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

PLENARY SESSION

17-22 July 2013
Busan
Republic of Korea

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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 white tip	*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 (2013)
ALBWG	Albacore Working Group	John Holmes (Canada)
BILLWG	Billifsh Working Group	Jon Brodziak (USA)
PBFWG	Pacific Bluefin Working Group	Ziro Suzuki (Japan)
SHARKWG	Shark Working Group	Suzanne Kohin (USA)
STATWG	Statistics Working Group	Ren-Fen Wu (Chinese Taipei)

Other Abbreviations and Acronyms Used in the Report

CDS	Catch documentation scheme
CIE	Center for Independent Experts
CMM	Conservation and Management Measure
CPUE	Catch-per-unit-of-effort
DWLL	Distant-water longline (Rep. of Korea
DWPS	Distant-water purse seine (Rep. of Korea)
EEZ	Exclusive economic zone
EPO	Eastern Pacific Ocean
F	Fishing mortality rate
FAD	Fish aggregation device
FAO	Fisheries and Agriculture Organization of the United Nations
FL	Fork length
HMS	Highly migratory species
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 (Chinese Taipei)
NC	Northern Committee (WCPFC)
NRIFSF	National Research Institute of Far Seas Fisheries of Japan
OFDC	Overseas Fisheries Development Council (Chinese Taipei)
PICES	North Pacific Marine Science Organization
SAC	Scientific Advisory Committee (IATTC)
SC	Scientific Committee (WCPFC)
SPC-OFP	Oceanic Fisheries Programme, Secretariat of the Pacific Community
SSB	Spawning stock biomass
STLL	Small-scale tuna longline (Chinese Taipei)
t	Metric tons, tonnes
WCNPO	Western Central and North Pacific Ocean
WCPFC	Western and Central Pacific Fisheries Commission

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Highlights of the ISC13 Plenary Meeting

The 13th ISC Plenary, held in Busan, Republic of Korea from 17-22 July 2013 was attended by members from Canada, Chinese Taipei, Japan, Korea, Mexico and the United States as well as the Western and Central Pacific Fisheries Management Commission. The Plenary reviewed results, conclusions, new data and updated analyses of the Billfish, Shark and Pacific Bluefin tuna working groups. The Plenary endorsed the findings that the Pacific blue marlin and North Pacific blue shark stocks are not overfished nor experiencing overfishing, and re-iterated that Pacific bluefin tuna are overfished and experiencing overfishing. It further provided projections for managers to consider in crafting management measures for North Pacific albacore tuna, swordfish, and striped marlin, and updated the conservation advice of ISC12 based on these projections. A special seminar on Pacific Ocean ecosystem and tuna dynamics was held. Plenary discussed formalizing the ISC structure and administration and began researching means of doing both. Plenary also noted the strides WGs had made in incorporating best available scientific information (BASI) into stock assessment work, enhanced stock assessment reports and the increased transparency in Working Group efforts. Observers from Pew Charitable Trust, International Seafood Sustainability Foundation and World Wildlife Fund attended. The ISC workplan for 2013-2014 includes completing new albacore tuna and swordfish stock assessments, and an updated Pacific bluefin tuna assessment in time for ISC14, completing a shortfin mako shark stock assessment in 2014, enhancing database and website management, and a tuna ageing workshop scheduled for November 2014 in Shimizu, Japan. The Plenary re-elected Gerard DiNardo for a second term as ISC Chair and welcomed Ziro Suzuki as the newly elected Pacific Bluefin Tuna Working Group Chair. The next Plenary will be held in Chinese Taipei in July 2014.

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 (USA). 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 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 Committee 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 North Pacific Ocean 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. In 2011 the catch of priority species monitored by the ISC was 80,206 t of North Pacific albacore tuna (ALB, *Thunnus alalunga*), 18,122 t of Pacific bluefin tuna (PBF, *T. orientalis*), 10,916 t of swordfish (SWO, *Xiphias gladius*), and 5,785 t of striped marlin (MLS, *Kajikia audax*). The total estimated catch of these four species is 103,624 t, or approximately 105 % from the 2010 total estimate (estimated to be 98,415 t). Annual catches of priority stocks throughout their ranges are shown in Tables 14-1 through 14-5.[1]

1.2 Opening of the Meeting

The Thirteenth Plenary session of the ISC (ISC13) was convened in Busan, Republic of Korea at 0900 on 17 July 2013 by the ISC Chairman, G. DiNardo. A roll call confirmed the presence of delegates from Canada, Chinese Taipei, Japan, Korea, Mexico, and USA (*Annex* 1). A representative from WCPFC was also present. ISSF, Pew Charitable Trust, and WWF were present as observers.

ISC Members China, the Secretariat of the Pacific Community (SPC), the Fisheries and Agriculture Organization of the United Nations (FAO), North Pacific Marine Science Organization (PICES), as well as organizations with significant interest, including the Inter-American Tropical Tuna Commission (IATTC), did not attend the Plenary.

Dr. Sohn of the Korean National Fisheries Research and Development Institute gave the welcoming address.

[1] FAO three-letter species codes are used throughout this report interchangeably with common names. See the list of acronyms and abbreviations for common and scientific names associated with these codes.

2 ADOPTION OF AGENDA

The proposed agenda for the session was considered and adopted with no changes (*Annex 2*). It was noted that observers would be given the opportunity at the end of each day to seek clarification on topics discussed daily. K. Dahl was assigned lead rapporteur duties. A list of meeting documents is contained in *Annex 3*.

3 DELEGATION REPORTS ON FISHERY MONITORING, DATA COLLECTION AND RESEARCH

3.1 Canada

J. Holmes presented a summary of Category I, II, and III data from the Canadian North Pacific albacore troll fishery in 2012 (*ISC/13/PLENARY/04).* The Canadian fleet of 175 vessels operated primarily within the eastern Pacific Ocean in Canadian coastal waters and adjacent high seas areas. Preliminary estimates of North Pacific albacore catch and effort in 2012 are 2,497 tonnes (t) and 6,010 vessel days (v-d), respectively. These figures represent a 54% decrease in catch and 30% decrease in effort relative to 2011. Approximately 81% of the catch and 83% of the effort occurred in Canadian waters in 2012; 90% of the overall catch was removed from cooler waters (15-16°C) than in previous years (16-19°C). Although the seasonal pattern of nominal CPUE was similar to the average for 2000-2009 with a peak in August, CPUE values were much lower than average. Fork length measurements (N = 11,139) were dominated by fish between 64-69 cm FL corresponding to 2-year old fish and a significant number of fish between 74-78 cm FL, which are 3-years old. The decline in catch and effort for 2012 resulted from a lack of Canadian vessel access to waters in the US EEZ due to the absence of a fishing regime for 2012 under the bilateral tuna treaty between Canada and the United States. Lower than normal CPUE and catches in cooler than normal SSTs are consistent with a redistribution of the Canadian troll fleet into less productive waters for albacore. Research in 2012 was focused on modeling climatic effects on albacore stock productivity, distribution, and abundance in the EPO. Several vessels (N = 5) were equipped with scales and collected weight-length data and will continue collecting these data again in 2013 as a way to monitor growth conditions. The 2004-2010 catch and effort data were revised to correct an error in the database loading procedure for the most recent year that slightly inflated estimates of catch and effort in prior years already loaded into the database. The data for 1995-2011 in this report are considered definitive while the 2012 data are provisional.

Discussion

The large drop in the 2012 landings of albacore, likely due to the redistribution of the fleet due to lapsing of access rights to US waters, was noted. Thus far there is only anecdotal information on the socioeconomic impact of the lack of access to the US EEZ by Canadian vessels in 2012. Canadian vessels targeting albacore also participate in other fisheries, including salmon and halibut fisheries, and some may have shifted their pattern of fishery participation in response to the closure. The number of vessels participating in the albacore fishery did not change in 2012 and this may reflect peripherally involved vessels targeting albacore in Canadian waters. But the core fleet has historically depended on access to the US EEZ and does not receive government subsidies to supplement any losses. The Canada Department of Fisheries and Oceans Economics Section may conduct a socioeconomic impact study at some point.

It was noted that the tagging program is intended to gather information on the seasonal movement of albacore into and out of the EPO region and vulnerability to the fishery.

3.2 Chinese Taipei

Y.-J. Lin presented the Chinese Taipei National Report for 2013 (*ISC/13/PLENARY/05).* There are two principal tuna fisheries of Chinese-Taipei operating in the North Pacific Ocean, namely the tuna longline fishery and distant-water purse seine fishery; other offshore and coastal fisheries include harpoon, set-net and gill-net fisheries, and account for a small proportion of overall tuna and tuna-like species catch. The catches of longline and purse seine fisheries account for 99% of the total tuna and tuna-like species catches in the North Pacific Ocean by Chinese Taipei. Longline fisheries comprise the large-scale tuna longline (LTLL, vessels larger than 100 GRT) and small-scale tuna longline (STLL, vessels less than 100 GRT) fleets. The total catch of tunas and billfish (including swordfish, striped marlin, blue marlin, black marlin, and sailfish) by the longline fishery (including the catch of LTLL and STLL) in the North Pacific Ocean was 31,298 t in 2012. There were 87 active vessels of LTLL operating in the Pacific Ocean in 2012 and 1,326STLL vessels. The total purse-seine fishery catch was 200,653 mt caught by 34 vessels in the Pacific Ocean in 2012. The tuna and tuna-like species catch by other offshore and coastal fisheries was estimated at 3,091mt.

For the LTLL fishery, Category I data sources include weekly catch reports and commercial data from individual fishing vessels. Categories II and III data are compiled from logbook data. Fishermen are required to measure the length of the first 30 fish caught in each set. For the STLL fishery, Category I data sources include landings and auction records of local fish markets, reports of market states, and monthly catch reports from individual fishing vessels. For the purse seine fishery, Category I and Category II data are obtained from logbooks.

In March 2010 a catch documentation scheme (CDS) was established in Taiwan requiring small-scale longline fishermen to attach a tag and to take length and weight measurements of each Pacific bluefin tuna caught. In 2011 a new Pacific bluefin tuna sampling program was initiated. Length and weight measurements of Pacific bluefin tuna are collected at landing markets by OFDC samplers. All Pacific bluefin tuna caught in the small-scale longline fishery are measured for length and weight; the collection of individual weight and length data from Pacific bluefin tuna reached 100% from 2010 to 2012.

An observer program has been operating in the Pacific Ocean since 2002. In accordance with the government's policy in establishing an observer program and availability of budgets to support the increase of observers, the observed trips have gradually increased year by year. In addition, the Fisheries Agency began to dispatch observers to STLL vessels in 2012. The number of observed trips in 2012 for LTLL and STLL was 26 and 11 respectively.

For sustainable utilization of the resource, Taiwanese scientists are conducting research on biology and stock assessments for tuna and tuna-like species in the North Pacific Ocean.

Discussion

Available data on shark catches in longline fisheries were discussed, because bycatch (discards) is a significant fraction of total fishing mortality. Catch data for STLL vessels are compiled from landing reports so there is limited information on shark bycatch. LTLL vessels maintain logbooks, which may include some information on bycatch because the revised logbooks now provide an opportunity to enter information on shark catch. In the future, Chinese Taipei should be able to provide more detailed data on shark catch by species.

Temporal changes in catch composition in the LTLL fishery must be considered in the context of two distinct targeting strategies, one for North Pacific albacore and the other for bigeye tuna. Generally, the behavior of these two segments of the fishery has not changed in the recent past.

STLL vessels may operate in the Indian Ocean and the Pacific Ocean. Hence, shifting between the two oceans may affect the annual counts of vessel numbers.

Purse seine vessels are subject to 100% observer coverage while LTLL coverage is approaching 5% and STLL coverage is still quite low. Chinese Taipei participates in the WCPFC Regional Observer Program (ROP) and observers may come from the domestic observer program or the ROP.

The fairly constant proportion of Pacific bluefin tuna catch in the STLL fishery before 2009, and the decline after 2009, were noted. This led to a discussion of the spatial distribution of the fishery. A real change in the spatial distribution of fishing effort in the STLL fishery is unlikely; rather, a substantial decline of the Pacific bluefin tuna catch in recent years likely caused the decline in the Pacific bluefin tuna catch proportion.

3.3 Japan

Y. Hiraoka reported on the recent trend of Japanese tuna fisheries in the North Pacific Ocean and updated the statistics since 2012 (*ISC/13/PLENARY/06*). Japanese tuna fisheries consist of three major fisheries (longline, purse seine, pole-and-line) and other miscellaneous fisheries like troll, drift-net, and set-net fisheries. Total landings of tunas (excluding skipjack) caught by Japanese fisheries in the North Pacific Ocean were 109,842 t in 2011 and 101,263 t in 2012. The total landings of swordfish and billfishes were 8,135 t in 2011 and 7,602 t in 2012. Skipjack tuna landings were 153,189 t in 2011 and 175,167 t in 2012. Japanese research activities on tuna and tuna-like species in the Pacific Ocean in 2012 were also briefly described, as was a recent international workshop on biological reference points and earthquake disaster reconstruction.

Discussion

Differences between vessel counts reported to the ALBWG and provided in the National Report were clarified: different methods were used in each report and Japan promised to bring revised vessel counts to the ALBWG workshop in November 2013. The Data Administrator also noted the need for corrections to the reported striped marlin catch.

Bycatch (discards) in the longline and pole-and-line fisheries depend on market value, which is determined by demand in the region where fish are landed. For example, in Tohoku sharks are landed but this is not the case for other ports. While the offshore longliners that target blue shark were not heavily damaged by the 2011 earthquake, many of the processing facilities were destroyed and have not been rebuilt. In response, harvesters are not as actively targeting the species, which has led to the recent decline in reported blue shark landings.

Japan described the management measures it has implemented in response to WCPFC Conservation and Management Measure (CMM) 2012-06 for Pacific bluefin tuna. These include voluntary measures not required by the CMM. Japan has detailed these measures in previous reports to the NC. While these measures may partially explain the reduction in catch in 2012, the drop in recruitment to the fishery of the 2011 year class has likely had a greater effect. Japan also explained how the biennial bluefin tuna quota for purse-seine vessels works in relation to the fishing year, which begins in October.

Japan clarified that catches destined for net-pen (aquaculture) operations are now reported as part of the troll fishery catch. It was observed that because small bluefin are being caught, the reported tonnage represents a very large number of fish.

The results of Pacific bluefin larval surveys were discussed. Very few larvae were captured in the Sea of Japan, especially compared to sample sites around the Southern Islands. These findings may reflect the difference in the density of adult spawners in these two areas.

The National Research Institute of Far Seas Fisheries is working with recreational fishermen to tag billfish. The results of these tagging efforts were reported to the BILLWG.

3.4 Korea

Z. G. Kim presented the National Report for the Republic of Korea (*ISC/13/PLENARY/07*). Two fishing gears are used -- distant-water tuna purse seines (DWPS) and distant water tuna longlines (DWLL) -- fishing for tuna and tuna-like species in the North Pacific Ocean. There are also coastal fisheries involved in Pacific bluefin tuna mortality, which are offshore large purse seine, coastal troll, and others.

Distant-water fisheries are managed by the Distant Water Fisheries Development Act;, coastal water fisheries are managed under the Fisheries Resources Conservation Act; and Pacific bluefin tuna fisheries are managed by Ministerial Directive. In 2012, Korea established the Data Collection and Reporting Requirement Act to improve data quality and accurate and timely reporting.

DWLL and DWPS catch were 16,730 t and 87,445 t, respectively in 2012. In the longline fishery, the species composition was: BET 67.9%, YFT 13.8%, SWO 5.1%, BUM 3.5%, ALB 0.9%, MLS 0.3%, and BLM 0.2%. In the purse seine fishery, the species composition was: SKJ 77.2%, YFT 22.4%, and BET 0.5 %. DWLL fishing effort was 33,689 thousand hooks in 2012 and they were deployed at relatively higher levels in both the central and the eastern areas. DWPS fishing effort was 2,408 sets in 2012. Notably, fishing effort declined the most in the western area in 2011, while it moved to the central area in 2012.

Pacific bluefin catch by offshore large purse seiners was 1,421 t and 1.1 t by coastal trollers in 2012. In 2012 there were 24 active offshore large purse seiners and of 34 coastal trollers. PBF catches were distributed in the South Sea around Jeju Island throughout the year. The peak periods of monthly catches differ from year to year. Size composition data showed that for 2012 the average length was 53.5 cm FL, an increase of 7 cm compared to 2011. On 6 June 2013, a pop-up archival tag (Wildlife Computers MK-10) was attached to a 78 cm FL Pacific bluefin tuna.

Discussion

Korea described that in the purse seine fishery, Pacific bluefin tuna is a secondary species taken by vessels mostly targeting pelagic species such as mackerel schools both at night and during the day. While those targeting pelagic species are the most important in terms of Korean seafood preference and socio-economics, Pacific bluefin tuna catch only accounts for about 0.7 % of total catch of purse seiners and is opportunistic. This makes controlling fishing effort relative to Pacific bluefin tuna by time-area closures difficult.

Data collection and reporting requirements for distant water tuna fisheries were significantly reinforced by the revision of the Data Collection and Reporting Requirement Act in 2012, resulting in attaining 100% logbook coverage.

3.5 Mexico

M. Dreyfus presented information on the Mexican tuna fisheries (*ISC/13/PLENARY/08).* The Mexican tuna fishery developed in the 1970s with the implementation of its EEZ. Starting in the 1980s it became the largest fishery for tunas in the EPO. More recently it has dropped to second place in terms of overall tuna catch but still takes the largest YFT catches. In 2012, the total catch was 127,135 t, most of it YFT, followed by SKJ, with 45 purse seine vessels operating in the EPO. Forty-two of these have a carrying capacity of 400 or more cubic meters and 100% have observers onboard covering all fishing trips (including all PBF fishing trips).

The PBF catch in Mexico is directed to farming activities off the northwestern Baja California peninsula. Due to the use of stereoscopic cameras during PBF transfer from purse seine nets to transportation pens, Mexico is starting to obtain better sample size composition data that show that the fishery has shifted selectivity (mean size in 2010-2011 of 92 cm) from earlier fishing periods in the EPO.

Mexico has no direct catches of ALB. The main historic component of catches of this species is by the US sport fishery operating mainly in the Mexican EEZ. This sport fishery also catches PBF and YFT in Mexican waters and these catches are included in the US statistics provided to ISC.

The shark fishery in Mexico dates back to at least the Second World War when there was high demand for vitamin A (from shark liver at that time). Since the 1940s sharks have been separated into two categories by size, and information on species composition has not been collected. Recently, however, new management regulations dictate that fishermen must provide species information in logbooks, except for the artisanal fishery (small boats with two or three fishermen). In the artisanal fishery the buyer must provide monthly reports with species catch composition. There are shark operations all over the coast of the Mexican Pacific, but the longline fleet operating off the northwestern Baja California peninsula also catches SWO. This fleet has a small percentage of observer coverage providing high quality data on species composition and catch rates. Mexico recently imposed an unprecedented two-month closure for shark fisheries, which will be implemented annually.

Except for SWO, there are no commercial catches of billfishes; they are reserved for the exclusive catch by the sport fishery, and this is primarily a catch-and-release fishery (with an estimated release rate of 78.9% in the 1990-2011 period). The main target of this fishery is MLS caught mainly in three locations in the Mexican North Pacific. Two of them are located in the southern-most part of the Baja California peninsula.

Discussion

Because there is 100% observer coverage on purse seine vessels, the entire commercial Pacific bluefin tuna catch is documented. The use of stereoscopic cameras to collect size data in net-pen operations offers an opportunity for a second data source on catch and size composition. Such independent confirmation is valuable, because the purse seine catch can only be estimated by observing live animals in a pursed set. Mexican purse seine vessels began deploying deeper nets when targeting Pacific bluefin tuna at the outset of net-pen operations in 2000, so any more recent changes in CPUE would not be attributable to this gear change.

With respect to sharks caught in the swordfish fishery, there is some information about the species composition of catches in the different fisheries based on either logbooks or buyer reports. The main species are blue, thresher, and mako sharks in more northerly waters and hammerhead species in tropical waters.

Mexico also noted that due to IATTC Resolutions for Pacific bluefin tuna, Mexico recently closed its Pacific bluefin tuna purse-seine fishery in response to reaching the 2013 quota.

3.6 United States

C. Werner reported on U.S.A. fishery data submissions (*ISC/PLENARY/13/09*) and relevant research by its Pacific Islands and Southwest Fisheries Science Centers related to its purse seine, albacore, and longline fisheries in the North Pacific in 2012. The new research center buildings in both La Jolla, California and Honolulu, Hawaii were also highlighted. The U.S. thanked Japan, Taiwan, and Mexico for their collaboration on age and growth research of sharks and tunas, and Japan for helping with the recovery of two U.S. albacore tags.

Discussion

The presence of small yellowfin tunas reported in the United States National Report was noted as unusual, because normally longline tuna fisheries catch adults. It was clarified that small fish have typically been a component of the catch in the Hawaii deep-set longline fishery.

The United States answered questions concerning albacore, swordfish, and bigeye tuna catch rates in its longline fishery. In particular the increasing catch of bigeye tuna without corresponding increases in yellowfin catch was discussed. The United States offered several explanations including changes in the two distinct segments of the fishery (shallow-set swordfish directed and deep-set tuna directed) and changes in the spatial distribution of fishing effort. However, the United States was unable to explain the size composition of yellowfin tuna in the catch of the Hawaii longline fishery and said that it will investigate this concern. There was discussion of the impact of turtle mitigation measures on the Hawaii swordfish fleet. Future climate scenarios results were discussed and it was clarified that predicting the Pacific Decadal Oscillation and other regime shifts was not yet possible but important to consider both statistically and in terms of management strategy.

Clarification was sought on the discrepancies in the shark catch in the ISC database and the USA National Report as well as between the numbers of albacore troll and pole-and-line vessels reported in the National Report and the ALBWG catch tables. The US addressed and rectified the discrepancy.

General Discussion

The ISC Chair noted that National Reports should have an adequate time series of key data and should provide a minimum of 5 years of spatial distribution data for the major HMS fisheries and all material should be in English. National Reports should also consistently use the FAO species codes listed at the beginning of each Plenary Report and in the ISC Operations Manual.

4 REPORT OF THE ISC CHAIRMAN

The ISC had another busy year since the ISC Plenary met in Sapporo, Japan in July 2012. The year was spent completing benchmark assessments for Pacific bluefin tuna, North Pacific blue shark, and Pacific blue marlin, and working on preparations for new stock assessments for shortfin mako shark and North Pacific swordfish in 2014. Preparatory work consisted of collecting fishery and biological data, compiling and analyzing data, testing of hypotheses and stock assessment model assumptions, and exploring new models or variations of standard models for use in the upcoming assessments. While numerous accomplishments and successes advanced the scientific integrity of ISC, we cannot afford to waiver from our scientific mission. The failure of ISC to complete assignments on time has far-reaching implications. Progress was made by improving best practices and scientific reporting procedures, compiling a catalogue and inventory of the ISC database, advancing development of the website and data enterprise system, and improving administration. Eight intercessional workshops were held to facilitate collaboration among Member scientists in implementing ISC work plans and coordinating research on the stocks. A peer review of the ISC function was completed with support from Japan, Republic of Korea and U.A, pointing out the unique role of ISC in the science arena, and Ziro Suzuki was elected as Chair of the ISC Pacific Bluefin Tuna Working Group (PBFWG).

Managing ISC activities continued to be a challenge during the past year. As before, the challenge is an inherent consequence of the ISC framework adopted by the Members. That is, 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. Given this framework, the Office of the Chairman takes on the role of a secretariat, but not a full-service one at that, owing to uncertain support from the Chairman’s funding source. Likewise, the working groups depend on in-kind contributions from Members who elect to participate in specific working groups. This support is uneven among the Members and Members with insufficient support cannot participate actively and hence, can delay progress of a working group in completing assignments. To date, the support for administration of ISC activities has been provided solely by the US for day-to-day operations of the office of the Chairman, and by Japan for operating 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. All of the support is appreciated and acknowledged. The recent peer review of the ISC function recognized this challenge and recommended that ISC seek ways to institutionalize its function.

In closing the Chair thanked all his colleagues who have worked on ISC tasks and who have provided the support to ISC and the Chair in advancing the objectives and purpose of the organization. The service of Chi-lu Sun, vice Chairman, for support and insightful advice is acknowledged. A special thanks and appreciation is owed to the Chairs of the Working Groups, namely Ren-Fen Wu, Jon Brodziak, John Holmes, Yukio Takeuchi, and Suzanne Kohin, who provided unselfish leadership in guiding the work of the Working Groups. In addition, the leadership role of Hideki Nakano with respect to the Data Administrator, Izumi Yamasaki, and Webmaster, Yumi Okochi, is appreciated. Finally, the Chair acknowledged the professional assistance of Sarah Shoffler, Lennon Thomas, and Lyn Katahira for their dedicated service to ISC and for assistance in completing tasks assigned to the Chairman. In that capacity, they served as point of contact for the office of the Chairman, led in organizing the facilities for annual meetings, led in writing and assembling technical information required for agenda items of meetings and for responding to inquiries, and served as advisors to me on aspects of ISC operations. Thanks to all of you for contributing to another successful year for ISC and for the support and service provided.

5 INTERACTION WITH REGIONAL ORGANIZATIONS

5.1 WCPFC

A. Beeching presented a brief overview of the MOU between the WCPFC and ISC, covering the provision of scientific advice, the framework for mutual cooperation, and finance. This was followed by details of the responses of SC8 to ISC's science presentations to SC8 on North Pacific striped marlin, North Pacific albacore, Pacific bluefin tuna, and North Pacific swordfish. There were no significant data issues between ISC and WCPFC; indeed it was noted that ISC now annually requests a data inventory exchange with SPC. Significant items discussed at the previous Commission Meeting (WCPFC9) were described, including the need for transparency in ISC and attendance of observers at ISC meetings; the WCPFC9 adoption of the NC's recommended CMM for PBF (CMM 2012-06); the ISC Chair's presentation on an additional set of North Pacific striped marlin projections, as requested by SC8 (Para 223, SC8 Report); and the ISC Chair's observation that ISC routinely conducts peer reviews of its assessments using the Center for Independent Experts (CIE) and that reviews were at that time underway for the North Pacific striped marlin stock assessment and planned for the Pacific bluefin tuna stock assessment. Finally, mention was made of the collaborative ISC-SPC-IATTC stock assessment on blue shark, which was not completed in time for review by the ISC SHARKWG.

Discussion

The ISC Chair reviewed concerns raised about cooperation on the blue shark stock assessment. The ISC, WCPFC, and IATTC mutually agreed that the ISC would take on the responsibility for assessing blue and shortfin mako shark stocks in the North Pacific. Since then the SPC has taken a greater role in assessing shark stocks for the WCPFC and recently the SPC Oceanic Fisheries Program (OFP) announced its intention to simultaneously assess North Pacific blue shark. As a result, SPC attended the April 2013 SHARKWG blue shark assessment meeting. The ISC also provided catch data and advice on the assessment model to the SPC OFP. In return it was agreed that the SPC OFP assessment would be considered as a joint SPC-ISC product to be reviewed by the ISC SHARKWG and Plenary, before submission and consideration at WCPFC-SC9. Unfortunately, the SPC OFP was unable to complete their collaborative assessment in time for SHARKWG review. It is hoped that in the future better coordination on collaborations can be achieved with these organizations. The ISC Chair agreed to discuss coordination and collaboration with WCPFC leadership.

5.2 PICES

5.2.1 Report of the 2012 PICES Meeting

H. Nakano represented ISC at the Twenty-first Annual Meeting of PICES 12–21 October 2012 in Hiroshima, Japan. He presented a poster on the activities of the ISC. H. Nakano reported on these activities, noting that the interaction was positive.

5.2.2 Prospective Collaboration

C. Werner reported on prospective collaboration between ISC and PICES discussed at the 2012 PICES Annual Meeting. In a presentation to the PICES Fishery Science (FIS) Committee several proposals for collaboration and a proposed topical session for the 2013 PICES Annual Meeting were discussed along with possible *ex officio* membership on appropriate committees. For example, PICES scientists could participate in ISC WGs and vice versa. In response, the FIS proposed ISC participation in an existing theme session as a co-convener

for one session in 2013. Jon Brodziak is an invited speaker for the session, which will focus on rethinking the use of recruitment curves and potential long-term changes to their estimation, such as incorporating predator-prey interactions and environmental variability in stock recruit functions. An ISC representative should plan to meet with the PICES FIS and Science Board Committees and the Governing Council, if invited. Overall, several avenues for prospective collaboration with PICES have opened up.

5.2.3 2013-2014 PICES Meetings

PICES invited the ISC to participate in the 2013 PICES Annual Meeting in Nanaimo, B.C., Canada from 11-20 October. It was agreed that three ISC Members will participate in the 2013 Annual Meeting, J. Holmes, J. Brodziak, and C. Werner. J. Holmes will present an ISC poster on ISC structure and recent activities, J. Brodziak is an invited speaker at a special session on recruitment dynamics, and C. Werner will address the Fishery Science Committee on future collaborations. In 2014 PICES is sponsoring a symposium, FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Ecosystems) Open Science Meeting, 15-18 April, Kohala Coast, Big Island, Hawaii, U.S.A., which offers another opportunity for ISC scientists to participate in PICES forums. The abstract submission deadline is December 15, 2013.

Discussion

The ISC Chair encouraged ISC scientists to participate, and indicted that he will inform PICES regarding our participation in the 2013 PICES Annual Meeting. The United States emphasized the need for continued interaction with the PICES FIS Committee. C. Werner agreed to develop a presentation for the FIS.

While PICES scientists have been invited to participate in the ISC Seminar, collaboration could be extended to participation in Working Group meetings, especially if there is a clear need to bring in PICES scientists with expertise on relevant topics.

6 REPORTS OF WORKING GROUPS AND REVIEW OF ASSIGNMENTS

6.1 Albacore

J. Holmes reported on the activities of the ALBWG over the past year (*ISC/13/ANNEX/07*). The ALBWG had an intercessional workshop 19-26 March 2013 in Shanghai, China, and held a two-day update meeting prior to ISC13. A request from NC8 for information on biological reference points was received in September 2012 and work plans and assignments were developed to complete the assignment for review and approval by ISC13.

Accomplishments of the ALBWG over the past year include:

1. Research on CPUE indices (reformulating, targeting behavior, spatial/temporal patterns), assessment model scaling, and environmental effects on distribution, abundance and recruitment were reviewed;
2. A checklist of information needs for working papers supporting CPUE index development was established and will be used to assess each index for inclusion/exclusion in the next assessment;
3. Completing and approving a recommended response to NC8 biological reference point information request (see *ISC/13/ANNEX/07*;
4. Increased understanding of Chinese North Pacific albacore fishery data and data collection programs. Updated catch data (2002-2011) were obtained and forwarded to the ISC data administrator;
5. Planning for a joint PBFWG and ALBWG age and growth workshop is underway; and

6. Stock status and conservation advice was developed based on qualitative data review.

The ALBWG recommends the following work plans and workshop schedule:

1. 5-12 November 2013 – Data Preparation workshop, Shimizu, Japan;
2. 13-16 November 2013 –Age Determination workshop, Shimizu, Japan;
3. 14-28 April 2014 – Stock Assessment workshop, La Jolla, CA, USA;
4. July 2014 – 1-day fishery update meeting in advance of ISC14; and
5. No intercessional workshops are planned between ISC14 and ISC15 – NC requests (if any) will be handled using online meeting tools (Webinar, WebEx) and conference calls.

The ALBWG Chair also summarized how the WG addressed the NC8 North Pacific albacore reference points request for information (see Attachment E to Summary Report of the Eighth Regular Session of the WCPFC Northern Committee, *ISC/13/PLENARY_INFO_DOC/01*). NC8 asked for:

1. Information on key biological relationships and parameters (stock-recruit, steepness, natural mortality, maturity) and fishery parameters (selectivity);
2. Projected expected yield (variability) and probability that SSB will be below SSB depletion levels in the future for three recruitment (low, average, high) and nine constant harvest scenarios, resulting in 27 combinations;
3. Comparison of stock performance relative to candidate BRPs under two fishing scenarios: $F_{2006\text{-}2008}$ and $F_{2002\text{-}2004}$; and
4. Assess regime shift and decadal oscillation effects on F_{SPR} and empirical reference points.

J. Holmes outlined specific responses to each item prepared by the ALBWG, noting that projections to estimate expected yield and probabilities of SSB falling below depletion levels were based on the 2011 model, i.e., the model was not updated with data for 2010 or 2011. SSB depletion level probabilities were estimated using $SSB_{F=0}$ as the reference level rather than model-estimated SSB_0 values, which is highly uncertain; separate $SSB_{F=0}$ were estimated for the low, average, and high historical recruitment scenarios. Expected yield increases with recruitment and the aggressiveness of the harvest scenario. Fishing at F_{MAX} was the most aggressive harvest scenario and F_{MED} was the least aggressive scenario. Yield decreases as $F_{SPR\%}$ increases across recruitment scenarios and there is no difference in yield at $F_{SSB\text{-}ATHL}$ for 10 or 25-yr projection periods. The probability that SSB would be depleted to 10% was low for harvest scenarios, except Fmax, which had between a 0.4 and 0.5 probability of depleting SSB to 10%. However, the probability that SSB would be depleted to 40% was much higher for all scenarios and exceeded 0.5. None of the candidate reference points would be exceeded if harvesting occurred at the rate of $F_{CURRENT}$ (2006-2008), but harvesting at $F_{2002\text{-}2004}$ would breach the F_{MED} and $F_{50\%}$ reference points. Less productive conditions associated with regime shifts could lead to reduced expected yield and increased risk (probabilities) that SSB will fall below SSB depletion levels.

Discussion

The ALBWG response to the NC8 assignment can be found in *ISC/13/ANNEX/7/APPENDIX/1/ATTACHMENT/5*.

Japan clarified the source of discrepancies between vessel numbers as reported to the ALBWG and in the Japan National Report. The revised vessel numbers will be provided to the ALBWG at its November 2013 data preparation workshop for use in the upcoming assessment.

6.2 Pacific Bluefin Tuna

Y. Takeuchi, PBFWG Chair, summarized the activities of the WG (*ISC/13/ANNEX/14*). The WG met 14-15 July 2013 in Busan, Korea, prior to the ISC13 Plenary. It focused on updating PBF catch statistics and reviewing updated Japanese longline and troll CPUE for review of recent stock trends after 2012 stock assessment. The WG briefly discussed the recently submitted CIE peer review reports. The WG proposed conducting an update of stock assessment early in 2014. Due to a two-term limit for ISC WG Chairs, the PBFWG also held an election for a new chair and unanimously elected Z. Suzuki as the next PBFWG chair. The ISC Chair thanked Y. Takeuchi for his two terms of service as the Chair of the PBFWG.

Stock Assessment Update Work Plan

The PBFWG Chair presented a work plan, including the expected merits, for conducting a stock assessment update before ISC14, as opposed to only conducting projections.

Work plan:

- Conduct model run with an additional two years (2011 and 2012) of data using the same SS model (version 3.23b from the 2012 stock assessment) for the stock assessment platform and using the same model structure and parameters as the representative run (base-case run) from the 2012 stock assessment.
- The stock assessment time period will be from July 1952 to June 2013.
- The WG will not change the fishery data (quarterly catch, size composition) from 1952-2010 (July 1952-June 2011) that was used in 2012 stock assessment.
- Therefore, fishery data from July 2011 to June 2013 will be required to be submitted by all Members.
- Quarterly catch time series and size composition data are expected to be available and data from July 2011 to June 2013 will be needed from all Members.
- The minimum requirement will be submission of quarterly catch data.
- In the case of CPUE time series, due to the nature of the CPUE standardizations method, the whole time series will need to be re-standardized with the additional 2 years data. The statistical method used to standardize CPUE (error structure, etc.) will be the same as that used in the 2012 stock assessment. Also note that this year the WG reviewed updated Japanese longline and troll CPUEs with one additional year of data. Therefore, Japan will only be required to include one additional year of data.
- A future projection will be conducted using a better F-level scenario, which will be more consistent with the management measures used by WCPFC and IATTC.
- Details of projection scenarios, including F-levels and future recruitment, will be determined by the WG during a workshop.
- The schedule will be:
    - 15 December 2013: Deadline for data submission
    - 15 February 2014: Finalize future projection scenarios
    - By 28 February 2014: Convene PBFWG workshop to complete assessment
    - By 31 March: Finalize stock assessment report and submit to ISC chair
- The proposed schedule was thought to be feasible by all WG Members and it enables the major country fishing for PBF (Japan) enough time to prepare their management action promptly.
- List of tasks each Member is responsible for:

- Quarterly catch data: Japan, Taiwan, Korea, Mexico, USA
- Size composition: Japan, Taiwan, Korea, Mexico, USA
- CPUE : Japan, (Taiwan)
- Base model run: Japan, USA
- Future projections: Japan
- Sensitivity analyses: Japan

- A backup plan

  In the event that the requested data are not provided according to the established schedule, the following backup plan requiring only projections will be invoked:
  - Future projection starting from the 2012 stock assessment base-case run, with fixing or applying prior on quarterly catch by fleet from 2011Q3-2013Q2
  - Introduction of a distribution to characterize uncertainty in recruitment strength of the 2011-2012 year classes using recruitment index (Troll CPUE) into currently existing future projection software.

The merits of updating the stock assessment:

- With the additional 2 years (or optionally 3 years) of recruitment estimates, the WG can provide more accurate estimates of the immediate risk of declining SSB below the historically lowest observed SSB.
- The 2012 stock assessment only evaluated the stock status before management measures were introduced (2011 by WCPFC, 2012 by IATTC) and this update will evaluate stock status since CMMs were introduced.
- These additional 2 years of stock size and recruitment strength estimates enables the WG to address actual fishing mortalities under management (Fs in 2011 and 2012), recognizing that uncertainties still remain.

Information Request to NC9

The PBFWG Chair also presented a list of items that need to be clarified regarding the NC8 projection request. These will be submitted to NC9 through the ISC Chair. It is assumed that NC wishes to evaluate the suitability of candidate reference points through future projection simulation. Also, it is expected NC will want analysis of the influence of the environmental variation such as regime shift and decadal change on F_{SPR} and empirically-based reference points.

The PBFWG needs the NC's advice on the items listed below; the following are suggestions from the PBFWG:

1. Projection years: 10 year
2. Recruitment scenarios: average (1952-2009), low (1980-1989), high (TBD by PBFWG))
3. F-level or choice of candidate F reference points (F reference points listed in *ISC/13/ANNEX/14 and ISC/10/PLENARY/04*)
4. Base F: $F_{2007\text{-}2009}$, $F_{2002\text{-}2004}$
5. Outputs:
   i. probability of SSB in the beginning of 2021 exceeding SSB_{MIN}, $SSB_{10\%}$, $SSB_{20\%}$, $SSB_{30\%}$, $SSB_{40\%}$
   ii. Future average yield with CI or CV
   iii. Other

Discussion

Discussion of the response to the NC request is summarized in section 7.2.

The following elements of the work plan were accepted: (1) Craft a response to the CIE peer review of the Pacific bluefin stock assessment within 90 days and post the reviews and response; (2) Conduct a workshop on tuna aging in November 2013.

There was substantial discussion of the proposed stock assessment update with respect to: (1) effects on completing the albacore stock assessment, because of the potential overlap in personnel between the two working groups; (2) the provision of necessary data including size composition data; (3) the timing of PBFWG activities with respect to completing the assessment update report including the possibility of using web-based technologies for some WG activities; (4) that an emergency Plenary meeting will be required to adopt the assessment in order for managers to use it prior to ISC14 in July 2014; and (5) identifying an alternative projection approach if the proposed assessment update procedure cannot be completed.

Based on these considerations the Plenary approved the work plan.

6.3 Billfish

J. Brodziak, the BILLWG Chair, provided a summary of the status of BILLWG work assignments. The Chair noted that the four primary assignments had been completed. These were: 1) completion of data preparation and analyses for the Pacific blue marlin stock assessment including summarization of catch by quarter data, CPUE standardization, size frequency data, tagging data, and life history parameters; 2) finalizing all Pacific blue marlin stock assessment data for the 2013 stock assessment; 3) conducting the Pacific blue marlin assessment and review; and 4) conducting and reviewing the swordfish projections requested by the Western and Central Pacific Fisheries Commission Northern Committee at the Eighth Regular Session of the Northern Committee.

The BILLWG Chair described the proposed 2014 BILLWG work plan which included one intercessional meeting in order to complete the North Pacific swordfish stock assessment update: 11-19 February 2014 in Hawaii. BILLWG Members are expected to present completed working papers on swordfish catch and standardized CPUE for both the Western and Central North Pacific and Eastern Pacific swordfish stocks at the February 2014 intercessional BILLWG workshop. In addition, the BILLWG plans to complete data preparation and conduct the updated swordfish stock assessment at the February 2014 meeting for review by the Plenary at ISC14.

The BILLWG Chair also described two ongoing challenges for ISC Billfish Working Group efforts to conduct and successfully complete stock assessments. First, some BILLWG Members are not providing catch data on a timely basis to the BILLWG. Second, some member countries (e.g., Korea) are not participating in BILLWG meetings. The BILLWG Chair noted that the lack of timely submission of current catch data can increase uncertainty about current stock status and future stock projections.

Discussion

It was noted that, as for blue shark and albacore, the Hawaii longline CPUE index used in the blue marlin assessment shows a different trend than other CPUE indices. This may be due to the small spatial area and

proportion of catch, the impacts of regulatory changes on catchability and change in fishery targeting behavior, and changes in the depth of the gear as the fishery increasingly targeted bigeye tuna.

The BILLWG Chair reviewed the requests from NC8 for projections from the swordfish stock assessment and confirmed that all the requests had been addressed (*ISC/13/ANNEX/9/APPENDIX/4*).

The Plenary agreed that the BILLWG will complete stock assessment updates for both WCPO and EPO swordfish stocks in 2014. It was recognized that the scope of the work would preclude full benchmark assessments for both stocks in the near future.

6.4 Shark

S. Kohin, SHARKWG Chair, provided a summary of SHARKWG progress over the past year (*ISC/13/ANNEX/06/08/& 11*). Three meetings were held with the primary goals of completing a North Pacific blue shark stock assessment by ISC13, as well as a Bayesian Surplus Production (BSP) modeling methods workshop. A secondary goal of the SHARKWG meetings over the past year was to gather fishery and life history information on shortfin mako sharks for their planned first shortfin mako shark assessment.

The BSP modeling methods workshop in Yokohama, Japan in November 2012, was led by Dr. Murdoch McAllister, the author of the BSP2 software that SHARKWG had agreed to use for the North Pacific blue shark assessment. A blue shark final data preparation meeting was held in January 2013 in La Jolla, California, USA. The blue shark stock assessment workshop was held in April 2013 in Shizuoka, Japan. Finally, the SHARKWG met for four days in advance of the Plenary in Busan, Korea to finalize stock status and conservation information on North Pacific blue sharks and continue to review information on shortfin mako sharks. Canada, Chinese Taipei, Japan, Korea, Mexico, USA, IATTC and the SPC all actively participated in at least one of the SHARKWG meetings over the past year.

The principal achievement of the SHARKWG over the past year was to complete the first ISC North Pacific blue shark stock assessment. This assessment includes catch and CPUE time series for the period 1971-2011 for fisheries operating throughout the North Pacific. The compiled data are considered to be significantly improved over the data used in the last North Pacific blue shark stock assessment that was conducted using fishery data for the Northwest and North Central Pacific only. Eastern Pacific fishery data compiled by the SHARKWG include additional fisheries operating along Canada, the US West Coast, and Mexico. The SHARKWG also reviewed fishery and life history information on shortfin mako sharks, as well as shortfin mako shark age and growth and tagging studies, among others.

One important challenge in conducting shark assessments is the lack of complete shark catch and biological data collection highlighted by the failure of many Members to meet agreed upon data submission deadlines. The SHARKWG planned to have a decision on the modeling approach to use for the shortfin mako shark assessment based on submitted information, but not all Members provided information in time for the July 2013 meeting. Thus the decision has been postponed. A second challenge is the need and desire to collaborate and coordinate with other organizations conducting assessment work on the same species of interest.

The SHARKWG proposed a revised work plan for completing the shortfin mako shark assessment that includes two data meetings prior to ISC14 and the shortfin mako assessment meeting in late 2014.

The SHARKWG has established the following tentative meeting plan to address uncertainties regarding shark age and growth and to complete the shortfin mako stock assessment before ISC15:

January 9-11, 2014 **La Jolla, CA USA**	Second ISC Shark Age and Growth Workshop
January 13-18, 2014 **La Jolla, CA USA**	Review of SS3 north Pacific blue shark assessment; Shortfin mako data review and selection of modeling approach
June 2-9, 2014 **Keelung, Chinese Taipei**	Shortfin mako data prep meeting
Fall/Winter 2014 **Location TBD**	Shortfin mako assessment meeting

To address the challenges in conducting collaborative work with other organizations, the SHARKWG Chair requested that the ISC Chairman work with WCPFC leadership to confirm the agreements between ISC and SPC in order to avoid similar challenges in the future and to promote collaborative work.

Discussion

It was agreed that the ISC Chair will meet with WCPFC leadership to discuss and, to the best of his ability, resolve problems with coordination and collaboration that arose with the blue shark stock assessments conducted by the SHARKWG and the SPC OFP.

It was noted that ISC data were provided to SPC OFP for these assessments and that these data would be used in accordance with ISC rules. In particular, under ISC rules, data held by the ISC remains the property of the individual contributors and release to the general public is governed by the policies of the contributors. Proprietary data shall be made available to contributors and Members of ISC Working Groups for use in the work of the Working Groups only. They are not to be retained and shared with non-Members of the Working Groups.

Mexico raised a point regarding data submission to ISC and other bodies. Mexico fully cooperates with ISC and also, as a Member, shares its data and information with the IATTC and is willing to share data with WCPFC, of which it is a cooperating nonparty. However, for ISC to provide data to other entities it will need the prior approval of the country involved, in this case Mexico, for the release of data. This should be done only when the the Member country concerned has given approval.

Finally, the use of the ISC and SPC OFP assessments by fishery management entities was discussed. It was noted that the WCPFC-SC may wish to develop conservation recommendations based on the SPC OFP assessment before the SHARKWG has had the opportunity to review it, and that this decision is clearly a WCPFC decision. Regardless of the decision, the SHARKWG will review the assessment at its next workshop.

The Plenary approved the list of meetings and workshops proposed by the SHARKWG, including an age and growth workshop that is expected to produce some guidelines on aging techniques and the development of reference collections. Such guidelines will be made available on the ISC website.

The meeting schedule indicates that the shortfin mako stock assessment would be completed in time for review and adoption at ISC15. The timing of this assessment in relation to the next Pacific bluefin tuna assessment was discussed. It is likely that the next benchmark Pacific bluefin tuna assessment will be completed in time for ISC16.

6.5 Seminar

Z.G. Kim convened a seminar at ISC13 focusing on Pacific Ocean ecosystem and tuna dynamics (*ISC/13/ANNEX/15*), including a better way to provide scientific advice to managers and fishers through various types of analysis with figures and tables. About 30 local participants from fisheries research institutes and universities attended the seminar. Summaries of each presentation follow.

Prof. C.I. Zhang presented *Ecosystem-based assessment and management for sustainable fisheries*. He introduced an ecosystem-based fisheries assessment approaches and integrated fisheries risk analysis method for ecosystems (IFRAME). In recent years, concern has grown over how ecosystems are being affected by fishing. A comprehensive ecosystem-based approach is required to holistically assess and manage fisheries resources by considering ecological interactions of target species with predators and prey species, interaction between fishes and their habitats, and the effect of fishing on these processes. IFRAME is used to evaluate the performance of management strategies relative to the goals of an ecosystem approach to management under different scenarios. From a practical standpoint, the ecosystem-based fisheries assessment approach is very appealing for its ability to incorporate a large number of quantitative data. Yet, even this approach should be further refined, sensitivity analyses conducted, the forecasting version of this approach further developed, and future applications tested in other ecosystems.

Dr. J.H. Lee presented *Ecosystem-based risk assessment of the Korean offshore large purse seine fishery under changing climate*. The warming trend is associated with changes in spatial distribution of some pelagic fish stock such as chub mackerel and tunas in Korean waters. Using IFRAME, the impacts of climate change were evaluated by projecting distributional ranges and stock status of chub mackerel and the Korean offshore large purse seine fishery in Korean waters. There was discussion on uncertainty regarding data used in the IFRAME model.

Dr. Y. Ishida presented *Outline of 2013 NRIFSF workshop on biological reference points for fisheries management under environmental changes*. The workshop was intended to identify target reference points and limit reference points, and introduced the application of biological reference points (BRPs) for Japanese fisheries management and WCPFC. There are various kinds of BRPs and their performance can be evaluated by management strategy evaluation (MSE). Environmental changes such as regime shifts affect many fish stocks including tuna species.

Dr. T. Nishida presented *Visualization of scientific advice and information: Bridging concrete images from scientists to managers and industry*. He proposed how to transfer scientific advice to non-scientists such as fishery managers and the fishing industry more effectively. It was highlighted that it is important to understand information in an easy way, and visualization (not too simple, but not too dramatized) is a very good method for

that. And it is expected that by using this method, managers can produce effective management strategies and the industry can follow them smoothly.

Dr. W.D. Yoon presented *Jellyfish blooms and fisheries damages in Korean waters*. He explained the reason why jellyfish blooms have occurred, especially in Korean waters in recent years. It was suggested that jellyfish blooms together with overfishing might be one of the causes of changes in ecosystem structure.

Discussion

The ISC Chair thanked Z.G. Kim for organizing an insightful seminar and the four presenters for contributing. Dr. Kim thanked the National Research Institute of Far Sea Fisheries of Japan for sending Dr. Y. Ishida and T. Nishida as presenters to this seminar. There was a request regarding the availability of the presentations for distribution among the Members, and Dr. Kim contacted the presenters and all but one of the presentations is available.

7 STOCK STATUS AND CONSERVATION ADVICE

7.1 Albacore

J. Holmes, Chair of the ALBWG, presented updated recommendations for stock status and conservation information for North Pacific albacore tuna (*Thunnus alalunga*). These recommendations are based on a qualitative review of catch and nominal effort (number of vessels by major gear types) data in 2012. Estimated total catch in 2012 was 82,040 t, which is above the 30-yr average of 72,864 t (1981-2010) and 2.3% higher than the total reported catch for 2011 (80,210 t). However, the provisional 2012 catch estimate does not include 2012 data from China or non-ISC member countries. Catches from China and Vanuatu in 2011 were greater than 11,000 t, which is three times higher than average for 2006-2010, indicating that these countries may be expanding their fisheries for North Pacific albacore. Examination of catch by major gears (troll, longline, pole-and-line) shows that catch by troll gear has been relatively stable since the mid-2000s, averaging about 18,535 t since 2006, while pole-and-line catches have been quite variable due to market conditions and target switching between skipjack and albacore. Longline catches reported by ISC countries exhibit a long-term declining trend, but show an increase since 2010 when catches from China and non-ISC member countries are included in the total. Nominal effort (measured as the number of vessels) of ISC member countries was either stable (troll, pole-and-line) or declining (longline).

Discussion

It was noted that for the US, vessel fishing-days is a more accurate measure of fishing effort compared to vessel counts; however, vessel counts are the only metric common to all national data sources.

Plenary discussed obtaining more detailed data (e.g., Category III) from China. The ALBWG Chair will work with the STATWG Chair to obtain these data for use in the next stock assessment in 2014. Although the rapid increase in albacore catches by China and Vanuatu is a concern, at this time there is not enough information to account for it in the conservation advice.

Stock Status and Conservation Advice

Stock Status

The ALBWG notes that the most recent assessment in 2011 used fishery data through 2009. Based on a qualitative review of catch and effort data in 2012, observed trends in catch or effort did not raise concerns about the status of the stock, except for a concern about the lack of catch data for 2012 from China and Vanuatu. The ALBWG notes, however, that albacore stock status may be related to recruitment and that it has no information with which to monitor recruitment between assessments.

The ALBWG recommends no changes to its stock status determination in 2011, i.e., the stock is considered healthy and overfishing is likely not occurring and the stock likely is not in an overfished condition, although biomass-based reference points have not been established.

Conservation Advice

The ALBWG noted that new information reviewed since the 2011 stock assessment was not judged to be sufficient to change its conservation advice for north Pacific albacore. Therefore, the ALBWG offered no new recommendations on conservation above and beyond those provided by ISC11 and shown below:

1. **The stock is considered to be healthy at average historical recruitment levels and fishing mortality ($F_{2006\text{-}2008}$).**
2. **Sustainability is not threatened by overfishing as the $F_{2006\text{-}2008}$ level (current F) is about 71% of $F_{SSB\text{-}ATHL}$ and the stock is expected to fluctuate around the long-term median SSB (~400,000 t) in the short- and long-term future.**
3. **If future recruitment declines by about 25% below average historical recruitment levels, then the risk of SSB falling below the SSB-ATHL threshold with $F_{2006\text{-}2008}$ levels increases to 54% indicating that the impact on the stock is unlikely to be sustainable.**
4. **Increasing F beyond $F_{2006\text{-}2008}$ levels (current F) will not result in proportional increases in yield as a result of the population dynamics of this stock.**
5. **The current assessment results confirm that F has declined relative to the 2006 assessment, which is consistent with the intent of the 2006 WG recommendation.**

7.2 Pacific Bluefin Tuna

Y. Takeuchi, PBFWG Chair, summarized results of the stock assessment studies by the PBFWG (*ISC/13/ANNEX/14*). The ISC intercessional Plenary in December 2012 had requested that the PBFWG complete the following tasks:

1. Conduct additional projection scenarios with recruitment levels consistent with the lower values estimated in the 1980s;

2. Pending approval from the WCPFC NC, conduct reference point research similar to that being conducted for North Pacific albacore and swordfish (see item 4 WCPFC-NC8);

3. Conduct fishery impact analyses to determine the relative effects of various gears on the overfishing and overfished status;

4. Develop and recommend Kobe plot(s) based on results from the current Pacific bluefin tuna stock assessment. Provide plausible explanations for Pacific bluefin tuna being in an overfished condition throughout the entire assessment period.

Additional projection with low recruitment scenarios: The PBFWG conducted additional future projections with two low recruitment scenarios: (1) a 30-year low recruitment period similar to that of 1980s, and (2) a 10-year low recruitment period followed by 20-year average recruitment level.

Using an $F_{2007\text{-}2009}$ harvest scenario, SSB is not expected to recover; and there is a very high probability that future SSB will fall below the historically lowest level with or without catch limits on purse seine fleets. Under an $F_{2002\text{-}2004}$ scenario, SSB is expected to increase to around 30,000 t with a small risk of future SSB falling below the historically lowest level in the long term, although short-term (2011-2015) risk remains.

NC questions: The PBFWG answered the first half of the second request from the plenary to summarize the information on the steepness and biological parameters used in the PBF stock assessment. The PBFWG recognized that in order to address the second half of the question it would have to evaluate the suitability of candidate reference points. The PBFWG requested further clarification from the NC on what conditions to specify and which biological reference points to model.

Fishery Impact Analysis: Historically, the Japan coastal fishery group has had the greatest impact on the PBF stock, but since about 1999 the WPO purse seine fleet has increased its impact, and the effect of this fleet is currently greater than any of the other fishery groups. The impact of the EPO fishery was large before the mid-1980s, but decreased after the 1990s. The WPO longline fleet has had a limited effect on the stock throughout the analysis period. The impact of a fishery on a stock depends on both the number and size of the fish caught by each fleet; i.e., catching a high number of smaller juvenile fish can have a greater impact on future spawning stock biomass than catching the same weight of larger mature fish.

Kobe plots: For illustrative purposes, two examples of Kobe plots (plot A based on SSB_{MED} and F_{MED}, plot B based on SSB20% and SPR20%, Figure 7-1) were prepared and presented. The PBFWG noted that because no reference points for PBF had yet been agreed to, these versions of the Kobe plot represent alternative reference points. It was agreed to present the two Kobe plot versions for further discussion by the Plenary.

Fishery indicators: The Japanese troll CPUE represents the recruitment trend. In 2011, CPUE was below average, although it remained within the normal range. In 2012, the Japanese troll recorded an unusually low catch (570 t, historical minimum 546 t). The part of purse seine fleet in the WPO mainly catching juvenile PBF recorded a substantial decline in catch compared with previous years. Other fisheries' catch generally declined in 2012.

Discussion

In discussing the Kobe plots, it was noted that one plot puts the stock in an overfished condition over the entire time period. The PBFWG did not provide plausible explanations for PBF being in an overfished condition throughout the entire assessment period. There was a concern that citating these plots without appropriate interpretation may be misleading for those without an understanding of the population dynamics of PBF. It was mentioned that if PBF productivity was heavily environmentally-driven, the state of the stock may be hard to present via a Kobe plot. However, Kobe plots are a key source of information to inform management decisions and must be included in stock assessment reports.

It was recommended that the purse seine fishery should be separated into tuna purse seine and small purse seine (Japan, Korea) in future fishery impact analyses, because of differences in history, fishing grounds, and size targeted by fleet.

Stock Status and Conservation Advice

Based on new information available after the 2012 stock assessment, the ISC13 updated the stock status and conservation advice for PBF.

Stock Status

Based on the reference point ratios, overfishing is occurring (Error! Reference source not found.**) and the stock is heavily overfished. Model estimates of 2010 SSB are at or near their lowest level and SSB has been declining for over a decade; however, the 2012 stock assessment, which used data through the first half of 2011, did not find evidence of reduced recruitment. Recently implemented WCPFC[2] (entered into force in 2011) and IATTC[3] (entered into force in 2012) conservation and management measures, combined with additional Japanese voluntary domestic regulations aimed at reducing mortality[4], if properly implemented and enforced, are expected to contribute to the recovery of the stock assuming historical average recruitment conditions.**

[2] This refers to WCPFC CMM 2010-04 which specifies that "total fishing effort by their vessels fishing for Pacific bluefin tuna in the area north of the 20 degrees north shall stay below the 2002-2004 levels for 2011 and 2012, except for artisanal fisheries. Such measures shall include those to reduce catches of juveniles (age 0-3) below the 2002-2004 levels, except for Korea. Korea shall take necessary measures to regulate the catches of juveniles () by managing Korean fisheries in accordance with this CMM. CCMs shall cooperate for this purpose." For full text see: http://www.wcpfc.int/system/files/documents/conservation-and-management-measures-and- resolutions/conservation-and-management-measures-/CMM%202010- 04%20%5BPacific%20Bluefin%20Tuna%5D%2004112011.pdf

[3] This refers to IATTC Resolution C-12-09 which specifies that "1. In the IATTC Convention Area, the commercial catches of bluefin tuna by all the CPCs during the two-year period of 2012-2013 shall not exceed 10,000 metric tons; 2. The commercial catch of bluefin tuna in the commercial fishery in the Convention Area shall not exceed 5,600 metric tons during the year 2012; 3. Notwithstanding paragraphs 1 and 2, any CPC with a historical record of Eastern Pacific bluefin catches may take a commercial catch of up to 500 metric tons of Eastern Pacific bluefin tuna annually." For full text see: http://www.iattc.org/PDFFiles2/Resolutions/C-12-09-Conservation-of-bluefin-tuna.pdf

[4] This is described in WCPFC-NC8-2012/DP-01. For full text see; http://www.wcpfc.int/system/files/documents/meetings/northern-committee/8th-regular-session/delegation- proposals-and-papers/NC8-DP-01-%5BEXPLANATION-AND-IMPLEMENTATION-CMM-2010-04%5D.pdf

Table 7-1. Computed F-based biological reference points (BRPs; F_{MAX}, F_{MED}, and $F_{20\%}$) for Pacific bluefin tuna (*Thunnus orientalis*) relative to $F_{2002\text{-}2004}$ and $F_{2007\text{-}2009}$, estimated depletion rate (ratio of SSB in 2010 relative to unfished SSB), and estimated SSB (t) in year 2010 for 20 model configurations (Runs). Run 2 is highlighted as it represents the base case model for the PBF stock assessment. F-ratio based BRP values less than 1 indicate overfishing.

	F_{max} ($F_{2002\text{-}2004}$)	F_{max} ($F_{2007\text{-}2009}$)	F_{med} ($F_{2002\text{-}2004}$)	F_{med} ($F_{2007\text{-}2009}$)	$F_{20\%}$ ($F_{2002\text{-}2004}$)	$F_{20\%}$ ($F_{2007\text{-}2009}$)	Depletion Rate	Estimated SSB (t) (yr = 2010)
Run 1	0.54	0.45	0.90	0.71	0.56	0.45	0.032	20,030
Run 2	0.57	0.48	0.91	0.73	0.58	0.47	0.036	22,606
Run 3	0.51	0.39	0.88	0.63	0.53	0.38	0.022	13,678
Run 4	0.54	0.41	0.89	0.64	0.55	0.40	0.025	15,794
Run 5	0.58	0.49	0.93	0.75	0.59	0.48	0.037	23,794
Run 6	0.60	0.50	0.97	0.78	0.60	0.49	0.041	25,595
Run 7	0.52	0.39	0.90	0.65	0.53	0.39	0.022	13,996
Run 8	0.54	0.40	0.90	0.65	0.55	0.40	0.024	15,388
Run 9	0.61	0.54	0.94	0.82	0.61	0.53	0.047	30,085
Run 10	0.63	0.57	0.96	0.84	0.63	0.55	0.051	32,519
Run 11	0.51	0.38	0.92	0.64	0.54	0.38	0.022	13,141
Run 12	0.46	0.39	0.82	0.66	0.48	0.39	0.021	13,060
Run 13	0.46	0.39	0.82	0.66	0.48	0.38	0.021	12,944
Run 14	0.62	0.55	0.98	0.82	0.64	0.54	0.051	31,196
Run 15	0.60	0.55	1.04	0.87	0.64	0.54	0.053	32,741
Run 16	0.61	0.55	1.04	0.87	0.65	0.55	0.054	33,383
Run 17	0.49	0.38	0.91	0.63	0.54	0.37	0.021	12,838
Run 18	0.46	0.39	0.81	0.65	0.48	0.39	0.022	13,389
Run 19	0.50	0.45	0.83	0.74	0.50	0.45	0.030	18,419
Run 20	0.49	0.45	0.82	0.74	0.50	0.45	0.030	18,206

A. B.

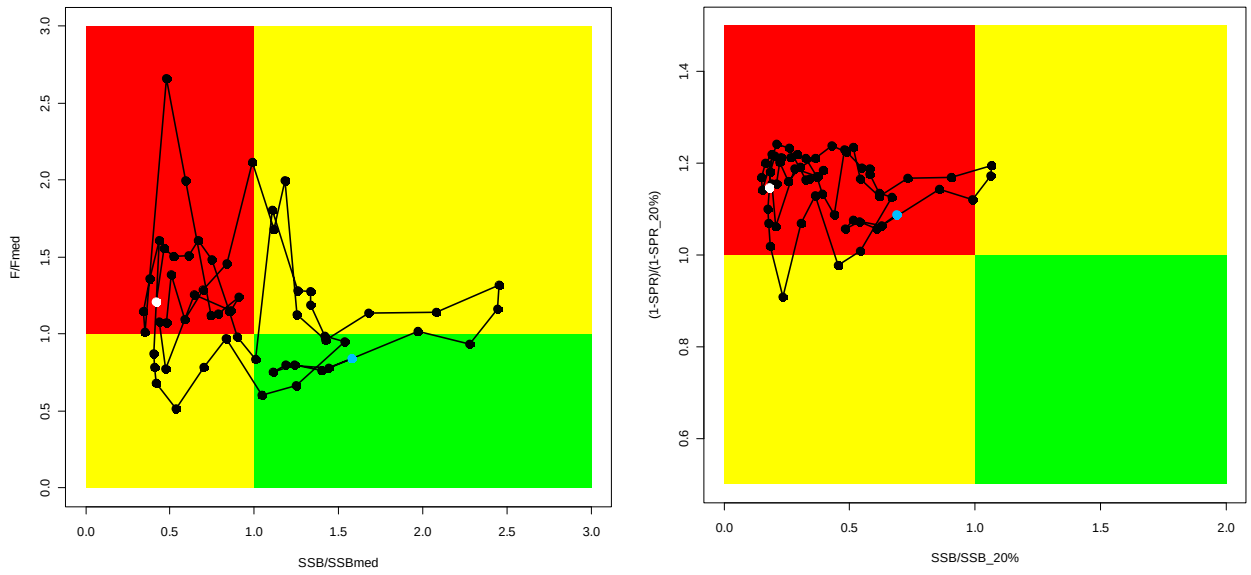


Figure 7-1. Alternative Kobe plots for Pacific bluefin tuna (*Thunnus orientalis*). A. SSB_{MED} and F_{MED}; B. SSB20% and SPR20%. Citation of these Kobe plots should include clarifying comments in the text.

Both Kobe plots (Figure 7-1) are based on alternative choices for reference points since the NC has not yet established reference points. Citation of these plots without appropriate interpretation may be misleading since our understanding of PBF population dynamics is incomplete. Plot A has a stock trajectory that is consistent with expectations that the stock was in a healthy condition early in the time series. However, plot B indicates overexploitation throughout the assessment (1952-2010) period. There is no plausible explanation why there was overexploitation at the beginning of the time-series (1952). If PBF productivity was strongly environmentally driven, the state of the stock may be hard to represent via a Kobe plot.

Fishery impact analysis (Figure 7-2 and Figure 7-3) suggests that historically, the Japan coastal fishery group has had the greatest impact (i.e., expected spawning stock biomass) on the PBF stock, but since about 1999 the impact of the WPO purse seine fleet has increased, and the effect of this fleet is currently greater than any of the other fishery groups. The impact of the EPO fishery was large before the mid-1980s, but decreased after the 1990s. The WPO longline fleet has had a limited effect on the stock throughout the analysis period.

As of 2010, the fishing impact proportions of the following fleet groups were: WPO coastal purse seine fishery, 47.5%; WPO other coastal fisheries, 34.5%; EPO coastal fisheries (including commercial purse seine and the US sport fishery), 16%; and the WPO coastal longline fishery, 1.9%.

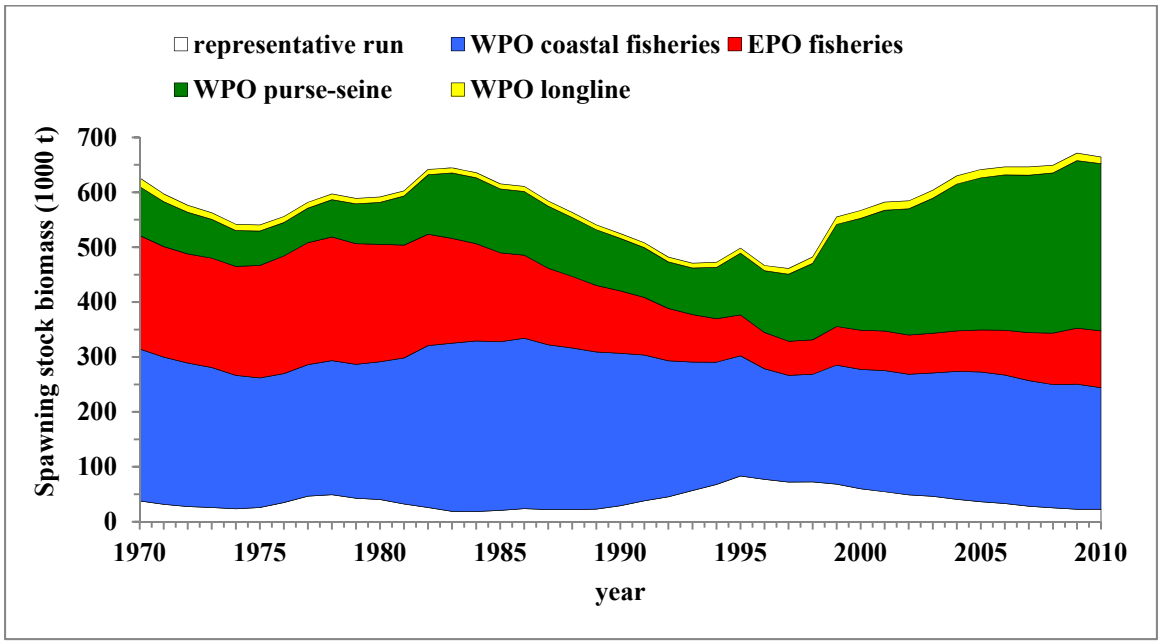


Figure 7-2. Trajectory of the spawning stock biomass of a simulated population of Pacific bluefin tuna (*Thunnus orientalis*) that was unexploited (topmost line) and that predicted by the representative (base-case) run (white area). The shaded areas between the two lines show the proportions of the fishery impact of each group.

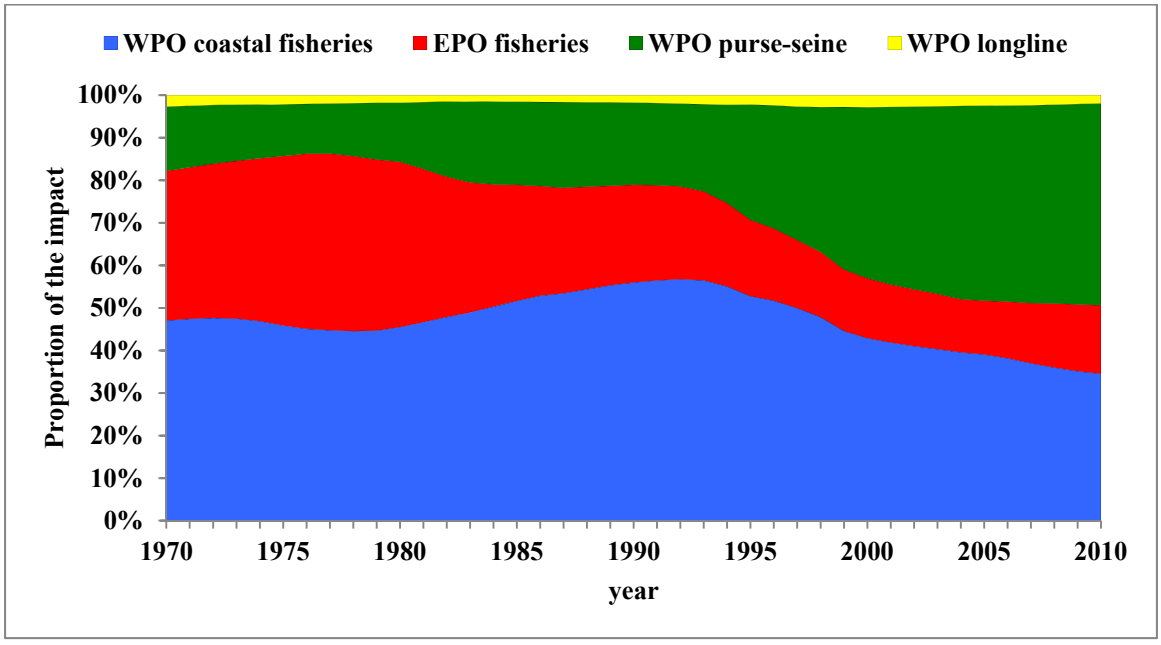


Figure 7-3. The proportion of the impact on the Pacific Bluefin tuna (*Thunnus orientalis*) spawning stock biomass in each group.

Based on newly available fishery data, concerns about stock status were reinforced by reported catches in 2012 that were lower than those reported in previous years across a number of fisheries in the Western Pacific Ocean

catching juvenile and adult PBF. CPUE in the Japan troll fishery in 2011 was within the range of variability for recent years. The unusually small amount of catch in the troll fishery in 2012 may be a sign of very low recruitment, similar to that observed in the 1980s. Japanese longline CPUE continued to decrease in 2012 and indicates no sign of stock recovery. Based on this information, the potential risk of decline of the spawning stock may be higher than previously thought. When recruitment is low, the risk of SSB falling below the historically lowest SSB level will increase under $F_{2007\text{-}2009}$ harvesting conditions while the risk under $F_{2002\text{-}2004}$ conditions will remain small in the long term, although some short-term risk remains.

Conservation Advice

Given the current stock status of PBF, ISC provides the following conservation information.

The current (2010) PBF biomass level is near historically low levels and experiencing high exploitation rates above all biological reference points (BRPs) commonly used by fisheries managers. Based on projection results, extending the status quo (2007-2009) fishing levels is unlikely to improve stock status. Continued monitoring of abundance indices is recommended to track SSB.

Preliminary WPO data indicate an unusually low catch of age-0 PBF in 2012; this may imply low recruitment, which would adversely affect projected stock rebuilding and increase the risk of SSB falling below its historical lowest level observed. Further reduction of fishing mortality, especially for juvenile fish, is needed to reduce the risk of SSB falling below its historically lowest level.

Strengthening the monitoring of recruitment is highly recommended to comprehend the trend of recruitment in a timely manner.

7.3 Blue Marlin

All available fishery data from the Pacific Ocean were used for the stock assessment. For the purpose of modeling observations of CPUE and size composition data, it was assumed that there was instantaneous mixing of fish throughout the stock area on a quarterly basis. Catches exhibited an increasing trend from the 1950s to the 1980s and then fluctuated without trend. In the 1990s the catch by Japanese fleets decreased while the catch by Taiwanese, WCPFC, and some IATTC member countries increased. Overall, longline gear has accounted for the vast majority of Pacific blue marlin catches since the 1950s.

Catch and size composition data were collected from ISC countries (Japan, Taiwan, and USA), some IATTC member countries, and the WCPFC. Standardized catch-per-unit effort data used to measure trends in relative abundance were provided by Japan, USA, and Chinese Taipei. The Pacific blue marlin stock was assessed using an age-, length-, and sex-structured assessment Stock Synthesis 3 model fit to time series of standardized CPUE and size composition data. Sex-specific growth curves and natural mortality were used because of the known sexual dimorphism of adult blue marlin. The value for steepness 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 data series used in the analyses, the natural mortality rate, the stock-recruitment steepness, the growth curve parameters, and the female age at 50% maturity.

Deterministic stock projections were conducted in Stock Synthesis to evaluate the impact of various levels of fishing intensity on future female spawning stock biomass and yield for blue marlin in the Pacific Ocean. The future recruitment was based on the stock- recruitment curve. These calculations used all the multi-fleet, multi-season, size- and age- selectivity, and complexity in the assessment model to produce consistent results. Projections started in 2012 and continued through 2020 under four levels of fishing mortality: (1) constant fishing mortality equal to the 2003-2005 average (F2003-2005 = F16%); (2) constant fishing mortality equal to $F_{MSY} = F_{18\%}$; (3) constant fishing mortality equal to the 2009-2011 average defined as current F ($F_{23\%}$); and (4) constant fishing mortality equal to $F_{30\%}$.

Biological reference points were computed with the Stock Synthesis base case model (Table 7-2). The point estimate of maximum sustainable yield was MSY = 19,459 mt. The point estimate of the spawning biomass to produce MSY (adult female biomass) was SSB_{MSY} = 19,437 mt. The point estimate of F_{MSY}, the fishing mortality rate to produce MSY (average fishing mortality on ages 2 and older) was $F_{MSY} = 0.32$ and the corresponding equilibrium value of spawning potential ratio at MSY was SPR_{MSY} = 18%. The point estimate of $F_{20\%}$ was 0.29 and the corresponding estimate of $SSB_{20\%}$ was 26,324 mt.

Table 7-2. Estimated biological reference points derived from the Stock Synthesis base-case model where "*MSY*" indicates maximum sustainable yield-based reference points, "20%" indicates reference points corresponding to a spawning potential ratio of 20%, *F* is the instantaneous annual fishing mortality rate, *SPR* is the annual spawning potential ratio, and SSB is female spawning stock biomass.

Reference point	Estimate
$F_{2009\text{-}2011}$ (age 2+)	0.26
$SPR_{2009\text{-}2011}$	23%
F_{MSY} (age 2+)	0.32
$F_{20\%}$ (age 2+)	0.29
SPR_{MSY}	18%
SSB_{2011}	24,990 mt
SSB_{MSY}	19,437 mt
$SSB_{20\%}$	26,324 mt
MSY	19,459 mt

Stock Status and Conservation Advice

Stock Status

Estimates of total stock biomass show a long-term decline. Population biomass (age-1 and older) averaged roughly 123,523 mt in 1971-1975, the first 5 years of the assessment time frame, but then declined by approximately 40% to an average of 78,663 mt in 2011 (Figure 7-4). Female spawning biomass was estimated to be 24,990 mt in 2011. Fishing mortality on the stock (average F, age-2 and older) averaged roughly F = 0.26 during 2009-2011.

The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is currently $SPR_{2009\text{-}2011} = 23\%$. The annual average in 2007–2011 was about 823×10^3 recruits, and there was no apparent long-term recruitment trend. The overall trends in spawning stock biomass showed a long-term decline. In contrast, recruitment fluctuated without any trend over the same period(Figure 7-4).

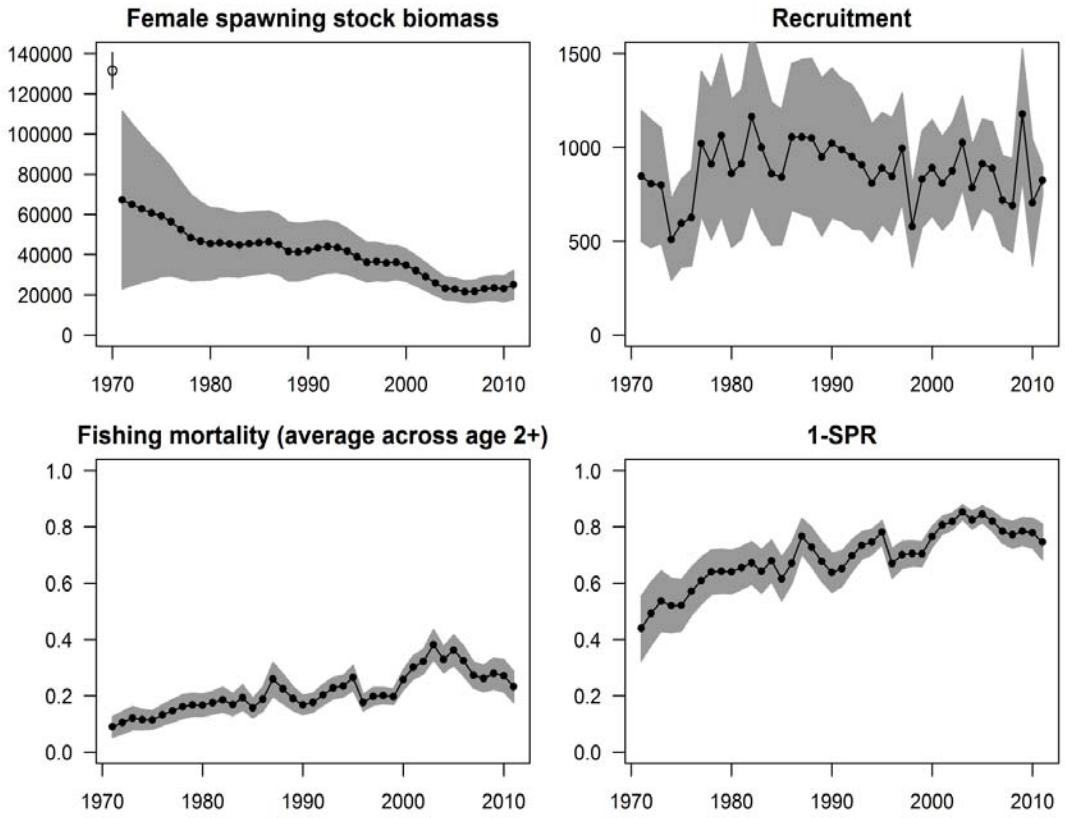


Figure 7-4. Estimates of female spawning stock biomass (top lef panel), recruitment (top right panel, fishing mortality (bottom left panel) and fishing intensity (bottom right panel) from the Stock Synthesis base-case model (point estimate, solid circle) with +/- 1.96 standard deviation shown (shaded area).

Kobe plots depict the stock status in relation to MSY-based reference points (Figure 7-5) from the base case SS model (Figure 7-4). The Kobe plots indicate that the Pacific blue marlin spawning stock biomass decreased to the MSY level in the mid-2000s, and since then has increased slightly. The base case assessment model indicates that the Pacific blue marlin stock is currently not overfished and is not subject to overfishing relative to MSY-based reference points.

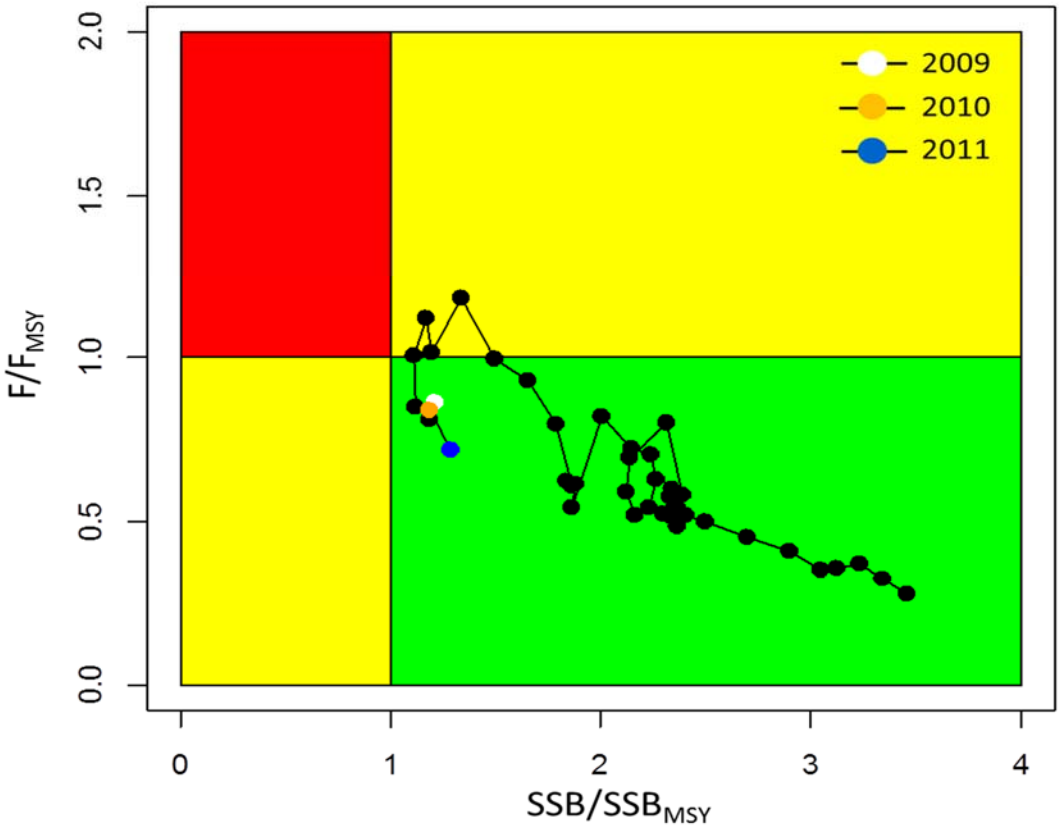


Figure 7-5. Kobe plot for blue marlin (*Makaira mazara*).

Conservation advice

Based on the results of the stock assessment, the stock is not currently overfished and is not experiencing overfishing. The stock is nearly fully exploited. Stock biomass has declined since the 1970s and has been stable since the mid- 2000s with a slight recent increase. The fishing mortality rate should not be increased from the 2009-2011 level to avoid overfishing.

7.4 Striped Marlin

The BILLWG Chair noted that there was new stock projection information for the Western and Central North Pacific (WCNPO) striped marlin stock. The BILLWG Chair presented the new projection information and conservation advice recommendations for the WCNPO striped marlin stock.

Discussion

The length frequency of striped marlin caught by Japanese longliners strongly suggests that 2010 was a strong year class (*ISC/13/PLENARY/06*). Thus, it was noted that recent data suggests that the current low recruitment hypothesis may not apply over the long term.

The timing of future stock assessments was considered. The latest stock assessment was completed shortly after the introduction of management measures for the stock by the WCPFC. Therefore, the effect of these measures is likely not reflected in the assessment results.

Stock Status and Conservation Advice

Stock Status

Female spawning biomass is currently low (Figure 7-6**) and averaged roughly 1,518 mt during 2007-2009 (56% of SB_{MSY}, the female spawning biomass to produce MSY). Fishing mortality on the stock (average F on ages 3 and older) is currently high (**Figure 7-7**) and averaged roughly F = 0.76 during 2007-2009 (24% above F_{MSY}). Recruitment averaged about 328,000 recruits during 1994-2008, which was roughly 30% below the 1975-2010 average. Compared to MSY-based reference points, the current (average during 2007-2009) spawning biomass is 44% below SB_{MSY} and the current fishing mortality exceeds F_{MSY} by 24%. Therefore, overfishing is currently occurring relative to MSY and the stock is in a depleted state (**Figure 7-8**).**

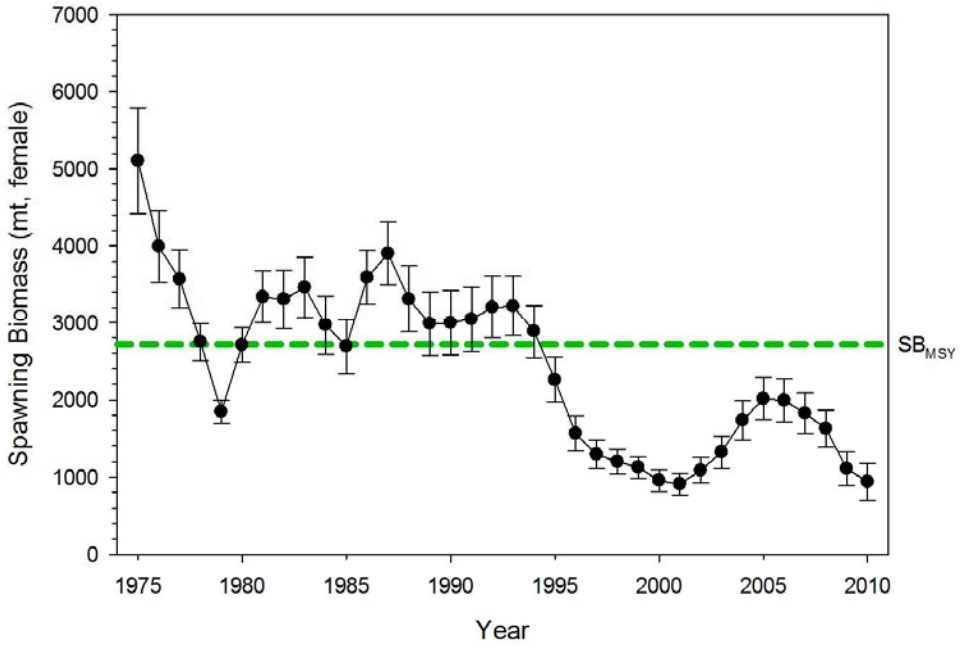


Figure 7-6. Trends in estimates of spawning biomass of WCNPO striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals.

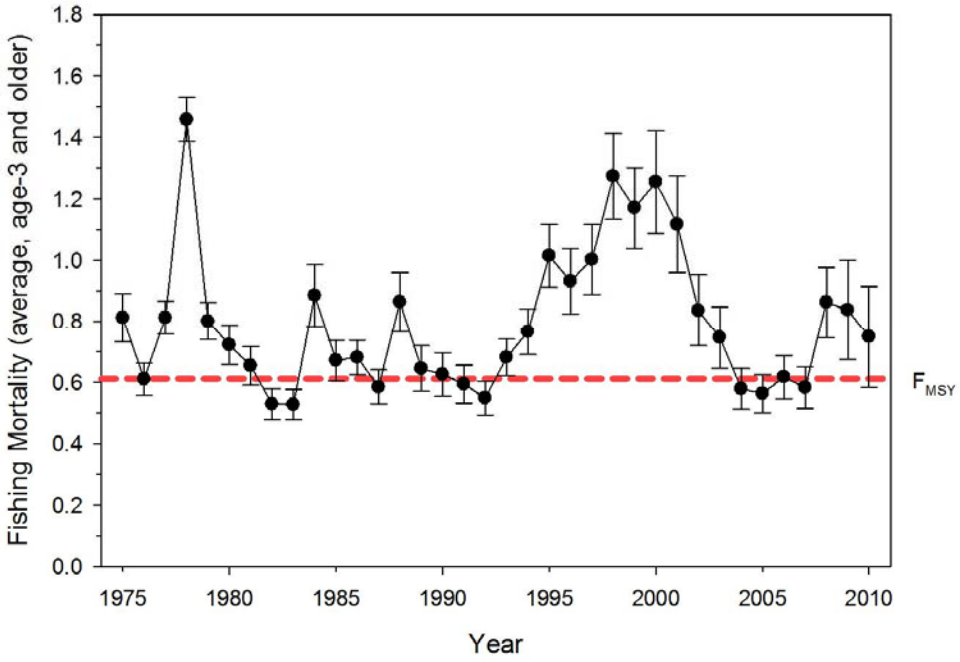


Figure 7-7. Trends in estimates of fishing mortality of WCNPO striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals.

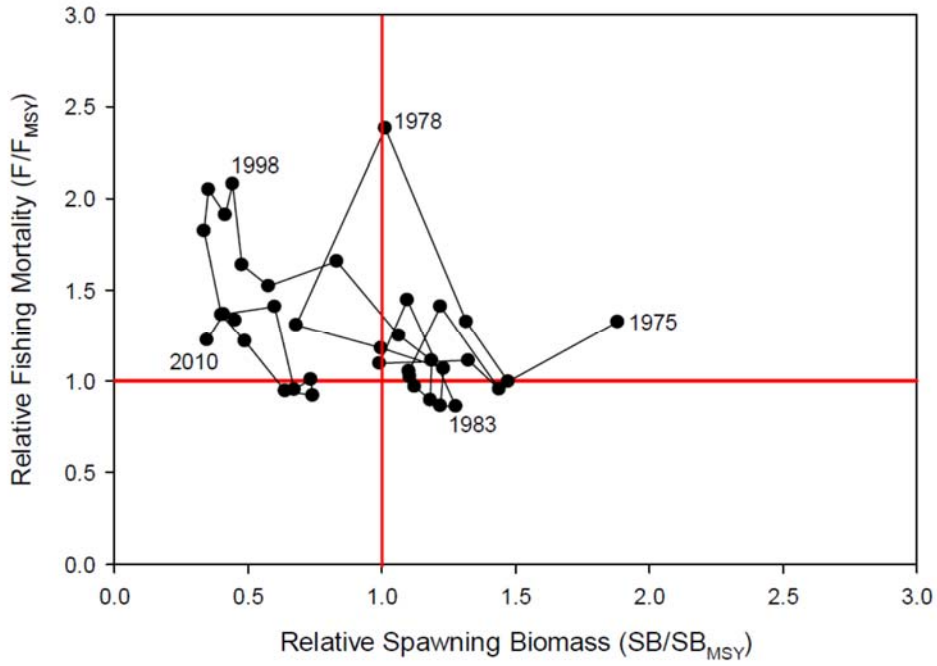


Figure 7-8. WCNPO striped marlin (*Kajikia audax*) Kobe plot, 1975-2012.

Conservation Advice

Reducing fishing mortality would likely increase spawning stock biomass and would improve the chances of higher recruitment. The BILLWG noted that current management measures to reduce catch put forward by the WCPFC in 2010 were based on the outdated 2007 stock assessment.

Based on new projection results, fishing at F_{MSY} would lead to a spawning biomass decrease of about 8% in 2017 under recent average recruitment. In contrast if recruitment improves to the medium or long-term average patterns, increases of roughly 45% to 73% may occur.

7.5 Swordfish

The BILLWG Chair noted that there was new stock projection information for the (WCNPO) swordfish stock and this information was used to develop conservation advice recommendations for the WCNPO swordfish stock.

Conservation Advice

Stock Status

Stock projections from 2007-2012 based on WCNPO swordfish catch through 2012 show that the stock is not likely to be overfished and is not likely to be experiencing overfishing (Figure 7-9, Figure 7-10, and Figure 7-11).

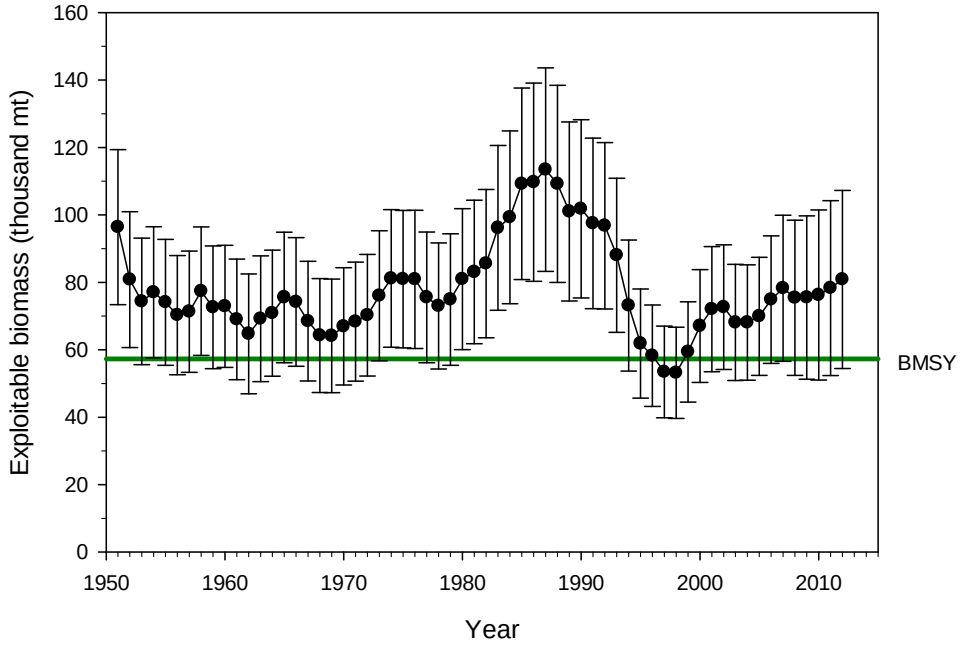


Figure 7-9 WCNPO swordfish (Xiphias gladius) exploitable biomass estimates during 1951-2012.

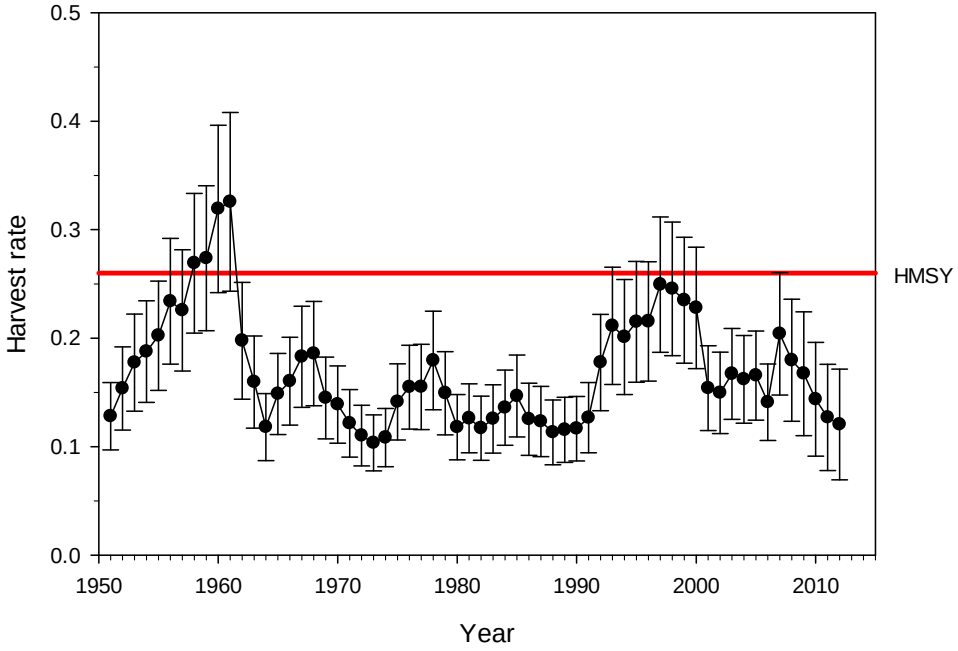


Figure 7-10. WCNPO swordfish (Xiphias gladius) harvest rate estimated during 1950-2012.

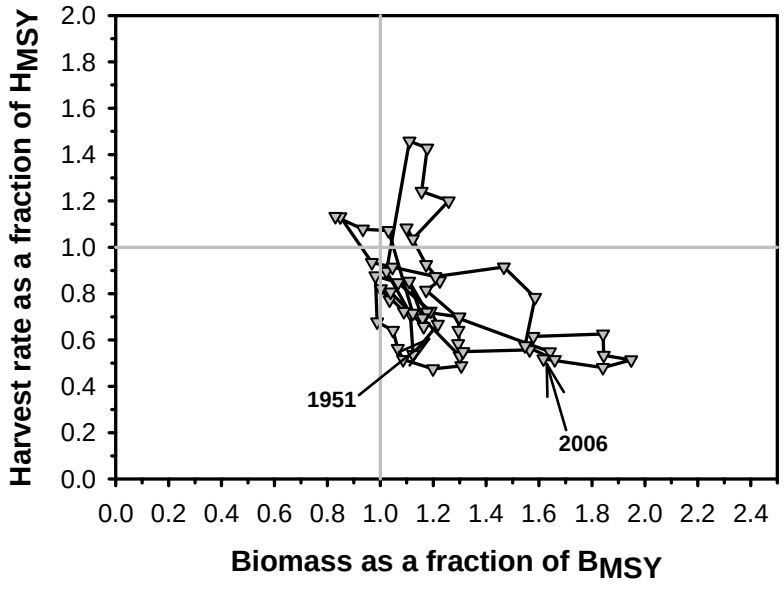


Figure 7-11. Sub-Area 1 biomass as a fraction of B_{MSY} and harvest rate as a fraction of H_{MSY} (1952 – 2006).

In 2012, the catch biomass of WCNPO swordfish by Japanese fleets totaled 4352 mt, a decline of 9 mt from the 2011 catch of 4343 mt (-0.2%)

Conservation Advice

The WCPO swordfish stock is healthy and is above the level required to sustain recent catches.

7.6 Blue Shark

S. Kohin, Chair of the SHARKWG, presented the recently completed North Pacific blue shark stock assessment (ISC/13/Annex 11). The assessment was completed in April 2013.

Stock biomass and fishing mortality levels were estimated using a state-space Bayesian surplus production model (BSP2) that fit estimated catch to standardized CPUE data compiled by the SHARKWG from 1971 through 2011. Annual catch estimates were derived for a variety of fisheries by nation and compiled into a single catch time series for input into the BSP2 model. The SHARKWG developed annual estimates of standardized CPUE for several fisheries and used criteria to select representative indices for the assessment.

Standardized CPUE from the Japanese shallow longline fleet that operates out of Hokkaido and Tohoku ports for the periods 1976-1993 and 1994-2010 were used as measures of relative population abundance in the base case assessment (Figure 7-12). A Fletcher-Schaefer production model was fit in a likelihood-based statistical framework with priors assigned to several parameters, including the intrinsic rate of population increase (r) and the ratio of initial biomass to carrying capacity (B_{init}/K). Bayesian posteriors of model parameters and derived outputs from the base case model were used to characterize stock status.

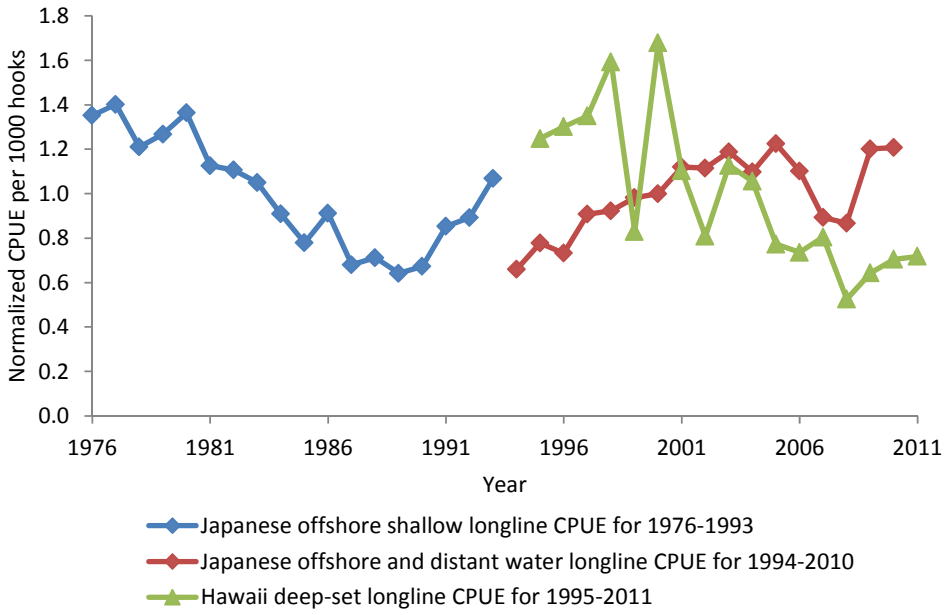


Figure 7-12. Standardized CPUEs used as abundance indices in the blue shark (*Prionace glauca*) stock assessment. The base-case model was fitted to the Japanese longline early (1976-1993), and late indices (1994-2010). A sensitivity run was fitted to the Hawaii deep-set longline index (1995-2011) and the Japanese longline early index to examine the effect of an alternative index for the late period.

The SHARKWG recognized uncertainties in the procedures used to estimate catch and standardized CPUE series, and in the selection of input parameters and priors. The influence of these uncertainties on biomass trends and the 2011 fishing mortality level was assessed by constructing 21 sensitivity scenarios, which were designed to capture the maximum range of uncertainty in the input information, using alternative data and/or parameterizations.

Stock projections of biomass and catch of blue shark in the North Pacific from 2012 to 2031 were conducted assuming 21 alternative harvest scenarios and starting biomass levels. Status quo catch and F were based on the average over the recent 5 years (2006-2010). Estimated catch from 2011 was not used for projections due to the impact of the March 2011 Great East Japan Earthquake on Japanese fishing effort. A simulation model was used for annual projections, and included uncertainty in the population size at the starting year of stock projection, fishing mortality and productivity parameters.

Based on the trajectory of the base case model, median stock biomass of blue shark in 2011 (B_{2011}) was estimated to be 456,000 mt (Figure 7-13). Median annual fishing mortality in 2011 (F_{2011}) was 7.14% of B_{2011}. Catch in 2011 (C_{2011}) was estimated to be 75% of replacement yield (REPY). Stock status is reported in relation to maximum sustainable yield (MSY). Stock biomass in 2011 was approximately 60% higher than B_{MSY} and F_{2011} was estimated to be well below F_{MSY} (Table 7-3).

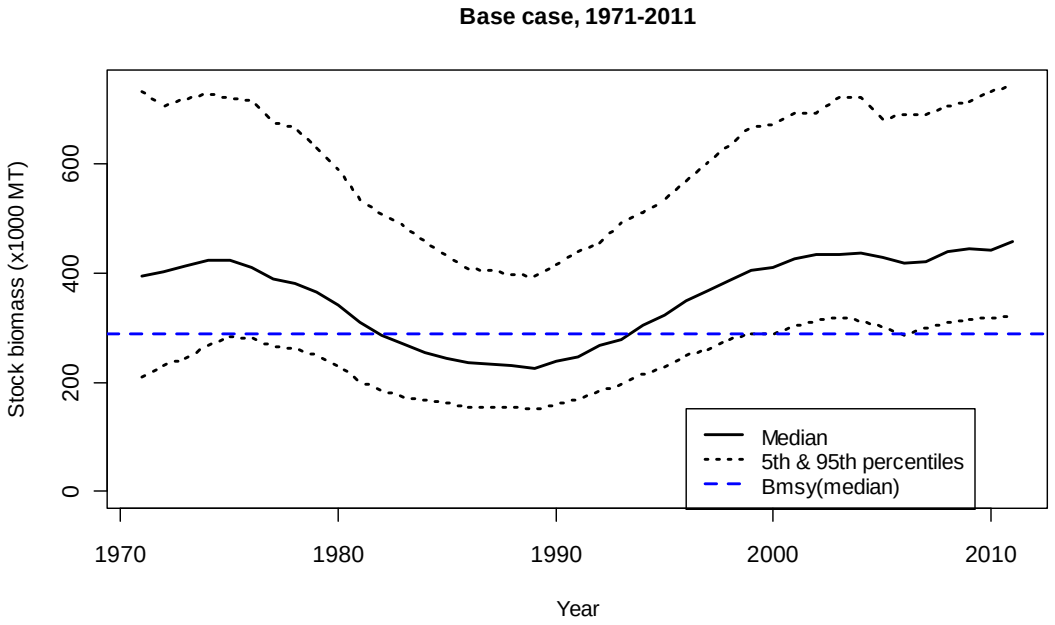


Figure 7-13.Median and 90% confidence intervals for the estimated historical stock dynamics of north Pacific blue shark (*Prionace glauca*).

Table 7-3. Base-case model results of blue shark (*Prionace glauca*) assessment - median and 90% confidence intervals for biological parameters and reference points. REPY and C_{2011} indicates replacement yield and catch in 2011, respectively.

Variable	5th Percentile	Median	95th Percentile
r	0.25	0.40	0.58
K ('000 t)	432	613	961
MSY ('000 t)	52	58	65
B_{MSY} ('000 t)	203	288	452
B_{1971} ('000 t)	208	393	732
B_{2011} ('000 t)	323	456	741
B_{2011}/B_{MSY}	1.30	1.59	1.88
B_{2011}/B_{1971}	0.81	1.17	1.94
B_{2011}/K	0.65	0.80	0.94
F_{MSY} (%)	12.6	20.0	29.0
F_{2011} (%)	4.4	7.1	10.0
F_{2011}/F_{MSY}	0.28	0.35	0.48
REPY ('000 t)	28	43	53
$C_{2011}/REPY$	0.59	0.75	1.08

While the results varied according to the input assumptions, there was agreement in nearly all scenarios in terms of the key model results: stock biomass was near a time-series high in 1971, fell to its lowest level in the late 1980s, and subsequently increased gradually and has leveled off at a biomass similar to that at the beginning of the time-series (Figure 7-14). A single scenario using CPUE data for the Hawaii-based deep longline fleet for 1995-2011 in place of the Japan shallow longline index for 1994-2010, showed a continual decline in stock biomass from 1971 to 2011. However, the Hawaii index was not considered to be representative of the stock due to the relatively small amount of catch and spatial coverage, and the potential impact of regulatory changes in the fishery.

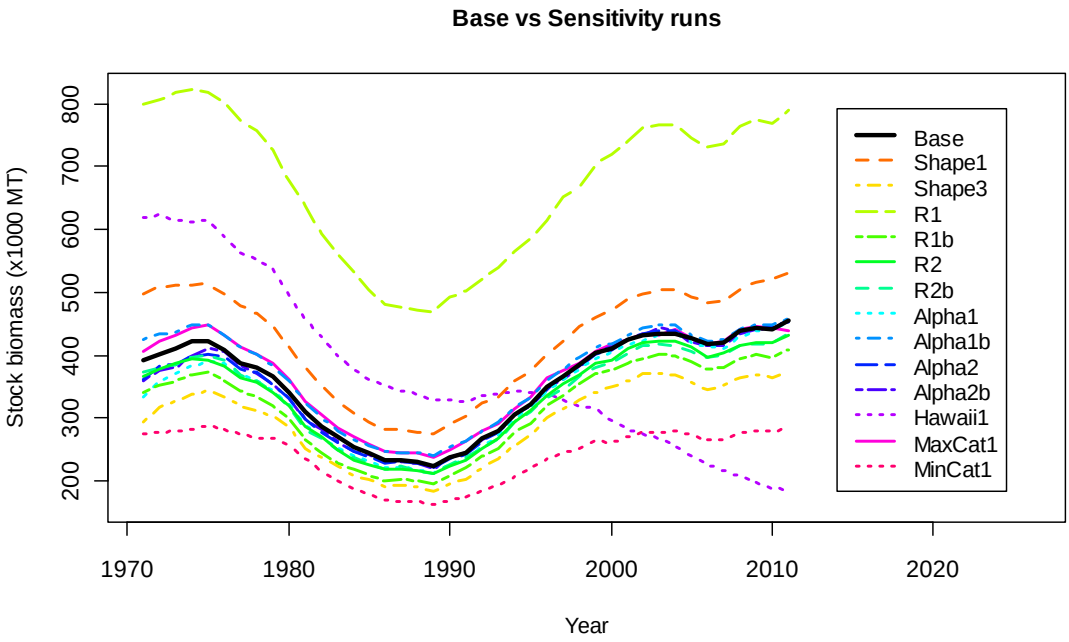


Figure 7-14. Comparison of trajectories of median stock biomass between the base case and sensitivity runs. See blue shark (*Prionace glauca*) assessment report (Annex 11) text for run identifiers and detailed descriptions of the sensitivity runs.

Future projections of the base-case model show that median blue shark biomass in the North Pacific will remain above B_{MSY} under the catch harvest policies examined (status quo, +20%, -20%). Similarly, future projections under different fishing mortality (F) harvest policies (status quo, +20%, -20%) show that median blue shark biomass in the North Pacific will remain above B_{MSY} (Table 7-4).

Projections under different catch and fishing mortality policies were also conducted for the maximum and minimum catch model scenarios. In all cases, patterns of trajectories were essentially the same as for the base case, and the projected stock biomass remained above B_{MSY}. Projected stock biomass was lower for runs with either catch or the F at 20% above current levels, but nonetheless remained above B_{MSY} (Table 7-4).

Discussion

The Plenary discussed several issues with the assessment that could affect the conclusions on stock status. First, the pattern of residuals for the Japan longline early CPUE index shows periodicity resulting in a non-normal distribution, which could indicate model misspecification. The SHARKWG Chair indicated that the residuals were low in magnitude and that the SHARKWG had concluded that model fitting was good [add something about WG examining the patterns]. Second, while the reasons for not including the Hawaii longline CPUE index in the base-case model were discussed at length, it was noted that inclusion of the Hawaii CPUE index would lead to a different conclusion concerning stock status but a poorer fit to the assessment data. It was reiterated that it was excluded because of the small scale and proportion of catch and potential impacts of regulatory changes on catchability. Third, the use of some CPUE indices to generate catch estimates raised concerns about the statistical treatment of these CPUE and catch data in the assessment model. Several catch time series were not estimated using CPUE indices. The potential effects of these issues should be investigated in the future through simulation.

Recognizing these concerns, the Plenary agreed that the blue shark assessment represents the best available science and can be used as a basis for conclusions on stock status and conservation advice.

Stock Status and Conservation Advice

Stock Status

Model inputs for this assessment have been improved since the previous assessment[5] and provide the best available scientific information. However, there are uncertainties in the time series for estimated catch and abundance indices for blue shark in the North Pacific, as well as for many life history parameters used to estimate stock productivity. Available catch composition information demonstrates evidence of spatial and temporal stratification by size and sex. The use of other modeling approaches, if sufficient data are available, may provide additional insights into stock dynamics. Improvements in the monitoring of blue shark catches, including recording the size and sex of sharks retained and discarded for all fisheries, as well as continued research into the biology and ecology of blue shark in the North Pacific are recommended.

Based on the base case and most alternative model scenarios, the blue shark biomass level in 2011 in the North Pacific is estimated to be near the highest levels seen in the time series, and the current fishing mortality rates and catch levels are below those expected to produce MSY. Stock status in relation to maximum sustainable yield (MSY) demonstrates that the stock is not overfished and that overfishing is not occurring (Figure 7-15**).**

[5] Kleiber, P., S. Clarke, K. Bigelow, H. Nakano, M. McAllister, and Y. Takeuchi. 2009. North Pacific Blue Shark Stock Assessment. NOAA Technical Memorandum, NMFS-PIFSC-17. p.

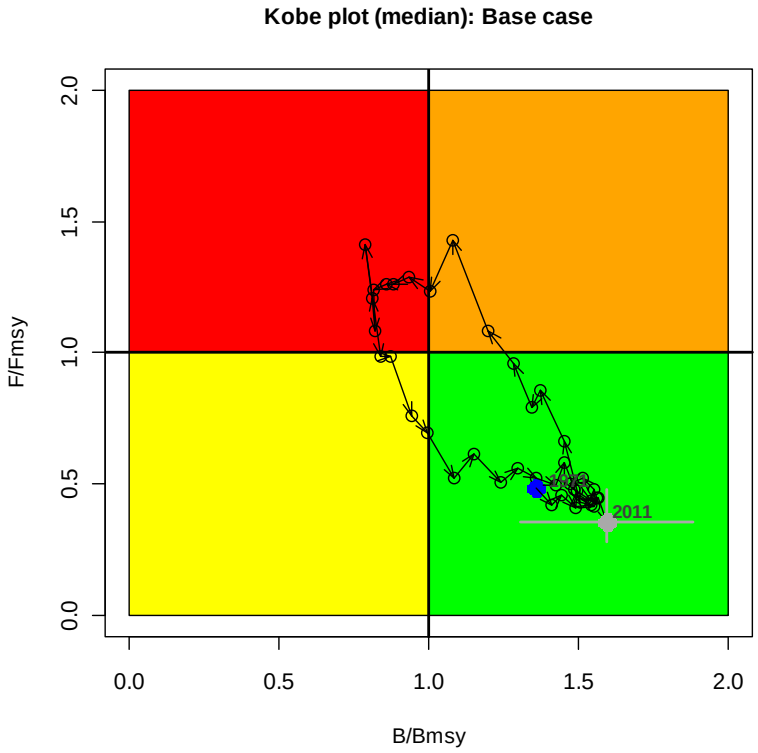


Figure 7-15. Kobe plot for the base-case in the North Pacific blue shark (*Prionace glauca*) stock assessment. The solid blue circle indicates the median estimate in 1971 (the start-year of stock assessment calculation); the solid gray circle and horizontal and vertical solid gray lines indicate the median and 90% confidence limits in 2011, respectively.

A single scenario using CPUE data for the Hawaii-based deep longline fleet for 1995-2011 in place of the Japan shallow longline index for 1994-2010 showed a continual decline in stock biomass from 1971 to 2011, which could lead to a different conclusion regarding stock status. The Hawaii index was not considered to be representative of the Pacific-wide stock due to the relatively small amount of catch, limited spatial coverage, and the potential impact of regulatory changes in the fishery.

Conservation Advice

Based on the base-case and most alternative model scenarios, the North Pacific blue shark stock is not overfished and overfishing is not occurring.

Future projections of the base case model show that median blue shark biomass in the North Pacific will remain above B_{MSY} under the catch harvest policies examined (status quo, +20%, -20%). Similarly, future projections under different fishing mortality (F) harvest policies (status quo, +20%, -20%) show that median blue shark biomass in the North Pacific will remain above B_{msy} (Table 7-4**).**

Table 7-4. Decision table based on results of future projections for the base case blue shark (*Prionace glauca*) assessment. Catch harvest control policies examined include status quo catch (calculated as the average for 2006-2010) and ± 20% change from status quo catch. F harvest control policies examined included status quo F (calculated as the average for 2006-2010), ± 20% change from status quo F, and Fmsy.

Harvest Policy		Current				5-Year Projection					20-Year Projection				
		Total C_{2011}	B_{2011} / B_{msy}	F_{2011} / F_{msy}	C_{2011} / REPY	Total C_{2016}	B_{2016} / B_{msy}	P(B_{2016} > B_{msy})	F_{2016} / F_{msy}	C_{2016} / REPY	Total C_{2031}	B_{2031} / B_{msy}	P(B_{2031} > B_{msy})	F_{2031} / F_{msy}	C_{2031} / REPY
Catch	Status Quo	32.54	1.59	0.35	0.75	40.64	1.55	1.00	0.45	0.93	40.64	1.58	0.99	0.44	0.95
	+ 20%	32.54	1.59	0.35	0.75	48.77	1.45	0.99	0.58	1.05	48.77	1.42	0.95	0.60	0.99
	- 20%	32.54	1.59	0.35	0.75	32.51	1.65	1.00	0.34	0.79	32.51	1.72	1.00	0.33	0.83
F	Status Quo	32.54	1.59	0.46	0.75	38.45	1.55	1.00	0.46	0.91	42.92	1.55	0.99	0.46	1.37
	+ 20%	32.54	1.59	0.56	0.75	43.99	1.46	0.99	0.56	0.96	48.45	1.44	0.96	0.56	1.28
	- 20%	32.54	1.59	0.37	0.75	32.24	1.63	1.00	0.37	0.85	36.42	1.65	1.00	0.37	1.54
	F_{msy}	32.54	1.59	0.35	0.75	66.38	1.12	NA	1.03	1.17	57.97	1.00	NA	1.00	1.00

The stock is in a healthy condition and current levels of *F* are sustainable in the short and long term. Due to data uncertainties, improvements in the monitoring of blue shark catches and discards, as well as continued research into the biology and ecology of blue shark in the North Pacific, are recommended.

8 REVIEW OF STOCK STATUS OF SECONDARY STOCKS

8.1 Eastern Pacific – Yellowfin, Bigeye, and Skipjack Tunas

M. Dreyfus presented the results of the recent IATTC YFT, BET and SKJ stock assessments. The principal component of effort related to tuna catches in the EPO is the purse seine fishery. For YFT, sets associated with dolphins are most important in terms of catch, although in terms of the impact to the stock, floating object sets and sets on non-associated schools surpass the impact of the dolphin-associated sets.The recent spawning biomass estimate is below the level estimated to produce MSY but the F multiplier was close to F_{MSY}.

For BET, the catch is dominated by the FAD fishery, which also has the biggest impact on the stock. Spawning biomass is above SB_{MSY}, but the F multiplier was slightly above F_{MSY}.

Recent assessments for both species have shown slight variations from these results so no special concern was pointed out by the scientific staff. Management regulations already in place in the EPO were considered to be beneficial and adopted for the 2014-2016 period.

In the case of SKJ, there is no formal assessment due to lack of information or reliability on several biological parameters. Based on several fishery indicators, there are no concerns about the level of catch. Nevertheless, management conservation measures in place do have a benefit for the stock although they are not directed to this stock.

8.2 Western and Central Pacific Ocean – Bigeye, Yellowfin, Skipjack, and South Pacific Albacore Tunas

A. Beeching gave the overview of tuna production by gear and species in the WCPO Reported total catch dropped in 2011, compared to the previous year, but has recovered in the current year. He then reported on the stock status of South Pacific albacore, Southwest Pacific striped marlin, oceanic whitetip shark, silky shark and

South Pacific swordfish. It was noted that no stock assessments had been conducted on yellowfin, skipjack and bigeye, these being scheduled for 2014. Actions taken in response to the peer review of the 2011 stock assessment for bigeye tuna were presented. The presentation concluded with a listing of the stock assessments due to be presented at SC9, and the upcoming WCPFC meetings and workshops scheduled for the latter half of 2013.

Discussion

Concerns about whether catch rates for South Pacific albacore are economically viable are based both on economic analyses and statements by affected countries. However, the economic analyses were conducted externally and have not yet been reviewed by the WCPFC.

9 REVIEW OF STATISTICS AND DATA BASE ISSUES

9.1 Report of the STATWG

Ren-Fan Wu, the STATWG Chair, provided a summary of STATWG activities since ISC12 (*ISC/13/ANNEX 4*). The STATWG Steering Group held two intercessional meetings in Shimizu, Japan, in 10-12 September 2012, and in 30 May 2013. The Steering Group also held a training workshop on the ISC online data submission system in Shimizu, Japan, in May 28-29, 2013. A meeting of the entire STATWG was held in Busan, Korea, in 9-10 July 2013, prior to ISC13; 1 Information Paper and 1 Working Paper was submitted for this meeting.

It was reported that all 10 items in the 2012 STATWG Work Plan were completed since ISC12. Accomplishments of the STATWG over the past year include:

1. Continuing with the successful exchange of data inventories with the WCPFC
2. Completed successfully an exchange of data inventories with the IATTC for the first time
3. Drafted guidelines for the archival of stock assessment files from the species Working Groups
4. Provided public domain graphs of ISC Member annual catches by species and gear on the ISC website
5. Modified the ISC database and initiated a new online data submission system for Members for Category Ic, Ie, and II data
6. Continued improvements and updates to the ISC website

At the STATWG meeting in July 9-10, the following topics were presented and discussed:

1. Updates to Member's data collection systems and port sampling programs
2. Data needs and concerns from the chairs of the species Working Groups
3. Member performance and Report Card (Annex13) for the submission of 2012 data
4. Member performance for the submission of historical data (CAT Ic, Ie, II, and III)

The 2013 Work Plan for the STATWG was developed, as well as recommendation to the ISC13 Plenary. The national contacts list for the STATWG was also provided. The STATWG Steering Group will schedule their next meeting in Honolulu, Hawaii, USA, in January, 2014.

Discussion

The ISC Chair will contact China to discuss its poor performance on annual data submissions to the ISC and participation at the ISC Plenary.

The STATWG Chair stated that members will be able to amend historical data in the ISC database in accordance with STATWG guidelines to be developed and adopted at the STATWG meeting prior to the ISC14 Plenary.

The US noted that discrepancies in shark catches and the count of albacore troll vessels between the database and National Reports have been rectified.

10 REVIEW OF MEETING SCHEDULE

10.1 Time and Place of ISC14

Chinese Taipei graciously agreed to host ISC14, the exact location to be determined at a later date. Working Group Workshops are tentatively scheduled for July 10-14, 2014, followed by the Plenary Meeting from July 16-21, 2014. The ISC Chair thanked Chinese Taipei for their offer.

10.2 Working Group Intercessional Meetings

The Plenary agreed to the schedule of working group meeting shown in Table 10-1.

Table 10-1. Schedule of ISC meetings August 2013-July 2014.

Date	Meeting	Contact
2013		
5-12 Nov	ALBWG - Shimizu, Japan (Data Prep)	J. Holmes John.Holmes@dfo-mpo.gc.ca
13-16 Nov	Tuna Ageing Workshop - Shimizu, Japan (Workshop)	O. Abe turtlea@affrc.go.jp
2014		
9-11 Jan	SHARKWG - La Jolla, CA (Age and growth workshop)	S. Kohin Suzanne.Kohin@noaa.gov
13-18 Jan	SHARKWG - La Jolla, CA (Mako data prep)	S. Kohin Suzanne.Kohin@noaa.gov
21-23 Jan	STAT (Steering Committee)	R.-F. Wu fan@ofdc.org.tw
11-19 Feb	BILLWG - Honolulu, HI (SWO Assessment Update)	J. Brodziak Jon.Brodziak@noaa.gov
17-23 Feb	PBFWG - La Jolla, CA (Assessment update)	Z. Suzuki zsuzuki@affrc.go.jp
14-28 Apr	ALBWG (Assessment)	J. Holmes John.Holmes@dfo-mpo.gc.ca
2-9 June	SHARKWG - Keelung, Chinese-Taipei (Mako data prep)	S. Kohin Suzanne.Kohin@noaa.gov
10-11 Jul	STATWG - Chinese-Taipei (Meeting)	R.-F. Wu fan@ofdc.org.tw
12 Jul	SHARKWG - Chinese-Taipei (Meeting)	S. Kohin Suzanne.Kohin@noaa.gov
13 Jul	ALBWG - Chinese-Taipei (Meeting)	J. Holmes John.Holmes@dfo-mpo.gc.ca
14 Jul	PBFWG - Chinese-Taipei (Meeting)	Z. Suzuki zsuzuki@affrc.go.jp
14 Jul	BILLWG - Chinese-Taipei (Meeting)	J. Brodziak Jon.Brodziak@noaa.gov
16-21 Jul	ISC14 - Chinese-Taipei (Plenary)	G. DiNardo Gerard.DiNardo@noaa.gov

[BILLWG=Billfish Working Group; PBFWG=Pacific Bluefin Tuna Working Group; SHARKWG=Shark Working Group; ALBWG=Albacore Working Group, STATWG=Statistics WG]

11 ADMINISTRATIVE MATTERS

11.1 Recommendations from Peer Review of Function and Process

S. Shoffler, Office of the ISC Chair, presented the results of the peer review of ISC's function. The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) requires the function of the ISC Committee and subsidiary bodies be reviewed every 5 years and was completed in 2012. A Peer Review Team (PRT) of three recognized peers with no Committee affiliation consisting of Drs. Jerry Ault (USA, Chair), Chang Ik Zhang (Republic of Korea) and Hiroyuki Matsuda (Japan) was formed. Terms of Reference provided 10 detailed questions for the PRT to specifically address. Their recommendations (Plenary document 10) were distributed to ISC Members in April 2013 and focused on improvements to the ISC operational guidelines, managing data information systems, working group and stock assessment reports,

clarification of assessment assumptions, outreach, research and science administration, and funding mechanisms for ISC. The PRT noted that ISC is a unique science organization due to its science-driven mission, and apparent independence. ISC has built a special role that covers the gaps and helps to plan the necessary future science with a vision to support next-generation stock assessments. ISC13 briefly reviewed and discussed the main PRT recommendations.

11.2 ISC Institutionalization and Draft ISC Administrative Budget

At ISC12, the existence of formal documentation of ISC membership was raised and the Chair agreed to look into the issue. Since then, the ISC Office of the Chair searched for documentary evidence of membership beyond the original agreement between Japan and the United States. Beyond that agreement are the following documents under which ISC has operated since 1995: The WCPFC Convention established NC and details who can or cannot be a Member of NC (Article 11, paras 6 and 7). The Convention also established the legitimacy of using an existing organization (e.g., ISC) as a science provider (Article 13). The ISC was established in 1995 through a joint press release by the US and Japan. Membership requirements are detailed in the ISC Operations Manual and have been accepted by participating ISC Members for the past several years. At the time ISC was established, it was understood that those who would be NC Members would also be ISC Members. The 2005 WCPFC-ISC MOU established the ISC as the science provider for the WCPFC NC. ISC and IATTC have a Memorandum of Cooperation which enables IATTC to participate in ISC Plenary and Working Group meetings without having to apply each time. The Office of the Chair points out that nations that have not participated in ISC have not contributed to the fishery science information and advice that ISC provides to the NC for CMM development. Members were asked to consider whether ISC should work towards a formal agreement, and the following questions were posed for discussion: What are the goals, benefits and drawbacks of formalizing ISC? Are the governments of the respective Members interested in and willing to formalize ISC?

Discussion

The Plenary generally supported efforts to create a formal institutional structure for ISC. Developing a formal relationship with PICES to accomplish this was discussed. This would be a medium-term solution while the option of establishing an existence through an inter-governmental agreement is explored. It is recognized that establishing an inter-governmental organization, for example through a multilateral treaty, will be a lengthy and complex process.

The US, while supporting greater communication and interaction with PICES as an interim approach, recommended against ISC making any binding organizational commitments with PICES at this time. Instead, the ISC should propose a 5-year program of scientific collaboration concerning the environmental influences on North Pacific highly migratory fish stocks.

It was agreed that the ISC should propose a special session at the 2014 PICES meeting in Korea or the formation of a study group in advance of that meeting. In this regard, ISC should highlight a set of science themes shared by ISC and PICES. The deadline for submitting a proposal for a workshop or session at the 2014 PICES meeting is 7 September 2013. The Chair agreed to work with members to develop and submit a proposal to that end.

11.3 Science Planning

G. DiNardo, ISC Chair, convened an ISC Science Planning Meeting to order on July 16, to discuss the rational for developing an integrated science plan and to exchange ideas for potential science themes that the ISC could engage in to advance its scientific mission. Participants included national delegation heads and senior scientists from Member countries, as well as the Chairs of the various working groups. Each delegation was asked to present their ideas for consideration, as was each working group Chairs.

It was noted that the development of a science plan was discussed briefly at ISC12 and was a recommendation stemming from the recent ISC Function Review. In keeping with this objective, attendees were asked to consider the proper scope of and overarching themes for ISC research. It was emphasized that expansion beyond the traditional role of stock assessments into areas such as capacity building (e.g., training or technical workshops, mentoring) could prove fruitful and cost-effective.

Scientific Themes

After a lengthy discussion six overarching scientific themes emerged. In addition, a suite of research topics for the ISC to consider also emerged. While not all of the themes are considered to be research, they are included due to their importance to the science enterprise system. As this was the first discussion concerning an ISC science plan, other topics could be included as the plan progresses. The research themes and topics include:

- Biology
    - stock structure (genetics & tagging)
    - age-growth
    - maturity & fecundity
    - distribution and migration patterns
    - Reproductive ecology
    - natural mortality

- Fishery Monitoring
    - catch and effort statistics
    - biosampling (i.e., length sampling)
    - data acessability and sharing
    - technological advancements to allow for real-time monitoring
    - comparability
    - cooperative research (with industry)

- Resource Monitoring
    - recruitment dynamics
    - schooling dynamics
    - steepness (h)

- Fisheries Oceanography and Habitat
    - influence of oceanography on recruitment, distribution and availability

    - essential habitat

- Resource Modeling and Assessments
    - CPUE standardization
    - model selection
    - advancing modeling platforms (existing or new)
    - visualization and decision support tools
    - management strategy evaluations
    - reference points (biological, economic and ecosystem)

- Capacity Building
    - mentoring
    - workshops
    - training
    - scientific exchange

It was suggested that all data collection programs should adhere to sound statistical sampling practices, and when conducting fisheries oceanography studies, working collaboratively with scientists from PICES should be considered.

G. DiNardo concluded the meeting by reiterating the importance of capacity building in the ISC and indicted that the next step could include the formation of a small "task force" (ca. 4 members) in the coming year to expand on the ideas discussed. The task force would be charged with completing the plan in time for consideration at ISC14.

Discussion

The Plenary discussed elements of a science plan, noting fisheries oceanography and social science topics. A science plan could enhance ISC capacity and stature through scientist exchanges and workshops. Specifically, a three-day training workshop could be held in advance of the Plenary instead of WG meetings. The ISC currently does not have a budget for such activities but with a science plan support for activities could be sought.

11.4 Tuna Age Determination Workshop

ISC12 agreed to a joint North Pacific albacore tuna (NPALB) and Pacific bluefin tuna (PBF) ageing workshop. Since then, a small steering committee has met and begun plans. The plan, to date, is to hold the workshop over four days from 13-16 November 2013, at National Research Institute of Far Seas Fisheries Laboratory, Shimizu, Japan. The group identified the following objectives for the workshop: (1) To identify existing age determination issues for PBF and NPALB; (2) To discuss and share practical methods for ageing techniques among specialists for improving technical skills; (3) To develop standardized protocols for ageing techniques where appropriate, and (4) To produce age determination manuals for PBF and NPALB. Expected participants would be tuna and tuna-like species ageing specialists from ISC member countries. Three or four specialists would be invited with funding from Fisheries Research Agency of Japan. Participation will be limited to 30 people. The workshop will produce a manual with chapters on Pacific bluefin tuna and North Pacific albacore tuna ageing techniques as an ISC product. Three contacts were identified: Osamu Abe (Ageing Workshop Chair

and local contact); John Holmes (ALB contact); and Sarah Shoffler (ISC Office of the Chair). The agenda will be finalized and workshop logistics finalized over the next few months.

11.5 Fifth International Billfish Symposium

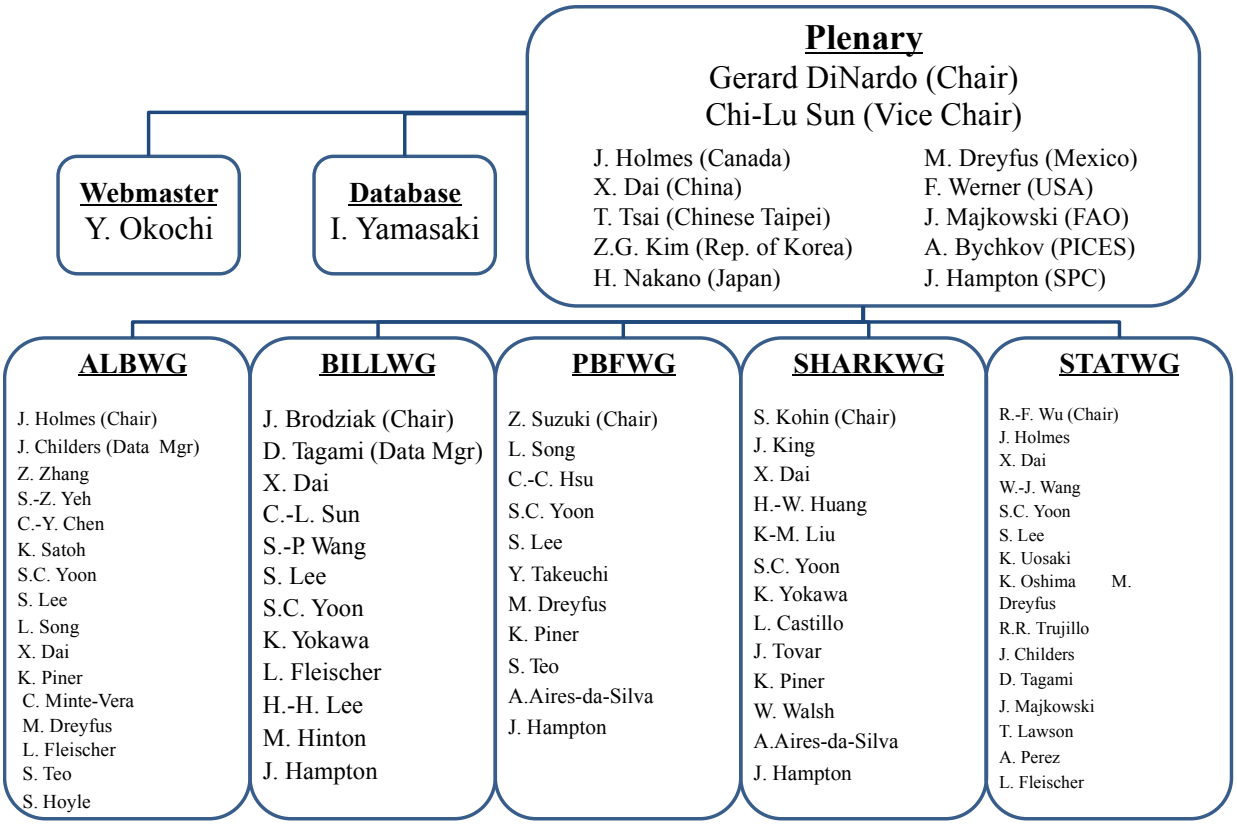
The 5th International Billfish Symposium, organized jointly by the Institute of Oceanography, National Taiwan University and the ISC, is scheduled for November 4-8, 2013 in Taipei, Taiwan. The symposium provides a forum for discussing recent advances in billfish research, including population structure, biological studies, tagging experiments, ecosystem modeling, stock assessments, and fisheries management. The symposium website is http://billfish5.oc.ntu.edu.tw.

11.6 Working Group Chairperson Elections and Terms

The Plenary reviewed the current terms of WG Chairs. It was noted that elections at ISC 14 will include the ISC vice Chair, as well as chairs of the BILLWG, SHARKWG, and STATWG.

11.7 Organizational Chart and Contact Persons

ISC Organizational Chart (July 2013)



11.8 Website

Y. Okochi, ISC Webmaster, reported on the status of ISC website improvements. Since ISC12, the following improvements have been implemented:

1. Public domain graphs of ISC Member annual catches by species and gear are displayed in the "Fishery Statistics" section; original data can also be downloaded
2. "Working Groups" sections have been completed and opened with information such as species profiles, fisheries, and stock status
3. New "Stock Assessments" page lists completed assessments since 2012, with access to the stock assessment reports and the schedule for future stock assessments

Enhancements of the functionality of the ISC website will be continued.

Discussion

The ISC Chair thanked Ms. Okochi for the continued improvements to the website. Since the business card of any organization is their website, the changes implemented by Ms. Okochi's during her tenure have clearly elevated both the visibility of, and accessibility to, the ISC.

11.9 ISC Chairperson

G. DiNardo was re-elected to a second 3-year term as ISC Chair. The reelected Chair thanked the Members for their support over the past 3 years, and looks forwarded to their continued commitment over the next three years.

11.10 Other Administrative Matters

There was a discussion of the need to develop criteria for when a stock assessment update should be performed. It was noted that in the past the ISC has done updates for a variety of reasons including changes in key biological parameters and concerns about stock condition. The Office of the Chair will gather information on criteria used by other organizations and provide its findings to the members.

12 ADOPTION OF REPORT

13 CLOSE OF MEETING

The meeting was closed at noon on 22 July 2014.

14 CATCH TABLES

Table 14-1 [1] North Pacific albacore catches (in metric tons) by fisheries, 1952-2012. Blank indicates no effort. -- indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

Year	Japan							Korea		Chinese-Taipei			United States of America [3]							Mexico		Canada	Other		Grand Total
	Purse Seine	Gill Net	Set Net	Pole and Line	Troll	Longline	Other	Gill Net	Longline	Gill Net [2]	Distant Water Longline	Offshore Longline	Purse Seine	Gill Net	Albacore Troll [4]	Tropical Troll & Handline	Sport	Longline	Other [5]	Purse Seine	Pole and Line [6]	Troll	Troll [7]	Longline [8,9]	
1952	154		55	41,787	--	26,687	182								23,843		1,373	46				71			94,198
1953	38		88	32,921	--	27,777	44								15,740		171	23				5			76,807
1954	23		6	28,069	--	20,958	32								12,246		147	13							61,494
1955	8		28	24,236	--	16,277	108								13,264		577	9							54,507
1956			23	42,810	--	14,341	34								18,751		482	6				17			76,464
1957	83		13	49,500	--	21,053	138								21,165		304	4				8			92,268
1958	8		38	22,175	--	18,432	86								14,855		48	7				74			55,723
1959			48	14,252	--	15,802	19								20,990		0	5				212			51,328
1960			23	25,156	--	17,369	53								20,100		557	4				141			63,403
1961	7		111	18,639	--	17,437	157								12,055		1,355	5	1	2	39	4			52,649
1962	53		20	8,729	--	15,764	171								19,752		1,681	7	1	0	0	1			47,264
1963	59		4	26,420	--	13,464	214								25,140		1,161	7		31	0	5			68,937
1964	128		50	23,858	--	15,458	269								18,388		824	4		0		3			62,393
1965	11		70	41,491	--	13,701	51								16,542		731	3	1	0		15			73,033
1966	111		64	22,830	--	25,050	521								15,333		588	8		0		44			66,149
1967	89		43	30,481	--	28,869	477				330				17,814		707	12				161			83,096
1968	267		58	16,597	--	23,961	1,051				216				20,434		951	11				1,028			69,480
1969	521		34	31,912	--	18,006	925				65				18,827		358	14		0		1,365			75,023
1970	317		19	24,263	--	16,222	498				34				21,032		822	9		0		390			68,022
1971	902		5	52,957	--	11,473	354		0		20				20,526		1,175	11		0		1,746			91,240
1972	277	1	6	60,569	--	13,022	638		0		187				23,600		637	8		100	0	3,921			106,716
1973	1,353	39	44	68,767	--	16,760	486		5		--				15,653		84	14		0		1,400			106,841
1974	161	224	13	73,564	--	13,384	891		91		486				20,178		94	9		1	0	1,331			115,204
1975	159	166	13	52,152	--	10,303	230		7,051		1,240				18,932		640	33	10	1	0	111			94,284
1976	1,109	1,070	15	85,336	--	15,812	270		2,213		686				15,905		713	23	4	36	5	278			126,175
1977	669	688	5	31,934	--	15,681	365		501		572				9,969		537	37		3	0	53			62,511
1978	1,115	4,029	21	59,877	--	13,007	2,073		670		6				16,613		810	54	15	1	0	23			99,264
1979	125	2,856	16	44,662	--	14,186	1,139	0			81				6,781		74	--		1	0	521			70,745
1980	329	2,986	10	46,742	--	14,681	1,177	6	592	--	249				7,556		168	--		31	0	212			75,121
1981	252	10,348	8	27,426	--	17,878	699	16	5,956	--	143				12,637		195	25		8	0	200			76,539
1982	561	12,511	11	29,614	--	16,714	482	113	4,874	--	38				6,609		257	105	21	0	0	104			72,439
1983	350	6,852	22	21,098	--	15,094	99	233	2,162	--	8				9,359		87	6		0	0	225			56,202
1984	3,380	8,988	24	26,013	--	15,053	494	516	1,925	--	--		3,728		9,304		1,427	2		107	6	50			72,047
1985	1,533	11,204	68	20,714	--	14,249	339	576	2,789	--	--		26	2	6,415	7	1,176		118	14	35	56			60,819
1986	1,542	7,813	15	16,096	--	12,899	640	726	3,833	--	--		47	3	4,708	5	196		66	3	0	30			49,054
1987	1,205	6,698	16	19,082	--	14,668	173	817	1,624	2,514	--		1	5	2,766	6	74	150	139	7	0	104			50,207
1988	1,208	9,074	7	6,216	--	14,688	170	1,016	800	7,389	--		17	15	4,212	9	64	307	76	15	0	155			46,036
1989	2,521	7,437	33	8,629	--	13,031	433	1,023	562	8,350	40		1	4	1,860	36	160	248	10	2	0	140			44,574
1990	1,995	6,064	5	8,532	--	15,785	248	1,016	30	16,701	4		71	29	2,718	15	24	177	20	2	0	302			53,738
1991	2,652	3,401	4	7,103	--	17,039	395	852	5	3,398	12			17	1,845	72	6	312	20	2	0	139			37,274
1992	4,104	2,721	12	13,888	--	19,042	1,522	271	2	7,866	--			0	4,572	54	2	334	40	10	0	363			54,802
1993	2,889	287	3	12,797	--	29,933	897		3		5			0	6,254	71	25	438	194	11	0	494	0	1	54,302
1994	2,026	263	11	26,389	--	29,565	823		3		83			38	10,978	90	106	544	66	6	0	1,998	0	6	72,995
1995	1,177	282	28	20,981	856	29,050	78		14		4,280			52	8,125	177	102	882	4	5	0	1,761	94	0	67,948
1996	581	116	43	20,272	815	32,440	127		158		7,596		11	83	16,962	188	88	1185	10	21	0	3,321	469	0	84,487
1997	1,068	359	40	32,238	1,585	38,899	135		404		9,119	337	2	60	14,325	133	1,018	1653	12	53	0	2,166	336	1	103,942
1998	1,554	206	41	22,926	1190	35,755	104		226		8,617	193	33	80	14,489	88	1,208	1120	15	8	0	4,177	341	0	92,371
1999	6,872	289	90	50,369	891	33,339	62		99		8,186	207	48	149	10,120	331	3,621	1542	61	0	57	2,734	228	2	119,297
2000	2,408	67	136	21,550	645	29,995	86		15		7,898	944	4	55	9,714	120	1,798	940	24	70	33	4,531	386	46	81,465
2001	974	117	78	29,430	416	28,801	35		64		7,852	832	51	94	11,349	194	1,635	1295	39	0	18	5,248	230	652	89,404
2002	3,303	332	109	48,454	787	23,585	85		112		7,055	910	4	30	10,768	235	2,357	525	13	28	0	5,379	466	223	104,760
2003	627	126	69	36,114	922	20,907	85		146		6,454	712	44	16	14,161	85	2,214	524	8	29	0	6,847	431	(657)	91,178
2004	7,200	61	30	32,255	772	17,341	54		78		4,061	927	1	12	13,473	157	1,506	361	3	104	0	7,857	82	4,617	90,953
2005	850	154	97	16,133	665	20,420	234		420		3,990	482		20	8,479	175	1,719	296	1	0	0	4,829	52	4,637	63,654
2006	364	221	55	15,400	460	21,027	42		135		3,848	469		3	12,547	95	385	270	0	109	0	5,833	1	5,469	66,733
2007	5,682	226	30	37,768	519	22,336	44		137		2,465	451	77	4	11,908	98	461	250	0	40	0	6,040	7	3,765	92,308
2008	825	1,531	101	19,060	549	19,092	15		405		2,490	579	--	1	11,761	29	418	354	0	10		5,464	0	2,992	65,676
2009	2,076	149	33	31,172	410	21,995	43		101		1,866	512	39	4	12,938	100	677	203	0	17		5,693	0	1,693	79,720
2010	330	24	42	19,561	588	21,167	37		109		2,281	537	--	5	12,634	55	704	421	19	25		6,527	0	3,854	68,919
2011	480	12	50	25,705	443	20,956	78		84	3	2,972	462	--	5	11,037	88	424	708	37	0		5,415	(0)	(11,248)	(80,206)
2012	(480)	(12)	(50)	(27,117)	(443)	(21,315)	(78)		(157)	(3)	(2,055)	(588)	(5)	(8)	(14,137)	(280)	(902)	(659)	(6)	(0)		(2,497)		(11,248)	(82,040)

1 Data are from the ISC Albacore Working Group, July 12, 2013 except as noted.

2 Chinese-Taipei gill net catches for 2011 include 2 t from Offshore Other gear category.

3 USA estimates updated July 2013.

4 Albacore Troll estimates include catches caught with Pole-and-Line gear.

5 Other may include catches by Purse Seine.

6 Mexico Pole-and-line catches for 1999 and 2000 include 34 and 4 metric tons, respectively, from Longline.

7 Other Troll catches are from vessels registered in Belize, Cook Islands, Tonga, and Ecuador.

8 Other Longline data are from WCPFC Yearbook 2011 for non-member nations. Other Longline also includes updates provided by China.

9 Catch reported for Other Longline in 2011 requires verification of accuracy as this figure is much higher than the historical record.

Table 14-2 Pacific bluefin tuna catches (in metric tons) by fisheries, 1952-2012. Blank indicates no effort. -- indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

Year	Japan[1]									Korea[3]			Taiwan					United States[4]			Mexico			
	Purse Seine		Dist. & Off. Longline		Coastal Longline	Troll[2]	Pole and Line	Set Net	Others	Purse Seine	Troll	Trawl	Longline	Purse Seine	Distant Driftnet	Others	Sub Total	Purse Seine	Others	Sport	Purse Seine	Others	Sub Total	
	Tuna PS	Small PS	NP	SP																				
1952	7,680		2,694	9		667	2,198	2,145	1,700								17,094	2,076		2			2,078	19,172
1953	5,570		3,040	8		1,472	3,052	2,335	160								15,636	4,433		48			4,481	20,117
1954	5,366		3,088	28		1,656	3,044	5,579	266								19,027	9,537		11			9,548	28,575
1955	14,016		2,951	17		1,507	2,841	3,256	1,151								25,739	6,173		93			6,266	32,005
1956	20,979		2,672	238		1,763	4,060	4,170	385								34,268	5,727		388			6,115	40,383
1957	18,147		1,685	48		2,392	1,795	2,822	414								27,302	9,215		73			9,288	36,590
1958	8,586		818	25		1,497	2,337	1,187	215								14,666	13,934		10			13,944	28,610
1959	9,996		3,136	565		736	586	1,575	167								16,760	3,506	56	13	171	32	3,779	20,539
1960	10,541		5,910	193		1,885	600	2,032	369								21,531	4,547	0	1			4,548	26,079
1961	9,124		6,364	427		3,193	662	2,710	599								23,078	7,989	16	23	130		8,158	31,236
1962	10,657		5,769	413		1,683	747	2,545	293								22,107	10,769	0	25	294		11,088	33,195
1963	9,786		6,077	449		2,542	1,256	2,797	294								23,201	11,832	28	7	412		12,280	35,481
1964	8,973		3,140	114		2,784	1,037	1,475	1,884								19,406	9,047	39	7	131		9,224	28,631
1965	11,496		2,569	194		1,963	831	2,121	1,106				54				20,334	6,523	77	1	289		6,890	27,224
1966	10,082		1,370	174		1,614	613	1,261	129								15,243	15,450	12	20	435		15,918	31,161
1967	6,462		878	44		3,273	1,210	2,603	302				53				14,825	5,517	0	32	371		5,920	20,745
1968	9,268		500	7		1,568	983	3,058	217				33				15,634	5,773	8	12	195		5,989	21,623
1969	3,236		313	20	565	2,219	721	2,187	195				23				9,479	6,657	9	15	260		6,940	16,419
1970	2,907		181	11	426	1,198	723	1,779	224								7,448	3,873	0	19	92		3,983	11,432
1971	3,721		280	51	417	1,492	938	1,555	317				1				8,773	7,804	0	8	555		8,367	17,140
1972	4,212		107	27	405	842	944	1,107	197				14				7,854	11,656	45	15	1,646		13,362	21,216
1973	2,266		110	63	728	2,108	526	2,351	636				33				8,821	9,639	21	54	1,084		10,798	19,619
1974	4,106		108	43	1,069	1,656	1,192	6,019	754				47			15	15,010	5,243	30	58	344		5,675	20,685
1975	4,491		215	41	846	1,031	1,401	2,433	808				61			5	11,332	7,353	84	34	2,145		9,616	20,948
1976	2,148		87	83	233	830	1,082	2,996	1,237				17			2	8,716	8,652	25	21	1,968		10,666	19,381
1977	5,110		155	23	183	2,166	2,256	2,257	1,052				131			2	13,335	3,259	13	19	2,186		5,477	18,811
1978	10,427		444	7	204	4,517	1,154	2,546	2,276				66			2	21,645	4,663	6	5	545		5,218	26,863
1979	13,881		220	35	509	2,655	1,250	4,558	2,429				58				25,595	5,889	6	11	213		6,119	31,715
1980	11,327		140	40	671	1,531	1,392	2,521	1,953				114			5	19,693	2,327	24	7	582		2,940	22,634
1981	25,422		313	29	277	1,777	754	2,129	2,653				179				33,532	867	14	9	218		1,109	34,641
1982	19,234		206	20	512	864	1,777	1,667	1,709	31			207		2		26,228	2,639	2	11	506		3,159	29,387
1983	14,774		87	8	130	2,028	356	972	1,117	13			175	9	2		19,670	629	11	33	214		887	20,557
1984	4,433		57	22	85	1,874	587	2,234	868	4			477	5		8	10,655	673	29	49	166		917	11,573
1985	4,154		38	9	67	1,850	1,817	2,562	1,175	1			210	80	11		11,975	3,320	28	89	676		4,113	16,089
1986	7,412		30	14	72	1,467	1,086	2,914	719	344			70	16	13		14,157	4,851	57	12	189		5,109	19,266
1987	8,653		30	33	181	880	1,565	2,198	445	89			365	21	14		14,474	861	20	34	119		1,033	15,507
1988	3,583	22	51	30	106	1,124	907	843	498	32			108	197	37	25	7,562	923	50	6	447	1	1,427	8,989
1989	6,077	113	37	32	172	903	754	748	283	71			205	259	51	3	9,707	1,046	21	112	57		1,236	10,943
1990	2,834	155	42	27	267	1,250	536	716	455	132			189	149	299	16	7,067	1,380	92	65	50		1,587	8,653
1991	4,336	5,472	48	20	170	2,069	286	1,485	650	265			342		107	12	15,262	410	6	92	9		517	15,779
1992	4,255	2,907	85	16	428	915	166	1,208	1,081	288			464	73	3	5	11,896	1,928	61	110	0		2,099	13,994
1993	5,156	1,444	145	10	667	546	129	848	365	40			471	1		3	9,825	580	103	298			981	10,806
1994	7,345	786	238	20	968	4,111	162	1,158	398	50			559				15,795	906	59	89	63	2	1,118	16,914
1995	5,334	13,575	107	10	571	4,778	270	1,859	586	821			335			2	28,248	657	49	258	11		975	29,224
1996	5,540	2,104	123	9	778	3,640	94	1,149	570	102			956				15,066	4,639	70	40	3,700		8,449	23,514
1997	6,137	7,015	142	12	1,158	2,740	34	803	811	1,054			1,814				21,720	2,240	133	156	367		2,897	24,617
1998	2,715	2,676	169	10	1,086	2,876	85	874	700	188			1,910				13,289	1,771	281	413	1	0	2,466	15,755
1999	11,619	4,554	127	17	1,030	3,440	35	1,097	709	256			3,089				25,973	184	184	441	2,369	35	3,213	29,185
2000	8,193	8,293	121	7	832	5,217	102	1,125	689	2,401		0	2,780			2	29,760	693	61	342	3,019	99	4,214	33,974
2001	3,139	4,481	63	6	728	3,466	180	1,366	782	1,176		10	1,839			4	17,241	292	48	356	863		1,559	18,800
2002	3,922	4,981	47	5	794	2,607	99	1,100	631	932		1	1,523			4	16,646	50	12	654	1,708	2	2,427	19,073
2003	956	4,812	85	12	1,152	2,060	44	839	446	2,601		0	1,863			21	14,892	22	18	394	3,211	43	3,689	18,580
2004	4,934	3,323	231	9	1,616	2,445	132	896	514	773		0	1,714			3	16,589		11	49	8,880	14	8,954	25,543
2005	4,034	8,783	107	14	1,818	3,633	549	2,182	548	1,318			1,368			2	24,356	201	7	79	4,542		4,830	29,186
2006	3,644	5,236	63	11	1,058	1,860	108	1,421	777	1,012			1,149			1	16,340		2	96	9,927		10,025	26,365
2007	2,965	3,875	83	8	2,004	2,823	236	1,503	1,209	1,281			1,401			10	17,398	42	2	14	4,147		4,205	21,603
2008	3,029	7,192	19	8	1,476	2,377	64	2,358	1,192	1,866			979			2	20,562		1	93	4,392	15	4,501	25,063
2009	2,127	5,950	8	7	1,304	2,003	50	2,236	913	936			877			11	16,422	410	5	176	3,019		3,610	20,032
2010	1,122	2,620	5	6	903	1,583	83	1,047	918	1,196			373			36	9,892		1	122	7,746		7,869	17,761
2011	2,227	6,113	9	11	933	1,820	63	1,957	654	670	0		292			24	14,772		(120)	(499)	2,730	1	3,350	(18,122)
2012	1,043	1,419	_5	_5	(594)	570	113	1,765	779	1,421	1		210			3	7,918		(43)	(617)	(6,667)	(1)	7,328	(15,246)

1 Part of Japanese catch is estimated by the WG from best available source for the stock assessment use.

2 Japanese troll catch since 1998 includes catch for farming.

3 Catch statistics of Korea derived from Japanese Import statistics for 1982-1999.

4 US in 1952-1958 contains catch from other countries - primarily Mexico. Other includes catches from gillnet, troll, pole-and-line, and longline.

5 The catch for Japanese coastal longline in 2011 includes that for the distant water and offshore lonliners.

Table 14-3. Annual catch of swordfish (*Xiphias gladius*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1951-2010. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton.
Provisional estimates in ().

	Japan								Mexico	United States[6]						Chinese Taipei[5]												Korea			Grand Total
										Hawaii	California																			
Year	Distant-water and Offshore Longline	Coastal and Other Longline	Squid Driftnet and Driftnet	Harpoon[3]	Bait Fishing	Trapnet	Other[4]	Japan Total	All Gears	Longline	Longline	Gill Net	Harpoon	Unknown[7]	US Total	Distant-water Longline	Offshore Longline	Offshore Gillnet	Offshore Others	Coastal Harpoon	Coastal Setnet	Coastal Gillnet & Other Net	Coastal Longline	Coastal Others	Other	Chinese Taipei Total	Longline	High-seas Drift Gillnet	Korea Total	
1951	7,246	115	10	4,131	88	78	10	11,678	-	-	-	-	-	-	-												-	-	-	0
1952	8,890	152	0	2,569	6	68	6	11,691	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1953	10,796	77	0	1,407	20	21	87	12,408	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1954	12,563	96	0	813	104	18	17	13,610	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1955	13,064	29	0	821	119	37	41	14,111	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1956	14,596	10	0	775	66	31	7	15,486	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1957	14,268	37	0	858	59	18	11	15,251	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1958	18,525	42	0	1,069	46	31	21	19,734	-	-	-	-	-	-	-	-	-									-	-	-	-	0
1959	17,236	66	0	891	34	31	10	18,267	-	-	-	-	-	-	-	-	427								91	518	-	-	-	518
1960	20,058	51	1	1,191	23	67	7	21,400	-	-	-	-	-	-	-	-	520								127	647	-	-	-	647
1961	19,715	51	2	1,335	19	15	11	21,147	-	-	-	-	-	-	-	-	318								73	391	-	-	-	391
1962	10,607	78	0	1,371	26	15	18	12,115	-	-	-	-	-	-	-	-	494								62	556	-	-	-	556
1963	10,322	98	0	747	43	17	16	11,244	-	-	-	-	-	-	-	-	343								18	361	-	-	-	361
1964	7,669	91	4	1,006	40	16	26	8,852	-	-	-	-	-	-	-	-	358								10	368	-	-	-	368
1965	8,742	119	0	1,908	26	14	182	10,991	-	-	-	-	-	-	-	-	331								27	358	-	-	-	358
1966	9,866	113	0	1,728	41	11	4	11,763	-	-	-	-	-	-	-	-	489								31	520	-	-	-	520
1967	10,883	184	0	891	33	12	5	12,008	-	-	-	-	-	-	-	-	646								35	681	-	-	-	681
1968	9,810	236	0	1,539	41	14	9	11,649	-	-	-	-	-	-	-	-	763								12	775	-	-	-	775
1969	9,416	296	0	1,557	42	11	14	11,336	-	-	-	-	-	-	-	0	843								7	850	-	-	-	850
1970	7,324	427	0	1,748	36	9	3	9,547	-	5	-	-	612	10	627	-	904								5	909	-	-	-	909
1971	7,037	350	1	473	17	37	31	7,946	-	1	-	-	99	3	103	-	992								3	995	0	-	0	995
1972	6,796	531	55	282	20	1	2	7,687	2	0	-	-	171	4	175	-	862								11	873	0	-	0	873
1973	7,123	414	720	121	27	23	2	8,430	4	0	-	-	399	4	403	-	860								119	979	0	-	0	979
1974	5,983	654	1,304	190	27	16	2	8,176	6	0	-	-	406	22	428	1	880								136	1,017	0	-	0	1,017
1975	7,031	620	2,672	205	58	18	2	10,606	-	0	-	-	557	13	570	29	899								153	1,081	0	-	0	1,081
1976	8,054	750	3,488	313	170	14	12	12,801	-	0	-	-	42	13	55	23	613								194	830	0	-	0	830
1977	8,383	880	2,344	201	71	7	2	11,888	-	17	-	-	318	19	354	36	542								141	719	219	-	219	938
1978	8,001	1,031	2,475	130	110	22	1	11,770	-	9	-	-	1,699	13	1,721	-	546								12	558	68	-	68	626
1979	8,602	1,038	983	161	45	15	4	10,848	7	7	-	-	329	57	393	7	661								33	701	-	-	-	701
1980	6,005	849	1,746	398	29	15	1	9,043	380	5	-	160	566	62	793	10	603								76	689	64	-	64	753
1981	7,039	727	1,848	129	58	9	3	9,813	1,575	3	0	473	271	2	749	2	656								25	683	-	-	-	683
1982	6,064	874	1,257	195	58	7	1	8,456	1,365	5	0	945	156	10	1,116	1	855								49	905	48	-	48	953
1983	7,692	999	1,033	166	30	9	2	9,931	120	5	0	1,693	58	7	1,763	0	783								166	949	11	-	11	960
1984	7,177	1,177	1,053	117	98	13	0	9,635	47	3	12	2,647	104	75	2,841	-	733								264	997	48	-	48	1,045
1985	9,335	999	1,133	191	69	10	0	11,737	18	2	0	2,990	305	104	3,401	-	566								259	825	24	-	24	849
1986	8,721	1,037	1,264	123	47	9	0	11,201	422	2	0	2,069	291	109	2,471	-	456								211	667	9	-	9	676
1987	9,495	860	1,051	87	45	11	0	11,549	550	24	0	1,529	235	31	1,819	3	1,328								190	1,521	44	-	44	1,565
1988	8,574	678	1,234	173	19	8	0	10,686	613	24	0	1,376	198	64	1,662	-	777								263	1,040	27	-	27	1,067
1989	6,690	752	1,596	362	21	10	0	9,431	690	218	0	1,243	62	56	1,579	50	1,491								38	1,579	40	-	40	1,619
1990	5,833	690	1,074	128	13	4	0	7,742	2,650	2,436	0	1,131	64	43	3,674	143	1,309								154	1,606	61	-	61	1,667
1991	4,809	807	498	153	20	5	0	6,292	861	4,508	27	944	20	44	5,543	40	1,390								180	1,610	5	-	5	1,615
1992	7,234	1,181	887	381	16	6	0	9,705	1,160	5,700	62	1,356	75	47	7,240	21	1,473								243	1,737	8	-	8	1,745
1993	8,298	1,394	292	309	43	4	1	10,341	812	5,909	27	1,412	168	161	7,677	54	1,174								310	1,538	15	-	15	1,553
1994	7,366	1,357	421	308	37	4	0	9,493	581	3,176	631	792	157	24	4,780	-	1,155								219	1,374	66	-	66	1,440
1995	6,422	1,387	561	423	34	7	0	8,834	437	2,713	268	771	97	29	3,878	50	1,135								225	1,410	10	-	10	1,420
1996	6,916	1,067	428	597	45	4	0	9,057	439	2,502	346	761	81	15	3,705	9	701	2	-	19	10	-	-	-		741	15	-	15	756
1997	7,002	1,214	365	346	62	5	0	8,994	2,365	2,881	512	708	84	11	4,196	15	1,358	1	1	27	8	-	24	-		1,434	100	-	100	1,534
1998	6,233	1,190	471	476	68	2	0	8,440	3,603	3,263	418	931	48	19	4,679	20	1,178	8	-	17	15	1	-	-		1,239	153	-	153	1,392
1999	5,557	1,049	724	416	47	5	0	7,798	1,136	3,100	1,229	606	81	27	5,043	70	1,385	4	-	51	5	1	-	-		1,516	132	-	132	1,648
2000	6,180	1,121	808	497	49	5	0	8,660	2,216	2,949	1,885	646	90	9	5,579	325	1,531	5	-	74	5	1	1	-		1,942	202	-	202	2,144
2001	6,932	908	732	230	30	15	0	8,847	780	220	1,749	375	52	5	2,401	1,039	1,691	17	-	64	8	1	1	-		2,821	438	-	438	3,259
2002	6,230	965	1,164	201	29	11	0	8,600	465	204	1,320	302	90	3	1,919	1,633	1,557	7	1	1	16	1	1	-		3,217	439	-	439	3,656
2003	5,376	1,063	1,198	149	28	4	0	7,818	671	147	1,812	216	107	0	2,282	1,084	2,196	3	-	-	8	-	-	-		3,291	381	-	381	3,672
2004	5,395	1,509	1,062	229	30	4	0	8,229	270	213	898	169	62	37	1,379	884	1,828	5	-	-	7	1	-	3		2,728	410	-	410	3,138
2005	5,359	1,294	956	187	337	3	0	8,136	235	1,622		220	76	0	1,918	437	1,813	1	-	-	5	2	-	18		2,276	434	-	434	2,710
2006	6,181	1,507	796	244	342	5	1	9,076	347	1,211		444	71	2	1,728	-	-	-	-	-	-	-	-	-	-	-	477	-	477	477
2007	6,109	2,016	829	122	367	2	1	9,446	383	1,735		484	58	0	2,277	-	-	-	-	-	-	-	-	-	-	-	452	-	452	452
2008	4,402	1,785	648	173	349	3	0	7,363	84	1,980		280	33	1	2,294	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2009	4,400	1,536	682	239	249	3	0	7,110	-	1813[1]		172[1]	34[1]	1[1]	2,020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2010	4240	1084	483	110	230	8	0	6156	0	1654[1]		33[1]	22[1]	4[1]	1713	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2011	(3,046)	(870)	(189)	(10)	(233)	(2)	()	(4,352)	()	()	()	()	()	()	()		()		()		()		()		()	()		()		-
2012	3129	(614)	(300)	(100)	(200)	()	()	(4,343)																						

[1] Catch data are currently unavailable for Republic of Korea, Philippines, and some other countries catching swordfish in the North Pacific.
[2] Catches by gear for 1952-1970 were estimated roughly using FAO statistics and other data. Catches for 1971-2002 are more reliably estimated.
[3] Contrains trolling and harpoon but majority of catch obtained by harpoon.
[4] For 1952-1970 "Other" refers to catches by net fishing and various unspecified gears.
[5] Offshore longline category includes some catches from harpoon and other fisheries but does not include catches unloaded in foreign ports.
[6] Estimated round weight of retained catch. Does not include discards.
[7] Unknown includes pole and line, purse seine, troll and troll/handline, half ring, and unspecified gears.

Table 14-4. Annual catch of striped marlin (*Kajikia audax*) in metric tons for fisheries monitored by ISC for assessments of North Pacific Ocean stocks, 1951-2011. Blank indicates no effort. - indicates data not available. 0 indicates less than 1 metric ton. Provisional estimates in ().

	Japan							Mexico			United States					Chinese Taipei[2]										Korea				
Year	Distant-water and Offshore Longline	Coastal Longline	Other Longline	Small Mesh Gillnet	Large Mesh Gillnet	Other[3]	Japan Total	Longline	Sport[2]	Mexico Total	Longline	Troll	Handline	Sport[2]	US Total	Distant-water Longline	High-seas Drift Gillnet	Offshore Longline	Offshore Gillnet	Offshore Others	Coastal Harpoon	Coastal Setnet	Gillnet & Other net	Coastal Longline	Coastal Others	Other	Chinese Taipei Total	Longline	High-seas Drift Gillnet	Korea Total	Grand Total
1951	2,494	-	673	-	0	1,281	4,448																							0
1952	2,901	-	722	-	0	1,564	5,187							23	23												-	-	-	-	0
1953	2,138	-	47	-	0	954	3,139							5	5												-	-	-	-	0
1954	3,068	-	52	-	0	1,088	4,207							16	16												-	-	-	-	0
1955	3,082	-	28	-	0	1,038	4,148							5	5												-	-	-	-	0
1956	3,729	-	59	-	0	1,996	5,785							34	34												-	-	-	-	0
1957	3,189	-	119	-	0	2,459	5,767							42	42												-	-	-	-	0
1958	4,106	-	277	-	3	2,914	7,300							59	59			543								387	930	-	-	-	930
1959	4,152	-	156	-	2	3,191	7,501							65	65			391								354	745	-	-	-	745
1960	3,862	-	101	-	4	1,937	5,904							30	30			398								350	748	-	-	-	748
1961	4,420	-	169	-	2	1,797	6,388							24	24			306								342	648	-	-	-	648
1962	5,739	-	110	-	8	1,912	7,769							5	5			332								211	543	-	-	-	543
1963	6,135	-	62	-	17	1,910	8,124							68	68			560								199	759	-	-	-	759
1964	14,304	-	42	-	2	2,344	16,692							58	58			392								175	567	-	-	-	567
1965	11,602	-	19	0	1	2,794	14,416							23	23			355								157	512	-	-	-	512
1966	8,419	-	112	0	2	1,570	10,103							36	36			370								180	550	-	-	-	550
1967	11,698	-	127	0	3	1,551	13,379							49	49	2		385								204	591	-	-	-	591
1968	15,913	-	230	0	0	1,043	17,186							51	51	1		332								208	541	-	-	-	541
1969	8,544	600	3	0	3	2,668	11,818							30	30	2		571								192	765	-	-	-	765
1970	12,996	690	181	0	3	1,032	14,902							18	18	0		495								189	684	-	-	-	684
1971	10,965	667	259	0	10	2,042	13,943							17	17	0		449								135	584	0	-	0	584
1972	7,006	837	145	0	243	993	9,224							21	21	9		380								126	515	0	-	0	515
1973	6,357	632	118	0	3,265	702	11,074							9	9	1		568								139	708	0	-	0	708
1974	6,700	327	49	0	3,112	775	10,963							55	55	24		650								118	792	0	-	0	792
1975	5,281	286	38	0	6,534	686	12,825							27	27	64		732								96	892	0	-	0	892
1976	5,136	244	34	0	3,561	585	9,560							31	31	32		347								140	519	0	-	0	519
1977	3,019	256	15	0	4,424	547	8,261							41	41	17		524								219	760	43	-	43	803
1978	3,957	243	27	0	5,593	546	10,366							37	37	0		618								78	696	28	-	28	724
1979	5,561	366	21	0	2,532	526	9,006							36	36	26		432								122	580	-	-	-	580
1980	6,378	607	5	0	3,467	536	10,993							33	33	61		223								132	416	37	-	37	453
1981	4,106	259	12	0	3,866	542	8,785							60	60	17		491								95	603	-	-	-	603
1982	5,383	270	13	0	2,351	656	8,673							41	41	7		397								138	542	39	-	39	581
1983	3,722	320	10	22	1,845	827	6,746							39	39	0		555								214	769	19	-	19	788
1984	3,506	386	9	76	2,257	719	6,953							36	36	0		965								330	1,295	23	-	23	1,318
1985	3,897	711	24	40	2,323	733	7,728					18		42	60	0		513								181	694	16	-	16	710
1986	6,402	901	33	48	3,536	577	11,497	-				19		19	38	0		179								148	327	61	-	61	388
1987	7,538	1,187	6	32	1,856	513	11,132	-			272	30	1	28	331	31		383								151	565	1	-	1	566
1988	6,271	752	7	54	2,157	668	9,909	-			504	54		30	588	7		457								169	633	11	-	11	644
1989	4,740	1,081	13	102	1,562	537	8,035	-			612	24	0	52	688	8		184								157	349	26	-	26	375
1990	2,368	1,125	3	19	1,926	545	5,986	-	181	181	538	27	0	23	588	2		137								256	395	315	-	315	710
1991	2,845	1,197	3	27	1,302	507	5,881	-	75	75	663	41	0	12	716	36		254								286	576	141	-	141	717
1992	2,955	1,247	10	35	1,169	303	5,719	-	142	142	459	38	1	25	523	1		219								197	417	318	-	318	735
1993	3,476	1,723	1	-	828	708	6,736	-	159	159	471	68	1	11	551	5		221								142	368	388	-	388	756
1994	2,911	1,284	1	-	1,443	383	6,022	-	179	179	326	35	0	17	378	1		137								196	334	1,045	-	1045	1,379
1995	3,494	1,840	3	-	970	283	6,590	-	190	190	543	52	0	14	609	27		83								82	192	307	-	307	499
1996	1,951	1,836	4	-	703	152	4,646	-	237	237	418	54	1	20	493	26		162	8	6	30	3	-	-	-	-	235	429	-	429	664
1997	2,120	1,400	3	-	813	163	4,499	-	193	193	352	38	1	21	412	59		290	9	-	33	3	-	2	-	-	396	1,017	-	1017	1,413
1998	1,784	1,975	2	-	1,092	304	5,157	-	345	345	378	26	0	23	427	90		205	15	-	19	6	1	9	-	-	345	635	-	635	980
1999	1,608	1,551	4	-	1,126	184	4,473	-	266	266	364	28	1	12	405	66		128	7	-	26	5	1	3	-	-	236	433	-	433	669
2000	1,152	1,109	8	-	1,062	297	3,628	-	312	312	200	14	1	10	225	153		161	17	1	29	6	1	1	-	-	369	537	-	537	906
2001	985	1,326	11	-	1,077	237	3,636	-	237	237	351	42	2	-	395	121		129	16	-	30	5	-	-	-	-	301	254	-	254	555
2002	764	796	5	-	1,264	290	3,119	-	305	305	226	30	0	-	256	251		226	14	-	6	8	1	-	-	-	506	188	-	188	694
2003	1,013	842	3	-	1,064	203	3,124	-	322	322	552	29	0	-	581	241		91	26	-	11	5	1	-	-	-	375	206	-	206	581
2004	699	1,000	2	-	1,339	92	3,132	-	-	0	376	34	1	-	411	261		95	8	1	7	5	2	-	1	-	380	75	-	75	455[1]
2005	562	668	1	0	1,214	98	2,543	-	-	0	511	20	0	-	531	176		76	1	-	5	9	9	-	8	-	284	141	-	141	425[1]
2006	623	539	1	0	1,190	95	2,448	-	-	-	611	21	0	-	632	-	-	-	-	-	-	-	-	-	-	-	123[4]	56	-	56	179[1]
2007	306	860	5	-	970	79	2,220	-	-	-	276	13	0	-	289	-	-	-	-	-	-	-	-	-	-	-	260[4]	28	-	28	288[1]
2008	390	609	10	-	1,302	97	2,408	-	-	-	426	14	0	-	440	-	-	-	-	-	-	-	-	-	-	-	196[4]	-	-	56[5]	252[1]
2009	166	451	21	-	821	90	1,550	-	-	-	256[1]	10[1]	0[1]	-	266[1]	-	-	-	-	-	-	-	-	-	-	-	198[4]	-	-	44[5]	242[1]
2010	187	641	42	-	899	82	1850[5]	0	0	0	158[1]	5[1]	0[1]	0	163[1]	-	-	-	-	-	-	-	-	-	-	-	183[4]	-	-	30[5]	213[1]
2011	(319)	(698)	(55)	-	(333)	(88)	(1,493)	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	(302)	(505)	()	-	(500)	(100)	(1,407)																								

[1] Provisional data
[2] Estimated from catch in number of fish
[3] Contrains bait fishing, net fishing, trapnet, trolling, harpoon, etc.
[5] From Appendix

Table14-5. 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.
Blanks indicate no effort or data not available; zero indicates less than 0.5 mt. Other values rounded up to the nearest ton.

Year	Japan				Korea		Chinese Taipei		China	USA			Mexico		Canada
	Offshore and Distant-water Longline	Coastal Longline	Drift Net	Other	Drift Net	Longline	Drift Net	Longline	Longline	Drift Net	Longline	Other	Longline	Drift Net	Misc. Gears
1980								9061							
1981								8223							
1982								8694							
1983								7558							
1984								6954							1
1985								8019		0		1			
1986								6944		1		1			
1987								5536		1		1			
1988								5557		0		3			
1989								5851				6			
1990								6422		0		20			
1991								6740		0		1			
1992								5426		1		1			
1993								5299		0		0			
1994	12305	79						4374		0		12			
1995	11201	157						7087		0		5			
1996	12730	176						7689		0		0			
1997	15830	75						9512		0		0			
1998	14231	64						8204		0		1			
1999	15751	2						10628		0		0			
2000	16041	11						14829		0		0			
2001	16386	5						7580				0			
2002	15500	14						8805				0			
2003	15456	22						8730		0		0			
2004	13136	42						9775				0			
2005	12624	31						10857				0			
2006	11093	50						11351				0			
2007	8994	41						10906		9	8	0			
2008	7252	227						11026	134		7				
2009	7943	163						11541	298	1	9	0			
2010	7652	181				0		7670	358	0	7	0			
2011	3767	262				5		13117			13	0			
2012	6038	179				34		10549			16				

All data are considered preliminary
Notes:
Japan data are from WG correspondent submission
Korea data are from WG correspondent submission
Chinese Taipei data are from ISC12 Plenary Table and update for 2009-2012 from Chinese Taipei National Report
China data are sum of North Pacific WCPFC, IATTC and Kiribati data provided to STATWG
USA data are from WG correspondent; other may include sport landings
Canada data are from WG correspondent submission