237
	2004	4	1,062	6,900	233	30	8,229	410	410	268	-	268
	2005	3	956	6,647	193	337	8,136	403	403	234	-	234
	2006	5	796	7,687	247	343	9,078	465	465	328	-	328
	2007	2	829	8,123	124	368	9,446	453	453	172	-	172
	2008	3	648	6,187	175	349	7,362	794	794	242	-	242
	2009	3	682	6,006	240	249	7,180	993	993	394	-	394
	2010	8	494	5,398	112	230	6,242	662	662	222	-	222
	2011	2	193	4,019	12	233	4,459	962	962	-	-	-
	2012	8	371	4,030	63	288	4,760	856	856	0	0	0
	2013	13	290	4,610	168	291	5,372	1,071	1,071	0	0	0
	2014	7	269	5,020	2	291	5,589	829	829	0	0	0
	2015	3	277	5,457	205	281	6,223	776	776	-	-	-
	2016	2	303	5,902	171	256	6,634	582	582	-	-	-
	2017	3	291	6,596	276	289	7,455	583	583	-	-	-
	2018	(3)	(291)	(6,985)	(276)	(289)	7,844	708	708	-	-	-
Retain catch total		**(932)**	**(44,067)**	**(583,391)**	**(41,459)**	**(6,569)**	676,418	**11,756**	11,756	**3,430**	**0**	**3,430**
Release	2010											
	2011											
	2018							+	+			
Release total												
Total		**(0,934)**	**(43,756)**	**(575,961)**	**(41,085)**	**(6,323)**	**(676,418)**	**11,174**	**11,174**	**3,430**	**-**	**3,430**

Table 15-3. Continued.

Catch disposition	Year	TWN							USA										Total
		Set-net	Gill-net	Harpoon	Longline	Others	Purse	TWN Total	Drift gill-	Harpoon	Handline	Longline	Pole and	Troll	Others	Purse	Sport	USA Total	
Retain catch	1951																		**11,678**
	1952																		**11,691**
	1953				-			-											**12,408**
	1954				-			-											**13,611**
	1955				-			-											**14,111**
	1956				-			-											**15,486**
	1957				-			-											**15,251**
	1958				-			-											**19,734**
	1959				427			427											**18,694**
	1960				520			520											**21,919**
	1961				318			318											**21,466**
	1962				494			494											**12,609**
	1963				343			343											**11,586**
	1964				358			358											**9,210**
	1965				331			331											**11,322**
	1966				489			489											**12,252**
	1967	-	-	5	646	30		681											**12,689**
	1968	-	8	3	763	1		775											**12,424**
	1969	-	1	6	843	-		850											**12,186**
	1970	-	1	5	904	-		910		612		5						617	**11,074**
	1971	-	-	3	992	-		995		99		1						100	**9,041**
	1972	-	-	12	862	-		874		171								171	**8,732**
	1973	-	-	113	860	6		979		399								399	**9,845**
	1974	-	-	98	881	38		1,017		406								406	**9,631**
	1975	-	-	152	928	1		1,081		557								557	**12,270**
	1976	-	-	159	636	35		830		42								42	**13,714**
	1977	-	2	139	578	-		719		318		17						335	**12,980**
	1978	-	3	10	546	-		559		1,699		9						1,708	**14,074**
	1979	-	5	24	668	4		701		329		7						336	**11,937**
	1980	-	4	72	613	1		690	160	566		5						731	**10,643**
	1981	-	3	18	658	4		683	473	271		3	2					749	**11,320**
	1982	-	3	46	856	-		905	945	156		5	3	6	1			1,116	**10,703**
	1983	-	3	164	783	-		950	1,693	58		5	2	3	1	1		1,763	**12,752**
	1984	43	5	259	733	-		1,040	2,647	104		15	49			26		2,841	**13,600**
	1985	3	29	166	566	61		825	2,990	305	4	2			104			3,405	**16,032**
	1986	3	1	201	456	6		667	2,069	291	4	2			109			2,475	**14,418**
	1987	-	-	187	1,331	3		1,521	1,529	235	4	24			31			1,823	**14,999**
	1988	-	1	80	777	183		1,041	1,376	198	6	24			64			1,668	**13,487**
	1989	3	2	61	1,541	35		1,642	1,243	62	7	218			56			1,586	**12,716**
	1990	4	2	118	1,452	88		1,664	1,131	64	5	2,437			43			3,680	**13,207**
	1991	4	2	205	1,430	56		1,697	944	20	6	4,535			44			5,549	**13,649**
	1992	12	1	287	1,494	33		1,827	1,356	75	1	5,762			47			7,241	**18,895**
	1993	13	3	194	1,228	100		1,538	1,412	168	4	5,936			161			7,681	**19,672**
	1994	12	3	211	1,155	9		1,390	792	157	4	3,807			24			4,784	**15,671**
	1995	6	2	14	1,185	203		1,410	771	97	6	2,981			29			3,884	**14,137**
	1996	10	2	19	710	1	-	742	761	81	5	2,848			15			3,710	**13,524**
	1997	8	1	27	1,397	1	-	1,434	708	84	7	3,393			11			4,203	**14,730**
	1998	15	9	17	1,198	-	-	1,239	931	48	7	3,681			19			4,686	**14,518**
	1999	5	5	51	1,455	+	-	1,516	606	81	9	4,329			27			5,052	**14,497**
	2000	5	6	74	3,716	-	-	3,801	649	90		4,834			33			5,606	**18,871**
	2001	8	18	64	4,853	-	-	4,943	375	52		1,969			19			2,415	**17,159**
	2002	16	8	1	5,400	1	-	5,426	302	90		1,524			3			1,919	**16,598**
	2003	8	3	-	4,771	-	-	4,782	216	107	10	1,958			11			2,302	**15,519**
	2004	7	6	1	4,248	2	-	4,264	182	69	7	1,185			44			1,487	**14,658**
	2005	5	3	16	3,964	2	-	3,990	220	77	5	1,622			5			1,929	**14,692**
	2006	7	2	49	4,382	3	-	4,443	443	71	4	1,211			5			1,734	**16,048**
	2007	2	2	20	4,099	2	-	4,125	490	59	5	1,735		1				2,290	**16,486**
	2008	3	6	39	3,745	+	-	3,793	405	48	6	2,014			19			2,492	**14,683**
	2009	83	7	31	3,550	-	-	3,671	253	50	5	1,817		0	0			2,125	**14,363**
	2010	6	4	42	2,844	-	-	2,896	62	37	3	1,676			18			1,796	**11,818**
	2011	8	17	52	3,577	1	+	3,655	119	24	5	1,623			90			1,861	**10,937**
	2012	3	15	30	3,746	+	0	3,794	118	5	6	1,395		1	1			1,526	**10,936**
	2013	2	8	0	2,846	1	0	2,857	95	6	6	1,270		1		7		1,385	**10,685**
	2014	4	4	0	2,817	+	+	2,825	127	6	7	1,665		1	0	4		1,811	**11,053**
	2015	4	4	0	3,199	0	0	3,207	99	5.3	5	1,516		1	1	13		1,640	**11,846**
	2016	2	3	+	2,054	1	0	2,060	174	26	4	1,092		0	11	42		1,348	**10,624**
	2017	+	3	0	2,197	+	+	2,200	177	28	6	1,618		0	3	44		1,876	**12,114**
	2018	(+)	(3)	(0)	(2,124)	(+)	(0)	2,127	145	10	3	1,053		1	1	69		1,282	**11,960**
Retain catch total		**(314)**	**(217)**	**(3545)**	**(98216)**	**(912)**	**(0)**	**(103,204)**	**28,865**	**8,575**	**157**	**70,158**	**56**	**14**	**1,046**	**93**	**+**	**(108,964)**	**(903,772)**
Release	2010															0		0	**0**
	2011															0		0	**0**
	2018																		**0**
Release total																**0**		**0**	**0**
Total		**(312)**	**(214)**	**(3,545)**	**(96,162)**	**(911)**	**(0)**	**(101,144)**	**28,656**	**8,548**	**153**	**69,064**	**56**	**14**	**1,042**	**27**	**+**	**107,560**	**(903,772)**

Table 15-4. Annual catch of striped marlin (*Kajikia audax*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN						KOR			MEX	
		Set-net	Drift gill-net	Longline	Others	Not specified	JPN Total	Longline	Purse seine	KOR Total	Sport	MEX Total
Retain catch	1951	92	-	2,494	1,822	39	4,447					
	1952	203	-	2,901	2,043	40	5,187					
	1953	126	-	2,138	840	36	3,140					
	1954	82	-	3,068	990	67	4,207					
	1955	106	-	3,082	878	82	4,148					
	1956	133	-	3,729	1,881	41	5,784					
	1957	71	-	3,189	2,431	76	5,767					
	1958	82	3	4,106	2,981	127	7,299					
	1959	87	2	4,152	3,061	200	7,502					
	1960	161	4	3,862	1,790	87	5,904					
	1961	161	2	4,420	1,707	98	6,388					
	1962	197	8	5,739	1,717	108	7,769					
	1963	92	17	6,135	1,590	292	8,126					
	1964	81	2	14,304	2,264	41	16,692					
	1965	81	1	11,602	2,659	73	14,416					
	1966	226	2	8,419	1,425	31	10,103					
	1967	82	3	11,698	1,521	75	13,379					
	1968	71	0	15,913	1,144	58	17,186					
	1969	71	3	9,144	2,519	81	11,818					
	1970	55	3	13,686	1,005	153	14,902					
	1971	61	10	11,632	1,933	307	13,943	0		0		
	1972	72	243	7,843	972	94	9,224	0		0		
	1973	80	3,265	6,989	594	146	11,074	0		0		
	1974	90	3,112	7,027	630	104	10,963	0		0		
	1975	105	6,534	5,567	530	89	12,825	0		0		
	1976	37	3,561	5,380	475	107	9,560	0		0		
	1977	103	4,424	3,275	352	107	8,261	0		0		
	1978	93	5,593	4,200	237	243	10,366	0		0		
	1979	66	2,532	5,927	348	133	9,006	0		0		
	1980	80	3,467	6,985	402	59	10,993	73		73		
	1981	88	3,866	4,365	397	69	8,785	0		0		
	1982	52	2,351	5,653	489	128	8,673	102		102		
	1983	124	1,867	4,042	557	156	6,746	49		49		
	1984	144	2,333	3,892	407	177	6,953	39		39		
	1985	81	2,363	4,608	523	153	7,728	13		13		
	1986	131	3,584	7,303	376	103	11,497	14		14		
	1987	102	1,888	8,725	250	167	11,132	15		15		
	1988	63	2,211	7,023	407	205	9,909	16		16		
	1989	47	1,664	5,821	358	145	8,035	24		24		
	1990	65	1,945	3,493	290	193	5,986	1		1	-	-
	1991	56	1,329	4,042	323	131	5,881	7		7	-	-
	1992	71	1,204	4,202	147	95	5,719	53		53	-	-
	1993	27	828	5,199	309	373	6,736	568		568	-	-
	1994	73	1,443	4,195	219	92	6,022	556		556	-	-
	1995	58	970	5,334	142	86	6,590	307		307	-	-
	1996	39	703	3,787	29	88	4,646	429		429	-	-
	1997	34	813	3,520	64	68	4,499	1,017		1,017	-	-
	1998	34	1,092	3,759	125	147	5,157	635		635	-	-
	1999	28	1,126	3,159	70	90	4,473	433		433	-	-
	2000	41	1,062	2,261	173	91	3,628	536		536	-	-
	2001	51	1,077	2,311	161	36	3,636	253		253	-	-
	2002	80	1,264	1,560	187	28	3,119	187		187	-	-
	2003	41	1,064	1,855	138	27	3,125	205		205	-	-
	2004	23	1,339	1,699	35	34	3,130	75		75	-	-
	2005	28	1,214	1,230	36	35	2,543	136		136	-	-
	2006	30	1,190	1,161	34	32	2,447	55		55	-	-
	2007	21	970	1,166	25	38	2,220	46		46	-	-
	2008	26	1,302	999	53	28	2,408	29		29	-	-
	2009	17	821	788	55	39	1,720	22		22	-	-
	2010	20	913	1,019	68	36	2,056	18		18	-	-
	2011	30	347	1,251	87	26	1,741	48		48	-	-
	2012	52	597	1,307	62	34	2,052	33		33	-	-
	2013	39	336	1,481	52	34	1,942	65		65	-	-
	2014	35	173	1,124	35	22	1,389	82		82	-	-
	2015	37	287	1,328	80	27	1,759	44		44	-	-
	2016	25	308	1002	74	32	1441	61		61	-	-
	2017	28	241	1258	76	28	1631	81		81		
	2018	(28)	(241)	(1,240)	(76)	(28)	1613	70		70		
Retain catch total		**(5,016)**	**(81,117)**	**(316,769)**	**(49,730)**	**(6,515)**	**(459,147)**	**6,396**		**6,396**	-	-
Release	2010											
	2011											
	2016								0	0		
	2018							0	2	2		
Release total									**2**	**2**		
Total		**(5,016)**	**(81,117)**	**(316,769)**	**(49,730)**	**(6,515)**	**(454,166)**	**6,396**	**2**	**6,398**		

Table 15.4. Continued.

Catch disposition	Year	TWN							USA							Total
		Set-net	Gill-net (not specified)	Harpoon	Longline	Others	Purse seine	TWN Total	Handline	Longline	Troll	Others	Purse seine	Sport	USA Total	
Retain catch	1951															**4,447**
	1952													23	23	**5,210**
	1953					-		-						5	5	**3,145**
	1954					-		-						16	16	**4,223**
	1955					-		-						5	5	**4,153**
	1956					-		-						34	34	**5,818**
	1957					-		-						42	42	**5,809**
	1958				543	387		930						59	59	**8,288**
	1959				391	354		745						65	65	**8,312**
	1960				398	350		748						30	30	**6,682**
	1961				306	342		648						24	24	**7,060**
	1962				332	211		543						5	5	**8,317**
	1963				560	199		759						68	68	**8,953**
	1964				392	175		567						58	58	**17,317**
	1965				355	157		512						23	23	**14,951**
	1966				370	180		550						36	36	**10,689**
	1967	-	-	141	387	63		591						49	49	**14,019**
	1968	-	40	134	333	34		541						51	51	**17,778**
	1969	-	5	159	573	28		765						30	30	**12,613**
	1970	-	8	175	495	6		684						18	18	**15,604**
	1971	-	16	101	449	18		584						17	17	**14,544**
	1972	-	1	124	389	1		515						21	21	**9,760**
	1973	-	4	115	569	20		708						9	9	**11,791**
	1974	-	7	53	674	58		792						55	55	**11,810**
	1975	-	7	86	796	3		892						27	27	**13,744**
	1976	-	9	61	379	70		519						31	31	**10,110**
	1977	-	9	207	541	3		760						41	41	**9,062**
	1978	-	7	70	618	1		696						37	37	**11,099**
	1979	2	18	104	458	-		582						36	36	**9,624**
	1980	-	39	92	284	1		416						33	33	**11,515**
	1981	-	25	70	508	-		603						60	60	**9,448**
	1982	-	26	112	404	-		542						41	41	**9,358**
	1983	-	31	144	555	39		769						39	39	**7,603**
	1984	-	16	314	965	-		1,295						36	36	**8,323**
	1985	1	6	152	513	23		695			18			42	60	**8,496**
	1986	-	13	119	179	16		327			19			19	38	**11,876**
	1987	1	2	132	414	16		565	1	272	29			28	330	**12,042**
	1988	7	12	70	464	80		633		504	54			30	588	**11,146**
	1989	-	23	124	192	10		349	+	612	24			52	688	**9,096**
	1990	12	16	207	139	21		395	+	538	27			23	588	**6,970**
	1991	-	81	173	290	32		576	+	663	41			12	716	**7,180**
	1992	-	11	163	220	24		418	1	459	37			25	522	**6,712**
	1993	3	7	132	226	-		368	1	471	67			11	550	**8,222**
	1994	4	5	176	138	11		334	+	326	35			17	378	**7,290**
	1995	4	5	67	110	6		192	+	543	52			14	609	**7,698**
	1996	3	8	30	188	6	-	235	1	418	53			20	492	**5,802**
	1997	3	9	33	351	-	-	396	1	352	37			21	411	**6,323**
	1998	6	16	19	304	-	-	345	+	378	26			23	427	**6,564**
	1999	5	8	26	197	-	-	236	1	364	27			12	404	**5,546**
	2000	6	18	29	315	1	-	369		200	15			10	225	**4,758**
	2001	5	16	30	250	-	-	301		351	44			+	395	**4,585**
	2002	8	15	6	477	-	-	506	+	226	30			+	256	**4,068**
	2003	5	27	11	922	+	-	965	+	538	29			+	567	**4,862**
	2004	5	10	7	522	2	-	546	2	376	31			+	409	**4,160**
	2005	9	9	5	783	9	-	815	+	511	20			+	531	**4,025**
	2006	-	30	117	741	+	-	888	+	611	21			+	632	**4,022**
	2007	-	29	141	301	-	-	471		276	13			+	289	**3,026**
	2008	-	43	168	270	2	-	483		427	14				441	**3,361**
	2009	-	46	92	262	-	-	400		258	10				268	**2,410**
	2010	-	42	131	253	3	-	429		165	19		1		185	**2,688**
	2011	1	27	95	343	4	0	470		362	16		0		378	**2,637**
	2012	+	34	114	443	1	+	592		282	11				293	**2,970**
	2013	+	24	197	372	+	+	593		398	8				406	**3,006**
	2014	+	5	64	140	+	1	210		426	12			1	439	**2,120**
	2015	1	4	28	228	+	0	261		493	11	0			504	**2,569**
	2016	0	3	21	214	+	1	239		390	12				402	**2,143**
	2017	+	7	41	389	0	0	437		406	6				412	**2,561**
	2018	(+)	(7)	(41)	(330)	(0)	(+)	378		465	11				476	**2,536**
Retain catch total		**(91)**	**(886)**	**(5,223)**	**(24,504)**	**(2,967)**	**(2)**	**(33,673)**	**8**	**13,061**	**879**	**0**	**1**	**1,484**	**15,433**	**496,744**
Release	2010												1		1	**1**
	2011												0		0	**0**
	2016						1	1								
	2018						0	0								**2**
Release total							**1**	**1**					**1**		**1**	**4**
Total		**(90)**	**(870)**	**(6,454)**	**(24,504)**	**(2,967)**	**(3)**	**(32,655)**	**8**	**13,061**	**879**	**0**	**2**	**1,484**	**15,434**	**(496,748)**

Table 15-5. Retained catches (metric tons, whole weight) of ISC Members of blue marlin (*Makaira nigricans*) by fishery in the North Pacific Ocean, north of the equator. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN		KOR			MEX		TWN							USA						Total
		Longline	JPN Total	Longline	Purse seine	KOR Total	Sport	MEX Total	Set-net	Gill-net (not specified)	Harpoon	Longline	Others	Purse seine	TWN Total	Handline	Longline	Troll	Others	Purse seine	USA Total	
Retain catch	1953											0			0							-
	1954											0			0							-
	1955											0			0							-
	1956											0			0							-
	1957											0			0							-
	1958											887			887							**887**
	1959											781			781							**781**
	1960											948			948							**948**
	1961											703			703							**703**
	1962											628			628							**628**
	1963											691			691							**691**
	1964											934			934							**934**
	1965											1,016			1,016							**1,016**
	1966											957			957							**957**
	1967								0	0	317	898	167		1,382							**1,382**
	1968								0	30	649	1,433	120		2,232							**2,232**
	1969								0	58	465	1,232	103		1,858							**1,858**
	1970								1	21	604	1,385	70		2,081							**2,081**
	1971	5,461	5,461	0		0			0	13	473	1,331	118		1,935							**7,396**
	1972	6,772	6,772	0		0			0	14	490	1,205	50		1,759							**8,531**
	1973	6,453	6,453	0		0			0	12	275	1,650	265		2,202							**8,655**
	1974	6,545	6,545	0		0			1	6	355	2,144	146		2,652							**9,197**
	1975	4,374	4,374	0		0			0	3	421	2,638	207		3,269							**7,643**
	1976	5,018	5,018	0		0			0	9	511	1,315	162		1,997							**7,015**
	1977	4,780	4,780	0		0			0	11	391	1,183	110		1,695							**6,475**
	1978	5,900	5,900	0		0			1	15	364	1,633	7		2,020							**7,920**
	1979	5,949	5,949	0		0			3	19	362	1,646	164		2,194							**8,143**
	1980	5,613	5,613	155		155			0	35	444	1,185	170		1,834							**7,602**
	1981	5,518	5,518	0		0			0	35	313	1,840	69		2,257							**7,775**
	1982	6,051	6,051	351		351			0	7	306	2,139	120		2,572							**8,974**
	1983	4,796	4,796	82		82			0	26	741	2,122	127		3,016							**7,894**
	1984	6,248	6,248	155		155			0	22	960	1,789	111		2,882							**9,285**
	1985	5,164	5,164	45		45			9	11	747	1,187	43		1,997			145			145	**7,351**
	1986	5,922	5,922	86		86			4	90	839	1,723	107		2,763			220			220	**8,991**
	1987	5,370	5,370	89		89			12	9	973	4,627	1		5,622		51	261			312	**11,393**
	1988	5,054	5,054	133		133			20	8	658	2,822	589		4,097		102	266			368	**9,652**
	1989	5,117	5,117	50		50			10	14	640	2,691	9		3,364		356	326			682	**9,213**
	1990	4,116	4,116	44		44	-	-	3	24	427	1,749	143		2,346		378	295			673	**7,179**
	1991	4,094	4,094	75		75	-	-	4	50	338	2,288	152		2,832		297	346			643	**7,644**
	1992	3,721	3,721	60		60	-	-	25	40	432	3,786	110		4,393		347	260			607	**8,781**
	1993	4,600	4,600	36		36	-	-	44	41	400	4,135	82		4,702		339	311			650	**9,988**
	1994	5,832	5,832	2		2	-	-	12	30	206	3,007	7		3,262		362	298			660	**9,756**
	1995	5,907	5,907	0		0	-	-	15	36	895	3,896	5		4,847		570	315			885	**11,639**
	1996	3,260	3,260	10		10	-	-	13	35	270	3,337	10	0	3,665		467	409			876	**7,811**
	1997	3,697	3,697	145		145	-	-	5	48	194	3,683	0	0	3,930		487	378			865	**8,637**
	1998	3,438	3,438	335		335	-	-	8	59	91	3,624	1	0	3,783		395	242			637	**8,193**
	1999	3,751	3,751	164		164	-	-	21	32	135	3,417	0	0	3,605		357	293			650	**8,170**
	2000	3,606	3,606	96		96	-	-	24	40	186	4,131	2	0	4,383		314	235			549	**8,634**
	2001	3,594	3,594	166		166	-	-	18	57	229	4,733	0	0	5,037		399	291			690	**9,487**
	2002	2,976	2,976	152		152	-	-	13	63	32	4,448	6	0	4,562		264	225	1		490	**8,180**
	2003	2,836	2,836	158		158	-	-	20	107	52	7,685	4	0	7,868		363	210			573	**11,435**
	2004	2,977	2,977	226		226	-	-	14	93	36	6,672	9	0	6,824		283	188	5		476	**10,503**
	2005	2,506	2,506	303		303	-	-	8	65	48	7,630	16	0	7,767		337	187			524	**11,100**
	2006	2,414	2,414	217		217	-	-	12	15	30	5,729	0	0	5,786		409	160			569	**8,986**
	2007	2,016	2,016	120		120	-	-	3	17	20	5,117	0	0	5,157	1	262	127			390	**7,683**
	2008	2,096	2,096	219		219	-	-	10	16	15	5,477	1	0	5,519	1	349	198			548	**8,382**
	2009	1,840	1,840	224		224	-	-	9	12	9	4,638	1	0	4,669	1	360	15			376	**7,109**
	2010	2,457	2,457	257		257	-	-	5	27	15	4,959	1	0	5,007	2	306	148			456	**8,177**
	2011	2,343	2,343	684		684	-	-	3	18	17	4,625	9	2	4,674	2	373	199			574	**8,275**
	2012	2,019	2,019	587		587	-	-	6	13	16	4,097	+	12	4,144	2	298	141			441	**7,191**
	2013	2,179	2,179	963		963	-	-	2	6	16	4,607	+	9	4,640	3	406	137			546	**8,328**
	2014	1,903	1,903	801		801	-	-	4	11	124	4,861	5	7	5,012	4	535	159		1	699	**8,415**
	2015	1,622	1,622	531		531	-	-	3	14	177	4,306	+	3	4,503	3	631	196		0	830	**7,486**
	2016	1,581	1,581	1,116	0	1,116	-	-	3	23	158	3,398	3	4	3,589	2	554	161			717	**7,003**
	2017	1,405	1,405	1,453		1,453			0	7	138	3,977	+	6	4,128	4	687	155		3	849	**7,835**
	2018	(1,255)	(1,255)	1,336		1,336			(0)	(7)	(138)	(3,501)	(+)	(10)	3,656	3	663	164		2	832	**7,079**
Retain catch total		**(192,146)**	**(192,146)**	**8,837**	**0**	**11,626**	-	-	**(368)**	**(1,460)**	**(16,866)**	**(169,398)**	**(3,602)**	**(37)**	**(199,515)**	**21**	**10,951**	**7,342**	**6**		**20,003**	**(423,290)**
Release	2010																			1	1	**1**
	2011																			6	6	**6**
	2012																					**0**
	2013													5	5							**5**
	2014																					**0**
	2015													3	3							**3**
	2016				1	1								4	4							**5**
	2017													6	6							**6**
	2018			1	1	2								6	6							**8**
Release total				**1**	**2**	**3**								**24**	**18**					**7**	**7**	**26**
Total		**(192,146)**	**(192,146)**	**8,838**	**2**	**11,629**	-	-	**(368)**	**(1,460)**	**(16,866)**	**(169,398)**	**(3,602)**	**(61)**	**(199,533)**	**21**	**10,951**	**7,342**	**6**	**7**	**20,010**	**(423,316)**

Numbers in paranthesus are provisional.

Table 15-6. Retained catches (metric tons, whole weight) of ISC Members of blue sharks (*Prionace glauca*) by fishery in the North Pacific Ocean, north of the equator. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN						KOR		MEX		TWN		USA						Total
		Set-net	Drift gill-net	Longline	Others	Not specified	JPN Total	Longline	KOR Total	Others	MEX Total	Longline	TWN Total	Drift gill-net	Longline	Troll	Others	Sport	USA Total	
Retain catch	1985													0			1		1	**1**
	1986													1			1		2	**2**
	1987													1			1		2	**2**
	1988													0			3		3	**3**
	1989																6		6	**6**
	1990													0			20		20	**20**
	1991													0			1		1	**1**
	1992													1			1		2	**2**
	1993													0			0		0	**0**
	1994	9	599	30,821	536	4	31,969							0			12		12	**20,074**
	1995	7	502	35,578	503	4	36,594							0			5		5	**18,432**
	1996	7	492	26,502	313	4	27,318							0			0		0	**21,251**
	1997	9	621	29,969	163	6	30,768							0			0		0	**26,105**
	1998	7	634	29,275	264	4	30,185							0			1		1	**23,989**
	1999	8	859	25,516	162	2	26,546							0			0		0	**26,541**
	2000	8	758	26,446	482	1	27,695							0			0		0	**27,511**
	2001	8	759	28,809	214	2	29,792			0	0						0		+	**28,126**
	2002	7	768	23,473	315	1	24,565			0	0						0		+	**26,345**
	2003	7	1,350	24,746	368	2	26,473			0	0			0			0		0	**26,278**
	2004	8	1,202	24,128	258	3	25,599			0	0						0		+	**22,470**
	2005	0	1,321	28,766	654	2	30,743			2,721	2,721						0		+	**21,887**
	2006	5	1,204	24,850	615	2	26,676			2,765	2,765						0		+	**19,063**
	2007	5	1,323	24,476	810	2	26,616			3,324	3,324			9	8		0		17	**17,280**
	2008	0	944	18,860	875	1	20,680			4,355	4,355				7				7	**25,311**
	2009	0	1,208	19,401	769	1	21,379			4,423	4,423	11,541	11,541	1	9		1		11	**37,354**
	2010	4	962	22,616	833	1	24,416			4,469	4,469	7,670	7,670	0	7		0		7	**36,562**
	2011	7	794	18,413	860	3	20,077			3,719	3,719	13,117	13,117		13		0		13	**36,926**
	2012	2	1,118	12,512	762	3	14,396			4,108	4,108	10,606	10,606		16		0		16	**29,705**
	2013	6	1,103	12,399	626	2	14,137	75	75	4,494	4,494	6,321	6,321		1	0	0		1	**29,210**
	2014	4	1,060	12,709	598	2	14,372	100	100	5,502	5,502	8,151	8,151		0	0	0	0	6	**28,130**
	2015	21	697	12,403	387	2	13,510	53	53			8,551	8,551			0	0	0	4	**22,118**
	2016	26	1,832	13,405	226	2	15,492					8,563	8,563		0	0	0	0	3	**24,057**
	2017	4	1,366	13,959	213	1	15,543	8	8			11,121	11,121			0	1	0	1	**26,673**
	2018	(4)	(1,366)	(13,959)	(213)	(1)	15,543	4	4			11,761	11,761			0	1	0	1	**27,308**
Retain catch total		**172**	**24,842**	**553,991**	**12,017**	**60**	**591,082**	**240**	**240**	**39,880**	**39,880**	**97,402**	**97,402**	**13**	**61**	**0**	**55**	**0**	**141**	**(728,744)**
Release	2015							0	0											**0**
	2016							8	8											**8**
	2017							11	11											**11**
	2018							58	58											**58**
Release total								**77**	**77**											**8**
Total		**172**	**24,842**	**553,991**	**12,017**	**60**	**591,082**	**317**	**317**	**39,880**	**39,880**	**(97402)**	**(97402)**	**13**	**61**	**0**	**55**	**0**	**141**	**(728,752)**

Table 15-7. Retained catches (metric tons, whole weight) of ISC Members of shortfin mako sharks (*Isurus oxyrhinchus*) by fishery in the North Pacific Ocean, north of the equator. "0": Fishing effort was reported but no catch. "+": Bellow 499kg catch. "-": Unreported catch or catch information not available. *: Data from the most recent years are provisional.

Catch disposition	Year	JPN						KOR		MEX		TWN			USA								Total
		Setnet	Drift	Longline	Other	Not	JPN	Longline	KOR	Others	MEX	Longline	Purse	TWN	Drift gill-	Harpoon	Troll	LX	Others	Purse	Sport	USA	
Retain catch	1985									43	43				129	1			19			149	**192**
	1986									84	84				250	1			59			310	**394**
	1987									197	197				208	3			188			399	**596**
	1988									248	248				106	3			214			323	**571**
	1989									135	135				117	1			137			255	**390**
	1990									288	288				229	3			141			373	**661**
	1991									228	228				125	1			91			217	**445**
	1992									376	376				118	3			19			140	**516**
	1993									442	442				87	1			32			120	**562**
	1994	14	123	902	25	0	1,064			336	336				80	1			46			127	**1,527**
	1995	11	103	808	27	0	949			333	333				79	1			14			94	**1,376**
	1996	10	101	842	132	0	1,085			413	413				85	1			9			95	**1,593**
	1997	13	127	795	61	0	997			401	401				118	3			11			132	**1,530**
	1998	11	130	800	6	0	948			386	386				85	1			12			98	**1,432**
	1999	11	176	1,087	54	0	1,329			439	439				52	+			9			61	**1,829**
	2000	11	156	820	31	0	1,017			539	539				64	+			12			76	**1,632**
	2001	12	156	886	50	0	1,103			491	491				30	1			10			41	**1,635**
	2002	4	122	945	29	0	1,100			488	488				69	+			12			81	**1,669**
	2003	5	229	799	5	0	1,038			471	471				57	+			9			66	**1,575**
	2004	0	134	979	6	0	1,119			865	865				38	1			13			52	**2,036**
	2005	42	155	902	14	0	1,113			609	609				25	1			8			34	**1,756**
	2006	5	178	844	2	0	1,030			641	641				38	+			7			45	**1,716**
	2007	12	244	883	12	0	1,151			689	689				37	+			6			43	**1,883**
	2008	12	212	985	34	0	1,244	-	-	609	609				27	1			5			33	**1,886**
	2009	1	294	914	95	0	1,305	-	-	653	653	78		78	21	1	0		7			29	**2,065**
	2010	18	272	890	54	0	1,234	-	-	760	760	54		54	10	0			10			20	**2,068**
	2011	11	163	519	45	0	738	-	-	758	758	208		208	8	0			8			16	**1,720**
	2012	1	229	550	5	0	786	0	0	715	715	74		74	9	0	0		11			20	**1,595**
	2013	7	345	595	19	0	966	8	8	711	711	107		107	16	0			12			28	**1,820**
	2014	3	263	591	4	0	861	8	8	0	0	119		119	7	0	0	3	6		9	25	**1,013**
	2015	11	334	914	1	0	1,260		0	-	-	322		322	7		0	1	4		2	15	**1,597**
	2016	15	448	634	12	0	1,110	0	0	-	-	220		220	12	0	0	1	4		0	18	**1,347**
	2017	9	271	571	10	0	862	0	0	-	-	187		187	12	0	0	1	6			19	**1,067**
	2018	9	271	571	10	0	862	0	0	-	-	265		265	11		0	1	5			17	**1,144**
Retain catch total		**282**	**5,143**	**19,788**	**731**	**0**	#####	**16**	**16**	**13,348**	**13,348**	**1,369**		**1,369**	**2,355**	**30**	**0**	**7**	**1,151**		**11**	**189**	**14,922**
Release	2011																			0		0	**0**
	2012												0	0									**0**
	2016							1	1														
	2018							1	1														**1**
Release total								**2**	**2**				**0**	**0**						**0**		**0**	**1**
Total								**18**	**18**	**13,348**	**13,348**	**1,369**	**0**	**1,369**	**2,355**	**30**	**0**	**7**	**1,151**	**0**	**11**	**189**	**14,923**

Numbers in parentheses are provisional.
Sharks catch is all retained, with no release data.
1) USA data provided mako shark data as MAK (shortfin mako and longfin mako shark).